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MINERALS YEARBOOK

AREA REPORTS

Volume III

1 9 5 2

Prepared by the field staff of the

U.S. BUREAU OF MINES

REGIONAL MINERAL INDUSTRY DIVISIONS

UNITED STATES DEPARTMENT OF THE INTERIOR

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FOREWORD

The presentation of the MINERALS YEARBOOK, 1952, in three volumes initiates a change made necessary by an increase in YEARBOOK material that could no longer be published under a single cover without increasing the book to a thickness that caused binding problems and to a weight that inconvenienced the reader. The change is one of several made over the years to meet expansion in the mineral industry and new needs of the reading public.

From initiation of this series as "Reports Upon the Mineral Resources of the United States" published in 1867 by the Treasury Department, the series has appeared as "Mineral Resources West of the Rocky Mountains," as a part of the "Annual Report of the Geological Survey," as "Mineral Resources of the United States," and as the "Minerals Yearbook," the first volume of which covered 1932 and carried the title, "Minerals Yearbook, 1932–33."

In the current three-volume presentation, volume I is made up of chapters on mineral commodities, both metals and nonmetals, but exclusive of the mineral fuels. Included also are a chapter reviewing these mineral industries, a statistical summary and recapitulation, and chapters on mining technology, metallurgical technology, and employment and injuries.

Volume II, which is devoted to the mineral fuels, consists of chapters on each mineral-fuel commodity, as well as chapters reviewing the industry as a whole, a statistical summary, and an employment and injury presentation.

Volume III is made up of chapters covering each of the 48 States, plus chapters on Alaska, the Territories and island possessions in the Pacific Ocean, and the Territories and island possessions in the Caribbean Sea, including the Canal Zone. Volume III also has a chapter recapitulating its statistics in summary form on a regional basis and another presenting employment and injury data regionally.

The MINERALS YEARBOOK will continue to present the year's development in the mineral industry with enough background data to give significance to the current record. The three-volume YEARBOOK permits fuller coverage in all phases of the reports, but major expansion has been undertaken in the regional presentation (volume III) and in the review of technologic developments and problems.

The Bureau of Mines wishes to acknowledge again the cooperation of industry and of many Government groups in the preparation of the yearbook. Among the latter, some of the State geological surveys and mining bureaus are of great importance, particularly in their help in gathering and preparing the material that appears principally in volume III.

J. J. FORBES, *Director.*

ACKNOWLEDGMENTS

The chapters in this volume of the Minerals Yearbook, except for the two review chapters, were prepared by the field staff of the Regional Mineral Industry Divisions. The following supervised the preparation of the chapters: Alfred L. Ransome, acting chief, Mineral Industry Division, Region I; Albert J. Kauffman, Jr., chief, Mineral Industry Division, Region II; R. B. Maurer, chief, Mineral Industry Division, Region III; A. J. Martin, assistant chief for mineral statistics, Mineral Industry Division, Region IV; Samuel A. Gustavson, chief, Mineral Industry Division, Region V; F. F. Netzeband, chief, Statistics Branch, Mineral Industry Division, Region VI; J. R. Thoenen, chief, Mineral Industry Division, Region, VII; and R. H. Mote, chief, Mineral Industry Division, Region VIII. Overall supervision for the volume and its coordination with the material appearing in volume I, were carried out by Charles W. Merrill, Assistant Chief, Minerals Division. Acknowledgment is also due Harry Perry, assistant chief, Fuels and Explosives Division, for overseeing the coordination of the data in the volume with those in volume II.

The Bureau of Mines was assisted in the collection of statistical data and mineral industry information by State and Territorial agencies, through cooperative agreements. Many of the State chapters were reviewed by staff members of these agencies, and in some instances the staff members collaborated in preparation of the chapters and are shown as coauthors. For this assistance acknowledgment is made to to the following cooperating State organizations:

Alabama: Geological Survey of Alabama.
Alaska: Alaska Territorial Department of Mines.
Arkansas: Division of Geology.
California: Division of Mines.
Delaware: Delaware Geological Survey.
Florida: Florida Geological Survey.
Georgia: Department of Mines.
Illinois: Illinois State Geological Survey.
Indiana: Indiana Department of Conservation.
Iowa: Iowa Geological Survey
Kansas: State Geological Survey of Kansas.
Kentucky: Kentucky Geological Survey.
Louisiana: Louisiana Geological Survey.
Maine: Maine Geological Survey.
Maryland: Department of Geology.
Michigan: Michigan Department of Conservation.
Mississippi: Mississippi Geological Survey.
Missouri: Division of Geological Survey.
Montana: Montana State Bureau of Mines & Geology.
Nevada: Conservation and Survey Division.
New Hampshire: Mineral Resources Committee.
New Jersey: Bureau of Geology & Topography.
New York: New York State Science Service.
North Carolina: Division of Mineral Resources.
North Dakota: North Dakota Geological Survey.
Oklahoma: Oklahoma Geological Survey.
Oregon: State Department of Geology and Mineral Industries.

Pennsylvania: Bureau of Topographic & Geologic Survey.
South Carolina: South Carolina Geological Survey.
South Dakota: State Geological Survey.
Tennessee: Tennessee Department of Conservation.
Texas: Bureau of Economic Geology.
Utah: Utah Geological and Mineralogical Survey.
Virginia: Department of Conservation and Development
Washington: State of Washington Division of Mines and Geology.
West Virginia: West Virginia Geological and Economic Survey.
Wisconsin: Wisconsin Geological & Natural History Survey.
Wyoming: The Geological Survey of Wyoming.

The data presented in the Minerals Yearbook are largely based upon information obtained from mineral producers, processors, and users, and acknowledgment is made of this indispensable cooperation given by industry.

Statisticians and researchers in the Mineral Industry Division who gave substantial assistance to the authors of the chapters were: In Region I, Opal Y. Sharman; in Region II, Catherine M. Vroman; in Region III, Roy Y. Ashizawa; in Region IV, Stella K. Drake, Virginia C. Halverson, and Francis J. Kelly; in Region V, Matthew G. Sikich; in Region VI, Naomi R. Harrison and Jo D. Stallings; in Region VIII, Roy H. Davis.

The review of the manuscripts on which this volume is based to insure statistical consistency between the tables, figures, and text, between this volume and volumes I and II, and between this volume and previous Minerals Yearbooks, was carried out by a group of Minerals Division personnel under the direct supervision of Kathleen J. D'Amico, assisted by Julia Muscal, Jane Doughman, and Adelaide Crickenberger. Many of the charts were drafted by Anne Rogers, with the assistance of Gene Nicolai of the Bureau's Pittsburgh office.

Editing of the volume and its preparation for the printer were done by Mabel E. Winslow, who also prepared the index.

CHARLES W. MERRILL,
Assistant Chief, Minerals Division.

CONTENTS

Statistical Summary of Mineral Production

By Kathleen J. D'Amico[1]

THIS SUMMARY corresponds in form and content with those presented in preceding editions of Minerals Yearbook. Volume I of this edition, which covers all mineral commodities except fuels, and volume II, mineral fuels, also include statistical summary chapters.

Statistics used in this chapter to derive total mineral production of the United States represent primary products only; that is, they exclude products from scrap. Geographically, the figures represent the 48 States, the District of Columbia, and the Territories and possessions of the United States. World production and the proportion of the total produced by the United States is also shown.

Mineral production may be measured at any of several stages of extraction and processing. The term "mine production" 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 at or near mines, such as sizing and cleaning (coal), and concentrating (metallic ores).

Because of inadequacies in the available statistics, some series deviate from the foregoing definition. In particular, the limestone, cement rock, and clay processed into cement are reflected in the series on cement rather than being included in their originally extracted form; similarly, limestone used for lime is reflected in the series on lime rather than in that on stone. The quantities of gold, silver, copper, lead, zinc, and tin are recorded on a mine basis—that is, as the recoverable content of ore sold or treated; the values assigned to these quantities, however, are based on the average selling price of refined metal, not the mine value. Mercury is measured in the form of recoverable metal and valued at the average New York price for metal.

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 the purchasing power of the dollar.

[1] Publications editor.

TABLE 1.—Value of mineral production in continental United States, 1925–52 by mineral groups [1]

[Million dollars]

Year	Mineral fuels [2]	Nonmetallic minerals (except fuels)	Metals	Total
1925	2,910	1,187	715	4,812
1926	3,371	1,219	721	5,311
1927	2,875	1,201	622	4,698
1928	2,666	1,163	655	4,484
1929	2,940	1,166	802	4,908
1930	2,500	973	507	3,980
1931	1,620	671	287	2,578
1932	1,460	412	128	2,000
1933	1,413	432	205	2,050
1934	1,947	520	277	2,744
1935	2,013	564	365	2,942
1936	2,405	685	516	3,606
1937	2,798	711	756	4,265
1938	2,436	622	460	3,518
1939	2,423	754	631	3,808
1940	2,662	784	752	4,198
1941	3,228	989	890	5,107
1942	3,568	1,056	999	5,623
1943	4,028	916	987	5,931
1944	4,574	836	900	6,310
1945	4,569	888	774	6,231
1946	5,090	1,243	729	7,062
1947	7,188	1,338	1,084	9,610
1948	9,502	1,552	1,219	12,273
1949	7,920	1,559	1,101	10,580
1950	8,689	1,815	1,351	11,855
1951	9,779	2,075	1,670	13,524
1952	9,615	2,156	1,611	13,382

[1] Data for 1925–46 are not strictly comparable with those for subsequent years, 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.
[2] Beginning with this volume asphalt, carbon dioxide, helium, and peat are included with "Mineral fuels."

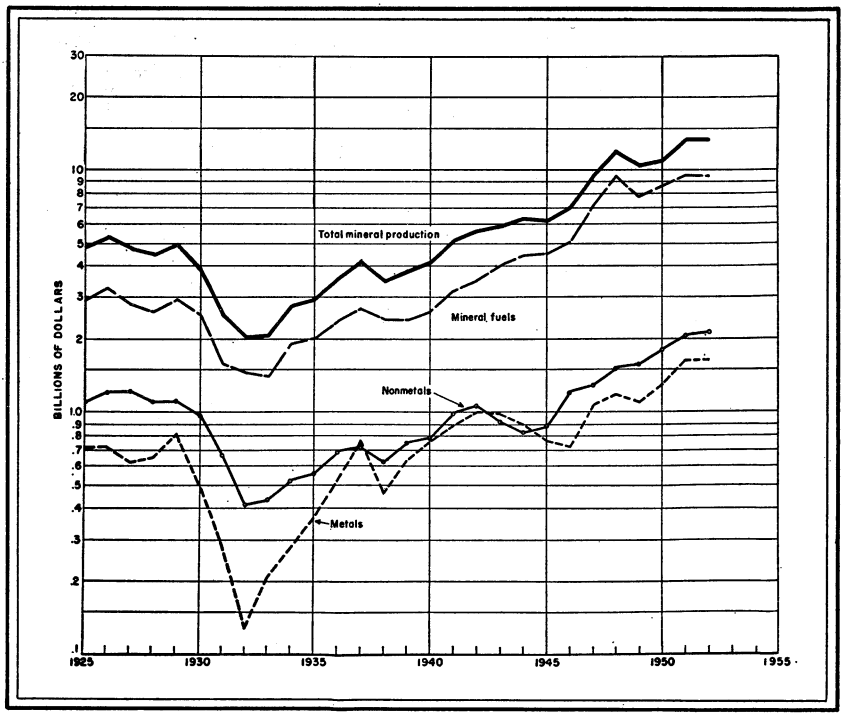

FIGURE 1.—Value of mineral production in continental United States, 1925–52.

TABLE 2.—Mineral production in continental United States, 1949–52 by individual minerals [1] [2]

Mineral	1949		1950		1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
MINERAL FUELS								
Asphalt and related bitumens (native): Bituminous limestone and sandstone	1,150,931	$4,264,989	1,184,676	$3,522,308	1,378,434	$4,159,259	1,570,698	$4,687,512
Gilsonite	51,462	1,303,584	66,186	1,774,330	65,521	1,895,374	60,740	1,779,815
Carbon dioxide, natural (estimated)—thousand cubic feet	489,000	376,000	472,334	369,000	547,436	161,000	737,000	226,250
Coal:								
Bituminous [3]	434,342,373	2,126,225,715	512,528,632	2,489,228,604	529,879,295	2,614,219,188	463,137,264	2,276,189,066
Lignite	3,092,130	7,335,553	3,369,966	8,111,730	3,291,104	8,043,962	3,017,300	7,211,912
Pennsylvania anthracite	42,701,724	358,008,451	44,076,703	392,398,006	42,669,997	405,817,963	40,582,558	379,714,076
Helium (shipments)—cubic feet	51,501,421	688,795	80,888,990	1,027,913	108,970,000	1,387,000	145,492,000	1,891,000
Natural gas—thousand cubic feet	5,419,736,000	344,034,063	6,282,060,000	408,521,516	7,457,359,000	542,964,400	8,013,457,000	623,649,460
Natural-gas liquids:								
Natural gasoline and cycle products—42-gallon barrels	99,217,000	303,136,000	109,679,000	321,832,000	118,377,000	369,718,000	121,482,000	371,468,000
LP-gases—do	57,869,000	99,054,000	72,282,000	97,773,000	86,377,000	138,443,000	102,033,000	161,692,000
Peat	129,532	1,020,014	130,723	1,142,566	194,416	1,489,225	210,582	1,729,511
Petroleum (crude)—42-gallon barrels	1,841,940,000	4,674,770,000	1,973,574,000	4,963,380,000	2,247,711,000	5,690,410,000	[4] 2,289,836,000	[4] 5,785,230,000
Total mineral fuels		7,920,000,000		8,689,000,000		9,779,000,000		9,615,000,000
NONMETALLIC MINERALS (EXCEPT FUELS)								
Abrasive stone: [5]								
Grindstones and pulpstones	4,507	246,679	4,468	232,562	5,571	315,871	3,974	247,434
Millstones	([6])	9,400	([6])	11,300	([6])	6,000	([6])	9,285
Pebbles (grinding)	2,374	64,038	1,923	53,007	3,062	84,306	4,140	96,537
Tube-mill liners (natural)	1,166	47,093	1,523	62,535	1,408	77,027	1,083	66,218
Asbestos	43,387	2,614,416	42,434	2,925,050	51,645	3,912,500	53,864	4,713,032
Barite (crude)	717,313	5,642,226	695,414	6,193,906	860,669	7,968,023	941,825	8,797,944
Boron minerals	467,592	11,511,893	647,735	15,890,000	862,797	20,030,000	583,828	14,105,000
Bromine—pounds	88,725,709	16,267,908	98,502,300	18,794,978	129,563,073	26,179,556	156,201,577	30,639,292
Calcium-magnesium chloride—75-percent (Ca, Mg) Cl_2 basis	255,797	3,260,675	299,821	3,801,508	328,042	4,756,242	([7])	([7])
Cement—376-pound barrels	207,142,364	475,074,352	228,787,765	537,651,523	240,331,112	611,751,089	250,821,410	637,746,171
Clays (including fuller's earth) [8]	28,473,844	74,618,654	32,301,425	89,675,599	[9] 35,612,343	[9] 120,569,827	33,847,609	122,385,736
Emery	4,909	60,917	5,949	75,308	11,634	160,212	10,352	141,911
Feldspar (crude)—long tons	369,378	2,278,441	407,925	2,558,390	400,439	2,815,587	420,831	3,696,018
Fluorspar	236,704	8,266,754	301,510	10,619,717	347,024	14,369,521	331,273	15,353,634
Garnet (abrasive)	6,578	505,231	9,304	793,558	14,050	1,246,947	11,390	981,841
Gem stones (estimated)	([6])	450,000	([6])	450,000	([6])	450,000	([6])	490,000
Graphite	5,213	475,264	5,605	427,908	6,808	771,434	5,081	594,618
Gypsum (crude)	6,608,118	18,318,553	8,192,625	22,734,568	8,665,534	24,024,101	8,415,300	22,896,051
Kyanite	12,115	403,169	([7])	([7])	([7])	([7])	([7])	([7])
Lime (open-market)	6,302,551	68,907,830	7,462,109	82,847,301	8,236,422	96,507,144	8,055,609	94,795,435
Lithium minerals	4,838	345,970	9,306	579,922	12,897	896,000	15,611	1,052,000

For footnotes, see end of table.

TABLE 2.—Mineral production in continental United States, 1949–52, by individual minerals [1] [2]—Continued

Mineral	1949		1950		1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
NONMETALLIC MINERALS (EXCEPT FUELS)—continued								
Magnesite (crude)	287,315	$1,950,153	429,392	$3,091,135	670,167	$4,506,712	510,750	$2,871,548
Magnesium compounds from sea water and brines (except for metal)—MgO equivalent	63,000	5,033,000	89,300	7,283,000	106,414	8,996,198	143,795	12,229,234
Marl:								
Calcareous (except for cement)	166,800	231,975	347,843	246,451	269,955	233,787	260,213	187,148
Greensand	6,128	276,564	3,935	304,321	5,067	263,944	4,600	177,847
Mica:								
Scrap	32,856	795,782	69,360	1,742,616	71,871	1,884,087	75,236	1,954,286
Sheet—pounds	513,994	132,097	578,818	125,928	594,884	160,322	697,989	908,135
Olivine	3,528	56,850	4,103	59,402	(7)	(7)	(7)	(7)
Perlite (crude)	71,203	510,646	101,536	649,162	[9] 153,502	[9] 858,099	164,845	1,002,920
Phosphate rock—long tons	8,986,933	51,415,027	10,253,552	59,027,848	11,095,204	66,158,078	11,324,158	68,120,918
Potassium salts—K_2O equivalent	1,120,653	35,105,799	1,276,164	39,774,447	1,408,408	44,788,880	1,598,354	53,754,316
Pumice and pumicite	716,742	2,369,082	719,356	2,661,052	749,192	2,739,907	597,044	2,266,981
Pyrites—long tons	888,388	3,904,000	931,163	4,059,000	1,017,769	4,656,000	994,342	4,947,000
Quartz from pegmatites and quartzite	107,552	475,491	160,508	706,724	281,047	1,165,370	246,604	1,013,637
Salt (common)	15,559,551	53,548,916	16,616,264	59,774,118	20,196,565	69,615,662	19,532,276	70,870,767
Sand and gravel	315,895,407	245,660,928	367,304,408	292,559,011	[9] 393,644,618	[9] 329,870,466	424,605,508	344,568,531
Sand and sandstone (ground)	610,789	5,258,464	750,673	6,462,503	818,479	7,163,343	792,802	6,922,586
Slate	740,260	12,164,276	930,370	15,047,481	[9] 819,360	[9] 14,534,327	739,640	12,706,651
Sodium carbonate (natural)	[10] 200,496	[10] 4,163,714	351,075	7,543,769	350,688	8,368,037	323,479	7,828,033
Sodium sulfate (natural)	186,223	2,733,853	186,537	2,199,336	(7)	(7)	236,825	3,217,000
Stone [11]	222,548,750	339,442,316	250,844,240	387,910,538	[9] 284,155,499	[9] 433,924,525	299,005,371	461,064,048
Sulfur:								
Ore for direct agricultural use—long tons	5,392	101,991	3,247	60,115	3,945	75,609	4,686	91,310
Frasch-process—do	4,789,311	86,208,000	5,504,714	104,000,000	4,988,101	107,300,000	5,141,392	110,925,000
Talc, pyrophyllite, and soapstone (ground)	461,896	7,523,478	620,750	10,620,743	636,068	11,322,830	593,147	11,347,317
Tripoli	25,525	690,564	43,720	1,173,647	37,476	1,105,135	35,459	1,043,124
Vermiculite	168,819	1,686,419	208,096	2,122,427	209,008	2,093,953	208,906	2,081,993
Wollastonite	500	7,000	800	16,200	(7)	(7)	(7)	(7)
Undistributed: Andalusite (1949), aplite, brucite, diatomite, dumortierite (1949), epsom salt from epsomite (1949–51), iodine, quartz crystal (1950), sharpening stones, sodium carbonate (Wyoming 1949), topaz (1949), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 7)		8,104,563		9,824,259		16,026,333		15,104,190
Total nonmetallic minerals		1,559,000,000		1,815,000,000		2,075,000,000		2,156,000,000

METALS								
Antimony ore and concentrate—gross weight	5,186	1,134,417	6,888	1,443,227	9,100	(12)	4,434	(12)
Bauxite—long tons, dried equivalent	1,148,792	6,778,181	1,334,527	7,692,809	1,848,676	12,477,516	1,667,047	10,776,254
Beryllium concentrate—gross weight	475	152,485	559	170,550	484	161,361	515	233,757
Chromite—do	433	11,662	404	(12)	7,056	510,741	21,304	1,776,981
Cobalt (content of ore)—pounds	673,773	(12)	660,025	(12)	755,631	(12)	836,372	(12)
Columbium—tantalum concentrate—pounds, gross weight	1,020	1,785	1,000	2,150	925	1,528	5,385	16,723
Copper (recoverable content of ores, etc.)	752,746	296,581,924	909,337	378,284,192	928,329	449,311,235	925,377	447,882,468
Gold (recoverable content of ores, etc.)—troy ounces	1,762,367	61,682,845	2,104,959	73,673,565	1,741,026	60,935,910	1,652,704	57,844,640
Iron ore, usable (excluding byproduct iron sinter) long tons, gross weight	84,174,399	377,637,131	97,150,704	483,358,130	115,621,556	629,837,139	97,236,397	590,346,970
Lead (recoverable content of ores, etc.)	409,857	129,514,812	430,678	116,283,060	388,143	134,297,478	390,161	125,631,842
Manganese ore (35 percent or more Mn)—gross weight	126,135	5,178,564	134,451	6,229,985	105,007	6,045,452	115,379	8,251,774
Manganiferous ore (5 to 35 percent Mn)—do	1,078,395	4,040,155	1,087,597	4,609,432	1,223,964	5,385,986	1,009,018	5,116,985
Manganiferous residuum—do	158,902	(12)	183,842	(12)	267,751	(12)	215,255	(12)
Mercury—76-pound flasks	9,830	781,092	4,535	368,514	7,293	1,532,478	12,519	2,492,533
Molybdenum (content of ore and concentrate)—pounds	23,280,000	19,332,000	44,544,000	37,729,000	37,954,544	36,176,900	42,717,443	40,844,575
Silver (recoverable content of ores, etc.)—troy ounces	34,638,896	31,349,949	42,406,376	38,379,912	39,733,909	35,961,195	39,419,344	35,676,497
Tin (content of ore and concentrate)—long tons	17	37,410	15	31,165	19	55,757	17	45,324
Titanium concentrate:								
Ilmenite—gross weight	389,234	6,212,348	452,370	5,607,584	510,840	7,689,272	522,514	8,022,752
Rutile—do	10,559	489,798	(12)	(12)	(12)	(12)	(12)	(12)
Tungsten concentrate—60-percent WO_3 basis	2,765	4,377,066	4,807	8,156,758	6,265	22,936,638	7,603	28,943,162
Zinc (recoverable content of ores, etc.)	593,201	148,912,878	623,369	178,667,197	681,188	249,330,389	666,001	222,981,864
Undistributed: Magnesium chloride for magnesium metal, platinum-group metals (crude), vanadium, zirconium concentrate, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 12)		6,670,946		10,215,783		17,755,280		23,581,606
Total metals		1,101,000,000		1,351,000,000		1,670,000,000		1,611,000,000
Grand total mineral production		10,580,000,000		11,855,000,000		13,524,000,000		13,382,000,000

[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, bauxite, and mercury. Excludes uranium ores and monazite.

[2] Beginning with this volume asphalt and related bitumens, carbon dioxide, helium and peat are included with "Mineral fuels."

[3] Includes small quantity of anthracite mined in States other than Pennsylvania.

[4] Final figure. Supersedes preliminary figure given in commodity chapter.

[5] Excludes sharpening stones, value for which is included with "Nonmetallic minerals, undistributed."

[6] Weight not recorded.

[7] Value included with "Nonmetallic minerals, undistributed."

[8] Excludes clays sold or used for cement as follows: 1949—6,676,000 short tons, $4,573,000; 1950—7,080,000 tons, $5,574,000; 1951—7,804,000 tons, $8,052,000; 1952—8,439,000 tons, $8,646,000.

[9] Revised figure.

[10] Excludes production from Wyoming, value for which is included with "Nonmetallic minerals, undistributed."

[11] Excludes abrasive stone, bituminous limestone, bituminous sandstone, and ground soapstone, all included elsewhere in table. Also excludes limestone for cement and lime.

[12] Value included with "Metals, undistributed."

TABLE 3.—Minerals produced in continental United States and principal producing States in 1952

Rank in value	Mineral	Principal producing States	
		In order of quantity	In order of value
	Abrasive stone:		
67	Grindstones and pulpstones	Ohio, West Virginia, Washington	Rank same as for quantity.
83	Millstones	Not available	North Carolina.
74	Pebbles (grinding)	Minnesota, North Carolina, Wisconsin, Texas	Minnesota, Wisconsin, North Carolina, Texas.
79	Sharpening stones	Arkansas, New Hampshire, Indiana	Rank same as for quantity.
77	Tube-mill liners (natural)	Minnesota, North Carolina, Wisconsin	Do.
62	Antimony ore and concentrate	Idaho, Nevada, Washington, California	Do.
66	Aplite	Virginia	Do.
41	Asbestos	Vermont, Arizona, Georgia	Do.
37	Asphalt (native)	Texas, Alabama, Kentucky, Oklahoma	Texas, Utah, Kentucky, Alabama.
31	Barite (crude)	Arkansas, Missouri, Georgia, Nevada	Rank same as for quantity.
30	Bauxite	Arkansas, Alabama, Georgia	Do.
68	Beryllium concentrate	South Dakota, New Mexico, Colorado, New Hampshire	Do.
25	Boron minerals	California	Do.
21	Bromine	Texas, Michigan, California, West Virginia	Michigan, Texas, California, West Virginia.
76	Brucite	Nevada	Rank same as for quantity.
40	Calcium-magnesium chloride	Michigan, California, West Virginia, Ohio	Do.
69	Carbon dioxide (natural)	New Mexico, California, Utah, Oregon	New Mexico, California, Oregon, Washington.
3	Cement	Pennsylvania, California, Texas, New York	Rank same as for quantity.
51	Chromite	California, Oregon	Do.
12	Clays	Ohio, Pennsylvania, Georgia, Missouri	Georgia, Ohio, Pennsylvania, Missouri.
2	Coal:		
	Bituminous	West Virginia, Pennsylvania, Kentucky, Illinois	Rank same as for quantity.
	Lignite	North Dakota, Montana, California	Do.
	Pennsylvania anthracite	Pennsylvania	Do.
64	Cobalt (content of ore)	Pennsylvania, Idaho	Do.
80	Columbium-tantalum concentrate	North Carolina, Colorado, South Dakota	Do.
8	Copper (in ores, etc.)	Arizona, Utah, New Mexico, Montana	Do.
35	Diatomite	California, Nevada, Oregon, Washington	Do.
73	Emery	New York	Do.
42	Feldspar (crude)	North Carolina, South Dakota, Colorado, New Hampshire	North Carolina, New Hampshire, Colorado, South Dakota.
24	Fluorspar	Illinois, Kentucky, Colorado, Utah	Illinois, Kentucky, Colorado, New Mexico.
60	Garnet (abrasive)	New York, Idaho, Florida	Rank same as for quantity.
65	Gem stones	Not available	California, Oregon, Texas, Nevada.
17	Gold (in ores, etc.)	South Dakota, Utah, California, Colorado	Rank same as for quantity.
63	Graphite:		
	Amorphous	Rhode Island	Do.
	Crystalline	Texas, Alabama	Do.
23	Gypsum (crude)	Michigan, California, New York, Iowa	Michigan, New York, Iowa, California.
49	Helium	Texas, Kansas	Rank same as for quantity.
53	Iodine	California	Do.
5	Iron ore (usable)	Minnesota, Michigan, Alabama, Utah	Minnesota, Michigan, Alabama, New York.
56	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, Illinois	Do.
54	Lithium minerals	South Dakota, North Carolina, California	Do.
44	Magnesite (crude)	Washington, Nevada, California	Do.
26	Magnesium chloride (for magnesium metal)	Texas	Do.
28	Magnesium compounds from sea water and brines (except for metal).	Michigan, California, New Jersey	Do.
32	Manganese ore	Montana, California, New Mexico, Arkansas	Montana, California, Nevada, Arkansas
38	Manganiferous ore	Minnesota, New Mexico, Michigan, Montana	Rank same as for quantity.
50	Manganiferous residuum	New Jersey	Do.
	Marl:		
71	Calcareous	Michigan, Virginia, Wisconsin, Indiana	Michigan, Virginia, Nevada, Indiana.
72	Greensand	New Jersey	Rank same as for quantity.
46	Mercury	California, Nevada, Idaho, Oregon	Do.
45	Mica	North Carolina, Georgia, Arizona, Colorado	North Carolina, Georgia, Idaho, Arizona.
	Scrap	do	North Carolina, Georgia, Arizona, Pennsylvania.
	Sheet	North Carolina, New Hampshire, Idaho, Connecticut	North Carolina, Idaho, New Hampshire, South Dakota.
19	Molybdenum (content of ore and concentrate)	Colorado, Utah, Arizona, New Mexico	Rank same as for quantity.
4	Natural gas	Texas, Louisiana, Oklahoma, California	Texas, California, Louisiana, West Virginia
6	Natural-gas liquids:		
	Natural gasoline and cycle products	Texas, California, Louisiana, Oklahoma	Rank same as for quantity.
	LP-gases	Texas, California, Oklahoma, Louisiana	Texas, California, Louisiana, Oklahoma.
70	Olivine	North Carolina, Washington	Rank same as for quantity.
52	Peat	Washington, Michigan, Ohio, Florida	Michigan, Ohio, New Jersey, Florida.
59	Perlite (crude)	New Mexico, Nevada, California, Colorado	Nevada, New Mexico, California, Colorado.
1	Petroleum (crude)	Texas, California, Louisiana, Oklahoma	Rank same as for quantity.
16	Phosphate rock	Florida, Tennessee, Idaho, Montana	Florida, Tennessee, Montana, Idaho.
81	Platinum-group metals (crude)	California	Rank same as for quantity
18	Potassium salts	New Mexico, California, Utah, Michigan	Do.
47	Pumice and pumicite	New Mexico, California, Idaho, Colorado	California, New Mexico, Oregon, Idaho.
39	Pyrites	Tennessee, California, Virginia, Montana	Rank same as for quantity.
57	Quartz from pegmatites and quartzite	Washington, California, North Carolina, Connecticut	Do.
15	Salt (common)	Michigan, New York, Ohio, Texas	Michigan, New York, Louisiana, Kansas.
9	Sand and gravel	California, Michigan, Wisconsin, Ohio	California, Ohio, Michigan, Pennsylvania.
36	Sand and sandstone (ground)	Illinois, New Jersey, West Virginia, Ohio	Illinois, West Virginia, New Jersey, Ohio.
20	Silver (in ores, etc.)	Idaho, Utah, Montana, Arizona	Rank same as for quantity.
27	Slate	Pennsylvania, Vermont, New York, Georgia	Pennsylvania, Vermont, New York, Virginia.
34	Sodium carbonate (natural)	California, Wyoming	Rank same as for quantity.
43	Sodium sulfate (natural)	California, Texas, Wyoming	Do.
7	Stone	Pennsylvania, Ohio, Illinois, Michigan	Pennsylvania, Ohio, Illinois, New York.
13	Sulfur (Frasch-process)	Texas, Louisiana	Rank same as for quantity.
75	Sulfur ore for direct agricultural use	Nevada, California, Wyoming	Do.
29	Talc, pyrophyllite, and soapstone (ground)	New York, California, North Carolina, Vermont	Do.
78	Tin (content of ore and concentrate)	Colorado, North Carolina	Do.
	Titanium concentrate:		
33	Ilmenite	New York, Florida, Virginia, North Carolina	Do.
61	Rutile	Florida	Do.
55	Tripoli	Illinois, Missouri, Pennsylvania	Missouri, Illinois, Pennsylvania.
22	Tungsten concentrate	California, Nevada, North Carolina, Colorado	Rank same as for quantity.
48	Vermiculite	Montana, South Carolina, Wyoming, North Carolina	Do.
82	Wollastonite	New York, California	Do.
10	Zinc (in ores, etc.)	Montana, Idaho, New Jersey, Oklahoma	Do.
58	Zirconium concentrate	Florida	Do.

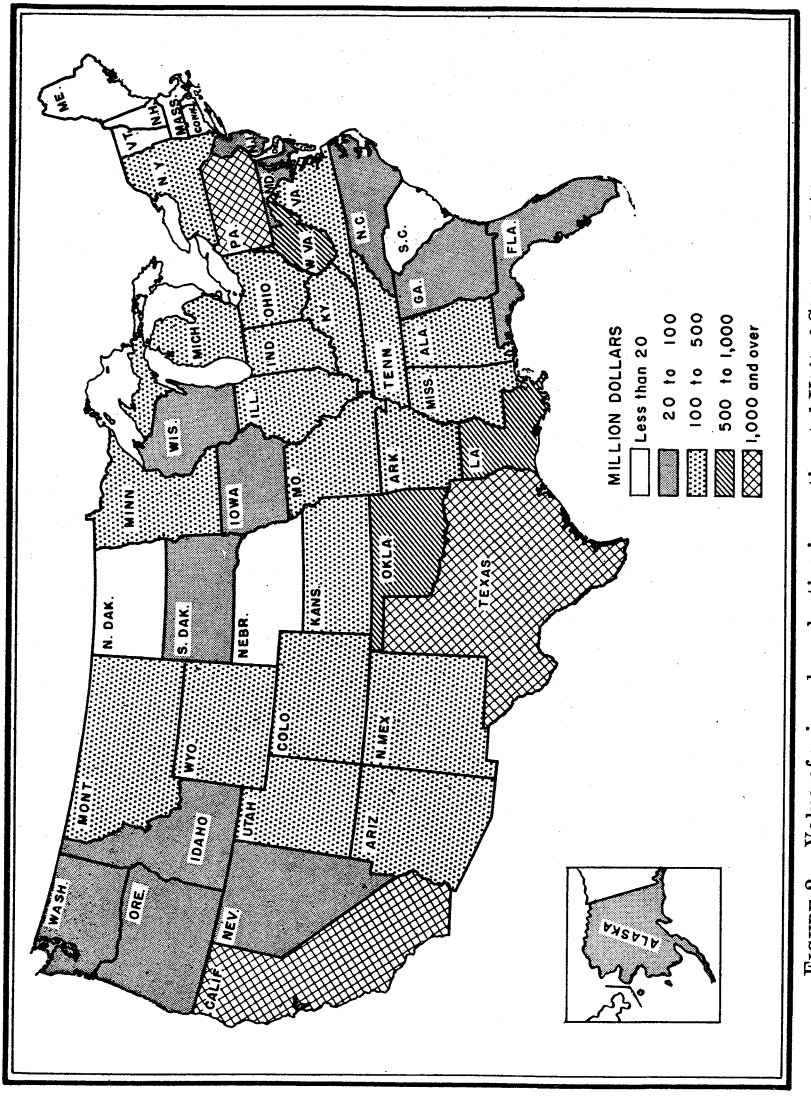

FIGURE 2.—Value of mineral production in continental United States and Alaska, 1952, by States

TABLE 4.—Value of mineral production in continental United States, 1949–52, by States, in thousands of dollars, and principal minerals produced in 1952

State	1949	1950	1951	1952			
				Value	Rank	Percent of U. S. total	Principal minerals, in order of value
Alabama	143,905	158,975	164,280	158,382	21	1.18	Coal, iron ore, cement, stone.
Arizona	181,094	207,406	243,886	231,702	15	1.73	Copper, zinc, lead, silver.
Arkansas	109,523	118,642	118,694	116,335	24	.87	Petroleum, bauxite, coal, natural-gas liquids.
California	1,075,612	1,056,047	[1] 1,209,381	1,214,285	2	9.07	Petroleum, natural gas, natural-gas liquids.
Colorado	139,873	154,898	179,435	187,589	17	1.40	Petroleum, molybdenum, coal, zinc.
Connecticut	4,887	5,675	[1] 6,247	7,125	45	.05	Stone, sand and gravel, lime, clays.
Delaware	335	522	[1] 584	677	48	.01	Sand and gravel, stone, clays.
District of Columbia	63	60	82	7	49	(2)	Clays.
Florida	55,018	67,717	78,548	80,335	27	.60	Phosphate rock, stone, cement, sand and gravel.
Georgia	35,508	44,157	[1] 47,555	52,398	34	.39	Clays, stone, cement, sand and gravel.
Idaho	64,292	79,077	[1] 82,795	77,060	28	.58	Zinc, lead, silver, sand and gravel.
Illinois	449,893	488,144	489,934	460,005	7	3.44	Coal, petroleum, stone, cement.
Indiana	141,025	166,632	174,388	161,925	20	1.21	Coal, petroleum, cement, stone.
Iowa	37,458	41,773	47,706	52,481	33	.39	Cement, stone, sand and gravel, coal.
Kansas	337,162	368,614	400,087	403,370	8	3.01	Petroleum, natural gas, cement, stone.
Kentucky	372,229	459,956	442,264	398,446	9	2.98	Coal, petroleum, natural gas, stone.
Louisiana	631,813	693,607	787,678	848,259	4	6.34	Petroleum, natural gas, natural-gas liquids, sulfur.
Maine	6,742	7,461	8,516	8,981	44	.07	Cement, sand and gravel, stone, slate.
Maryland	20,461	22,725	[1] 26,148	26,847	37	.20	Sand and gravel, stone, cement, coal.
Massachusetts	12,449	16,014	16,951	17,719	41	.13	Stone, sand and gravel, lime, clays.
Michigan	201,260	229,941	[1] 257,937	254,532	14	1.90	Iron ore, cement, petroleum, sand and gravel.
Minnesota	257,540	331,567	[1] 433,096	397,441	10	2.97	Iron ore, sand and gravel, stone, manganiferous ore.
Mississippi	103,711	102,945	103,030	101,875	25	.76	Petroleum, natural gas, natural-gas liquids, clays.
Missouri	111,293	113,191	[1] 135,249	140,977	22	1.05	Lead, cement, stone, coal.
Montana	98,070	103,389	126,166	121,400	23	.91	Copper, zinc, petroleum, manganese ore.
Nebraska	10,102	14,022	18,469	20,597	39	.15	Cement, petroleum, sand and gravel, stone.
Nevada	37,373	48,499	[1] 57,674	64,231	29	.48	Copper, tungsten, zinc, gold.
New Hampshire	1,389	1,711	1,295	1,941	46	.02	Sand and gravel, stone, feldspar, mica.
New Jersey	38,584	46,391	59,023	57,309	30	.43	Zinc, stone, sand and gravel, iron ore.
New Mexico	198,825	210,294	[1] 256,302	288,500	12	2.16	Petroleum, potassium salts, copper, zinc.
New York	138,493	156,529	[1] 188,790	180,741	18	1.35	Cement, iron ore, stone, sand and gravel.
North Carolina	19,755	26,338	29,647	34,726	35	.26	Stone, sand and gravel, tungsten, feldspar.
North Dakota	8,818	9,614	10,247	12,057	43	.09	Coal, petroleum, sand and gravel, natural gas.
Ohio	242,080	274,572	302,612	292,689	11	2.19	Coal, stone, cement, lime.
Oklahoma	484,264	527,095	607,486	621,351	6	4.64	Petroleum, natural-gas liquids, natural gas, zinc.

For footnotes, see end of table.

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TABLE 4—Value of mineral production in continental United States, 1949–52, by States, in thousands of dollars, and principal minerals produced in 1952—Continued

State	1949	1950	1951	1952			
				Value	Rank	Percent of U. S. total	Principal minerals, in order of value
Oregon	21,845	21,542	28,402	26,674	38	.20	Stone, sand and gravel, cement, diatomite.
Pennsylvania	1,035,970	1,186,212	1,289,226	1,145,598	3	8.56	Coal, cement, petroleum, stone.
Rhode Island	929	1,425	1,278	1,250	47	.01	Stone, sand and gravel, graphite.
South Carolina	9,026	11,394	11,286	14,531	42	.11	Stone, clays, cement, sand and gravel.
South Dakota	26,746	32,716	[1] 29,652	30,455	36	.23	Gold, stone, cement, clays.
Tennessee	77,333	89,694	99,853	100,509	26	.75	Coal, cement, stone, zinc.
Texas	2,379,793	2,673,950	3,268,555	3,378,557	1	25.25	Petroleum, natural-gas liquids, natural gas, sulfur.
Utah	177,825	229,956	257,145	265,502	13	1.98	Copper, coal, lead, gold.
Vermont	17,384	18,563	[1] 18,516	17,891	40	.13	Stone, asbestos, slate, copper.
Virginia	116,408	137,806	161,252	164,679	19	1.23	Coal, stone, cement, sand and gravel.
Washington	40,863	49,055	[1] 54,554	56,129	31	.42	Cement, sand and gravel, zinc, coal.
West Virginia	718,119	829,624	941,723	825,675	5	6.17	Coal, natural gas, petroleum, natural-gas liquids.
Wisconsin	35,878	41,693	[1] 48,350	55,710	32	.42	Sand and gravel, stone, iron ore, zinc.
Wyoming	150,998	177,577	[1] 201,838	204,495	16	1.53	Petroleum, coal, clays, natural-gas liquids.
Total	10,580,000	11,855,000	13,524,000	13,382,000	-------	100.00	Petroleum, coal, cement, natural gas.

[1] Revised figure.
[2] Less than 0.005 percent.

TABLE 5.—Mineral production in the United States, 1949–52, by States [1]

ALABAMA

Mineral	1949		1950		1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement [2]—376-pound barrels	9,394,348	$20,320,658	10,574,955	$23,175,772	10,586,825	$24,523,073	10,642,409	$25,084,379
Clays (except for cement)	856,719	934,262	992,836	1,045,217	918,598	1,367,545	921,588	1,560,858
Coal	12,933,830	79,187,827	14,421,810	88,343,572	13,596,982	82,465,625	11,383,427	70,759,815
Iron ore (usable)—long tons, gross weight	7,314,204	27,553,175	7,402,208	28,932,801	8,181,737	34,799,951	7,243,214	37,940,412
Lime (open-market)	359,446	3,203,564	389,071	3,577,850	455,953	4,395,922	424,028	4,458,604
Manganese ore (35 percent or more Mn)—gross weight			138	(3)				
Natural gas—thousand cubic feet			2,000	100	1,000	50	4,000	160
Petroleum (crude)—42-gallon barrels	462,000	(3)	735,000	(3)	1,020,000	(3)	[4] 1,279,000	(3)
Sand and gravel	3,296,582	2,268,013	3,616,363	2,463,722	3,535,871	2,806,540	3,722,555	2,955,630
Stone (except for cement and lime)	2,636,930	6,039,867	2,587,500	6,038,220	2,818,421	7,254,671	3,052,150	7,948,410
Undistributed: Native asphalt, bauxite, puzzolan cement, graphite, mica (1952), salt (1952), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		4,398,078		5,398,108		6,666,181		7,673,680
Total Alabama		143,905,000		158,975,000		164,280,000		158,382,000

ARIZONA

Clays	189,854	$432,813	223,586	$512,025	226,672	$471,973	247,329	$579,175
Coal	4,850	23,514	4,446	26,676	4,969	29,814	5,003	33,000
Copper (recoverable content of ores, etc.)	359,010	141,449,940	403,301	167,773,216	415,870	201,281,080	395,719	191,527,996
Fluorspar	846	(3)	952	(3)	1,623	(3)	434	(3)
Gold (recoverable content of ores, etc.)—troy ounces	108,993	3,814,755	118,313	4,140,955	116,093	4,063,255	112,355	3,932,425
Gypsum (crude)	(3)	(3)	(3)	(3)	(3)	(3)	11,314	28,285
Lead (recoverable content of ores, etc.)	33,568	10,607,488	26,383	7,123,410	17,394	6,018,324	16,520	5,319,440
Lime (open-market)	43,529	607,709	51,530	717,885	54,023	772,899	53,019	757,390
Manganese ore (35 percent or more Mn)—gross weight	223	(3)	222	(3)	173	(3)	203	(3)
Manganiferous ore (5 to 35 percent Mn)—do					224	(3)		
Mica (scrap)	(3)	(3)	(3)	(3)	1,763	50,030	(3)	(3)
Molybdenum (content of ore and concentrate)—pounds	(3)	(3)	(3)	(3)	1,172,740	1,101,641	2,022,832	1,987,418
Perlite (crude)	519	2,670	1,923	10,487	(3)	(3)	(3)	(3)
Sand and gravel	1,511,953	970,813	2,498,777	1,590,001	2,691,100	2,203,345	1,824,330	1,635,903
Silver (recoverable content of ores, etc.)—troy ounces	4,970,736	4,498,767	5,325,441	4,819,793	5,120,985	4,634,750	4,701,330	4,254,941
Stone (except limestone for cement and lime)	356,050	203,295	228,490	139,810	308,881	353,872	235,020	355,709
Tungsten concentrate—60-percent WO_3 basis	(5)	(3)	1	(3)	11	36,663	71	251,136
Zinc (recoverable content of ores, etc)	70,658	17,523,184	60,480	17,176,320	52,999	19,291,636	47,143	15,651,476

For footnotes, see end of table.

TABLE 5.—Mineral production in the United States, 1949–52, by States [1]—Continued

ARIZONA—Continued

Mineral	1949		1950		1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Undistributed: Asbestos, barite, beryllium concentrate (1949–51), cement, feldspar, gem stones, lithium (1951), mercury (1951), pumice (1949, 1951–52), quartz, vanadium, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		$958,882		$3,374,993		[6] $3,577,171		$5,388,080
Total Arizona		181,094,000		207,406,000		243,886,000		231,702,000

ARKANSAS

Barite (crude)	363,382	[7] $2,907,056	343,168	[7] $3,089,512	407,085	[7] $3,765,536	428,522	[7] $3,963,828
Bauxite long tons, dried equivalent	1,094,924	6,433,964	1,307,335	7,531,535	1,815,274	12,259,742	1,603,833	10,235,254
Clays (except for cement)	433,909	1,067,033	460,826	996,253	483,059	1,198,458	546,334	1,507,692
Coal	961,511	7,534,415	1,169,068	8,882,876	1,106,705	8,686,410	873,088	6,839,113
Gem stones and industrial diamonds carats	[8] 246	[8] 1,000						
Iron ore (usable) long tons, gross weight			1,444	(3)	1,343	(3)	115	(3)
Lead (recoverable content of ores, etc.)	1	316	9	2,430	33	11,418	4	1,288
Manganese ore (35 percent or more Mn) gross weight	2,851	(3)	1,224	(3)	3,718	(3)	2,246	(3)
Manganiferous ore (5 to 35 percent Mn) do	5,555	(3)	6,359	(3)	1,429	(3)	896	(3)
Natural gas thousand cubic feet	47,788,000	1,912,000	48,047,000	1,682,000	44,656,000	1,786,000	42,325,000	1,735,000
Natural-gas liquids:								
Natural gasoline and cycle products 42-gallon barrels	1,427,000	4,080,000	1,395,000	3,926,000	1,386,000	4,247,000	1,471,000	4,580,000
LP-gases do	853,000	1,492,000	938,000	1,197,000	962,000	1,606,000	1,169,000	2,079,000
Petroleum (crude) do	29,986,000	74,360,000	31,108,000	76,530,000	29,798,000	73,900,000	[4] 29,440,000	[4] 72,420,000
Sand and gravel	2,507,244	2,128,474	4,118,080	3,446,578	3,868,940	3,569,114	5,011,095	4,977,219
Slate	(3)	(3)	(3)	(3)	27,080	174,329	(3)	(3)
Stone (except limestone for cement and lime)	[9] 1,279,250	[9] 2,247,236	3,952,720	7,419,110	2,535,746	3,216,426	[9] 2,967,479	[9] 3,346,201
Zinc (recoverable content of ores, etc.)	1	248	8	2,272	50	18,200	26	8,632
Undistributed: Abrasive stones, cement, gypsum, lime, sand and gravel (1949), stone (unclassified 1949, dimension miscellaneous 1952), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		5,359,172		3,936,998		4,254,895		4,641,801
Total Arkansas		109,523,000		118,642,000		118,694,000		116,335,000

Antimony ore and concentrate—gross weight							9	(3)
Boron minerals	467, 592	$11, 511, 893	647, 735	$15, 890, 000	862, 797	$20, 030, 000	583, 828	$14, 105, 000
Calcium-magnesium chloride—75-percent (Ca, Mg) Cl_2 basis	11, 166	204, 024	(3)	(3)	(3)	(3)	(3)	(3)
Carbon dioxide, natural (estimated)—thousand cubic feet	(3)	(3)	200, 000	200, 000	(3)	(3)	(3)	(3)
Cement—376-pound barrels	23, 201, 982	57, 464, 213	26, 685, 004	65, 258, 675	28, 956, 470	77, 753, 697	29, 786, 245	79, 457, 745
Chromite—gross weight	433	11, 662	404	(3)	6, 302	[6] 447, 769	14, 713	[7] 1, 269, 000
Clays (including fuller's earth) [10]	1, 391, 088	2, 744, 069	1, 454, 846	2, 904, 750	1, 615, 241	3, 757, 325	1, 886, 649	3, 993, 052
Coal (lignite)	3, 900	39, 000	(3)	(3)	3, 657	37, 500	2, 998	30, 700
Copper (recoverable content of ores, etc.)	649	255, 706	646	268, 736	921	445, 764	800	387, 200
Gem stones (estimated)	(11)	(3)	(11)	(3)	(11)	(3)	(11)	100, 000
Gold (recoverable content of ores, etc.)—troy ounces	417, 231	14, 603, 085	412, 118	14, 424, 130	339, 732	11, 890, 620	258, 176	9, 036, 160
Gypsum (crude)	753, 581	1, 852, 452	962, 373	2, 462, 604	1, 092, 883	2, 602, 758	1, 236, 430	2, 721, 134
Iron ore (usable)—long tons, gross weight	584, 109	(3)	849, 489	(3)	1, 182, 799	(3)	1, 463, 239	(3)
Lead (recoverable content of ores, etc.)	10, 318	3, 260, 488	15, 831	4, 274, 370	13, 967	4, 832, 582	11, 199	3, 606, 078
Lime (open-market)	153, 483	2, 516, 262	171, 440	2, 722, 835	203, 344	3, 366, 959	238, 957	3, 752, 738
Magnesium compounds from sea water and bitterns (partly estimated)—MgO equivalent	27, 600	1, 770, 000	43, 300	2, 730, 000	53, 900	3, 564, 500	50, 204	3, 529, 362
Manganese ore (35 percent or more Mn)—gross weight	280	(3)	37	(3)			8, 081	(3)
Manganiferous ore (5 to 35 percent Mn)—do	386	(3)	640	5, 766			56	(3)
Mercury—76-pound flasks	4, 493	357, 014	3, 850	312, 851	4, 282	899, 777	7, 241	1, 441, 683
Natural gas—thousand cubic feet	550, 903, 000	64, 731, 000	558, 398, 000	66, 449, 000	566, 751, 000	82, 745, 000	517, 450, 000	86, 414, 000
Natural-gas liquids:								
Natural gasoline and cycle products—42-gallon barrels	20, 568, 000	67, 407, 000	21, 247, 000	65, 527, 000	21, 132, 000	65, 923, 000	20, 738, 000	64, 945, 000
LP-gases—do	6, 585, 000	19, 553, 000	7, 081, 000	14, 497, 000	8, 401, 000	15, 528, 000	9, 376, 000	16, 700, 000
Peat	5, 670	35, 193	6, 399	37, 192	6, 432	42, 016	10, 527	76, 706
Perlite (crude)	4, 043	27, 158	(3)	(3)	(3)	(3)	(3)	(3)
Petroleum (crude)—42-gallon barrels	332, 942, 000	752, 450, 000	327, 607, 000	707, 630, 000	354, 561, 000	797, 760, 000	[4] 359, 450, 000	[4] 801, 570, 000
Pumice and pumicite	149, 878	799, 602	157, 497	970, 826	264, 411	1, 228, 569	129, 780	793, 716
Salt (common)	964, 807	4, 110, 271	868, 496	3, 816, 655	1, 275, 574	5, 261, 780	1, 148, 693	4, 880, 392
Sand and gravel	36, 279, 816	30, 198, 924	41, 894, 039	35, 547, 558	46, 927, 452	41, 279, 835	53, 051, 260	43, 633, 125
Silver (recoverable content of ores, etc.)—troy ounces	783, 880	709, 451	1, 071, 917	970, 139	1, 145, 219	1, 036, 481	1, 099, 658	995, 246
Sodium carbonate (natural)	200, 496	4, 163, 714	(3)	(3)	(3)	(3)	(3)	(3)
Stone (except limestone for cement and lime)	11, 373, 700	12, 594, 048	11, 764, 630	13, 998, 432	12, 537, 344	14, 714, 524	14, 374, 930	17, 697, 085
Sulfur ore for direct agricultural use—long tons	1, 302	26, 444	1, 463	27, 797	(3)	(3)	(3)	(3)
Talc, pyrophyllite, and soapstone (ground)	83, 359	1, 434, 046	109, 747	2, 069, 211	126, 784	2, 269, 771	120, 574	2, 868, 255
Tungsten concentrate—60-percent WO_3 basis	952	(3)	2, 025	3, 392, 244	3, 007	11, 557, 325	2, 980	11, 360, 569
Zinc (recoverable content of ores, etc.)	7, 209	1, 787, 832	7, 551	2, 144, 484	9, 602	3, 495, 128	9, 419	3, 127, 108
Undistributed: Abrasive stones (1949), asbestos (1949-51), barite, bromine, diatomite, feldspar, iodine, lithium minerals, magnesite, molybdenum, platinum group metals (crude), potassium salts, pyrites, quartz, ground sand and sandstone, slate, sodium sulfate, titanium concentrate (1949), wollastonite (1952), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		18, 994, 011		27, 514, 386		36, 910, 670		35, 793, 673
Total California		1, 075, 612, 000		1, 056, 047, 000		[6] 1, 209, 381, 000		1, 214, 285, 000

For footnotes, see end of table.

TABLE 5.—Mineral production in the United States, 1949–52, by States [1]—Continued

COLORADO

Mineral	1949		1950		1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate—gross weight	144	$43,200	97	$30,500	97	$32,339	54	$24,588
Carbon dioxide, natural (estimated)—thousand cubic feet	8,000	3,000					[3]	[3]
Clays (except for cement)	254,691	499,294	310,130	618,814	443,403	958,115	413,386	931,810
Coal	4,636,432	23,734,510	4,258,500	21,668,857	4,102,639	21,165,518	3,623,015	19,215,657
Copper (recoverable content of ores, etc.)	2,403	946,782	3,141	1,306,656	3,212	1,554,608	3,606	1,745,304
Feldspar (crude)—long tons	60,966	341,049	59,457	329,120	50,451	283,153	38,268	224,385
Fluorspar	22,324	763,296	18,489	654,089	20,661	820,322	29,185	1,505,968
Gold (recoverable content of ores, etc.)—troy ounces	102,618	3,591,630	130,390	4,563,650	116,503	4,077,605	124,594	4,360,790
Gypsum (crude)	[3]	[3]	62,150	183,976	[3]	[3]	[3]	[3]
Lead (recoverable content of ores, etc.)	26,853	8,485,548	27,007	7,291,890	30,336	10,496,256	30,066	9,681,252
Manganiferous ore (5 to 35 percent Mn)—gross weight							76	[3]
Mica (scrap)	4,168	60,072	1,467	27,068	1,882	32,901	[3]	[3]
Molybdenum (content of ore and concentrate)—pounds	10,482,600	[3]	24,090,200	[3]	22,911,949	[3]	24,557,149	[3]
Natural gas—thousand cubic feet	8,490,000	443,000	11,168,000	436,000	14,128,000	608,000	34,260,000	1,884,000
Natural-gas liquids:								
Natural gasoline—42-gallon barrels	152,000	463,000	217,000	584,000	[3]	[3]	[3]	[3]
LP-gases—do	189,000	281,000	169,000	289,000	[3]	[3]	[3]	[3]
Peat	2,800	24,504	3,210	28,088	2,241	19,611	2,312	20,230
Perlite (crude)	12,729	89,105	13,691	95,842	[3]	[3]	[3]	[3]
Petroleum (crude)—42-gallon barrels	23,587,000	60,150,000	23,303,000	59,420,000	27,823,000	70,670,000	[4] 30,381,000	[4] 77,470,000
Pyrites—long tons	13,877	50,498	[3]	[3]	[3]	[3]	[3]	[3]
Sand and gravel	4,751,431	2,964,588	5,154,287	3,940,439	6,916,631	4,452,489	8,461,039	6,268,367
Silver (recoverable content of ores, etc.)—troy ounces	2,894,886	2,620,018	3,492,278	3,160,688	2,787,882	2,523,174	2,813,643	2,546,489
Stone (except limestone for cement and lime)	[5] 1,816,790	[5] 2,803,538	[5] 1,679,960	[5] 2,776,331	1,470,123	2,334,376	1,708,872	2,566,401
Tin (content of ore and concentrate)—long tons	17	37,410	15	31,165	18	54,033	13	33,723
Tungsten concentrate—60-percent WO_3 basis	222	[3]	196	302,248	336	1,092,780	625	2,354,664
Zinc (recoverable content of ores, etc.)	47,703	11,830,344	45,776	13,000,384	55,714	20,279,896	53,203	17,663,396
Undistributed: Cement, columbium-tantalum concentrate, gem stones, lime (1949), pumice and pumicite (1950–52), stone (dimension, unclassified 1949–50), sulfur ore (1949–50), vanadium, vermiculite (1949–50), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		19,647,411		34,159,514		[6] 37,980,248		39,091,485
Total Colorado		139,873,000		154,898,000		179,435,000		187,589,000

CONNECTICUT

Clays	289,090	$216,829	292,367	$236,317	275,900	$252,725	157,500	$157,500
Feldspar (crude)—long tons	12,659	95,044	13,580	101,851	13,811	107,083	10,929	87,432
Peat	5,974	33,011	6,294	35,145	5,586	33,702	(3)	(3)
Quartz from pegmatites and quartzite	16,225	97,350	27,560	166,810	29,273	175,638	(3)	(3)
Sand and gravel	2,648,343	1,587,446	2,998,424	1,861,741	[6] 2,321,715	[6] 1,708,910	2,581,247	1,933,214
Stone (except limestone for lime)	1,695,650	2,460,547	[9] 1,860,700	[9] 2,789,532	2,278,466	3,360,378	2,837,045	4,101,060
Undistributed: Nonmetallic minerals, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		396,810		483,981		608,407		845,491
Total Connecticut		4,887,000		5,675,000		[6] 6,247,000		7,125,000

DELAWARE

Clays	33,212	$46,293	41,000	$40,375	35,950	$35,450	(3)	(3)
Sand and gravel	233,977	196,451	367,524	291,715	[6] 454,563	[6] 303,643	515,399	$382,484
Stone	37,240	92,100	77,050	190,113	99,201	245,002	94,911	251,759
Undistributed: Nonmetallic minerals, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)								42,805
Total Delaware		335,000		522,000		[6] 584,000		677,000

FLORIDA

Clays (including fuller's earth) [10]	95,516	$1,446,544	126,852	$1,954,641	132,563	$2,288,855	112,113	$1,985,587
Natural gas—thousand cubic feet	39,000	2,000	8,000	416	10,000	1,000	15,000	1,000
Peat	11,800	69,000	23,022	151,270	25,748	161,417	23,729	154,164
Petroleum (crude)—42-gallon barrels	441,000	(3)	487,000	(3)	596,000	(3)	[4] 591,000	(3)
Phosphate rock—long tons	6,815,989	37,857,983	8,085,870	45,377,842	8,496,831	50,262,562	8,781,125	51,541,799
Sand and gravel	2,243,898	1,879,733	2,793,865	2,806,431	4,418,573	4,300,682	4,154,613	3,848,077
Stone (except limestone for cement and lime)	4,215,090	4,748,253	5,313,400	6,885,394	8,032,966	9,419,682	7,836,634	9,577,541
Undistributed: Cement, abrasive garnet (1951–52), lime, calcareous marl (1949), titanium concentrate, zirconium concentrate, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		9,014,380		10,540,532		12,113,358		13,226,587
Total Florida		55,018,000		67,717,000		78,548,000		80,335,000

For footnotes, see end of table.

TABLE 5.—Mineral production in the United States, 1949–52, by States [1]—Continued

GEORGIA

Mineral	1949		1950		1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Barite (crude)	50,267	$465,325	(3)	(3)	(3)	(3)	(3)	(3)
Clays (including fuller's earth) [10]	1,983,001	16,653,426	2,325,292	$20,937,991	2,528,599	$23,090,280	2,490,167	$23,033,977
Coal	16,600	98,360	(3)	(3)	(3)	(3)	32,100	160,500
Gold (recoverable content of ores, etc.)—troy ounces	18	630			3	105		
Iron ore (usable)—long tons, gross weight	228,689	692,649	202,427	677,248	357,754	1,339,248	319,959	1,439,251
Lime (open-market)	7,028	67,252	11,998	121,556	10,616	104,626	7,854	87,587
Mica (sheet)—pounds	(3)	(3)	(3)	(3)	(3)	(3)	13,010	18,852
Peat	1,870	56,000	1,750	41,000	2,250	41,000	2,150	38,000
Sand and gravel	[12] 984,488	[12] 757,680	[12] 1,211,782	[12] 936,726	1,226,231	1,041,561	2,133,970	2,029,367
Sand and sandstone (ground)	771	7,712	1,176	11,760	1,874	18,740	1,765	17,650
Stone (except limestone for cement and lime)	[9] 4,156,220	[9] 8,427,627	[9] 6,144,980	[9] 11,917,482	[6] 5,234,131	[6] 14,813,413	7,141,923	18,114,604
Talc and soapstone (ground)	49,338	580,405	70,749	774,148	77,895	823,133	56,491	653,144
Undistributed: Asbestos, bauxite, beryllium concentrate (1952), cement, feldspar (1949–51), kyanite (1949), scrap mica, 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)		7,700,505		8,739,539		6,282,755		6,805,259
Total Georgia		35,508,000		44,157,000		[6] 47,555,000		52,398,000

IDAHO

Antimony ore and concentrate—gross weight	4,838	$1,053,177	6,868	(3)	8,805	(3)	4,173	(3)
Clays (except for cement)	24,850	30,780	25,858	$30,811	28,281	$42,545	23,533	$24,683
Coal	3,219	25,059						
Cobalt (content of ore)—pounds							196,516	(3)
Copper (recoverable content of ores, etc.)	1,438	566,572	2,107	876,512	2,160	1,045,440	3,213	1,555,092
Gold (recoverable content of ores, etc.)—troy ounces	77,829	2,724,015	79,652	2,787,820	45,064	1,577,240	32,997	1,154,895
Gypsum (crude)					65	293	400	1,200
Lead (recoverable content of ores, etc.)	79,299	25,058,484	100,025	27,006,750	76,713	26,542,698	73,719	23,737,518
Mercury—76-pound flasks					357	75,016	887	176,602
Mica:								
Scrap							170	5,100
Sheet—pounds							20,020	115,572
Phosphate rock—long tons	(3)	(3)	(3)	(3)	694,446	1,748,074	(3)	(3)
Pumice and pumicite	71,373	105,360	93,990	121,044	83,528	133,192	88,085	141,253
Sand and gravel	3,271,362	2,286,609	4,281,908	3,043,905	4,057,391	2,971,264	3,925,863	2,745,201

Sand and sandstone (ground)			3,700	29,600	11,968	107,738	9,500	80,000
Silver (recoverable content of ores, etc.) troy ounces	10,049,257	9,095,085	16,095,019	14,566,805	14,753,023	13,352,231	14,923,165	13,506,218
Stone (except limestone for cement)	1,440,680	1,878,801	[9] 644,020	[9] 861,290	1,457,182	1,811,422	[9] 1,630,034	[9] 2,441,236
Tungsten concentrate 60-percent WO_3 basis	66	[3]	222	[3]	377	1,402,866	333	1,245,499
Zinc (recoverable content of ores, etc.)	76,555	18,985,640	87,890	24,960,760	78,121	28,436,044	74,317	24,673,244
Undistributed: Barite, cement, abrasive garnet, fluorspar (1951–52), stone (crushed sandstone and limestone, 1950, crushed limestone, 1952), titanium concentrate (1951), vanadium, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		2,482,678		4,791,655		3,548,945		5,456,623
Total Idaho		64,292,000		79,077,000		82,795,000		77,060,000

ILLINOIS

Cement 376-pound barrels	7,976,972	$16,645,730	7,857,969	$16,920,234	8,377,387	$19,853,132	8,710,621	$20,600,347
Clays (including fuller's earth) [10]	1,956,639	2,706,777	2,302,330	3,242,577	2,399,787	3,836,617	2,156,071	3,690,099
Coal	47,207,959	190,863,252	56,290,921	228,137,929	54,199,375	220,547,562	45,789,982	187,827,712
Fluorspar	120,881	4,621,733	154,623	6,110,765	204,328	9,294,703	188,293	9,481,223
Lead (recoverable content of ores, etc.)	3,824	1,208,384	2,729	736,830	3,160	1,003,360	4,262	1,372,364
Lime (open-market)	276,161	3,197,890	367,485	4,465,413	462,690	5,878,289	460,775	5,917,038
Natural gas thousand cubic feet	12,391,000	1,398,000	13,285,000	1,342,000	11,425,000	1,748,000	10,183,000	1,650,000
Natural-gas liquids:								
Natural gasoline 42-gallon barrels	905,000	3,533,000	989,000	3,019,000	[3]	[3]	[3]	[3]
LP-gases do	2,313,000	4,941,000	2,118,000	3,436,000	2,071,000	4,727,000	[3]	[3]
Petroleum (crude) do	64,501,000	178,670,000	62,028,000	171,820,000	60,243,000	166,870,000	[4] 60,089,000	[4] 165,850,000
Sand and gravel	17,128,144	14,780,487	18,695,433	16,531,797	20,130,567	19,146,502	19,584,308	19,214,195
Sand and sandstone (ground)	217,577	1,887,144	263,122	2,278,237	262,488	2,300,102	267,180	2,342,549
Silver (recoverable content of ores, etc.) troy ounces	3,128	2,831	2,001	1,811	3,465	3,136	3,781	3,422
Stone (except limestone for cement and lime)	17,054,110	20,682,162	17,911,480	21,970,537	19,298,968	23,474,516	22,334,887	28,326,060
Zinc (recoverable content of ores, etc.)	18,157	4,502,936	26,982	7,662,888	21,776	7,926,464	18,816	6,246,912
Undistributed: Nonmetallic minerals and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		251,730		468,248		[6] 3,235,087		7,483,497
Total Illinois		449,893,000		488,144,000		489,934,000		460,005,000

INDIANA

Clays (except for cement)	1,022,699	$1,197,982	1,159,257	$1,395,662	1,267,159	$1,656,885	1,020,840	$1,389,751
Coal	16,549,756	66,988,237	19,957,029	79,301,847	19,450,445	78,617,530	16,350,202	64,977,328
Marl, calcareous (except for cement)	44,026	49,543	20,380	13,977	12,960	18,129	16,414	9,021
Natural gas thousand cubic feet	334,000	25,000	956,000	67,000	845,000	83,000	836,000	79,000
Peat	7,949	28,537	5,703	18,966	5,699	22,824	10,115	49,775
Petroleum (crude) 42-gallon barrels	9,696,000	26,860,000	10,699,000	29,530,000	11,100,000	30,530,000	[4] 12,037,000	[4] 33,100,000
Pyrites long tons	559	1,873	[3]	[3]	[3]	[3]	[3]	[5]

For footnotes, see end of table.

TABLE 5.—Mineral production in the United States, 1949–52, by States [1]—Continued

INDIANA—Continued

Mineral	1949		1950		1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Sand and gravel	8,887,231	$6,695,426	9,723,033	$7,516,509	11,030,814	$8,763,936	11,546,014	$9,279,908
Stone (except limestone for cement and lime)	[9] 6,332,360	[9] 15,227,818	6,994,670	20,686,160	[9] 8,641,670	[9] 23,729,433	9,126,837	21,965,454
Undistributed: Abrasive stones, cement, lime, stone (sandstone, 1949; dimension sandstone, 1951), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		23,950,991		28,101,638		30,966,381		31,074,713
Total Indiana		141,025,000		166,632,000		174,388,000		161,925,000

IOWA

Cement—376-pound barrels	6,655,208	$14,602,554	7,231,807	$16,157,979	8,024,492	$19,800,084	9,336,727	$22,849,597
Clays (except for cement)	571,505	628,674	579,423	645,057	576,955	719,785	519,918	2,332,283
Coal	1,724,484	6,911,956	1,891,411	6,976,616	1,630,298	6,109,776	1,380,733	5,297,074
Gypsum (crude)	858,464	2,188,002	981,647	2,507,651	1,127,705	2,881,150	1,122,409	2,797,704
Peat	[3]	[3]	3,000	19,500	13,545	107,909	14,500	110,334
Sand and gravel	7,978,229	4,446,661	8,994,822	4,795,835	9,943,372	5,916,950	10,796,979	6,032,898
Stone (except limestone for cement)	6,831,190	8,663,201	[9] 8,425,490	[9] 10,668,427	9,261,317	12,170,082	9,899,404	13,036,726
Undistributed		16,560		2,151				24,750
Total Iowa		37,458,000		41,773,000		47,706,000		52,481,000

KANSAS

Cement [13]—376-pound barrels	7,640,540	$16,880,156	8,759,103	$19,400,068	8,163,916	$19,413,144	8,811,762	$20,956,886
Clays (except for cement)	302,208	260,318	351,756	320,869	373,365	370,326	349,418	473,129
Coal	2,031,117	7,968,140	2,124,980	8,233,527	1,961,101	7,734,478	2,028,601	7,902,590
Helium (shipments)—cubic feet					26,280,000	327,000	38,509,000	491,000
Lead (recoverable content of ores, etc.)	9,772	3,087,952	9,487	2,561,490	8,947	3,095,662	5,916	1,904,952
Natural gas—thousand cubic feet	294,078,000	15,910,000	364,024,000	24,026,000	417,538,000	33,821,000	412,544,000	34,241,000
Natural-gas liquids:								
Natural gasoline—42-gallon barrels	1,880,000	4,772,000	2,572,000	6,146,000	2,645,000	6,931,000	2,743,000	7,286,000
LP-gases—do	768,000	1,164,000	1,115,000	1,487,000	1,621,000	2,445,000	1,843,000	3,116,000
Petroleum (crude)—do	101,868,000	262,820,000	107,586,000	276,500,000	114,522,000	294,320,000	[4] 114,807,000	[4] 293,910,000
Salt (common)	832,442	5,217,844	846,374	5,914,514	900,917	6,639,343	911,744	6,850,027
Sand and gravel	6,186,719	3,327,920	9,781,123	6,782,285	7,676,888	4,747,544	8,380,065	5,023,593

Stone (except limestone for cement)	[9] 5,978,420	[9] 7,951,490	7,630,300	8,920,207	7,191,483	9,058,512	8,830,871	12,051,740
Zinc (recoverable content of ores, etc.)	29,433	7,299,384	27,176	7,717,984	28,904	10,521,056	25,482	8,460,024
Undistributed: Natural cement, gypsum, pumicite, and stone (dimension sandstone, 1949)		502,347		603,624		662,541		703,011
Total Kansas		337,162,000		368,614,000		400,087,000		403,370,000
KENTUCKY								
Clays (except for cement)	571,427	$2,902,661	660,550	$3,552,718	816,585	$5,210,630	782,099	$5,002,491
Coal	62,583,264	315,472,327	78,495,603	393,637,526	74,972,335	366,686,901	66,114,341	317,386,725
Fluorspar	63,438	2,018,209	80,137	2,554,668	68,635	2,334,485	48,308	1,863,262
Lead (recoverable content of ores, etc.)	187	59,092	66	17,820	107	37,022	60	19,320
Natural gas thousand cubic feet	51,851,000	9,888,000	73,316,000	14,443,000	76,097,000	16,513,000	73,427,000	15,934,000
Natural-gas liquids:								
Natural gasoline 42-gallon barrels	202,000	595,000	244,000	687,000	265,000	799,000	730,000	2,191,000
LP-gases do	1,419,000	1,591,000	1,535,000	1,658,000	1,901,000	2,129,000	3,719,000	3,963,000
Petroleum (crude) do	8,803,000	24,300,000	10,381,000	28,650,000	11,622,000	32,190,000	[4] 11,918,000	[4] 32,890,000
Sand and gravel	2,375,906	2,168,626	2,382,672	2,262,964	2,801,639	2,434,799	3,334,261	2,656,053
Stone (except limestone for cement)	7,100,160	8,586,402	[9] 7,417,200	[9] 8,865,913	7,048,771	8,609,609	[9] 8,817,859	[9] 10,816,707
Zinc (recoverable content of ores, etc.)	935	231,880	731	207,604	3,457	1,258,348	3,280	1,088,960
Undistributed: Native asphalt, cement, and stone (crushed sandstone, 1950, dimension sandstone, 1952)		4,415,471		3,418,768		4,060,716		4,634,339
Total Kentucky		372,229,000		459,956,000		442,264,000		398,446,000
LOUISIANA								
Clays (except for cement)	134,366	$106,841	209,433	$184,890	152,906	$152,906	157,025	$200,697
Natural gas thousand cubic feet	732,845,000	32,025,000	831,771,000	44,084,000	1,054,199,000	61,143,000	1,237,143,000	82,889,000
Natural-gas liquids:								
Natural gasoline and cycle products 42-gallon barrels	13,936,000	45,259,000	14,603,000	44,548,000	15,643,000	49,202,000	16,001,000	48,579,000
LP-gases do	5,318,000	9,573,000	6,165,000	7,991,000	6,839,000	15,374,000	7,082,000	14,890,000
Petroleum (crude) do	190,826,000	507,730,000	208,965,000	554,520,000	232,281,000	614,680,000	[4] 243,929,000	[4] 645,090,000
Salt (common)	2,030,076	5,837,714	2,278,811	6,902,502	2,737,149	7,662,179	2,553,448	7,807,693
Sand and gravel	[12] 5,050,148	[12] 6,107,311	5,505,362	6,310,425	6,384,328	7,419,570	6,005,119	6,736,524
Sulfur (Frasch-process) long tons	1,111,115	20,000,000	1,256,026	23,700,000	1,152,821	25,400,000	1,449,668	32,015,000
Undistributed: Cement, gypsum (1950-52), noncommercial sand and gravel (1949), and stone (except limestone for cement, 1949-50, 1952)		5,173,868		5,365,814		6,644,231		10,051,053
Total Louisiana		631,813,000		693,607,000		787,678,000		848,259,000

For footnotes, see end of table.

TABLE 5.—Mineral production in the United States, 1949–52, by States [1]—Continued

MAINE

Mineral	1949		1950		1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement—376-pound barrels	1,057,413	$2,526,182	1,127,220	$2,705,034	1,236,299	$3,182,918	1,457,250	$3,750,483
Clays (except for cement)	27,918	24,568	31,917	26,561	21,885	21,885	26,050	26,050
Feldspar (crude)—long tons	18,286	130,275	17,487	124,821	19,273	154,695	18,644	147,371
Mica (scrap)	45	1,087	23	592	(3)	(3)	(3)	(3)
Peat	3,312	79,360	2,912	61,600	1,805	36,870	1,695	57,541
Sand and gravel	4,605,172	1,393,676	4,897,143	1,726,217	5,366,694	1,817,317	7,078,078	2,187,531
Stone (except limestone for cement and lime)	258,810	2,025,870	[9] 309,740	[9] 2,214,164	644,594	2,582,541	[9] 316,874	[9] 1,795,768
Undistributed: Beryllium concentrate, columbium-tantalum concentrate (1951), gem stones (1949–51), lime, lithium minerals (1950), mica (sheet, 1950–52), quartz from pegmatites or quartzite (1950–52), slate, stone (crushed sandstone, 1950, and crushed limestone 1952), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		561,208		601,873		[6] 720,095		1,015,827
Total Maine		6,742,000		7,461,000		8,516,000		8,981,000

MARYLAND

Clays (except for cement)	586,453	$922,822	675,749	$1,158,031	697,528	$1,354,883	709,248	$1,363,882
Coal	668,332	3,505,099	647,923	3,134,704	588,639	2,781,343	587,903	2,694,842
Gold (recoverable content of ores, etc.)—troy ounces			20	700	1	35		
Lime (open-market)	64,299	617,696	64,687	691,843	67,684	722,011	72,885	746,893
Natural gas—thousand cubic feet			373,000	74,000	3,422,000	684,000	2,372,000	460,000
Sand and gravel	[12] 4,776,815	[12] 6,028,791	5,864,472	7,789,764	7,054,488	8,170,851	6,956,640	8,136,697
Stone (except limestone for cement and lime)	[9] 1,789,830	[9] 3,036,410	1,975,690	3,459,605	3,181,434	5,983,380	[9] 3,391,679	[9] 6,330,443
Undistributed: Cement, potassium salts, quartz (1949 and 1952), noncommercial sand and gravel (1949–50), slate, stone (dimension granite, 1949 and dimension limestone and crushed marble 1952), talc and ground soapstone		6,350,471		6,416,645		[6] 6,451,707		7,113,819
Total Maryland		20,461,000		22,725,000		[6] 26,148,000		26,847,000

MASSACHUSETTS

Clays	156,017	$135,813	155,279	$139,060	150,370	$167,646	140,148	$160,371
Lime (open-market)	107,931	1,360,328	139,357	1,830,625	143,316	1,930,225	132,135	1,999,545
Peat	595	7,415	650	7,575	(3)	(3)	(3)	(3)
Quartz from pegmatites and quartzite	577	4,265	2,145	23,646	2,186	17,489	(3)	(3)
Sand and gravel	5,504,841	4,379,030	7,111,067	5,430,790	7,232,088	5,592,640	7,645,728	6,128,744
Sand and sandstone (ground)	1,514	9,650	1,829	9,882	(3)	(3)	(3)	(3)
Stone (except limestone for lime)	2,290,940	6,552,935	[9] 3,284,470	[9] 8,484,999	[9] 3,225,839	[9] 9,172,425	[9] 3,355,819	[9] 9,331,871
Undistributed				87,230		70,461		98,245
Total Massachusetts		12,449,000		16,014,000		16,951,000		17,719,000

MICHIGAN

Bromine—pounds	28,034,765	$7,023,211	(3)	(3)	(3)	(3)	(3)	(3)
Cement—376-pound barrels	12,747,791	28,823,055	12,854,423	$29,619,766	14,112,639	$35,121,324	14,760,783	$36,819,042
Clays (except for cement)	368,578	333,249	416,023	380,511	391,134	461,862	436,939	471,938
Coal	11,450	115,912	11,500	116,380	7,347	74,861		
Copper (recoverable content of ores, etc.)	19,506	7,685,364	25,608	10,652,928	24,979	12,089,836	21,699	10,502,316
Gypsum (crude)	1,264,511	3,470,294	1,474,210	4,090,777	1,566,276	4,402,725	1,487,642	4,200,418
Iron ore (usable)—long tons, gross weight	10,993,239	55,237,126	12,821,344	72,358,822	13,611,621	81,765,748	11,779,366	76,088,935
Magnesium compounds from well brines (partly estimated) MgO equivalent	23,700	2,719,000	34,000	3,871,000	45,692	5,010,674	(3)	(3)
Manganiferous ore (5 to 35 percent Mn)—gross weight			117,619	(3)			22,095	(3)
Marl, calcareous (except for cement)	1,500	1,500	218,429	122,212	178,010	96,639	164,519	86,529
Natural gas—thousand cubic feet	14,753,000	2,242,000	11,250,000	1,485,000	11,194,000	1,657,000	9,052,000	1,322,000
Natural-gas liquids: Natural gasoline—42-gallon barrels	86,000	196,000	79,000	161,000	(3)	(3)	(3)	(3)
Peat	(3)	(3)	12,750	174,000	20,180	320,100	29,304	419,856
Petroleum (crude)—42-gallon barrels	16,517,000	45,420,000	15,826,000	42,730,000	13,927,000	37,880,000	[4] 13,251,000	[4] 35,250,000
Salt (common)	4,064,106	16,109,117	4,446,667	18,178,765	5,137,639	21,221,330	4,778,347	21,446,382
Sand and gravel	20,475,996	13,992,903	24,556,911	16,699,203	27,540,921	20,976,632	29,193,763	22,400,879
Stone (except limestone for cement and lime)	16,546,670	13,387,334	19,095,540	15,391,366	20,851,733	17,514,720	17,973,685	15,770,816
Undistributed: Calcium-magnesium chloride, lime, natural-gas liquids (LP-gases, 1952), potassium salts, ground sand and sandstone (1951–52), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		4,503,892		13,909,808		19,343,326		29,753,153
Total Michigan		201,260,000		229,942,000		257,937,000		254,532,000

MINNESOTA

Clays	133,565	$153,446	129,220	$151,074	129,942	$187,605	113,492	$160,408
Gem stones (estimated)	(11)	5,000						
Iron ore (usable)—long tons, gross weight	55,943,714	239,858,902	64,538,759	311,716,341	78,164,527	411,468,895	63,906,069	375,765,251

For footnotes, see end of table.

TABLE 5.—Mineral production in the United States, 1949–52, by States [1]—Continued

MINNESOTA—Continued

Mineral	1949		1950		1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Manganiferous ore (5 to 35 percent Mn)—gross weight	990, 202	[3]	869, 838	[3]	1, 132, 250	[3]	912, 118	[3]
Marl, calcareous (except for cement)	8, 840	$7, 244	19, 375	$7, 600	2, 925	$1, 549	1, 449	$722
Peat	12, 820	54, 255	400	13, 100				
Sand and gravel	12, 935, 392	4, 903, 908	15, 472, 815	5, 903, 025	17, 229, 526	6, 008, 994	19, 825, 157	6, 808, 763
Stone (except limestone for cement and lime)	1, 878, 910	5, 278, 716	[9] 1, 953, 450	[9] 5, 334, 028	[9] 1, 906, 407	[9] 5, 613, 157	[9] 2, 394, 178	[9] 5, 498, 177
Undistributed: Abrasive stones, cement, lime, stone (crushed sandstone, 1950–51 and crushed basalt, 1952), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		7, 278, 961		8, 442, 083		9, 815, 600		9, 207, 947
Total Minnesota		257, 540, 000		331, 567, 000		433, 096, 000		397, 441, 000

MISSISSIPPI

Clays (including fuller's earth) [10]	508, 425	$1, 653, 473	561, 951	$2, 184, 429	673, 062	$4, 250, 237	504, 799	$2, 677, 263
Natural gas—thousand cubic feet	68, 062, 000	4, 199, 000	114, 153, 000	7, 192, 000	158, 845, 000	10, 007, 000	174, 100, 000	10, 620, 000
Natural-gas liquids:								
Natural gasoline and cycle products—42-gallon barrels	776, 000	2, 264, 000	780, 000	2, 274, 000	729, 000	2, 503, 000	803, 000	2, 606, 000
LP-gases—do	495, 000	572, 000	532, 000	864, 000	473, 000	852, 000	467, 000	777, 000
Petroleum (crude)	37, 966, 000	93, 400. 000	38, 236, 000	88, 330, 000	37, 039, 000	82, 970, 000	[4] 36, 310, 000	[4] 80, 970, 000
Sand and gravel	[12] 1, 942, 941	[12] 1, 330, 413	2, 764, 444	1, 985, 908	3, 012, 152	2, 279, 034	2, 296, 577	1, 833, 306
Stone	[3]	[3]	100, 000	115, 000	171, 131	168, 933	90, 000	103, 500
Undistributed		292, 186						2, 287, 612
Total Mississippi		103, 711, 000		102, 945, 000		103, 030, 000		101, 875, 000

MISSOURI

Barite (crude)	186, 891	$1, 497, 985	212, 736	$1, 924, 520	281, 895	$2, 697, 200	304, 080	$2, 919, 795
Cement—376-pound barrels	8, 518, 636	19, 347, 814	9, 779, 657	22, 751, 226	10, 217, 421	25, 760, 473	10, 086, 850	25, 523, 038
Clays (except for cement)	1, 468, 516	3, 962, 674	1, 532, 685	4, 329, 456	1, 904, 015	10, 098, 711	2, 159, 010	11, 226, 794
Coal	3, 647, 456	14, 919, 384	2, 963, 081	12, 368, 575	3, 269, 283	13, 405, 436	2, 954, 450	12, 048, 141
Copper (recoverable content of ores, etc.)	3, 670	1, 445, 980	2, 982	1, 240, 512	2, 422	1, 172, 248	2, 576	1, 246, 784
Iron ore (usable)—long tons, gross weight	144, 549	[3]	194, 138	[3]	172, 466	[3]	268, 218	[3]
Lead (recoverable content of ores, etc.)	127, 522	40, 296, 952	134, 626	36, 349, 020	123, 702	42, 800, 892	129, 245	41, 616, 890

Lime (open-market)	878,561	8,035,117	1,035,176	9,447,669	1,122,299	11,285,877	1,130,970	11,326,941
Natural gas thousand cubic feet	24,000	4,000	21,000	3,000	14,000	2,000	16,000	3,000
Petroleum (crude) 42-gallon barrels	49,000	(3)	32,000	(3)	24,000	(3)	[4] 21,000	(3)
Sand and gravel	5,193,672	4,346,681	6,232,411	5,267,939	6,809,857	5,969,849	6,790,422	6,122,195
Silver (recoverable content of ores, etc.) troy ounces	123,413	111,695	236,273	213,839	184,424	166,913	517,432	468,302
Stone (except limestone for cement and lime)	9,562,720	13,969,008	10,300,400	14,406,627	11,294,227	15,255,427	15,106,544	20,676,958
Tripoli	15,888	505,851	(3)	(3)	(3)	(3)	(3)	(3)
Tungsten concentrate 60-percent WO_3 basis	2	(3)	(5)	(3)				
Zinc (recoverable content of ores, etc.)	5,911	1,465,928	8,189	2,325,676	11,476	4,177,264	13,986	4,643,352
Undistributed: Native asphalt, ground sand and sandstone, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		1,383,431		2,563,363		2,456,861		3,155,176
Total Missouri		111,293,000		113,191,000		135,249,000		140,977,000

MONTANA

Antimony ore and concentrate gross weight					29	(3)		
Clays	53,914	$124,314	37,617	$37,617	39,231	$41,631	51,304	$73,601
Coal:								
Bituminous	2,720,935	6,160,754	2,468,036	5,685,690	2,310,348	6,038,638	2,038,808	5,698,778
Lignite	45,068	150,785	52,130	175,504	35,070	123,263	30,550	112,953
Copper (recoverable content of ores, etc.)	56,611	22,304,734	54,478	22,662,848	57,406	27,784,504	61,948	29,982,832
Fluorspar	422	(3)	41	(3)			16,160	(3)
Gold (recoverable content of ores, etc.) troy ounces	52,724	1,845,340	51,764	1,811,740	30,502	1,067,570	24,161	845,635
Lead (recoverable content of ores, etc.)	17,996	5,686,736	19,617	5,296,590	21,302	7,370,492	21,279	6,851,838
Manganese ore (35 percent or more Mn) gross weight	122,382	5,068,425	131,201	(3)	100,562	(3)	100,070	(3)
Manganiferous ore (5 to 35 percent Mn) do	5,517	(3)	6,810	(3)	7,598	(3)	9,357	(3)
Natural gas thousand cubic feet	35,291,000	1,962,000	39,186,000	2,077,000	36,424,000	2,003,000	28,714,000	1,752,000
Natural-gas liquids:								
Natural gasoline 42-gallon barrels	86,000	210,000	98,000	350,000	113,000	392,000	(3)	(3)
LP-gases do	144,000	431,000	153,000	450,000	164,000	481,000	(3)	(3)
Petroleum (crude) do	9,118,000	23,520,000	8,109,000	20,430,000	8,958,000	22,130,000	[4] 9,606,000	[4] 21,610,000
Phosphate rock long tons	355,169	2,574,330	210,165	1,496,537	304,507	2,353,381	332,299	2,620,764
Sand and gravel	6,682,144	3,365,472	9,044,125	5,140,207	9,582,843	6,201,888	6,765,955	3,579,932
Silver (recoverable content of ores, etc.) troy ounces	6,327,025	5,726,277	6,590,747	5,964,959	6,393,768	5,786,683	6,138,185	5,555,367
Stone (except limestone for cement and lime)	[6] 602,890	[6] 563,465	919,090	949,545	871,508	986,327	[6] 690,081	[6] 792,897
Tungsten concentrate 60-percent WO_3 basis	9	(3)			1	2,832		
Zinc (recoverable content of ores, etc.)	54,195	13,440,360	67,678	19,220,552	85,551	31,140,564	82,185	27,285,420
Undistributed: Barite (1951–52), cement, gem stones (1949–51), gypsum, lime, pumice and pumicite (1950–51), pyrites, sodium sulfate (1951), stone (basalt and unclassified, 1949 and dimension granite 1952), talc, vermiculite, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		4,936,368		11,640,301		12,261,998		14,637,692
Total Montana		98,070,000		103,389,000		126,166,000		121,400,000

For footnotes, see end of table.

TABLE 5.—Mineral production in the United States, 1949–52, by States [1]—Continued

NEBRASKA

Mineral	1949		1950		1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays (except for cement)	86,593	$85,347	100,299	$109,294	86,186	$86,686	90,245	$90,720
Natural gas—thousand cubic feet			17,000	2,000	3,895,000	499,000	5,568,000	740,000
Petroleum (crude)—42-gallon barrels	330,000	730,000	1,547,000	3,300,000	2,558,000	5,960,000	[4] 2,660,000	[4] 6,490,000
Pumice and pumicite	4,622	40,000	[3]	[3]	[3]	[3]	[3]	[3]
Sand and gravel	5,114,766	2,911,734	5,077,792	3,167,659	4,969,243	3,477,409	5,436,540	3,874,106
Stone (except limestone for cement)	[5] 504,870	[5] 840,758	[5] 736,660	[5] 1,042,035	942,967	1,437,899	1,245,106	1,946,448
Undistributed: Cement, natural-gas liquids (1951–52), stone (sandstone, 1949–50), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		5,493,674		6,400,618		7,008,419		7,455,871
Total Nebraska		10,102,000		14,022,000		18,469,000		20,597,000

NEVADA

Antimony ore and concentrate—gross weight	280	$76,964	20	[3]	156	[3]	152	[3]
Barite (crude)	70,576	416,416	47,608	$268,874	63,201	$387,026	68,062	$391,242
Clays (including fuller's earth)	[3]	[3]	[3]	[3]	3,220	33,420	3,958	36,278
Copper (recoverable content of ores, etc.)	38,058	14,994,852	52,569	21,868,704	56,474	27,333,416	57,537	27,847,908
Fluorspar	5,847	[3]	7,577	[3]	[3]	[3]	[3]	[3]
Gold (recoverable content of ores, etc.)—troy ounces	130,399	4,563,965	178,447	6,245,645	121,036	4,236,260	117,203	4,102,105
Gypsum (crude)	495,229	1,347,666	604,604	1,614,107	643,637	1,811,757	608,284	1,666,938
Iron ore (usable)—long tons, gross weight	3,094	[3]	5,465	[3]	299,010	898,306	911,657	3,991,970
Lead (recoverable content of ores, etc.)	10,626	3,357,816	9,408	2,540,160	7,148	2,473,208	6,790	2,186,380
Manganese ore (35 percent or more Mn)—gross weight					328	[3]	695	[3]
Manganiferous ore (5 to 35 percent Mn)—do	4,964	52,990	8,942	102,348	1,250	[3]	7,947	[3]
Mercury—76-pound flasks	4,170	331,348	680	55,257	1,400	294,182	3,523	701,429
Sand and gravel	1,346,608	1,212,166	2,617,052	2,253,258	2,616,629	2,657,654	2,098,211	2,380,419
Silver (recoverable content of ores, etc.)—troy ounces	1,800,209	1,629,280	1,537,217	1,391,259	981,669	888,460	941,195	851,829
Stone (except limestone for lime)	518,510	668,960	[5] 274,460	[5] 269,478	834,807	959,815	830,712	1,158,608
Sulfur ore for direct agricultural use—long tons	860	15,050	867	15,173	[3]	[3]	[3]	[3]
Talc and soapstone (ground)	8,837	147,148	8,581	170,736	6,919	152,878	7,580	180,328
Tungsten concentrate—60-percent WO_3 basis	740	[3]	1,123	[3]	1,482	4,780,237	2,329	8,820,598
Zinc (recoverable content of ores, etc.)	20,443	5,069,864	21,606	6,136,104	17,443	6,349,252	15,357	5,098,524
Undistributed: Andalusite (1949), brucite, diatomite, dumortierite (1949), gem stones (1949 and 1952), lime, magnesite, calcareous marl, molybdenum, perlite, pumice and pumicite,								

salt, stone (crushed limestone, 1950), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		3,487,138		5,567,815		[6] 4,418,333		4,816,659
Total Nevada		37,372,000		48,499,000		[6] 57,674,000		64,231,000
NEW HAMPSHIRE								
Beryllium concentrate	[3]	[3]	106	$40,310	50	$16,670	[3]	[3]
Clays	26,392	$19,795	22,719	17,115	28,501	28,501	30,135	$30,135
Peat	15	296					[3]	[3]
Sand and gravel	[14] 2,000,842	[14] 236,895	[14] 1,713,284	[14] 226,424	2,260,410	517,927	3,200,232	1,001,591
Stone	6,910	381,141	[9] 15,760	[9] 383,667	[9] 62,355	[9] 349,606	69,850	546,177
Undistributed: Abrasive stones, feldspar, mica, sand and gravel (commercial, 1949–50), stone (crushed unclassified, 1950 and crushed granite, 1951), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		751,699		1,043,718		382,691		362,614
Total New Hampshire		1,390,000		1,711,000		1,295,000		1,941,000
NEW JERSEY								
Clays	537,480	$1,314,186	602,369	$1,277,860	683,439	$2,106,628	598,775	$1,962,599
Iron ore (usable) long tons, gross weight	448,489	4,468,575	588,199	5,651,563	657,930	7,810,776	685,466	6,760,467
Manganiferous residuum gross weight	158,902	[3]	183,842	[3]	267,751	[3]	215,255	[3]
Marl (greensand)	6,128	276,564	3,935	304,321	5,067	263,944	4,600	177,847
Peat	25,500	180,750	26,466	186,338	27,678	213,500	21,800	191,664
Sand and gravel	[12] 5,555,121	[12] 6,981,862	[12] 7,620,422	[12] 8,636,141	6,652,383	9,106,052	7,060,074	9,473,428
Sand and sandstone (ground)	107,946	755,215	131,744	936,817	144,098	1,053,991	138,434	1,011,844
Stone (except limestone for lime)	4,070,790	7,896,619	[9] 4,672,050	[9] 9,119,251	6,457,248	10,987,705	6,102,324	12,307,480
Zinc (recoverable content of ores, etc.)[15]	50,984	14,443,062	55,029	17,258,637	62,917	24,279,745	59,190	21,520,612
Undistributed: Lime, magnesium compounds, noncommercial sand and gravel (1949–50), stone (unclassified, 1950), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		2,266,802		3,020,515		3,200,574		3,902,859
Total New Jersey		38,584,000		46,391,000		59,023,000		57,309,000
NEW MEXICO								
Beryllium concentrate gross weight	8	[3]	[3]	[3]	141	$47,008	101	$29,185
Carbon dioxide, natural (estimated) thousand cubic feet	87,000	$35,000	68,000	$27,000	[3]	[3]	[3]	[3]
Clays	97,751	69,002	63,337	77,582	75,653	148,876	57,668	107,633
Coal	1,004,034	5,226,678	726,958	3,917,461	782,698	4,501,842	759,437	4,382,286
Copper (recoverable content of ores, etc.)	55,388	21,822,872	66,300	27,580,800	73,558	35,602,072	76,112	36,838,208

For footnotes, see end of table.

347615—55——3

TABLE 5.—Mineral production in the United States, 1949–52, by States [1]—Continued

NEW MEXICO—Continued

Mineral	1949		1950		1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Fluorspar	12,844	$446,086	20,036	$742,408	24.402	$1,163,098	16,443	$823,320
Gold (recoverable content of ores, etc.)—troy ounces	3,249	113,715	3,414	119,490	3,959	138,565	2,949	103,215
Iron ore (usable)—long tons, gross weight			14,284	(3)	32,210	(3)	7,793	(3)
Lead (recoverable content of ores, etc.)	4,652	1,470,032	4,150	1,120,500	5,846	2,022,716	7,021	2,260,762
Manganese ore (35 percent or more Mn)—gross weight			1,320	(3)	226	(3)	2,360	(3)
Manganiferous ore (5 to 35 percent Mn)—do	65,511	(3)	74,348	(3)	79,844	(3)	52,934	(3)
Natural gas—thousand cubic feet	204,961,000	5,985,000	212,909,000	6,387,000	300,169,000	11,406,000	359,377,000	16,414,000
Natural-gas liquids:								
Natural gasoline—42-gallon barrels	2,733,000	7,728,000	3,021,000	8,898,000	3,307,000	10,507,000	3,903,000	11,660,000
LP-gases—do	1,292,000	1,462,000	1,998,000	2,061.000	2,281,000	3,170,000	2,724,000	3,600,000
Petroleum (crude)—do	47,645,000	116,250,000	47,367,000	115,100,000	52,719,000	129,160,000	[4] 58,681,000	[4] 144,940.000
Potassium salts—K_2O equivalent	932,497	27,950,111	1,072,772	31,944,365	1,217,617	37,209,740	1,411,125	46,385,452
Pumice and pumicite	351,368	1,026,479	351,642	1,109,883	245,564	884,311	217,482	755,139
Sand and gravel	883,223	610,839	937,653	923,270	1,080,256	1,087,857	496,921	499,589
Silver (recoverable content of ores, etc.)—troy ounces	380,855	344,693	338,581	306,433	443,267	401.179	479,318	433,807
Stone	138,290	106,135	364,930	243,841	1,022,901	592,179	[5] 317,894	[5] 191,642
Zinc (recoverable content of ores, etc.)	29,346	7,277,808	29,263	8,310,692	45,419	16,532,516	50,975	16,923,700
Undistributed: Barite, gem stones, gypsum (1949), lithium minerals (1950), mica (1950), molybdenum, perlite, salt, stone (crushed miscellaneous, 1952), vanadium (1950–52), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		900,497		1,424,492		1,726,948		2,151,749
Total New Mexico		198,825,000		210,294,000		256,302,000		288,500,000

NEW YORK

Cement [13]—376-pound barrels	12,679,906	$28,483,681	13,271,469	$30,895,295	13,862,522	$34,687,090	14,624,274	$36,679,379
Clays (except for cement)	976,751	769,290	1,153,909	938,740	1,224,229	1,297,635	872,577	945,463
Emery	4,909	60,917	5,949	75,308	11,634	160,212	10,352	141,911
Gypsum (crude)	916,117	2,805,154	1,280,100	3,876,176	1,259,484	4,010,766	1,143,920	3,816,148
Iron ore (usable)—long tons, gross weight	2,344,518	22,184,757	2,917,257	27,914,818	3,649,531	39,819,368	2,896,531	34,514,879
Lead (recoverable content of ores, etc.)	1,317	416,172	1,484	400,680	1,500	519,000	1,120	360,640
Marl, calcareous (except for cement)	550	3,000	(3)	(3)	(3)	(3)	(3)	(3)
Natural gas—thousand cubic feet	3,693,000	907,000	3,336,000	837,000	3,214,000	807,000	3,627,000	1,059,000
Natural gasoline—42-gallon barrels	167	1,000						
Petroleum (crude)—do	4,425,000	15,750,000	4,143,000	15,660,000	4,254,000	17,990,000	[4] 4,242,000	[4] 17,940,000

Salt (common)	2,951,750	12,709,819	2,806,927	14,405,362	3,518,715	16,552,890	3,417,443	16,746,462
Sand and gravel	18,543,071	15,116,820	21,778,089	18,075,237	21,008,701	19,285,299	20,270,058	18,287,623
Silver (recoverable content of ores, etc.) troy ounces	18,378	16,633	32,628	29,530	47,568	43,051	38,895	35,202
Slate	122,180	1,617,097	151,160	2,054,725	[6] 126,070	[6] 2,000,106	125,930	1,810,865
Stone (except limestone for cement and lime)	13,022,070	18,160,387	13,121,850	19,728,957	15,559,372	24,326,118	16,234,549	25,244,245
Talc	115,636	2,658,774	163,974	4,039,973	152,652	4,170,987	149,837	4,069,771
Wollastonite	500	7,000	800	16,200	(3)	(3)	(3)	(3)
Zinc (recoverable content of ores, etc.)	37,973	9,417,304	38,321	10,883,164	40,051	14,578,564	32,636	10,835,152
Undistributed: Natural cement, feldspar (1949), abrasive garnet, lime, sheet mica (1950), peat (1952), pyrites, titanium concentrate, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		7,408,070		6,698,272		8,542,154		8,254,006
Total New York		138,493,000		156,529,000		[6] 188,790,000		180,741,000

NORTH CAROLINA

Abrasive stone: Millstones	(11)	$8,000	(11)	$9,500	(11)	$6,000	(11)	$9,285
Clays	1,181,047	1,335,954	1,437,202	1,766,785	1,462,030	2,177,515	1,357,700	2,080,172
Coal	13,646	104,392	(3)	(3)	(3)	(3)	1,600	12,684
Feldspar (crude) long tons	160,916	973,431	183,027	1,107,061	166,361	1,230,404	240,364	2,416,031
Gold (recoverable content of ores, etc.) troy ounces	13	455						
Mica:								
Scrap	24,8[illegible]	640,374	48,193	1,281,584	52,550	1,441,886	58,576	1,551,071
Sheet pounds	470,072	121,270	483,736	102,179	464,949	127,204	595,331	664,075
Olivine	2,458	(3)	4,063	(3)	(3)	(3)	(3)	(3)
Sand and gravel	5,092,929	3,553.180	8,352,475	5,465,067	7,656,370	4,435,702	8.724,748	5,665,169
Stone	6,225,290	10,077,976	7,711,580	11,894,745	[9] 8,612,967	[9] 13,292,690	[9] 9,647,513	[9] 14,694,698
Talc, pyrophyllite and soapstone (ground)	86,208	1,344,767	116,895	1,855.163	113,950	1,982,927	115,481	1,771,518
Tin (content of ore and concentrate) long tons					1	1,724	4	11,601
Titanium concentrate (ilmenite)	31,714	(3)	25,842	(3)	32,400	(3)	25,328	(3)
Tungsten concentrate 60-percent WO_3 basis	770	(3)	1,240	(3)	1,041	(3)	1,254	(3)
Vermiculite	(3)	(3)	2,366	66,627	(3)	(3)	(3)	(3)
Undistributed: Abrasive stones (grinding pebbles and tube-mill liners), asbestos (1950–51), beryllium concentrate (1949 and 1951), columbium-tantalum concentrate (1952), lithium minerals (1951–52), quartz, ground sand and sandstone (1950), stone (dimension marble 1951–52, and crushed marble 1952), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		1,594,981		2,789,457		[6] 4,951,305		5,849,314
Total North Carolina		19,755,000		26,338,000		29,647,000		34,726,000

NORTH DAKOTA

Clays	(3)	(3)	(3)	(3)	18,250	$35,250	(3)	(3)
Coal (lignite)	2,967,260	$7,003,712	3,260,973	$7,757,935	3,224,027	7,784,191	2,983,752	$7,068,259

For footnotes, see end of table.

TABLE 5.—Mineral production in the United States, 1949–52, by States [1]—Continued

NORTH DAKOTA—Continued

Mineral	1949		1950		1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Natural gas thousand cubic feet	533,000	$27,000	608,000	$31,000	456,000	$24,000	369,000	$23,000
Petroleum (crude) 42-gallon barrels					25,000	(3)	[4] 1,549,000	(3)
Sand and gravel	4,370,521	1,638,293	4,270,838	1,660,371	4,573,341	2,140,466	6,557,069	1,841,216
Stone	(3)	(3)	193,250	135,698	281,219	213,061	67,064	4,968
Undistributed: Nonmetallic minerals, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		149,181		28,800		50,000		3,119,900
Total North Dakota		8,818,000		9,614,000		10,247,000		12,057,000
OHIO								
Cement 376-pound barrels	10,157,001	$22,388,726	10,512,004	$24,012,983	11,872,278	$29,498,956	11,377,806	$28,488,500
Clays (except for cement)	4,043,999	7,447,829	4,497,550	8,695,537	5,146,531	13,223,958	5,003,870	13,153,782
Coal	30,960,537	123,053,152	37,761,091	143,852,921	37,948,692	146,677,710	36,208,450	138,090,700
Lime (open-market)	1,712,248	20,321,387	2,142,344	26,273,098	2,289,473	29,046,196	2,205,432	28,393,260
Natural gas thousand cubic feet	46,512,000	8,991,000	43,163,000	8,374,000	38,879,000	7,854,000	30,993,000	6,725,000
Natural-gas liquids: Natural gasoline 42-gallon barrels	123,000	432,000	103,000	344,000	107,000	399,000	38,000	114,000
Peat	20,372	181,117	22,145	245,379	21,378	261,891	24,828	290,664
Petroleum (crude) 42-gallon barrels	3,483,000	10,200,000	3,383,000	10,250,000	3,140,000	9,580,000	[4] 3,350,000	[4] 10,020,000
Salt (common)	2,195,778	5,134,923	2,515,205	5,491,553	3,112,472	5,848,478	2,827,455	5,991,626
Sand and gravel	14,955,657	14,428,820	15,664,175	16,209,267	19,430,898	21,394,891	20,751,493	23,069,458
Stone (except limestone for cement and lime)	[9] 19,364,230	[9] 27,419,158	20,466,350	28,628,678	[9] 25,190,277	[9] 36,436,081	[9] 24,693,189	[9] 36,197,485
Undistributed: Abrasive stones, bromine (1950–51), calcium-magnesium chloride, gypsum, ground sand and sandstone, and stone (crushed unclassified, 1949, 1951–52, dimension unclassified, 1952)		2,081,719		2,194,910		2,390,845		2,154,151
Total Ohio		242,080,000		274,572,000		302,612,000		292,689,000
OKLAHOMA								
Clays (except for cement)	244,104	$222,256	315,512	$313,360	345,566	$356,207	249,819	$307,189
Coal	3,021,859	15,242,403	2,678,571	14,567,225	2,223,229	13,873,424	2,193,409	12,687,855
Lead (recoverable content of ores, etc.)	19,858	6,275,128	20,724	5,595,480	16,575	5,734,950	15,137	4,874,114

Natural gas—thousand cubic feet	435,262,000	20,327,000	482,360,000	23,636,000	538,756,000	28,554,000	554,033,000	29,918,000
Natural-gas liquids:								
Natural gasoline—42-gallon barrels	6,855,000	20,360,000	7,980,000	21,579,000	9,458,000	27,498,000	9,660,000	29,459,000
LP-gases—do	5,630,000	8,408,000	6,753,000	8,393,000	8,084,000	12,436,000	8,953,000	14,090,000
Petroleum (crude)—do	151,660,000	388,250,000	164,599,000	423,020,000	186,869,000	480,250,000	[4] 190,435,000	[4] 487,510,000
Sand and gravel	2,921,157	1,525,415	3,286,834	2,356,853	3,183,251	2,321,653	3,769,663	2,911,845
Stone (except limestone for cement and lime)	4,341,930	4,027,409	5,021,660	4,848,223	6,966,676	6,917,548	[9] 9,636,475	[9] 8,974,334
Zinc (recoverable content of ores, etc.)	44,033	10,920,184	46,739	13,273,876	53,450	19,455,800	54,916	18,232,112
Undistributed: Native asphalt, cement, gypsum, lime, pumice and pumicite (1949–50 and 1952), salt, ground sand and sandstone, and stone (dimension limestone, 1952)		8,706,045		9,511,828		10,088,324		12,387,022
Total Oklahoma		484,264,000		527,095,000		607,486,000		621,351,000

OREGON

Antimony ore and concentrate—gross weight	54	$2,851						
Carbon dioxide, natural (estimated)—thousand cubic feet	[16]	50,000	[3]	[3]	[3]	[3]	[3]	[3]
Chromite—gross weight					754	$62,972	6,591	$507,981
Clays (except for cement)	109,405	89,931	112,313	$90,906	94,963	105,285	213,711	506,607
Coal			1,384	8,416			1,179	8,650
Copper (recoverable content of ores, etc.)	20	7,880	19	7,904	11	5,324	1	484
Gold (recoverable content of ores, etc.)—troy ounces	16,226	567,910	11,058	387,030	7,927	277,445	5,509	192,815
Lead (recoverable content of ores, etc.)	12	3,792	17	4,590	2	692	1	322
Mercury—76-pound flasks	1,167	92,730	5	406	1,177	247,323	868	172,819
Perlite (crude)	[3]	[3]	17,397	69,616	[3]	[3]	[3]	[3]
Pumice and pumicite	104,475	273,427	79,653	320,530	47,026	137,136	59,578	201,809
Sand and gravel	7,134,751	7,682,272	8,199,900	8,168,293	10,504,339	9,117,343	12,219,486	8,556,218
Silver (recoverable content of ores, etc.)—troy ounces	12,195	11,037	13,565	12,277	6,218	5,628	4,037	3,654
Stone (except limestone for cement and lime)	[9] 4,397,390	[9] 6,479,164	[9] 3,836,550	[9] 5,559,010	8,721,799	10,831,483	6,250,849	8,893,368
Tungsten concentrate—60-percent WO_3 basis	3	[3]			1	2,795	4	15,960
Zinc (recoverable content of ores, etc.)	6	1,488	21	5,964	3	1,092	1	332
Undistributed: Asbestos (1949–51), cement, diatomite, gem stones, lime (1950–52), 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)		6,582,965		6,906,725		7,607,511		7,612,727
Total, Oregon		21,845,000		21,542,000		28,402,000		26,674,000

PENNSYLVANIA

Cement—376-pound barrels	36,905,254	$84,839,175	39,450,611	$94,604,230	41,560,431	$107,035,506	40,037,761	$103,388,586
Clays (except for cement)	3,154,680	7,527,012	3,300,859	8,478,579	3,992,403	13,663,764	3,528,161	12,308,828
Coal:								
Anthracite	42,701,724	358,008,451	44,076,703	392,398,006	42,669,997	405,817,963	40,582,558	379,714,076
Bituminous	89,214,603	446,774,181	105,870,121	529,461,785	108,163,843	572,194,085	89,181,232	473,475,646

For footnotes, see end of table.

TABLE 5.—Mineral production in the United States, 1949–52, by States [1]—Continued

PENNSYLVANIA—Continued

Mineral	1949		1950		1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cobalt (content of ore)—pounds	673,773	(3)	660,025	(3)	755,631	(3)	639,856	(3)
Gold (recoverable content of ores, etc.)—troy ounces	1,645	$57,575	1,764	$61,740	2,179	$76,265	1,500	$52,500
Iron ore (usable)—long tons, gross weight	952,762	9,324,197	1,116,338	11,626,216	1,215,033	(3)	992,110	(3)
Lime (open-market)	911,065	10,190,679	1,086,451	12,663,074	1,181,100	14,260,054	1,202,981	13,842,213
Natural gas—thousand cubic feet	84,739,000	21,727,000	91,137,000	23,058,000	128,715,000	35,654,000	108,684,000	30,758,000
Natural-gas liquids:								
Natural gasoline—42-gallon barrels	228,000	683,000	232,000	702,000	192,000	656,000	171,000	548,000
LP-gases—do	17,000	45,000	14,000	55,000	18,000	71,000	19,000	75,000
Peat	6,663	30,035	(3)	(3)	8,591	46,568	7,898	43,874
Petroleum (crude)—42-gallon barrels	11,374,000	40,600,000	11,859,000	45,300,000	11,345,000	48,220,000	[4] 11,233,000	[4] 47,740,000
Sand and gravel	11,698,939	14,398,577	13,858,154	17,172,215	15,737,464	21,488,540	14,696,106	19,920,003
Silver (recoverable content of ores, etc.)—troy ounces	10,827	9,799	10,563	9,560	13,575	12,286	9,247	8,369
Slate	228,170	4,578,644	285,120	5,546,014	268,830	5,688,870	214,860	4,487,648
Stone (except limestone for cement and lime)	21,226,480	34,855,664	25,493,230	42,205,691	[9] 27,399,564	[9] 46,668,590	[9] 25,609,812	[9] 44,676,456
Tripoli (rottenstone)	452	9,713	(3)	(3)	(3)	(3)	(3)	(3)
Undistributed: Copper, mica, potassium salts (1949), pyrites, ground sand and sandstone, stone (dimension unclassified, 1951; dimension basalt, 1952), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		2,311,584		2,870,381		[6] 17,672,755		14,558,890
Total Pennsylvania		1,035,970,000		1,186,212,000		1,289,226,000		1,145,598,000
RHODE ISLAND								
Sand and gravel	398,487	$378,896	579,528	$580,322	534,785	$576,781	589,451	$557,396
Stone	[9] 74,670	[9] 451,029	239,400	798,186	239,248	651,931	168,993	654,782
Undistributed: Nonmetallic minerals		98,760		46,500		48,945		37,500
Total Rhode Island		929,000		1,425,000		1,278,000		1,250,000
SOUTH CAROLINA								
Clays (except for cement)	664,333	$3,795,657	955,072	$4,995,971	902,603	$4,689,609	869,819	$4,597,802
Sand and gravel	[12] 287,108	[12] 145,142	348,060	166,710	320,195	139,258	1,048,099	892,312
Stone	[9] 2,440,540	[9] 3,628,596	[9] 2,557,510	[9] 3,836,056	[9] 2,828,868	[9] 3,690,114	[9] 2,914,839	[9] 3,881,178

Undistributed: Barite, cement, kyanite, sand and gravel (noncommercial, 1949), stone (crushed unclassified, 1949–50; dimension granite, 1951–52), topaz (1949), and vermiculite		1,456,480		2,394,796		2,767,017		5,159,307
Total South Carolina		9,026,000		11,394,000		11,286,000		14,531,000

SOUTH DAKOTA

Beryllium concentrate—gross weight	139	$39,772	96	$29,920	138	$46,007	334	$166,251
Clays (except for cement)	151,341	1,529,542	205,585	2,207,827	[6] 254,116	[6] 2,917,952	227,934	2,575,783
Coal (lignite)	26,429	91,646	[2]	[2]	28,350	99,008		
Feldspar (crude)—long tons	32,272	156,548	43,875	249,176	48,559	290,520	40,163	220,954
Gold (recoverable content of ores, etc.)—troy ounces	464,650	16,262,750	567,996	19,879,860	458,101	16,033,535	482,534	16,888,690
Lead (recoverable content of ores, etc.)	4	1,264			2	692	2	644
Mica:								
Scrap	1,125	31,285	1,902	24,989	2,292	42,714	915	24,148
Sheet—pounds	8,367	3,388	13,018	1,684			4,308	32,034
Natural gas—thousand cubic feet	1,000	63			7,000	350	6,000	300
Sand and gravel	5,456,742	2,315,430	5,392,247	2,750,847	5,037,384	2,502,340	5,846,140	2,478,314
Silver (recoverable content of ores, etc.)—troy ounces	109,383	98,997	142,065	128,576	139,590	126,336	132,102	119,559
Stone (except limestone for cement and lime)	[9] 1,023,710	[9] 4,473,432	[9] 1,205,910	[9] 4,860,858	1,263,322	4,660,074	1,671,187	4,806,882
Tungsten concentrate—60-percent WO_3 basis							[5]	335
Undistributed: Cement, columbium-tantalum concentrate (1951–52), lime, lithium minerals, stone (crushed granite, 1949; crushed unclassified, 1950), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		1,741,194		2,582,405		2,932,392		3,141,115
Total South Dakota		26,745,000		32,716,000		[6] 29,652,000		30,455,000

TENNESSEE

Barite (crude)	13,376	$137,120	[2]	[2]	[2]	[2]	[2]	[2]
Cement—376-pound barrels	5,992,571	12,857,600	6,663,427	$14,682,487	7,162,841	$17,203,080	7,428,604	$17,834,060
Clays (including fuller's earth) [10]	623,774	2,399,337	787,403	3,093,526	820,835	2,956,759	702,393	3,179,297
Coal	4,172,272	21,894,594	5,069,800	27,360,273	5,400,946	26,956,174	5,264,954	25,559,740
Fluorspar					140	[2]	348	[2]
Gold (recoverable content of ores, etc.)—troy ounces	171	5,985	160	5,600	108	3,780	241	8,435
Iron ore (usable)—long tons, gross weight					35,908	142,447	[2]	[2]
Lead (recoverable content of ores, etc.)	257	81,212	113	30,510	14	4,844	18	5,796
Lime (open-market)	117,053	1,108,139	98,232	958,325	108,970	1,097,874	100,189	1,005,235
Manganese ore (35 percent or more Mn)—gross weight	175	[3]	133	[3]			126	[3]
Natural gas—thousand cubic feet	83,000	8,000	132,000	13,000	132,000	12,000	107,000	11,000
Petroleum (crude)—42-gallon barrels	18,000	[3]	12,000	[3]	14,000	[3]	[4] 15,000	[3]
Phosphate rock—long tons	1,342,252	9,065,588	1,384,473	10,028,404	1,419,892	10,604,638	1,452,508	10,874,760
Sand and gravel	4,056,398	4,054,463	4,152,684	4,411,105	4,645,041	5,186,617	5,173,401	5,303,321
Silver (recoverable content of ores, etc.)—troy ounces	41,833	37,861	39,958	36,164	24,960	22,590	57,569	52,103
Stone (except limestone for cement and lime)	[9] 7,613,530	[9] 13,026,948	7,978,590	13,802,288	[9] 8,838,796	[9] 14,765,988	10,377,320	17,652,763

For footnotes, see end of table.

TABLE 5.—Mineral production in the United States, 1949–52, by States [1]—Continued

TENNESSEE—Continued

Mineral	1949		1950		1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Zinc (recoverable content of ores, etc.)	29,788	$7,387,424	35,326	$10,032,584	38,639	$14,064,596	38,020	$12,622,640
Undistributed: Copper, pyrites, stone (crushed sandstone, 1949; dimension sandstone, 1951), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		5,269,005		5,239,265		6,831,780		6,400,037
Total Tennessee		77,333,000		89,694,000		99,853,000		100,509,000

TEXAS

Abrasive stone: Pebbles, grinding	226	$2,900	343	$4,709	350	$4,710	510	$3,100
Cement—376-pound barrels	14,741,805	33,409,347	17,281,521	39,677,804	17,642,654	42,648,536	19,849,455	48,042,901
Clays (including fuller's earth) [10]	1,234,607	3,001,975	1,454,485	3,576,797	1,544,064	4,271,976	1,389,434	3,790,596
Coal (lignite)	49,473	50,410	18,169	30,662				
Copper (recoverable content of ores, etc.)	24	9,456	2	832	1	483	18	8,712
Feldspar (crude)—long tons	(3)	(3)	(3)	(3)	(3)	(3)	2,600	31,200
Fluorspar	1,770	(3)	719	(3)				
Gold (recoverable content of ores, etc.)—troy ounces	40	1,400	49	1,715	32	1,120	39	1,365
Gypsum (crude)	843,292	2,178,569	1,076,251	2,771,812	1,136,824	2,987,890	1,021,161	2,682,019
Helium (shipments)—cubic feet	51,501,421	688,795	80,888,990	1,027,913	82,690,000	1,060,000	106,983,000	1,400,000
Iron ore (usable)—long tons, gross weight	568,722	(3)	1,189,415	(3)	1,053,131	(3)	787,193	(3)
Lead (recoverable content of ores, etc.)	132	41,712	129	34,830	43	14,878	56	18,032
Lime (open-market)	173,724	1,739,185	216,439	2,074,367	279,957	2,532,387	281,604	2,622,975
Manganese ore (35 percent or more Mn)—gross weight							56	(3)
Natural gas—thousand cubic feet	2,588,921,000	118,832,000	3,126,402,000	146,941,000	3,781,136,000	204,181,000	4,147,805,000	257,164,000
Natural-gas liquids:								
Natural gasoline and cycle products—42-gallon barrels	47,327,000	138,924,000	54,007,000	156,786,000	59,907,000	189,973,000	61,657,000	188,500,000
LP-gases—do	29,704,000	45,108,000	39,643,000	50,266,000	48,624,000	71,943,000	58,497,000	88,635,000
Peat	1,531	12,000	977	10,566	1,238	10,750	1,200	12,000
Petroleum (crude)—42-gallon barrels	744,834,000	1,932,050,000	829,874,000	2,147,160,000	1,010,270,000	2,610,790,000	[4] 1,022,139,000	[4] 2,641,860,000
Salt (common)	1,641,171	2,419,963	1,852,138	2,846,789	2,401,063	4,000,100	2,640,209	4,402,032
Sand and gravel	14,997,506	13,467,849	17,972,105	15,707,724	18,488,463	15,651,531	18,661,403	17,275,255
Silver (recoverable content of ores, etc.)—troy ounces	2,691	2,435	2,454	2,221	1,381	1,250	4,672	4,228
Stone (except limestone for cement and lime)	4,158,430	5,289,647	[9] 4,893,150	[9] 5,580,463	[9] 7,351,069	[9] 7,626,122	7,604,468	8,664,633
Sulfur (Frasch-process)—long tons	3,678,196	66,208,000	4,248,688	80,300,000	3,835,280	81,900,000	3,691,724	78,910,000
Talc and soapstone (ground)	(3)	(3)	(3)	(3)	(3)	(3)	17,800	216,569
Zinc (recoverable content of ores, etc.)					24	8,736	3	996

Undistributed: Native asphalt, bromine, gem stones, graphite, magnesite (1949), magnesium chloride (for metal, magnesium compounds (except for metal, 1949), mercury (1951), pumice and pumicite, sodium sulfate, stone (crushed basalt and dimension granite, 1950–51), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		16,355,560		19,147,721		28,947,682		34,311,770
Total Texas		2,379,793,000		2,673,950,000		3,268,555,000		3,378,557,000
UTAH								
Asphalt and related bitumens, native: Gilsonite	51,462	$1,303,584	66,186	$1,774,330	65,521	$1,895,374	60,740	$1,779,815
Carbon dioxide, natural (estimated)—thousand cubic feet	94,000	38,000	104,334	42,000	97,436	10,000	84,500	10,000
Clays (including fuller's earth) [10]	221,701	624,164	293,958	929,964	285,128	1,269,203	180,066	1,115,642
Coal	6,159,592	29,357,488	6,669,896	32,050,470	6,135,957	32,652,543	6,140,305	32,410,303
Copper (recoverable content of ores, etc.)	197,245	77,714,530	278,630	115,910,080	271,086	131,205,624	282,894	136,920,696
Fluorspar	8,332	180,166	18,936	337,912	17,827	398,480	17,304	438,699
Gold (recoverable content of ores, etc.)—troy ounces	314,058	10,992,030	457,551	16,014,285	432,216	15,127,560	435,507	15,242,745
Iron ore (usable)—long tons, gross weight	2,698,632	4,403,767	3,111,167	5,746,808	4,637,239	10,141,653	3,990,505	15,025,899
Lead (recoverable content of ores, etc.)	53,072	16,770,752	44,753	12,083,310	50,451	17,456,046	50,210	16,167,620
Lime (open-market)	36,082	355,516	49,419	456,471	(4)	(3)	(3)	(3)
Manganese ore (35 percent or more Mn)—gross weight			120	(3)			95	(3)
Manganiferous ore (5 to 35 percent Mn)—do	4,981	39,983	3,041	(3)	1,369	(3)	3,397	(3)
Natural gas—thousand cubic feet	6,126,000	368,000	3,950,000	237,000	3,733,000	246,000	3,006,000	225,000
Natural gasoline—42-gallon barrels	10,000	36,000	6,000	20,000	(3)	(3)	(3)	(3)
Perlite (crude)	731	2,762	2,585	13,072	3,422	16,017	(3)	(3)
Petroleum (crude)—42-gallon barrels	637,000	(3)	1,228,000	(3)	1,305,000	(3)	1,737,000	(3)
Phosphate rock—long tons			(3)	(3)	580	2,900	(3)	(3)
Pumice and pumicite	(3)	(3)	8,719	10,891	9,422	11,478	(3)	(3)
Salt (common)	78,611	386,935	116,694	511,938	131,444	570,379	136,125	522,721
Sand and gravel	2,331,688	1,553,408	3,435,277	2,251,515	2,971,268	2,268,750	3,260,044	2,350,412
Silver (recoverable content of ores, etc.)—troy ounces	6,724,880	6,086,356	7,083,808	6,411,204	7,310,665	6,616,521	7,194,109	6,511,032
Stone (except limestone for cement and lime)	283,020	427,418	929,410	880,667	1,226,710	1,291,118	[9] 852,351	[9] 1,123,108
Tungsten concentrate—60-percent WO_3 basis	1	(3)			(5)	565	3	9,449
Zinc (recoverable content of ores, etc.)	40,670	10,086,160	31,678	8,996,552	34,317	12,491,388	32,947	10,938,404
Undistributed: Native asphalt (bituminous sandstone 1949–51), cement, diatomite (1950), gem stones (1949), gypsum, molybdenum, potassium salts, quartz crystal (1950), stone (crushed marble, 1952), vanadium, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		17,098,281		25,277,349		23,472,911		24,710,335
Total Utah		177,825,000		229,956,000		257,145,000		265,502,000

For footnotes, see end of table.

TABLE 5—Mineral production in the United States, 1949–52, by States [1]—Continued

VERMONT

Mineral	1949		1950		1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Gold (recoverable content of ores, etc.)—troy ounces	120	$4,200	146	$5,110	156	$5,460	162	$5,670
Lime (open-market)	28,914	356,381	32,843	415,910	32,179	432,483	[3]	[3]
Pyrites—long tons							17,892	[3]
Sand and gravel	1,581,614	728,394	1,040,977	661,994	965,702	646,702	1,264,490	749,835
Silver (recoverable content of ores, etc.)—troy ounces	27,446	24,840	28,205	25,527	41,300	37,379	45,361	41,054
Slate	184,040	3,624,230	238,740	4,471,869	[3]	[3]	[3]	[3]
Stone (except limestone for lime)	441,770	8,276,287	447,310	8,038,892	450,980	7,253,824	404,391	6,016,530
Talc	64,508	788,341	72,135	906,396	78,694	998,792	71,027	926,646
Undistributed: Asbestos, clays, copper, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		3,581,645		4,037,573		[6] 9,141,814		10,150,945
Total Vermont		17,384,000		18,563,000		[6] 18,516,000		17,891,000

VIRGINIA

Clays (except for cement)	449,122	$403,598	545,984	$519,641	544,147	$593,999	648,334	$704,189
Coal	14,584,087	82,366,554	17,666,647	96,965,407	21,399,869	115,978,072	21,579,368	114,861,137
Feldspar (crude)—long tons	33,936	234,442	26,879	188,153	30,979	232,099	[3]	[3]
Iron ore (usable)—long tons, gross weight	4,349	[3]	5,245	[3]	7,248	[3]	[3]	[3]
Lead (recoverable content of ores, etc.)	3,313	1,046,908	3,254	878,580	1,508	521,768	3,792	1,221,024
Lime (open-market)	349,132	3,213,897	428,339	3,861,932	452,680	4,551,656	442,845	4,448,924
Manganese ore (35 percent or more Mn)—gross weight	224	[3]	56	[3]			1,011	[3]
Manganiferous ore (5 to 35 percent Mn)—do	1,279	[3]						
Marl, calcareous (except for cement)	62,482	117,251	52,181	53,861	[3]	[3]	[3]	[3]
Natural gas—thousand cubic feet	65,000	5,000	46,000	4,000	64,000	10,000	1,133,000	279,000
Petroleum (crude)—42-gallon barrels	43,000	[3]	21,000	[3]	12,000	[3]	[4] 10,000	[3]
Sand and gravel	4,412,583	4,049,157	4,373,984	4,144,846	5,772,781	5,750,409	7,136,112	5,556,953
Stone (except limestone for cement and lime)	7,509,740	12,442,765	9,272,740	16,434,602	9,277,252	16,621,116	9,670,961	16,969,952
Zinc (recoverable content of ores, etc.)	13,166	3,265,168	12,396	3,520,464	7,332	2,668,848	13,409	4,451,788
Undistributed: Abrasive stone (millstones 1949–50), aplite, cement, gypsum, kyanite, mica, phosphate rock (1949), pyrites, salt, ground sand and sandstone, slate, talc and soapstone (ground), titanium concentrate, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		9,263,172		11,234,649		14,324,190		16,185,952
Total Virginia		116,408,000		137,806,000		161,252,000		164,679,000

WASHINGTON

Abrasive stone:								
Pebbles (grinding)	20	$240	25	$300	28	$336	20	$240
Pulpstones	28	1,975	33	2,100	22	1,970	12	908
Antimony ore and concentrate, gross weight	14	1,425			110	(3)	100	(3)
Carbon dioxide, natural (estimated), thousand cubic feet	(16)	50,000	(3)	(3)	(3)	(3)	(3)	(3)
Clays (except for cement)	219,738	267,300	216,886	251,850	205,187	285,631	225,277	286,719
Coal	899,046	6,028,636	873,989	5,828,555	857,026	6,031,400	844,197	5,986,129
Copper (recoverable content of ores, etc.)	5,275	2,078,350	5,057	2,103,712	4,089	1,979,076	4,357	2,108,788
Gold (recoverable content of ores, etc.), troy ounces	71,994	2,519,790	92,117	3,224,095	67,405	2,359,175	54,776	1,917,160
Gypsum (crude)			(3)	(3)	(3)	(3)	7,900	29,625
Lead (recoverable content of ores, etc.)	6,417	2,027,772	10,334	2,790,180	8,002	2,768,692	11,744	3,781,568
Manganese ore (35 percent or more Mn), gross weight							436	(3)
Manganiferous ore (5 to 35 percent Mn), do							142	(3)
Olivine	1,070	(3)	40	(3)	(3)	(3)	(3)	(3)
Peat	(3)	(3)			45,304	98,955	42,580	111,386
Pumice and pumicite	8,610	18,221	11,013	22,672	5,105	10,832	3,604	8,089
Sand and gravel	9,215,914	6,391,412	10,605,791	7,435,340	10,546,949	7,595,837	13,322,279	9,422,117
Silver (recoverable content of ores, etc.), troy ounces	357,853	323,875	363,656	329,127	334,948	303,145	315,645	285,675
Stone (except limestone for cement and lime)	[9] 3,688,890	[9] 4,105,516	4,930,820	5,734,563	5,029,735	5,664,433	4,523,234	5,491,525
Tungsten concentrate, 60-percent WO_3 basis					9	33,417	4	14,008
Zinc (recoverable content of ores, etc.)	10,740	2,663,520	14,807	4,205,188	18,189	6,620,796	20,102	6,673,864
Undistributed: Cement, diatomite (1949–50, 1952), epsom salt made from epsomite (1949–51), gem stones, lime, magnesite, quartz, ground sand and sandstone, stone (dimension unclassified, 1949), talc, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		14,384,537		17,126,954		[6] 20,800,634		20,010,946
Total Washington		40,863,000		49,055,000		54,554,000		56,129,000

WEST VIRGINIA

Clays (except for cement)	477,503	$759,065	569,615	$925,305	992,599	$2,183,979	865,077	$2,304,716
Coal	122,610,578	649,696,884	144,115,683	754,370,245	163,309,822	853,893,679	141,713,059	741,421,131
Lime (open-market)	350,311	3,535,352	(3)	(3)	(3)	(3)	(3)	(3)
Natural gas, thousand cubic feet	181,176,000	29,296,000	189,980,000	31,917,000	191,146,000	35,553,000	180,995,000	35,475,000
Natural-gas liquids:								
Natural gasoline, 42-gallon barrels	997,000	2,945,000	1,048,000	2,899,000	1,107,000	3,337,000	1,031,000	3,069,000
LP-gases, do	2,763,000	3,591,000	3,575,000	4,195,000	3,844,000	5,568,000	4,757,000	6,187,000
Petroleum (crude), do	2,839,000	8,770,000	2,808,000	9,350,000	2,757,000	10,370,000	[4] 2,602,000	[4] 9,780,000
Salt (common)	355,515	1,288,471	367,942	1,238,588	379,299	1,314,818	392,519	1,438,490
Sand and gravel	[12] 3,284,805	[12] 5,491,274	3,613,046	6,241,057	4,735,271	8,314,195	4,120,105	7,275,370
Stone (except limestone for cement and lime)	4,854,590	6,960,191	[9] 5,367,510	[9] 7,825,653	[9] 5,754,378	[9] 8,472,639	[9] 4,869,442	[9] 6,826,113

For footnotes, see end of table.

TABLE 5—Mineral production in the United States, 1949–52, by States [1]—Continued

WEST VIRGINIA—Continued

Mineral	1949		1950		1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Undistributed: Abrasive stones, bromine, calcium-magnesium chloride, cement, calcareous marl, sand and gravel (noncommercial, 1949), ground sand and sandstone, stone (dimension limestone, 1950–52), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	----------	$5, 786, 036	----------	$10, 662, 099	----------	$12, 715, 426	----------	$11, 898, 325
Total West Virginia	----------	718, 119, 000	----------	829, 624, 000	----------	941, 723, 000	----------	825, 675, 000

WISCONSIN

Abrasive stone: Pebbles (grinding)	(3)	(3)	530	$10, 600	1, 327	$26, 540	723	$17, 352
Clays (except for cement)	80, 198	$64, 932	80, 293	70, 317	48, 376	48, 376	31, 817	31, 857
Iron ore (usable)—long tons, gross weight	1, 405, 775	(3)	1, 701, 619	(3)	1, 745, 120	(3)	1, 485, 845	(3)
Lead (recoverable content of ores, etc.)	857	270, 812	532	143, 640	1, 391	481, 286	2, 000	644, 000
Lime (open-market)	107, 339	1, 254, 751	124, 530	1, 448, 095	124, 852	1, 562, 200	107, 813	1, 368, 556
Marl, calcareous (except for cement)	18, 533	10, 293	22, 025	13, 931	20, 625	12, 925	17, 000	8, 833
Peat	(3)	(3)	2, 293	9, 536	(3)	(3)	(3)	(3)
Sand and gravel	17, 023, 466	10, 456, 561	19, 117, 115	11, 959, 012	19, 391, 772	12, 392, 464	24, 895, 947	16, 938, 228
Stone (except limestone for cement and lime)	7, 326, 710	13, 636, 020	6, 999, 630	14, 494, 750	7, 609, 323	14, 671, 858	8, 578, 882	16, 754, 675
Zinc (recoverable content of ores, etc.)	5, 295	1, 313, 160	5, 722	1, 625, 048	15, 754	5, 734, 456	20, 588	6, 835, 216
Undistributed: Abrasive stone (tube-mill liners), cement, quartz (1949, 1951–52), ground sand and sandstone, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	----------	8, 871, 417	----------	11, 917, 595	----------	13, 420, 085	----------	13,111,395
Total Wisconsin	----------	35, 878, 000	----------	41, 693, 000	----------	48, 350, 000	----------	55, 710, 000

WYOMING

Clays (except for cement)	369, 782	$3, 567, 044	413, 271	$4, 102, 122	483, 050	[6] $5, 999, 451	706, 748	$9, 176, 507
Coal	6, 000, 924	22, 972, 007	6, 348, 249	24, 048, 403	6, 429, 633	26, 937, 896	6, 088, 421	26, 451, 530
Gem stones (estimated)	(11)	20, 000	(11)	(3)	(11)	(3)	(11)	(3)
Gold (recoverable content of ores, etc.)—troy ounces	389	13, 615	----------	----------	9	315	1	35
Iron ore (usable)—long tons, gross weight	539, 554	(3)	491, 906	(3)	616, 949	(3)	484, 945	(3)

Natural gas	thousand cubic feet	50, 815, 000	2, 820, 000	62, 062, 000	3, 724, 000	71, 508, 000	5, 363, 000	75, 313, 000	5, 874, 000
Natural-gas liquids:									
Natural gasoline	42-gallon barrels	926, 000	3, 248, 000	1, 058, 000	3, 382, 000	1, 176, 000	3, 511, 000	1, 226, 000	4, 016, 000
LP-gases	do	379, 000	842, 000	493, 000	934, 000	784, 000	1, 634, 000	928, 000	1, 881, 000
Petroleum (crude)	do	47, 890, 000	109, 190, 000	61, 631, 000	133, 120, 000	68, 929, 000	148, 200, 000	[4] 68, 074, 000	[4] 148, 400, 000
Phosphate rock	long tons	[3]	[3]	[3]	[3]	178, 948	1, 186, 523	137, 675	919, 987
Pumice				1, 460	6, 353	1, 867	9, 141	2, 851	10, 918
Sand and gravel		2, 352, 493	1, 912, 838	1, 937, 943	1, 251, 220	2, 347, 078	1, 730, 900	2, 426, 999	1, 738, 548
Silver (recoverable content of ores, etc.)	troy ounces	21	19			2	2		
Stone (except limestone for cement)		1, 802, 580	2, 227, 096	1, 841, 400	2, 214, 037	1, 645, 475	1, 857, 267	1, 466, 567	1, 688, 890
Sulfur ore for direct agricultural use	long tons	3, 112	57, 322	[3]	[3]	[3]	[3]	[3]	[3]
Undistributed: Cement, feldspar (1949), gypsum, sodium carbonate and sulfate, vermiculite (1950–52), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)			4, 128, 407		4, 794, 582		5, 408, 858		4, 337, 869
Total Wyoming			150, 998, 000		177, 577, 000		[6] 201, 838, 000		204, 495, 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, bauxite, and mercury. Excludes uranium ores and monazite.
[2] Excludes puzzolan cement, value for which is included with "Undistributed."
[3] Value included with "Undistributed."
[4] Final figure. Supersedes preliminary figure given in commodity chapter.
[5] Less than 1 ton.
[6] Revised figure.
[7] Estimate.
[8] Sales in 1948 included with 1949.
[9] Excludes certain stone, value for which is included with "Undistributed."
[10] Except clays sold or used for cement.
[11] Weight not recorded.
[12] "Commercial." Value of "Noncommercial" included with "Undistributed."
[13] Excludes natural cement, value for which is included with "Undistributed."
[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] Quantity not available.

TABLE 6.—Mineral production in Territories of the United States, 1949–52, by individual minerals

Territory and mineral	1949		1950		1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Alaska:								
Antimony ore and concentrate—gross weight	74	$31,356			301	(1)	420	(1)
Coal	433,533	3,309,303	412,455	$3,033,445	494,333	$3,766,987	686,218	$5,779,423
Copper (recoverable content of ores, etc.)	4	1,576	6	2,496	[2] 1	387		
Gold (recoverable content of ores, etc.)—troy ounces	229,416	8,029,560	289,272	10,124,520	239,637	8,387,295	240,557	8,419,495
Lead (recoverable content of ores, etc.)	51	16,116	149	40,230	[2] 21	7,266	1	386
Mercury—76-pound flasks	100	7,946					28	5,575
Sand and gravel	(1)	(1)	3,050,020	2,377,407	6,887,646	3,738,516	10,781,926	8,650,582
Silver (recoverable content of ores, etc.)—troy ounces	36,056	32,633	52,638	47,640	32,870	29,749	32,986	29,854
Tin (content of ore and concentrate)—long tons	51	114,800	79	170,281	69	197,163	82	220,956
Tungsten concentrate—60-percent WO_3 basis			13	(1)	10	(1)	8	(1)
Zinc (recoverable content of ores, etc.)	2	496	6	1,704	[2] 1	218		
Undistributed: Gem stones (1952), platinum-group metals, pumice (1950), stone, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 1)		4,005,086		2,054,735		3,441,090		3,195,336
Total Alaska		15,549,000		17,852,000		19,569,000		26,302,000
Hawaii: [3]								
Lime (open-market)	8,404	226,926	8,141	219,861	8,740	236,052	8,894	240,786
Sand and gravel					2,561	5,710	1,069	936
Stone	[4] 653,890	[4] 718,705	696,310	1,554,906	[4] 650,094	[4] 1,337,474	705,994	1,545,301
Undistributed: Other nonmetallic minerals		42,826				147,063		17,164
Total Hawaii		988,000		1,775,000		1,726,000		1,804,000
Total Territories		16,537,000		19,627,000		21,295,000		28,106,000

[1] Value included with "Undistributed."
[2] Produced in 1950, but not shipped until 1951 from a mine not active in 1951.
[3] Includes Palmyra, Johnston and Jarvis Islands.
[4] Excludes certain stone value for which is included with "Undistributed."

TABLE 7.—Mineral production in possessions of the United States, 1949–52, by individual minerals

Possession and mineral	1949		1950		1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Canal Zone:								
Sand and gravel [1 2]	39,000	$58,500	22,000	$15,000	32,000	$26,000	56,600	$53,000
Stone (crushed) [1 2]	109,200	163,800	53,000	83,000	55,500	112,000	86,000	152,000
Total, Canal Zone		222,000		98,000		138,000		205,000
Canton: Stone (crushed) [1]	(3)	(3)	(3)	(3)	360	900	150	375
Guam: Stone [1]	2,605,000	5,209,000	[2] 1,528,000	[2] 3,055,000	720,000	[4] 675,000	948,000	870,000
Midway: Stone (crushed) [1]	(3)	(3)	(3)	(3)	(3)	(3)	7,200	[5] 6,000
Puerto Rico:								
Cement—376-pound barrels	2,171,486	6,109,041	3,187,451	8,299,186	4,297,583	11,252,350	3,994,483	10,517,894
Iron ore (usable)—long tons					39,219	225,509	138,613	797,025
Lime (open-market)	7,347	184,618	8,166	180,828	10,350	191,415	8,575	195,000
Salt (common)	12,664	77,322	13,545	137,225	10,566	119,338	12,676	122,158
Sand and gravel	(6)	(6)	101,013	103,806	99,628	99,657	122,730	164,166
Stone	[7] 519,870	[7] 826,621	[7] 250,010	[7] 574,709	283,697	613,751	[7] 689,320	[7] 1,807,388
Undistributed: Other nonmetallic minerals		138,641		1,375				6,328
Total, Puerto Rico		7,336,000		9,297,000		12,502,000		13,610,000
Virgin Islands: Stone (crushed) [1 2]	[8] 9,700	[5 8] 16,000	[8] 2,540	[5 8] 4,000	11,600	47,300	12,900	51,900
Wake: Stone (crushed) [1]	(3)	(3)	(3)	(3)	240	600	4,260	8,000
Total		12,783,000		12,454,000		13,364,000		14,751,000

[1] Quantities are estimated equivalents of cubic yards reported.
[2] Data for fiscal years ended June 30.
[3] Data not available.
[4] Revised figure.
[5] Estimate.
[6] Value included with "Undistributed."
[7] Excludes certain stone value for which is included with "Undistributed."
[8] St. Croix Island only. Data for St. Thomas Island not available.

TABLE 8.—Comparison of world and United States production of principal minerals and metals, 1951–52

[Compiled by Berenice B. Mitchell, Pauline Roberts, Helen Hunt, and Lee Petersen]

Mineral	1951			1952		
	World	United States		World	United States	
	Thousand metric tons		Percent of world	Thousand metric tons		Percent of world
Metals, mine basis:						
Antimony [1]—Sb content	62	3	5	46	2	4
Arsenic [1]	57	15	26	46	14	30
Bauxite	10,984	1,878	17	12,837	1,694	13
Beryl [1]	6	[2]	7	7	[2]	7
Bismuth—thousand kilograms	1,700	[3]	[3]	1,800	[3]	[3]
Cadmium—do	6,120	3,770	62	6,280	3,886	62
Chromite	2,800	6	[4]	3,200	19	[4]
Cobalt [1]—contained	8	[5]	4	10	[5]	4
Columbium—thousand pounds	2,850	[6]	[6]	3,400	5	[4]
Copper—Cu content	2,630	842	32	2,735	839	31
Gold—thousand fine ounces	33,500	1,895	6	34,200	1,927	6
Iron ore	294,000	118,375	40	297,000	99,490	33
Lead—Pb content	1,685	352	21	1,820	354	19
Manganese ore	7,100	95	1	7,700	105	1
Mercury—thousand flasks	148	7	5	150	13	9
Molybdenum—do	21	18	86	22	20	91
Nickel—Ni content	159	1	[4]	173	1	[4]
Platinum group thousand troy oz. Pt, Pd, etc	675	37	5	675	34	5
Silver [1]—thousand fine ounces	197,500	39,907	20	210,200	39,840	19
Tantalite—thousand pounds	38	1	3	95	[7]	[7]
Tin [1]—thousand long tons	170	[8]	[4]	173	[8]	[4]
Titanium:						
Ilmenite	893	486	54	893	480	54
Rutile	42	[3]	[3]	47	[3]	[3]
Tungsten—60 percent WO_3	51	6	12	55	7	13
Zinc—Zn content	2,290	618	27	2,522	604	24
Metals, smelter basis:						
Aluminum	1,790	759	42	2,050	850	41
Copper	2,815	940	33	2,830	929	33
Iron, pig (including ferroalloys)	150,000	65,745	44	152,000	57,507	38
Lead	1,604	376	23	1,796	429	24
Magnesium	81	37	46	151	96	64
Steel ingots	211,000	95,435	45	212,000	84,520	40
Tin [1]—thousand long tons	169	32	19	171	23	13
Zinc	2,097	800	38	2,199	821	37
Fuels:						
Coal:						
Anthracite	144,700	38,709	27	146,400	36,816	25
Bituminous and lignite	1,778,300	484,130	27	1,785,600	423,509	24
Coke:						
Gashouse	[9] 33,000	115	[4]	[9] 34,000	41	[4]
Oven and beehive	204,000	71,967	35	207,000	61,919	30
Fuel briquets and packaged fuel	88,000	2,274	3	90,000	2,155	2
Natural gas—million cubic meters	[10] 240,000	211,170	88	[11]	226,917	[11]
Peat	53,000	176	[4]	54,000	191	[4]
Petroleum, crude thousand barrels	4,286,443	2,247,711	52	4,495,896	[12] 2,289,836	51
Nonmetallic minerals (other):						
Asbestos	1,425	47	3	1,425	49	3
Barite	1,825	767	42	1,900	919	48
Cement	148,400	42,548	29	159,000	43,091	27
Corundum	10			10		
Diamonds thousand metric carats	16,780			18,694		
Diatomite	530	233	44	520	233	45
Feldspar [1]	770	407	53	815	428	53
Fluorspar	1,000	315	32	1,190	303	25
Graphite	190	6	3	190	5	3
Gypsum	24,700	7,861	32	24,300	7,634	31
Magnesite	3,800	608	2	3,800	463	1
Mica (including scrap)	125	65	52	120	69	58
Nitrogen, agricultural fiscal year	4,011	996	25	4,380	1,099	25
Phosphate rock	24,000	10,948	46	25,500	12,224	49
Potash—K_2O equivalent	4,900	1,288	26	5,500	1,511	27
Pumice	940	680	72	780	542	69
Pyrites	13,200	1,034	8	14,200	1,010	7
Salt	54,000	18,332	34	54,000	17,731	33

For footnotes, see end of table.

TABLE 8.—Comparison of world and United States production of principal minerals and metals, 1951–52—Continued

Mineral	1951			1952		
	World	United States		World	United States	
	Thousand metric tons		Percent of world	Thousand metric tons		Percent of world
Nonmetallic minerals (other)—Con.						
Sulfur, native thousand long tons	5,800	5,278	91	6,000	5,293	88
Talc, pyrophyllite, and soapstone	1,650	581	35	1,475	545	37
Vermiculite [1]	216	190	88	226	190	84

[1] World total exclusive of U. S. S. R.
[2] In 1951 United States production was 439 metric tons and in 1952, 467 tons.
[3] Bureau of Mines not at liberty to publish United States figure separately.
[4] Less than one percent.
[5] In 1951 United States production was 343 metric tons and in 1952, 379 tons.
[6] Columbium and tantalite production in United States not always differentiated; see tantalite.
[7] Columbium and tantalite production in United States not always differentiated; see columbium.
[8] In 1951 United States production was 88 long tons and in 1952, 99 tons.
[9] Includes low- and medium-temperature and gashouse coke.
[10] Consumption estimated by the United Nations.
[11] Data not available.
[12] Final figure; supersedes preliminary figure given in commodity chapter.

Employment and Injuries in the Mineral Industries

By Seth T. Reese [1]

THIS CHAPTER of the Minerals Yearbook contains the overall injury and related employment experiences at coal mines, coking plants, metal and nonmetallic mineral mines, metallurgical plants, and stone quarries in the United States for the calendar year 1952. Volume I of the Yearbook contains these experiences in the metal and nonmetal industries, and those in the fuel industries—coal, coke, oil, and gas—are outlined in volume II. The Bureau of Mines is authorized to collect data on injuries and employment from all sections of the mineral industries; but there is no Federal law, except the one applying to the coal-mining industry, that requires operators to supply such data; hence, the reports received from operators, other than those in the coal-mining industry, are voluntary responses to the Bureau's requests for information. Although the figures presented herein may not be complete for all mineral industries of the Nation, every effort has been exerted to make them so, and the figures given are believed to be thoroughly representative of the hazards to which workers in these industries are exposed.

Employment in the mineral industries declined 3 percent in 1952 to an average of 664,341 men working daily. Mineral plants were active an average of 230 days, 5 less than in 1951. Owing to the smaller labor force and to the fewer days of operation, the total man-hours worked in 1952 declined more than 5 percent from 1951. The average worker at mineral plants in 1952 had a shift of 7.87 hours or slightly less than his 7.91-hour shift in 1951. The average hours of work per man-year in the industries was 1,811, or 45 less than the previous year. The lower rate of operating activity in 1952 was noted in each of the major branches of the mineral industries, except metallurgical plants. The greatest reduction in rate of operation was in the coal and coke industries. The decline at metal and nonmetal mines and quarries was moderate.

The injury record of the mineral industries was not as favorable as it was in 1951, although the total of 770 fatalities was 210 less than the 1951 total death toll and the rate of 0.64 per million man-hours at which these fatalities occurred was 17 percent less than the corresponding rate of 0.77 in 1951. The number of nonfatal injuries increased to a total of 53,196, or 1,041 more than the previous year. This increase in lost-time injuries, coupled with the decrease in man-

[1] Chief, Accident Analysis Branch.

hours of worktime, resulted in a frequency rate of 44.22 injuries per million man-hours, or almost 8 percent greater than the 41.06 rate for 1951.

TABLE 1.—Salient statistics of employment and injury experience in the mineral industries in the United States, 1948–52, by industry groups

	1948	1949	1950	1951	1952 [1]
Average number of men working daily: [2]					
Coal mines	507,333	485,306	483,239	441,905	421,500
Metal mines	71,436	71,664	68,292	71,603	73,400
Nonmetal mines (except stone quarries)	11,950	12,077	11,977	12,500	12,800
Stone quarries	77,344	82,209	85,730	84,802	83,200
Coke plants	25,157	24,471	24,347	25,715	25,241
Metallurgical plants	47,768	47,663	46,277	48,019	48,200
Total	740,988	723,390	719,862	684,544	664,341
Average number of active mine-days: [3]					
Coal mines	227	170	189	202	197
Metal mines	282	252	271	278	265
Nonmetal mines (except stone quarries)	287	277	293	298	284
Stone quarries	284	275	272	277	284
Coke plants	350	321	341	344	315
Metallurgical plants	317	294	314	318	319
Total	249	205	221	235	230
Man-days worked, in thousands:					
Coal mines	115,083	82,437	91,231	89,365	82,875
Metal mines	20,125	18,067	18,522	19,913	19,443
Nonmetal mines (except stone quarries)	3,432	3,340	3,512	3,729	3,635
Stone quarries	21,993	22,569	23,347	23,470	23,664
Coke plants	8,798	7,860	8,292	8,834	7,939
Metallurgical plants	15,121	14,031	14,539	15,247	15,381
Total	184,552	148,304	159,443	160,558	152,937
Man-hours worked, in thousands:					
Coal mines	898,231	642,476	711,389	697,247	642,380
Metal mines	161,516	144,368	147,765	159,417	155,450
Nonmetal mines (except stone quarries)	27,784	26,948	28,456	30,130	29,510
Stone quarries	179,111	182,258	189,535	191,113	189,755
Coke plants	70,021	62,446	65,861	70,191	62,803
Metallurgical plants	121,028	112,095	116,430	122,088	123,040
Total	1,457,691	1,170,591	1,259,436	1,270,186	1,202,938
Number of injuries:					
Fatal:					
Coal mines	999	585	643	785	548
Metal mines	104	69	84	95	110
Nonmetal mines (except stone quarries)	15	10	19	17	17
Stone quarries	75	66	54	57	71
Coke plants	20	7	14	10	8
Metallurgical plants	14	23	29	16	16
Total	1,227	760	843	980	770
Nonfatal:					
Coal mines	53,472	35,405	37,264	35,553	37,020
Metal mines	7,631	6,940	6,611	6,824	6,705
Nonmetal mines (except stone quarries)	1,176	1,125	1,238	1,351	930
Stone quarries	4,994	4,826	4,762	4,945	4,980
Coke plants	917	713	780	768	546
Metallurgical plants	2,749	2,567	2,574	2,714	3,015
Total	70,939	51,576	53,229	52,155	53,196
Injury rates per million man-hours:					
Fatal:					
Coal mines	1.11	0.91	0.90	1.13	0.85
Metal mines	.64	.48	.57	.60	.71
Nonmetal mines (except stone quarries)	.54	.37	.67	.56	.58
Stone quarries	.42	.36	.28	.30	.37
Coke plants	.29	.11	.21	.14	.13
Metallurgical plants	.12	.21	.25	.13	.13
Total	.84	.65	.67	.77	.64

See footnotes at end of table.

TABLE 1.—Salient statistics of employment and injury experience in the mineral industries in the United States, 1948–52, by industry groups—Con.

	1948	1949	1950	1951	1952 [1]
Injury rates per million man-hours—Continued					
Nonfatal:					
Coal mines	59.53	55.11	52.38	50.99	57.63
Metal mines	47.25	48.07	44.74	42.81	43.13
Nonmetal mines (except stone quarries)	42.33	41.75	43.51	44.84	31.51
Stone quarries	27.88	26.48	25.12	25.87	26.24
Coke plants	13.10	11.42	11.84	10.94	8.69
Metallurgical plants	22.71	22.90	22.11	22.23	24.50
Total	48.67	44.06	42.26	41.06	44.22

[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 turnover 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 weighed by average number of workers in mine.

During 1952 there were 4 major disasters (a single accident in which 5 or more men are killed) in the mineral industries. There were 2 major disasters in the coal-mining industry; a total of 11 men died. One of these was a gas explosion in a bituminous-coal mine, claiming 6 lives, and the other occurred at a Pennsylvania anthracite mine when an abandoned area filled with water was tapped; 5 men were drowned in this accident. When a trestle collapsed at a quarry operation, 5 men were killed; and a gas explosion in the shaft of a gold mine killed 5 men. In 1951, 157 men lost their lives in 5 major disasters, all in the coal-mining industry.

Fatality experience was improved sharply in the coal-mining industry and slightly in the coking industry; that at metallurgical plants remained unchanged from 1951. The frequency of occurrence of fatalities at metal and nonmetal mines and at stone quarries was greater than in the previous year. The nonfatal-injury record presented a somewhat different picture in 1952. In the coal-mining industry there was a sharp recession, as the lost-time injuries increased in rate of occurrence from 50.99 to 57.63 per million man-hours; the corresponding rate at metal mines increased from 42.81 to 43.13. At stone quarries and at metallurgical plants rates higher than the 1951 rates were also recorded. Only at nonmetallic mineral mines and at coke plants in 1952 were nonfatal-injury rates lower than the 1951 rates.

Work Stoppages.—According to the Bureau of Labor Statistics, there were 651 work stoppages in the mineral industries during 1952. Of these, 560 at bituminous-coal mines caused a loss of 2,760,000 man-days, 41 at Pennsylvania anthracite mines resulted in a loss of 104,000 man-days, and 29 at metal mines accounted for a loss of 1,300,000 man-days. The 21 stoppages at nonmetal mines, stone quarries, and petroleum-refining operations resulted in an additional loss of 140,000 man-days. The total of 4,304,000 man-days of work idleness in the mineral industries in 1952 was 3 times as great as the total loss caused by work stoppages in 1951, although the total number of work stoppages was virtually identical in each of the 2 years.

Average Earnings.—The hourly and weekly earnings increased in each of the mineral industries for which data are published by Bureau of Labor Statistics, as shown in table 2.

TABLE 2.—Work stoppages, average earnings, and labor turnover in certain mineral industries in the United States, 1948–52

Industry and year	Work stoppages [1]		Average earnings [2]		Labor-turnover rates [3]	
	Number	Man-days lost (thousands)	Weekly	Hourly	Accession	Separation
Coal mining:						
Anthracite:						
1948	26	274	$66.57	$1.81	1.7	1.9
1949	34	1,400	56.78	1.88	1.5	2.1
1950	41	80	63.24	1.97	1.8	1.8
1951	30	81	66.66	2.20	1.8	2.3
1952	41	104	71.19	2.26	1.4	2.2
Bituminous:						
1948	561	9,560	72.12	1.90	3.3	3.1
1949	421	16,700	63.28	1.94	2.0	2.9
1950	430	9,320	70.35	2.01	[4] 2.0	[4] 2.4
1951	549	887	77.79	2.21	1.9	2.6
1952	560	2,760	78.32	2.29	1.9	2.8
Metal mining:						
Total:						
1948	11	473	60.80	1.43	4.7	4.5
1949	9	970	61.55	1.51	3.8	4.5
1950	14	235	65.58	1.55	4.6	4.0
1951	23	269	74.56	1.71	5.3	4.9
1952	29	1,300	81.65	1.86	5.8	5.7
Iron:						
1948	[5]	[5]	58.32	1.41	3.1	2.9
1949	[5]	[5]	58.91	1.48	2.1	2.2
1950	[5]	[5]	61.96	1.52	2.7	2.3
1951	[5]	[5]	72.68	1.71	2.7	2.5
1952	[5]	[5]	80.34	1.83	2.9	2.9
Copper:						
1948	[5]	[5]	65.81	1.46	5.9	5.5
1949	[5]	[5]	63.96	1.51	4.8	5.3
1950	[5]	[5]	72.05	1.60	5.1	4.3
1951	[5]	[5]	78.54	1.70	5.1	4.8
1952	[5]	[5]	85.73	1.88	5.4	5.1
Lead-zinc:						
1948	[5]	[5]	61.37	1.49	6.4	6.0
1949	[5]	[5]	64.79	1.57	3.9	5.5
1950	[5]	[5]	66.64	1.60	4.3	3.8
1951	[5]	[5]	76.11	1.77	5.3	4.8
1952	[5]	[5]	81.60	1.92	4.4	4.5
Nonmetal mining and quarrying:						
1948	16	57	55.31	1.24	[5]	[5]
1949	17	166	56.38	1.30	[5]	[5]
1950	22	64	59.88	1.36	[5]	[5]
1951	24	53	67.05	1.49	[5]	[5]
1952	17	94	71.10	1.58	[5]	[5]
Cement:						
1948	4	37	54.76	1.31	3.7	3.4
1949	3	37	57.49	1.38	1.7	1.8
1950	12	57	60.13	1.44	2.2	2.0
1951	12	12	65.21	1.56	2.9	2.7
1952	[5]	[5]	67.72	1.62	2.7	2.6
Coke and byproducts:						
1948	3	11	58.56	1.48	[5]	[5]
1949	3	31	61.07	1.55	[5]	[5]
1950	2	2	62.85	1.58	[5]	[5]
1951	4	11	69.39	1.66	[5]	[5]
1952	[5]	[5]	73.74	1.76	[5]	[5]
Petroleum refining:						
1948	6	728	72.06	1.79	1.1	.9
1949	6	39	75.33	1.87	.4	1.0
1950	10	638	77.93	1.93	.8	.8
1951	8	37	84.66	2.08	1.2	.8
1952	4	46	88.44	2.20	1.0	.8

[1] Number of stoppages beginning during the 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 all additions to the work force, whether new or rehired employees; separations and all terminations of employment including quits, discharges, layoffs, 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.

Labor Turnover.—Labor turnover in the mineral industries for which data were published by the Bureau of Labor Statistics followed the same pattern in 1952 as in 1951, with the highest in metal mining and the lowest in petroleum refining. The separation rates were lower than the accession rates in 1951 in each of the mineral industries, except anthracite, bituminous-coal, and lead-zinc mining. The rates at iron mines were identical. The accession rate in the bituminous-coal industry and the separation rate in the petroleum-refining industry remained unchanged in 1952 and 1951.

NATIONAL SAFETY COMPETITION

Safety competitions, sponsored and conducted annually by the Bureau of Mines, have proved effective in promoting accident-prevention work in the mineral industries of the country. An encouraging number of the 760 mineral plants enrolled in the National Safety Competition and the National Sand and Gravel Competition made outstanding safety records in 1952. Of the operations enrolled in these 2 contests 259 (34 percent) attained injury-free records. The aggregate worktime of these injury-free plants was almost 171 million man-hours. In addition, the Bureau of Mines conducts four other competitions sponsored annually by national associations connected with the mineral industries. These associations are: National Sand and Gravel, National Lime, National Crushed Stone, and National Slag. In these contests, of the 265 plants enrolled in 1952, 92 (35 percent) had injury-free records during an aggregate worktime of about 31 million man-hours.

Trophy awards for the best safety record in each of the six groups of the 1952 National Safety Competition were made to the following:

Anthracite Underground Mines.—The Hunter Tunnel mine of the Philadelphia and Reading Coal and Iron Company, Ashland, Pa.

Bituminous-Coal Mines.—The Short Creek mine of the Tennessee Coal & Iron Division of the United States Steel Co., Adamsville, Ala.

Metal Underground Mines.—The Buck mine of Pickands Mather & Co. (the Verona Mining Co.), Caspian, Mich.

Nonmetal Underground Mines.—The Annandale mine of the Michigan Limestone Division of the United States Steel Co., Boyers, Pa.

Open-Pit Mines.—The Noralyn mine of the International Minerals & Chemical Corp., Bartow, Fla.

Quarries.—The Hillsville quarry of the Michigan Limestone Division of the United States Steel Co., Hillsville, Pa.

TABLE 3.—Employment and injury experience of the mineral industries of the United States, 1931–52

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	719,862	221	159,443,478	1,259,436,140	843	53,229	.67	42.26
1951	684,544	235	160,558,417	1,270,186,435	980	52,155	.77	41.06
1952 [1]	664,341	230	152,937,119	1,202,938,237	770	53,196	.64	44.22

[1]Includes preliminary data except those for coke, which are final.

The Mineral Industry of Alabama

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Alabama.

By G. D. Jermain[1] and Walter B. Jones[2]

NUMEROUS minerals are mined in Alabama, including coal, iron ore (limonite and hematite), clay (fire, kaolin, and miscellaneous), limestone and dolomite, mica, graphite, bauxite, natural gas, petroleum, sandstone, marble, salt, and sand and gravel.

Alabama's mineral production in 1952 decreased in value $5,898,000 (4 percent) below that of 1951. Coal mining suffered the greatest loss.

Jefferson County, with its concentration of metallurgical industries, led all other counties in mineral production by a wide margin.

Table 1 shows mineral production for 1951–52.

TABLE 1.—Mineral production in Alabama, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement [2]—376-pound barrels	10,586,825	$24,523,073	10,642,409	$25,084,379
Clays (except for cement)	918,598	1,367,545	921,588	1,560,858
Coal	13,596,982	82,465,625	11,383,427	70,759,815
Iron ore (usable)—long tons, gross weight	8,181,737	34,799,951	7,243,214	37,940,412
Lime (open-market)	455,953	4,395,922	424,028	4,458,604
Natural gas—thousand cubic feet	1,000	50	4,000	160
Petroleum (crude)—42-gallon barrels	1,020,000	(3)	[4] 1,279,000	(3)
Sand and gravel	3,535,871	2,806,540	3,722,555	2,955,630
Stone (except for cement and lime)	2,818,421	7,254,671	3,052,150	7,948,410
Undistributed: Native asphalt, bauxite, puzzolan cement, graphite, mica (1952), salt (1952), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		6,666,181		7,673,680
Total Alabama		164,280,000		158,382,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels and bauxite are strictly production.
[2] Excludes puzzolan cement, value for which is included with "Undistributed."
[3] Value included with "Undistributed."
[4] Final figure. Supersedes preliminary figure given in commodity chapter.

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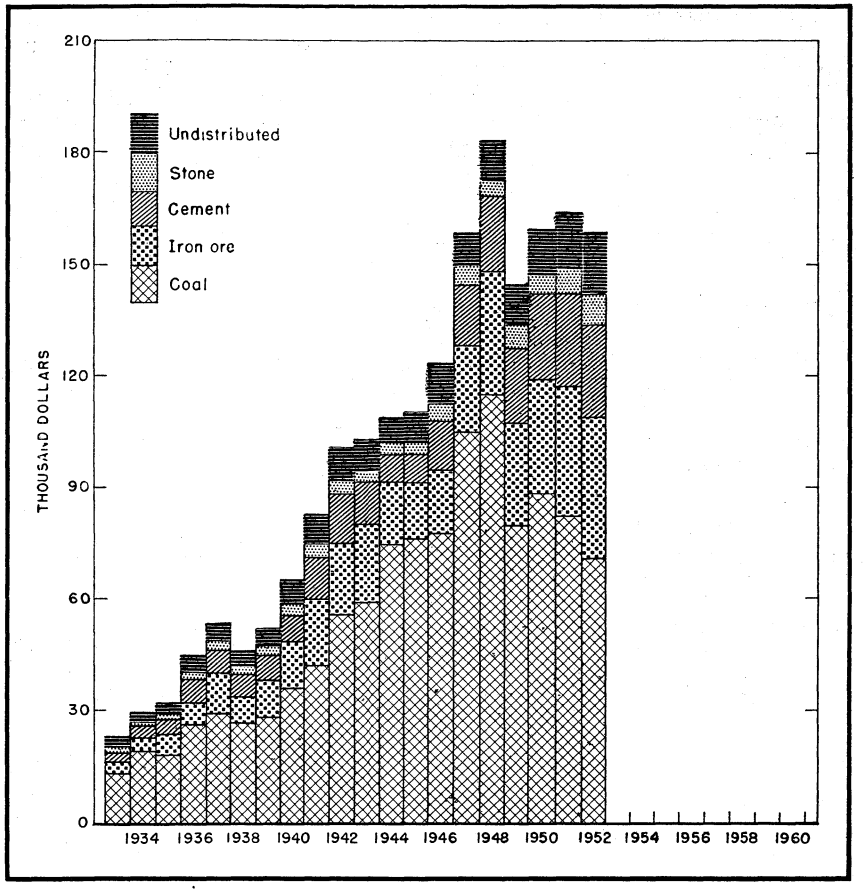

FIGURE 1.—Value of mineral production in Alabama, 1933–52.

REVIEW BY MINERAL COMMODITIES

METALS

Bauxite.—Bauxite is found in Cherokee, Calhoun, Talladega, Colbert, Barbour, and Henry Counties. Mining at present is done only in Barbour County. The ore occurs in pockets and depressions along the eroded surface of the Midway or Clayton limestone. Several varieties of ore are present, from the white chalky ore to the hard white and red varieties. The belt carrying most of the deposits is about 12 miles long and 8 miles wide at its widest point. Usually the belt is not more than 2 miles wide.

Iron Ore.—Shipments of usable iron ore in Alabama, the third largest producing State, declined 938,523 long tons (11 percent) under 1951. On the other hand, despite the decrease in tonnage, the total value of iron ore shipped increased $3,140,461 (9 percent) over 1951.

The Tennessee Coal & Iron Division of the United States Steel Corp. was again the largest producer of hematite. It shipped ore from its Red Mountain mines, comprising the Muscoda, Ishkooda, and Wenonah groups. Most of this ore went direct to blast furnaces after crushing and blending. Approximately one-fourth of the ore, consisting of fines, was sintered or briquetted. Republic Steel Corp., with blast furnaces in Birmingham and Gadsden, shipped sintered concentrate from its Spaulding operation and direct-shipping ore from its Edwards mine. The Woodward Iron Co. shipped ore from its Red Ore, Songo, and Pyne mines. Sloss-Sheffield (United States Pipe & Foundry Co.) operated the Sloss Red Ore and Ruffner mines. In addition to the above producers, a small quantity of hematite was mined by the Zeigler Construction Co.

Brown iron ore or limonite was produced by 27 operators in Blount, Butler, Calhoun, Cherokee, Etowah, Franklin, Marshall, Shelby, Talladega, and Tuscaloosa Counties. Of these, Franklin and Tuscaloosa Counties produced the bulk of the ore. Brown-iron-ore production remained virtually the same as in 1951.

TABLE 2.—Production and consumption of iron ore, 1952

	Long tons		Long tons
Crude iron ore mined:		Types of products:	
Hematite	6, 273, 538	Direct-shipping ore	5, 084, 652
Brown ore	4, 970, 934	Sinter	990, 896
Totals	11, 244, 472	Concentrate	1, 147, 972
Mining method:		Consumption of iron ores and uses:	
Open pit	5, 263, 769	Metallurgical uses:	
Underground	5, 980, 703	Iron blast furnaces	6, 977, 833
Crude ore shipped from mine:		Steel furnaces	55, 241
Direct to consumers	1, 858, 524	Sintering plants	1, 162, 725
To beneficiation plants	9, 293, 904	Miscellaneous uses:	
Totals	11, 152, 428	Cement plant	69, 658
Usable iron ore produced:		Other	90
Hematite	6, 186, 663		
Brown ore	1, 053, 685		
Totals	7, 240, 348		

Number of mines—38.
Iron content, usable ore, natural, percent (ave.)—37.76.

TABLE 3.—Iron-ore shipments, 1943–47 (average) and 1948–52

Year	Long tons	Value	Year	Long tons	Value
1943–47 (average)	6, 821, 714	$18, 834, 705	1950	7, 402, 208	$28, 932, 801
1948	8, 024, 052	32, 543, 715	1951	8, 181, 737	34, 799, 951
1949	7, 314, 204	27, 553, 175	1952	7, 243, 214	37, 940, 412

TABLE 4.—Principal iron-ore mines in 1952, by size of crude-ore output

Name of mine	Operator	Kind of ore	County	Method of mining	Production, gross tons	
					Crude ore	Usable ore
Wenonah	Tennessee Coal & Iron Division of United States Steel.	Hematite	Jefferson	Underground	1, 929, 082	1, 928, 891
Muscoda	do	do	do	do	1, 078, 889	1, 078, 782
Ishkooda	do	do	do	do	1, 041, 713	1, 041, 609
Adkins	Shook & Fletcher	Brown	Tuscaloosa	Open pit	999, 710	199, 942
Pyne	Woodward Iron	Hematite	Jefferson	Underground	966, 704	966, 704
Warner	Shook & Fletcher	Brown	Franklin	Open pit	950, 000	188, 688
Blackburn	do	do	do	do	920, 000	184, 170
Schroeder	E. C. Schroeder	do	do	do	622, 300	124, 454
Russellville No. 14	Sloss-Sheffield	do	do	do	612, 724	178, 679

NONMETALS

Cement.—Several extensive limestone formations in the State are utilized in manufacturing portland cement. Two plants utilize Ordovician limestone; 3 plants derive their limestone from the Cambrian Conasauga formation; 1 uses argillaceous limestone of Cretaceous age; and the remaining plant uses oyster shells. Deposits of shale, clay, sandstone, and sand are common.

Cement production in 1952 decreased 163,757 barrels (2 percent), but shipments increased 55,584 barrels over those in 1951. Stocks on hand December 31, 1952, were 551,641 barrels, a reduction of 33,175 barrels below December 31, 1951.

Higher prices prevailed, the average price per barrel being $2.36 for 1952 compared to $2.32 in 1951.

Puzzolan cements are manufactured by two plants in Alabama.

TABLE 5.—Finished portland cement produced, shipped, and in stock, 1948–52

	1948	1949	1950	1951	1952
Number of plants	7	7	7	7	7
Production—barrels	9, 908, 219	9, 721, 542	10, 371, 834	10, 772, 991	10, 609, 234
Total value of production, based on average value of shipments	$20, 014, 602	$20, 998, 531	$22, 714, 316	$24, 993, 339	$25, 037, 792
Shipments from mills:					
Barrels	9, 948, 600	9, 394, 348	10, 574, 955	10, 586, 825	10, 642, 409
Value	$20, 140, 177	$20, 320, 658	$23, 175, 772	$24, 523, 073	$25, 084, 379
Average value per barrel	$2. 02	$2. 16	$2. 19	$2. 32	$2. 36
Stocks at mills on Dec. 31—barrels	274, 577	601, 771	398, 650	584, 816	551, 641

Clays.—Clays of nearly every variety are found in the State. Fire clay is found underlying coal seams in the coal measures and is widely distributed over the coal fields. Kaolin production is restricted to the area of the crystalline or metamorphic rocks, embracing part or all of Cleburne, Clay, Randolph, Lee, Macon, Tallapoosa, Elmore, Coosa, and Chilton Counties. Miscellaneous clays and shales suitable for brickmaking are found in a large number of counties.

Total clay production in 1952, excluding clay for cement, increased 2,990 tons in weight and $193,313 (14 percent) in value over that of 1951.

Fire Clay.—The total quantity of fire clay sold or used by producers increased 8 percent over 1951. Walker County led in the production of fire clay, followed by Blount and Jefferson Counties. Other counties reporting production were Calhoun, Chilton, Franklin, St. Clair, and Shelby.

TABLE 6.—Fire clay sold or used by producers, 1943–47 (average) and 1948–52

Year	Short tons	Value	Year	Short tons	Value
1943–47 (average)	115,680	$230,316	1950	167,779	$295,764
1948	170,789	346,526	1951	203,339	707,030
1949	122,052	246,112	1952	220,009	757,451

Kaolin.—Marion County was the only source of kaolin.

Miscellaneous clays.—Russell County led in the production of miscellaneous clays, followed by Montgomery and Jefferson Counties. Other counties reporting output were Baldwin, Calhoun, Dallas, Escambia, Etowah, Fayette, Houston, Madison, and St. Clair.

TABLE 7.—Miscellaneous clays sold or used by producers, 1943–47 (average) and 1948–52 [1]

Year	Short tons	Value	Year	Short tons	Value
1943–47 (average)	704,766	$483,446	1950	1,170,153	$900,329
1948	1,075,790	782,395	1951	(2)	(2)
1949	1,048,599	760,845	1952	(2)	(2)

[1] Except clay for cement.
[2] Figure withheld to avoid disclosure of individual company operations.

Graphite.—In 1952 graphite was produced by one operator in Clay County. The known deposits of graphite in Alabama are in the metamorphosed rocks of the Piedmont area, which outcrop in the eastern portion of the State. The graphite occurs in a schist which forms lenses in the Ashland series of the crystalline belt.

The majority of the deposits are confined to a zone with a northeast-southwest trend running from the northwestern corner of Clay County to Millerville. A gap occurs in the southwestern part of Clay County; but the graphite-bearing rocks show up again near Goodwater, Coosa County, and continue entirely across Coosa County and for a little way into Chilton County.

Lime.—Lime is manufactured at present from three formations: The Newala limestone member of the Knox dolomite, the Ketona member of the same formation, and the Bangor limestone. The Newala limestone, which has its best development in Shelby County from the vicinity of Calera to Pelham, is perhaps the best limestone in the State for lime production.

In 1952, 7 plants produced quicklime and 5 plants hydrated lime. Total production of lime decreased 31,925 tons (7 percent), but total value increased $62,682 (1 percent) over that of 1951. Sales of hydrated lime were increased 16,226 tons, but output of quicklime decreased 48,151 tons.

TABLE 8.—Lime sold by producers, by types and major uses, 1948–52

	1948		1949		1950		1951		1952	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
By type:										
Quicklime	331, 537	$2, 705, 863	318, 783	$2, 697, 857	345, 581	$3, 024, 647	409, 699	$3, 875, 697	361, 548	$3, 674, 023
Hydrated	56, 660	569, 539	40, 663	505, 707	43, 490	553, 203	46, 254	520, 225	62, 480	784, 581
Total	388, 197	3, 275, 402	359, 446	3, 203, 564	389, 071	3, 577, 850	455, 953	4, 395, 922	424, 028	4, 458, 604
Number of plants producing:										
Quicklime	8		8		7		7		7	
Hydrated	5		4		4		5		5	
By use:										
Masons	32, 621	298, 211	21, 005	237, 833	8, 848	112, 546	13, 712	174, 105	20, 675	255, 356
Masonry mortars	31, 171	249, 736	26, 247	232, 976	70, 413	702, 166	72, 101	721, 135	71, 872	716, 597
Chemical	310, 152	2, 604, 709	299, 796	2, 614, 549	296, 298	2, 627, 202	356, 038	3, 329, 430	317, 400	3, 299, 539
Other [1]	14, 253	122, 746	12, 398	118, 206	13, 512	135, 936	14, 102	171, 252	14, 081	187, 112
Total	388, 197	3, 275, 402	359, 446	3, 203, 564	389, 071	3, 577, 850	455, 953	4, 395, 922	424, 028	4, 458, 604

[1] Includes finishing, agricultural, dead-burned dolomite, and other uses.

Mica.—Mica was mined during 1952 in Clay and Randolph Counties by several small operators.

The mica deposits of Alabama are confined to certain zones in the crystalline belt of the Piedmont area, with most of the development being located in Randolph, Clay, and Coosa Counties.

Salt.—Salt was produced near McIntosh, Washington County, in 1952 for the first time from an extensive salt dome, the top of which is 422 feet below the surface.

Sand and Gravel.—Sand and gravel production in 1952 was reported by operators in 23 counties. The bulk of the sand is used for building and paving purposes, and, for the most part, is produced locally from deposits near areas in which construction occurs. Some sands are used as filter, engine, molding sand, etc.

In 1952 production of sand increased 139,996 tons (9 percent), but its value decreased $77,828 (6 percent) below 1951. The largest increase was made in the use of paving sand.

Gravel production increased only 46,688 tons (2 percent), but its value increased $226,918 (14 percent) over that of 1951.

Total production of sand and gravel from commercial and noncommercial producers increased 186,684 tons (5 percent) and in value $149,090 (5 percent) over 1951.

TABLE 9.—Sand and gravel sold or used by producers, 1943–47 (average) and 1948–52

Year	Short tons	Value	Year	Short tons	Value
1943–47 (average)	2,917,832	$1,798,390	1950	3,616,363	$2,463,722
1948	3,619,469	2,405,901	1951	3,535,871	2,806,540
1949	3,396,582	2,268,013	1952	3,722,555	2,955,630

Stone.—Production of crushed and broken limestone increased 235,965 tons (9 percent) and $947,429 (19 percent) over 1951. Riprap and fluxing stone decreased in tonnage, but gains were registered in all other crushed-limestone products.

Dimension marble, limestone, and sandstone decreased 55,976 cubic feet (20 percent) and $369,353 (24 percent) in value below 1951. Dimension marble and limestone showed losses, whereas dimension sandstone gained.

Other stone products of marble, sandstone, and miscellaneous stone comprising products used for rough construction, rubble, and such crushed-marble products as terrazzo, riprap, etc., increased only 214 tons in quantity but $115,663 (20 percent) in value over 1951.

Dimension limestone is quarried in the vicinity of Russellville, Franklin County, from a bed of oolitic limestone. The bed is remarkably uniform in texture and ranges from 20 to 30 feet in thickness. The stone is light gray to almost white.

The crystalline marbles occur in a narrow belt extending from Marble Valley in Coosa County through Talladega County into Calhoun County. The marble ranges from almost pure white to cream, with various grades of streaked or clouded varieties. The crushed material and refuse from the marble pits are used for terrazzo, whiting, etc.

TABLE 10.—Stone sold or used by producers 1948–52, in short tons

	1948		1949		1950		1951		1952	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Limestone (crushed and broken stone):										
Riprap					6,500	$8,211	71,968	$82,250	36,440	$49,194
Fluxing stone	1,837,350	$2,042,804	1,766,820	$2,142,465	1,736,780	2,076,658	1,832,605	2,298,861	1,816,833	2,330,467
Crushed stone:										
Concrete and road metal	(1)	(1)	89,170	109,975	259,740	510,665	261,840	383,491	531,508	1,302,532
Railroad ballast	(1)	(1)	80	71						
Agriculture	229,050	287,805	239,330	277,349	199,110	271,632	227,220	286,816	244,716	286,358
Miscellaneous	227,890	416,492	278,140	893,971	245,830	909,856	306,431	2,052,440	306,532	2,082,736
Undistributed	66,150	85,367								
Total	2,360,440	2,832,468	2,373,540	3,423,831	2,447,960	3,777,022	2,700,064	5,103,858	2,936,029	6,051,287

	1948	1949	1950	1951	1952
Dimension marble, limestone, and sandstone:					
Total cubic feet	236,940	414,980	339,020	277,094	221,118
Total value	$1,199,601	$1,980,623	$1,731,491	$1,576,209	$1,206,856
Equivalent tons	18,310	32,200	25,970	21,318	18,868

Other stone products[2] of marble, sandstone, and miscellaneous stone	96,780	450,064	231,190	635,413	113,590	529,707	97,039	574,604	97,253	690,267

[1] Included with "Undistributed."
[2] Rough construction, rubble, crushed-marble products, riprap, and undistributed.

MINERAL FUELS

Coal.—Coal production in 1952 decreased 2,213,555 tons (16 percent) and $11,705,810 (14 percent) in value below 1951, despite an average increase per ton from $6.06 to $6.22.

In the order of their importance, coal was produced in the following counties: Jefferson, Walker, Tuscaloosa, Marion, Bibb, Blount, Shelby, Cullman, St. Clair, Winston, and Jackson.

TABLE 11.—Coal production, 1948–52, in short tons

Year	Short tons	Value	Year	Short tons	Value
1948	18,800,954	$115,534,604	1951	13,596,982	$82,465,625
1949	12,933,830	79,187,827	1952	11,383,427	70,759,815
1950	14,421,810	88,343,572			

Natural Gas.—Natural-gas production increased 3 million cubic feet over that of 1951.

TABLE 12.—Natural-gas production, 1950–52, in thousand cubic feet

Year	Thousand cubic feet	Value
1950	2,000	$100
1951	1,000	50
1952	4,000	160

Petroleum (Crude).—The three producing fields in Alabama—the Gilbertown and East Gilbertown in Choctaw County and the Pollard in Escambia County—yielded 1,279,000 barrels of crude petroleum, an increase of 259,000 barrels over 1951.

Production is obtained along a fault plane on the northern flank of the Hatchetigbee anticline in the Gilbertown field. Some of the oil wells are completed in fractured zones of the Selma chalk at about 2,800 feet, while others go to the Eutaw sands at about 3,400 feet.

The total production of crude petroleum in 1952 was 4,962,000 barrels.

TABLE 13.—Production of crude petroleum, 1948–52

Year	Barrels (42-gallon)	Year	Barrels (42-gallon)
1948	466,000	1951	1,020,000
1949	462,000	1952	1,279,000
1950	735,000		

REVIEW BY COUNTIES

BALDWIN

Production of miscellaneous clays was continued by the Fairhope Brick Co., but total quantity and value of material sold or used decreased 14 percent below 1951.

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BARBOUR

Operations were continued by the Aluminum Co. of America and the D. M. Wilson Bauxite Co. Total crude bauxite mined increased 37 percent and total value 42 percent over 1951.

BIBB

TABLE 14.—Coal sold or used by producers in Bibb County, 1943–47 (average) and 1948–52

Year	Short tons	Value	Year	Short tons	Value
1943–47 (ave.)	814,166	$3,908,604	1950	384,597	$2,680,651
1948	724,685	5,174,251	1951	265,458	1,890,060
1949	405,872	2,792,399	1952	187,740	1,301,038

BLOUNT

The Cheney Lime & Cement Co. continued to produce puzzolan cement at the Graystone mill. Shipments increased 64 percent and total value 37 percent over 1951. Fire clay was mined by the Harbison-Walker Refractories Co. and by the Lehigh Coal Co. Total quantity sold or used increased 44 percent and total value 57 percent over 1951. Coal production declined 33,657 tons (16 percent) in quantity and $161,607 (12 percent) in value over 1951. Iron-ore production increased 2,034 long tons over 1951. Shook & Fletcher Supply Co. continued to operate the Taits Gap mine. Dimension sandstone amounting to 568 short tons valued at $9,000 was produced from a newly opened quarry.

BULLOCK

The Bullock County Highway Department produced 500 tons of sand valued at $250 and 750 tons of gravel valued at $375.

BUTLER

Shipments of brown iron ore amounted to 2,749 long tons valued at $15,065. Greenville Mining Co. mined and shipped brown iron ore.

CALHOUN

The Donoho Foundry Co. and the C. E. Kraus Estate produced fire clay. Total quantity sold or used decreased 8 percent below 1951, but total value increased 8 percent. The Agricola Brick Co. mined clay for use in heavy clay products. Production of brown iron ore was continued by several operators, including J. L. Coleman, Edward F. Emerson, C. E. Franklin, C. E. Gore, C. T. Haynes, M. Howell, McCullough Industries, Price & Jackson, and the Superior Products Co. John B. Lagarde, Inc., continued to mine sand and gravel, but the quantity sold or used was considerably less than in 1951. Total quantity and value of crushed sandstone sold or used increased 26 percent over 1951.

CHEROKEE

Brown-iron-ore mining was continued by the Georgia-Alabama Ore Co., Giles, Smith & Wood, and Woodward mines. The Wolf Creek Sand Co. continued to produce sand. Total quantity sold or used increased 5 percent, and total value increased 3 percent over 1951.

CHILTON

Norman E. Smith mined a small quantity of fire clay. The Southeastern Sand-Gravel Co. continued to produce sand and gravel. Total quantity sold or used increased 6 percent and total value 21 percent over 1951.

CLAY

The General Graphite Co. operated the Pocahontas mine. Lett & Starrett marketed both scrap and sheet mica from the Hurst mine. In addition, Duke & Fitterman mined scrap mica and Arthur Cook sheet mica.

COLBERT

A single operator produced crushed asphaltic limestone. The Tennessee Valley Sand & Gravel Co. continued to operate the Spruce Pine pit. Total quantity sold or used increased 11 percent over 1951, but total value decreased 3 percent.

DALE

The Alabama State Highway Department produced 54,000 tons of sand valued at $23,200.

DALLAS

Clay production by the Henry Brick Co. was less than in 1951. Production of sand and gravel by C. Pierson Cosby and the Dallas Sand & Gravel Co. increased. Total quantity sold or used was 48 percent more and total value 30 percent more than in 1951.

ELMORE

Kirkpatrick Sand-Cement Co. produced sand and gravel.

ESCAMBIA

The Keego Clay Products Co. operated the Brewton mine. Total clay sold or used was greater than in 1951. The Escambia County Highway Department and Rufus Campbell mined paving sand and gravel.

ETOWAH

A small quantity of clay was mined by the Cranford Brick Co. E. C. Bookout Mining Co. shipped a car of red iron ore. One operator sold or used 260,812 short tons of crushed stone valued at $356,150. Sand and gravel sold or used by the Milner Sand Co. decreased 9 percent and total value 17 percent below 1951.

FAYETTE

Much more clay was mined by the Columbus Brick Co. in 1952 than in 1951.

FRANKLIN

Twenty-three percent less clay was mined by the Tennessee Valley Sand & Gravel Co. in 1952 than in 1951. Less crushed stone was sold or used by producers than in 1951. Dimension stone sold or used decreased 21 percent and total value 29 percent below 1951. Brown-iron-ore mining was continued by several operators, including R. S. Bowen, Robert Fuller, the Schroeder Co. (Belgreen mine), the Shook & Fletcher Supply Co. (Blackburn and Warner Mines), the U. S. Pipe & Foundry Co. (Russellville No. 14 mine), C. S. Wilson, and F. F. Wilson & Sons. Sand and gravel sold or used by the Tennessee Valley Sand-Gravel Co. decreased 7 percent and total value 8 percent below 1951.

GREENE

More sand and gravel were sold or used by the Bigbee Block & Gravel Co. and the L. C. Smith Sand & Gravel Co. than in 1951.

HOUSTON

The Gordon Brick Co. operated at the same rate as in 1951.

JACKSON

TABLE 15.—Coal sold or used by producers in Jackson County, 1943–47 (average) and 1948–52

Year	Short tons	Value	Year	Short tons	Value
1943–47 (average)	22,969	$95,166	1950	9,490	$53,618
1948	18,030	101,328	1951	3,722	20,061
1949	5,981	33,493	1952	1,419	7,819

JEFFERSON

Portland-cement shipments were continued by four companies, the Alpha Portland Cement Co. (Phoenixville mill), the Lehigh Portland Cement Co. (Birmingham mill), the Lone Star Cement Corp. (Birmingham mill), and the Universal Atlas Cement Co. (Leeds mill). The Southern Cement Co. (Birmingham mill) operated throughout the year. Shipments increased 20 percent and value of shipments 14 percent over 1951. Fire clay sold or used by the Bibby Coal, Shale & Clay Co. and the Dixie Fire Brick Co. Inc., increased 19 percent and total value 85 percent over 1951. Miscellaneous clay operations were continued by the National Fireproofing Corp., the Stephenson Brick Co. (Lovick mine), and the Watkins Brick Co. (Ensley mine). Coal production declined 1,510,801 tons (18 percent) in quantity and $8,423,660 (14 percent) in value below 1951, despite an increased value per ton from $6.28 in 1951 to $6.43 in 1952. Mining operations were continued by the Republic Steel Corp. (Edwards and Spaulding mines), the Tennessee Coal & Iron Division of the United States Steel Corp. (Ishkooda, Muscoda, and Wenonah

mines), the United States Pipe & Foundry Co., formerly the Sloss-Sheffield Steel & Iron Co. (Ruffner and Sloss red ore mines), the Woodward Iron Co. (Pyne, Red Ore, and Songo mines), and the Zeigler Construction Co. (Griffin mine). The Tennessee Coal & Iron Division of the United States Steel Corp. operated the Dolonah limekiln. Total quantity sold or used decreased 34 percent and total value decreased 16 percent below 1951. Three companies continued to produce crushed limestone. The total quantity sold or used and the total value decreased 8 percent below 1951. Production was continued by Sam P. Action, E. E. Vann, and the Louisville & Nashville Railroad Co. The total quantity and value of material sold or used were greater than in 1951.

LAMAR

The Alabama State Highway Department mined 33,978 short tons of sand valued at $4,490, and 11,524 short tons of gravel valued at $1,521.

LAUDERDALE

A single operator produced crushed limestone. The total quantity sold or used was considerably less than in 1951.

MACON

The Macon County Sand & Gravel Co. mined sand and gravel.

MADISON

Production of clay for heavy clay products was continued by the Alabama Brick & Tile Co. (Farley mine) and the Huntsville Brick & Tile Co. Total quantity sold or used decreased 30 percent and total value 34 percent below 1951. One operator sold or used 170,000 short tons of crushed limestone valued at $243,250.

MARENGO

The Lone Star Cement Corp. operated the Spocari mill throughout the year. Total shipments and value increased 3 percent over 1951.

MARION

The Thomas Alabama Kaolin Co. continued to operate the Hackelburg mine at the same rate as in 1951. Coal production increased 1,739 tons in quantity and $138,686 in value over 1951. Sand and gravel sold or used by Guin Concrete Products and the Marion County Highway Department increased 59 percent over 1951, and total value was considerably greater.

MARSHALL

Shipments by B. F. Sweet (Guntersville mine) were 16 percent less than in 1951, but total value increased 22 percent.

MOBILE

The Ideal Cement Co. operated the Mobile mill throughout the year. Shipments were about the same as in 1951 but total value increased 7 percent. Operations were continued by the Ideal Cement

Co. (Mobile limekiln). Quantity sold or used and total value decreased 10 percent below 1951.

MONTGOMERY

Clays sold or used by the Excelsior Brick Co. and the Jenkins Brick Co. increased 14 percent in quantity and 24 percent in total value over 1951. The weight of stone crushed by the Alabama State Highway Department in Montgomery County was 40 percent below 1951 and total value decreased 44 percent. Sand and gravel operators included the Alabama State Highway Department, the City of Montgomery, the City Sand & Gravel Co., the Montgomery County Highway Department, and the Montgomery Gravel Co. The total quantity sold or used was about the same as in 1951, but total value decreased 5 percent.

MORGAN

One operator produced crushed limestone. Sand and gravel sold or used by the Decatur Sand & Gravel Co. increased 14 percent over 1951 and total value increased 21 percent.

RANDOLPH

Bourne Associates sold sheet mica from the Arnott and Friendship No. 2 mines.

RUSSELL

Clays sold or used by the Bickerstaff Co. (Ceramic mine) and the Bickerstaff Brick Co. (Brickyard mine) was about the same as in 1951, but total value increased. Two operators mined sand and gravel—the Consolidated Gravel Co. Inc., and the Kendrick Sand & Gravel Co. Total quantity and value of material sold or used were greater than in 1951.

ST. CLAIR

The National Cement Co. operated the Ragland mill throughout the year. Shipments decreased 2 percent below 1951 and total value 1 percent. Fire clay sold or used by the Riverside Clay Co. increased 11 percent above 1951 and total value 17 percent. Miscellaneous clays sold or used by the Alphons Custodis Chimney Construction Co. was considerably more than in 1951. Coal production increased 11,097 tons in quantity and $66,968 in value over 1951. J. M. Page mined a small quantity of red iron ore, but shipments were 25 percent below 1951 and total value decreased 19 percent. A single operator crushed 25,683 short tons of stone valued at $79,610.

SHELBY

Clays sold or used by the Montevallo Clay Co. decreased 9 percent below 1951, but total value increased 1 percent. Coal production increased 6,065 tons (6 percent) in quantity and $73,653 in value over 1951, owing to an increase in the average value of coal from $6.19 in 1951 to $6.52 in 1952. Shipments of brown iron ore by the C–J Mining Co. and the Shelby Sand & Ore Co. were 20,660 long tons valued at $112,037. Operations were continued by the Alabaster Lime Co. (Scotrock limekiln), the Cheney Lime & Cement Co.

(Landmark limekiln), Keystone Lime Works (Keystone limekiln), the Longview Lime Corp. (Longview No. 2 limekiln), and the Southern Cement Co. (Shelby limekiln). Sales of crushed limestone by the Alabaster Lime Co. and the Longview Lime Corp. decreased 22 percent below 1951, but total value decreased 33 percent.

SUMTER

The Alabama State Highway Department and the Sumter County Highway Department mined 46,748 short tons of sand and gravel valued at $9,223 compared to 29,633 tons valued at $658 in 1951.

TALLADEGA

G. H. Gallant shipped a small quantity of brown iron ore. A single operator produced crushed limestone. Two operators continued to produce crushed marble. The total quantity of dimension marble sold or used by 2 operators increased 10 percent over 1951, but total value decreased 17 percent.

TUSCALOOSA

Coal production declined 159,235 tons (23 percent) and $669,170 (21 percent) in value under 1951. The Shook & Fletcher Supply Co. operated the Adkins mine for brown iron ore. Sand and gravel sold or used by the Finnell Sand & Gravel Co. decreased 16 percent below 1951, and total value decreased 8 percent.

WALKER

Fire-clay production was continued by the Harris Coal & Clay Co. (Cordova mine), the National Fireproofing Corp., the Russell Coal & Clay Co., and the Taft Coal & Clay Co. Coal production declined 408,592 tons (12 percent) and $1,909,728 (10 percent) in value below 1951. The Walker County Highway Department mined 55,000 tons of sand and gravel.

WASHINGTON

The first production of salt in Alabama was made by the Mathieson Chemical Corp. from brine produced from a buried salt dome.

WINSTON

TABLE 16.—Coal sold or used by producers in Winston County, 1943–47 (average) and 1948–52

Year	Short tons	Value	Year	Short tons	Value
1943–47 (average)	20,647	$87,045	1950	3,527	$21,232
1948	25,237	151,169	1951	1,540	8,870
1949	19,032	113,621	1952	3,848	22,626

UNDISTRIBUTED

Limestone (Crushed).—The United States Forest Service produced 7,500 short tons of crushed limestone valued at $18,000.

VALUES

The values of mineral production shown in the tables are the values as reported at the mine or plant. Table 17 shows the average unit values of all commodities produced in Alabama, 1948–52:

TABLE 17.—Average unit values of mineral production in Alabama, 1948–52, in dollars per unit [1]

Mineral	Unit	1948	1949	1950	1951	1952
Bauxite	Long ton	$5.73	$5.84	$5.88	$6.02	$6.20
Cement:						
Portland	376-pound bbl	2.02	2.16	2.19	2.32	2.36
Puzzolan	do				3.16	2.96
Clays:						
Fire	Short ton	2.02	2.02	1.76	3.48	3.44
Kaolin	do	9.66	9.14	9.71	5.00	5.00
Miscellaneous	do	.73	.73	.77	.84	1.07
Coal	do	6.15	6.12	6.13	6.06	6.22
Graphite	do	82.70	96.35	96.13		117.92
Iron ore:						
Hematite	Long ton	4.05	3.77	3.91	4.25	5.16
Limonite	do					5.71
Lime	Short ton	8.44	8.92	9.20	9.64	10.51
Limestone:						
Crushed	do	1.20	1.44	1.54	1.89	1.57
Dimension	do	38.08	46.63	48.27	53.47	47.90
Marble:						
Crushed	do	3.96	3.62	3.97	(2)	(2)
Dimension	do	146.57	156.80	150.85	149.25	112.04
Mica	do					45.76
Salt	do					1.08
Sand and gravel	do	.66	.69	.68	.79	.79
Sandstone:						
Crushed	do	5.88	2.44	6.61	8.90	8.90
Dimension	do					15.85
Stone, miscellaneous	do				1.35	

[1] For greater detail on prices by grades and markets, see volume I, Minerals Yearbook 1952.
[2] Figure withheld to avoid disclosure of individual company operations.

The Mineral Industry of Alaska

By Alfred L. Ransome [1] and William H. Kerns [2]

GOLD dropped to second place in 1952 in terms of value of output among the Territory's mineral commodities; sand and gravel took the leading position. Coal production in Alaska, which reached the highest level in the history of the industry, ranked third after sand and gravel and gold in terms of value of output by mineral commodity. Chiefly because of the marked increase in sand and gravel and coal output, the total value of all minerals produced advanced 34 percent in 1952 over that for 1951. Mining of platinum continued to be an important component of the mineral industry of Alaska, but production of crude platinum-group metals was slightly lower than in the preceding year. Silver output in 1952 was nearly the same as in 1951. A very small quantity of lead was produced from one lode mine. No copper or zinc was produced in the Territory during 1952. Output of tin, higher than in 1951, was significant because the major part was produced from a lode-tin mine. Although the output of tungsten was small in 1952 (slightly less than in 1951), the activity in and exploration for tungsten was increased. A small quantity of mercury was produced in 1952; this was the first output of mercury in Alaska since 1949.

Adverse economic conditions continued to plague the mining industry. The rising cost of labor (in competition with high wage rates paid on construction projects under Government contracts) made it impracticable for many mining companies to compete in the labor market. This factor, coupled with the high cost of materials and supplies and with an unchanged established United States Treasury price of $35 per fine ounce of gold, caused activity to cease at many gold-mining operations and curtailment at others. Those that continued to operate did so by working only the higher grade portion of the ground and by leaving marginal areas that may never be worked, or by increasing the efficiency of operation through further mechanization.

Risk and development capital is critically short in Alaska; but, during 1952, Government assistance through the Defense Minerals Exploration Administration, Defense Materials Procurement Agency, and Reconstruction Finance Corporation stimulated more exploration and development than has been accomplished in recent years. During 1952 DMEA authorized contracts totaling $929,091 for the purpose of exploring for strategic and critical minerals (including antimony, cobalt, copper, mercury, nickel, tin, and tungsten) at 10 localities in Alaska. DMPA authorized one very substantial loan as an operating

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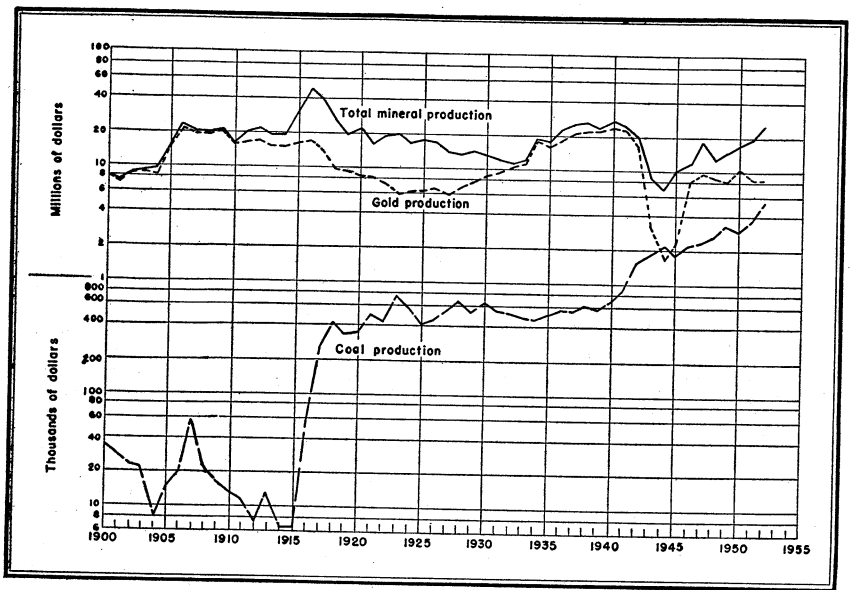

FIGURE 1.—Value of total mineral production, gold, and coal in Alaska, 1900–52. From 1911–31 copper production accounted for most of the value of minerals other than gold.

TABLE 1.—Mineral production of Alaska, 1951–52

Mineral	1951		1952	
	Quantity	Value	Quantity	Value
Mineral fuels: Coal, bituminous ..... short tons	494,333	$3,766,987	686,218	$5,779,423
Metals:				
Antimony ore ..... short tons	301	(1)	420	(1)
Copper ..... do	[2] 1	387		
Gold ..... troy ounces	239,637	8,387,295	240,557	8,419,495
Lead ..... short tons	[2] 21	7,266	1	386
Mercury ..... flasks (76 pounds)			28	5,575
Silver ..... troy ounces	32,870	29,749	32,986	29,854
Tin (Sn content) ..... long tons	69	197,163	82	220,956
Tungsten (60-percent concentrates) (shipments) ..... short tons	10	(1)	8	(1)
Zinc ..... do	[2] 1	218		
Nonmetals: Sand and gravel ..... do	6,887,646	3,738,516	10,781,926	8,650,582
Undistributed [3]		3,441,090		3,195,336
Total		19,569,000		26,302,000

[1] Value included with "Undistributed."
[2] Produced in 1950, but not shipped until 1951 from a mine not active in 1951.
[3] Comprises value of gem stones (1952), pumice (1951), stone, platinum-group metals, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 1).

advance against future production at a tin-tungsten lode operation. Government loan assistance was available through RFC to qualified applicants for mineral-industry projects in the Territory when financing could not be obtained from private sources.

Under the DMEA activities, the principal discovery during the year was a hitherto unsuspected deep tin-placer channel on Cape Creek, Seward Peninsula. Substantial reserves have been proved, and plans for commercial exploitation of the deposit are being made.

TABLE 2.—Prices of mineral commodities, 1951–52

Commodity	Unit	Price	
		1951	1952
Mineral fuels: Coal, bituminous [1]	Short ton	$7.62	$8.42
Metals:			
Antimony [2]	Pound	.4417	.4402
Copper [3]	do	.242	.242
Gold [4]	Troy ounce	35.00	35.00
Lead [3]	Pound	.173	.161
Mercury [5]	Flask (76 pounds)	210.130	199.097
Silver [6]	Troy ounce	.9050505	.9050505
Tin (Straits quality) [5]	Pound	1.27077	1.20473
Tungsten [5]	Short ton		65.00
Zinc [3]	Pound	.182	.166
Nonmetals: Sand and gravel [1]	Short ton	.543	.802

[1] Average unit price f. o. b. mine or quarry, Alaska.
[2] Annual average American Metal Market quoted price at New York.
[3] Annual average weighted price of all grades of primary metal sold by producers.
[4] Price under authority of Gold Reserve Act of January 31, 1934.
[5] Annual average Engineering and Mining Journal quoted price at New York.
[6] Treasury buying price for newly mined silver.

Consumption and Markets.—No metal-processing plants are operating in Alaska; all direct-smelting ores and concentrates produced in Alaska must be shipped to smelters or to buyers in the United States for treatment. All producers of gold and silver from placer mines sell their products in the form of nuggets, dust, bars, or amalgam to banks and gold buyers in Alaska or ship directly to the mints in the United States.

No recorded imports of coal into Alaska were made in 1952 and all coal produced in Alaska in 1952 was used in the Territory. Consumption of coal in Alaska has increased greatly during the past few years as the direct result of expanded civilian population and construction of additional coal-utilizing power and heating plants at military installations. The mines have had difficulty in keeping up with the increased demand.

All sand and gravel and stone produced in Alaska in 1952 were used locally for concrete aggregate, road metal, and railroad ballast.

Transportation.—Although air transportation is highly developed in Alaska, other forms of transportation to and within Alaska are inadequate for the full development of its mineral resources; furthermore ocean and rail transportation rates are among the highest in the world. New industries that would use Alaskan raw materials possibly could materially influence the entire rate structure by providing back haul cargoes.

The Alaska shipping trade is not attractive to ship operators because it is seasonal; most ocean-borne cargo to the Territory moves during the summer. Only one major American company provides regular service to the Territory.

Labor disputes have caused frequent ship tieups, costly to the ship operators. Since 1934, excluding the war years 1942–45 when ocean shipping was controlled by the United States Army, the shipping to Alaska has been tied up an average of 72 days a year. Labor disputes during 1952 cut off all ocean shipments to Southeastern Alaska and part of the shipments to the interior of Alaska for at least 70 days during the peak of the summer shipping season.

TABLE 3.—DMEA activities in Alaska, 1952

Property	Operator	Location	Mineral	Contract	Government participation
Cape Creek	Zenda Gold Mining Co	Cape Creek, Port Clarence dist., Seward Peninsula region.	Tin (placer)	$120,000	$108,000.00
Lost River mine	United States Tin Corp	Cassiterite Creek, Port Clarence dist., Seward Peninsula region.	Tin (lode)	226,000	203,400.00
Stepovich and Colbert	Alaska Metals Mining Co	Gilmore Dome, Fairbanks dist., Yukon River region.	Tungsten (lode)	179,234	133,675.50
Mertie Lode	Admiralty-Alaska Gold Mining Co	Funter Bay, Admiralty district, Southeastern Alaska region.	Nickel-copper-cobalt (lode)	120,000	108,000.00
Red Top mine	Wren, Waskey & Wolfe (partnership).	Marsh Mountain, Bristol Bay dist., Bristol Bay region.	Mercury (lode)	25,614	19,210.50
Tozimoran Creek	I. W. Purkeypile and Sara Purkeypile.	Tozimoran Creek, Melozitna dist., Yukon River region.	Tin (placer)	18,000	16,200.00
Tillicum mine	Tillicum Mining Co	Caamano Point, Ketchikan dist., Southeastern Alaska region.	Antimony (lode)	24,695	18,521.25
Fidalgo-Alaska mine	Alaska Copper Corp	Fidalgo Bay, Prince William Sound dist., Copper River region.	Copper (lode)	112,548	56,274.00
Rocky Mountain Creek	do	Rocky Mtn. Creek, Nome dist., Seward Peninsula region.	Tungsten (lode)	41,000	30,750.00
Stampede mine	Earl R. Pilgrim & Co	Stampede Creek, Kantishna dist., Yukon River region.	Antimony (lode)	62,000	46,540.00
Total				929,091	740,571.25

The only railroad in the Territory, the Alaska Railroad, Government owned and operated, serves the interior of Alaska on 530 miles of track from tidewater at Seward and Whittier to Fairbanks. A program of modernization and rehabilitation of the railroad and equipment over a period of several years was continued during 1952 in an effort to reduce the freight rates to compare with those in the United States.

Throughout huge portions of the Territory there is still no means of communication other than the airplane or the dog team. In Alaska more per capita use is made of air transportation than anywhere in the world. In addition to personnel, nearly all items of supply and equipment go by air to a large proportion of the mining camps. Through competition and the building of landing fields to accomodate larger planes, the air freight rates have been reduced in many areas.

Power.—Diesel oil, coal, and water are used to generate power for the mining operations in Alaska. Of these sources of power, diesel oil is the most widely used in Alaska because of its adaptability to mining operations in the remote areas. Many of these outlying mining operations have, in recent years, constructed airfields at or near their property and have found it more expedient to have their summer's supply of oil flown in from the nearest water freight terminal than to have it freighted in by cat-train over the snow and ice during the winter. Diesel power is by no means cheap but in most instances is the only source of power available.

The Nome unit of the United States Smelting, Refining & Mining Co. operated a centrally situated diesel-electric plant at Nome to supply power to the fleet of three electrically powered dredges that it operated in the vicinity of Nome during 1952.

The Fairbanks unit of the United States Smelting, Refining & Mining Co. used coal from the Nenana field to generate electrical power at its powerplant at Fairbanks; in 1952 this power was used to operate six dredges in the Fairbanks district.

The New York Alaska Gold Dredging Corp, at Nyac in the Aniak district used hydroelectric power, supplemented by diesel-electric power, to operate two dredges in 1952.

In the past many small hydroelectric plants have been developed for mining operations along the coast and in the mountainous areas in the interior of Alaska. Some of these plants, at inactive mines, are being used at present to supply power to adjacent communities.

Several of the finest undeveloped hydroelectric power potentials on the North American Continent are in Alaska. During 1952 the Aluminum Co. of America investigated the possibility of utilizing the power potential of transmountain diversion of water from the chain of lakes that constitutes the source of the Yukon River in Canada to the Taiya River Valley 10 miles north of Skagway, Alaska. The cheap power thus generated was to be used to produce aluminum in a proposed plant at Dyea, near Skagway. At the year's end the project had been suspended in favor of exclusively Canadian development by Frobisher, Ltd.

Labor.—The active mining season at many operations in Alaska is limited to 5 months or less because of climatic conditions; at some placer operations 110 days constitutes the average actual mining

season each year. For this reason, most of the skilled labor for the mining industry is imported for the season, with resultant high cost. The short season necessitates working the men as many or more overtime hours at premium pay as at regular pay. The cost-of-living differential in Alaska ranges from 25 to 75 percent above that in the United States.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Coal mining, which has become one of the most important components of the mining industry in Alaska, ranked third after sand and gravel and gold in value of output in 1952. The mines in the Territory produced 686,218 short tons of bituminous and subbituminous coal in 1952, a 39-percent increase over the previous all-time record of 494,333 tons in 1951. The new record was established despite a serious drop in production from April through June at two coal-mining operations. This drop was caused partly by labor difficulties at mines of the Healy River Coal Corp. and of the Usibelli Coal Mine, Inc., in the Nenana field and partly by a major fire that destroyed most of the surface buildings at the Healy River Coal Corp. mine on August 28.

All coal produced in Alaska in 1952 came from four fields: Matanuska and Broad Pass, Cook Inlet-Susitna region; Nenana, Yukon River region; and Point Barrow, Northern Alaska region. The coal produced from the Matanuska and Broad Pass fields was marketed in Anchorage, and coal from the Nenana field in Fairbanks. The relatively small quantity of coal from the Point Barrow field was produced by the Alaska Native Service for local use. Bituminous-coal deposits in the vicinity of Eska, Matanuska Valley coal field, were described.[3]

Eighty-six percent of the total coal output in Alaska in 1952 came from three mines, operated, respectively, by Evans Jones Coal Co., Usibelli Coal Mine, Inc., and Healy River Coal Corp.

Table 4 shows the production of coal in Alaska, 1880–1952.

Petroleum and Natural Gas.—No production of crude petroleum was recorded in Alaska during 1952. The exploration program begun in 1944 by the Navy on the Naval Petroleum Reserve No. 4, situated between the Arctic Ocean and Brooks Range in the Northern Alaska region, was continued throughout 1952. Substantial reserves of oil have been reported in this field, but no attempt has been made to produce any oil. Some gas has been tapped and is being used to heat one of the camps in the area.

Interest in prospecting for oil in Alaska increased during 1952. Several oil companies were formed during 1952 and acquired oil-land leases; at least two of them had parties in the field doing examination work in the Cook Inlet, Cold Bay, and Katalla areas. Three companies had made arrangements for drilling equipment, but none had arrived in Alaska in 1952.

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[3] Jolley, Theodore R., Toenges, Albert L., and Turnbull, Louis A. Bituminous-Coal Deposits in the Vicinity of Eska, Matanuska Valley Coal Field, Alaska: Bureau of Mines Rept. of Investigations 4838 1952, 87 pp.

TABLE 4.—Production of coal in Alaska, 1880–1952

	Coal			Coal	
	Short tons	Value		Short tons	Value
1880–1940	[1] 2,612,629	[1] $12,904,400	1948	407,906	$2,789,275
1941	238,960	944,588	1949	433,533	3,309,303
1942	260,893	1,623,264	1950	412,455	3,033,445
1943	289,232	1,842,708	1951	494,333	3,766,987
1944	348,375	2,239,684	1952	686,218	5,779,423
1945	297,644	1,868,592			
1946	366,809	2,354,952	Total	7,210,207	45,011,418
1947	361,220	2,554,797			

[1] From published records of the Federal Geological Survey.

METALS

Antimony.—A slackened demand and lower price resulted in a considerably lessened interest and activity in antimony in Alaska in 1952. Earl R. Pilgrim & Co., the only operation producing antimony in Alaska in 1952, mined 19 tons of ore containing 10 tons of antimony from the Stampede mine in the Kantishna district but did not ship it.

During 1951 Alamco, Inc., of Fairbanks mined antimony ore at the Sawtooth mine near Rampart and at the Rambler mine on Boulder Creek near Tok, and also did some development work on a prospect on Smith Creek near Wiseman. During 1952 the company's only activity was to ship 420 tons of ore that had been produced from the Sawtooth mine the previous year.

The Tillicum Mining Co. was granted a contract by DMEA in 1952 for exploring its lode-antimony property on Caamano Point on the southern tip of the Cleveland Peninsula in Southeastern Alaska.

Table 5 shows all production data on antimony in Alaska available for publication.

TABLE 5.—Production of antimony in Alaska, 1943–52

Year	Ore and concentrate (shipments)		
	Gross weight (short tons)	Content (short tons)	Value
1943 [1]	405	184	$33,324
1944	73	35	6,465
1945–46	40	26	16,056
1947	68	44	29,336
1948	74	44	31,356
1949			
1950	301	147	[2]
1951	420	210	[2]
1952			

[1] Figures before 1943 not available for publication.
[2] Value cannot be shown because it would disclose individual operations not at liberty to publish.

Copper.—No copper was produced in Alaska in 1952. Prospecting on the Nelson and the Radovan copper-lode properties on Glacier Creek in the Nizina district, begun in 1951, was continued by the owners. The Alaska Copper Corp. completed an exploration program at the Fidalgo–Alaska mine on Fidalgo Bay in the Prince William

Sound district, with the assistance of a DMEA contract. A report was published on the investigation of the Millet copper deposit, Southwestern Alaska.[4]

Gold.—Gold dropped to second place in 1952 in terms of value of output among the Territory's mineral commodities; the total value of gold produced was 32 percent of the total of all minerals produced. Output was 240,557 fine ounces (in terms of recoverable metal) valued at $8,419,495 in 1952 compared with 239,637 ounces valued at $8,387,295 in 1951. Most of the gold was produced by a relatively few well-established companies.

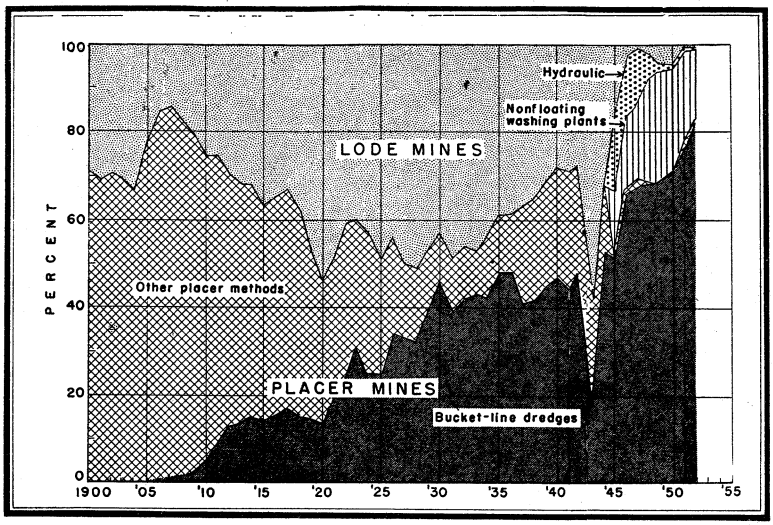

FIGURE 2.—Percentage of total Alaska gold produced at lode and placer mines and by various methods of placer mining, 1900–1952; "other placer methods" include hydraulic and nonfloating washing plants, for which separate data are not available before 1943.

Production was higher than might have been expected considering the adverse economic conditions under which the gold miners continued to operate and considering the fact that there was a 15-percent drop in the total number of operations producing gold. In 1952, 6 operations were classed as lode-gold mines, and 119 were classed as placer mines from which gold was recovered; this compares with 6 and 140, respectively, in 1951. The rising cost of labor (in competition with high wage rates paid on construction projects under Government contracts), the high cost of materials and supplies, and an unchanged established United States Treasury price of $35 per fine ounce of gold were factors that caused cessation of activity at many gold-mining operations and in curtailment at others.

Placer mines supplied 99.5 percent of the total gold produced in Alaska in 1952. The 15 leading gold-producing mines (all placer) in Alaska in 1952 yielded 87 percent of the total recorded gold output

[4] Rutlege, F. A., and Mulligan, J. J., Investigation of the Millet Copper Deposit, Illiamna Lake, Southwestern Alaska Bureau of Mines Rept. of Investigations 4890, 1952, 22 pp.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in Alaska, 1943–47 (average) and 1948–52, and total, 1880–1952, in terms of recoverable metals [1]

Year	Mines producing		Material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1943–47 (average)	14	194	379,260	144,753	$5,066,355	34,815	$28,133
1948	24	274	6,014	248,395	8,693,825	67,341	60,947
1949	18	223	78,839	229,416	8,029,560	36,056	32,633
1950	11	216	58,668	289,272	10,124,520	52,638	47,640
1951	6	140	13,870	239,637	8,387,295	32,870	29,749
1952	6	119	11,459	[3] 240,557	8,419,495	[3] 32,986	29,854
1880–1952	--------	--------	[4]	27,610,693	679,388,857	20,078,339	14,342,280

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1943–47 (average)	10	$2,920	127	$28,007	5	$1,210	$5,126,624
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
1951	1	387	21	7,266	1	218	8,424,915
1952	----------	----------	[3] 1	386	----------	----------	8,449,735
1880–1952	685,905	226,580,307	25,741	3,032,445	56	14,320	923,358,209

[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] Does not include gravel washed.
[3] Includes 195 ounces of gold, 51 ounces of silver, and 100 pounds of lead recovered from mill cleanup at three inactive lode properties; ore was reported in years before 1952.
[4] Figures not available.

of the Territory; these mines are listed in table 7. The 5 leading producers (all placers and using bucketline dredges) supplied 76 percent of the total Alaska output of gold in 1952, compared with 67 percent in 1951. Bucketline dredges (23 in both 1951 and 1952) recovered 83 percent of the total placer gold in 1952 (78 percent in 1951); nonfloating washing plants (dragline-bulldozer-hydraulic combinations by which gravel is mechanically handled) accounted for 16 percent; hydraulic, small-scale hand, and drift operations accounted for the remaining 1 percent. See table 8 and figure 2. For mine production of gold by months and by regions, see tables 9 and 10.

Of the lode-gold ore and old tailings handled during 1952, all was treated at mills; none was shipped for direct smelting. Of the lode gold produced, 50 percent was recovered by amalgamation, 44 percent by cyanidation, and 6 percent from concentrates shipped to smelters. See tables 11–14.

The sale of unprocessed or "natural" gold on the open market at prices exceeding $35 per fine ounce apparently was considerably less in volume in 1952 than in 1951. The recorded production for 1952 included 998 fine ounces of gold contained in natural gold reported by two operators as having been sold on the open market. In addition, 69 ounces of natural gold, in the form of nuggets, grains, and dust, were reported sold by two producers on the open market for prices equivalent to $35 or more per fine ounce of gold contained therein. Specific and accurate data regarding natural gold sales are not readily obtainable; therefore some natural gold may have been

TABLE 7.—Fifteen leading gold-producing mines in Alaska in 1952, in order of output [1]

Rank	Mine	District	Region	Rank in 1951	Operator	Source of gold
1	Fairbanks Unit	Fairbanks	Yukon River	1	United States Smelting, Refining & Mining Co.	Dredge.
2	Nome Unit	Nome	Seward Peninsula	2	do	Do.
3	New York Alaska Gold Dredging Corp.	Aniak	Kuskokwim River	3	New York Alaska Gold Dredging Corp.	Do.
4	Callahan Zinc-Lead Co.	Tolovana	Yukon River	4	Callahan Zinc-Lead Co.	Do.
5	Casa de Paga Gold Co.	Fairhaven	Seward Peninsula	6	Casa de Paga Gold Co.	Do.
6	Alluvial Gold, Inc.	Circle	Yukon River	[2]	Alluvial Gold, Inc.	Do.
7	Collinsville	Yentna	Cook Inlet-Susitna	[2]	Collinsville Mine	Nonfloat.
8	Mohawk Association	Iditarod	Yukon River	15	North American Dredging Co.	Dredge.
9	Colorado Creek Mining Co.	Innoko	do	10	Colorado Creek Mining Co.	Nonfloat.
10	Strandberg & Sons	Hughes	do	8	Strandberg & Sons	Do.
11	Miscovich Bros.	Iditarod	do	20	Miscovich Bros.	Do.
12	Rosander and Reed	Innoko	do	18	Rosander and Reed	Do.
13	Brinker-Johnson Co.	Fairbanks	do	5	Brinker-Johnson Co.	Dredge.
14	C. J. Berry Dredging Co.	Circle	do	13	C. J. Berry Dredging Co.	Do.
15	Long Creek Mining Co.	Ruby	do	31	Long Creek Mining Co.	Nonfloat.

[1] Based on known output including "natural" gold sales in cases where fine gold content was calculable.
[2] Did not produce in 1951.

TABLE 8.—Gold produced at placer mines in Alaska, 1948–52, by classes of mines and by methods 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:						
Bucketline dredges:						
1948	23	28	11,300,000	171,161	$5,990,635	$0.530
1949	21	29	14,663,000	157,306	5,505,710	.375
1950	20	28	12,557,000	205,641	7,197,435	.573
1951	15	23	14,560,000	187,216	6,552,560	.450
1952	14	23	13,470,000	198,524	6,948,340	.516
Nonfloating washing plants: [2]						
1948	106	106	4,170,000	56,076	1,962,660	.471
1949	117	117	3,392,000	57,979	2,029,265	.598
1950	116	116	4,908,500	68,199	2,386,965	.486
1951	84	84	2,667,000	47,244	1,653,540	.620
1952	78	78	2,137,000	39,661	1,388,135	.650
Gravel hydraulically handled:						
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
1951	17	-------	166,500	2,798	97,930	.588
1952	9	-------	39,000	660	23,100	.592
Small-scale hand methods (wet):						
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
1951	20	-------	17,000	1,026	35,910	2.112
1952	17	-------	16,400	422	14,770	.901
Underground placers (drift):						
1948	4	-------	700	88	3,080	4.400
1949	2	-------	170	24	840	4.941
1950	6	-------	2,200	269	9,415	4.280
1951	4	-------	500	243	8,505	17.010
1952	1	-------	600	23	805	1.342
Grand total placers:						
1948	274	-------	16,744,000	242,802	8,498,070	0.508
1949	223	-------	18,363,000	221,089	7,738,115	.421
1950	216	-------	17,621,000	277,111	9,698,885	.550
1951	140	-------	17,411,000	238,527	8,348,445	.479
1952	119	-------	15,663,000	239,290	8,375,150	.535

[1] Excludes itinerant prospectors, snipers, high-graders, and others who gave no evidence of legal right to property.

[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."

TABLE 9.—Mine production of gold, silver, and lead in Alaska in 1952, by months, in terms of recoverable metals [1]

Month	Gold (fine ounces)	Silver (fine ounces)	Lead (short tons)
January	7	288	1
February	209	27	-------
March	27	1	-------
April	2,609	302	-------
May	8,841	1,148	-------
June	31,639	4,111	-------
July	41,432	5,170	-------
August	41,432	5,904	-------
September	43,633	5,734	-------
October	40,374	5,824	-------
November	30,354	4,477	-------
December	240,557	32,986	1
Total			

[1] Derived mostly from mint and smelter receipts; data are adjusted to exclude receipts during the first part of 1952 previously credited to 1951 production and to include receipts in 1953, which are part of actual output in 1952; no copper or zinc produced in 1952.

TABLE 10.—Mine production of gold, silver, and lead, in Alaska in 1952, by regions, in terms of recoverable metals [1]

Region	Mines producing [1]		Gold (lode and placer)		Silver (lode and placer)		Total value
	Lode	Placer	Fine ounces	Value	Fine ounces	Value	
Cook Inlet-Susitna	2	9	3,930	$137,550	594	$538	$138,088
Copper River		4	147	5,145	32	29	5,174
Kuskokwim River		9	18,784	657,440	1,649	1,492	658,932
Northwestern Alaska and Seward Peninsula [2]	1	21	46,884	1,640,940	5,308	4,804	1,645,744
Southeastern Alaska	1		254	8,890	97	88	[3] 9,042
Yukon River	2	76	170,558	5,969,530	25,306	22,903	[3] 5,992,755
Total	6	119	240,557	8,419,495	32,986	29,854	[3] 8,449,735

[1] No copper or zinc produced in 1952.
[2] Combined to avoid disclosure of the operation of one active mine in Northwestern Alaska region.
[3] Includes value of 1 short ton (actually 2,400 pounds) of lead ($386); which represents 400 pounds of lead ($64) from Southeastern Alaska and 2,000 pounds of lead ($322) from Yukon River.

TABLE 11.—Mine production of gold, silver, and lead in Alaska in 1952, by classes of ore and other source material, in terms of recoverable metals [1]

Source	Number of mines	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Lead (pounds)
Ore:					
Dry gold	2	207	[2] 450	[2] 88	[2] 400
Lead	1	2		233	2,000
Other "lode" material: Old tailings [3]	3	11,250	817	137	
Total "lode" material	6	11,459	[2] 1,267	[2] 458	[2] 2,400
Gravel (placer operations)	119		239,290	32,528	
Total, all sources	125	11,459	[2] 240,557	[2] 32,986	[2] 2,400

[1] No copper or zinc produced in 1952.
[2] Includes 195 ounces of gold, 51 ounces of silver and 100 pounds of lead recovered from mill clean-up at 3 inactive properties.
[3] Dry gold.

TABLE 12.—Mine production of gold, silver, and lead in Alaska in 1952, by methods of recovery and types of material processed, in terms of recoverable metals [1]

Methods of recovery and types of material processed	Gold (fine ounces)	Silver (fine ounces)	Lead (pounds)
Lode:			
Amalgamation:			
Ore	369	58	
Old tailings	266	58	
Total	635	116	
Cyanidation: Old tailings	551	79	
Total recoverable in bullion	1,186	195	
Concentration and smelting concentrates: Old tailings	81	30	400
Direct smelting: Ore		233	2,000
Total	81	263	2,400
Placer	239,290	32,528	
Grand total	240,557	32,986	2,400

[1] No copper or zinc produced in 1952.

TABLE 13.—Mine production of gold, silver, and lead, in Alaska in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

A. *For material treated at mills*

BY REGIONS

	Material treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters [1] and recoverable metal					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Cook Inlet-Susitna	205	[2] 206	[2] 12	2	20	1			
Seward Peninsula	2,420	551	79						
Southeastern Alaska	8,680	[3] 193	[3] 68	4	[3] 61	[3] 29		[3] 400	
Yukon River	152	236	36						
Total: 1952	11,457	[4] 1,186	[4] 195	6	[4] 81	[4] 30		[4] 400	
1951	13,870	717	101	100	393	1,921	1,600	42,000	1,200
BY CLASSES OF MATERIAL TREATED									
Dry gold:									
Ore	207	[4] 431	[4] 83	1	[4] 19	[4] 5		[4] 100	
Old tailings	11,250	755	112	5	62	25		300	
Total: 1952	11,457	[4] 1,186	[4] 195	6	[4] 81	[4] 30		[4] 400	
BY CLASS OF CONCENTRATE SHIPPED TO SMELTERS [1]									
Dry gold: 1952				6	81	30		400	
1951				100	393	1,921	1,600	42,000	1,200

B. *For ore shipped directly to smelters* [5]

BY CLASS OR ORE TREATED

	Recoverable metal content					
	Ore shipped (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Yukon River	2		233		2,000	
Lead: Ore	2		233		2,000	

[1] Excludes concentrates treated only by amalgamation and/or cyanidation.
[2] Includes 156 ounces of gold and 9 ounces of silver recovered from mill cleanup at an inactive property.
[3] Includes 20 ounces of gold and 37 ounces of silver recovered in bullion and 19 ounces of gold, 5 ounces of silver, and 100 pounds of lead in concentrates from mill cleanup at 2 inactive properties.
[4] Includes gold and silver indicated in footnotes 2 and 3.
[5] No ore shipped directly to smelters in 1951.

produced and sold without being reported. The quantity of unrecorded gold sales is believed to be relatively small.

Lead.—The only activity in lead in Alaska in 1952 was a test shipment by Fred Wackwitz of 2 tons of lead ore to a smelter in the United States. The lead ore was produced from a lode prospect on Cleary Creek adjacent to the Cleary Hill mine in the Fairbanks district. (See tables 1, 6, and 9–14.) The Riverside mine near Hyder in Southeastern Alaska, the major producer of lead in Alaska before 1951, remained inactive in 1952.

TABLE 14.—Mine production of gold, silver, copper, and lead in Alaska in 1952 by method of recovery (except placer) and class of material processed in terms of gross metal content

CONCENTRATE SHIPPED TO SMELTERS

Class of material	Quantity shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Dry gold: 1952	6	81	30	24	658	----------
1951	100	393	1,921	2,347	43,553	1,404
ORE SHIPPED DIRECTLY TO SMELTERS[1]						
Lead: 1952	2	----------	233	----------	2,242	----------

[1] No ore shipped directly to smelters in 1951.

Mercury.—In 1952 one mine produced mercury in Alaska (none in 1950 and 1951). The DeCoursey Mountain Mining Co., Inc., mined and treated 70 tons of ore from the Red Devil mine, 8 miles west of Sleitmute on the Kuskokwim River in the Aniak district, to produce 28 flasks of mercury. The company also controls the DeCoursey Mountain mine 20 miles north of Crooked Creek in the Aniak district, but no work was done on the property during 1952. Wren, Waskey, and Wolfe were granted a Government contract for exploration of a mercury lode prospect near Dillingham in the Bristol Bay district in 1952. Table 15 shows all production data available for publication on mercury in Alaska.

TABLE 15.—Production of mercury in Alaska, 1943–47 average, and 1948–52

Year	Producing mines	Flasks (76 pounds)	Price[1] (per flask)	Value
1943–47 (average)	2	746	$126.09	$100,853
1948	1	100	76.49	7,649
1949	1	100	79.46	7,946
1950–51	----------	----------	----------	----------
1952	1	28	199.10	5,575

[1] Average yearly price New York from Engineering and Mining Journal.

Platinum.—The Goodnews Bay Mining Co. continued to be the only producer of platinum-group metals in Alaska and the only operator in the United States or its Territories that mined platinum as a principal product. The recovery of crude platinum metals in 1952 was substantial but slightly less than in 1951.

Silver.—Of the 32,986 fine ounces of silver produced in Alaska in 1952 (32,870 in 1951), 99 percent was a byproduct of gold from placer mining, and the remaining 1 percent was from dry gold ore and old tailing milled and lead ore smelted. The most important producer of silver in 1952 was the United States Smelting, Refining & Mining Co., which recovered silver as a byproduct of bucketline-dredging operations in the Fairbanks district, Yukon River region, and in the Nome district, Seward Peninsula region. The 5 leading producers of gold

recovered 75 percent of the total silver output in Alaska in 1952; the 15 leading producers of gold recovered 85 percent of the total silver output. (See tables 1, 6, and 9–14.)

Tin.—Production of tin in Alaska in 1952 was 139 short tons of concentrate containing 82 long tons of tin compared with 115 short tons of concentrate containing 69 long tons of tin in 1951. The 19-percent increase in output was significant, in that one-third of the concentrate produced in 1952 came from a mine that had the distinction of being the only active lode-tin mine within the United States or its Territories.

In the past, tin has been produced from various localities in Alaska as a byproduct of placer-gold mining operations in the Hot Springs and Ruby districts of the Yukon River region and from placer-tin mining operations in the Port Clarence district of the Seward Peninsula region. In 1952 interest and activity in tin mining and exploration were concentrated in the Port Clarence district, where the Northern Tin Co. continued its placer-tin operation on Buck Creek, the United States Tin Corp. mined and milled tin-tungsten ore at the Lost River mine on Cassiterite Creek, and the Zenda Gold Mining Co. conducted a drilling-exploration program for placer tin on Cape Creek.

I. W. Purkepile conducted an exploration program on a tin prospect on Tozimoran Creek in the Melozitna district of the Yukon River region in 1952 (with Government assistance). The work consisted of churn drilling and test pitting.

Tungsten.—The tungsten-buying program of the General Services Administration and the participating exploration contracts provided by the DMEA stimulated increased interest in tungsten in Alaska in 1952. The actual production of tungsten in Alaska in 1952 was small, slightly less than in 1951; all of it was obtained from only two properties. The United States Tin Co. produced tungsten as a byproduct from tin mined from the Lost River mine on Cassiterite Creek in the Port Clarence district of the Seward Peninsula region; Russell R. Schaefer produced tungsten as a byproduct of a gold-placer operation on Forty-seven Creek (a tributary of the Holitna River) in the Aniak district of the Kuskokwim River region.

The Alaska Metals Mining Co. continued exploration work (with DMEA assistance) begun in 1951 on a lode-tungsten deposit (Stepovich and Colbert properties) on Gilmore Dome near Fairbanks in the Yukon River region.

In the Nome district of the Seward Peninsula region, a program of exploration (with DMEA assistance) conducted by the Alaska Copper Corp. on a lode-tungsten deposit on Rocky Mountain Creek in 1952 failed to disclose any new reserves, but a small quantity of tungsten concentrate was produced (but not shipped) by the claim owners (Rocky Mountain Mining Co.) from previously developed reserves on the same property.

Zinc.—No zinc was produced in Alaska in 1952.

NONMETALS

A preliminary report [5] was published on the nonmetallic deposits

[5] Rutledge, F. A., Thorne, R. L., Kerns, W. H., and Mulligan, J. J., Preliminary Report: Nonmetallic Deposits Accessible to the Alaska Railroad as Possible Sources of Raw Materials for the Construction Industry: Bureau of Mines Rept. of Investigations 4932, 1952, 129 pp.

accessible to the Alaska Railroad as possible sources of raw materials for the construction industry. A report [6] was published on Bureau of Mines investigations at the Gypsum-Camel prospect in Southeastern Alaska.

Gem Stones.—The Empire Jade Co., operating in the Shungnak district, Northwestern Alaska region, made small shipments during 1952 of material identified as nephrite jade. By careful selection and cutting, gem-quality jade is obtained from this material.

Pumice.—In 1951 a limited quantity of pumice obtained from beach deposits at Geographic Bay off Shelikof Strait, Bristol Bay region, was shipped by barge to Anchorage for subsequent use in the local manufacture of building blocks, but none was produced in 1952.

Sand and Gravel.—The output of sand and gravel increased from 6,887,646 short tons (valued at $3,738,516) in 1951 to 10,781,926 short tons (valued at $8,650,582) in 1952. The expanded programs of construction and rehabilitation of Alaskan roads by the Alaska Road Commission and by the Bureau of Public Roads and of construction and enlargement of the military establishments in Alaska were responsible for most of the 57-percent increase in the output of sand and gravel in Alaska in 1952 (compared to 1951). Commercial suppliers of sand and gravel which was used in the construction of private housing facilities also showed an increased output in 1952.

Stone.—Stone was used principally for fill and riprap in the construction of causeways and seawalls. The output of stone in Alaska in 1952 was the highest yearly production that has been recorded in the history of the industry.

REVIEW BY REGIONS

COOK INLET-SUSITNA

In terms of value of output by commodity, coal exceeded by far any other commodity produced in the Cook Inlet-Susitna region in 1952. Of the five coal mines that were active in the region in 1952, the three largest producers supplied 43 percent of the total coal output in the Territory.

Activity in gold mining in the region in 1952 was limited to 9 producing placer operations, 2 producing lode mines, and a cleanup at 1 lode mine.

The sand and gravel produced in the region in 1952 contributed greatly to the total value of mineral output.

Valdez Creek District.—The Alaska Aggregate Corp. reopened the Dunkle underground coal mine on Costello Creek (8 miles northwest of Colorado Station on the Alaska Railroad) as a strip mine during 1952. The coal was trucked from the mine and loaded directly into railroad cars at Colorado Station. The company operated 4 months, August through November 1952, and production helped to meet the increased demand for coal in the Territory.

Willow Creek District.—Renshaw & Brown did annual assessment work at the Gold Cord mine on Fishhook Creek (under lease from the Gold Cord Development Corp.) from July 5 to August 3, 1952. The 20-ton amalgamation-flotation mill was operated 12 shifts (12 hours

[6] Jermain, G. D., and Rutledge, F. A., Diamond Drilling the Gypsum-Camel Prospect, Iyoukeen Cove Chichagof Island, Southeastern Alaska: Bureau of Mines Rept. of Investigations 4852, 1952, 6 pp.

TABLE 16.—Mine production of gold, silver, and lead, in Alaska in 1952, by region and district, in terms of recoverable metals [1]

Region and district [2]	Mines producing [3]		Ore and old tailings (short tons)	Gold (fine ounces)			Silver [4] (lode and placer) (fine ounces)	Lead (pounds)	Total value
	Lode	Placer		Lode	Placer	Total			
Cook Inlet-Susitna region:									
Willow Creek	2	------	205	[5] 226	------	[5] 226	[5] 13	----------	$7,922
Yentna	------	9	----------	------	3,704	3,704	581	----------	130,166
Kuskokwim River region: Aniak	------	6	----------	------	16,752	16,752	1,523	----------	587,698
Northwestern Alaska region: Kiana	------	([6])	----------	------	147	147	13	----------	5,157
Seward Peninsula region:									
Fairhaven	------	3	----------	------	5,424	5,424	580	----------	190,365
Kougarok	------	4	----------	------	570	570	62	----------	20,006
Nome	1	7	2,420	551	38,318	38,869	4,424	----------	1,364,419
Serpentine	------	1	----------	------	52	52	6	----------	1,825
Southeastern Alaska region:									
Chichagof	------	------	Cleanup	19	------	19	5	100	686
Juneau	1	------	8,680	[7] 235	------	[7] 235	[7] 92	300	8,356
Yukon River region:									
Chisana	------	------	----------	------	4	4	1	----------	141
Circle	------	10	----------	------	8,425	8,425	1,132	----------	295,900
Eagle	------	------	----------	------	210	210	25	----------	7,372
Fairbanks	2	12	154	236	125,047	125,283	19,353	2,000	4,402,742
Fortymile	------	4	----------	------	1,342	1,342	283	----------	47,226
Hot Springs	------	4	----------	------	2,776	2,776	598	----------	97,701
Iditarod	------	8	----------	------	6,778	6,778	1,030	----------	238,162
Innoko	------	9	----------	------	9,011	9,011	1,264	----------	316,529
Kantishna	------	([6])	----------	------	5	5	2	----------	177
Koyukuk	------	10	----------	------	817	817	66	----------	28,655
Marshall	------	1	----------	------	591	591	76	----------	20,754
Rampart	------	5	----------	------	274	274	23	----------	9,611
Ruby	------	4	----------	------	2,634	2,634	413	----------	92,564
Tolovana	------	3	----------	------	9,095	9,095	821	----------	319,068
Other districts [8]	------	19	----------	------	7,314	7,314	600	----------	256,533
Total Alaska	6	119	11,459	[9] 1,267	239,290	[9] 240,557	[9] 32,986	2,400	8,449,735

[1] No copper or zinc produced in 1952.
[2] Only those districts shown separately for which Bureau of Mines is at liberty to publish; others producing listed in footnote 8 and their output included with "Other districts."
[3] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[4] Sources of total silver as follows: 458 ounces from lode mines, and 32,528 from placers.
[5] Includes 156 ounces of gold and 9 ounces of silver, from mill cleanup at an inactive property.
[6] Property not active; production was before, but not reported until 1952.
[7] Includes 20 ounces of gold, 37 ounces of silver from mill cleanup at an inactive property.
[8] Includes the following districts from which quantities and values cannot be shown separately (number of operations in parentheses): Chistochina (1), Nelchina (2), and Yakataga (1) in Copper River region; Goodnews Bay (2) and McGrath (1) in Kuskokwim River region; Shungnak (1) in Northwestern Alaska region; Council (2), Koyuk (1), and Port Clarence (2) in Seward Peninsula region; and Bonnifield (2), Chandalar (1), Hughes (1), and Melozitna (2) in Yukon River region.
[9] Includes 195 ounces of gold, 51 ounces of silver, and 100 pounds of lead recovered from mill cleanup at 3 inactive properties.

each) to recover 31 ounces of gold and 2 ounces of silver as bullion by amalgamation and to recover 2 tons of concentrate containing 20 ounces of gold and 1 ounce of silver by flotation, from 50 tons of gold ore and 150 tons of old tailing milled. A small quantity of gold was recovered by Keith M. Locker and Fred W. Catlett, Jr., while prospecting at the Whistler lode mine on Craigie Creek. The Black Butte Mining Co. operated the Fern mine on Archangel Creek during 1951 (under lease from the Fern Gold Mining Co.) and had planned to operate it again in 1952, but fire destroyed the 50-ton mill at the beginning of the 1952 season before any ore was mined or milled. The company recovered 156 ounces of gold and 9 ounces of silver in bullion and from concentrate from a cleanup of the mill, then relin-

quished its lease in June 1952. The Independence lode-gold mine on Fishhook Creek, owned by the Alaska Pacific Consolidated Mining Co., was idle throughout the year.

Of the four coal mines that were active in the district during 1952, the Evan Jones Coal Co. at the Jonesville mine was the largest producer in the district and also the largest producer in the Territory. In addition to mining underground, the company developed and started strip mining a bed of coal, and also began re-treating a dump of previously unmarketable coal and waste in its new heavy-medium cleaning plant. The Duck Flat Co (subleasers from the Houston Coal Co.) operated the Duck Flat strip mine (formerly known as the Houston strip mine) from May through September. In August 1952 the Buffalo Coal Mining Co., Inc., with the help of an RFC loan, began rehabilitating the underground mine and building a new surface plant at the Buffalo mine on Moose Creek, but no coal was produced. Late in 1952 the Mrak Coal Co., Inc., started an underground operation 2 miles northeast of Eska. An access road, a tipple (at the main entry), and a loading ramp (at the Eska railroad siding) were constructed. By the end of the year a small tonnage of coal had been produced.

The Bureau of Mines continued its diamond-drilling program during 1952 to determine the extent and position of minable coal beds in the Matanuska coal field of the Willow Creek district. Work was limited chiefly to deep-hole drilling on Wishbone Hill, but several relatively shallow holes also were drilled near Houston on the Alaska Railroad.

The Geological Survey continued its program of detailed geologic mapping of the coal fields and started auger-drill exploration for coal deposits along the Little Susitna River during 1952.

Yentna (Formerly Yentna-Cache Creek) District.—The Collinsville Mines (dry-land dredge with dragline equipment) on Mills Creek, after a year of inactivity, was again the largest producer of gold in the Yentna district in 1952 (as in the years 1948 through 1950). Phillip Brandl on Nugget Creek and Mike A. Trepte on Bird Creek (both hydraulic operations) ranked second and third, respectively, in total gold output in the district in 1952. Several other operators produced small quantities of gold by small-scale hand and hydraulic methods.

COPPER RIVER

Four placer mines in the Copper River Region produced small quantities of gold during 1952—1 in the Chistochina district, 2 in the Nelchina district, and 1 in the Yakataga district.

Prospecting was continued by the owners on the Nelson and the Radovan copper-lode properties on Glacier Creek in the Nizina district, 18 air miles east of the famous but now idle Kennecott mine. The Alaska Copper Corp. completed an exploration program at the Fidalgo-Alaska mine in Fidalgo Bay in the Prince William Sound district with the assistance of a DMEA contract.

KUSKOKWIM RIVER

Three bucketline dredges, 2 operated by the New York Alaska Gold Dredging Corp. at Nyac in the Aniak district and 1 by Strand-

berg & Sons on Candle Creek in the McGrath district, produced the greater part of the gold output of the Kuskokwim River region in 1952.

The Goodnews Bay Mining Co. continued mining platinum-group metals by placer methods on Salmon Creek in the Goodnews Bay district in 1952.

Aniak (formerly Tuluksak-Aniak) District.—In 1952 the New York Alaska Gold Dredging Corp., the largest gold producer in the Kuskokwim River region and (as during the previous 3 years) the third largest in the Territory, operated two electrically powered bucketline dredges. One dredge on California Creek was equipped with eighty 6-cubic-foot buckets, and one dredge on the Tuluksak River was equipped with sixty-five 1½-cubic-foot buckets. Donlin Placers (Robert Lyman and Richard Acheson) on Snow Gulch was the second largest producer of gold in the district in 1952; 848 ounces of gold and 75 ounces of silver were recovered. Because of the low gradient of the creek, the boxes were elevated on a ramp to facilitate removal of the tailings. Russell R. Schaefer on Forty-seven Creek (a tributary of the Holitna River) produced a moderate quantity of gold by using a bulldozer and bedrock sluice boxes; he also marketed considerable scheelite concentrate which was a byproduct of the gold-placer operation. Two other operators in the district in 1952, Taylor Creek Placers using dragline-bulldozer equipment on Taylor Creek and Canyon Creek Mining Co. using a bulldozer on Canyon Creek, removed a moderate quantity of gold.

Goodnews Bay District.—The Goodnews Bay Mining Co. operated its electrically powered bucketline dredge (with ninty-three 8-cubic-foot buckets) and a dragline (1¼-cubic-yard)-bulldozer-hydraulic combination on a bench of the Salmon River during 1952. The primary product recovered was platinum-group metals, but a moderate quantity of gold was produced as a byproduct.

McGrath District.—In 1952 Strandberg & Sons continued to rework old tailing on Candle Creek with its flume-type bucketline dredge. In 1951 it was necessary to begin reworking the old tailing because the economics of gold mining would not withstand the cost of hiring additional men to strip and thaw the ground ahead of the dredge in virgin ground. The gold output from this operation in 1952 was substantially less than in 1951.

It was reported that some development work was done during 1952 on the Nixon Fork lode-gold mine at Medfra on the Kuskokwim River, which was a steady producer for 20 years before 1948.

NORTHWESTERN ALASKA

Tronstad & Goodwick (using hydraulic equipment on Dahl Creek in the Shungnak district) was the only active mining operation in the Northwestern Alaska region in 1952.

SEWARD PENINSULA

Although gold continued to be the commodity with the greatest value of output in the Seward Peninsula region in 1952, the increased interest and activity in tin was significant. In the Port Clarence district of the region, 1 operation produced tin-tungsten concentrate from a lode mine, 1 produced tin concentrate as a primary product

from a placer mining operation, and 1 explored a placer-tin deposit for a possible dredging operation.

Ninty-four percent of the total gold output in the region in 1952 was produced by the 8 bucketline dredges operated by 5 companies. Fifteen other operations produced gold in the region in 1952 by the use of hydraulic giants, bulldozers, dragline excavators, and hand tools, either separately or in combination. One other operator produced gold by cyaniding mill tailing from a former operation.

Council (Formerly Council-Bluff) District.—The Alaska Placer Co. operated a bucketline dredge equipped with sixty 3-cubic-foot buckets on the Niukluk River from July 2 to August 25, 1952. Shaw & Maphis operated on Dutch Creek, a tributary of Ophir Creek, where they recovered 33 ounces of gold and 3 ounces of silver from 300 cubic yards of gravel washed by the use of a bulldozer and sluice boxes.

Fairhaven District.—The Casa de Paga Gold Co. operated two flume-type bucketline dredges on the Inmachuk River from July 1 to October 18, 1952; it was the largest producer of gold in the Fairhaven district and the second largest in the region. Two bulldozers and five No. 2 hydraulic giants were used to remove 132,650 cubic yards of overburden. The dredges handled 326,700 cubic yards of gold-bearing gravel to recover 4,696 ounces of gold and 478 ounces of silver. Havenstrite Oil Co., Mining Division, on Candle Creek (formerly operated by Candle Creek Mining Co.) recovered a moderate quantity of gold using dragline-bulldozer-hydraulic equipment. O. F. and Fred Weinard recovered a moderate quantity of gold from Mud Creek, using a combination bulldozer-hydraulic method, during the 1952 mining season.

Kougarok District.—P. R. & H. Mining Co. operated a bulldozer-hydraulic combination on Henry Creek during August and September; it was the largest producer of gold in the district in 1952. The company, new to the district, formerly operated on Lower Deadwood Creek in the Circle district in the Yukon River region. Atlas Mines (George J. Waldhelm), operating on Atlas Creek with a dragline-bulldozer-hydraulic combination, washed 5,555 cubic yards of gravel between June 1, and August 29, 1952, to recover 93 ounces of gold and 7 ounces of silver. In addition to the gravel washed, 33,333 cubic yards of overburden was removed by the use of five No. 1 hydraulic giants. N. B. Tweet & Sons (formerly operating on Mascot Gulch) was active during 1952 on the Kougarok River (property formerly owned by Kougarok Consolidated Placers), repairing and checking equipment preparatory to mining in 1953.

Koyuk District.—Only one producer was reported active in the Koyuk district in 1952. J. E. Baldwin and C. T. Moon produced a substantial quantity of gold by the use of bulldozer-hydraulic equipment on Sweepstakes Creek.

Nome District.—Five floating bucketline dredges were operated in the Nome district in 1952 (one more than in 1951). Four-fifths of the total gold output of the Seward Peninsula in 1952 was produced in the Nome district.

The United States Smelting, Refining & Mining Co. (Nome unit), operating 3 of its fleet of 4 electrically powered bucketline dredges in the vicinity of Nome from May 25 to November 29, was the largest producer of gold in the Nome district and in the Seward Peninsula

region; its production ranked second in the Territory in 1952. The three dredges are equipped with 134, 109, and 78 9-cubic-foot buckets, respectively. Lee Bros. Dredging Co., the second largest gold producer in the district in 1952, operated 1 of its 2 bucketline dredges on the Solomon River. The dredge operated is diesel-powered, flume-type, and equipped with seventy-five 5-cubic-foot buckets. Another active dredge in the district in 1952 was operated by Elmer Straub and Earl Towner on Buster Creek. The dredge is an example of the ingenuity of some Alaskan placer miners; it was home-built of sundry pieces of salvaged mechanical equipment. It is a flume-type, diesel-powered dredge, equipped with twenty-four 1-cubic-foot buckets (open-link); its pontoons are made from oil drums.

Lane & Owens recovered a moderate quantity of gold by cyaniding mill tailing from the former operation at the Big Hurrah mine near Solomon.

A program of exploration (with DMEA assistance) by the Alaska Copper Corp. on a lode-tungsten deposit on Rocky Mountain Creek in 1952 failed to disclose any new reserves. A small quantity of tungsten concentrate was produced (but not shipped) in 1952 by the Rocky Mountain Mining Co. from its lode prospect on Rocky Mountain Creek.

Port Clarence District.—The Northern Tin Co. continued to mine placer tin at its property on Buck Creek during 1952; its production is estimated to be 91 short tons of 70-percent tin concentrate from a Bodison nonfloating washing plant (utilizing Pan-American jigs) fed by a ¾-yard dragline; a small quantity of gold was recovered as a byproduct. The United States Tin Corp. began active lode-tin mining and milling at the Lost River mine on Cassiterite Creek early in 1952; during the year it produced 46 short tons of tin-tungsten concentrate which contained 54.13 percent tin and 4 percent tungsten. Increased production can be expected when an adequate water supply is developed for milling and camp use and when the metallurgical problems of ore treatment are solved sufficiently to permit higher recovery of the metals from the ore. The company operated under a Government operating loan made as an advance against future production. Zenda Gold Mining Co. (with DMEA assistance) churn-drilled 7,520 feet and sank 97 feet of shaft in the vicinity of Cape Creek near Tin City in 1952. This work was done to explore for a commercial placer-tin dredging operation.

Ole Martinsen recovered a small quantity of gold from a shovel-in operation on Gold Run in 1952.

Serpentine (Formerly Serpentine River) District.—George Bodis recovered 52 ounces of gold and 6 ounces of silver from 1,200 cubic yards of gravel washed by hydraulic equipment on claim No. 4 below Discovery on Dick Creek in 1952.

SOUTHEASTERN ALASKA

Admiralty (Formerly Admiralty Island) District.—Exploration work by the Admiralty-Alaska Gold Mining Co. (with DMEA assistance) at its nickel-copper-cobalt lode mine at Funter Bay, Admiralty Island, was continued throughout 1952.

Chichagof (Formerly Chichagof Island) District.—A small quantity of gold was recovered in 1952 by Hayes & Whiteley Enterprises from a cleanup of the Chichagof mill (from ore mined and milled before 1952) near Klag Bay on the west coast of Chichagof Island.

Juneau District.—Hayes & Whiteley Enterprises re-treated (by sluicing) 8,680 tons of old tailing from the Alaska Juneau mill on the Gastineau Channel near Juneau in 1952; the total recovery was 215 ounces of gold, 55 ounces of silver, and minor quantities of copper and lead, from bullion and from concentrate shipped to a smelter in the United States. A small quantity of gold was recovered by the Alaska Juneau Gold Mining Co. in 1952 from a cleanup of its mill (ore mined and milled before 1952).

Ketchikan District.—The Tillicum Mining Co. was granted a participating contract by DMEA in 1952 for exploration of its lode-antimony property on Caamano Point on the southern tip of Cleveland Peninsula.

YUKON RIVER

Eleven bucketline dredges (operated by 6 companies) and 70 other placer-mining operations in the Yukon River region produced 71 percent of the total gold output in Alaska in 1952. The Fairbanks district alone supplied 73 percent of the total gold output of the Yukon River region in 1952.

Fifty-seven percent of the 1952 coal output in the Territory came from 2 strip mines and 1 underground mine in the Nenana field of the Bonifield district.

One lode-gold mine operator in the Fairbanks district mined and milled ore in 1952. Also in the Fairbanks district, a few tons of lead ore was mined and shipped. One company did exploration work on a tungsten-lode deposit. Antimony ore was mined at the Stampede mine in the Kantishna district in 1952, but the ore was not shipped.

Bonnifield (Formerly Bonnifield-Nenana) District.—Usibelli Coal Mine, Inc., operating its strip mine on the Healy River, was the largest producer of coal in the Nenana field and the second largest coal producer in the Territory in 1952. The output from this operation was curtailed drastically from April through June because of labor difficulties, which resulted in an extended shutdown. Following the settling of the labor strike, the company steadily increased its coal output from July through December to fulfill a military contract.

The Healy River Coal Corp., the second largest producer of coal in the Nenana field in 1952 and the third largest in the Territory, operated the Suntrana mine adjacent to the Usibelli property; it was the only underground operation in the Nenana field. During the year the company was confronted with two major setbacks, which greatly reduced its coal output. These setbacks were labor disputes from April through June and a fire on August 28 which destroyed most of the surface buildings (tipple, powerhouse, messhall, offices, and commissary). Immediately after the fire the company began rebuilding the surface plant. The output of coal for the month of October was nearly normal.

The Cripple Creek Coal Co. operated its strip coal mine on Cripple Creek (a tributary of the Healy River) from January through Feb-

ruary and October through December 1952 to fulfill military contracts. As at the Usibelli operation, the coal was trucked to the railroad at Suntrana. Trucking operations were hampered by a series of road washouts.

Circle District.—Two bucketline dredges were active in the Circle district during 1952. Alluvial Golds, Inc., operated a diesel-powered dredge equipped with seventy-two 4½-cubic-foot buckets on Woodchopper Creek from April 15 to October 22, 1952 (after being inactive during 1950 and 1951). C. J. Berry Dredging Co., operating its dredge on Lower Mammoth Creek from June 9 to September 26, washed 294,790 cubic yards of gravel to recover 2,097 ounces of gold and 428 ounces of silver; the company placer ground was reported to have been dredged out at the close of the 1952 mining season. Gold Placers, Inc., did not operate its diesel-powered dredge on Coal Creek during the year but recovered a moderate quantity of gold incidental to stripping operations which used bulldozer-hydraulic equipment to prepare the ground for future dredging. The practice is to keep the stripping several years ahead of the dredge to take advantage of solar thawing of the gold-bearing gravel. The Deadwood Mining Co. operation on Independence Creek, using a bulldozer to deliver gravel to a sluice plate, a hydraulic giant to wash it through the sluice boxes, and a dragline to stack the tailing, recovered 674 ounces of gold and 157 ounces of silver from 33,000 cubic yards of gravel washed between May 1 and September 26, 1952.

Three other placers in the district (all using bulldozers to deliver gravel to sluice boxes) produced 200 ounces or more of gold in 1952—Four A Mining Co. on Porcupine Creek (254 ounces of gold and 63 ounces of silver), Lucky Seven Mining Co. on Mastodon Creek (226 ounces of gold and 52 ounces of silver from 11,667 cubic yards of gravel washed), and Robert R. Wilkinson on Miller Creek (283 ounces of gold and 51 ounces of silver from 21,000 cubic yards of gravel washed).

Fairbanks District.—The United States Smelting, Refining & Mining Co. (Fairbanks unit) operated six bucketline dredges in the Fairbanks district in 1952; as in previous years, it was by far the largest producer of gold in the district and in the Territory. The electrically powered dredges include one 3-cubic-foot, three 6-cubic-foot, and two 10-cubic-foot. The dredges are in the vicinity of Fairbanks on Cripple, Engineer, Little Eldorado, Fairbanks, and Pedro Creeks and on Gold Hill (a bench on the Left Limit of Ester Creek). In addition to dredges, the company used 200 hydraulic giants and an electrically powered 8- to 12-cubic-yard dragline to remove approximately 10 million cubic yards of overburden.

Brinker-Johnson Co., the second largest producer of gold in the Fairbanks district in 1952, operated its diesel-powered dredge equipped with seventy-eight 4½-cubic-foot buckets on Caribou Creek from May 18 to August 24.

The Wolf Creek Mining Co. on Wolf Creek, 25 miles north of Fairbanks, ranked third in total gold output in the district in 1952. A bulldozer was used to dig and deliver the gravel to a 1½-cubic-yard dragline, which, in turn, delivered it to an elevated sluice box. Because of the scarcity of water, a pump recirculated water for washing.

Alder Creek Mining Co. on Fairbanks Creek recovered 574 ounces

of gold and 88 ounces of silver from 68,000 cubic yards of gravel washed between May 1 and October 1, 1952, by using a bulldozer to deliver gravel to sluice boxes placed on bedrock and by a dragline to remove and stack tailing. Eight No. 2 hydraulic giants and a dragline were used to remove approximately 200,000 cubic yards of overburden.

Other operations that produced moderate quantities of gold from placer mines by using combinations of dragline, bulldozer, and hydraulic equipment with sluice boxes in the Fairbanks district in 1952 were Chatham Creek Mining Co. on Chatham Creek, Hassel & Sticha on Ready Bullion Creek, Hope Mine on Faith Creek, Johnson & Tweiten on Cleary Creek, and Ernest Maurer on First Chance Creek.

Two lode mines were active in the Fairbanks district in 1952 (none in 1951). Verne Jokela & Charles Lazeration worked the Greenback claims at the head of Little Eldorado Creek, 1 mile north of Pedro Dome; they recovered 236 ounces of gold and 36 ounces of silver bullion from 152 tons of gold ore treated by amalgamation at the Cleary Hill Mines Co. mill on Cleary Creek. Fred Wackwitz shipped 2 tons of lead ore containing 233 ounces of silver and 2,242 pounds of lead to a smelter in the United States from a lode mine on Cleary Creek, adjacent to the Cleary Hill mine.

Exploration work, on a DMEA contract, begun in 1951 by the Alaska Metals Mining Co. on a lode-tungsten deposit on Gilmore Dome in the Fairbanks district, was continued during 1952.

Fortymile District.—The total gold output from the Fortymile district in 1952 (only 45 percent of the output for 1951) was produced by 4 operations (compared to 8 in 1951). The Franklin Mining Co., operating a dragline-bulldozer-hydraulic combination on claim No. 2 below Discovery on Chicken Creek, was the largest gold producer in the district in 1952. William Meldrum, using bulldozer-hydraulic equipment on claim No. 1 above Discovery on Chicken Creek, ranked second in production of gold in the district in 1952. George F. Robinson, during a 17-day bulldozer operation (August 12–29) on Wade Creek, recovered 73 ounces of gold and 18 ounces of silver from 5,333 cubic yards of gravel washed.

Hot Springs District.—Four placer-gold operations were active in the Hot Springs district in 1952; all produced moderate quantities of gold by using various combinations of bulldozer, dragline, and hydraulic equipment with nonfloating washing plants. Strandberg & Sons purchased property on Eureka Creek and Tofty Gulch from L. McGee and operated on Eureka Creek during part of the 1952 mining season. Enstrom & McDougal operated on American Creek, Tony Lanning operated on upper Omega Creek, and A. W. Pringle operated on claims No. 5 and 6 on Rhode Island Creek.

Hughes District.—The only producer of gold reported to have been active in the Hughes district in 1952 was the Strandberg & Sons operation on Indian River. A substantial quantity of gold was recovered by the use of dragline-bulldozer equipment with a dry-land washing plant. A dragline with an 80-foot boom and a 3-cubic-yard bucket was used exclusively for stripping overburden which averaged 15 feet in depth. A dragline with a 2-cubic-yard bucket delivered gravel to the hopper of the dry-land washing plant.

Iditarod District.—North American Dredging Co., the largest producer of gold in the Iditarod district in 1952, as it has been for the past 4 years, operated its diesel-powered bucketline dredge equipped with seventy 3½-cubic-foot buckets on the Mohawk Association property on Otter Creek. Miscovich Bros., on Discovery claim on Otter Creek, was the second largest producer of gold in the district in 1952. This operation was unique in that the ground had been worked previously by hand and drag-scraper methods. The tailing from the former operation was rewashed, and the blocky bedrock was dug with a hoe shovel to recover the gold lodged in the crevices that were missed by the first operation. Bulldozers are used to deliver gravel to a sluice plate, a hydraulic giant washes the gravel through the sluice boxes, and a dragline removes and stacks the tailing. Patrick Savage was the third largest producer of gold in the Iditarod district in 1952. Dragline-bulldozer-hydraulic equipment was used on the Alpha Association claims on Flat Creek and also on Willow Creek. Gust Backstrom, on Chicken Creek Dome at the head of Flat Creek, recovered 134 ounces of gold and 21 ounces of silver from 1,667 cubic yards of gravel washed by hydraulic methods during 1952. Other placer operations that produced 100 ounces or more of gold in the district in 1952 were Hatton & Turner on Chicken Creek and Prince Creek Mining Co. on Prince Creek.

Innoko District.—The Colorado Creek Mining Co. on Colorado Creek was the largest producer of gold in the Innoko district in 1952. Using a bulldozer to move gravel to a self-feeding sluice plate at the head of the sluice boxes and a dragline with a 2-cubic-yard bucket to stack tailing, 91,350 cubic yards of gravel was washed to recover 2,640 ounces of gold and 354 ounces of silver. In addition, 115,000 cubic yards of overburden was removed with the dragline and bulldozer during the 1952 season. The second largest producer of gold in the district in 1952 was Rosander & Reed on Yankee Creek, 15 miles southeast of Ophir. Using a dragline-bulldozer-hydraulic combination with bedrock sluice boxes, the company washed 240,000 cubic yards of gravel between May 29 and October 17 to recover a substantial quantity of gold. (Special equipment of interest used at this mining operation was one No. 1 and one No. 2 "Intelligiant" (automatic hydraulic giant) and an International TD 24 bulldozer (the largest manufactured).) Uotila & Hard produced a substantial quantity of gold from two separate operations on Ophir Creek, using dragline-bulldozer-hydraulic equipment and bedrock sluice boxes. The Bedrock Mining Co., a newcomer in the district in 1952, recovered a moderate quantity of gold from placer operations on three streams, Bedrock, Ester, and Little Creek.

Other placer operations in the district that recovered moderate to substantial quantities of gold in 1952 by the use of various combinations of dragline-bulldozer-hydraulic equipment were J. A. Degnan Mining Co. and Grover R. Gurtler on Little Creek and Eric Hard on Bear Creek.

Kantishna District.—Earl Pilgrim & Co. operated the Stampede mine in the Kantisbna district in 1952 and produced 19 short tons of 52 percent antimony ore. The ore was not shipped during 1952.

Koyukuk District.—Total gold production in the Koyukuk district in 1952 more than doubled the 1951 production. Ten placer-gold

operations in the district in 1952 compared to 11 in 1951. Only 2 operations recovered over 100 ounces of gold, Rudolph Kransi on Myrtle Creek and Erling Nesland on Vermont Creek. The only drift placer mine active in Alaska in 1952 was operated by Joseph B. Blundell on Wakeup Creek in the Koyukuk district.

Melozitna District.—The Iditarod Operating Co., using bulldozer-hydraulic equipment, produced a substantial quantity of gold from Golden Creek in the Melozitna district in 1952.

Rampart District.—The greater part of the gold output from the Rampart district in 1952 was produced by 3 of the 5 active placer-mining operations—Harry F. Haverilack on Gunnison Creek, Hunter Creek Mining Co. on Hunter Creek, and Dean Ricks on Hoosier Creek.

Ruby District.—Long Creek Mining Co., using a dragline-bulldozer-hydraulic combination on Long Creek, was the largest gold producer in the Ruby district in 1952. Miscovich Bros. operated its placer-gold property on Timber Creek during June only at the beginning of the 1952 mining season; to combat high labor costs, the company concentrated subsequent effort on its Otter Creek operation in the Iditarod district. Using the bulldozer-hydraulic mining method, the Granite Creek Mining Co. (William Carlo) on Ophir Creek and Clarence Zaiser on Spruce Creek recovered a substantial quantity of gold.

Tolovana District.—The Callahan Zinc-Lead Co. operated a bucket-line dredge (with eighty-six 6-cubic-foot buckets) on Livengood Creek in the Tolovana district from June 1 to November 18, 1952, on a management basis for RFC. The average depth of the gold-bearing gravel dredged was 30 feet. During the season the company thawed and removed 745,000 cubic yards of overburden with 16 hydraulic giants. Olive Creek Mining Co., using dragline-bulldozer equipment with bedrock sluice boxes on Olive Creek from May 26 to September 17, 1952, was the second largest producer of gold in the district. Warwick Mines on Gertrude Creek, using bulldozer-hydraulic equipment, produced a small quantity of gold in 1952.

Alamco, Inc., shipped 420 tons of antimony ore in 1952 from a stockpile at the Sawtooth mine; the material was mined in 1951. The ore was freighted 50 miles by caterpillar-tractor train from the mine to Livengood during the winter.

The Mineral Industry of Arizona

By Paul Luff[1]

ALTHOUGH a marked increase in the mining of gypsum, manganese, and tungsten ores in Arizona was evident during 1952, the State mineral industry continued to be dominated by copper mining. However, even though more copper ore was mined in 1952 than in any year in Arizona's history, production of the metal was less than in 1951, due principally to a decline in the grade of ore mined at open pits. On the other hand, activity in lead-zinc mining, one of the principal industries of the State, declined during the last 6 months of the year as the result of shutdowns caused by continued decreases in the domestic prices of lead and zinc. The total value of Arizona's mineral output, exclusive of uranium, in 1952—$231,702,000—decreased 5 percent from $243,886,000 produced in 1951. Of the total value in 1952, copper contributed 83 percent, zinc 7, gold 2, lead 2, silver 2, and other minerals 4. The value of the metals—copper, gold, lead, molybdenum, and silver—recovered from copper ore (including precipitates) was $194,921,113 in 1952 or 84 percent of the State total. Production of molybdenum—a byproduct of copper ore—was 72 percent greater in 1952 than in 1951, but production of gold and silver (mainly byproducts of copper ore) was less. Production of asbestos, cement, clays, gypsum, manganese, mica, perlite, tungsten, and uranium was greater in 1952 than in 1951. In contrast, production of barite, feldspar, fluorspar, lead, lime, pumice, sand and gravel, silver, stone, and zinc was less.

Outstanding features that affected Arizona mining activities in 1952 were the accelerated mining of copper ore; the closing of the San Xavier lead-silver-zinc mine in Pima County in August; the suspension of mining copper-zinc ore at the Magma mine, Pinal County, in August; a substantial decrease in output of copper ore and copper-zinc ore at the United Verde mine in Yavapai County; the marked increase in production of cement in Pima County; establishment of a Government Purchase Depot for manganese ore at Deming, N. Mex., in November 1951; and the Government program of purchasing tungsten.

In 1952 Arizona remained the largest producer of copper in the United States and ranked fourth in silver, fifth in gold, sixth in lead, and seventh in zinc.

Over 95 percent of the State gold production, 84 percent of th- silver, and 99 percent of the copper came from 9 districts—Ajo, Big Bug, Copper Mountain (Morenci), Eureka (Bagdad), Globe-Miami, Mineral Creek (Ray), Pioneer (Superior), Verde (Jerome), and Warren (Bisbee); 88 percent of the lead came from 6 districts—Aravaipa, Big Bug, Harshaw, Old Hat, Pima, and Warren; and 93 percent of the zinc came from 10 districts—Aravaipa, Big Bug, Cochise, Eureka, Harshaw, Old Hat, Pima, Pioneer, Verde, and Warren.

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Except for lead and zinc during the latter half of the year, markets and prices for metals and nonmetals were stable throughout 1952. The demand for some metals was unusually high due to the requirements for national defense purposes.

The Treasury price of gold remained at $35 a fine ounce and of silver at $0.905+; the average weighted price of copper remained at $0.242 per pound, but the average weighted price of lead dropped to $0.161 per pound and zinc to $0.166 per pound. The year opened with lead quoted at 19.0 cents a pound and zinc at 19.5 cents a pound and ended with lead quoted at 14.75 cents a pound and zinc at 12.50 cents a pound.

The labor supply, both skilled and unskilled, was ample throughout the year. An average of 14,900 employees per month was maintained in 1952 in the mineral industries in Arizona—12,900 in the copper industry alone. No serious strikes occurred in 1952; however, a strike of short duration occurred at the Ray copper property of the Kennecott Copper Corp. At major operations, the workweek remained 6 days throughout the year; the average weekly wage for all mining and quarrying was $90.69, according to the Employment Security Commission of Arizona.

Federal Government assistance in financing exploration projects in search of reserves of strategic and critical minerals, authorized by the Defense Production Act of 1950, continued throughout 1952. From 1951 through December 31, 1952, the Government has financed projects in Arizona as follows: Asbestos (3), copper (3), copper-zinc (2), copper-lead-zinc (1), fluorspar (1), lead-zinc (6), mercury (1), and tungsten (1). The total authorized cost of the 18 projects was to be $920,857, with the Government to provide $550,964 and private industry, $369,893. Details covering the various projects are given in table 3.

Mills, Smelters, and Purchase Depots.—Fifty-five milling plants operated in Arizona in 1952. The most important mills that operated nearly all year were the copper-concentration plants at Morenci (45,000 tons a day), Ajo (25,000 tons), Miami (18,000 tons), Inspiration (18,000 tons), Hayden (12,000 tons), Castle Dome (10,000 tons), Bagdad (4,000 tons), Clarkdale (2,100 tons), and Superior (1,500 tons); the copper-leaching plants at Inspiration (9,000-ton) and Miami (3,000-ton); and the lead-zinc concentration mills at Bisbee (Copper Queen 900-ton), Humboldt (Iron King 670-ton), Sahuarita (Eagle-Picher 500-ton, closed down in August), Tiger (St. Anthony 500-ton), Patagonia (Trench 200-ton), and Klondyke (Athletic 100-ton). Besides copper ore, the concentrators at Clarkdale and Superior and those near Bagdad, Dragoon, Patagonia, Red Rock, and Yucca treated copper-zinc ore. Zinc, copper-zinc, and lead-zinc ores were shipped to custom mills at Bagdad, Ariz., and Deming, N. Mex. In addition to company ore, the Iron King and Trench mills treated custom ores. Six milling plants near Globe treated asbestos ore; 6 mills—Boriana near Yucca, Goldfield at Apache Junction, Hillside at Hillside, Maudina at Oracle, Stetler at Quartzsite, and U. S. Manganese near Wickenburg—treated tungsten ore. The following plants treated various types of material: Arizona Barite at Mesa (barite), Consolidated Feldspar at Kingman (feldspar and silica), and Arizona Gypsum at Phoenix (gypsum). Perlite Industries of Arizona operated

a plant near Phoenix that produced expanded perlite. Four plants—Arizona Portland Cement Co. at Rillito, Grand Canyon Lime & Cement Co. at Nelson, Hoopes & Co. at Globe, and the Paul Lime Plant at Paul Spur—operated on limestone.

Arizona has six copper smelters—Phelps Dodge Corp. at Ajo, Douglas, and Morenci, International Smelting & Refining Co. at Miami, American Smelting & Refining Co. at Hayden, and Magma Copper Co. at Superior; each smelter operated continuously all year. Most of the copper concentrate produced at Arizona mills was treated at smelters in the State. However, Arizona has no lead or zinc smelters; all the lead concentrate produced in the State was shipped to the smelter at El Paso, Tex., and all the zinc concentrate to smelters at Amarillo, Corpus Christi, and Dumas, Tex.; Bartlesville and Henryetta, Okla.; Fort Smith, Ark.; Anaconda and Great Falls, Mont.; and Aquashicola, Pa. Purchasers of small lots of base-metal ores in Arizona in 1952 were Hawley & Hawley at Douglas, T. E. Harper at Prescott, and Robert Lenon at Patagonia. Tungsten ore and concentrate were purchased by E. Fernstrom, Tucson. Government Purchasing Depots were established at Globe for asbestos and at Wenden for manganese.

New Plants or Projects and New Industries.—New projects being developed in 1952 will increase Arizona's annual output of copper by at least 125,000 tons in the near future. The largest of these includes development of underground ore reserves at the San Manuel property south of Tiger, Pinal County, and construction of a 30,000-ton concentrator, a smelter, a railroad spur, and a complete town. This project will cost over $100,000,000, and the Reconstruction Finance Corporation has signed a contract with the San Manuel Copper Corp. for advancing $94,000,000 to be used when needed. Diamond and churn drilling at the property has proved 479,500,000 tons of ore, averaging 0.77 percent copper. The Phelps Dodge Corp. developed its Lavender pit (Bisbee East ore body) in Cochise County throughout the year. The ore body contains 41,000,000 tons of milling ore averaging 1.14 percent copper and 31,000,000 tons of leaching ore averaging 0.42 percent copper. This project will cost approximately $25,000,000. The corporation has completed designs for a new 12,000-ton-per-day concentrator to process the ore. Another important project concerns conversion of the Silver Bell property (American Smelting & Refining Co.) in Pima County into an open pit. Initial plans call for erection of 100 homes for employees, stripping the overburden, and constructing a new milling plant. The cost of this project is estimated at $17,000,000. Ore reserves of 32,000,000 tons averaging 0.90 percent copper have been determined by churn and diamond drilling. The Copper Cities Mining Co. (wholly owned subsidiary of the Miami Copper Co.) is developing an open pit at its copper property in Gila County. The project will cost approximately $15,200,000; part of this sum will be financed by the Federal Government through a Reconstruction Finance Corporation loan. Ore reserves are estimated at 33,000,000 tons, averaging 0.69 percent copper. New projects at Bagdad, Yavapai County, will greatly increase the production of copper and tungsten. In 1952 the Hillside Mining & Milling Co. added a 300-ton unit to its milling plant at Hillside, Yavapai County, for treating tungsten ore. The 70-ton

copper mill of the U. S. Manganese Corp. 12 miles northeast of Wickenburg was converted into a tungsten mill. The Iron King Branch of the Shattuck Denn Mining Corp. is sinking a new four-compartment vertical shaft at its gold-silver-lead-zinc property at Humboldt, Yavapai County.

Base-Metal Ore Output in 1952.—Copper ore was mined in Arizona at a greater rate in 1952 than in any year of its history. The output reached a record total of 44,472,500 tons, a gain of 1,688,100 tons (4 percent) over the former record established in 1951. On the other hand, the output of lead-zinc ore declined to 459,600 tons, a loss of 43,700 tons (9 percent), and output of copper-zinc ore dropped to 338,000 tons, a loss of 95,200 tons (22 percent). These losses resulted from shutdowns at several properties caused by a drop in the domestic prices of lead and zinc. The output of lead ore and zinc ore also declined, but that of copper-lead-zinc ore increased. Of the total ore mined (44,406,700 tons), 98 percent was copper ore from the Ajo, Copper Mountain, Eureka, Globe-Miami, Mineral Creek, Pioneer, and Warren districts. The remainder comprised 444,700 tons of lead-zinc ore mined in the Aravaipa, Big Bug, Harshaw, Old Hat,

TABLE 1.—Mineral production in Arizona, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	226,672	$471,973	247,329	$579,175
Coal	4,969	29,814	5,003	33,000
Copper (recoverable content of ores, etc.)	415,870	201,281,080	395,719	191,527,996
Fluorspar	1,623	(2)	434	(2)
Gold (recoverable content of ores, etc.) troy ounces	116,093	4,063,255	112,355	3,932,425
Gypsum (crude)	(2)	(2)	11,314	28,285
Lead (recoverable content of ores, etc)	17,394	6,018,324	16,520	5,319,440
Lime (open-market)	54,023	772,899	53,019	757,390
Manganese ore (35 percent or more Mn) gross weight	173	(2)	203	(2)
Manganiferous ore (5 to 35 percent Mn) do	224	(2)		
Mica (scrap)	1,763	50,030	(2)	(2)
Molybdenum (content of ore and concentrate) pounds	1,172,740	1,101,641	2,022,832	1,987,418
Perlite	1,520	10,795	2,747	14,568
Sand and gravel	2,691,100	2,203,345	1,824,330	1,635,903
Silver (recoverable content of ores, etc.) troy ounces	5,120,985	4,634,750	4,701,330	4,254,941
Stone (except limestone for cement and lime)	308,881	353,872	235,020	355,709
Tungsten concentrate 60-percent WO_3 basis	11	36,663	71	251,136
Zinc (recoverable content of ores, etc.)	52,999	19,291,636	47,143	15,651,476
Undistributed: Asbestos, barite, beryllium concentrate (1951), cement, feldspar, gem stones, lithium (1951), mercury (1951), pumice and pumicite, quartz, vanadium, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)		[3] 3,566,376		5,373,512
Total Arizona		243,886,000		231,702,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers) except that fuels, gypsum, and mercury are strictly production. Excludes uranium ores.
[2] Value included with "Undistributed."
[3] Revised figure.

Pima, and Warren districts, 336,700 tons of copper-zinc ore mined in the Cedar Valley, Cochise, Eureka, Pioneer, Silver Bell, and Verde districts; and 128,900 tons of miscellaneous ores from various districts throughout the State. Mining operations at 6 open pits—Ajo, Bagdad, Inspiration, Miami (Castle Dome), Morenci, and Ray—produced 37,478,700 tons of copper ore in 1952, averaging 0.908 percent copper, compared with 34,839,200 tons of ore in 1951 averaging 1.003 percent copper. More copper ore was mined from open pits in 1952 than in any other year, but production of copper was less than in 1951.

Of the 45,385,300 tons of ores, old tailings, and mill cleanings mined and treated in 1952 in Arizona, 41,002,400 tons (90.34 percent) was treated at 35 milling plants, 3,735,800 tons (8.23 percent) at 1 straight leaching (copper) plant, and 647,100 tons (1.43 percent) was shipped crude to smelters. Crude ore treated at milling plants comprised chiefly 40,175,300 tons of copper ore averaging 0.93 percent copper and containing minor quantities of gold and silver per ton; 457,400 tons of lead-zinc ore, averaging 0.06 ounce of gold and 2.92 ounces of silver to the ton, 0.40 percent copper, 3.74 percent lead, and 8.10 percent zinc; and 338,000 tons of copper-zinc ore averaging 0.025 ounce of gold and 1.767 ounces of silver to the ton, 2.374 percent copper, 0.335 percent lead, and 7.030 percent zinc.

TABLE 2.—Average prices of certain mineral commodities in Arizona, 1951–52

Commodity	Unit	1951	1952
Asbestos	Short ton	[1]	[1]
Barite	do	$7.500	$7.500
Cement	Barrel (376 pounds)	3.235	3.234
Clays	Short ton	2.082	2.342
Coal	do	6.000	6.600
Copper [2]	Pound	.242	.242
Feldspar	Long ton	4.475	5.500
Fluorspar (concentrate)	Short ton	39.889	43.758
Gold [3]	Troy ounce	35.000	35.000
Gypsum (crude)	Short ton	4.190	2.500
Lead [2]	Pound	.173	.161
Lime:			
Quicklime	Short ton	12.870	12.817
Hydrated	do	22.716	23.299
Manganiferous ore	Long ton (5 to 35 percent Mn)	25.469	26.973
Mica (scrap)	Short ton	28.378	29.832
Molybdenum	Mo content, pound	.966	.982
Perlite (crude)	Short ton	7.102	4.943
Pumice and pumicite	do	6.000	6.000
Sand and gravel:			
Commercial	do	1.094	1.073
Noncommercial	do	.448	.276
Silver [4]	Troy ounce	.905+	.905+
Stone	Short ton	1.146	1.514
Tungsten	Unit (60 percent WO_3)	55.970	58.830
Zinc [2]	Pound	.182	.166

[1] Price ranged from $150 to $1,500 per ton, depending upon grade.
[2] Yearly average weighted price of all grades of primary metal sold by producers.
[3] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[4] Treasury buying price for newly mined silver.

NOTE.—Prices of barite, cement, clay, coal, feldspar, fluorspar, gypsum, lime, mica, perlite, pumice, sand and gravel, and stone are based on average value f. o. b. mines or mills reported by the producers. More detail on prices by grades and markets will be found in the commodity chapter in Volume I of this series.

TABLE 3.—Defense Minerals Exploration Administration contracts from the beginning in 1951 through December 31, 1952

Name of commodity and contractor	Property	County	Date of contract	Participation	
				Government	Private
Asbestos					
Sorsen Asbestos Corp.	Salt Group	Gila	Oct. 20, 1952	$19,575	$2,175
The Bear Canyon Mining Co.	Bear Canyon	do	Nov. 13, 1952	23,598	2,622
American Asbestos Cement Corp.	74 claims	do	Aug. 14, 1951	111,482	12,387
Copper					
Arizona Copper Mines, Inc.	Santa Catalina Copper	Pima	Oct. 27, 1952	25,000	25,000
Banner Mining Co.	Mineral Hill	do	June 29, 1951	63,396	63,396
Eugene J. Meyer	Stoddard	Yavapai	Nov. 6, 1951	2,095	2,095
Banner Mining Co.	Twin Buttes	Pima	June 30, 1951	67,895	67,895
Copper-lead-zinc					
Nash Mines	Bonanza	Santa Cruz	May 13, 1952	19,300	19,300
Copper-zinc					
Sherwood B. Owens	Abril	Cochise	Nov. 14, 1951	31,963	31,963
Yucca Mining & Milling Co.	Antler	Mohave	Dec. 19, 1951	29,735	29,735
Fluorspar					
Fluorspar Producers Corp.	Polly Anne and Elizabeth.	Greenlee	Sept. 19, 1952	6,925	6,925
Lead-zinc					
Arizona Metals Co.	Summit and Silver Monster.	Mohave	Aug. 25, 1952	23,050	23,050
Ike W. Kusisto	Mormon Girl	Yavapai	June 25, 1951	2,500	2,500
Magma King Manganese Mining Co.	Ajax	Pinal	Oct. 23, 1952	11,550	11,550
Reed & Reed Mining Co.	Fountain Head	Mohave	May 15, 1952	10,000	10,000
Yuma Metals, Inc.	Red Cloud	Yuma	Dec. 3, 1952	37,500	37,500
Mercury					
Ord Mercury Mines	5 patented claims	Gila	Nov. 10, 1952	21,000	7,000
Tungsten					
Nikas Mining Co.	Maudina and Morning Star.	Pinal	July 18, 1952	44,400	14,800
Total				550,964	369,893

REVIEW BY MINERAL COMMODITIES

METALS

Beryllium.—No beryllium ore was produced in Arizona in 1952; a small quantity was marketed in 1951.

Copper.—Arizona output of recoverable copper was 395,700 short tons in 1952—a decrease of 20,200 tons (5 percent) from the record production in 1951. A substantial decrease in production from the Copper Mountain and Verde districts more than offset increases from the Ajo, Eureka, Globe-Miami, Pima, Pioneer, and Warren districts. The Copper Mountain district, with an output of 124,900 tons, remained the leading copper-producing district in the State, although its production declined 13 percent; it was followed by the Globe-Miami district with 93,100 tons, Ajo with 63,800, Mineral Creek with

49,300, Warren with 27,400, Pioneer with 17,700, Eureka with 9,200, and Verde with 4,500. Production from the Verde district decreased 5,200 tons (54 percent) and that from the Mineral Creek district 1,300 tons (3 percent). The total copper yield—774,749,700 pounds from copper ore and old tailings (including precipitates)—was obtained as follows: 40,181,300 tons of copper ore and old tailings treated by concentration, 79 percent; 3,735,800 tons of copper ore leached and 30,900 tons of cement copper (from mine-water precipitates and underground leaching operations), 14 percent; and 622,300 tons of copper ore and old tailings shipped crude to smelter, 7 percent. The quantity of copper recovered from 6 open-pit operations in 1952 was 560,068,900 pounds compared with 576,585,700 pounds in 1951. The Morenci mine (open pit of Phelps Dodge) was again the largest copper producer in Arizona, followed in order by the New Cornelia (open pit of Phelps Dodge), Ray (open pit and underground), Inspiration (open pit and underground), Copper Queen, Castle Dome (open pit), Miami, Magma, Bagdad (open pit), and United Verde (Phelps Dodge) properties. These 10 properties produced 98 percent of the State total.

Gold.—Arizona gold production declined to 112,400 fine ounces in 1952, a loss of 3,700 ounces (3 percent) from 1951. This loss resulted from a decrease in gold production from copper-zinc ore and lead-zinc ore. Most of the gold, as well as silver, produced in the State is a byproduct of copper ore and lead-zinc ore; in 1952 copper ore yielded 83,700 ounces of gold (74 percent of the total), an increase of 171 ounces over 1951, and lead-zinc ore 19,200 ounces (17 percent of the total), a decrease of 2,900 ounces. Production of gold from copper-zinc ore was 5,100 ounces, a decrease of 2,400 ounces. Most of the remaining gold came from gold and gold-silver ores. Gold from placers decreased from 156 ounces to 70. The New Cornelia copper mine of the Phelps Dodge Corp., Pima County, continued to be the leading gold producer in the State; it was followed by the Copper Queen mine of the Phelps Dodge Corp., Cochise County; the Iron King mine, Yavapai County; the Magma mine, Pinal County; the Morenci mine of the Phelps Dodge Corp., Greenlee County; and the United Verde mine of the Phelps Dodge Corp., Yavapai County; these 6 properties produced 92 percent of the total gold.

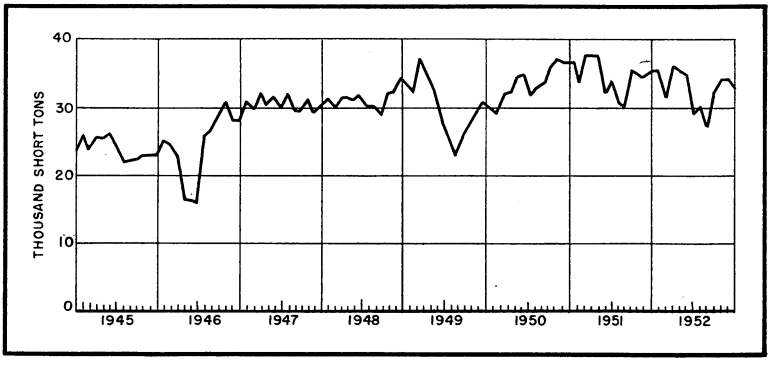

FIGURE 1.—Mine production of copper in Arizona, 1945–52, by months, in terms of recoverable metal.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc 1943–47 (average), 1948–52, and total 1860–1952, in terms of recoverable metals [1]

Year	Mines producing		Material sold or treated (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1943–47 (average)	242	23	34,698,558	107,216	$3,752,553	4,300,799	$3,298,866
1948	360	39	39,925,686	109,487	3,832,045	4,837,740	4,378,399
1949	340	32	38,372,879	108,993	3,814,755	4,970,736	4,498,767
1950	309	24	42,709,272	118,313	4,140,955	5,325,441	4,819,793
1951	265	18	43,820,353	116,093	4,063,255	5,120,985	4,634,750
1952	187	7	45,385,327	112,355	3,932,425	4,701,330	4,254,941
1860–1952	--------	--------	[2]	11,529,260	291,019,255	322,212,730	243,986,370

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1943–47 (average)	340,826	$105,326,699	21,159	$4,421,808	37,459	$8,801,975	$125,601,901
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
1951	415,870	201,281,080	17,394	6,018,324	52,999	19,291,636	235,289,045
1952	395,719	191,527,996	16,520	5,319,440	47,143	15,651,476	220,686,278
1860–1952	13,493,331	4,327,923,108	526,387	96,360,644	617,872	150,731,533	5,110,020,910

[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] Figure not available.

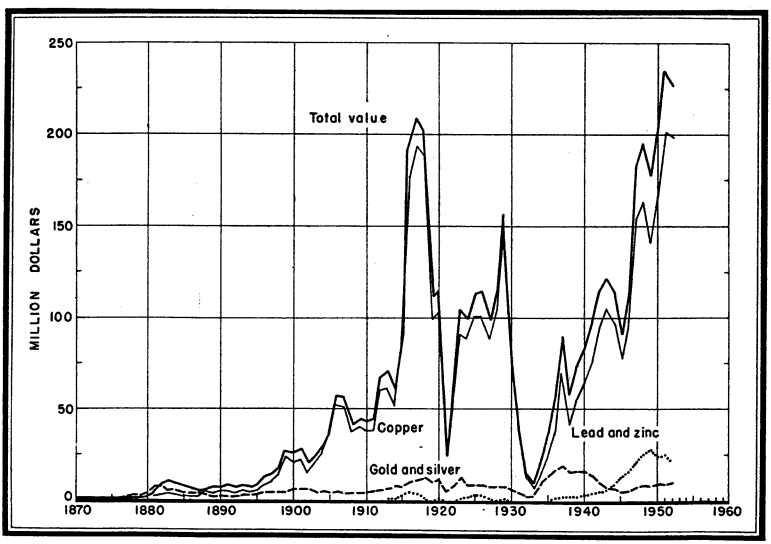

FIGURE 2.—Value of mine production of gold, silver, copper, lead, and zinc in Arizona, 1870–1952.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in 1952, by months, in terms of recoverable metals [1]

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	9,160	425,850	35,471	1,330	4,044
February	9,635	446,185	31,421	1,510	4,444
March	10,150	431,295	35,946	1,490	4,574
April	10,140	438,340	35,008	1,480	4,829
May	10,055	448,035	34,991	1,555	4,759
June	9,260	392,735	29,296	1,405	4,264
July	8,125	308,975	30,286	1,255	3,909
August	7,585	331,985	27,736	1,425	3,674
September	9,260	353,985	32,136	1,310	3,034
October	10,225	371,155	34,861	1,335	3,239
November	9,640	370,985	34,851	1,330	3,309
December	9,120	381,805	33,716	1,095	3,064
Total	112,355	4,701,330	395,719	16,520	47,143

[1] Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metal (or gross metal as indicated) contained in concentrates, ores, tailings, and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

TABLE 6.—Gold produced at placer mines, 1943–47 (average) and 1948–52, by classes of mines and 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:					
Nonfloating washing plants: [1]					
1943–47 (average)	2	4,350	75	$2,625	$0.60
1948	3	97,800	637	22,295	.23
1949	3	76,800	426	14,910	.19
1950	1	100	75	2,625	26.25
1951	1	150	61	2,135	14.23
1952	1	200	58	2,030	10.15
Small-scale hand methods:					
Wet and dry:					
1943–47 (average)	19	3,000	282	9,870	3.29
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
1951	15	1,265	89	3,115	2.46
1952	5	530	11	385	.73
Underground placers:					
Drift:					
1943–47 (average)	3	138	14	476	3.45
1948	11	135	16	560	4.15
1949	2	320	9	315	.98
1950	3	450	19	665	1.48
1951	2	150	6	210	1.40
1952	1	50	1	35	.70
Grand total placers:					
1943–47 (average)	23	46,063	363	12,691	.28
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
1951	18	1,565	156	5,460	3.49
1952	7	780	70	2,450	3.14

[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 7.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties, in terms of recoverable metals

County	Mines producing		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Cochise	21		26,944	$943,040	1,290,391	$1,167,869
Gila	17	1	2,877	100,695	164,298	148,698
Graham	6		129	4,515	18,505	16,748
Greenlee	3		7,058	247,030	538,665	487,519
Maricopa	5	1	30	1,050	1,011	915
Mohave	15		145	5,075	17,251	15,613
Pima	29		36,710	1,284,850	603,542	546,236
Pinal	26		15,104	528,640	898,435	813,129
Santa Cruz	27		201	7,035	256,231	231,902
Yavapai	26	3	22,704	794,640	910,211	823,787
Yuma	12	2	453	15,855	2,790	2,525
Total	187	7	112,355	3,932,425	4,701,330	4,254,941

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Cochise	29,316	$14,188,944	2,360	$759,920	9,470	$3,144,040	$20,203,813
Gila	93,760	45,379,840	43	13,846	31	10,292	45,653,371
Graham	113	54,692	865	278,530	1,315	436,580	791,065
Greenlee	124,882	60,442,888					61,177,437
Maricopa	10	4,840					6,805
Mohave	453	219,252	166	53,452	1,025	340,300	633,692
Pima	65,676	31,787,184	1,867	601,174	3,836	1,273,552	35,492,996
Pinal	67,214	32,531,576	4,156	1,338,232	7,548	2,505,936	37,717,513
Santa Cruz	261	126,324	2,593	834,946	5,059	1,679,588	2,879,795
Yavapai	14,030	6,790,520	4,454	1,434,188	18,859	6,261,188	16,104,323
Yuma	4	1,936	16	5,152			25,468
Total	395,719	191,527,996	16,520	5,319,440	47,143	15,651,476	220,686,278

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1952, by classes of ore or other source materials, in terms of recoverable metals

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	15	8,091	1,109	2,723	2,767	400	
Dry gold-silver	2	9,528	821	16,629	91,200	48,100	7,200
Dry silver	8	14,982	503	143,452	38,482	2,216	
Total	25	32,601	2,433	162,804	132,449	50,716	7,200
Copper	69	44,472,522	83,692	2,900,851	730,809,903	928	
Copper-lead	3	4	2	124	353	2,232	
Copper-lead-zinc	2	4,361		8,238	184,135	279,680	539,708
Copper-zinc	13	338,030	5,115	458,644	13,854,152	615,202	34,288,749
Lead	55	4,577	262	20,083	9,881	1,178,926	43,188
Lead-zinc	33	459,567	19,236	1,122,474	2,420,298	30,067,665	57,144,167
Zinc	9	5,341	40	11,401	54,245	180,499	1,910,263
Total	169	45,284,402	108,347	4,521,815	747,332,967	32,325,132	93,926,075
Other "lode" material:							
Old tailings, etc. [2]	12	68,324	1,505	16,701	489,476	664,152	352,725
Copper precipitates	6				43,483,108		
Total	18	68,324	1,505	16,701	43,972,584	664,152	352,725
Total "lode" material	187	45,385,327	112,285	4,701,320	791,438,000	33,040,000	94,286,000
Gravel (placer operations)	7		70	10			
Total, all sources	194	45,385,327	112,355	4,701,330	791,438,000	33,040,000	94,286,000

[1] Detail will not necessarily add to totals because some mines produce over 1 class of ore.
[2] Old tailings: Copper, 66,815 tons. Mill cleanings: Copper, 16 tons; lead, 982 tons; zinc, 305 tons; lead-zinc, 124 tons; copper-lead-zinc, 6 tons. Smelter cleanings: Lead, 76 tons.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery and types of material processed, in terms of recoverable metals

Method of recovery and type of material processed	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation [1]	386	136			
Concentration, and smelting of concentrates:					
Ore	86,584	3,419,272	630,822,249	30,479,812	93,551,202
Old tailings	295	1,850	89,565		
Total	86,879	3,421,122	630,911,814	30,479,812	93,551,202
Direct smelting:					
Ore	23,810	1,265,211	51,608,289	1,896,036	382,073
Old tailings, etc	1,210	14,851	399,911	664,152	352,725
Copper precipitates [2]			43,483,108		
Total	25,020	1,280,062	95,491,308	2,560,188	734,798
Other:					
Straight leaching of copper ore [3]			65,034,878		
Placer	70	10			
Grand total	112,355	4,701,330	791,438,000	33,040,000	94,286,000

[1] Ore only; no old tailings, etc., processed by this method in Arizona in 1952.
[2] Distributed as follows: Cochise County, 264,500 pounds; Gila County, 23,965,651 pounds; Greenlee County, 12,515,000 pounds; Pinal County, 6,447,557 pounds; and Yavapai County, 290,400 pounds.
[3] All from 1 plant in Gila County.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

A. For ore and old tailings 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									
Cochise	255,591			67,318	6,092	252,400	17,967,973	3,932,585	18,848,655
Gila	8,395,117			160,196	2,715	154,539	96,703,206	19,674	28,613
Graham	21,567			3,670	13	16,724	212,330	1,422,354	2,545,100
Greenlee	15,588,946			495,917	6,500	400,000	235,978,000		
Maricopa	225			15	27	32	6,400		
Mohave	25,905			5,136	102	14,927	898,916	207,812	2,029,350
Pima	9,349,698	1		225,936	35,938	564,130	128,046,008	3,723,556	7,670,800
Pinal	5,701,118	385	136	265,860	12,970	860,309	122,859,211	7,601,214	14,775,800
Santa Cruz	60,958			13,760	155	248,903	510,291	4,753,105	9,957,324
Yavapai	1,602,709			125,335	22,367	908,626	27,729,479	8,791,085	37,695,560
Yuma	604			29		532		28,427	
Total: 1952	41,002,438	386	136	1,363,172	86,879	3,421,122	630,911,814	30,479,812	93,551,202
1951	39,491,121	329	115	1,410,713	92,546	3,703,891	684,362,464	31,439,651	105,192,244
BY CLASSES OF ORE AND OLD TAILINGS TREATED									
Dry gold	7,543	386	136	27	117	74			
Dry gold-silver	7,750			385	540	11,785	90,200	48,100	7,200
Copper:									
Ore	40,175,312			1,183,392	61,716	1,814,481	614,245,361		
Old tailings	6,000			1,202	295	1,850	89,565		
Copper-zinc	338,030			67,423	5,115	458,644	13,854,152	615,202	34,288,749
Copper-lead-zinc	4,284			942		7,802	176,460	245,260	518,675
Lead	756			55		636	111	54,204	
Lead-zinc	457,422			107,525	19,056	1,114,449	2,401,720	29,336,547	56,826,315
Zinc	5,341			2,219	40	11,401	54,245	180,499	1,910,263
Total: 1952	41,002,438	386	136	1,363,172	86,879	3,421,122	630,911,814	30,479,812	93,551,202

BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS

Dry gold	27	117	74			
Copper	1,214,509	65,857	2,167,298	626,752,782	134,590	146,720
Copper-lead	1,669	314	75,836	348,593	881,560	133,128
Copper-lead-zinc	9		177	2,265	1,025	1,130
Iron (from zinc and lead-zinc ore)	20,244	2,967	48,545	47,268	434,622	1,354,936
Lead	32,835	14,087	809,211	1,438,194	25,639,396	4,510,262
Lead-zinc	424		4,433	12,115	332,885	136,825
Total to copper and lead plants	1,269,717	83,342	3,105,574	628,601,217	27,424,078	6,283,001
Zinc concentrate to zinc plants	93,455	3,537	315,548	2,310,597	3,055,734	87,268,201
Total: 1952	1,363,172	86,879	3,421,122	630,911,814	30,479,812	93,551,202
1951	1,410,713	92,546	3,703,891	684,362,464	31,439,651	105,192,244

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

B. For copper ore treated by straight leaching

	Ore treated (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Gila	3,735,773			65,034,878		
Total: 1952	3,735,773			65,034,878		
1951	3,696,413			62,774,397		

C. For ore, old tailings, etc., shipped directly to smelters

	Material treated (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Cochise	372,241	20,852	1,037,991	40,664,027	787,415	91,345
Gila	56,275	161	9,759	25,781,916	66,326	33,387
Graham	1,052	116	1,781	13,670	307,646	84,900
Greenlee	81,855	558	138,665	13,786,000		
Maricopa	86	2	979	13,600		
Mohave	382	43	2,324	7,084	124,188	20,650
Pima	70,327	771	39,412	3,305,992	10,444	1,200
Pinal	62,530	1,749	37,990	11,568,789	710,786	320,200
Santa Cruz	1,249	46	7,328	11,709	432,895	160,676
Yavapai	763	328	1,585	330,521	116,915	22,440
Yuma	356	394	2,248	8,000	3,573	
Total: 1952	647,116	25,020	1,280,062	95,491,308	2,560,188	734,798
1951	632,819	23,062	1,416,968	84,603,139	3,348,349	805,756

Dry gold	548	606	2,513	2,767	400	
Dry gold-silver	1,778	281	4,844	1,000		
Dry silver	14,982	503	143,452	38,482	2,216	
Copper:						
Ore	561,437	21,976	1,086,370	51,529,664	928	
Old tailings and mill cleanings	60,831	452	6,866	367,105		
Precipitates				43,483,108		
Copper-lead	4	2	124	353	2,232	
Copper-lead-zinc:						
Ore	77		436	7,675	34,420	21,033
Mill cleanings	6	13	93	953	4,762	750
Lead:						
Ore	3,821	262	19,447	9,770	1,124,722	43,188
Smelter cleanings and mill cleanings	1,058	632	6,282	23,993	618,970	67,200
Lead-zinc:						
Ore	2,145	180	8,025	18,578	731,118	317,852
Mill cleanings	124	101	710	490	7,570	14,775
Total to copper and lead plants	646,811	25,008	1,279,162	95,483,938	2,527,338	464,798
Zinc: Mill cleanings to zinc plant	305	12	900	7,370	32,850	270,000
Total: 1952	647,116	25,020	1,280,062	95,491,308	2,560,188	734,798

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TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

Class of material	Quantity shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
ORES AND OLD TAILINGS TREATED AT MILLS						
Dry gold	7,543	557	404			
Dry gold-silver	7,750	775	19,375	155,000	80,000	80,000
Copper:						
Ore	40,175,312	76,763	2,159,148	749,450,544		
Old tailings	6,000	500	3,000	150,000		
Copper-lead-zinc	4,284		8,096	213,663	260,611	614,826
Copper-zinc	338,030	8,449	597,366	16,051,605	2,263,121	47,527,758
Lead	756		869	200	72,250	
Lead-zinc	457,422	27,651	1,337,633	3,669,651	34,242,162	74,127,396
Zinc	5,341	54	15,088	80,084	223,547	2,273,125
Total: 1952	41,002,438	114,749	4,140,979	769,770,747	37,141,691	124,623,105
1951	39,491,121	125,666	4,669,072	829,968,386	39,480,390	143,274,418
CONCENTRATES SHIPPED TO SMELTERS						
Dry gold	27	117	74			
Copper	1,214,509	66,466	2,202,482	642,620,244	831,520	4,059,341
Copper-lead	1,669	314	75,836	393,312	915,076	209,956
Copper-lead-zinc	9		177	2,635	1,048	1,453
Iron (from zinc and lead-zinc ore)	20,244	2,967	48,545	55,620	446,530	2,355,223
Lead	32,835	14,087	809,211	1,690,169	26,248,856	5,803,898
Lead-zinc	424		4,433	14,254	340,021	173,862
Total to copper and lead plants	1,269,717	83,951	3,140,758	644,776,234	28,783,051	12,603,733
Zinc concentrate to zinc plants	93,455	4,176	370,039	2,925,424	3,807,068	95,642,141
Total: 1952	1,363,172	88,127	3,510,797	647,701,658	32,590,119	108,245,874
1951	1,410,713	94,315	3,833,652	702,039,583	34,373,740	124,264,493
ORE TO STRAIGHT LEACHING PLANT						
Copper	3,735,773			74,075,928		
Total: 1952	3,735,773			74,075,928		
1951	3,696,413			72,936,589		
ORES, OLD TAILINGS, ETC., SHIPPED DIRECTLY TO SMELTERS						
Dry gold	548	606	2,513	2,897	532	
Dry gold-silver	1,778	281	4,844	1,060		
Dry silver	14,982	503	143,452	39,655	3,415	
Copper:						
Ore	561,437	21,976	1,086,370	53,206,537	1,329	5,000
Old tailings and mill cleanings	60,831	452	6,866	422,987		
Precipitates				44,131,374		
Copper-lead	4	2	124	409	2,281	
Copper-lead-zinc:						
Ore	77		436	8,925	35,303	26,965
Mill cleanings	6	13	93	1,151	4,945	960
Lead:						
Ore	3,821	262	19,447	11,710	1,155,410	56,920
Mill cleanings and smelter cleanings	1,058	632	6,282	28,226	633,089	86,500
Lead-zinc:						
Ore	2,145	180	8,025	20,902	746,713	407,870
Mill cleanings	124	101	710	584	7,787	19,160
Total to copper and lead plants	646,811	25,008	1,279,162	97,876,417	2,590,804	603,375
Zinc: Mill cleanings to zinc plant	305	15	1,076	9,214	38,643	300,000
Total: 1952	647,116	25,023	1,280,238	97,885,631	2,629,447	903,375
1951	632,819	23,062	1,416,968	87,100,550	3,480,087	1,048,575

Lead.—Arizona's production of recoverable lead dropped to 16,500 short tons in 1952—a decrease of 900 tons (5 percent) from 1951. This decrease resulted mainly from a decline in the market prices of lead and zinc, which caused several producers of lead ore and lead-zinc ore to suspend operations. The San Xavier mine near Sahuarita (Pima County), one of the principal lead producers in Arizona, suspended operations in August. During the first quarter of the year the quoted price of lead was 19.00 cents a pound; it dropped to 13.50 cents in October and rose to 14.75 cents a pound in December. However, good increases in lead production in 1952 from the Copper Queen, Iron King, and Flux properties prevented a greater loss in the State lead output. In 1952, 91 percent of the Arizona lead output was recovered from lead-zinc ore and 4 percent from lead ore; the remainder was recovered largely from copper-zinc ore and old mill cleanings (lead). Lead- and zinc-producing districts, including the Big Bug, Yavapai County; Old Hat, Pinal County; Pima, Pima County; Harshaw, Santa Cruz County; Warren, Cochise County; and Aravaipa, Graham County; produced 88 percent of the State lead output. The Iron King mine at Humboldt was the leading lead producer in 1952, followed by the St. Anthony property at Tiger, Flux group near Patagonia, San Xavier mine near Sahuarita, Copper Queen mine at Bisbee, and Aravaipa group near Klondyke.

Manganese and Manganiferous Ores.—Mining of manganese ores expanded greatly in Arizona in 1952 owing to establishment of a Government Purchase Depot at Deming, N. Mex., in November 1951. A depot at Wenden, Ariz., was established by the Government late in 1952. Manganese ore (35 percent or more Mn) was marketed in 1952 from mines in Coconino, Graham, Greenlee, Pima, and Yuma Counties. Shipments from 5 mines totaled 203 long tons, averaging 40.90 percent manganese. In addition, 2,380 tons, averaging 23.06 percent manganese, was shipped from mines in Cochise, Gila, Greenlee, Maricopa, Mohave, Pima, Santa Cruz, Yavapai, and Yuma Counties to the Government Purchase Depot and to the U. S. Manganese custom mill, both at Deming; 60 percent of the output came from 3 mines in Cochise and Santa Cruz Counties.

Mercury.—No mercury was produced or sold in Arizona in 1952. The Ord Mercury Mines did exploration work at its property in Gila County under a DMEA contract.

Molybdenum.—Production (2,022,800 pounds) of molybdenum in Arizona in 1952 was 72 percent greater than that in 1951; all of it was a byproduct of copper ore. Molybdenite concentrate produced was shipped to eastern destinations for consumption and export; the largest producer was the Morenci mine of the Phelps Dodge Corp. in Greenlee County. Other producers were the Miami Copper Co., Gila County, and the Bagdad Copper Corp., Yavapai County.

Silver.—Arizona silver production was 4,701,300 fine ounces in 1952, a decrease of 419,700 ounces (8 percent) from 1951. This loss resulted mainly from a decline in the average grade of silver in copper ore and from a drop in output of copper-zinc ore, lead-zinc ore, and siliceous silver ore. Copper ore yielded 2,900,900 ounces (62 percent of the State total), a decrease of 187,000 ounces (6 percent) from 1951, and lead-zinc ore yielded 1,122,500 ounces (24 percent of the total), a decrease of 20,700 ounces (2 percent). Copper-zinc ore yielded

458,600 ounces (10 percent of the total), a decrease of 143,400 ounces (24 percent). Most of the remaining silver came from silver ore (143,500 ounces), a decrease of 99,400 ounces (41 percent). The Phelps Dodge Corp., with 15 percent less production than in 1951, continued to be the chief silver producer in Arizona; its 4 properties (Copper Queen, Morenci, New Cornelia, and United Verde) produced 50 percent of the State total. Other large silver producers were Magma, Iron King, Ray (Kennecott), Flux, Ash Peak, and San Xavier (Eagle-Picher) properties.

Tungsten.—Exploration for tungsten deposits in Arizona expanded greatly in 1952 as the result of the Government purchase program begun May 10, 1951. The program provides a market for standard-grade tungsten concentrate at $63 per short-ton unit until July 1, 1958, unless 3,000,000 units are purchased earlier. The number of operations in Arizona increased from an estimated 28 in 1951 to 65 in 1952. Tungsten ore was treated in 1952 in milling plants near Hillside, Apache Junction, Yucca, Oracle, Quartzsite, and Wickenburg, Ariz., and some ore was hauled to milling plants at Barstow and Bishop, Calif. Most of the ore came from the Eureka district, Yavapai County; Boriana area, Mohave County; Benson, Dragoon, Hereford, and Tombstone, Cochise County; Quartzsite and Salome, Yuma County; Arivaca, Pima County; and Oracle, Pinal County.

Uranium.—Because of provisions in the Atomic Energy Act of 1946, as amended, and regulations based upon it, the Bureau of Mines is not at liberty to publish statistical data on uranium. However, production of uranium ore in 1952 was greater than in 1951 as a result of extensive expansion in exploration, mine development, and metallurgical research.

In 1952 most of the Arizona uranium was recovered from ore mined in Apache, Coconino, and Navajo Counties. Activity in the search for uranium deposits included exploration in Gila and Mohave Counties. A significant discovery of uranium ore was made in 1952 in the Lukachukai Mountains and near Window Rock, Apache County. Toward the close of 1952 it was reported that an ore-processing plant would be built at Shiprock, N. Mex., to treat ore mined from a deposit in the Lukachukai Mountains. Besides greater activity in exploration and development by private companies, valuable assistance in various forms was afforded uranium operators in 1952 by the Atomic Energy Commission, Federal Geological Survey, and Federal Bureau of Mines.

Vanadium.—For security reasons, because of the close relationship between the output of vanadium and uranium, production figures on vanadium have not been published since 1947. However, the production of vanadium has greatly increased since World War II as a result of the demand for uranium. Vanadium-bearing ore output in Arizona in 1952 came largely from Apache and Navajo Counties.

Zinc.—Arizona production of recoverable zinc was 47,100 short tons in 1952 compared with 53,000 tons in 1951—a decrease of 5,900 (11 percent). This decrease resulted mainly from a decline in the market prices of lead and zinc, which caused several producers of lead-zinc ore and zinc ore to suspend operations. The price of zinc remained at 19.5 cents a pound, the approximate ceiling price, until June 3, 1952, when it began to drop; it reached a low of 12.5 cents October 23, where

it stayed the rest of the year. Marked decreases in zinc production in 1952 occurred at the United Verde, Magma, and San Xavier properties; operations in the copper-zinc area of the Magma mine was suspended in August; and the San Xavier lead-zinc mine was shut down in the same month. However, a substantial increase in zinc production from the Copper Queen, Iron King, Old Dick, and Republic-Mammoth properties prevented a greater loss in the State zinc output. Fifty-nine percent of the zinc in 1952 came from lead- and zinc-producing districts, including the Aravaipa, Big Bug, Old Hat, Pima, Harshaw, and Warren; and 39 percent came from copper- and zinc-producing districts, including the Verde, Cochise, Pioneer, Eureka, Patagonia, and Cedar Valley. Of the State 1952 zinc production, 61 percent was recovered from lead-zinc ore and 36 percent from copper-zinc ore; the remainder was recovered largely from zinc ore. The leading zinc producer in 1952 was the Iron King mine, followed by the Copper Queen, United Verde, Republic-Mammoth, Magma, Flux, San Xavier, St. Anthony, Old Dick, and Aravaipa properties.

NONMETALS

Asbestos.—All of Arizona's 1952 asbestos production came from 11 mines north of Globe, Gila County; production was greater than in 1951. All asbestos of the better grades was sold to the General Services Administration (Government Purchase Depot at Globe). Milling plants were operated in 1952 by the American Asbestos Cement Corp., Apache Asbestos Mines, Inc., Bear Canyon Mining Co., D. W. Jaquays, Metate Asbestos Corp., and Phillips Asbestos Mines.

Barite.—The Arizona Barite Co. is the only producer of barite in Arizona; production in 1952 was slightly less than in 1951. The company operated its mill at Mesa nearly all year on ore hauled from its mine near the Granite Reef Dam, Maricopa County.

Cement.—The cement plant of the Arizona Portland Cement Co. at Rillito, Pima County, is the only one in Arizona; burning and grinding capacity of the plant was doubled during November and December 1951, and as a result cement production in 1952 nearly doubled that in 1951. The company obtains its limestone from quarries near the plant, gypsum from depostis near Winkelman, and iron ore from Fierro, N. Mex.

Clays.—The total output of clays in Arizona in 1952 was 247,300 short tons valued at $579,200; 141,600 tons was bentonite produced from a pit in Apache County and shipped to oil refineries in California, and 105,700 tons was common clay produced and used by 6 brick companies in Maricopa and Pima Counties.

Feldspar.—In 1952, as in past years, all feldspar produced in Arizona came from the property of the Consolidated Feldspar Corp. near Kingman, Mohave County. Production in 1952 was 30 percent less than in 1951. The crude feldspar was ground in the corporation plant at Kingman and the resulting product shipped largely to California for use by the ceramic industry.

Fluorspar.—Four mines produced 829 short tons of crude fluorspar in 1952, which yielded 434 tons of concentrate—a decrease of 1,212 tons (59 percent) from 1951. Most of the fluorspar came from prop-

erties near Benson, Cochise County; Duncan Greenlee County; and Wickenburg, Maricopa County. Over half of the 1952 output was hauled to the Zuni custom mill at Los Lunas, N. Mex., for upgrading.

Gem Stones.—The Saddle Mountain area, covering parts of Pinal and Graham Counties, reportedly produced 8 to 10 tons of agate. The Inspiration mine in the Globe-Miami district of Gila County reportedly produced about 5 tons of chrysocolla; and 3,000 pounds of turquoise was produced from claims in the district. Some of the old mines in the Mineral Park area of Mohave County were reopened in 1952, and approximately 2,000 pounds of oiling-grade (chalk) turquoise was produced.

Gypsum.—Arizona's 1952 gypsum production was nearly double that in 1951. The gain resulted mainly from a greater demand for gypsum required by the Arizona Portland Cement Co. at Rillito. All of the State's gypsum production in 1952 came from the Arizona Gypsum Corp.'s mine near Winkelman, Pinal County.

Lime.—Three lime plants—1 in Cochise, 1 in Gila, and 1 in Yavapai County—produced 53,000 short tons of lime in 1952 compared with 54,000 tons in 1951. Most (45,000 tons) of it was chemical lime used by the copper milling and smelting industries in Arizona.

Lithium Minerals (Amblygonite, Lepidolite, Spodumene).—A little spodumene was produced and sold in 1951 from a claim near Castle Hot Springs, Yavapai County. In 1952 some spodumene was produced from the Vulture mine, Maricopa County, but none was sold.

Mica.—Production of mica more than doubled the 1951 output. All of it was scrap mica that came largely from the Buckeye property in Maricopa County. Some mica was produced also from a claim in Pima County.

Perlite.—Arizona's output of crude perlite in 1952 was 2,747 short tons compared with 1,520 tons in 1951; most of it was used as an aggregate in making plaster and concrete blocks. All output in both years came from properties near Superior, Pinal County; the largest producer in 1952 was the Perlite Industries of Arizona.

Pumice and Pumicite.—All of the pumice produced in Arizona in 1952 came from the Superlite property near Williams, Coconino County; it was used by the Superlite Corp. as an aggregate in making concrete blocks.

Sand and Gravel.—Arizona's 1952 output of sand and gravel was 32 percent less than in 1951. Of the total output in 1952 (1,824,300 short tons), 1,419,900 tons was commercial (produced by industrial companies) and 404,400 tons noncommercial (produced and used by county highway departments). The gravel output amounted to 1,247,700 short tons and the sand output to 576,600 short tons. Most of the 1952 sand and gravel came from 10 pits in Maricopa, Pima, and Pinal Counties.

Silica (Quartz).—All silica production in 1952, as in past years, was high-grade quartz from the property of the Consolidated Feldspar Corp. near Kingman, Mohave County. The material was ground in the corporation plant at Kingman and the resulting product shipped largely to California for use by the ceramic industry.

Stone.—Stone production in Arizona in 1952 comprised 158,900 short tons of crushed limestone, 70,900 tons of crushed miscellaneous

stone, 4,000 tons of crushed basalt, 800 tons of crushed sandstone, and 400 tons of dimension sandstone, a total of 235,000 tons compared with 308,900 in 1951. Of the total stone, 123,100 tons was commercial crushed stone (limestone and miscellaneous stone) used as an aggregate in making concrete for roads and for flux purposes in copper smelting, and 111,500 tons was noncommercial crushed stone (basalt, limestone, and sandstone) used as an aggregate in making concrete for roads. Most of the commercial crushed stone was produced from two quarries in Cochise and Pinal Counties and most of the noncommercial crushed stone from a quarry in Coconino County. Dimension sandstone was produced from a quarry in Yavapai County.

MINERAL FUELS

Coal was the only mineral fuel produced in Arizona in 1952—5,003 tons valued at $33,000 from a mine in Navajo County. In 1951 the same mine produced 4,969 tons.

REVIEW BY COUNTIES

APACHE

In 1952 bentonite was the only mineral produced in Apache County. In 1951, 194,300 short tons of sand and gravel was produced, in addition to bentonite. C. A. McCarrell and associates continued operations in 1952 at their bentonite claims near Sanders and shipped 141,600 short tons to oil refineries in California compared with 116,900 tons in 1951. Exploration was carried on throughout the year at uranium deposits.

COCHISE

Cochise County has been an important producer of gold, silver, copper, lead, zinc, and lime for many years; in 1952 it also produced limestone, fluorspar, manganese, and tungsten. In 1952 the county ranked first in lime and silver production in Arizona, second in gold, manganese, and zinc, fourth in lead, and fifth in copper. The Copper Queen mine of the Phelps Dodge Corp. at Bisbee in the Warren district continued to be the most important producer of minerals in the county; the corporation reported that the mine produced 497,216 tons of copper ore and 43,242 tons of lead-zinc ore in 1952 compared with 490,184 and 40,426 tons, respectively, in 1951. In addition, 585 tons of mill cleanings and 381 tons of copper precipitate were shipped. The corporation 900-ton flotation mill at Bisbee and copper smelter at Douglas operated continuously, except for the usual summer shutdown of 2 weeks for vacations.

According to the Phelps Dodge Corp. annual report for 1952, the Copper Queen mine produced 55,279,692 pounds of copper, 2,818,278 pounds of lead, and 7,729,458 pounds of zinc compared with 55,837,413, 2,530,056, and 7,432,219 pounds, respectively, in 1951.

In developing the open pit at the Bisbee East ore body (Lavender pit), the corporation moved 14,646,875 tons of waste in 1952. Production of copper was scheduled to begin some time during the last quarter of 1954.

The Coronado Copper & Zinc Co. operated its Republic and Mammoth mines and 200-ton flotation mill near Dragoon (Cochise district)

TABLE 12.—Value of mineral production in Arizona 1951–52,[1] by counties, and minerals produced in 1952

County	1951	1952	Minerals produced in 1952, in order of value
Apache	$545,615	$480,430	Clay (bentonite).
Cochise	20,147,426	20,717,125	Copper, zinc, silver, gold, lead, lime, limestone, tungsten, fluorspar.
Coconino	99,070	241,784	Stone, pumice and pumicite, manganese ore.
Gila	45,854,196	47,094,741	Copper, asbestos, molybdenum, lime, silver, gold, sand and gravel, lead, zinc.
Graham	1,014,895	792,274	Zinc, lead, copper, silver, gold, manganese ore.
Greenlee	71,158,780	62,469,489	Copper, molybdenum, silver, gold, fluorspar, manganese ore.
Maricopa	1,207,109	1,305,527	Sand and gravel, barite, clay, copper, fluorspar, manganese ore, gold, silver.
Mohave	762,952	790,104	Zinc, copper, feldspar, silica (quartz), lead, tungsten, silver, gold.
Navajo	112,114	43,100	Coal, stone, sand and gravel.
Pima	38,733,742	40,273,579	Copper, cement, gold, zinc, lead, silver, sand and gravel, clay, tungsten, mica, manganese ore.
Pinal	39,793,737	37,960,627	Copper, zinc, lead, silver, gold, stone, sand and gravel, gypsum, perlite, tungsten.
Santa Cruz	2,667,270	2,879,795	Zinc, lead, silver, copper, gold.
Yavapai	21,194,017	16,523,059	Copper, zinc, lead, silver, gold, lime, molybdenum, tungsten, stone.
Yuma	78,957	93,931	Mica, tungsten, sand and gravel, gold, lead, manganese ore, silver. copper.
Undistributed [2]	516,120	36,392	
Total	243,886,000	231,702,000	

[1] Exclusive of uranium produced in 1951–52 and manganese-ore shipments in 1952 to the Government Purchase Depot at Deming, N. Mex.
[2] Includes value of gem stones, vanadium, and some tungsten, sand and gravel, and stone that cannot be assigned to specific counties.

all year. The mill treated 77,748 tons of zinc-copper ore in 1952 (64,654 tons in 1951), which yielded 5,710 tons of copper concentrate and 8,209 tons of zinc concentrate. The property ranked fourth in Arizona in 1952 in zinc production. Five mines in the California district produced 3,417 tons of ore in 1952; most of it was 3,315 tons of lead-zinc ore from the Hilltop mine near Portal, operated all year by American Zinc, Lead & Smelting Co. Two mines—Scribner and Swisshelm—in the Swisshelm district produced 1,467 tons of ore in 1952 containing 141 ounces of gold, 6,856 ounces of silver, 1,500 pounds of copper, and 303,205 pounds of lead. In the Tombstone district production was mainly 452 tons of manganese ore averaging 22.8 percent manganese from the Prompter mine, 420 tons of lead ore from the Gallagher-Bradshaw group, and 300 tons of lead-zinc ore from the Mary Jo group. Sherwood B. Owens operated the Abril group in the Turquoise district all year and shipped 1,605 tons of ore containing 585 ounces of silver, 16,344 pounds of copper, 6,509 pounds of lead, and 449,818 pounds of zinc. The rest of the district output included chiefly 460 tons of lead ore and 327 tons of lead-zinc ore from the Costello group, 378 tons of lead-zinc ore from the Shannon mine, 361 tons of zinc ore from the San Juan (Gordon) mine, and 83 tons of copper ore from the Tejon mine. Output from the Smelter district was 107 tons of cleanup material (copper-lead); zinc ore (41 tons) was produced from the Dragoon Zinc mine (Golden Rule district).

The Paul Lime Plant near Douglas produced 26,687 short tons of quicklime in 1952 and 2,816 tons of hydrated lime. This plant produced more lime than any other in Arizona; the lime was produced mainly for use as a reagent in copper milling. Paul also quarried and

sold 47,023 short tons of limestone, which was used chiefly for fluxing in copper smelting and for improving roads.

All fluorspar produced in Cochise County in 1952 came from the Lone Star mine near Benson, operated by the Mid-Continent Mining Co.; output from the mine in 1952 was far below that in 1951. Exploration for tungsten deposits in the county expanded greatly in 1952; numerous small lots of tungsten ore were produced from claims near Benson, Dragoon, Hereford, and Tombstone and sold to a buyer (E. Fernstrom) in Tucson.

COCONINO

Coconino County is well known for its high-grade flagstone; most of it comes from quarries near Ashfork and is shipped largely to the building trade in California. In 1952 the county also produced some crushed limestone, 14,500 tons of pumice, and 47 tons of manganese ore averaging 40.6 percent manganese. The crushed limestone was used by the Forest Service for improving National Forest roads in Arizona; the pumice was produced from the Superlite property near Williams and shipped to the company plant at Phoenix for use as an aggregate in making concrete blocks.

GILA

In 1952 Gila County produced the following mineral commodities: Asbestos, copper, gold, lead, lime, manganese, molybdenum, sand, gravel, silver, and zinc. The county, with an output of 187,520,000 pounds of recoverable copper in 1952 (182,114,000 in 1951), continued to rank second among the copper-producing areas in Arizona. Of the total, 99 percent came from three large producers—Castle Dome, Inspiration, and Miami—in the Globe-Miami district. The Inspiration property, with a yield of 85,070,392 pounds of copper in 1952, remained the leading copper producer in the county and ranked fourth in the State. The Inspiration Consolidated Copper Co. reported that 3,735,773 tons of ore, averaging 0.991 percent copper, was treated in 1952 by acid ferric sulfate in the main leaching plant; 344,912 tons of slime, removed from ore at the main leaching plant, was treated by flotation; and 17,891 tons of copper ore and 11,066 tons of cement copper were sent direct to the smelter at Miami. Ore production was from both underground and open pit—2,680,143 tons—was mined from the open pit and 1,430,713 tons from underground. According to the company annual report to stockholders, operations in 1952 were unhampered by labor disturbances, and copper production (85,070,392 pounds) exceeded that of 1951 by 6,820,953 pounds. Mining was on a 6-day-per-week basis, and the treatment plants operated continuously.

The Miami mine of the Miami Copper Co. and the Castle Dome Copper Co., Inc. (a wholly owned subsidiary of the Miami Copper Co.) produced 100,539,679 pounds of copper in 1952 (52,655,859 pounds from the Castle Dome and 47,883,820 pounds from the Miami), according to the annual report of the Miami Copper Co. Copper was produced at the Miami mine in 1952 by underground mining, followed by flotation and by acid leaching of material overlying the mined-out

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties and districts, in terms of recoverable metals

County and district	Mines producing		Material sold or treated (short tons)	Gold (fine ounces)			Silver (fine ounces)			Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total	Lode	Placer	Total				
Cochise County:													
California	5		3,417				4,918		4,918	13,200	355,000	231,100	$103,163
Cochise (Dragoon)	1		77,748	22		22	26,930		26,930	3,675,300		8,531,600	2,330,812
Dos Cabezas and Tevis	1		34	7		7	21		21	800	200		490
Golden Rule	1		41				11		11	200		14,700	2,498
Smelter	(1)		107	8		8	485		485	36,000	2,600		9,850
Swisshelm (Elfrida)	2		1,467	141		141	6,856		6,856	1,300	294,700		58,902
Tombstone	3		724	23		23	1,116		1,116	2,200	144,400	21,300	29,131
Turquoise	7		3,251	46		46	7,119		7,119	23,000	267,200	559,400	149,498
Warren (Bisbee)	1		541,043	26,697		26,697	1,242,935		1,242,935	54,880,000	3,655,900	9,581,900	17,519,469
Gila County:													
Banner (Christmas)	4	1	37,637	149	1	150	7,720		7,720	1,359,400	63,100	51,500	359,920
Globe-Miami	10		12,149,485	2,717		2,717	156,484		156,484	186,158,500	16,000	9,900	45,291,297
Green Valley	1		21	9		9	84		84	100	6,900	600	1,626
Pioneer [2]	1		12	1		1	10		10	200			92
Summit [3]	1		10							1,800			436
Graham County:													
Aravaipa	5		22,618	129		129	18,495		18,495	225,900	1,729,200	2,630,000	790,903
Stanley Butte	1		1				10		10	100	800		162
Greenlee County:													
Ash Peak	1		13,539	498		498	136,072		136,072				140,582
Copper Mountain (Morenci)	2		15,657,262	6,560		6,560	402,593		402,593	249,764,000			61,036,855
Maricopa County:													
Agua Fria	1		47	1		1	52		52	8,500			2,139
Big Horn		1			1	1							35
Cave Creek and Camp Creek	2		23	1		1	885		885	4,400			1,901
Ellsworth [4]	1		225	27		27	32		32	6,400			2,523
Four Peaks	1		16				42		42	700			207
Mohave County:													
Bentley (Grand Wash Cliffs)	1		21				31		31	4,600			1,141
Cedar Valley	3		24,737	60		60	10,406		10,406	891,300	91,600	1,841,900	547,716
Owens	2		104	1		1	600		600	700	47,100		8,330
Wallapai (Chloride, Cerbat, Stockton Hill)	9		1,425	84		84	6,214		6,214	9,400	193,300	208,100	76,505
Pima County:													
Ajo	1		9,341,108	36,372		36,372	450,303		450,303	127,615,000			32,563,397
Arivaca	2		5				180		180	1,100			429
Baboquivari	1		3				11		11	100	800		163
Bronnel	1		428				2,244		2,244	9,600			4,354
Cababi (Comobabi)	3		34	2		2	432		432	2,000	4,400	1,200	1,852
Fresnal	1		1,778	281		281	4,844		4,844	1,000			14,461
Greaterville	1		1				21		21		800		148

Growler	1		405	4		4	1,317		1,317	67,800			17,740
Helvetia (Rosemont)	6		11,332	7		7	12,743		12,743	1,333,000			334,364
Mohawk	1		2				10		10	100			33
Pima (Sierritas, Papago, Twin Buttes)	10		55,938	28		28	128,847		128,847	2,179,800	3,728,000	6,943,000	2,397,851
Silver Bell	1		8,991	16		16	2,590		2,590	142,500		727,800	158,204
Pinal County:													
Casa Grande	4		120	1		1	316		316	2,800	11,900		2,915
Cottonwood	1		33				64		64	900			276
Goldfield	2		7,538	502		502	210		210				17,760
Martinez Canyon	1		187				189		189	200	52,600		8,688
Mineral Creek (Ray)	4		5,255,768	1,454		1,454	214,030		214,030	98,547,500	85,400	7,500	24,108,087
Mineral Hill	4		104	16		16	316		316	900	18,200	2,700	4,442
Old Hat (Oracle, Mammoth)	4		93,861	1,466		1,466	76,726		76,726	440,200	7,826,700	6,735,800	2,605,521
Pioneer (Superior) [2]	5		405,964	11,664		11,664	606,553		606,553	35,432,500	317,200	8,350,000	10,969,035
Summit [3]	1		73	1		1	31		31	3,000			789
Santa Cruz County:													
Cave Creek and Gardner Canyons	1		28	1		1	263		263	1,500			636
Harshaw	6		48,290	155		155	176,778		176,778	148,000	3,841,000	7,847,400	2,122,303
Oro Blanco (Ruby)	1		144	19		19	1,390		1,390	500	19,600		5,200
Palmetto	1		25	2		2	242		242	500	900		555
Patagonia (Duquesne)	13		12,744				70,733		70,733	366,800	901,100	2,098,000	646,128
Redrock	1		1				21		21		400		83
Tyndall	4		975	24		24	6,804		6,804	4,700	423,000	172,600	104,890
Yavapai County:													
Agua Fria	2		149	6		6	116		116	7,900	2,100	7,800	3,860
Big Bug	4		196,186	17,317		17,317	581,699		581,699	411,300	8,269,600	21,724,000	6,169,687
Black Canyon	1		7	2		2	211		211		800	500	473
Bullard or Pierce	1		46	34		34	73		73	1,000			1,498
Castle Creek	2		66	14		14	10		10	5,300			1,782
Copper Basin	2		167	5		5	136		136	900	10,300	30,200	7,187
Eureka (Bagdad)	4		1,240,379	84		84	74,282		74,282	18,456,000	293,300	7,039,200	5,752,249
Hassayampa (Prescott, Groom Creek)	5		1,602	272		272	7,699		7,699	24,700	232,200	188,600	91,157
Tip Top	1		143	6		6	159		159	15,700			4,153
Turkey Creek	1	1	3		4	4	31		31		1,600		426
Verde (Jerome)	1		156,842	4,328		4,328	233,946		233,946	9,047,000	50,000	8,720,500	4,008,240
Walker	1	2	7,750	540	5	545	11,785		11,785	90,200	48,100	7,200	60,508
Weaver (Rich Hill, Octave)	1		132	87		87	64		64				3,103
Yuma County:													
Castle Dome	3		608				600		600		31,800		5,663
Cienega	1		28	5		5				3,200			949
Ellsworth [4]	5		295	383		383	2,180		2,180	2,800	200		16,088
Plomosa	3	1	29	6	1	7				2,000			729
Trigo		1			58	58		10	10				2,039
Total	187	7	45,385,327	112,285	70	112,355	4,701,320	10	4,701,330	791,438,000	33,040,000	94,286,000	220,686,278

[1] Not counted as mine, production coming from smelter cleanings.
[2] Pioneer district lies in both Gila and Pinal Counties.
[3] Summit district lies in both Gila and Pinal Counties.
[4] Ellsworth district lies in both Maricopa and Yuma Counties.

areas. The company 18,000-ton concentrator treated 3,749,162 tons of ore averaging 0.656 percent copper and containing small quantities of gold, molybdenum, and silver. Production of copper was less than in 1951 because of a 15-day shutdown resulting from mechanical failure of the ore hoist and because lower grade ore was treated. Molybdenum production was 550,665 pounds according to the annual report compared with 589,996 pounds in 1951. Exploration by churn drilling in 1952 proved the existence of 23,000,000 tons of low-grade ore. Minable reserves, as of January 1, 1953, were estimated to be 31,500,000 tons. Some facts regarding mining methods at the Miami mine were published in October 1952.[2] The Castle Dome open pit and 10,000-ton concentrator were operated continuously in 1952; 4,300,937 tons of ore averaging 0.764 percent copper and containing small quantities of gold and silver was treated. As of January 1, 1953, ore reserves were estimated to be 3,200,000 tons, which at the current rate of mining will be exhausted before the end of 1953. Operations at the property of the Copper Cities Mining Co. (wholly owned subsidiary of the Miami Copper Co.) consisted of excavation and the pouring of concrete foundations for the concentrator, crushers, and tailing thickeners and moving 6½ million tons of waste in preparing the ore body for production. Of the 20 million tons of total waste to be moved, 46 percent had been moved by the end of 1952. As of January 1, 1953, ore reserves were estimated to be 33,000,000 tons averaging 0.69 percent copper.

The remainder of the Globe-Miami district output was largely 682 tons of copper ore from the Iron Cap, High Line, and Pontiac properties and 339 tons of low-grade manganese ore from the Superior & Boston, Globe-Miami, and Thomas properties.

In the Banner district high-lime fluxing ore (19,267 tons), containing an average of 3.16 percent copper, and 18,165 tons of old siliceous copper tailing from the Christmas property were the principal output. Grissom Mines, Inc., worked the "79" mine all year and shipped 187 tons of ore containing 770 ounces of silver, 11,629 pounds of copper, 71,152 pounds of lead, and 68,353 pounds of zinc; 18 tons of copper ore was produced from the Round Top claim. Output in the Green Valley district was 21 tons of lead ore from the El Lobo claim.

Gila County was also an important producer of asbestos in 1952; 11 operators north of Globe reported production. Most of the ore was treated in milling plants operated by American Asbestos Cement Corp., Apache Asbestos Mines, Inc., Bear Canyon Mining Co., D. W. Jaquays, Metate Asbestos Corp., and Phillips Asbestos Mines. All of the county lime production was quicklime produced at the Hoopes & Co. plant near Globe for use as a reagent in milling copper ores. In all, 63,305 short tons of sand and gravel was produced in 1952 and used by the Gila County Highway Department for improving roads. No mercury was produced in 1952; the Ord Mercury Mines did exploration work at its property near Tonto Basin under a Defense Minerals Exploration Administration contract. Tungsten deposits south of Globe were investigated.

[2] Mining World, Block Caving at Miami: Vol. 14, No. 11, October 1952, pp. 26–30.

GRAHAM

Lead-zinc ore from the Aravaipa group of the Athletic Mining Co. in the Aravaipa district continued to be the main source of metal production in Graham County; 21,149 tons of ore containing 40 ounces of gold, 21,149 ounces of silver, 320,000 pounds of copper, 2,144,000 pounds of lead, and 4,213,000 pounds of zinc was treated in the company 100-ton flotation mill. Other district production comprised 824 tons of lead-zinc ore from the Sein Fein mine, 418 tons of zinc ore from the Ben Hur group, and 227 tons of lead ore from the H. & S., Santa Teresa, and Ten Strike properties. Twelve tons of manganese ore, averaging 47.8 percent manganese, was produced in 1952 from the Blackhawk mine southeast of Klondyke.

GREENLEE

Greenlee County, with a production of 249,764,000 recoverable pounds of copper in 1952, continued to be the chief copper-producing area in Arizona, although its output had dropped from 287,842,000 in 1951 and 309,378,100 in 1950. This decrease resulted from a decline in the grade of ore mined at the Morenci mine of the Phelps Dodge Corp. in the Copper Mountain district. Nevertheless, the mine remained the outstanding producer of copper in the State and was also an important producer of gold, silver, and molybdenum; molybdenum production in 1952 more than doubled that in 1951 owing mainly to improved recovery at the molybdenum unit of the mill. The corporation reported that 15,588,946 tons of copper ore from the Morenci mine was treated in the 45,000-ton concentrator in 1952 compared with 15,466,625 in 1951. In addition, 67,051 tons of crude copper ore and 7,951 tons of copper precipitate were shipped direct to the Morenci smelter, and 1,170 tons of molybdenite concentrate was produced at the Morenci mill. According to the Phelps Dodge Corp. annual report, the total tonnage mined at the Morenci open pit in 1952 set a new record of 44,650,524 tons, of which 15,655,997 tons was ore and 28,994,527 tons waste. From the beginning of open-pit mining in 1937 through 1952, 433 million tons of waste and ore had been removed.

Other Copper Mountain district production was 1,265 tons of copper ore from the Molinar-Alaska group. In the Ash Peak district the Ash Peak Lease worked the Ash Peak mine all year and shipped 13,539 tons of fluxing ore, averaging 0.037 ounce of gold and 10.05 ounces of silver to the ton, and 80 percent silica. Some manganese ore was produced from the Denton claims in the district and shipped to the Government Purchasing Depot at Deming.

Mine operators in Greenlee County produced also 219 short tons of crude fluorspar in 1952; most of it came from Foster's property northwest of Duncan. The ore was hauled to the Zuni custom mill at Los Lunas, N. Mex., for upgrading.

MARICOPA

In 1952 Maricopa County produced the following mineral commodities: Barite, clay, copper, fluorspar, gold, gravel, manganese, mica, sand, silver, and spodumene. The most important production in 1952

was 1,280,889 short tons of sand and gravel valued at $1,019,512 from 7 pits near Mesa and Phoenix. All of Arizona's barite in 1952 came from Maricopa County. Barite was produced at the mill of the Arizona Barite Co. at Mesa; the ore was hauled to the mill from the company mine near the Granite Reef Dam. The 1952 county clay production (53,392 short tons) was all common clay produced and used by the Phoenix Brick Co., Wallapai Brick & Clay Products Co., and Western Clay Products Co.; output in 1952 was 11 percent less than in 1951. Two mines—Big Spar and Spar—near Wickenburg produced 255 tons of crude fluorspar in 1952, a 62-percent increase over 1951. Five properties produced 311 tons of copper ore in 1952; most of it (225 tons) came from the Bullard mine, Ellsworth district. Manganese ore was produced in 1952 from mines near Aguila and shipped to the U. S. Manganese custom mill at Deming. The mill of the Buckeye Mica Co. at Buckeye operated a short time in 1952 and produced some scrap mica. Some spodumene was produced from the Vulture mine, Vulture district, but none was sold.

MOHAVE

Mining zinc-copper ore at the Antler and Copper World mines near Yucca (Cedar Valley district) continued to be the most important operation in Mohave County, although mining tungsten ore in the Boriana area of the Cedar Valley district expanded in 1952. The Antler mine and 130-ton mill were operated all year by the Yucca Mining & Milling Co., and the Copper World mine and 100-ton mill were operated all year by the Mountain States Metals Co. The Antler mine produced 13,237 tons of ore containing approximately 94 ounces of gold, 9,200 ounces of silver, 615,000 pounds of copper, 140,000 pounds of lead, and 1,726,000 pounds of zinc. The Copper World mine produced 11,500 tons of ore containing approximately 26 ounces of gold, 9,000 ounces of silver, 580,000 pounds of copper, 40,000 pounds of lead, and 1,520,000 pounds of zinc. Dye & Bathrick operated the Boriana tungsten mine and mill in 1952; the mill treated 2,316 tons of ore averaging 0.30 percent tungsten. In addition to tungsten concentrate, the mill yielded 26 tons of copper concentrate. Tungsten ore was produced also from the Tungstenite mine (108 tons) near Yucca; Phillips property (129 tons) near Wickieup; and Florescent mine (107 tons) near Kingman. Most of the tungsten concentrate produced was sold to buyers in Bishop, Calif.

The property of the Consolidated Feldspar Corp. near Kingman (Wallapai district) produced all of Arizona's 1952 production of silica (quartz) and feldspar; production of each commodity was less than in 1951. The crude ores were ground in the corporation mill at Kingman and the resulting products shipped to the ceramic industry, largely in California. Other 1952 production in the Wallapai district comprised chiefly 992 tons of lead-zinc ore from the Atwater Kent, Banner, De La Fountaine, Samoa, and Summit properties; 299 tons of zinc ore from the Detroit and Fountain Head mines; and 100 tons of lead-silver ore from the New London and St. Louis mines. Other county production included 21 tons of copper ore from the Cox Ross mine (Bentley district), 104 tons of lead-silver ore from the McCracken and Rawhide properties (Owens district), and some low-grade man-

ganese ore from the Black Warrior mine (Artillery Peak district). In 1951 the Merlo Mica Mining Co. produced some scrap mica from its Mica Hill mine near Kingman; none was produced in 1952.

NAVAJO

In 1952 Navajo County produced 5,003 short tons of coal, 4,050 short tons of crushed stone, and 1,910 short tons of sand and gravel. Coal production, which came from one mine, was virtually the same as that in 1951. Production of crushed stone and sand and gravel was less than in 1951; most of the crushed stone and sand and gravel was used for improving roads. Exploration was carried on throughout the year at uranium deposits.

PIMA

Copper mining at Ajo continued to be the most important industry in Pima County. In 1952 the county ranked first in cement and gold production in Arizona, fourth in copper and silver, and fifth in lead and zinc. Production continued to be mostly copper ore from the open pit at the New Cornelia mine of the Phelps Dodge Corp. in the Ajo district and lead-zinc ore from the San Xavier property of the Eagle-Picher Co. in the Pima district. The county also produced some clay, gravel, manganese, mica, sand, and tungsten. According to the annual report of the Phelps Dodge Corp., the 25,000-ton concentrator at the New Cornelia mine treated 9,298,458 tons of copper ore in 1952 compared with 9,160,517 tons in 1951. However, smelter production of copper from concentrates treated declined from 129,553,788 pounds to 128,602,215. The total tonnage removed from the open pit in 1952 was 20,274,502, of which 9,297,458 tons was ore and 10,977,044 tons waste. In addition, 42,650 tons of old siliceous copper tailing was shipped to the Ajo smelter for fluxing purposes. The mine remained the largest producer of gold in Arizona and ranked second in copper and fifth in silver. Other district production in 1952 was scrap mica from the San Antonio mine.

The San Xavier group near Sahuarita in the Pima district, one of the most important producers of lead-zinc ore in Arizona, closed August 11 (including the 500-ton flotation mill) owing to a drop in the market prices of lead and zinc. The Eagle-Picher Co. reported that the mine produced 42,232 tons of lead-zinc ore in 1952 compared with 71,182 tons in 1951. The Pima Mining Co. began operating the Alpha mine early in 1952 and from May through December shipped 13,650 tons of copper ore to the El Paso smelter. The remainder of the district output was mainly small lots of lead-silver ore and copper ore from various claims.

Leasing operations at the By Chance claim (Bronnel district) produced 428 tons of siliceous silver ore. Output in the Cababi district was largely 20 tons of lead ore from the Sun-Gold claim. Lessees operated the Allison Chance group near Sells (Fresnal district) all year and shipped 1,778 tons of siliceous gold-silver ore. Copper ore (405 tons) was produced from the Jeff Milton mine near Lukeville (Growler district). Six mines—King in Exile, Elgin, Old Dick, Peach, Forbes, and Southern Cross—in the Helvetia district produced 11,332 tons of ore containing 7 ounces of gold, 12,743 ounces of silver, and 1,374,159

pounds of copper. In the Silver Bell district the B. S. & K. Mining Co. operated the Atlas group all year. The company reported that its new 100-ton flotation mill treated 8,991 tons of zinc-copper ore, which yielded 714 tons of zinc concentrate and 214 tons of copper concentrate. The American Smelting & Refining Co. worked its Oxide and El Tiro mines (Silver Bell unit) all year, mainly in removing waste before open-pit operations. Ore reserves are estimated at 32,000,000 tons averaging 0.9 percent copper; copper production was planned to begin during the summer of 1954.

Pima County has the only cement plant in Arizona—owned and operated by the Arizona Portland Cement Co. at Rillito; production of cement in 1952 was nearly double that in 1951, because the burning and grinding capacity of the plant was doubled during November and December 1951. The county clay output increased also, from 50,056 short tons in 1951 to 52,353 tons in 1952; all of it was common clay produced and used by the Tucson Pressed Brick Co., Grabe Brick Co., and Louis DeVry & Son. Some manganese ore averaging 41.4 percent Mn was produced from the Blackbird mine (Coyote district) and shipped to the Government Depot at Deming. The county 1952 output (271,987 short tons) of sand and gravel was less than half that in 1951, as the number of producers decreased from 3 to 1. The loss was mainly in production of noncommercial sand and gravel (used by the county highway department for improving roads). Tungsten operations in Pima County expanded in 1952, especially in the Arivaca (Las Guijas) and Pima districts, and as a result tungsten production increased from 91 units in 1951 to 563 units in 1952. The principal producers were the Carboloy mine south of Tucson and the Las Guijas mine near Arivaca.

PINAL

The most important operations in Pinal County continued to be copper mining in the Mineral Creek (Ray) district, copper mining and zinc-copper mining in the Pioneer (Superior) district, and lead-zinc mining in the Old Hat (Oracle) district. However, zinc-copper mining in the Pioneer district ceased in August because of the drop in the market price of zinc. In 1952 the county ranked first in gypsum and perlite production in Arizona, second in lead, third in copper, silver, and zinc, and fourth in gold. All of Arizona's gypsum and perlite output in 1952 came from Pinal County.

A record output of copper ore was made in 1952 in the Mineral Creek district as a result of expanded open-pit operations at the Ray property of the Kennecott Copper Corp. However, production of copper did not increase proportionately because the average grade of ore declined from 1.392 percent copper in 1951 to 1.096 percent in 1952. Nevertheless, the mine continued to rank third in copper production in Arizona. The corporation reported that 4,329,763 tons of ore was mined from the open pit and 920,726 tons from underground compared with 3,061,636 and 1,163,728 tons, respectively, in 1951. In addition, 3,894 tons of copper precipitate was shipped to a smelter in New Mexico. Some facts regarding the Ray open pit were published.[3]

[3] Mining World, Kennecott Pits the Ray: Vol. 15, No. 1, January 1953, pp. 26-30.

The remainder of the Mineral Creek district output comprised 4,195 tons of siliceous copper ore, averaging 3.06 percent copper, produced from the Copper Butte open pit, 847 tons of siliceous silver ore from the Monitor group, and 237 tons of oxide lead ore from the Ray Silver-Lead property.

In the Pioneer district the Magma mine of the Magma Copper Co., one of the most important producers of gold, silver, copper, and zinc in Arizona, produced 328,447 tons of copper ore and 71,387 tons of zinc-copper ore. In addition, 6,000 tons of old copper tailing was treated in the company 1,500-ton mill. Production of zinc-copper ore, however, ceased in August. According to the company annual report for 1952, operations suffered from several unfavorable factors, such as lower ore tonnage, lower grade ore, higher labor costs, and lower zinc price. Mining of zinc-copper ore will not be resumed, as ore reserves have been largely exhausted. The net metal produced from Magma crude smelting ore and concentrates comprised 11,147 ounces of gold, 544,351 ounces of silver, and 35,269,250 pounds of copper; 8,753 tons of zinc concentrate was produced, averaging 50.98 percent zinc. The average net cost of producing copper in 1952 was 20.82 cents per pound. The mine ranked second in silver production in Arizona, fourth in gold, fifth in zinc, and eighth in copper.

Production of perlite from open pits near Superior (Pioneer district) increased from 1,520 short tons in 1951 to 2,747 tons in 1952, as the number of producers rose from 2 to 4. The chief producers were the Perlite Industries of Arizona and The Perlite Corp. The Perlite Industries of Arizona has a plant to make expanded material. The rest of the district output was 67 tons of copper ore from the Blue Bird, Bomboy, and Lake Superior & Arizona properties and 63 tons of silver ore from the Reymert mine.

The Old Hat district continued to be one of the most important producers of lead and zinc in Arizona, resulting from steady operations at the Mammoth-Collins group of the St. Anthony Mining & Development Co., Ltd. However, operations were discontinued at the close of 1952; and the property, including all surface buildings, was sold to the Magma Copper Co. According to the Magma Copper Co. 1952 annual report, the Mammoth-Collins property was acquired principally for its housing facilities, which are needed immediately for operations at the adjoining San Manuel project. The St. Anthony Mining & Development Co., Ltd., reported that 92,687 tons of lead-zinc ore was treated in its 500-ton gravity-flotation mill in 1952 compared with 102,686 tons in 1951. In addition, 776 tons of mill and smelter cleanings was shipped to a smelter. The mine ranked second in lead production in Arizona in 1952 and eighth in zinc. The remainder of the district output was mostly 300 tons of lead-zinc ore from the Stove Lid mine, 88 tons of copper ore from the Copper Rose claim, and 200 tons of tungsten ore from claims near Oracle. Production of tungsten declined from 189 units in 1951 to 176 in 1952; the principal producers in 1952 were the Maudina and Morning Star mines.

The San Manuel Copper Corp. (wholly owned subsidiary of Magma Copper Co.) continued shaft sinking and underground development at its property south of Tiger (Old Hat District). Plans for a permanent plant to put the property into production in 1956 progressed during the

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year. Ore reserves are estimated at 479,500,000 tons averaging 0.77 percent copper.

Hebner & Landis worked the old Mammoth mine near Apache Junction (Goldfield district) 6 months in 1952; 7,525 tons of gold ore was treated by amalgamation and concentration. Similar ore (13 tons) was produced from the Gold Nugget claim. Production in other districts included 80 tons of lead ore from the Silver Reef mine and 37 tons of copper ore from the Copper Head and Kick Back claims (Casa Grande district); 33 tons of copper ore from the Holy Cross mine (Cottonwood district); 187 tons of lead ore from the Silver Bell mine (Martinez Canyon district); 53 tons of lead ore from the Woodpecker claim and 51 tons of gold ore from the Sunset, Thanksgiving, and Tom Thumb properties (Mineral Hill district); and 73 tons of copper ore from the Lorraine mine (Summit district). All of the county gypsum in 1952 came from the Arizona Gypsum Corp. plant at Phoenix; production in 1952 (11,314 short tons) nearly doubled that in 1951 owing to an increased demand for gypsum required in making cement at the Rillito plant of the Arizona Portland Cement Co.

The remainder of the 1952 production from Pinal County was 70,889 short tons of crushed stone and 54,139 short tons of commercial sand and gravel from pits operated by the Coolidge Sand & Rock Co., and 121,500 short tons of noncommercial sand and gravel produced and used by the Pinal County Highway Department.

SANTA CRUZ

Output in Santa Cruz County in 1952 was chiefly lead-zinc ore from the Flux mine of the American Smelting & Refining Co. near Patagonia in the Harshaw district and various types of ore from the Duquesne group in the Patagonia district. The county was also the largest producer of manganese ore in the State. The Flux mine and 200-ton flotation mill were operated continuously throughout the year; 48,236 tons of lead-zinc ore was treated in 1952 compared with 46,966 tons in 1951. The mill also treated custom ores totaling 12,771 tons. Manganese ore (383 tons) averaging 20 percent manganese was produced in 1952 from claims 8 miles south of Patagonia (Harshaw district) and shipped to the Government Purchase Depot at Deming; the principal producer was the Bender mine operated by the American Minerals Chemical Co. Lessees operated 11 claims of the Duquesne group (Patagonia district) in 1952 and trucked 12,620 tons of various types of ore to the American Smelting & Refining Co. custom mill near Patagonia; the ore contained 73,235 ounces of silver, 439,049 pounds of copper, 943,547 pounds of lead, and 2,500,197 pounds of zinc. In addition, 48 tons of copper ore was shipped direct to a smelter. Other district production was mainly 588 tons of manganese ore averaging 27 percent manganese shipped from the Mowry group to the Government Depot at Deming.

Four mines in the Tyndall district produced 975 tons of ore—933 tons was lead-zinc ore from the Glove and Bull Springs mines and 42 tons lead-silver ore from the Dixie and San Ramon properties. Other county production was largely 144 tons of lead-silver ore from the Montana Consolidated Mine group (Oro Blanco district).

YAVAPAI

Most of the production in Yavapai County in 1952 was copper ore, zinc-copper ore, and tungsten ore from the Eureka district, lead-zinc-iron ore from the Big Bug district, and copper ore and zinc-copper ore from the Verde district. In 1952 the county ranked first in lead, tungsten, and zinc production in Arizona, second in silver, third in gold and molybdenum, and sixth in copper. The county also produced some lime, manganese, and miscellaneous stone.

Of the total (196,186 tons) ore and mill cleanings produced in the Big Bug district in 1952, 196,136 tons was lead-zinc-iron ore and mill cleanings from the Iron King property of the Shattuck Denn Mining Corp. The ore, containing an average of 0.128 ounce of gold and 3.674 ounces of silver to the ton, 0.163 percent copper, 2.552 percent lead, 7.401 percent zinc, and 16.90 percent iron, was treated in the company 670-ton flotation mill. The mine was the largest producer of lead and zinc in Arizona in 1952 and ranked third in gold and silver. Some facts regarding the Iron King mine and mill were published.[4] The rest of the district output was largely 26 tons of gold ore from the Gladstone-McCabe group.

Four mines in the Eureka district produced 1,240,379 tons of copper, zinc-copper, and zinc ores in 1952 containing 139 ounces of gold, 89,799 ounces of silver, 23,492,815 pounds of copper, 424,336 pounds of lead, 464,064 pounds of molybdenum, and 8,332,547 pounds of zinc; 2 mines produced 12,343 tons of tungsten ore. Molybdenum reported was the gross content of molybdenum in copper ore mined at the Bagdad open pit. Most of the silver and copper was recovered from copper ore from the Bagdad mine, and most of the lead and zinc from zinc-copper ore from the Old Dick mine. Tungsten was recovered in the Hillside mill from ore produced from the Black Pearl and Tungstona properties; production in 1952 was far above that in 1951. The Bagdad Copper Corp. operated its open pit and 4,000-ton flotation mill all year; 1,221,220 tons of ore was treated, which yielded 26,835 tons of copper concentrate and 174 tons of molybdenum concentrate. Production of molybdenum (Mo) was 192,076 pounds. Some facts regarding the mill were published.[5] The Manhattan Consolidated Mines Development Co. worked the Old Dick mine all year and shipped 16,729 tons of zinc-copper ore, containing an average of 0.78 ounce of silver to the ton, 3.34 percent copper, 0.65 percent lead, and 20.57 percent zinc, to custom-milling plants in Arizona and New Mexico. Other district production was largely 2,361 tons of zinc ore from the Copper King mine operated by Scholz & Cazier.

In 1952 the Verde district produced 137,050 tons of zinc-copper ore, 19,792 tons of copper ore, and 222 tons of copper precipitate compared with 212,391, 87,338, and 159 tons, respectively, in 1951. All the output in both years came from the United Verde mine of the Phelps Dodge Corp., but production of zinc-copper ore in 1952 was 35 percent less than in 1951 and copper ore 77 percent less. These large decreases resulted from the fact that the ore reserves are nearly exhausted. Nevertheless, the property ranked third in zinc production in

[4] Mining World, New Shaft for the Iron King: Vol. 14, No. 9, August 1952, pp. 49–50. Fine Milling at the Iron King: Vol. 15, No. 2, February 1953, pp. 26–29.
[5] Mining World, Bagdad Expands Copper Mill: Vol. 14, No. 3, March 1952, pp. 30–33.

Arizona in 1952, sixth in gold and silver, and tenth in copper. According to the corporation annual report for 1952, cleanup of the last underground stope at the United Verde mine was underway at the end year. Mining operations at the mine, which began in 1881, will cease after completion of the work in the last underground stope.

In the Walker district, the Allison Steel Manufacturing Co. placed a 100-ton flotation mill on the old Sheldon property and treated 7,750 tons of gold-silver ore from January through September; the mill was removed during the last quarter of the year.

The county lime production in 1952 came from the plant of the Grand Canyon Lime & Cement Co. at Nelson; most of it was chemical lime produced for use as a fluxing agent in copper smelting. A total of 5,588 short tons of limestone and sandstone was produced in 1952 from quarries operated by Arizona Quarry & Stone Co. and Ray Hughes; no limestone or sandstone was produced in 1951. Thirty-four tons of manganese ore averaging 26.4 percent manganese was produced in 1952 from the John Jay claim near Seligman. A little lithium (spodumene) was produced and marketed in 1951 from a property at Castle Hot Springs; none was marketed in 1952.

The remainder of Yavapai County production in 1952 was largely 1,562 tons of lead-zinc ore from the Cash, Combination, Mount Union Consolidated, and Sacramento properties (Hassayampa district); 116 tons of zinc ore from the Boston-Arizona mine and 51 tons of lead-zinc ore from the U. S. Navy mine (Copper Basin district); 104 tons of lead-zinc ore and 43 tons of copper ore from the Stoddard mine (Agua Fria district); 143 tons of copper ore from the Kay Copper mine (Tip Top district); and 132 tons of gold ore from the Monica mine (Weaver district).

YUMA

The most important mineral production in Yuma County in 1952 was tungsten from several claims near Quartzsite (Plomosa district) and Salome (Ellsworth district); production increased from 145 units in 1951 to 787 in 1952. The largest producer was the Tunghill mine near Quartzsite, operated by J. J. Stetler. The mine is equipped with a 25-ton concentrator, which was used also to treat custom ore. Sand and gravel (7,950 short tons) valued at $19,272 were marketed by the Yuma Sand & Gravel Co. Some manganese ore averaging over 35 percent Mn was produced from a property north of Blaisdell, and some low-grade manganese ore was produced from the Black King Tunnel mine near Dateland; ore from both properties was shipped to the Government Purchasing Depot at Deming. The remainder of the 1952 production from Yuma County comprised principally 600 tons of lead ore from the Castle Dome waste dump (Castle Dome district) treated by gravity-concentration; 256 tons of gold ore from the Magic mine (Ellsworth district); and 58 ounces of placer gold from the Colorado River Valley property 50 miles north of Yuma (Trigo district).

The Mineral Industry of Arkansas

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the State Geological Survey of Arkansas.

By F. F. Netzeband,[1] Howard E. Rollman,[1] and Norman F. Williams.[2]

ARKANSAS, the 26th largest State in the Union, with an area of 52,102 square miles in 75 counties, was the 24th ranking State in the production of mineral wealth in the Nation in 1952. There was a decline of $2,359,000 (2 percent) in the total value of mineral production from the record high in 1951. Arkansas was the largest producer of bauxite and barite and the fourth largest producer of manganese in 1952. The State also produced important tonnages of clays, coal, sand and gravel, and stone, as well as important volumes of crude petroleum, natural-gas liquids, and natural gas. In all, 15 different minerals (in addition to oil, natural gas, and coal which are designated mineral fuels) were produced in the State (table 1).

TABLE 1.—Mineral production in Arkansas, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Barite (crude)	407,085	[2] $3,765,536	428,522	[2] $3,963,828
Bauxite long tons, dried equivalent	1,815,274	12,259,742	1,603,833	10,235,254
Clays (except for cement)	483,059	1,198,458	546,334	1,507,692
Coal	1,106,705	8,686,410	873,088	6,839,113
Iron ore (usable) long tons, gross weight	1,343	[3]	115	[3]
Lead (recoverable content of ores, etc.)	33	11,418	4	1,288
Manganese ore (35 percent or more Mn) gross weight	3,718	[3]	2,246	[3]
Manganiferous ore (5 to 35 percent Mn) do	1,429	[3]	896	[3]
Natural gas thousand cubic feet	44,656,000	1,786,000	42,325,000	1,735,000
Natural-gas liquids:				
Natural gasoline and cycle products, 42-gallon barrels	1,386,000	4,247,000	1,471,000	4,580,000
LP-gases do	962,000	1,606,000	1,169,000	2,079,000
Petroleum (crude) do	29,798,000	73,900,000	[4] 29,440,000	[4] 72,420,000
Sand and gravel	3,868,940	3,569,114	5,011,095	4,977,219
Slate	27,080	174,329	[3]	[3]
Stone (except limestone for cement and lime)	2,535,746	3,216,426	[5] 2,967,479	[5] 3,346,201
Zinc (recoverable content of ores, etc.)	50	18,200	26	8,632
Undistributed: Abrasive stones, cement, gypsum, lime, stone (dimension miscellaneous 1952), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		4,254,895		4,641,801
Total Arkansas		118,694,000		116,335,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels and gypsum are strictly production.
[2] Estimate.
[3] Value included with "Undistributed."
[4] Final figure. Supersedes preliminary figure given in commodity chapter.
[5] Excludes certain stone, value for which is included with "Undistributed."

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There were four principal metal-mining areas in Arkansas, in Independence, Hot Spring, Pulaski, and Saline Counties. Nonmetallic mining was centered in the western half of the State. Petroleum production originated in the southwestern counties—Columbia, Lafayette, Miller, Nevada, Ouachita, and Union. Natural gas was produced in Crawford, Franklin, Johnson, Pope, Sebastian, and Washington Counties in the northwestern part of the State, and additional amounts were received from oil production in the southern part.

CONSUMPTION AND MARKETS

The value of mineral resources produced in Arkansas in 1952 ($116,335,000) compared favorably with that of agriculture and forestry products. State income and State revenues depended, in large measure, upon the mineral industries, which included oil, gas, and coal. Arkansas has made considerable progress in balancing its economy in conformance with the national economy wherein value added by manufacturing equals the combined values of mineral production, agriculture, and forestry.

Considerable quantities of the State's minerals, as well as minerals imported from outside the State, were processed within its boundaries. Industrial establishments included oil refineries processing Arkansas crude oil; alumina and aluminum-reduction plants using Arkansas and foreign bauxite; zinc smelters treating out-of-State ores; and portland-cement, brick, tile, pottery, crushed-stone, sand, and gravel plants. Ready access to bountiful supplies of natural gas, electric power, and ground water, and an ample labor force offered special attractions for new industries or expansion of established ones.

TRENDS AND DEVELOPMENTS

The Aluminum Ore Co., a subsidiary of the Aluminum Co. of America, started operations at its new $40 million alumina plant at Bauxite in the last quarter of 1952. Capacity operation was expected by early spring 1953, with a production of 400,000 tons of alumina annually from locally mined ore. A $5 million addition was planned even before this new alumina plant was completed. The expansion unit will manufacture alumina chemicals for use in the abrasive, ceramic, paper, and rubber industries and for medical purposes. This unit should be completed in 2 years and will employ about 700 persons.

Reynolds Metals Co. began constructing an aluminum-reduction plant at Arkadelphia, Clark County, in May 1952. The plant, named the Robert P. Patterson, will have an annual capacity of 55,000 tons of primary metal and should begin production by mid-1953. The plant will use the Soderburg process for producing aluminum and will require 110,000 kw.-hr. of power. Electric power will be supplied by the Southwest Power Administration and the Arkansas Power & Light Co. The alumina will come from the company alumina plant at Hurricane Creek.

General Motors Corp. will construct a $3,200,000 small-parts plant adjacent to the reduction works of the Reynolds Metals Co. at Jones Mill, Ark. The General Motors plant will use molten aluminum

metal from the Reynolds works in fabricating its parts. The new plant should employ approximately 1,000 persons.

The Arkansas Resources and Development Commission reported recent discoveries of columbium ore, and efforts will be made to determine the feasibility of commercial production.

The Westmoreland Manganese Corp., Batesville, Ark., began excavating for the new 6,000-ton concentrator to be built about 4 miles east of Cushman. Pending construction of the new plant, the company reconditioned the old Potashnik concentrator for early production of manganese concentrate. Road construction to the area to be mined was begun.

The Baxter-Denison interests began rehabilitating the old Aydelott washing plant about 2 miles southeast of Cushman for producing manganese concentrate.

The Dulin Bauxite Co. began strip-mining bauxite on the Confederate property at Sweet Home in Pulaski County. The company planned to mine about 50,000 tons of bauxite annually.

H. E. McBride and Marshall McGee shipped the first carload of manganese ore from the Batesville district under the Government's new domestic purchasing plan. Churn drilling in the Southern Hill area and stripping operations at Polk, Southard, and Turner mines were in progress.

Smelters.—In addition to the two aluminum-reduction plants of the Reynolds Metals Co. at Arkadelphia and Jones Mill mentioned under Trends and Developments, an established zinc-retort smelter of the Athletic Mining & Smelting Co. treated ores from the Tri-State district (Oklahoma, Kansas, and Missouri) and from Illinois, Kentucky, Tennessee, Arizona, New Mexico, and foreign sources. Metal stocks at this smelter increased during the year because of the extended steel strike.

During 1952 the program of the Defense Minerals Exploration Administration continued to encourage systematic investigation of strategic and critical mineral occurrences. Financial assistance extended under the Government contracts was repayable from royalties on ore discovered and subsequently mined. Table 2 lists the projects active under the program during 1952.

TABLE 2.—Defense Minerals Exploration Administration contracts active during 1952

Operator	Property	County	Mineral	Total contract	Actual Government participation	Certification of discovery
Westmoreland Manganese Corp.	Southern Hill, North Southern Hill, Page & Turner.	Independence.	Manganese	$16,000	$10,900.38 final total.	Jan. 31, 1953.
Do	do	do	do	20,000	$13,347.12 final total.	Do.
Arkansas Manganese Co.	Unpatented mining claims.	Polk	do	20,000	$8,456.12 final total.	None.
Ashley & J. Gold.	Otto mine	Sevier	Antimony	16,913	$8,377.70 final total.	None.
Inland Mining Corp.	American, Caddo, Sugartree, and Boar Tusk group of claims.	Polk	Manganese	100,000	$14,082.78 (in progress).	

DMPA negotiated a purchase contract of over $17,000,000 with the Westmoreland Corp. for producing 264,000 tons of manganese ore to be produced over a 6-year period. The Government advanced $3,807,000 for the project. Another contract was made with the Southwestern Engineering Co. for doing research in manganese.

EMPLOYMENT IN MINERAL INDUSTRIES

Employment.—The labor force in Arkansas was adequate to meet all mineral-production requirements in 1952. Mechanization rather than increased manpower accounted for most of the increased industrial output.

Accidents.—There were no reported major disasters in the mineral industries of Arkansas in 1952.

Wages.—Hourly wage rates of workers in the mineral industries of Arkansas advanced in about the same proportion as the wage rates in manufacturing.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Production of coal was centered in a group of five counties in the west-central part of the State, but mainly in Sebastian, Johnson, and Logan Counties. In 1952 both the quantity and value of production declined 21 percent. This was the lowest point in quantity of production in recent years. Coal production in Arkansas is reviewed in table 3.

The average production per mine in Arkansas was about 18,000 net tons as compared with the United States average of 64,000 net tons. Sixty-four percent of the coal was mined underground and 36 percent strip-mined. Mechanical loading was practiced in 85 percent of the underground mines. About 94 percent of the coal mined underground was cut by machine.

In 1950 the coal reserves [3] in the State were estimated at over 1.5 billion tons. Of the estimated original reserves, about 81 percent was bituminous coal, 14 percent anthracite or semianthracite, and 5 percent lignite.

TABLE 3.—Coal production, 1943–47 (average) and 1948–52, in short tons

Year	Production	Value		Year	Production	Value	
		Total	Average per ton			Total	Average per ton
1943–47 (average)	1,809,340	$9,545,800	$5.27	1950	1,169,068	$8,883,000	$7.60
1948	1,662,187	12,879,396	7.75	1951	1,106,705	8,686,410	7.85
1949	961,511	7,534,415	7.84	1952	873,088	6,839,113	7.83

Natural Gas.—The quantity of marketed production of natural gas dropped to a 5-year low in 1952 as the quantity marketed decreased 5 percent and the value of this production declined 3 percent. Of the estimated production (67,600 million cubic feet), 42,325 million

[3] Averitt, Paul, and Berryhill, L. R., Coking-Coal deposits of the Western United States. Geol. Survey, Circ. 94, 1951, p. 5.

cubic feet was marketed; 22,070 million feet was repressured; and 3,205 million cubic feet was vented and wasted. Loss from venting and wasting was 338 million cubic feet less than in 1951.

Table 4 gives production figures of natural gas in Arkansas.

TABLE 4.—Marketed production of natural gas 1943–47 (average) and 1948–52, in million cubic feet [1]

Year	Quantity	Value	Mills value per thousand cubic feet	Year	Quantity	Value	Mills value per thousand cubic feet
1943–47 (average)	45,065	$2,964,000	66	1950	48,047	$1,682,000	35
1948	53,946	2,422,000	45	1951	44,656	1,786,000	40
1949	47,788	1,912,000	40	1952	42,325	1,735,000	41

[1] Comprises gas either sold or consumed by producers including losses in transmission, amounts added to storage, and increases in gas pipelines.

Natural-Gas Liquids.—Production of all types of natural-gas liquids increased 12 percent in quantity and 14 percent in value in 1952 (tables 5 and 6). The percentage of increase in LP-gases was the most marked, having a growth of 22 percent in quantity. Natural gasoline and cycle products increased 6 percent at the same time.

TABLE 5.—Natural-gas liquids produced, 1943–47 (average) and 1948–52, in 42-gallon barrels

Year	Natural gasoline and cycle products		LP-gases		Total	
	Barrels	Value	Barrels	Value	Barrels	Value
1943–47 (average)	1,169,060	$2,477,400	720,880	$815,600	1,889,940	$3,293,000
1948	1,387,738	5,454,000	870,714	2,021,000	2,259,000	7,475,000
1949	1,426,833	4,080,000	852,881	1,492,000	2,280,000	5,572,000
1950	1,395,000	3,926,000	938,000	1,197,000	2,333,000	5,123,000
1951	1,386,000	4,247,000	962,000	1,606,000	2,348,000	5,853,000
1952	1,471,000	4,580,000	1,169,000	2,079,000	2,640,000	6,659,000

TABLE 6.—Production of natural-gas liquids, by type of product, in 1952

Type of product	Quantity (thousand barrels)	Value	Type of product	Quantity (thousand barrels)	Value
Natural gasoline	1,348	$4,155,000	Other products	58	$163,000
LP-gases	1,169	2,079,000	Total	2,640	6,659,000
Finished gasoline and naphtha	65	262,000	Natural gas treated (million cubic feet)	77,317	----------

Oil and Gas Exploration.—Drilling activity in 1952 remained at about the same level as in the previous year, with a slight increase in the number of dry holes. Twelve new oil fields were discovered during the year.

Petroleum.—Petroleum production and values in 1952 were the lowest in the past 5 years (table 7). All production came from counties in the southern part of the State. Ouachita County was again the largest producer of petroleum, followed by Columbia, Union, Lafayette, and Miller Counties.

There were 3,930 producing oil wells in 1952, 130 more than the number of wells in 1951. The average daily output per well declined slightly in 1952 to 20.9 barrels from the 1951 average of 21.8 barrels.

Daily average demand for crude petroleum was 80,700 barrels a day in 1951 and 79,600 barrels a day in 1952, a decline of 1,100 barrels a day.

As of December 31, stocks at Arkansas refineries were 727,000 barrels, and there were 1,524,000 barrels in the pipelines and tank farms. Of the 21,299,000 barrels of domestic crude received at refineries in Arkansas in 1952, 20,324,000 came from Arkansas producers, and 975,000 was brought in from Louisiana.

Most crude shipments to the refineries were made by pipeline as illustrated below:

Type of transportation:	*Barrels shipped*	
	Intrastate	*Interstate*
Pipelines	20, 101, 000	746, 000
Tank cars and trucks	223, 000	226, 000
Boats	----------	3, 000

Mileage of petroleum pipelines increased 9 percent in Arkansas in the period from 1949–52 (table 8). During the period, 225 miles of old pipeline was taken up; 115 miles of second-hand pipe was laid; and 281 miles of new pipe was laid. Cubic capacity increased a little over 6 percent during this period.[4]

At the end of 1952 there were 6 operating refineries in Arkansas with a capacity of 62,800 barrels of crude oil a day and cracking capacity to produce cracked gasoline of 11,400 barrels a day. Crude-oil-refining capacity of 1,500 barrels a day was under construction and 2,700 barrels a day of capacity was shutdown. An additional cracking capacity of 9,000 barrels a day was under construction. Table 9 shows the consumption of refinery products in Arkansas.

TABLE 7.—Production of crude petroleum, 1943–47 (average) and 1948–52, in 42-gallon barrels

Year	Quantity	Value		Year	Quantity	Value	
		Total	Average per barrel			Total	Average per barrel
1943–47 (ave.)	28, 790, 800	$35, 960, 000	$1. 25	1950	31, 108, 000	$76, 530, 000	$2. 46
1948	31, 682, 000	78, 570, 000	2. 48	1951	29, 798, 000	73, 900, 000	2. 48
1949	29, 986, 000	74, 360, 000	2. 48	1952	29, 440, 000	72, 420, 000	2. 46

TABLE 8.—Mileage and cubic capacity of petroleum pipelines, 1949–52

Type of pipeline	Cubic capacity (thousand barrels)		Mileage		Type of pipeline	Cubic capacity (thousand barrels)		Mileage	
	1949	1952	1949	1952		1949	1952	1949	1952
Gathering lines	70	76	718	774	Product lines	98	155	254	400
Crude oil trunklines	720	712	809	778	Total	888	943	1, 781	1, 952
Total crude lines	790	788	1, 527	1, 552					

[4] Coumbe, A. T., and Avery, I. F., Crude Oil and Refined Products Pipeline Mileage in the United States, January 1, 1953: Bureau of Mines Inf. Circ. 7671, 1953, 10 pp.

TABLE 9.—Sales of petroleum products, 1951–52

Product	Quantity (thousand barrels)		Change from 1951 (percent)	Product	Quantity (thousand barrels)		Change from 1951 (percent)
	1951	1952			1951	1952	
Gasoline	10,119	10,672	+5	Distillate fuel oil	2,244	2,325	+4
Kerosine	1,777	1,736	−2	Residual fuel oil	2,051	1,497	−27
Range oil	1,050	1,051	(1)				

[1] Less than 1 percent.

METALS

Bauxite.—Mine production of crude bauxite in Arkansas declined 13 percent in 1952 to 1,903,101 long tons. About 96 percent of the bauxite produced in the Nation came from Arkansas. There were two alumina plants and one aluminum plant in the State for processing part of the bauxite produced. The Aluminum Co. of America began its new Bauxite, Ark., alumina plant, which, with the Hurricane Creek alumina plant of the Reynolds Metals Co., gave the State substantial alumina capacity. At Jones Mill, Reynolds Metals operated its aluminum-reduction plant, which had a rated capacity of 97,000 tons of aluminum metal a year. Bauxite production and shipments are shown in table 10.

TABLE 10.—Mine production of bauxite and shipments from mines and processing plants to consumers, 1943–47 (average) and 1948–52, in long tons

Year	Mine production			Shipments from mines and processing plants to consumers		
	Crude	Dried bauxite equivalent	Value	As shipped	Dried bauxite equivalent	Value
1943–47 (average)	3,034,510	2,578,720	$12,294,010	3,003,980	2,528,680	$12,105,960
1948	1,649,926	1,395,341	8,299,486	1,430,688	1,314,069	9,458,476
1949	1,287,358	1,094,924	6,433,964	1,232,883	1,132,330	8,119,574
1950	1,552,047	1,307,335	7,531,535	1,416,724	1,301,374	9,277,076
1951	2,153,786	1,815,274	12,259,742	1,583,320	1,493,557	11,994,882
1952	1,903,101	1,603,833	10,235,254	2,067,241	1,849,287	14,084,274

There were 10 operating companies with 21 operations active in Arkansas in 1952. All of these operations were in Pulaski and Saline Counties. In addition to bauxite produced for making alumina and aluminum, considerable quantities were used in the chemical and abrasive industries. All of the bauxite mined by Reynolds Mining Co. was shipped to Reynolds Metals Co. as crude. Aluminum Co. of America shipped to other bauxite users as well as to its own alumina facilities in Saline County. The Dulin Bauxite Co. and Riffe Construction Co. were unaffiliated operators and sold to most bauxite-consuming industries. Dulin operated a crushing, drying, and calcining plant near Sweet Home, Ark. Chemical-grade bauxite was mined by Consolidated Chemical Industries, Inc., and the American Cyanamid Co. for chemical and oil-refining use. The Norton Co. and the Crouch Mining Co. mined and calcined bauxite for affiliated abrasive industries. The Porocel Co. and the Campbell Bauxite Co. produced activated bauxite from purchased crude.

Iron.—The Magnet Iron Co. produced 115 tons of iron concentrates in Hot Spring County in 1952.

Lead.—Prospecting activities in Marion County resulted in a small production of 4 tons of recoverable lead valued at $1,288 compared with 33 tons valued at $11,418 in 1951.

Manganese.—Production of both high- and low-grade manganese ore declined in 1952. Production of manganese ore with 35 percent or more manganese declined 40 percent in 1952 to a total of 2,246 short tons. Low-grade ore production decreased from 1,429 tons of manganiferous ore in 1951 to 896 tons in 1952. Most of this production went to Government stockpiles under the Government purchase program. All of the production was from Independence County and is shown in table 11.

TABLE 11.—Manganese and ferruginous manganese ores shipped from mines 1943–47 (average) and 1948–52, in short tons

Year	Manganese ore [1]		Ferruginous manganese [2]	
	Gross weight	Mn content	Gross weight	Mn content
1943-47 (average)	4,210	1,680	8,370	1,790
1948	212	104	1,165	349
1949	2,851	1,284	5,555	1,388
1950	1,224	473	6,359	1,667
1951	3,718	1,442	1,429	395
1952	2,246	1,007	896	269

[1] Containing 35 percent or more manganese (natural).
[2] Containing 10 to 35 percent manganese (natural).

Zinc.—Prospecting activities in Marion County resulted in production of 26 tons of zinc valued at $8,632 in 1952. This was about 50 percent of the production of the previous year.

NONMETALS

Nonmetallic mineral commodities produced in Arkansas in 1952 included abrasive stones, barite, cement, clays, gypsum, lime, sand and gravel, slate, and stone. The value of nonmetallic production increased 13 percent during 1952 as compared with 1951.

Abrasive Stone.—Production of oilstones and whetstones in Garland County decreased 38 percent during the year. There were four producers of abrasive stone in the county.

Barite.—Arkansas continued as the Nation's principal producer of barite in 1952, when 428,572 tons was produced, a 5-percent increase over that of 1951 (table 12). The entire output originated in Hot Spring County and was used for heavy drilling mud for the well-drilling industry.

TABLE 12.—Primary barite produced and sold or used, 1944–47 (average) and 1948–52, in short tons

Year	Production	Sold or used		Year	Production	Sold or used	
		Quantity	Value [1]			Quantity	Value [1]
1944–47 (average)	271,160	271,160	$1,803,820	1950	343,168	343,168	$3,088,512
1948	362,470	362,470	2,899,760	1951	407,085	407,085	3,765,536
1949	363,382	363,382	2,907,056	1952	428,572	428,522	3,963,828

[1] Estimate.

Cement.—Shipments from the cement mill near Okay in Howard County increased about 10 percent during the year.

Clays.—The quantity of clays produced in Arkansas was 61,000 tons more in 1952 than in 1951 (table 13). A marked increase in the quantity of fire clay produced offset the decline in miscellaneous clays and resulted in an overall increase of 12 percent in the quantity of clays produced.

Fire clay was produced in Hempstead, Hot Spring, and Ouachita Counties. A large part of the fire-clay production was used by the producers for making heavy clay products, such as brick, tile, and pipe. The rest of the fire clay was used in refractories. All miscellaneous clays were used for heavy clay products.

TABLE 13.—Clays sold or used by producers, 1943–47 (average) and 1948–52, by kinds, in short tons

Year	Miscellaneous clays		Fire clay		Total	
	Quantity	Value	Quantity	Value	Quantity	Value
1943–47 (average)	163,330	$126,010	141,470	$404,660	304,800	$530,670
1948	193,913	186,984	273,540	909,376	467,453	1,096,360
1949	175,758	182,687	276,245	897,917	452,003	1,080,604
1950	219,117	217,127	256,042	789,876	475,159	1,007,003
1951	171,518	184,532	319,941	1,022,326	491,459	1,206,858
1952	166,465	176,392	386,111	1,337,542	552,576	1,513,934

Gypsum.—There was only one producer of gypsum in the State—in Pike County. Production declined 13 percent during the year.

Lime.—The only active lime plant in the State (in Independence County) curtailed production 7 percent during the year.

Sand and Gravel.—Twenty commercial operations and a number of noncommercial operations in 20 counties produced 5,011,100 short tons of sand and gravel valued at $4,977,200 during 1952 (table 14). This was a 30-percent increase in the quantity of sand and gravel sold or used and a 39-percent increase in total value over 1951. Most of this increased output was due to greater activity of Government-and-contractor producers.

About 85 percent of the sand was used for paving or commercial building. Of the gravel used, 89 percent was for paving.

TABLE 14.—Sand and gravel sold or used by producers, 1951–52, by classes of operations and uses

	1951			1952		
	Short tons	Value	Average	Short tons	Value	Average
COMMERCIAL OPERATIONS						
Sand:						
Building	576,000	$360,442	$0.63	669,973	$383,742	$0.57
Paving	419,279	352,589	.84	324,229	242,736	.75
Grinding and polishing	2,550	1,830	.72			
Gravel:						
Building	90,560	97,019	1.07	89,977	101,071	1.12
Paving	872,926	968,895	1.11	843,329	883,173	1.05
Railroad ballast	228,074	188,902	.83	245,549	195,129	.79
Other	(1)	(1)	(1)	57,298	60,104	1.05
Undistributed [2]	233,649	430,254	1.84	213,890	404,003	1.89
Total commercial sand and gravel	2,423,038	2,399,931	.99	2,444,245	2,269,958	.93
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand: Paving	39,166	29,375	.75	144,855	106,080	.73
Gravel: Paving	1,406,736	1,139,808	.81	2,421,995	2,601,181	1.07
Total Government-and-contractor sand and gravel	1,445,902	1,169,183	.81	2,566,850	2,707,261	1.05
Grand total	3,868,940	3,569,114	.92	5,011,095	4,977,219	.99

[1] Figure withheld to avoid disclosure of individual company operations.
[2] Includes glass, molding, engine, railroad ballast, and other sand and other gravel; Bureau of Mines not at liberty to publish separately.

Slate.—Production of slate decreased over the previous year. There was only one operation in the State—at Caddo Gap in Montgomery County.

Stone.—Stone was produced in eight counties in Arkansas in 1952. The major stone-producing counties were Pulaski, Izard, Independence, and Washington. Quantity of production of all stone was 17 percent above that of 1951, amounting to 2,967,479 short tons valued at $3,346,201 (table 15). About 75 percent of total stone production was miscellaneous stone from Pulaski County.

Marble was quarried in Independence County. Sandstone was produced in Independence, Johnson, and Logan Counties. Miscellaneous stone was quarried in Hot Spring, Logan, and Pulaski Counties, and limestone and dolomite production was recorded in Benton, Independence, Izard, Pulaski, and Washington Counties.

TABLE 15.—Stone sold and used by producers, 1948–52, by kinds, in short tons

Year	Marble		Limestone		Sandstone		Miscellaneous stone		Total stone	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1948	1,640	$57,000	342,320	$772,853	(1)	(1)	(1)	(1)	1,379,410	$1,883,500
1949	890	16,600	1,261,200	2,166,285	17,160	$64,351	(1)	(1)	[2] 1,279,250	[2] 2,247,236
1950	1,350	17,250	2,470,490	5,848,341	180,370	235,822	1,300,510	$1,317,697	3,952,720	7,419,110
1951	1,525	95,200	826,896	1,298,154			1,707,325	1,823,072	2,535,746	3,216,426
1952	321	14,588	778,380	910,459	28,271	115,017	[3] 2,160,507	[3] 2,306,137	[3] 2,967,479	[3] 3,346,201

[1] Figures withheld to avoid disclosing individual company operations.
[2] Incomplete figure. Excludes miscellaneous stone.
[3] Incomplete figure. Excludes dimension miscellaneous stone.

REVIEW BY COUNTIES

Production of metals and nonmetals in 1952 was reported in 37 of the 75 counties in Arkansas. Counties producing metals were Pulaski, Saline, Independence, Hot Spring, and Marion. Most of nonmetallic minerals were found in the western half of the State.

Production of petroleum, natural gas, and natural-gas liquids are not broken down by county in this chapter. Petroleum was produced in Columbia, Lafayette, Miller, Nevada, Ouachita, and Union Counties. In the northwestern part of the State natural gas was produced mainly in Crawford, Franklin, Johnson, Pope, Sebastian, and Washington Counties.

BENTON

Limestone was produced by the Independent Gravel Co. for agricultural purposes at its plant at Sulphur Springs.

CALHOUN

The St. Francis Materials Corp., operating near Harrell, Ark., and the Sam D. Crawford Co. produced sand and gravel in the county for paving and railroad ballast.

CHICOT

The Warren Bros. Roads Co. produced sand and gravel under contract with the Government for use in constructing concrete mattress for revetment purposes. Material was dredged from the Mississippi River.

CLARK

Shale production was recorded by the Hope Brick Works at its pit near Arkadelphia for use in the manufacture of heavy clay products.

CRAIGHEAD

The Hall-Wheeler Brick Co., Inc. produced red-silt clay at its pit near Jonesboro for the manufacture of heavy clay products. Near Jonesboro the Jewell Hoffman Co. produced gravel for railroad ballast at its Brookland operation. In the same locality the Cotton Belt Gravel Co. produced gravel.

CRAWFORD

During 1952 the Arkhola Sand & Gravel Co. produced sand and gravel in Crawford County.

CROSS

The Cross County Gravel Co. produced gravel at its pit near Wynne.

DALLAS

The St. Francis Materials Corp. produced sand and gravel at its pit near Sparkman for use at the Naval Ordnance Depot, Shumaker.

DREW

A pit near Monticello operated by the Wilson Estate produced gravel.

FRANKLIN

There were 5 producers of coal in Franklin County, mining 18,393 tons valued at $109,438.

GARLAND

Oilstones and whetstones were produced by four operators east of Hot Springs. Production declined about 38 percent. The Chappell Construction Co., Inc., produced gravel for the Bureau of Public Roads near Hot Springs.

GREENE

The B & S Gravel Co. produced gravel for paving and road gravel at its pit 8 miles west of Paragould for the State, Greene County, and the city of Paragould.

HEMPSTEAD

Fire clay was produced by the Hope Brick Works at two mines near Hope—the Streaked Pit on Highway 29 and the pit on the Hope Patmos Road. The clay was used for brick products.

HOT SPRING

This county is the largest producer of barite in the Nation. The Baroid Sales Division of the National Lead Co. and the Magnet Cove Barium Corp. were in production near Malvern.

Fire clay and shale were produced by the Acme Brick Co. at its pits near Perla and Malvern for brick products. The Malvern Brick & Tile Co. manufactured common brick and facing tile from fire clay mined at its pit near Malvern. The Magnet Iron Co. produced 115 tons of iron-ore concentrates from magnetite at its plant near Little Rock. Sand and gravel were produced by the Malvern Gravel Co. at its operation near Malvern for use in paving and as railroad ballast. The Chicago Rock Island & Pacific Railroad produced miscellaneous crushed stone for use as ballast.

HOWARD

The Arkansas Portland Cement Division of the Ideal Cement Co. has the State's only cement mill at Okay.

INDEPENDENCE

Lime was produced by the State's only producer, the Batesville White Lime Co., near Batesville. Manganese was produced by a number of small operators in the Batesville district and shipped through several shippers to permit handling in carlots. Most of the ore went to Government stockpiles under a Government purchasing plan. Sandstone, marble, and limestone and dolomite were quarried by four stone producers.

IZARD

Glass sand and molding sand were produced by the Silica Products Co. at its plant near Guion. Limestone and dolomite were crushed by the Arkansas Limestone Co. at its quarry at Myersville for use by the aluminum industry as a metallurgical flux.

JACKSON

The Mobley Construction Co., Inc., produced sand and gravel for building and paving use near Newport.

JEFFERSON

The Pine Bluff Sand & Gravel Co. produced building sand at a pit near Pine Bluff.

JOHNSON

There were 13 active coal-mining operations in the county during 1952. The Texas Ledge Stone Co. produced dimension sandstone near Lamar.

LAFAYETTE

Gravel was produced by the Meriweather Gravel Co., Inc.

LOGAN

There were 9 active coal-mining operations; 2 mines became worked out during the year. The Texas Ledge Stone Co. quarried dimension sandstone at the Harmony Ledgestone quarry for architectural purposes. Near Paris, dimension sandstone and flagging were quarried by the Logan County Building Stone Co.

MADISON

Sand and gravel were produced in Madison County.

MARION

Some small tonnage of lead and zinc resulted from prospecting in Marion County.

MILLER

The W. S. Dickey Clay Manufacturing Co. produced shale for making heavy clay products.

MISSISSIPPI

Gravel was produced by Elliott Sartain Sand Co. for building, paving, and other uses at the San Souci operation near Osceola.

MONTGOMERY

Slate granules were produced at Caddo Gap in Montgomery County by Bird & Son, Inc.

OUACHITA

Plastic clay was mined by the Hope Brick Co. for making face brick at Chidester. Sand and gravel for paving were produced near Camden by the Standard Gravel Co.

PIKE

The Arkansas Gypsum Co. quarried gypsum from its open-pit operation near Murfreesboro.

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POPE

Coal was produced in Pope County by several operators. One mine was shut down during the year. The Mobley Construction Co., Inc., operated a dredge for sand and gravel for building and paving uses near Dardanelle.

PULASKI

Artificially colored roofing granules were produced near Little Rock by the Minnesota Mining & Manufacturing Co. Shale was mined by the Acme Brick Co. near Little Rock for the manufacture of heavy clay products. Miscellaneous stone was produced by the Big Rock Stone & Material Co. near Little Rock. The same company produced sand from pits near Little Rock for building, paving, fire or furnace sand, and other uses.

Pulaski County was the second largest bauxite-producing county in the United States. Crude bauxite was produced by Alcoa Mining Co., the American Cyanamid Co., Bauxite Co., the Consolidated Chemical Industries, Inc., Dulin Bauxite Co., and the Riffe Construction Co. Dried, calcined, and activated bauxite, as well as crude, was produced in the county.

ST. FRANCIS

Sand and gravel for paving and roads were produced near Forrest City at the Crow Creek plant of the St. Francis Materials Corp.

SALINE

Most of the Nation's domestic production of bauxite comes from the deposits in Saline County. Aluminum Co. of America, the Crouch Mining Co., the Dulin Bauxite Co., the Norton Co., and the Reynolds Mining Co. produce crude bauxite. Reynolds and Aluminum Co. of America supplied most of this output. The latter company produced dried and calcined bauxite, as well as crude bauxite. The Norton Co. produced activated bauxite.

SEBASTIAN

Sebastian County was the largest coal-producing region in the State; there were 38 operators, but 2 mines were shut down during the year.

Shale for heavy clay products was mined by the Acme Brick Co. near Fort Smith.

SEVIER

The W. S. Dickey Clay Manufacturing Co. produced shale for making heavy clay products near De Queen.

UNION

Common and face brick were manufactured by the El Dorado Brick Works from clay mined near El Dorado.

WASHINGTON

Limestone was crushed by the McClinton Construction Co. at the Johnson Quarry near Fayetteville for use in concrete, as road metal, and for agricultural purposes.

The Mineral Industry of California

By R. B. Maurer[1] and Robert E. Wallace[2]

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the United States Bureau of Mines and the Division of Mines, California Department of Natural Resources.

CALIFORNIA mineral production in 1952, for the fifth consecutive year, passed the one-billion-dollar mark in value; it reached the alltime high of $1,214,285,000, a slight increase over the $1,209,381,000 (revised figure) in 1951.

The total value of mineral fuels, which include petroleum, natural gas, natural-gas liquids, coal, and peat, amounted to $969,777,000—an increase of $7,706,000 (1 percent over 1951). Nonmetallic minerals supplied $202,065,000—17 percent of the total yield and a decrease of $2,433,000 (1 percent less than 1951). The output of metals and metallic ores and concentrates amounted to $42,443,000—4 percent of the State total mineral yield and a decrease of $369,600 (1 percent below 1951).

The advance in mineral output was by no means general. To cope with the rapid increase in California's population, gains in production of cement, sand and gravel, stone, lime, and clays (except for cement) were achieved to meet the demands of an accelerated construction program. These improvements were to alleviate civilian building shortages while maintaining military bases of supply for the Korean action and to provide an adequate system of highways in addition to dams for conserving water and furthering flood control, canals for irrigation projects, and plants for generating electrical energy. Talc, pyrophyllite, and ground soapstone, consumed heavily in the expanded ceramic and paint industries, advanced in total value but declined in quantity produced. In contrast, the output of boron minerals, reflecting a slackening demand, and diatomite, adversely affected by a labor dispute, declined noticeably. Salt output was lower than in 1951 due principally to smaller harvests in the San Francisco Bay area ponds, and pumice and pumicite yield declined under the competition of other materials, particularly in the light-aggregate and abrasive fields.

California metals in 1952 were influenced by a complex turn of events, both domestic and international in origin. Tungsten concentrates headed the list of metals, production being bolstered by the Government's domestic tungsten program, which offered a steady market and an attractive price. Production of iron ore, in second place, reflected the expansion of California's steel industry and rose substantially, whereas gold, continuing to slump under the fixed Treasury price dating from 1934, was relegated to third position. Chromite, manganese ore, and magnesium output also advanced sub-

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stantially, aided largely by the stockpiling program. Mercury production gained in 1952 despite somewhat lower prices than in the previous year. Lead and zinc, under pressure of foreign imports which deflated prices, declined moderately. Copper output, in a favorable economic climate, nevertheless slumped, owing largely to its close association with zinc production. The silver yield, largely a byproduct of lead and zinc output, reflected the declines of these base metals.

TABLE 1.—Mineral production in California, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Antimony ore and concentrate—gross weight	----------	----------	9	(2)
Boron minerals	862,797	$20,030,000	583,828	$14,105,000
Cement—376-pound barrels	28,956,470	77,753,697	29,786,245	79,457,745
Chromite—gross weight	6,302	[3] 447,769	14,713	[4] 1,269,000
Clays (except for cement)	1,615,241	3,757,325	1,886,649	3,993,052
Coal (lignite)	3,657	37,500	2,998	30,700
Copper (recoverable content of ores, etc.)	921	445,764	800	387,200
Gem stones (estimated)	(5)	(2)	(5)	100,000
Gold (recoverable content of ores, etc.) troy ounces	339,732	11,890,620	258,176	9,036,160
Gypsum (crude)	1,092,883	2,602,758	1,236,430	2,721,134
Iron ore (usable)—long tons, gross weight	1,182,799	(2)	1,463,239	(2)
Lead (recoverable content of ores, etc.)	13,967	4,832,582	11,199	3,606,078
Lime (open-market)	203,344	3,366,959	238,957	3,752,738
Magnesium compounds from sea water and bitterns, (partly estimated) MgO equivalent	53,900	3,564,500	50,204	3,529,362
Manganese ore (35 percent or more Mn) gross weight	----------	----------	8,081	(2)
Manganiferous ore (5 to 35 percent Mn)—do	----------	----------	56	(2)
Mercury—76-pound flasks	4,282	899,777	7,241	1,441,683
Natural gas—thousand cubic feet	566,751,000	82,745,000	517,450,000	86,414,000
Natural-gas liquids:				
Natural gasoline and cycle products 42-gallon barrels	21,132,000	65,923,000	20,738,000	64,945,000
LP-gases—do	8,401,000	15,528,000	9,376,000	16,700,000
Peat	6,432	42,016	10,527	76,706
Petroleum (crude)—42-gallon barrels	354,561,000	797,760,000	[6] 359,450,000	[6] 801,570,000
Pumice and pumicite	264,411	1,228,569	129,780	793,716
Salt (common)	1,275,574	5,261,780	1,148,693	4,880,392
Sand and gravel	46,927,452	41,279,835	53,051,260	43,633,125
Silver (recoverable content of ores, etc.) troy ounces	1,145,219	1,036,481	1,099,658	995,246
Stone (except limestone for cement and lime)	12,537,344	14,714,524	14,374,930	17,697,085
Talc, pyrophyllite, and ground soapstone	126,784	2,269,771	120,574	2,868,255
Tungsten concentrate—60-percent WO_3 basis	3,007	11,557,325	2,980	11,360,569
Zinc (recoverable content of ores, etc.)	9,602	3,495,128	9,419	3,127,108
Undistributed: Asbestos (1951), barite, bromine, calcium-magnesium chloride, diatomite, feldspar, iodine, lithium minerals, magnesite, molybdenum, platinum group metals (crude), potassium salts, pyrites, quartz, ground sand and sandstone, slate, sodium carbonate, sodium sulfate, sulfur ore, wollastonite (1952), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)	----------	36,910,670	----------	35,793,673
Total California	----------	[3] 1,209,381,000	----------	1,214,285,000

[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, and mercury.
[2] Value included with "Undistributed."
[3] Revised figure.
[4] Estimate.
[5] Weight not recorded.
[6] Final figure. Supersedes preliminary figure given in commodity chapter.

TABLE 2.—Average United States prices of selected mineral commodities, 1943–47 (average) and 1948–52 [1]

Commodity	1943–47 (average)	1948	1949	1950	1951	1952
Antimony, cents per pound	19.7	36.7	38.7	29.4	44.2	44.0
Antimony ore, 50–55 percent Sb, dollars per short-ton unit Sb	2.54–2.63	4.55–4.76	3.74–3.93	2.92–3.05	5.57–5.82	4.08–4.34
Cement (average net mill realization), dollars per barrel	1.68	2.18	2.30	2.35	2.54	2.54
Copper [2], cents per pound	15.4	21.7	19.7	20.8	24.2	24.2
Gold [3], dollars per troy ounce	35.00	35.00	35.00	35.00	35.00	35.00
Iron ore (average value at mine), dollars per long ton	2.94	3.91	4.50	4.99	5.46	6.09
Lead [2], cents per pound	9.9	17.9	15.8	13.5	17.3	16.1
Manganese ore, cents per long-ton unit Mn	84.3	68.5	74.50	88.5	83.0	91.5
Mercury [4], dollars per 76-pound flask	126.09	76.49	79.46	81.26	210.13	199.10
Molybdenum concentrate, 90 percent MoS_2 concentrate, cents per pound MoS_2	45.0	45.0	54.0	59.0	60.0	60.0
Silver [5], cents per troy ounce	76.9+	80.8+	90.5+	90.5+	90.5+	90.5+
Tungsten concentrate, dollars per short-ton unit WO_3	22.56	26.27	26.38	28.25	64.67	65.00
Zinc [2], cents per pound	11.6	13.3	12.4	14.2	18.2	16.6

[1] Prices are discussed in detail in the commodity chapters of volume I, Minerals Yearbook.
[2] Yearly average weighed 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.
[3] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[4] Average quoted price at New York.
[5] Treasury buying price for newly mined silver, 1943 to June 30, 1946—$0.71111111; July 1, 1946, to Dec. 31, 1947—$0.905; 1948–52—$0.9050505.

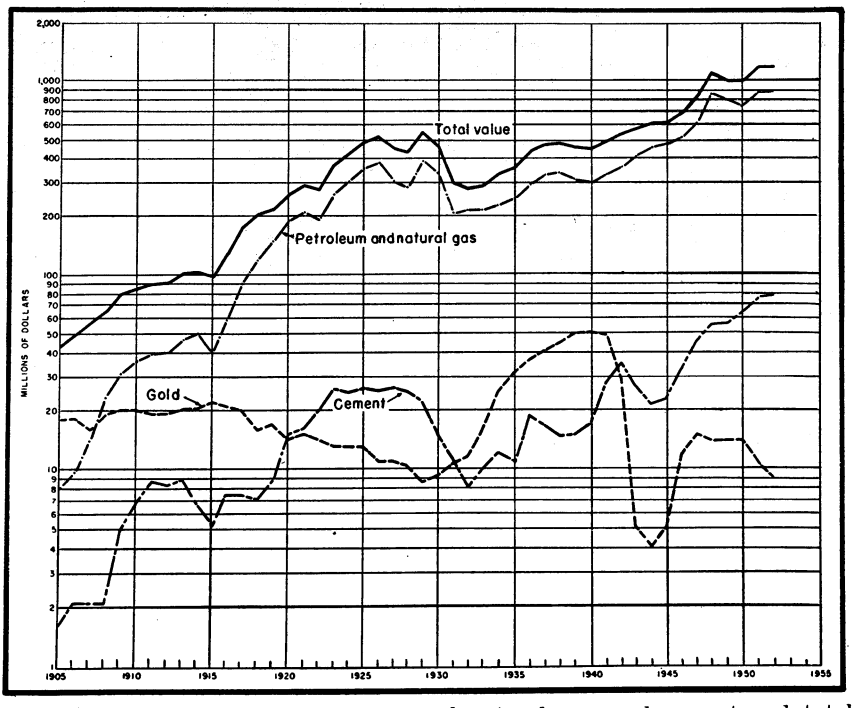

FIGURE 1.—Value of gold, petroleum and natural gas, and cement and total value of mineral production in California, 1905–52.

Output of rare-earth-metals concentrates for the first time in California from the newly opened bastnaesite deposits at Mountain Pass, San Bernardino County, was a significant development of a mineral industry that will help to make the United States independent of foreign sources of supply for the rare-earth compounds in the steel industry.

CONSUMPTION AND MARKETS

California ranked second among the Nation's mineral producers in 1952 and was one of the chief mineral consumers. The variety of mineral products produced in the State had made it relatively self-sufficient, notable exceptions being coking coal, certain types of clays, and refractory chromite.

The diversity of the State's mineral products and industry results in a wide variety of marketing practices. Some mineral producers deal directly with the Government—for example, gold producers who sell to a mint or chromite producers who sell to General Services Administration. Some convert their raw mineral into a finished product, such as the contractor who mines and washes the sand and gravel with which he builds concrete structures. A petroleum company is an example of an integrated industry that retails products after processing and in the process is prospector, developer, producer, transporter, refiner, and finally retailer at service stations.

General Services Administration Purchase Depots and Stockpiles.—The General Services Administration did not maintain purchase depots in California, but tungsten concentrates were accepted at designated milling points in California. Most of the State chromite production was shipped to the Grants Pass, Oreg., Government Purchase Depot. Considerable low-grade manganese ore was consigned to the Deming, N. Mex., and Wenden, Ariz., depots despite the high transportation cost.

Custom Mills and Smelters.—The leading operators of tungsten metallurgical plants that received custom material were: United States Vanadium Co. and El Diablo Mining Co., Bishop, Inyo County, and Black Rock Mining Co. near Benton, Mono County. Other mills that accepted custom tungsten ore included: M. J. Gustay, Havilah, and Mojave Mining & Milling Co., Mojave, Kern County; Sun Valley Tungsten, Sun Valley, and Midwest Milling Co., Los Nietos, Los Angeles County; Lighthouse Mining Corp. and Parker Mining & Milling Co., Barstow, San Bernardino County; and J. B. Huston, Lindsay, Tulare County. The Castle Crag Chrome Co., Shasta County, concentrated some chromite on a custom basis. Gold ore was accepted at Burton Bros., Inc., custom-cyanide mill, Rosamond, Kern County, and Empire Star Mining Co., Ltd., treated custom lots of gold ore and gold concentrate at its Grass Valley, Nevada County, amalgamation-cyanidation mill. The largest metallurgical custom plant in California, the Selby lead plant and refinery of the American Smelting & Refining Co., at Selby, Contra Costa County, continued to be the State's only smelter treating primary nonferrous material. Custom grinders of nonmetallic minerals are mentioned under Review by Counties and Districts (p. 38).

Mineral Brokers and Bullion Buyers.—There was considerable activity by mineral brokers in purchasing tungsten concentrates in small lots, not accepted by the General Services Administration, for accumulated resale. Some small transactions in chromite and iron ore for distribution within the State were handled, but the principal trade was in Nevada and Utah iron ore exported from California ports. Purchases of gold bullion by licensed buyers were seasonal and of minor consideration.

NEW PLANTS OR PROJECTS

Completion of the slag-fuming plant at the American Smelting & Refining Co. Selby lead plant will allow recovery of a substantial percentage of contained zinc, derived from both domestic and foreign ores smelted, in current slags and in the large accumulation of cold slag which will be progressively treated.

Operation of the Yerington copper mine in Nevada was to be attended by the opening in 1953 of the largest sulfur deposit ever worked in California. The Leviathan mine in Alpine County was to be the source of sulfur for the sulfuric acid in the huge copper-leaching project.

Pilot-plant work in an area of the Ione clay deposit, Amador County, showed the feasibility of separating silica sand and high-alumina clay and the eventual preparation of marketable products of both materials.

To cope with the increasing demand for magnesia products, Kaiser Aluminum & Chemical Corp. initiated heavy-density separation for treating quarried dolomite at Natividad, Monterey County. This innovation is designed to increase recovery, improve the grade of material, and permit quarrying in areas heretofore not worked because of low dolomite yield and high percentage of siliceous and granitic impurities.[3]

NEW INDUSTRIES AND NEW USES

Opening the Mountain Pass, San Bernardino County, bastnaesite deposit for production of rare-earth metals concentrates stimulated the search for additional ore in that area.

FLOW OF MINERALS

Moving California minerals is usually a complex integration of the available modes of transport. Basically, railroads handle a large percentage of the material requiring long hauls, and motortrucks are used predominantly in the shorter trips. However, combination truck-railroad movement of minerals to their destinations is common practice. There are exceptions to the general rule, as, for example, the long truck haulage of tungsten ores and concentrates to custom mills, and chromite and manganese ore to depots outside the State. Intrastate water transport of minerals has declined, but interstate commerce by ship, particularly with Gulf and Eastern Coast States, continues at a relatively high rate.

[3] Engineering and Mining Journal, HMS Unit Improves and Increases Dolomite Production: Vol. 153, No. 8, August 1952, pp. 97–99.

Domestic Imports and Exports.—California's high self-sufficiency has been lessened somewhat by the rapid rise in local requirements of raw minerals. Barite, coking coal, sulfur, special clays and sands, gypsum, phosphate rock, and crude perlite are all noteworthy among the minerals imported into California from other States. Owing to heavy local production, surpluses of other minerals and mineral materials, which include cement, diatomite, magnesia, salines, talc, mercury, and some special sands, are exported to other States. California is an important supplier of tungsten concentrates, molybdenum concentrate, and rare-earth metal concentrates which are consumed in other States.

Foreign Imports and Exports.—Considerable refractory chromite and kyanite are imported from foreign countries, and gypsum from Lower California supplements local output in the cement industry. Japan, in industrial resurgence, facing limited national mineral resources and the loss of raw-material sources on the Asiatic mainland, competed with domestic and European bidders for some of California's surpluses.

EMPLOYMENT IN MINERAL INDUSTRIES

Employment.—The accompanying table shows fluctuations in employment in California mineral industries during recent years.

TABLE 3.—Estimated number of wage and salary workers in the mineral-extraction industry, 1943–47 (average) and 1948–52 [1]

Year	Metal Mining	Crude-petroleum and natural-gas production	Nonmetallic mining and quarrying	Total mineral-extraction industry
1943–47 (average)	4,000	22,600	5,000	31,500
1948	3,500	26,700	5,400	35,600
1949	3,200	26,000	5,300	34,400
1950	3,100	23,300	5,800	32,300
1951	3,400	25,000	6,600	35,000
1952	3,400	26,100	6,400	35,900

[1] Data from Division of Labor Statistics and Research, California Department of Industrial Relations, in cooperation with the Bureau of Labor Statistics.

Accidents.—No major disaster occurred in any California mineral industry during 1952. Accident statistics for 1951 and 1952 are shown in an accompanying table.

TABLE 4.—Fatal and nonfatal disabling work injuries, mineral-extraction industry, 1951–52 [1]

Industry	1951			1952			Disabling work injuries per 1,000 workers [2]	
	Fatal	Nonfatal	Total	Fatal	Nonfatal	Total	1951	1952
Mineral extraction	41	3,550	3,591	58	3,530	3,588	103	100
Metal mining	8	461	469	15	380	395	138	116
Crude-petroleum and natural-gas production	24	2,411	2,435	34	2,482	2,516	97	96
Nonmetallic mining and quarrying	9	678	687	9	668	677	104	106

[1] State of California Department of Industrial Relations, Division of Labor Statistics and Research: California Work Injuries, 1952, pp. 17–18.

[2] A disabling work injury is defined as one which causes disability beyond the day of the accident.

Wages.—Data released by the State of California Department of Public Relations, through the Bureau of Labor Statistics,[4] on wages in the mineral-extraction industry in 1952, with comparative figures for 1951 in parentheses, follow: Average hourly earnings in metal mining in 1952 were $1.79 ($1.70) and average weekly earnings were $77.70 ($75.09); in crude-petroleum and natural-gas production, average hourly earnings were $2.16 ($2.05) and average weekly earnings, $85.89 ($81.44); in nonmetallic mining and quarrying, $2.02 ($1.92) hourly and $83.12 ($79.79) weekly.

GOVERNMENT ASSISTANCE

Defense Minerals Exploration Administration Program.—The Defense Minerals Exploration Administration program, designed to provide Government aid in finding new sources of strategic and critical minerals in the United States, was initiated May 16, 1951. Twenty-four contracts, having an approved total project cost of $1,411,000, were executed with mines in California from its inception through 1952. The Government agreed to advance $993,000 to the projects. Of these, 2 were zinc-copper properties; 1, copper; 11, tungsten; 3, asbestos; 2, lead-zinc; 3, mercury; and 1, manganese.

Other Government Assistance Activities.—Under authority of the Defense Production Act of 1950, the Defense Materials Procurement Agency used one of the several instruments at its disposal for achieving expansion of California mineral facilities. In 1952 the Tungstar Corp. & Hanging Valley Tungsten Mines, Inyo County, was granted a direct loan of $75,000, certified by the Reconstruction Finance Corporation, for that purpose.

To assist further the development and production of strategic minerals, the Bureau of Public Roads, under sec. 6, Defense Highway Act of 1941, 55 Stat. 765, and sec. 12, Federal Highway Act of 1950, expended public funds to construct access roads in 1952 to several California mines, listed on table 5.[5] A road had been provided for the Strawberry tungsten mine, Madera County, late in 1951.

REVIEW BY MINERAL COMMODITIES

METALS

Antimony.—Some antimony ore mined in the Agua Caliente district, Kern County, in 1952 was concentrated at Mojave, Calif. Slackened demand and lower prices for the metal caused a dearth of antimony-concentrate purchasers, and the milled material was not marketed. An undetermined quantity of antimony in California precious-metal and other base-metal ores, principally lead ore, was recovered at smelters.

Cadmium.—An undetermined quantity of cadmium was recovered at zinc smelters from zinc concentrates derived from California ores mined, particularly in the Coso district, Inyo County; the Cow Creek (Ingot) district, Shasta County; and the West Belt (Campo Seco) district, Calaveras County. Smelter data indicate that the average cadmium content of the Coso district and the Cow Creek (Ingot) district zinc concentrates shipped in 1952 was 0.26 percent.

[4] Earnings and hours, by industry, California, 1951 and 1952.
[5] Data from Bureau of Public Roads, U. S. Department of Commerce.

TABLE 5.—Defense Minerals Exploration Administration projects, either initiated or still active in 1952

Operator	Property	County	District	Commodity	Government participation	Total contract
Copper Hill Venture (R. E. Fitzgerald, trustee).	Copper Hill	Amador	West Belt	Zinc-copper	$10,310	$20,620
Sierra Copper Co	Donner	Calaveras	do	Copper	8,307	16,613
Holmestake Mining Co	Cargo Muchacho	Imperial	Cargo Muchacho	Tungsten	14,250	19,000
F. Dumontier & S. Skartvedt	Indian Camp	Inyo	Gold Belt	Asbestos	5,335	5,927
H. E. Briggs	Red Cloud	do	South Park	Lead-zinc	8,650	17,300
L. D. Foreman	Defense	do	Modoc	do	6,120	12,240
Miller & Warnken	Fernando	do	Coso (Darwin)	Tungsten	45,000	60,000
Northfield Mines, Inc	Adamson	do	Bishop (Pine Creek)	do	33,540	44,720
California Quicksilver Mines, Inc	Abbott	Lake	Hot Springs	Mercury	29,580	39,440
Black Rock Mining Corp	Scheelore	Mono	McGee Creek	Tungsten	46,218	61,234
Do	Black Rock	do	Yellow Jacket Spring	do	86,250	115,000
Philip Carey Mfg. Co	Stark	Nevada	Washington	Asbestos	71,550	79,500
Lakeview Manganese Mines	Iron Dyke-Lakeview-Trail	Plumas	Crescent Mills	Manganese	9,750	13,000
Sweeney Tungsten Co., Ltd	Rainbow	Riverside	Chuckawalla (Red Cloud)	Tungsten	22,350	29,800
New Idria Mining & Chemical Co	New Idria-West Idria	San Benito	Idria	Mercury	182,512	243,349
Hidden Hills Co	Birthday Star	San Bernardino	Danby	Tungsten	12,600	16,800
Tungsten Prospecting Associates	TPA	do	Round Valley	do	5,025	6,700
Cordero Mining Co	New Almaden	Santa Clara	Almaden	Mercury	150,621	200,828
Glidden Co	Bully Hill-Rising Star	Shasta	Bully Hill	Zinc-copper	147,150	294,300
Philip Carey Mfg. Co	Virginia Bruce	Trinity	Mad River	Asbestos	71,550	79,500
T. A. Hazelton	Mount Lewis	Tuolumne	East Belt	Tungsten	4,470	5,960

TABLE 6.—Bureau of Public Roads special projects, in 1952

Establishment served	Commodity	County	Estimated cost
Pine Creek mine	Tungsten, molybdenum, copper	Inyo	$17,000
Pine Creek mill	do	do	25,000
Locarno mine	Tungsten	Kern	20,000
Black Rock mine	do	Mono	57,000
Blythe Manganese Co. mine and mill	Manganese	Riverside	45,000
High Plateau mine	Chromite	Del Norte	31,000
Leviathan mine	Sulfur	Alpine	[1] 281,547

[1] Includes portion of road in Douglas County, Nev.

Chromite.—California mines in 1952 continued to lead the Nation in production of chromite and surpassed the 1951 yield of 6,300 short tons valued at $447,800 by 133 percent in quantity and 183 percent in value. However, the 1952 production of 14,700 short tons of chromite material shipped did not approach the peak production of the decade 1943–52—62,500 short tons in 1943. For the period 1948–50, California's average yearly chromite production was 370 short tons and the market value $14,500.

Of the total chromite material shipped from mines in 1952, 79 percent was ore and 21 percent concentrate; 90 percent of the total material was consigned to the Grants Pass, Oreg., Government Purchase Depot, whereas 10 percent was sold on the open market, principally for refractories.

The following 5 leading producers of chromite shipped 68 percent of the State total in 1952, if shipments are evaluated in terms of chromic oxide content: Ruth Robertson, Cyclone Gap mine, Preston Peak district, Siskiyou County; H–J Chrome Co. & International Metallurgical Chrome Corp., Sweetwater and Norcross mines, Santa

TABLE 7.—Shipments of chromite ore and concentrate, by counties, in 1952

County	Active mines	Rank in State	Material shipped (gross weight, short tons)				Total value
			Under 45 percent Cr_2O_3		45 percent Cr_2O_3 and over		
			Ore	Concentrate	Ore	Concentrate	
Butte	1	6	1,428	78			$36,349
Del Norte	15	1	1,088		3,716		484,637
El Dorado	1	4			[1]		[1]
Fresno	1	11			[2]		[2]
Monterey	1	5			587		53,207
Placer	2	12			[1] 1,122		[1] 105,001
San Luis Obispo	3	3			[2] 28	[2] 2,940	[2] 210,220
Santa Barbara	1	10			46		4,671
Shasta	2	7		80	78		12,428
Siskiyou	16	2	7		3,373		347,925
Tehama	2	8			[3]	[3]	[3]
Trinity	2	9			[3] 81	[3] 61	[3] 14,691
Total	47		2,523	158	9,031	3,001	[4] 1,269,000

[1] El Dorado County included with Placer County.
[2] Fresno County included with San Luis Obispo County.
[3] Tehama County included with Trinity County.
[4] Partly estimated.

Lucia district, San Luis Obispo County; Eugene R. Brown, High Plateau mine, High Plateau district, Del Norte County; Helmke, Thomas & Janssen, Lambert mine, Magalia district, Butte County; and Allied Mining Co., Pilliken mine, Rattlesnake district, El Dorado County.

Copper.—Recoverable copper from the complex zinc ores of Shasta and Calaveras Counties provided 61 percent of the State's relatively minor copper output in 1952. New Penn Mines, Inc., successor to Penn Chemical Co., led the California mines in copper yield by virtue of the metal recovered from the Penn mine, West Belt district, Calaveras County, zinc concentrate, copper concentrate, and copper precipitates (from mine water) shipped to smelters. The Coronado Copper & Zinc Co. Afterthought mine, Cow Creek (Ingot) district, Shasta County, ranked second in zinc concentrate and zinc-lead-copper concentrate shipped; and the Anaconda Copper Mining Co., Darwin group, Coso district, Inyo County, was in third place, due to copper recovered from zinc concentrate and lead concentrate smelted.

Exploration for straight copper ore was moderate, and no significant developments were reported in 1952. Mines of this category in the small-shipper class included the Jesse Belle, West Belt district, Madera County; the Virginia May-Horn group, Turtle Mountain district, San Bernardino County; and the Bagdad-Chase mine, Buckeye district, San Bernardino County. The Bureau of Mines published data on concentrating copper ore from the Sierra Copper mine, West Belt district, Calaveras County.[6]

Gold.—Gold production, which had followed a diminishing trend since 1947, fell sharply in 1952 and decreased 24 percent below 1951. Placer mines furnished 55 percent of the total gold in 1952, and lode mines contributed 45 percent. The respective percentage declines in 1952 output below 1951 from lode mines and placer mines were identical. Increasingly unprofitable operations of gold mines, due largely to a fixed Treasury price for gold of $35 per ounce, coupled with rising costs and depletion of workable gold-bearing material at some properties, particularly dredging ground, contributed to the slump. A minor quantity of gold was sold on the open market as "natural gold." Among metals and their ores produced in California, gold was relegated to third place in value behind tungsten concentrates and iron ore. Tungsten assumed the lead for the first time since the war years 1943 and 1944. The Bureau of Mines published data on gold recovery from activated carbon.

The following 10 leading gold-producing properties in California in 1952, listed in order of output, yielded 89 percent of the total gold, the 5 leaders alone producing 76 percent: The Natomas Co., American River district, Sacramento County (dredging); Yuba Consolidated Gold Fields, Yuba Unit, Yuba River district, Yuba County (dredging); Idaho Maryland Mines Corp., Brunswick mine, Grass Valley-Nevada City district, Nevada County (gold ore); Empire Star Mines Co., Ltd., Empire Star group, Grass Valley-Nevada City district, Nevada County (gold ore); Original Sixteen to One Mine, Inc., Original Sixteen to One mine, Alleghany district, Sierra County; Capital Dredging Co., American River district, Sacramento County

[6] Engel, A. L., Concentration Tests on Various Base-Metal ores: Bureau of Mines Rept. of Investigations 4927, 1952, 14 pp.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties, in terms of recoverable metals

County	Mines producing [1]		Gold					
			Lode		Placer		Total	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value	Fine ounces	Value
Amador	3	4	6,690	$234,150	211	$7,385	6,901	$241,535
Butte	1	7	3	105	8,572	300,020	8,575	300,125
Calaveras	4	4	871	30,485	1,006	35,210	1,877	65,695
El Dorado	5	5	5,853	204,855	52	1,820	5,905	206,675
Fresno		4			277	9,695	277	9,695
Imperial	4		412	14,420			412	14,420
Inyo	26		2,764	96,740			2,764	96,740
Kern	12	3	9,531	333,585	259	9,065	9,790	342,650
Los Angeles and Mono [2]	3	1	5	175	89	3,115	94	3,290
Madera	4	6	86	3,010	139	4,865	225	7,875
Mariposa	12		631	22,085	35	1,225	666	23,310
Merced and Yuba [2]	1	6	(3)	(3)	49,416	[4] 1,729,560	[3 4] 49,416	[3 4] 1,729,560
Modoc	3		75	2,625			75	2,625
Nevada	9	17	[3] 74,842	[3] 2,619,470	1,077	37,695	[3] 75,919	[3] 2,657,165
Placer	1	10	13	455	540	18,900	553	19,355
Plumas	1	4	1	35	107	3,745	108	3,780
Riverside	7		33	1,155			33	1,155
Sacramento	1	7	21	735	73,333	2,566,655	73,354	2,567,390
San Bernardino [4]	19	(4)	668	23,380	(4)	(4)	[4] 668	[4] 23,380
San Mateo		(5)			3	105	3	105
Shasta	8		669	23,415	71	2,485	740	25,900
Sierra	8	8	12,534	438,690	231	8,085	12,765	446,775
Siskiyou	3	13	4	140	95	3,325	99	3,465
Stanislaus		(5)			30	1,050	30	1,050
Trinity	1	8	25	875	6,769	236,915	6,794	237,790
Tulare [6]	1							
Tuolumne	4	1	102	3,570	31	1,085	133	4,655
Total	141	108	115,833	4,054,155	142,343	4,982,005	258,176	9,036,160

County	Silver					
	Lode		Placer		Total	
	Fine ounces	Value	Fine ounces	Value	Fine ounces	Value
Amador	1,469	$1,330	28	$25	1,497	$1,355
Butte	1	1	796	720	797	721
Calaveras	38,955	35,256	82	74	39,037	35,330
El Dorado	2,093	1,894	8	7	2,101	1,901
Fresno			44	40	44	40
Imperial	182	165			182	165
Inyo	856,523	775,197			856,523	775,197
Kern	45,341	41,036	52	47	45,393	41,083
Los Angeles and Mono [2]	2,454	2,221	12	11	2,466	2,232
Madera	326	295	38	34	364	329
Mariposa	364	329	4	4	368	333
Merced and Yuba [2]	(3)	(3)	3,354	3,036	[3] 3,354	[3] 3,036
Modoc	70	63			70	63
Nevada	22,379	20,254	140	127	22,519	20,381
Placer	2	2	57	51	59	53
Plumas	1	1	6	5	7	6
Riverside	427	386			427	386
Sacramento	4	4	3,123	2,826	3,127	2,830
San Bernardino [4]	7,014	6,348	(4)	(4)	[4] 7,014	[4] 6,348
San Mateo			1	1	1	1
Shasta	111,222	100,662	7	6	111,229	100,668
Sierra	2,333	2,111	47	43	2,380	2,154
Siskiyou	1	1	14	13	15	14
Stanislaus			2	2	2	2
Trinity	8	7	655	593	663	600
Tulare [6]	4	4			4	4
Tuolumne	11	10	4	4	15	14
Total	1,091,184	987,577	8,474	7,669	1,099,658	995,246

See footnotes at end of table.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties, in terms of recoverable metals—Continued

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Amador							$242,890
Butte							300,846
Calaveras	528,500	$127,897	93,800	$15,102	1,658,400	$275,294	519,318
El Dorado			28,700	4,621			213,197
Fresno							9,735
Imperial			300	48			14,633
Inyo	319,000	77,198	20,918,700	3,367,911	11,754,700	1,951,280	6,268,326
Kern	800	194	200	32			383,959
Los Angeles and Mono [2]			11,000	1,771	800	133	7,426
Madera	37,000	8,954					17,158
Mariposa			4,300	692			24,335
Merced and Yuba [2]							1,732,596
Modoc							2,688
Nevada	800	194					[3]2,677,740
Placer							19,408
Plumas							3,786
Riverside	2,200	532	12,200	1,964			4,037
Sacramento							2,570,220
San Bernardino [4]	77,900	18,852	120,000	19,320	12,600	2,092	[4] 69,992
San Mateo							106
Shasta	633,700	153,355	1,208,800	194,617	5,411,500	898,309	1,372,849
Sierra							448,929
Siskiyou							3,479
Stanislaus							1,052
Trinity							238,390
Tulare [6]	100	24					28
Tuolumne							4,669
Total	1,600,000	387,200	22,398,000	3,606,078	18,838,000	3,127,108	17,151,792

[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] Yuba County lode gold and lode silver included with Nevada County.
[4] San Bernardino County placer gold and silver combined with Merced and Yuba Counties to avoid disclosure of individual output.
[5] From property not classed as a mine.
[6] Includes metal from ore mined in 1951.

(dredging); Central Eureka Mining Co., Old Eureka mine, Mother Lode district, Amador County (gold ore); Fairview Placers, Trinity River district, Trinity County (dredging); Hazel Creek Mining Corp.,

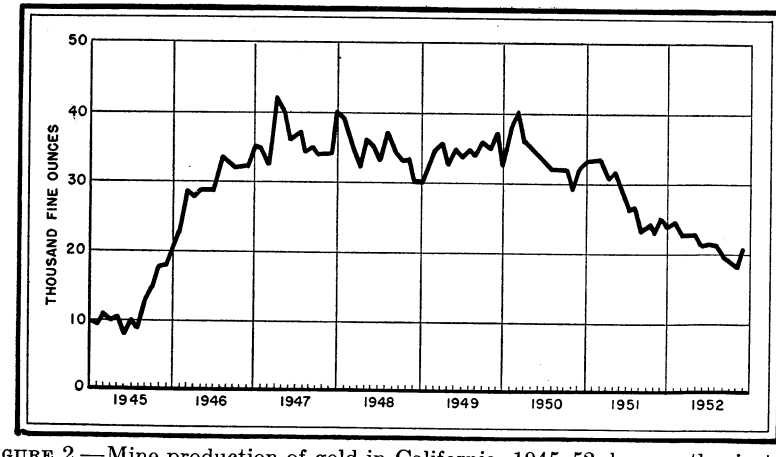

FIGURE 2.—Mine production of gold in California, 1945–52, by months, in terms of recoverable gold.

Hazel Creek mine, East Belt district, El Dorado County; and Thurman & Wright dredge No. 3, Butte Creek district, Butte County (dredging).

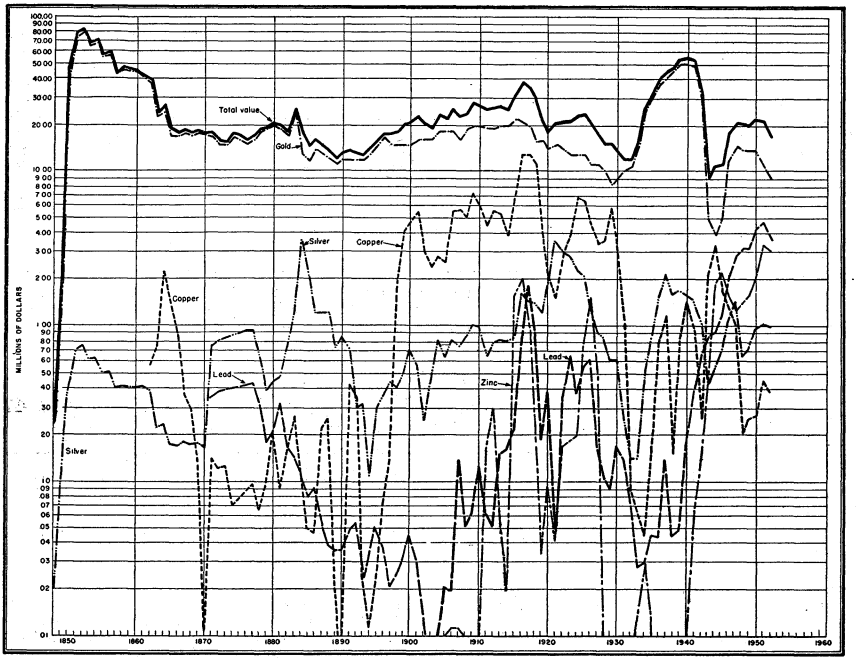

FIGURE 3.—Value of mine production of gold, silver, copper, lead and zinc, and total value in California, 1848–1952.

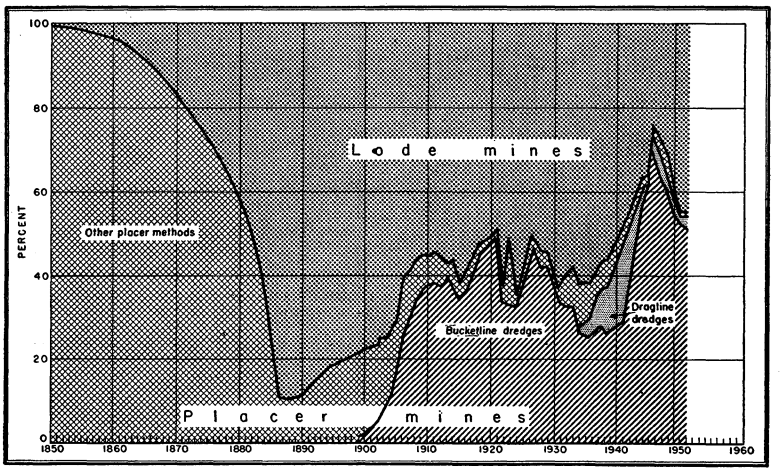

FIGURE 4.—Percentage of total California gold produced at lode and placer mines and by various methods of placer mining, 1850–1952.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1951 by months, in terms of recoverable metals [1]

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	23,980	96,142	69	1,100	916
February	24,572	103,667	68	1,228	859
March	22,820	105,397	70	1,174	981
April	23,446	106,450	88	1,227	979
May	22,977	119,434	89	1,272	1,039
June	20,846	96,459	85	780	775
July	21,232	79,316	65	776	763
August	21,021	79,955	56	751	822
September	19,574	65,781	48	562	489
October	18,508	87,771	57	810	608
November	18,257	83,571	58	694	549
December	20,943	75,715	47	825	639
Total	258,176	1,099,658	800	11,199	9,419

[1] Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metal (or gross metal as indicated) contained in concentrates, ores, tailings, and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc, 1943–47 (average), 1948–52 and total, 1848–1952, in terms of recoverable metals [1]

Year	Mines producing [2]		Material sold or treated (short tons) [3]	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1943–47 (average)	139	126	732,087	240,376	$8,413,160	1,062,980	$843,860
1948	241	195	526,776	421,473	14,751,555	724,771	655,954
1949	242	190	494,906	417,231	14,603,085	783,880	709,451
1950	243	186	547,241	412,118	14,424,130	1,071,917	970,139
1951	173	121	494,151	339,732	11,890,620	1,145,219	1,036,481
1952	141	108	427,412	258,176	9,036,160	1,099,658	995,246
1848–1952			[4]	104,161,364	2,347,751,392	114,622,975	92,953,898

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1943–47 (average)	6,921	$1,969,040	7,746	$1,618,180	6,505	$1,519,869	$14,364,109
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
1951	921	445,764	13,967	4,832,582	9,602	3,495,128	21,700,575
1952	800	387,200	11,199	3,606,078	9,419	3,127,108	17,151,792
1848–1952	631,728	203,870,964	230,157	42,780,955	124,728	29,139,828	2,716,497,037

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings or slimes re-treated; tungsten ore; and ore, old tailings, slag, flue dust, and pyritic ore residue shipped to smelters during calendar year indicated.
[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[3] Does not include gravel washed.
[4] Figure not available.

TABLE 11.—Gold production at placer mines, 1943–47 (average), 1948–52, and total, 1848–1952, by classes of mines and methods 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:						
Bucketline dredges:						
1943–47 (average)	15	22	48,759,000	147,217	$5,152,595	$0.106
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
1951	13	25	68,714,600	175,870	6,155,450	.090
1952	6	16	49,881,800	131,806	4,613,210	.092
Dragline dredges: [3]						
1943–47 (average)	18	17	2,966,800	13,046	456,610	.154
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	3,417,900	15,499	542,465	[4].156
1951	13	11	1,363,000	6,652	232,820	.166
1952	7	7	1,447,700	6,655	232,925	.161
Suction dredges:						
1943–47 (average)	2	1	16,500	119	4,165	.252
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
1951	13	9	180,500	717	25,095	.139
1952	9	9	74,100	305	10,675	.144
Nonfloating washing plants: [3 5]						
1943–47 (average)	15	15	[4] 56,000	2,335	81,725	[4].211
1948	15	15	44,700	1,159	40,565	[4].155
1949	25	26	95,000	3,452	120,820	[4].903
1950	30	30	76,500	3,293	115,255	[4]1.295
1951	16	16	99,900	2,210	77,350	[4].562
1952	18	18	11,600	1,462	51,170	2.040
Gravel hydraulically handled:						
1943–47 (average)	16	----------	326,900	1,165	40,775	.125
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
1951	13	----------	55,000	440	15,400	.280
1952	9	----------	53,100	409	14,315	.270
Small-scale hand methods: [6]						
1943–47 (average)	53	----------	321,900	3,716	130,060	.406
1948	85	----------	211,900	7,731	270,585	1.277
1949	68	----------	126,060	2,596	90,860	.721
1950	59	----------	204,050	3,029	106,015	.520
1951	43	----------	59,200	1,513	52,955	.895
1952	48	----------	51,900	1,576	55,160	1.063
Underground placers:						
Drift:						
1943–47 (average)	7	----------	3,600	455	15,925	4.424
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
1951	10	----------	2,800	222	7,770	2.775
1952	11	----------	3,700	130	4,550	1.230
Grand total placers:						
1943–47 (average)	126	----------	[4] 52,450,700	168,053	5,881,855	[4].111
1948	195	----------	98,496,900	285,556	9,994,460	.101
1949	190	----------	87,415,960	250,548	8,769,180	.100
1950	186	----------	86,868,650	248,303	8,690,605	.100
1951	121	----------	70,475,000	187,624	6,566,840	.093
1952	108	----------	51,523,900	142,343	4,982,005	.097
1848–1952	----------	----------	[7]	66,959,706	1,479,327,356	[7]

[1] For historical data by years, see Minerals Yearbook, Review of 1940, p. 219.
[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[3] Includes commercial rock plants and tungsten mines that produced byproduct gold from gravels; byproduct gold is included with gold recovered, but material treated and average value per cubic yard refer only to straight gold dredging.
[4] Revised figures.
[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, rockers, dry washers, etc.
[7] Complete data not available.

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery and types of material processed, in terms of recoverable metals

Method of recovery and type of material processed	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation:					
Ore	[1] 70,725	12,142			
Old tailings	24	5			
Total	70,749	12,147			
Cyanidation:					
Ore	30,277	28,842			
Old tailings	7	5			
Total	30,284	28,847			
Total recoverable in bullion	[1] 101,033	40,994			
Concentration, and smelting of concentrates:					
Ore	7,643	800,947	1,232,900	15,510,300	17,025,000
Old tailings [2] [4]	272	9,093	74,000	500	
Total	7,915	810,040	1,306,900	15,510,800	17,025,000
Direct smelting:					
Ore	6,761	220,094	112,000	6,412,500	1,163,900
Old tailings, etc. [3] [4]	124	20,056	181,100	474,700	649,100
Total	6,885	240,150	293,100	6,887,200	1,813,000
Placer	142,343	8,474			
Grand total	258,176	1,099,658	1,600,000	22,398,000	18,838,000

[1] Includes gold recovered and sold as "natural gold."
[2] Includes tungsten ore concentrates.
[3] Includes copper precipitates, pyritic residue, lead residue, and zinc-lead flue dust
[4] Combined to avoid disclosure of individual output.

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1952, by classes of ore or other source materials, in terms of recoverable metals

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	88	231,045	111,171	60,771	2,200	33,100	----------
Dry gold-silver	2	775	219	12,011	100	11,800	----------
Dry silver	2	19	8	2,863	----------	200	----------
Total	92	231,839	111,398	75,645	2,300	45,100	----------
Copper	9	1,987	312	3,182	99,100	100	----------
Lead	22	27,433	1,837	220,748	59,800	7,893,500	1,270,100
Lead-copper	1	6	3	118	700	2,300	----------
Zinc	4	40,722	1,256	141,278	983,300	905,900	6,470,700
Zinc-lead	6	120,557	600	621,054	199,700	13,075,900	10,448,100
Total	38	190,705	4,008	986,380	1,342,600	21,877,700	18,188,900
Other "lode" material:							
Old tailings, etc. [2]	10	4,762	372	21,833	77,200	475,200	649,100
Copper precipitates and tungsten ore [3]	4	[4] 106	55	7,326	177,900	----------	----------
Total	13	4,868	427	29,159	255,100	475,200	649,100
Total "lode" material	141	427,412	115,833	1,091,184	1,600,000	22,398,000	18,838,000
Gravel (placer operations)	108	([5])	142,343	8,474	----------	----------	----------
Total, all sources	249	----------	258,176	1,099,658	1,600,000	22,398,000	18,838,000

[1] Detail will not necessarily add to total, because some mines produce more than 1 class of material.

[2] Metal recovered by classes of old tailings, flue dust, pyritic ore residue, and leach residue as follows: Gold, 1,620 tons, 250 ounces of gold, 1,777 ounces of silver, 15,500 pounds of copper, 500 pounds of lead; copper, 59 tons, 4 ounces of gold, 1,521 ounces of silver, 10,000 pounds of copper; lead, 452 tons, 13 ounces of gold, 7,092 ounces of silver, 900 pounds of copper, 71,000 pounds of lead, 13,000 pounds of zinc; zinc-lead, 2,631 tons, 105 ounces of gold, 11,443 ounces of silver, 50,800 pounds of copper, 403,600 pounds of lead, 636,100 pounds of zinc.

[3] Combined to avoid disclosure of individual output.

[4] Tungsten ore tonnage not included.

[5] 51,523,900 cubic yards. Does not include material washed at commercial gravel plants and tungsten mines to produce 839 ounces of byproduct gold and 104 ounces of byproduct silver included in placer totals.

TABLE 14.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

A. For material treated at mills

	Material treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters [1] and recoverable metals					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES									
Amador	28,276	6,690	1,469	--	--	--	--	--	--
Butte	200	3	1	--	--	--	--	--	--
Calaveras	28,446	316	125	2,718	540	38,822	468,900	93,800	1,658,400
El Dorado	7,275	3,264	417	332	2,589	1,676	--	28,700	--
Imperial	10	2	--	--	--	--	--	--	--
Inyo	132,323	38	28	26,172	1,276	663,899	269,900	14,523,000	10,590,100
Kern	8,016	5,320	15,813	--	--	--	--	--	--
Los Angeles and Mono [2]	112	4	2	17	1	2,452	--	11,000	800
Madera	1,090	33	8	104	53	318	36,000	--	--
Mariposa	2,496	334	67	48	297	297	--	4,300	--
Modoc	100	20	7	--	--	--	--	--	--
Nevada	[3]163,153	[3]73,020	[3]20,853	519	1,821	1,526	800	--	--
Placer	20	13	2	--	--	--	--	--	--
Plumas	52	1	1	--	--	--	--	--	--
Riverside	132	4	2	12	25	289	1,300	9,500	--
Sacramento	3	21	4	--	--	--	--	--	--
San Bernardino	1,918	141	79	219	266	2,355	15,900	35,300	300
Shasta	12,301	127	16	6,207	433	98,242	514,100	805,200	4,775,400
Sierra	15,073	11,554	2,081	64	614	164	--	--	--
Siskiyou	20	3	--	--	--	--	--	--	--
Trinity	25	25	8	--	--	--	--	--	--
Tuolumne	9	100	11	--	--	--	--	--	--
Total: 1952	401,050	101,033	40,994	36,412	7,915	810,040	1,306,900	15,510,800	17,025,000
1951	452,217	142,547	66,048	33,309	6,219	737,470	1,400,800	14,597,700	16,514,700
BY CLASSES OF MATERIAL TREATED									
Dry gold:									
Crude ore	224,951	100,506	29,801	989	5,462	3,719	1,400	33,000	--
Old tailings and tungsten ore [2]	[4]1,619	31	10	405	272	9,093	74,000	500	--
Dry gold-silver ore	775	203	11,061	16	16	950	100	11,800	--
Dry silver ore	5	--	--	1	1	151	--	--	--
Lead ore	11,737	--	--	2,442	552	38,213	12,900	1,547,100	185,700
Lead-copper ore	--	--	--	--	--	--	--	--	--
Zinc ore	40,615	293	122	8,922	961	137,050	983,000	899,000	6,433,800
Zinc-lead ore	120,348	--	--	23,533	598	620,546	199,500	13,019,400	10,405,500
Copper ore	1,000	--	--	104	53	318	36,000	--	--
Total: 1952	401,050	101,033	40,994	36,412	7,915	810,040	1,306,900	15,510,800	17,025,000
BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS [1]									
Dry gold	--	--	--	1,147	5,746	5,515	16,900	33,500	--
Silver	--	--	--	1	1	151	--	--	--
Copper	--	--	--	[5]1,194	[5]494	[5]37,089	[5]453,400	58,300	--
Lead	--	--	--	17,507	1,091	613,557	151,900	14,060,700	1,905,400
Zinc	--	--	--	14,550	315	78,050	243,900	646,400	14,554,300
Zinc-lead	--	--	--	6	--	317	--	700	800
Zinc-lead-copper	--	--	--	2,007	268	75,361	440,800	711,200	564,500
Total: 1952	--	--	--	36,412	7,915	810,040	1,306,900	15,510,800	17,025,000

See footnotes at end of table.

TABLE 14.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

B. For material shipped directly to smelters

	Material shipped (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Amador	1					
Calaveras	67	15	8	59,600		
Imperial	1,090	410	182		300	
Inyo	16,175	1,450	192,596	49,100	6,375,700	1,164,600
Kern	4,897	4,211	29,528	800	200	
Madera	1			1,000		
Modoc	17	55	63			
Nevada	3	1				
Riverside	10	4	136	1,000	2,700	
San Bernardino	1,366	261	4,580	61,900	84,700	12,300
Shasta	2,731	109	12,964	119,600	403,600	636,100
Sierra	1	366	88			
Siskiyou	1	1	1			
Tulare	1		4	100		
Tuolumne	1	2				
Total: 1952	26,362	6,885	240,150	293,100	6,867,200	1,813,000
1951	41,934	3,342	329,239	441,200	13,336,300	2,689,300
BY CLASSES OF MATERIAL						
Dry gold:						
Crude ore	6,094	5,203	27,251	800	100	
Old tailings	1	2				
Dry silver: Crude ore	14	7	2,712		200	
Copper:						
Crude ore	987	259	2,864	63,000	100	
Precipitates and pyrite residue [2]	165	4	1,521	129,400		
Lead: Crude ore and leach residue [2]	16,148	1,298	189,627	47,800	6,417,500	1,097,400
Lead-copper ore	6	3	118	800	2,300	
Zinc ore	107	2	4,106	300	6,900	36,900
Zinc-lead: Crude ore and flue dust [2]	2,840	107	11,951	51,000	460,100	678,700
Total: 1952	26,362	6,885	240,150	293,100	6,887,200	1,813,000

[1] Excludes concentrates treated only by amalgamation and/or cyanidation.
[2] Combined to avoid disclosure of individual output.
[3] Includes ore milled and contained recoverable metal from Yuba County.
[4] Tungsten ore tonnage not included with material treated.
[5] Includes concentrates and contained recoverable metal from tungsten ore.

TABLE 15.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

Class of material	Quantity shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCENTRATE SHIPPED TO SMELTERS						
Dry gold	1,147	5,746	5,515	17,744	34,760	
Silver	1	1	151			
Copper	[1] 1,194	[1] 495	[1] 37,111	[1] 466,768	106,028	186,300
Lead	17,507	1,091	613,773	179,539	14,305,738	2,380,861
Zinc	14,550	353	83,076	294,986	716,027	15,227,009
Zinc-lead	6		317	17	731	1,052
Zinc-lead-copper	2,007	268	75,361	518,431	723,580	705,607
Total: 1952	36,412	7,954	815,304	1,477,485	15,886,864	18,500,829
1951	33,309	6,263	745,159	1,598,363	14,948,425	17,926,468
ORE, ETC., SHIPPED DIRECTLY TO SMELTERS						
Dry gold:						
Crude ore	6,094	5,206	27,259	906	145	93
Old tailings	1	2				
Dry silver: Crude ore	14	7	2,712		257	
Copper:						
Crude ore	987	259	2,864	64,643	105	3
Precipitates and pyrite residue	165	4	1,521	133,471		
Lead: Crude ore and leach residue	16,148	1,298	189,887	57,199	6,545,127	1,463,798
Lead-copper ore	6	3	118	1,037	2,314	
Zinc ore	107	3	4,222	488	7,160	44,651
Zinc-lead: Crude ore and flue dust	2,840	107	11,951	60,017	467,931	848,443
Total: 1952	26,302	6,889	240,534	317,761	7,023,039	2,356,988
1951	41,934	3,345	330,447	483,317	13,588,145	3,487,512

[1] Includes concentrate and contained metal from tungsten ore.

TABLE 16.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties and districts, in terms of recoverable metals [1]

County and district	Mines producing [2]		Lode material (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					
Amador County:											
East Belt [4]	(5)	1		17	60	77	13				$2,707
Mokelumne River		1			33	33	3				1,158
Mother Lode [6]	3	1	28,277	6,673	8	6,681	1,467				235,163
West Belt [7]		(5)			6	6					210
Butte County:											
Butte Creek	1	4	200	3	5,601	5,604	576				196,661
Centerville		(5)			3	3					105
Forbestown		(5)			4	4					140
Honcut		(5)			5	5					175
Merrimac		1			1	1					35
Oroville		1			2,946	2,946	218				103,307
Yankee Hill		1			12	12	3				423
Calaveras County:											
East Belt [4]	3	1	88	48	108	156	33				5,490
Mokelumne River		(5)			2	2					70
West Belt [7]	1	1	28,425	821	768	1,589	38,981	528,500	93,800	1,658,400	509,187
El Dorado County:											
American River [8]		(5)			6	6	1				211
Mother Lode [6]	3	2	500	22	33	55	10				1,934
Fresno County:											
Friant		3			273	273	44				9,595
Kings River		1			4	4					140
Imperial County:											
Cargo Muchacho	3		1,099	412		412	172				14,576
Paymaster	1		1				10		300		57
Inyo County:											
Cerro Gordo (Swansea)	2		78				305		7,300	23,000	5,270
Chloride Cliff	2		74	130		130	88				4,630
Lee	1		44	2		2	3,953	300	1,200	16,000	6,570
Le Moyne	1		199	2		2	329	100	69,200		11,533
Modoc	2		821	8		8	9,128	2,500	222,300		44,936
Slate Range	3		683	127		127	196	600	13,600	5,500	7,870
South Park	3		16	8		8	92		4,100		1,023
Wild Rose	3		167	15		15	407	200	36,800	25,700	11,132
Kern County:											
Green Mountain	1		1	1		1					35
Keyes	1		1	1		1					35
Mojave	7		12,296	9,242		9,242	45,271	800	200		364,669
Randsburg [9]	3	1	615	287	(10)	[10] 287	[10] 70				[10] 10,108
Madera County:											
Chowchilla River		3			20	20	6				705
Fresno River (Dennis)		3			119	119	32				4,194
Hildreth	1		40	6		6	3				213
West Belt [7]	2		1,001	53		53	318	37,000			11,097

See footnotes at end of table.

TABLE 16.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties and districts, in terms of recoverable metals[1]—Con.

County and district	Mines producing[2]		Lode material (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					
Mariposa County:											
East Belt[4]	3		835	506		506	345		4,300		$18,714
Mother Lode[6]	9	(5)	1,661	119	23	142	20				4,988
West Belt[7]	(5)	(5)		6	12	18	3				633
Merced County: Le Grand		1			2	2					70
Modoc County: High Grade	2		103	44		44	19				1,557
Nevada County:											
French Corral		7			198	198	20				6,948
Grass Valley-Nevada City[11]	4	4	163,073	74,830	109	74,939	22,384	800			2,643,317
Washington (North Bloomfield)	4	3	80	11	729	740	109				25,999
You Bet		3			41	41	6				1,441
Placer County:											
American River[8]		(5)			6	6					210
Auburn		(5)			11	11	1				386
Butcher Ranch		(5)			13	13					455
Colfax		(5)			49	49	4				1,719
Dutch Flat	(5)	(5)		1	138	139	15				4,878
Forest Hill	1	3	20	12	181	193	27				6,779
Iowa Hill		3			73	73	6				2,560
Plumas County:											
Butte Valley		1			10	10					350
Greenville (Crescent Mills)	1	2	52	1	3	4	1				141
La Porte		(5)			91	91	6				3,190
Rich (Virgilia)		(5)			2	2					70
Quincy		1			1	1					35
Riverside County:											
Chuckawalla	3		4	3		3	6		300		158
Dale	1		8	1		1					35
Pinacate	1		2	1		1	1				36
Sacramento County: American River (Folsom)[8]	1	7	3	21	73,333	73,354	3,127				2,570,220
San Bernardino County:											
Belleville (Ord Mountain)	3		38				335	1,800	4,900		1,528
Black Hawk	1		79	86		86	69				3,072
Calico	1		100	72		72	8				2,527
Clark Mountain	2		300	1		1	1,260	1,800	65,800		12,205
Coolgardie		(5)			2	2					70
Lava Bed	1		5				43		600	300	186
Silver Mountain	2		4	2		2	2				72
Soda Lake	1		53	2		2	329	700	7,500	900	1,893
Turtle Mountain	1		329				111	20,800			5,134
Whipple Mountains (Monumental)	1		5				1	200			49

San Mateo County: San Mateo (Beach)		(5)			3	3	1				106
Shasta County:											
Battle Creek		(5)			2	2					70
Cottonwood Creek		(5)			8	8	2				282
Dog Creek		(5)			14	14					490
Flat Creek	2		2,731	109		109	12,964	119,600	403,600	636,100	215,064
French Gulch		(5)			5	5	1				176
Igo (Centerville)	3	(5)	8	13	1	14					490
Redding	1	(5)	1	3	26	29	3				1,017
Sierra County:											
Alleghany	5	2	11,445	9,587	96	9,683	1,696				340,439
Gibsonville		1			12	12	1				421
Poker Flat (Port Wine) (Table Rock)	1	1	70	12	11	23	3				808
Sierra City		(5)			1	1					35
Siskiyou County:											
Klamath River	1	3	19	2	35	37	7				1,301
Salmon River		4			16	16	2				562
Scott River	1	2	1	1	5	6	1				211
Yreka	1	3	1	1	38	39	5				1,370
Trinity County:											
Cinnabar		1			3	3					105
Hayford	1	1	25	25	3	28	8				987
Trinity River		5			6,758	6,758	654				237,122
Tulare County: Camp Wishon	1		1				4	100			28
Tuolumne County:											
East Belt [4]	2	(5)	2	12	2	14	2				492
Mother Lode [6]	2	1	(12)	(12)	29	[12] 29	[12] 4				[12] 1,019
Yuba County:											
Browns Valley	1	(5)		(11)	6	[11] 6	[11] 1				[11] 211
Camptonville		1			5	5					175
Challenge		(5)			2	2					70
Dobbins		(5)			2	2					70
Smartville		(5)			69	69	5				2,420
Strawberry		(5)			9	9	2				317
Other districts [13]			171,728	12,471	50,143	62,614	954,305	884,200	21,462,200	16,472,100	9,458,945
Total California	141	108	427,412	115,833	142,343	258,176	1,099,658	1,600,000	22,398,000	18,838,000	17,151,792

[1] Only those districts are shown separately for which Bureau of Mines is at liberty to publish figures; other producing districts are listed in footnote 13 and their output grouped as "Other districts."

[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.

[3] Source of total silver as follows: 1,091,183 ounces from lode mines and 8,475 ounces from placer mines.

[4] East Belt district lies in Amador, Calaveras, El Dorado, Mariposa, and Tuolumne Counties.

[5] From property not classed as a mine.

[6] Mother Lode district lies in Amador, Calaveras, El Dorado, Mariposa, and Tuolumne Counties.

[7] West Belt distrct lies in Amador, Calaveras, El Dorado, Madera and Mariposa Counties.

[8] American River (Folsom) district lies in El Dorado, Placer, and Sacramento Counties.

[9] Randsburg district lies in Kern and San Bernardino Counties.

[10] Exclusive of placer output, which is included with "Other districts."

[11] Browns Valley district, Yuba County lode gold and lode silver included with Grass Valley-Nevada City district, Nevada County.

[12] Exclusive of lode output, which is included with "Other districts."

[13] Includes following districts: Cosumnes River, Amador County; Mother Lode, Calaveras County; East Belt and West Belt, El Dorado County; Bishop (Pine Creek), Confidence, Coso, Independence, Resting Springs, and Ubehebe, Inyo County; Kern River, Kern County; Neenach, and San Gabriel, Los Angeles County; Potter Ridge, Madera County; Merced River, Merced County; Winters, Modoc County; White Mountains, Mono County; Meadow Lake, Nevada County; Last Chance, Michigan Bluff and Rocklin (Loomis), Placer County; Eagle Mountain, Riverside County; Barstow, Buckeye, Holcomb (Bear Valley), Lead Mountain and Randsburg, San Bernardino County; Cow Creek (Ingot) and Shasta, Shasta County; Downieville and Pike (Indian Hill), Sierra County; Cottonwood, Siskiyou County; Tuolumne River (La Grange), Stanislaus County; New River, Trinity County; Yuba River, Yuba County.

Iron, Steel, and Iron Ore.—The Kaiser Steel Corp. Eagle Mountain mine (Bald Eagle and North-South pits), Eagle Mountain district, Riverside County, supplied a preponderant percentage of California's hematite-magnetite yield in 1952. The increase of 24 percent in quantity and 39 percent in value of State production over 1951 was attributed directly to the company expansion at its Fontana steel mills. The new North-South pit was opened in May 1952. The Iron Age mine, Dale district, San Bernardino County, was the other California iron mine that shipped a hematite-magnetite mixture sporadically for iron and steel use in Utah and California and for open-hearth furnaces in the midwestern United States. Cave Canyon mine magnetite-hematite (Baxter district, San Bernardino County) was produced specifically for use in California low-heat-of-hydration cement. Shipments of usable iron ore in 1952 averaged 56.2 percent iron.

At Fontana the Kaiser Steel Corp. operated 2 blast furnaces which averaged 1,471 tons of metal per day each on iron ore and limestone from California and coke produced from Utah, Oklahoma, Arkansas, and New Mexico coals. Most of the coke used was prepared at the Fontana works. A third furnace and second sintering machine were under construction. Steel was produced in open hearths and worked in the plant rolling mills. The company also constructed a new electrolytic tinplating plant in 1952. Columbia-Geneva Steel Division, U. S. Steel Corp., operated open hearths and rolling mills at Pittsburg and Torrance, and the Bethlehem Pacific Coast Steel Corp. processed steel at South San Francisco. In addition, Columbia-Geneva Steel Division, U. S. Steel Corp., at Pittsburg received a substantial percentage of the corporation's Utah steel output in coil form; it is cold-rolled into sheets locally. A tinplating plant also is operated at Pittsburg. Both companies also operated electric furnaces in the Los Angeles area. These plants used a charge made up largely of scrap iron to which pig iron produced outside of California was added. Pacific States Steel Co. at Niles and Judson Steel Corp. at Emeryville operated open hearths and rolling mills. The former also operated electric furnaces at Niles.

TABLE 17.—Iron ore and other metallic materials consumed and pig iron produced, 1945–47 (average) and 1948–52, in net tons

Year	Iron and manganiferous iron ores		Sinter	Miscellaneous [1]	Total	Pig iron produced
	Domestic	Foreign				
1945–47 (average)	361,313	5,353	258,016	58,806	683,487	370,106
1948	280,776	2,912	285,267	70,546	639,501	361,659
1949	447,021	756	346,488	95,635	889,900	504,581
1950	585,085	67	430,825	116,308	1,132,285	660,463
1951	862,977	----------	623,836	121,854	1,608,667	921,695
1952	952,606	----------	612,356	172,227	1,737,189	977,121

[1] Excludes recycled materials.

Lead.—Lead output slumped noticeably in 1952, declining 20 percent from 1951. A large percentage of the State output was supplied by the Anaconda Copper Mining Co. Darwin group, Coso

district, Inyo County, and its Shoshone mines, Resting Springs district, Inyo County, which ranked first and second, respectively, in order of California lead producing mines in 1952. The Coronado Copper & Zinc Co. Afterthought mine, Cow Creek district, Shasta County, was in third place by virtue of recoverable lead in zinc ore mined.

As in past years, shipments of lead-bearing flue dust, mill tailings, and dump ore plus ore from mines in the small-producer class rounded out the State total lead yield through sporadic operations, the frequency of which was influenced largely by lead prices. The price decline in 1952 affected the State total adversely, to the extent that many of the irregular shippers, faced with high mining and transportation costs, ceased operating; but the leading factor in the decline was the curtailed production after midyear at Anaconda's Shoshone group while exploration for new ore bodies progressed.

Magnesium.—Magnesium was produced in 1952 at Manteca, San Joaquin County, by Kaiser Magnesium Co., using the silicothermic process in which calcined dolomite is mixed with ferrosilicon and retorted. The resulting magnesium vapors are condensed into crystals, which are melted and refined. This plant, held in the National Industrial Reserve, was reactivated June 1951 to provide magnesium for the expanded defense program. Monterey County dolomite and Mariposa County vein quartz were utilized.

Manganese.—From an activity that accomplished some stockpiling at mines but no shipments of manganese ore in 1951, the 1952 yield rose to 8,100 short tons of manganese and manganiferous ores, comprising metallurgical and battery grades shipped from 9 mines. San Joaquin, Riverside, Imperial, Plumas, Trinity, and Lake Counties, listed in order of output, furnished the State production. The average grade of the manganese ore was 38 percent, whereas the ferruginous manganese ore averaged 18 percent manganese. All the battery ore was milled near Tracy and the concentrate shipped out of State. Some metallurgical ore was consigned to a Utah steel mill, but the greater tonnage was received at the Wenden, Ariz., and Deming, N. Mex., Government Purchase Depots. Teekay Mines, Inc., operating its mill and the Ladd mine, San Joaquin County, led in California manganese produced and was followed by the Calrado Development Co. Arlington-Blackjack mine and mill, Riverside County, leased to Blythe Manganese Co. The Bureau of Mines published data on concentration of manganese ores from Siskiyou, San Bernardino, and Mendocino Counties.[7]

Mercury.—The mercury production attained by California mines in 1952 was the largest since 1948 and a 69-percent increase over 1951. The State continued to predominate in output, contributing 58 percent of the Nation's production; but only 21 percent of the recent peak output of 33,812 flasks, or 65 percent of the total, in the World War II year 1943. Apparently the uncertain future of the metal in the face of near-record imports in 1952 deterred any appreciable expansion, other than normal development at operating mines in the State's largely

[7] Agey, W. W., Hussey, S. J., and Long, W. S., Concentration of Oxide Manganese Ores From San Bernardino County, Calif.: Bureau of Mines Rept. of Investigations 4846, 1952, 14 pp.
Potter, G. M., Sandell, W. G., and Vincent, K. C., Concentration of Oxide and Silicate Manganese Ores From Siskiyou and Mendocino Counties, Northern Calif.: Bureau of Mines Rept. of Investigations 4849, 1952, 14 pp.

marginal ores. Cordero Mining Co., operating under a DMEA contract, explored the New Almaden mine, Santa Clara County, for extensions of the depleted ore bodies.

The two leading producers, New Idria Mining & Chemical Co., New Idria mine, (including San Carlos), Idria district, San Benito County, and Sonoma Quicksilver Mines, Mount Jackson-Great Eastern mine, Guerneville district, Sonoma County, dominated the State production. The California Quicksilver Mines, Inc., Abbott mine, Sulphur district, Lake County, Culver-Baer mine, Mayacmas district, Sonoma County, and Louis Sciocchetti Juniper mine, Panoche district, San Benito County, followed in output in the order named.

TABLE 18.—Mercury produced in 1952, by counties

County	Producing mines	Ore treated (short tons)	Mercury recovered	
			Flasks (76 pounds)	Value [1]
Contra Costa	1	[2]	[2]	[2]
Del Norte	1	placer	1	$199
Fresno	1	[3]	[3]	[3]
Lake	2	3,919	599	119,261
Napa	3	[4] 9	[5] 41	8,163
San Benito	7	24,558	3,129	622,984
San Luis Obispo	2	[2] 2,580	[2] 188	[2] 37,431
Santa Clara	2	[3] 2,336	[3] [6] 219	[3] 43,603
Sonoma	4	50,268	3,062	609,644
Yolo	1	cleanup	2	398
Total	24	83,670	[4] [5] 7,241	1,441,683

[1] Value calculated at average price at New York.
[2] Contra Costa County combined with San Luis Obispo County.
[3] Fresno County combined with Santa Clara County.
[4] Estimated.
[5] Includes 39 flasks from dump material.
[6] Includes 4 flasks from dump material.

TABLE 19.—Mercury produced, 1943–47 (average) and 1948–52, by methods of recovery

Year	Furnaced [1]		Retorted		Unclassified [2]	Total		Operating mines
	Ore (short tons)	Flasks of 76 pounds	Ore (short tons)	Flasks of 76 pounds	Flasks of 76 pounds	Flasks of 76 pounds	Value [3]	
1943–47 (average)	193,356	22,761	2,059	375	466	23,602	$3,192,902	44
1948	84,670	10,594	110	97	497	11,188	855,770	13
1949	39,846	4,318	165	90	85	4,493	357,014	15
1950	30,479	3,008	571	619	223	3,850	312,851	14
1951	54,316	3,837	1,440	170	275	4,282	899,777	27
1952	82,431	6,992	1,239	202	47	7,241	1,441,683	24

[1] Includes ore and mercury from dumps not separable.
[2] Includes mercury recovered from miscellaneous dump material, placer and cleanup operations.
[3] Value calculated at average price at New York.

Molybdenum.—The United States Vanadium Co. was California's sole producer of molybdenum concentrate, which was derived from tungsten ore milled at the Pine Creek mine, Inyo County. The 1952 yield exceeded the previous year by 24 percent.

Platinum.—A few hundred ounces of crude platinum was recovered as a byproduct from gold dredging in Butte, Sacramento, and Yuba Counties and beach gold placer mining in San Mateo County.

Rare-Earth Metals.—Rare-earth-metal concentrates were produced commercially for the first time in 1952 from the bastnaesite (fluocarbonate of the cerium metals) discovered in 1949 near Mountain Pass, San Bernardino County. The Molybdenum Corp. of America effected separation of the rare-earth material from the barite-carbonate rock by flotation at its 150-ton-a-day mill. The potential of this industry as yet is indefinite while the use of rare-earth additives to steel is being developed. The Bureau of Mines described methods of concentrating Mountain Pass bastnaesite and other cerium ores.[8]

Silver.—The output of silver dropped 4 percent in 1952 compared with 1951 and is considered largely a byproduct metal. Its content is often an important factor—particularly in base-metal ores—in determining the profitable working of such material in California.

The Anaconda Copper Mining Co. Darwin group, its Shoshone group, the Coronado Copper & Zinc Co. Afterthought mine, and the New Penn Mines, Inc. (Penn Chemical Co.) Penn mine—all producers of base-metal ore—together produced 87 percent of the State silver. Other contributors of the metal were the Golden Queen group, Kern County; the Brunswick mine, Nevada County; and the Empire-Star group, Nevada County, producers of gold ore.

Titanium.—Production of titanium-iron oxide granules from the beach deposits near Hermosa Beach, Los Angeles County, for the nontitanium use of manufacturing roofing material was reported in 1952.

Tungsten.—In a surge of activity, 148 California tungsten mines increased their 1952 output, in terms of units of WO_3, 12 percent over 1951. Shipments, which included California production plus some out-of-State material forwarded to State mills for final concentration, totaled 178,800 units valued at $11,361,000, 2 percent less than in 1951. Most of the concentrates produced were scheelite; however, occasional lots of wolframite concentrate were shipped. A large percentage of the low-grade tungsten flotation concentrates produced at mills was shipped to chemical plants for digestion, the commercial product being synthetic scheelite. Inyo County, center of tungsten production, furnished 86 percent of the State yield. Other counties that contributed to the total output and listed in descending order of importance were San Bernardino, Madera, Tulare, Fresno, Kern, Alpine, and Mono. The United States Vanadium Co. Pine Creek mine, Bishop district, Inyo County, was the leading tungsten producer by a wide margin, both in the State and the Nation; the Surcease Mining Co., Atolia property, Randsburg (Atolia) district, San Bernardino County, ranked second, followed by Strawberry Tungsten Mines, Jackass district, Madera County; Garnet Dike mine, Kings River Canyon area, Fresno County; and Tulare County Tungsten Mines' Big Jim property, northeast of Exeter, Tulare County.

The widespread occurrence of tungsten in small deposits resulted in a problem—facing many small proprietors without mills—of ore beneficiation within a reasonable distance of the mines. The condition was aggravated in winter when heavy snow blanketed approaches to the

[8] Zadra, J. B., Engel, A. L., and Shedd, E. S., Concentration of Bastnaesite and Other Cerium Ores, With Analytical Methods by A. C. Rice: Bureau of Mines Rept. of Investigations 4919, 1952, 14 pp.

principal milling areas, which were largely at high elevations. The Bureau of Mines described treatment of California scheelite ore and scheelite tailings from Mono and San Bernardino Counties.[9]

Uranium.—Considerable interest was shown in uranium prospecting in California. Occurrences of radioactive minerals near Rosamond, Kern County, were the subject of a special study by the Federal Geological Survey.

During the summer of 1952, a reconnaissance was conducted in California in search of new deposits of uranium-bearing carbonaceous rocks. Occurrences of uranium were found in the following coal deposits: Newhall prospect, Los Angeles County; Fireflex mine, San Benito County; American lignite mine, Amador County; and Tesla prospect, Alameda County. Oil-saturated sandstone near Edna, San Luis Obispo County, also had showings of uranium.

Zinc.—In the nearly general decline of base-metal production during 1952 zinc fell only 2 percent below 1951, largely because output for the first 8 months was relatively high. Cessation of operations at the Coronado Copper & Zinc Co. Afterthought mine, Cow Creek (Ingot) district, Shasta County, in August 1952, owing to depletion of its zinc ore, which contained recoverable copper and lead, precipitated the decline.

Output was confined principally to California's three leading producers of zinc—the State's only producers of zinc concentrates: Anaconda Copper Mining Co. Darwin group, Inyo County, the Afterthought mine, Shasta County, and the Penn mine, Calaveras County. Shipments were made to Montana and Texas zinc plants. Some zinc in accumulations of flue dust from abandoned Shasta County copper smelters, in lead ores and concentrates from San Bernardino, Inyo, and Mono Counties and in oxidized zinc ore from Inyo County, was recovered at the slag-fuming plant of a Utah lead smelter. The Bureau of Mines published data on concentrating zinc-copper ore from the Copper Hill mine, West Belt district, Calaveras County.[10]

NONMETALS

Andalusite.—The andalusite mine in the White Mountains, Mono County, formerly worked by Champion Sillimanite, Inc., was idle in 1952, but some ore was shipped from a stockpile.

Asbestos.—Considerable interest was shown in California asbestos as new sources of long-fiber chrysotile were sought by Canadian and United States producers. Chrysotile deposits in Trinity, Calaveras, Nevada, Inyo, San Benito, Lake, and Shasta Counties were explored, but no commercial activity resulted from the findings. A dearth of sufficiently large single occurrences of high-grade asbestos has retarded expansion of the industry in the State. There was some development of amphibole in San Bernardino County and chrysotile associated with antigorite in Tuolumne County.

Barite.—Barite was produced by Barium Products, Ltd., at the Almanor mine, Plumas County, for barium chemicals. At the

[9] Engel, A. L., Treatment Tests of Scheelite Ores and Tailings: Bureau of Mines Rept. of Investigations 4867, 1952, 11 pp.
[10] Work cited in footnote 5.

bastnaesite operation of Molybdenum Corp. of America near Mountain Pass, San Bernardino County, considerable barite was recovered as a concentrate in the process of separating the rare-earth minerals.

Boron Minerals.—The State's principal output of boron minerals in 1952 was in Kern County, where Pacific Coast Borax Co. worked its deposits of kernite (rasorite) and tincal at Boron. Borax was produced in Inyo and San Bernardino Counties. There was some output of colemanite in Inyo County and anhydrous sodium tetraborate and boric acid production in San Bernardino County. Compared with 1951, the yield of boron minerals and compounds dropped 32 percent in quantity and 30 percent in value. Although boron compounds have a wide variety of uses, about half of the California total output (incidentally the Nation's entire production) is consumed by the glass and ceramics industries.

Bromine.—Bromine and bromine compounds were produced in 1952 as byproducts by Westvaco Chemical Division of Food Machinery & Chemical Corp., in Alameda County from salt-works bitterns and by American Potash & Chemical Corp. from brines of Searles Lake, San Bernardino County.

Calcium Chloride.—Calcium chloride was produced in San Bernardino County from well brines and dry-lake brines at Bristol Lake in the Amboy area.

Carbon Dioxide (natural).—Carbon dioxide gas, used largely for "dry ice," was withdrawn from the Salton Sea field, Imperial County, and the Hopland field, Mendocino County.

Coal.—Lignite for nonfuel use was mined in Amador County as a raw material in the preparation of extracted products, principally montan wax, pigment, humic acid, and a component of commercial soil conditioner.

Clays.—California clays and shale production continued to expand, but the extensive resources were exploited largely for consumption within the State in the brick, ceramic, cement, and miscellaneous industries because transporting these bulky materials to distant markets is not profitable in the highly competitive industry.

In 1952, exclusive of clays sold or used for the manufacture of cement, production increased 17 percent in quantity and 6 percent in value. The 1952 output, by classes of clays, follows: Kaolin, 21,005 tons valued at $253,589; fire clay, 562,135 tons valued at $1,717,964; miscellaneous clays, fuller's earth and bentonite together, 1,293,509 tons valued at $2,021,499.

Cement, Portland.—California finished portland-cement production decreased 1 percent in 1952 compared with 1951, but shipments from mills increased 3 percent in the same period. The northern California mills produced 13,676,000 barrels of cement in 1952—an increase of 1 percent over 1951—and shipped 13,714,000 barrels valued at $36,959,000—an increase of 6 percent over 1951. The southern California mills produced 15,909,000 barrels of cement—a decrease of 3 percent below 1951—and shipped 16,072,000 barrels valued at $42,499,000—an increase of 1 percent over 1952. The estimated surplus in local supply of portland cement in 1952 was 4,425,000 barrels compared with a surplus of 3,765,000 barrels in 1951.

TABLE 20.—Clays (except clay for cement) production by counties and total clays produced, 1951–52

County	1951		1952	
	Short tons	Value	Short tons	Value
Alameda	11,320	$46,465	13,810	$12,650
Amador	188,112	614,223	165,395	544,002
Calaveras	20,789	29,989	7,450	10,222
Contra Costa	62,239	62,239	61,888	82,720
Humboldt	617	465	500	500
Inyo	(1)	(1)	5,386	164,095
Kern	98,098	727,890	122,406	831,901
Los Angeles	466,820	381,148	566,557	615,462
Orange	24,949	144,331	21,871	76,795
Placer	146,282	292,428	121,560	252,020
Riverside	182,101	510,653	195,692	594,288
Sacramento	20,687	59,811	167,376	149,282
San Benito	(1)	(1)	49	490
San Bernardino	32,760	364,331	23,616	247,492
San Diego	33,827	25,381	34,144	25,616
Santa Clara	84,788	64,675	55,511	45,792
Stanislaus	5,160	19,664	3,674	12,140
Tulare	8,580	6,435	4,048	3,036
Ventura	101,528	97,433	185,731	173,196
Undistributed [1]	126,584	309,764	129,985	151,353
Total	1,615,241	3,757,325	1,886,649	3,993,052
Clay for cement (undistributed)	974,799	974,799	856,481	859,214
Grand total	2,590,040	4,732,124	2,743,130	4,852,266

[1] Fresno, Imperial (1951), Inyo (1951), Marin, Mono (1952), Santa Barbara, San Benito (1951), San Joaquin, and Sutter Counties included with "Undistributed" to avoid disclosure of individual company operations.

Of the 11 plants operated in 1952, 5 are in northern California (1 each in Calaveras, Santa Clara, Santa Cruz, San Mateo, and San Benito Counties) and 6 in southern California (3 in San Bernardino County and 1 each in Kern, Riverside, and Los Angeles Counties).

TABLE 21.—Finished portland cement produced, shipped, consumed, and in stock, 1943–47 (average) and 1948–52

Year	Active plants	Estimated capacity, 1,000 barrels	Production, 1,000 barrels	Shipments from mills			Estimated consumption, 1,000 barrels	Stocks at mills (December 31), 1,000 barrels
				1,000 barrels	Value			
					Total $1,000	Average		
1943–47 (average)	12	27,750	18,280	18,345	$30,826	$1.65	14,728	1,006
1948	11	29,170	24,602	24,163	57,742	2.39	20,568	1,056
1949	11	29,870	23,218	23,202	57,464	2.48	19,944	1,127
1950	11	30,870	26,277	26,685	65,259	2.45	23,508	818
1951	11	32,620	29,918	28,956	77,754	2.69	25,192	1,776
1952	11	35,120	29,585	29,786	79,458	2.67	25,361	[1] 1,575

[1] Subject to revision.

Diatomite.—California diatomite, the principal source in the United States, was largely from Santa Barbara County, where Johns-Manville Products Corp. and Great Lakes Carbon Corp. operated quarries and processing plants in the Lompoc area, and from the Great Lakes Carbon Corp. deposit and plant at Walteria, Los Angeles County. Output also was reported from Inyo and Stanislaus Counties. The 1952 yield, adversely affected by work stoppages at Lompoc during

the year, fell 40 percent below the 1951 output; it was utilized as follows: Filtration, 62 percent; fillers, 20 percent; insulation, 14 percent; and other uses, 4 percent.

TABLE 22.—Production, shipments from mills, and stocks at mills of finished portland cement in 1952, by months, in thousands of barrels

Month	Mill production	Mill shipments	Shipments to California [1]	Stocks at mills (end of month)
January	1,892	1,823	1,419	1,845
February	2,028	2,346	1,975	1,527
March	2,407	2,067	1,747	1,867
April	2,422	2,446	2,095	1,843
May	2,447	2,405	2,043	1,884
June	2,463	2,428	2,056	1,919
July	2,473	2,680	2,252	1,712
August	2,636	2,868	2,435	1,481
September	2,620	2,786	2,434	1,315
October	2,810	3,233	2,811	892
November	2,774	2,488	2,215	1,179
December	2,619	2,222	1,884	1,575

[1] Includes interstate and intrastate shipments.

Feldspar.—The California feldspar output was furnished by Gladding McBean & Co., from its San Bernardino County property (potash feldspar for ceramics) and Del Monte Properties Co., Monterey County beach operation (soda feldspar for glass).

Fluorspar.—No fluorspar production was reported in California in 1952; however, the Holmestake Mining Co. developed its mill to separate fluorite from Arizona ores.

Gem Stones.—Gem-stone production in California is difficult to determine accurately, as numerous transactions that involve collectors are not recorded. Of the activity in gem stones reported in 1952, agate found in the Mojave Desert region accounted for a large percentage of the State's estimated yield. In addition, the value of tourmaline from San Diego County, idocrase from Siskiyou County, and jade (none of fine quality) produced in Mendocino, Monterey, and San Benito Counties contributed to the State total.

Gypsum.—Production of gypsum increased 13 percent in quantity and 5 percent in value in 1952 compared with 1951. The principal producers of gypsum for use in the manufacture of cement, wallboard, plaster, and other building materials operated mines in Imperial, Kern, Riverside, and Ventura Counties. In addition, a substantial quantity of gypsum (including gypsite), much of which was relatively impure, was produced in Kern, Fresno, Kings, Merced, and San Luis Obispo Counties to supply the expanding requirements for improving California soil.

TABLE 23.—Crude gypsum mined, 1943–47 (average) and 1948–52

Year	Active mines	Short tons	Value
1943–47 (average)	7	559,934	$1,140,364
1948	15	962,038	2,354,390
1949	13	753,581	1,852,452
1950	11	962,373	2,462,604
1951	10	1,092,883	2,602,758
1952	13	1,236,430	2,721,134

Iodine.—Deepwater Chemical Co., Ltd., and Great Western Division, Dow Chemical Co., supplied California's crude-iodine production in 1952; this was incidentally the total output of the commodity in the United States. The iodine was recovered from waste brines of oil wells in the Los Angeles Basin.

Iron Oxide Pigments.—American Lignite Products Co. produced natural iron oxide-pigment material from Amador County lignite, and C. K. Williams & Co. manufactured iron oxide pigments at Emeryville.

Lime.—Owing largely to increased consumption in the chemical industry, California's total lime production in 1952 rose 18 percent in quantity and 11 percent in value compared with 1951. Of the total lime produced in 1952, 205,668 tons was quicklime and 33,289 tons hydrated. In the previous year, the yield was 168,790 tons of quicklime and 34,554 tons of hydrated. Consumption of lime by industrial category, in order of magnitude, follows: Chemical, dead-burned dolomite, building, and agriculture. Limekilns were operated in El Dorado, Monterey, San Bernardino, and Tuolumne Counties.

Lithium Minerals.—American Potash & Chemical Corp. produced crude sodium-lithium phosphate as a byproduct of its Trona operation at Searles Lake, San Bernardino County. The plant was being converted to produce lithium carbonate.

Magnesium Salts.—The output of magnesium compounds, which advanced substantially over 1951, was supplied by Westvaco Chemical Division of Food Machinery & Chemical Corp., in Alameda and San Diego Counties; Kaiser Aluminum & Chemical Corp., in Monterey County; and Marine Magnesium Products Division of Merck & Co., Inc., in San Mateo County. Raw sea water, sea-water bitterns, and dolomite from Monterey and San Benito Counties were the basic materials consumed.

Magnesite.—Magnesite was mined by Westvaco Chemical Division of Food Machinery & Chemical Corp. south of Livermore in Santa Clara County. The production of magnesia from sea water, bitterns, and calcined dolomite satisfied a market that formerly depended chiefly on magnesite.

Peat.—Peat, dug in Orange, Modoc, and Contra Costa Counties, was utilized for soil improvement.

Perlite.—Production of California crude perlite rose 141 percent in 1952 compared with 1951; however, this increased output fell short of the requirements of the State's plants that expanded crude material. In 1952, 28,663 tons of expanded perlite was produced and 28,419 tons valued at $1,202,603 sold, whereas 25,850 tons was produced and 25,648 tons valued at $1,481,428 sold in 1951. Crude perlite was quarried in Napa, Inyo, and San Bernardino Counties. Expanding plants were operated in Contra Costa, Los Angeles, San Diego, San Bernardino, Napa, and Marin Counties.

Petroleum and Natural Gas.—Petroleum and natural-gas production is discussed in volume II, Minerals Yearbook.

Potassium Salts.—American Potash & Chemical Corp., which treated brine from Searles Lake, San Bernardino County, was the principal producer of potassium salts in California in 1952. Some low-grade potash material, a byproduct of cement manufacture used as a soil fertilizer, was recovered in Santa Cruz County.

Pumice and Pumicite.—Reported pumice production in California in 1952 was considerably lower than in 1951, reflecting the growing competition of perlite and bloated shales in light aggregates and ground silica sand in preparing scouring compounds. Occurrence of this commodity is widespread, and the State total output was obtained from Calaveras, Fresno, Imperial, Inyo, Kern, Madera, Modoc, Mono, Napa, San Bernardino, and Siskiyou Counties. Consumption of the 1952 pumice yield, by uses, in order of magnitude, follows: Concrete aggregate; miscellaneous uses, including soil conditioner, pesticide diluents, absorbents, and building tile; miscellaneous abrasives; insulating medium; concrete admixture; cleansing and scouring compositions, and handsoaps.

Pyrites.—The Mountain Copper Co., Ltd., produced pyrites in California in 1952 from the Hornet mine, Shasta County. The ore was shipped principally to Contra Costa County sulfuric acid plants; some was consigned for export.

Salt.—The California salt industry was centered in Alameda County on the shores of San Francisco Bay. Solar evaporation was the main treatment of the bay water, although the vacuum-pan method of evaporation also was employed. Salt also was produced by solar evaporation in Kern, Monterey, Orange, San Bernardino, and San Diego Counties. The State's 1952 yield fell 10 percent in quantity and 7 percent in value below 1951, owing largely to below-normal harvests in the San Francisco Bay region salt ponds.

TABLE 24.—Salt sold or used by producers, 1943–47 (average) and 1948–52

Year	Short tons	Percent of United States total	Value	Year	Short tons	Percent of United States total	Value
1943–47 (average)	700,134	5	$3,314,283	1950	868,496	5	$3,816,655
1948	914,035	6	3,927,722	1951	1,275,574	6	5,261,780
1949	964,807	6	4,110,271	1952	1,148,693	6	4,880,392

Sand and Gravel.—Sand and gravel were produced in virtually all California counties in 1952. The production rose 13 percent in quantity and 6 percent in value compared with 1951. As a large percentage of the sand and gravel yield was used in building and other construction projects, it followed that the greater outputs were from areas of maximum construction activity. Aggregate material normally has not been transported any appreciable distance, owing to its widespread occurrence in California. However, the encroachment of expanding metropolitan districts, particularly in southern California on land comprised of alluvium is changing this situation.

Los Angeles County furnished nearly 30 percent of the State's total sand and gravel production. Other counties that contributed heavily to the California yield included: Alameda, Fresno, San Diego, Orange, Sacramento, Riverside, Monterey, San Bernardino and Sonoma.

TABLE 25.—Sand and gravel sold or used by producers, 1943–47 (average) and 1948–52

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	11,122,548	$7,616,283	15,569,829	$10,910,134	26,692,377	$18,526,417
1948	15,164,089	13,030,314	18,622,431	17,562,651	33,786,520	30,592,965
1949	14,912,709	12,643,953	21,367,107	17,554,971	36,279,816	30,198,924
1950	17,812,379	15,136,857	24,081,660	20,410,701	41,894,039	35,547,558
1951	19,009,895	16,640,752	27,917,557	24,639,083	46,927,452	41,279,835
1952	20,434,017	18,060,627	32,617,243	25,572,498	53,051,260	43,633,125

TABLE 26.—Sand and gravel sold or used by producers, 1951–52, by commercial and Government-and-contractor operations, and by uses

	1951			1952		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Glass	(1)	(1)	(1)	315,614	$1,226,622	$3.89
Molding	42,455	$106,882	$2.52	61,209	208,140	3.40
Building	11,697,957	10,175,138	.87	12,195,416	10,443,281	.86
Paving	4,628,940	3,661,058	.79	5,269,028	4,389,199	.83
Blast	90,337	251,697	2.79	121,070	372,611	3.08
Engine	(1)	(1)	(1)	71,392	77,280	1.08
Filter	10,310	65,199	6.32	18,277	53,762	2.94
Railroad ballast	(1)	(1)	(1)	1,440	792	.55
Other [1]	834,697	1,424,544	1.71	104,148	105,469	1.01
Total commercial sand	17,304,696	15,684,518	.91	18,157,594	16,877,156	.93
Gravel:						
Building	12,277,073	11,774,362	.96	13,994,664	13,379,052	.96
Paving	7,560,915	6,767,856	.90	8,601,253	8,463,624	.98
Railroad ballast	141,072	97,617	.69	181,257	121,851	.67
Other	367,609	241,907	.66	522,628	378,321	.72
Total commercial gravel	20,346,669	18,881,742	.93	23,299,802	22,342,848	.96
Total commercial sand and gravel	37,651,365	34,566,260	.92	41,457,396	39,220,004	.95
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building	327,752	426,377	1.30	235,601	89,910	.38
Paving	1,377,447	529,857	.38	2,040,822	1,093,561	.54
Total Government-and-contractor sand	1,705,199	956,234	.56	2,276,423	1,183,471	.52
Gravel:						
Building	1,554,665	1,734,460	1.12	328,234	96,266	.29
Paving	6,016,223	4,022,881	.67	8,989,207	3,133,384	.35
Total Government-and-contractor gravel	7,570,888	5,757,341	.76	9,317,441	3,229,650	.35
Total Government-and-contractor sand and gravel	9,276,087	6,713,575	.72	11,593,864	4,413,121	.38
ALL OPERATIONS						
Sand	19,009,895	16,640,752	.88	20,434,017	18,060,627	.88
Gravel	27,917,557	24,639,083	.88	32,617,243	25,572,498	.78
Grand total	46,927,452	41,279,835	.88	53,051,260	43,633,125	.82

[1] Included with "Other" to prevent disclosure of individual output.

Silica (Quartz).—Silica in the form of quartz was produced in Mariposa County, as quartzite in San Bernardino County and sand in Monterey County. Its chief uses were in sulfate-resistant cements, refractories, ceramics, and ferrosilicon.

Slate.—A relatively small slate production was reported from El Dorado County during 1952. Most of the material was ground for filler, but some slate was utilized as flagging. The 1952 output was 2 percent greater in quantity but 1 percent lower in value than 1951.

Sodium Compounds.—Natural sodium carbonates (soda ash and trona) were extracted from lake brines at Keeler and Bartlett, Inyo County, and at Trona, San Bernardino County (soda ash).

TABLE 27.—Stone sold or used by producers, commercial and noncommercial, 1948–52, by kinds

Year	Granite		Basalt and related rocks (traprock)		Marble		Limestone	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1948	1,567,340	$1,752,131	[1] 1,312,990	[1] $1,379,099	3,140	$56,466	780,180	$1,953,576
1949	1,756,280	1,617,996	1,393,150	1,607,735	3,930	78,580	789,130	2,413,666
1950	1,834,060	1,690,722	1,293,030	1,371,622	4,410	80,212	1,061,040	2,819,555
1951	1,910,307	2,088,967	1,652,314	1,921,527	8,435	171,083	1,158,999	3,443,408
1952	1,903,866	1,979,756	1,996,836	2,524,972	7,168	137,664	1,727,224	4,148,150

Year	Sandstone		Other stone [2]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1948	1,529,110	$1,452,938	6,743,480	$6,561,244	[1] 11,936,240	$13,155,454
1949	1,614,840	1,632,594	5,816,370	5,243,477	11,373,700	12,594,048
1950	1,698,020	1,777,982	5,874,070	6,258,339	11,764,630	13,998,432
1951	1,508,495	1,549,001	6,298,794	5,540,538	12,537,344	14,714,524
1952	1,029,084	1,290,141	7,806,607	7,731,349	14,374,930	17,697,085

[1] Incomplete figure.
[2] Includes light-color volcanics, schist, serpentine, river boulders, and such other stone as cannot properly be classed in any main group.

TABLE 28.—Production of stone,[1] commercial and noncommercial, by counties, in 1952

County	Short tons	Value	County	Short tons	Value
Alameda	1,166,824	$1,129,231	Riverside	20,046	$39,714
Amador	71,835	50,892	Sacramento	443,677	569,643
Butte	280,178	203,778	San Bernardino	478,262	1,256,917
Contra Costa	668,926	774,684	San Diego	274,673	534,569
Del Norte	13,000	5,200	San Mateo	937,515	1,254,028
El Dorado	166,681	508,979	Santa Clara	895,413	577,266
Fresno	377,028	571,995	Santa Cruz	41,725	253,021
Humboldt	22,100	47,808	Shasta	44,510	31,805
Imperial	30,167	22,691	Solano	326,548	392,737
Kern	158,335	148,107	Sonoma	145,895	155,072
Lassen	17,041	42,012	Trinity	58,664	57,357
Los Angeles	3,928,457	3,384,550	Tulare	122,023	197,699
Marin	773,771	1,152,028	Tuolumne	57,433	331,407
Monterey	245,253	485,056	Other counties [2]	2,284,994	3,019,253
Orange	253,884	235,081	Undistributed	62,390	139,598
Placer	3,407	118,405			
Plumas	4,275	6,502	Total	14,374,930	17,697,085

[1] Excludes limestone for lime and cement.
[2] Includes Alpine, Kings, Madera, Mariposa, Mendocino, Napa, Nevada, San Benito, San Joaquin, San Luis Obispo, Santa Barbara, Sierra, Siskiyou, Ventura, and Yolo Counties, combined to avoid disclosure of individual producers' outputs.

The lake brines at Trona, San Bernardino County, also yielded natural sodium sulfate.

Stone.—Stone was mined in 45 of the State's 58 counties in 1952. Production increased 15 percent in quantity and 20 percent in value compared with 1951.

TABLE 29.—Stone, commercial and noncommercial, sold or used, 1951–52, by uses

Use	1951		1952	
	Quantity	Value	Quantity	Value
Dimension stone:				
Construction and rubble, short tons	15,343	$75,281	39,916	$163,800
Architectural, cubic feet	4,683	79,929	40,075	174,262
Approximate equivalent in short tons	378		3,259	
Monuments and mausoleums, cubic feet	32,947	241,074	35,266	254,777
Approximate equivalent in short tons	2,701		2,892	
Flagging, cubic feet	14,822	28,318	7,529	11,000
Approximate equivalent in short tons	1,256		640	
Total dimension stone (quantities approximate, in short tons)	19,678	424,602	46,707	603,839
Crushed and broken stone:				
Riprap, short tons	481,284	710,830	994,892	1,470,061
Metallurgical, do	277,807	635,099	86,481	251,912
Concrete and road metal, do	8,489,478	8,321,258	9,984,529	10,361,036
Railroad ballast, do	543,667	407,358	526,654	404,843
Agricultural, do	339	1,629	279	1,719
Chemical, do	497,353	1,163,485	506,661	1,210,942
Miscellaneous [1], do	2,227,738	3,050,263	2,228,727	3,392,733
Total crushed and broken stone, do	12,517,666	14,289,922	14,328,223	17,093,246
Grand total (quantities approximate, in short tons)	12,537,344	14,714,524	14,374,930	17,697,085

[1] Includes whiting or whiting substitute, filler, mineral food, poultry grit, stucco, roofing granules, filter beds, terrazzo, and miscellaneous uses.

Strontium Minerals.—A small quantity of strontium ore, mined in Imperial County, was used in 1952 for preparing strontium carbonate.

Sulfur.—Minor tonnages of sulfur ore, which averaged 25 percent sulfur, were shipped for direct agricultural use from deposits in Inyo County. The Anaconda Copper Mining Co. developed sulfur at the Leviathan mine in Alpine County for its Yerington, Nev., sulfuric acid plant. The Chemi-Cal Corp. developed a deposit of sulfur in Lake County. Byproduct sulfur as brimstone and in acid sludge was recovered at California oil refineries. Sulfuric acid was produced as a byproduct of the smelting of sulfide ores at Selby, Contra Costa County. It also was obtained at various oil refineries by using the sulfur contained in hydrogen sulfide gas evolved in the refining process.

Talc, Pyrophyllite, and Soapstone.—Total crude talc, pyrophyllite, and soapstone mined in California in 1952 was 5 percent below 1951. Most of the crude-talc output came from Inyo County, although substantial production was reported from San Bernardino County. Pyrophyllite was mined in Mono and San Bernardino Counties. Los Angeles, Inyo, and El Dorado County deposits were worked for soapstone. Of the ground material prepared at California mills, 52 percent was consumed in ceramics, 21 percent in paint, 10 percent in insecticides, and 17 percent in miscellaneous items, including asphalt filler,

paper, rice polishing, roofing, rubber, textiles, and toilet preparations. Geology of the Superior Talc area in Death Valley was described by Wright,[11] and uses of California talc in the paint industry was discussed by Lamar.[12]

Wollastonite.—A relatively small production of wollastonite was reported from the Ironwood district, Riverside County, in 1952. Wollastonite is used largely in ceramics and as a chemical raw material. Other uses include: Electrical insulators, paint extender, paper filler, and industrial and building tile.

TABLE 30.—Consumption of ferrous scrap and pig iron, and percentage of total scrap derived from home scrap and purchased scrap, 1943–47 (average) and 1948–52

Year	Total scrap (short tons)	Percentage of total		Pig iron (short tons)
		Home	Purchased	
1943–47 (average)	1,622,578	32	68	536,181
1948	2,144,442	31	69	625,229
1949	1,822,065	37	63	673,613
1950	2,217,674	40	60	937,740
1951	2,638,565	40	60	1,271,574
1952	2,470,169	40	60	1,288,561

TABLE 31.—Consumption of ferrous scrap and pig iron, 1951–52, by type of furnace and miscellaneous uses

Ferrous scrap and pig iron charged to—	1951 (short tons)	1952 (short tons)	Percent of change from 1951
Steel furnaces: [1]			
Home scrap	883,395	838,803	−5
Purchased scrap	1,253,203	1,192,892	−5
Pig iron	1,089,877	1,099,156	+1
Total	3,226,475	3,130,851	−3
Iron furnaces: [2]			
Home scrap	163,263	153,672	−6
Purchased scrap	270,931	232,799	−14
Pig iron	181,697	189,405	+4
Total	615,891	575,876	−6
Miscellaneous uses: [3]			
Home scrap	4		−100
Purchased scrap	67,769	52,003	−23
Total	67,773	52,003	−23
All uses:			
Home scrap	1,046,662	992,475	−5
Purchased scrap	1,591,903	1,477,694	−7
Total scrap	2,638,565	2,470,169	−6
Pig iron	1,271,574	1,288,561	+1
Grand total	3,910,139	3,758,730	−4

[1] Includes open-hearth and electric furnaces.
[2] Includes cupola, air, and blast furnaces; also direct castings.
[3] Includes rerolling, copper precipitation, nonferrous, and chemical uses.

[11] Wright, L. A., Geology of the Superior Talc Area, Death Valley, California: State of California Department of Natural Resources Special Rept. 20, 1952, 22 pp.
[12] Lamar, R. S., California Talc in the Paint Industry: California Jour. Mines and Geol., July 1952, vol. 48, No. 3, pp. 189–199.

SECONDARY METALS

Iron and Steel Scrap.—The dependence of California's industry on iron and steel scrap is shown by the fact that in 1952 the State consumed 4 percent of the Nation's iron and steel scrap compared to 2 percent of the Nation's pig iron. The gap between percentages of scrap and pig iron used has narrowed since 1943, when California consumed 3 percent of the country's iron and steel scrap and only 1 percent of the country's pig iron. This transition was influenced largely by the progressive expansion of pig-iron production at the Kaiser Steel Corp. Fontana plant for use at its steel mill.

Nonferrous Metals Scrap.—Production of secondary lead, zinc, brass, white metals, type metals, antimonial lead, and other alloys, particularly in the San Francisco and Los Angeles areas, provided serious competition for sellers of primary metals in the markets.

In 1952 California foundries reported consumption of 16,200 short tons of brass and bronze ingot, made chiefly from copper-base scrap, compared with 20,200 tons in 1951. Leaded red brass ingot, the largest single item used, amounted to 11,500 tons in 1952 and 13,500 tons in 1951.

REVIEW BY COUNTIES AND DISTRICTS

ALAMEDA

Alameda County was much more important in the processing and consumption of minerals than in their production. Operations to obtain salt from sea water were carried on at San Francisco Bay tidal flats and plants in Alameda County by American Salt Co. and Oliver Bros. Salt Co., at Mount Eden, and by the Leslie Salt Co. and Morton Salt Co., at Newark. Westvaco Chemical Division of Food Machinery & Chemical Corp., produced magnesium compounds (with gypsum a byproduct) and bromine from salt-works bitterns; some bitterns were shipped. Common clay was produced at Niles for consumption at its plants by Interlocking Roof Tile Co., California Pottery Co., and Kraftile Co., and at Decoto by M & S Tile Co. Tesla Clay & Sand Co. produced a consolidated mixture of fire clay and quartz sand at Tesla. The material is used principally as a refractory mortar. Nonmetallic minerals were ground by Industrial Minerals & Chemical Co., and the Philadelphia Quartz Co. at Berkeley. C. K. Williams & Co. processed iron oxide pigments, and Yuba Milling Co. ground barite at Emeryville. Heafey Moore Co. Division, Gallagher & Burke, Inc., produced stone for construction purposes at the Leona quarry, Oakland. San Leandro Rock Co. quarried traprock at San Leandro, and Henry J. Kaiser Co. produced sand, gravel, and crushed rock at Radum. Leslie Salt Co. and Niles Quarry Co. quarried stone (red rock), at Newark and Niles, respectively, for riprap. Pacific Coast Aggregates, Inc., crushed stone and produced sand and gravel for concrete at its Pleasanton plant 104 and Centerville plant 106. Other commercial producers of sand and gravel were: Bell Sand & Gravel, Irvington; California Rock & Gravel Co., Livermore; Henry J. Kaiser Co., Niles; and Rhodes & Jamieson, Inc., Centerville.

ALPINE

Hope Valley District.—Carson Tungsten Co. worked the Valpine mine in 1952 and recovered 8 tons of scheelite concentrate, containing 507 units of WO_3, from 2,576 tons of ore milled in Nevada. R. D. Morris shipped scheelite concentrate produced from Alpine mine ore.

Monitor (Mogul) District.—Anaconda Copper Mining Co. prepared the Leviathan sulfur mine for production in 1952. According to the company report, "Expenditures in 1952 for construction, development, etc., amounted to $13,381,909, increasing total at December 31, 1952 to $16,240,649."

AMADOR

Cosumnes River District.—Lorentz & Swingle dredged the Lorentz mine gravel, 7 miles northeast of Plymouth, with a 1¼-cubic-yard dragline excavator and a gasoline-powered Bodinson floating washing plant. Gold and silver were produced.

East Belt District.—Garibaldi Bros. worked the Garibaldi mine gravel on Pioneer and Sutter Creeks with dragline and trommel; 60 ounces of gold and 9 ounces of silver were recovered from 8,000 cubic yards of gravel washed.

Mokelumne River (Lancha Plana, Camanche) District.—Humacid Co. operated a plant near Camanche, designed for wax extraction, on lignite mined south of Lancha Plana for a short period in 1952. Glenn Modrell recovered gold and silver, using a dragline dredge, on the Brown property east of Camanche.

Mother Lode District.—Central Eureka Mining Co. operated the Old Eureka mine throughout 1952. Gold and silver were recovered by amalgamation and cyanidation from 28,200 tons of ore milled at the company 250-ton plant. Martin Ares worked the Keystone mine and produced gold and silver from 60 tons of ore amalgamated at the Centennial mill in Calaveras County.

West Belt (Ione) District.—Deposits of high-grade fire clay in the Ione area, one of the State's important sources of that material, were worked by Western Refractories Co., Pacific Clay Products, and Gladding McBean & Co. in 1952. Calaveras Cement Co. produced kaolin used in white portland cement prepared at its Calaveras County cement plant. Gladding McBean & Co., with Owens Illinois Glass Co., operated a pilot plant designed to separate Ione clays and silica sand. American Lignite Products Co. operated a lignite strip mine near Ione and processed the coal near Buena Vista, extracting principally montan wax and some natural iron oxide-pigment materials. The Copper Hill mine east of Plymouth was explored for copper ore.

BUTTE

Mathews Ready Mix produced sand and gravel at Gridley. Natural gas was produced also in Butte County.

Butte Creek (Nimshew) District.—Thurman & Wright operated its dredge No. 3, an electric Bodinson floating washing plant and 5-cubic-yard power shovel, on the contiguous McLain, Statham Skillen, McEnespy, and Clark properties, terminating dredging December 12, 1952. Gold, silver, and crude platinum were recovered. Butte Creek Rock Co. operated a commercial rock crusher and sand plant

on dredged ground near Chico and recovered some byproduct gold and silver. C. E. Wager developed auriferous gravel in the Kelly Hill drift mine and suspended operation March 1, 1952. Ready Mix Concrete Co. produced sand and gravel at Chico.

Magalia District.—Helmke, Thomas & Janssen shipped 1,275 long tons of refractory-grade chromite ore from the Lambert mine. In addition, 70 long tons of chromite concentrate averaging 43 percent Cr_2O_3 recovered at the mine pilot mill was consigned to the Grants Pass Depot.

Merrimac District.—Harry Dawes recovered 1 ounce of gold from 75 cubic yards of gravel sluiced at the Success mine.

Oroville District.—Yuba Consolidated Gold Fields operated its electric bucketline dredge, with eighty-four 9-cubic-foot buckets, on land adjoining the Feather River. Operation closed November 7, 1952. Gold and silver were recovered. Henry J. Kaiser Corp. produced sand, gravel, and crushed stone at its Adelaide plant.

Yankee Hill District.—I. S. Perkins recovered gold from gravel sluiced at the New Era mine on Dry Creek. Pentz Gravel produced sand and gravel at Pentz.

CALAVERAS

Calaveras Cement Co., the largest industrial enterprise in the county, operated its enlarged plant (from 1 million to 3 million barrels annually) throughout 1952; limestone and shale were quarried at the company No. 4 pit in the East belt and trucked to the plant west of the Mother Lode at Kentucky House. Neilsen Sand & Gravel Co. produced sand and gravel at San Andreas.

East Belt District.—Mid-State Dredging Co. recovered gold and silver from the Tobia Granitta ranch gravel by dragline dredging. Bon Ton Mining Co. shipped gold ore to a smelter from the Bower mine.

Mother Lode District.—Gold Bar Mining Co. worked gravel at the Altaville drift mine and recovered gold and silver. Calaveras Central Gold Mining Co., Ltd., recovered some gold and silver from gravel moved at the Calaveras Central drift mine in the course of development.

West Belt (Campo Seco) District.—Penn Chemical Co. and its successor, New Penn Mines, Inc., together milled 28,400 tons of zinc ore at the Penn mine enlarged 250-ton flotation mill. Zinc concentrate, containing recoverable gold, silver, copper, lead, and cadmium; copper concentrate, containing recoverable gold, silver, and lead; and gold jig concentrate, containing recoverable silver, copper, and lead, were shipped to smelters. The milled ore also yielded some free gold. Mine water treated yielded copper precipitate, which was shipped to a smelter. Mountain Gold Dredging Co. produced gold and silver from 131,282 cubic yards of gravel on the McCarty property, using a dragline with 2-cubic-yard bucket and a diesel-Bodinson floating washing plant. Pacific Clay Products and California Pottery Co. shipped fire clay from pits at Valley Springs. W. D. Warren pumice plant shipped crude pumice from the Warren mine near Burson.

COLUSA

Sand and gravel were produced at Colusa by Paul Entremont, Cortina Sand Gravel & Silt, and C. B. & D. O. McKasson.

CONTRA COSTA

Contra Costa County continued to be the center of petroleum refining in northern California, and natural gas was withdrawn from county fields. The State's only smelter treating principally nonferrous primary materials—the Selby lead plant and gold-silver refinery of the American Smelting & Refining Co. at Selby—received gold bullion, ores, concentrates, and secondary nonferrous materials from California, seven other Western States, and Alaska, but the operation was chiefly based on ores and concentrates from South America, Central America, Asia, and the Antipodes. One of California's principal steel plants is situated at Pittsburg and was operated by Columbia-Geneva Steel Division, United States Steel Corp. General Chemical Division, Allied Chemical & Dye Corp., and Stauffer Chemical Co. manufactured sulfuric acid at Nichols and Stege, respectively, from Shasta County pyrite. Mountain Copper Co., Ltd., produced copper salts at Mococo, largely from scrap material. Demolition of the Cowell Portland Cement Co. plant, inactive owing to depletion of local raw materials, was in progress. Shale was quarried by the Port Costa brick works at Port Costa and by United Materials & Richmond Brick Co., Ltd., at Richmond. Peat was dug on Bethel Island by Pacific Natural Products Co. Serra Bros. quarried sandstone at Pacheco, Blake Bros. produced blue traprock at its San Pablo quarry, and Henry J. Kaiser Corp. quarried basalt for concrete at Antioch and Upton. American Perlite Corp. expanded crude perlite at Richmond. At Antioch building sand was produced by Basalt Rock Co., Inc., and Morris sand pit and Marchio Silica Sand Co. prepared molding sand.

Mount Diablo District.—Ronnie Smith produced mercury from the Mount Diablo-mine ore in 1952. A 40-ton rotary furnace was operated.

DEL NORTE

Marlin Tryon produced sand and gravel at Fort Dick, and Stimson Logging Co. prepared road gravel at Klamath.

French Hill District.—J & W Mining Co. shipped chromite ore from the French Hill (Tyson) mine to the Government Purchase Depot at Grants Pass, Oreg.

Clear Creek District.—C. H. McClendon worked the Buckskin and Fourth of July claims and shipped chromite concentrate with a chromium-iron ratio of 2 : 1 and averaging 43 percent Cr_2O_3 to the Grants Pass Depot.

Low Divide District.—W. B. Barton Chrome Co. and Harold Funk operated the Barton (Old Doe) mine. Shipments of chromite ore were made to the Grants Pass, Oreg., Government Purchase Depot. Alta Copper Co., Inc., formerly the Alta Mining Co., developed the Alta (Alta California) mine copper ore in 1952.

High Plateau District.—Eugene R. Brown, operator of the High Plateau mine and California's third largest producer of chromite in

terms of quantity and second largest in value in 1952, shipped ore averaging 52 percent Cr_2O_3 and a chromium-iron ratio exceeding 3.1 : 1. Other chromite mines worked included the Bonanza and Paday.

Patrick Creek District.—Holliday Mines, Inc., shipped a substantial quantity of chromite ore from the Holliday mine to the Grants Pass stockpile; the ore averaged 47.9 percent Cr_2O_3 and a chromium-iron ratio of 2.9 : 1. Production also was reported from the Elk Camp mine and Chrome Hill No. 1 claim in 1952. David L. Webb recovered 1 flask of free mercury by panning at his Patrick Creek claim.

Smith River District.—Tyson Mining Co. operated the Mountain View mine, and Ted Webb worked the Higgins Copper property in 1952; chromite ore produced was shipped to the Grants Pass, Oreg., Government Purchase Depot. A small output of chromite ore was reported from the Hollywood mine.

EL DORADO

East Belt District.—Hazel Creek Mining Corp. worked the Hazel Creek mine in 1952 and recovered gold and silver by amalgamation at the company 30-ton mill. Flotation concentrates shipped to a smelter yielded substantial quantities of gold and silver and some lead. T. C. Nutt quarry and R. C. Young produced rhyolite for building stone.

Mother Lode District.—Volo Mining Co. recovered gold and silver by cyaniding Shaw mine ore in 1952. Ellis B. Matherly operated a suction dredge in auriferous gravel near Lotus; gold and some silver were produced. Diamond Springs Lime Corp. produced lime at Diamond Springs from company-quarried limestone and shipped crushed limestone principally for construction. Kelsey Slate Co. quarried slate for flagging and filler material.

Rattlesnake District.—The Allied Mining Co. shipped chromite ore to the Grants Pass, Oreg., Government Purchase Depot, from the Pilliken mine. The ore averaged 48.2 percent Cr_2O_3, with a chromium-iron ratio of 2.7 : 1. A new gravity mill was under construction.

West Belt District.—Clark Bros. produced gold and silver from the Pine Knoll (Clark Bros.) pocket mine by amalgamation in 1952. Young & Runkle sluiced the Margaret D. mine gravel and recovered some gold and silver. Calivada Development Co. developed the El Dorado Copper mine in 1952. A 125-ton flotation mill designed to concentrate the copper ore was under construction.

The El Dorado Limestone Co. mined low-magnesium limestone, largely chemical and metallurgical grades by underground methods near Shingle Springs. Hughes Vertin Lime Co. calcined limestone from the California Rock & Gravel Co. quarry near Cool and produced quicklime, largely for use in steel; this quarry also shipped chemical-grade limestone and building stone. Soapstone and slate quarried near Shingle Springs by Pacific Minerals Co., Ltd., were shipped to grinding plants. Central Rock & Sand Co. produced sand and gravel, and Erwin Goltz prepared building sand.

FRESNO

Superior Academy Granite Co. produced granite at Academy for rough and dressed dimension stone. Crushed stone, sand, and gravel were produced by Herndon Rock Products at Herndon. The Atchison

Topeka & Santa Fe Railway Co. prepared gravel at Oakhurst and crushed stone at Piedra. Fresno County's chief mineral production continued to be petroleum and natural gas. Craycroft Brick Co. produced common clay near Fresno. Gypsum for improving soil was mined by Edward Jones in the Panoche Hills and by Agricultural Mineral & Fertilizer Co. in Little Panoche Valley. Activity in the Fresno County high-Sierra tungsten-bearing tactite zones was moderate. The Garnet Dike mine, 68 miles northeast of Fresno in the Kings River Canyon, was fourth largest producer of tungsten concentrates in California in 1952; it produced a substantial tonnage of tungsten ore averaging 0.65 percent WO_3. Production of 3 tons of tungsten concentrate containing 185 units of WO_3 was reported from the Garnet mine on Dinkey Creek. E. A. McMurtry shipped scheelite concentrate produced from ore mined at the Alfred Benson ranch on Sycamore Creek, 10 miles southeast of Toll House.

Coalinga District.—West Coast Chrome Producers shipped chromite ore averaging 47 percent Cr_2O_3 to the Grants Pass, Oreg., Depot from the James-Thickstun No. 1 claim. L. D. Folsom produced sand and gravel.

Friant District.—Adobe Mining Co. operated its suction dredge with 16-inch centrifugal pump on the San Joaquin River from December 1951 to June 1952 and produced 148 ounces of gold and 27 ounces of silver from 72,000 cubic yards of gravel washed. Pacific Coast Aggregates, Inc., and Anderson rock plant prepared sand and gravel and recovered some byproduct gold and silver. California Industrial Minerals Co. milled pumice mined in Madera County.

Idria District.—Mercury was produced at the Archer mine.

Kings River District.—Central Rock & Sand Co. prepared sand and gravel for concrete aggregate 3 miles east of Sanger, and some gold and silver was recovered in the sand launders. Pine Flat Contractors and Sanger Rock & Gravel produced sand and gravel and H. L. Wolfe crushed miscellaneous stone.

GLENN

Orland Sand & Gravel Co. produced sand and gravel at Orland. Gravel was prepared by Madsen and Wade and W. J. Rabbit at Willows and by the Southern Pacific Co. at Wyo. Natural gas was produced in Glenn County.

HUMBOLDT

Frederickson Bros. produced crushed stone at its Alton pit. Hindley Clay Products dug common clay for its plant use at Eureka. Sand and gravel were produced by Eureka Sand & Gravel Co., Eureka; Mercer Frazer Co., Inc., Arcata and Fortuna; Kelly and McWhorter, Fortuna; and Mad River Sand & Gravel Co., Arcata. Natural gas was produced in the county also.

IMPERIAL

Carbon dioxide gas extensively used in the manufacture of "dry ice," was withdrawn from the Salton Sea carbon dioxide gas field in 1952 by Cardox Western, Inc. The Imperial Irrigation District pro-

duced noncommercial crushed granite at Androde and Mount Signal. Superlite Products Corp. shipped prepared pumice from its Obsidian Butte deposit near Calipatria. The Valley Transit Cement Co. produced sand and gravel at El Centro.

Cargo Muchacho District.—Holmestake Mining Co. shipped 1,084 tons of siliceous ore containing 402 ounces of gold and 163 ounces of silver to an Arizona copper smelter. Milling of Arizona fluorspar was planned, and the property also was explored for tungsten ore in 1952. La Colorado mine was prospected for tungsten, and development ore treated at the American Girl mill yielded gold and silver.

Fish Creek Mountain District.—Pan Chemical Co. utilized a small tonnage of strontium ore for use at its own plant. United States Gypsum Co., largest producers of gypsum in California in 1952, worked its Fish Creek Mountain quarry; the gypsum was calcined at the company plant.

Paymaster District.—L. Mills Beam operated the Pioneer mine and shipped manganese ore averaging 37 percent manganese to the General Services Administration Stockpile.

INYO

Sierra Talc & Clay Co. produced talc from the following mines: Frisco, Saline, Talc City, and Trinity (near Keeler) and Tecopa. The company operated a grinding plant equipped with a micronizer mill at Keeler. Kennedy Minerals Co. worked the Eclipse talc mine west of Tecopa, the Death Valley mine, and the Lone Springs mine. Wm. & Bernice Bonham shipped talc from the Alberta, Florence, Trinity, and White Mountain properties, all in the vicinity of Keeler; Louise Grantham & Associates mined talc at the Warm Springs mine near Shoshone, and Multi Mines produced sheridanite from the Gates property. Ray Harliss shipped talc from the Eureka mine in the Big Pine district. Other producers of talc included: G. W. Koest (Alliance) and Poling & Knight (Silver Dollar) at Darwin and Delbert Leonard (Mass Talc) at Keeler. Fuller's earth was produced by Calearth Inc., Ltd., and Industrial Minerals & Chemical Co. at Olancha. Silicates Corp. and Multi Mines, Inc., shipped bentonite from Death Valley. Huntley Industrial Minerals Co. operated two 5-roller, high-side, Raymond mills at Laws and ground white clay and pyrophyllite. That company also ground talc at its Blue Star mill at Zurich. Columbia-Southern Chemical Corp., Pittsburgh Plate Glass Co., produced borax and natural sodium carbonates at Bartlett, and United States Borax Co. produced colemanite (natural calcium borate) near Shoshone. Natural Sodium Products Co. extracted natural sodium carbonates from lake brines at Keeler; the operation was discontinued June 1952. Tungsten production was reported from the Furnace Creek area of Death Valley by California Tungsten Mining & Milling Co. and by R. S. Dahl, who worked the High Noon mine. Output of the latter property was 830 pounds of scheelite concentrate containing 28 units of WO_3 from 4 tons of high-grade ore. Diatomite mined by the Hazen Mining Co. near Zurich was ground at the Blue Star mill. Crownite Corp. and H. B. Jarvis shipped volcanic cinder from Red Cinder Mountain in Rose Valley, and Western Talc Co. produced volcanic ash one-quarter mile south

of Shoshone. F. Dumontier and S. Skartredt explored the Indian Camp chrysotile asbestos deposit in the Gold Belt Springs area. Sulfur was shipped from the Last Chance Range by the Inyo Soil Sulphur Co. (Crater mine) and Mrs. G. L. Ott (Fraction No. 1 mine).

Bishop District.—The United States Vanadium Co., a division of Union Carbide & Carbon Corp., worked the Pine Creek mine during 1952. This operation was the leading producer of tungsten and contributed the entire State molybdenum output. In addition, copper concentrate containing gold and a substantial quantity of silver was shipped to a smelter. The company 1,000-ton flotation mill did custom milling of tungsten ore, and the chemical plant accepted low-grade tungsten concentrates for upgrading. Incidentally, this plant which employs pressure digestion in an autoclave followed by precipitation had a virtual monopoly in re-treatment of western low-grade domestic scheelite. The following mines, with operators in parentheses, contributed to the district tungsten output: The Tungsten Blue or Shamrock (Don Burgner), Lime Rock No. 1 (Geo. S. Kerr); Round Valley (Pinnacle Tungsten Co.), Hanging Valley or J & M (Tungstar Hanging Valley Mining Co.), Brownstone group (Brownstone Mining Co.), Valley (Ray & L. B. McMurray), Tip Top (F. J. Penny & Walter Thomas), Moonlight (J. L. Peters), Rossi (Frank Phillips), Scheelite Hope (Hedgecock & Lasley), Tungsten City—the Little Sister (Elmer Lovelace), Tungsten Hill (Sterling Carter), White Mountain (V. W. Eldred), Morning Glory (Morning Glory Mining Co.), Shannon Creek or Buckshot (Shannon Creek Mining Co.), Black Monster (Joe Bracket), L & L (Lester Brown), Coyote (Coyote Mining Co.), and Santa Claus (Ray Harvey). The El Diablo Mining Co. operated a custom mill, largely on Bishop district tungsten ore.

Cerro Gordo (Swansea) District.—E. P. Aseltine shipped oxidized zinc ore containing lead and silver to a Utah fuming plant from the Leary mine. Victor Lani shipped 15 tons of ore containing 0.17 ounce of gold, 182 ounces of silver, 1,991 pounds of lead, and 2,500 pounds of zinc to a Utah custom mill from the Pennsylvania mine.

Chloride Cliff District.—P. L. Harris operated the Black Iron mine and shipped 50 tons of ore containing 92 ounces of gold and 70 ounces of silver to a smelter. Michael Harris shipped gold ore from the Keane Wonder Extension mine to a smelter.

Confidence District.—Lowell V. Crawford developed the Patty's Pride mine near Ibex Pass, and ore containing gold, silver, copper, lead, and zinc was shipped to a lead smelter.

Coso District.—Anaconda Copper Mining Co. operated the Darwin group, leading producer of California zinc, lead, and silver in 1952 and a contributor of gold, copper, and recoverable cadmium. Zinc-lead ore was concentrated at the company 435-ton oxide-sulfide flotation mill; the zinc concentrate and lead concentrate produced were shipped to smelters. Lead ore containing recoverable zinc was shipped direct to a lead smelter-fuming plant. Miller & Warnken operated the Fernando mine and mill; scheelite concentrate was shipped.

Deep Springs District.—A. A. Goehring worked the Kilroy tungsten claim and shipped concentrates which averaged 65.7 percent WO_3.

H. N. Scott developed the Valley View group scheelite and wolframite ores and produced some tungsten concentrate.

Fish Springs District.—United States Mining Co. quarried crude perlite 7 miles south of Big Pine.

Independence (Russ) District.—Reward Mining & Milling Co. et al. worked the Reward mine. Gold-silver ore milled at a custom plant yielded lead concentrate. Some lots of copper ore and lead ore were direct smelted. T. L. Bright shipped ore containing silver and copper to a smelter from the Silver Bar claim. Frank Libel and Louis Monette shipped 529 tons of scheelite ore from the Amup mine to a Kern County custom mill.

Lee District.—Glenn & Soderlund shipped 44 tons of ore containing 1.54 ounces of gold, 3,953 ounces of silver, 396 pounds of copper, 1,321 pounds of lead, and 20,038 pounds of zinc from the Silver Reid group to a smelter-fuming plant. The Santa Rosa lead mine, leased and optioned by Anaconda Copper Mining Co., was explored in 1952.

LeMoyne District.—W. V. Skinner operated the LeMoyne mine and shipped 199 tons of ore containing 2 ounces of gold, 329 ounces of silver, 100 pounds of copper, and 69,200 pounds of lead for direct smelting.

Modoc District.—Foreman & Foreman developed the Defense mine and shipped 474 tons of lead ore to a smelter. Finley & Vignich shipped 347 tons of lead ore from the Minnietta mine to a smelter. The American Smelting & Refining Co. acquired the property in 1952 and pursued exploration.

Resting Springs District.—Anaconda Copper Mining Co. Shoshone group, second largest producer of California lead and silver and an important contributor of gold and recoverable zinc, was operated throughout the year. Lead ore was milled at the company 100-ton flotation mill until June 10, 1952, and the mine was on development basis for the rest of the year. Lead concentrate and lead ore were shipped to a smelter-fuming plant.

Slate Range District.—Roy Argo produced lead ore at the Lilly No. 2 claim. Selected zinc-lead dump ore from the Ophir mine was shipped to a smelter-fuming plant. W. A. Fritz operated the Stockwell mine in 1952. Gold and silver were recovered at the company 25-ton mill by the carbon-adsorption cyanidation process. Gold concentrate containing silver and copper was shipped for direct smelting, as was gold ore containing silver, copper, and lead. One lot of gold ore was cyanided at a custom mill.

South Park District.—Foster, Kinkhead & Carter shipped lead ore containing gold and silver from the Doodle Bug group. Harry E. Briggs developed the Red Cloud mine zinc-lead ore.

Ubehebe District.—Hinds, Mix & Hageman, lessees, consigned 39 tons of ore containing 0.59 ounce of gold, 153 ounces of silver, 35 pounds of copper, 9,695 pounds of lead, and 9,695 pounds of zinc to a smelter-fuming plant from the Ubehebe Lead mine. Lippincott Lead Mines worked the Lippincott (Lead King) mine; lead ore containing silver was reduced at the company smelter near Bonnie Clare, Nev. The base bullion was consumed at a battery plant.

Wildrose District.—Woody J. Lorenz shipped 137 tons of ore containing 2 ounces of gold, 400 ounces of silver, 244 pounds of copper, 37,452 pounds of lead, and 32,073 pounds of zinc from the Big Four

mine to a smelter-fuming plant. Aguerreberry & Bennett recovered gold and silver by amalgamating Independent (Cashier) (Aguerreberry) mine ore. Bennett & Smith amalgamated Skidoo-mine gold ore.

KERN COUNTY

The principal minerals produced in Kern County in 1952 were petroleum and natural gas.

American Minerals Co. shipped kaolin from its pit 8 miles west of Cantil. Miscellaneous clay for rotary-drilling mud was produced by McKittrick Mud Co. near McKittrick and by Macco Corp. 12 miles east of Rosamond. Mojave Corp. and Kernco Materials Co. worked Muroc Lake silt deposits for use in drilling mud. Excel Mineral Co. produced fuller's earth in the Taft area. Pacific Coast Borax Co. mined tincal (borax) and kernite (rasorite), a sodium borate, at its Boron mine. Monolith Portland Cement Co. operated its cement plant at Monolith and produced limestone for the mill 3 miles east of Monolith. The plant suffered moderate damage in the 1952 earthquake. The following produced gypsum for soil conditioning: C. L. Fannin, 4 miles north of Lost Hills; Western Gypsum Co., Belridge deposit; H. M. Holloway, Lost Hills mine; J. R. Canady, Daly deposit, Koehn Lake; and Roberts Farms Gypsum mines, Lost Hills. Long Beach Salt Co. recovered salt by solar evaporation at Dry Salt Lake, 6 miles northeast of Cantil. Calsilco Corp. shipped prepared volcanic ash from its deposit 10 miles northeast of Cantil. Agate was produced in the Mojave Desert region.

Agua Caliente District.—Antimony ore was produced by Maurice Van Cantfort at the Bingo mine and by Davies & Garahan, who operated the Antimony Queen mine. The ore was concentrated at Mojave.

Clear Creek (Havilah) District.—Seager & Hilton produced 17 tons of scheelite ore from the Tungsten V mine. Tungsten King mines milled 72 tons of Tungsten King mine ore which averaged 0.375 percent WO_3. Johnson & Seward milled Tungsten Hill mine dump ore. Isabella Mines milled 723 tons of Tungsten Hill No. 1 mine scheelite ore. M. J. Gustey operated a custom mill on tungsten ore at Havilah.

Greenhorn Mountain District.—John S. Hitchcock produced scheelite concentrate from Butte (Hillside) mine ore which averaged 0.65 percent WO_3.

Indian Wells District.—California Tungsten shipped scheelite ore to a custom mill from the Triangle mine near Inyokern. R. A. Edwards produced 5 tons of tungsten ore averaging 0.62 percent WO_3 from the Snow White No. 1 claim.

Kern River District.—C & H Materials Co. and Hartman Concrete Materials Co. prepared sand and gravel and recovered gold and silver incidental to the operations. Griffith Co. and Kern Rock Co., Ltd., produced concrete aggregate.

Keyes (Bodfish) (Isabella) District.—Herman Kutzner and Charles Fluheart shipped 4½ tons of scheelite ore averaging 0.72 percent WO_3 to a custom mill from the Easter mine south of Bodfish. R. W. Copland shipped 88 tons of tungsten ore averaging 0.54 percent WO_3 to a custom mill from the Trojan (Pappy claims) mine.

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Mojave District.—Burton Bros. operated the Tropico cyanide mill principally on gold ore from the Tropico mine and Cactus Queen mine both worked by Burton Mines, Inc., and lessees. Some lots of gold ore and gold-silver ore from Mojave district mines treated on a custom basis included the output of the Standard mine (E. B. Blickenstaff) and Whitmore mine (Red Ink Mining Co.). N. W. Sweetser et al. shipped 4,883 tons of fluxing ore containing gold, silver, and some copper from the Golden Queen group to a smelter. Margaret Wegmann worked the Wegmann group and shipped 14 tons of high-grade silver ore containing gold and lead to a smelter. Mojave Mining & Milling Co. operated a custom mill and produced lead, antimony, and tungsten concentrates. Occurrences of radioactive minerals 4½ miles north of Willow Springs were studied.

Randsburg (Stringer) District.—King Solomon lease amalgamated Yellow Aster mine ore and Nine Spot mine dump ore at the King Solomon mill; gold and silver were recovered. In addition Nine Spot mine auriferous gravel was worked by dry-placering methods. L. C. Bills washed Jim-Tom mine gravel, which yielded gold and silver. He also produced tungsten concentrate at the Ada R. claim. L. J. Sain produced 500 pounds of scheelite concentrate averaging 61 percent WO_3 from 49 tons of Bluebird mine ore. Stryker & Harrel produced 2 tons of scheelite concentrate containing 129 units of WO_3 from 80 tons of Barbara Diana (Nine Spot) mine ore milled. Borawa Mines, Inc., shipped tungsten ore to a custom mill but subsequently closed down the mine. Broken Hills Mining & Milling Co. shipped tungsten ore to a Mojave custom mill.

Sageland District.—White Eagle Tungsten Mining Co. opened the Weldon Meadow mine in 1952 and produced some scheelite concentrate. Sageland Mining & Milling Co. developed the High Enough and Jumper tungsten claims and prepared its concentrating mill near Nicolls Peak for production.

KINGS

Thompson Materials Construction Co., Inc., produced sand and gravel near Avenal for construction purposes. Gypsum for soil conditioning was quarried in the Kettleman Plain area by H. M. Holloway at the Avenal Gap mine and by McPhaill Gypsum Co. Petroleum and natural gas were produced.

LAKE

Chemi-Cal Corp. developed the Canary Hill sulfur deposit in the Chalk Mountain area. Lange Bros. sand and gravel plant produced sand and gravel at Kelseyville.

Lower Lake District.—Consolidated Manganese Corp. shipped ferruginous manganese ore averaging 18 percent manganese to a Utah steel mill.

Sulphur District.—California Quicksilver Mines, Inc., worked the Abbott mine and produced 598 flasks of quicksilver from 3,919 tons of ore treated. A Gould-type, 40-ton, rotary furnace and 2 "D" retorts to handle condenser mud were operated. This mine was the third most productive in California in 1952.

LASSEN

At Susanville, J. B. Wegender operated the Greig granite quarry for dimension stone, and Grayson Concrete Materials produced sand and gravel.

LOS ANGELES

Los Angeles County was the largest producer and consumer of minerals in California. Petroleum and natural gas provided the major portion of the mineral output.

Sun Valley Tungsten concentrated tungsten ore at Sun Valley, and Midwest Milling Co. operated a custom mill on tungsten ore at Los Nietos. Wright & Johnston produced ilmenite-iron oxide from sands near Hermosa Beach for use in roofing material. Gladding McBean & Co. produced miscellaneous clays at its Harrison (Pico) and Los Angeles—Santa Monica pits. Others who reported clay output were: Atlas Sewer Pipe Co., Whittier; J. C. Booth, Pacific Brick Co., Santa Monica; Builders Brick Co., Higgins Brick & Tile Co., Moneta; Davidson Brick Co., Atkinson Brick Co., Simmons Brick Co., Los Angeles; Pomona Brick Co., Pomona; Castaic Brick Co., Castaic; Angulo Tile Co., San Vallee Tile Kilns, Reseda; Valley Brick & Supply Co., Van Nuys; and Pacific Clay Products Co., Los Nietos. Soapstone was produced by L. H. Katz near Acton. Talc-clay grinding and blending plants were operated in the Los Angeles area by Western Talc Co., American Minerals Co., Kennedy Minerals Co., Inc., Southern California Minerals Co., and Sierra Talc & Clay Co. Blue Diamond Corp. manufactured portland cement from purchased clinker at its Los Angeles grinding plant. Great Lakes Carbon Corp. quarried and prepared diatomite at Walteria in the Palos Verdes Hills. Pan Chemical Co. prepared strontium carbonate from Imperial County strontium ore. Byproduct sulfur was produced by the Wilshire Oil Co., Inc., at Norwalk and by Hancock Chemical Co. at Watson Station. H. A. Jones quarried biotite schist for flagstone and building use at his Bouquet mine near Saugus. Hanawalts quarried granite and prepared aggregate material at LaVerne and Graham Bros. crushed stone at the Empire quarry on Santa Catalina Island. Companies that supplied sand and gravel for the expanded building industry included: The Arrow Rock Co. and Blue Diamond Corp., each with plants at Monrovia and Roscoe; Richard Ball, Walteria; W. T. Bonfield, Laurel Canyon quarry; California Materials Co., Sun Valley and Monrovia plants; Chandler Sand & Gravel, Lomita; City Rock Co., Sunland; Connolly-Pacific Co., Pebble Beach plant; Consolidated Rock Products Co., Largo, Irwindale, Roscoe, Sierra, Hewitt, and Claremont plants; Gordon Transfer Co., El Segundo; Graham Bros. Inc., Monrovia; the Granite Materials Co., Roscoe plant; Lindauer Corp., LaHabra; Livingston Rock & Gravel Co., Rolling Hills plant; Los Angeles Decomposed Granite Co., Montebello quarry; Manning Bros. Rock & Sand Co., Irwindale plant; MacArthur & Son, Palmdale; Miller Bros. Trucking Co., Huntington Park; Osborn Co., Pasadena; Owl Rock Products Co., Monrovia; Pacific Rock & Gravel Co., Monrovia plant; Edward Sidebotham & Son, Inc., Lomita; and Sierra Rock Products Co., Monrovia. Pabco Products, Inc., calcined gypsum quarried in Nevada at South Gate. Iodine was produced by Deepwater Chemical Co., Ltd., at Compton and by

Great Western Division, Dow Chemical Co., at Long Beach and Venice. Perlite-expanding plants were operated in the Los Angeles area by Great Lakes Carbon Corp. (plant closed March 1952), Panacalite Pacific, Inc., United States Perlite Manufacturing Co., Paramount Perlite Co., Redco, Inc., and Peerless Perlite Co.

Neenach District.—Newa Mining Corp. shipped gold ore from the Rogers-Gentry mine to a custom-cyanide mill.

San Gabriel District.—Azusa Rock & Sand Co. prepared sand and gravel and San Gabriel Valley Placers recovered gold and silver incidentally at the aggregate plant.

MADERA

Natural gas was withdrawn from County fields.

Chowchilla River District.—Howell Bros. operated a 12-inch suction dredge 5 miles northwest of Raymond on the Buchannan property; gold and silver were recovered. W. R. Phelps dredged the Wood property, using suction equipment. Cy Perkinson concrete supplier and San Joaquin Valley Pipe Co. produced sand for aggregate at Chowchilla.

Fresno River District.—D. J. Yearout recovered 32 ounces of gold and 9 ounces of silver from 4,000 cubic yards of gravel on the Heiskell property; an 8-inch suction dredge was operated. R. C. Jordan worked Parker Ranch gravel with a 10-inch suction dredge; 8,000 cubic yards of gravel yielded 72 ounces of gold and 16 ounces of silver. Elmer Holiday operated a suction dredge on the Casaurang property. Valley Feed & Fuel Co. produced building sand at Madera.

Friant District.—Elmer Erickson produced crude pumice for preparing bricks at the Erickson mine. California Industrial Minerals Co. produced pumice at the Taylor mine.

Jackass District.—Strawberry Tungsten Mines, Inc., third largest producer of tungsten concentrates in California in 1952, produced tungsten concentrate from Strawberry mine ore that averaged 0.63 percent WO_3.

Potter Ridge District.—F. Gilman Low amalgamated New Deal mine ore and recovered gold and silver. The mine was closed August 1, 1952.

West Belt (Daulton) District.—H. J. Buchenau operated the Jesse Belle mine and 50-ton flotation mill. Copper concentrate containing some gold and silver was shipped to a smelter.

MARIN

L. P. McNear Brick Co. produced weathered shale for use at its brick plant, and McNear Brick Co. utilized unweathered shale for lightweight aggregate at McNear. Hutchinson Co. crushed sandstone at its Greenbrae quarry. Basalt Rock Co., Inc., produced crushed stone at McNear. Perolite Products Co. expanded perlite at Sausalito.

MARIPOSA

East Belt District.—The Glenn Co., successor to Glenn-Steintorff, worked the Marble Springs mine near Bower Cave. Gold and silver were recovered by amalgamation; flotation concentrates shipped to a

smelter yielded gold, silver, lead, and some copper. Joseph Dupret amalgamated gold ore from the Horseshoe mine and Schroeder Mines operated the Schroeder group of gold claims. Midlands Mining Co. developed the Blue Star tungsten mine near El Portal.

Mother Lode District.—Frank E. Gallagher operated the Mariposa mine at Mariposa and recovered gold and silver by amalgamation. Gold and silver were recovered by amalgamating ore from several small mines, including: The Cal-Penn-Tex group, Eureka, Fortuna-Esperanza-Cube group, Lucky Boy, Margaret, Nelly Kaho, Specimen group, and Texas Gulch. Placer gold and silver were produced by prospectors. Mariposa Sand & Gravel Co. and Wm. Sayre produced sand and gravel on Mariposa Creek.

West Belt District.—Soapstone was shipped by F. Ewing from a deposit 5 miles west of Mariposa. Gold and silver were recovered from gravels by itinerant producers. Kaiser Aluminum & Chemical Corp. quarried silica rock at its White Rock quarry for ferrosilicon manufacture.

MENDOCINO

C. A. Haun Gravel Co. prepared sand and gravel at Willits on Center Valley Road. Ukiah Gravel & Cement Co. and Walsh & Ford produced sand and gravel at Ukiah. Cal Dri Ice Corp. produced "dry ice" from natural carbon dioxide at Hopland. A small quantity of jade was produced.

MERCED

Agricultural Minerals and Fertilizer Co. quarried gypsum at the Ortigalita Creek deposit. Sand and gravel were produced by Los Banos Gravel Co., Los Banos, and Merced Sand & Gravel Co., Winton.

LeGrand District.—Some gold and silver were recovered at the Hanner Bros. (LeGrand Sand & Gravel) commercial sand and gravel plant on Mariposa Creek.

Merced River District.—Snelling Gold Dredging Co. operated its Yuba bucketline dredge with 7-cubic-foot buckets near Snelling and recovered gold and silver. The operation ceased January 17, 1952. Turlock Rock Co. produced sand and gravel near Ballico.

MODOC

Modoc Peat Moss Co. dug peat from beds at Likely. Pumice was produced in the Glass Mountain area by Rod Gordenker, C. W. Jesky, and Glass Mountain Brick Co. U. S. Pumice Supply Co. operated a pumice plant at Newell to process company crude output from Siskiyou County. The Great Northern Railway Co. prepared stone for railway ballast at Mammoth and Malin.

High-Grade District.—Klondyke Mining & Milling Co. shipped direct-smelting gold ore containing silver. Sunset Mining Co. recovered gold and silver by amalgamating Yellow Jacket mine ore. Moonlight Mines Oregon, Ltd. gold property was active.

Winters District.—A. K. Wylie shipped direct-smelting ore from the Lost Cabin (Hess) mine, which yielded gold and silver.

MONO

Huntley Industrial Minerals Co. produced kaolin used in paints, rubber, and stucco near Casa Diablo. The Black Rock Mining Corp., Black Rock tungsten mine, in Black Rock Canyon 7½ miles south of Benton, was productive. Blue Ridge Midway Gold Mines Co., Ltd., worked the Hilton Creek tungsten mine on Hilton Creek northeast of Bishop and shipped 1,588 tons of scheelite ore averaging 0.53 percent WO_3 to a custom mill. Insulating Aggregates Co. shipped prepared pumice from its property near Laws. U. S. Pumice Supply Co., Inc., operated a pumice mine and plant at Leevining.

Mammoth Lakes District.—Nick Pappas trucked scheelite ore from the Good View mine to a Bishop custom mill.

Piute District.—Elmer Lovelace operated the Mohawk mine under lease from D. P. McConnell and Joe Smith and recovered 230 pounds of concentrate averaging 52.17 percent WO_3 from 14 tons of ore mined.

White Mountain District.—Fowler Mining Corp. operated the Alexander group (Green Monster mine) south of Indian Creek. Ore milled at the company 50-ton gravity plant yielded concentrate containing silver, lead, zinc, and traces of gold and copper. H. N. Scott worked the Argentite Maid mine on Indian Creek and produced silver concentrate containing some gold at his 25-ton flotation mill. Frank C. Fernandez developed the Mono Piute Rainbow gold-silver mine on Piute Creek. Huntley Industrial Minerals, Inc., shipped pyrophyllite from the Pacific mine to its Laws grinding plant.

MONTEREY

Kaiser Aluminum & Chemical Corp. operated its magnesia plant at Moss Landing using sea water and calcined dolomite as raw materials. The dolomite was quarried and calcined at Natividad. Periclase produced is consumed at the company refractory brick plant. Some Butte County chromite was mixed with the periclase to produce chrome-magnesia brick. Within the Del Monte Forest on the Monterey Peninsula, Del Monte Properties Co. produced a variety of products from dune material at its flotation plant, including glass sand and other special sands, construction sand, feldspar, and quartz. The company also quarried miscellaneous stone. Owens-Illinois Glass Co. prepared glass sand in the same area. Carmel Stone Quarry produced sandstone for structural purposes at Carmel Valley. A small quantity of jade was produced. Monterey Bay Salt Works produced salt by solar evaporation at Moss Landing. Sand for aggregate was prepared by Max Cazin, Metz; Monterey Sand Co., Seaside; M. J. Murphy, Inc., Carmel; and Pacific Coast Aggregates, Inc., Prattco and Lapis plants. Northwestern Pacific Railroad Co. utilized engine sand produced near Monterey. Petroleum and natural gas were produced in the county.

Los Burros District.—Holman & Powell Paving Co. shipped 524 tons of chromite ore averaging 45 percent Cr_2O_3 from the South Slope mine to the Grants Pass, Oreg., Depot.

NAPA

Basalt Rock Co. produced lightweight aggregate from shales at Napa and in addition quarried basalt largely for concrete aggregate.

This company also produced crude pumice for concrete aggregate 4½ miles northeast of Napa. Crude perlite was produced by Napa Perlite Co. and Perlite Aggregates, Inc., in the St. Helena area; the latter company expanded perlite at St. Helena.

Knoxville District.—George Gamble recovered two flasks of mercury from the Knoxville mine. Jim Adams produced mercury from dump ore at the same mine.

Mayacmas District.—T. Marino recovered mercury by retorting concentrates washed from the Oat Hill mine dumps and with A. Garcia, J. Garcia, and J. Kinsela produced mercury from cinnabar recovered at James Creek Placers.

NEVADA

French Corral District.—Small-scale gold-placer activity was reported in 1952 by L. M. White (Atomic claim); H. B. Moore (Jersey Slide claim); M. E. McCree (Madrone claim); S & W Mining Co. (Polaris mine); and J. C. Brooks on Shady Creek and the Middle Yuba River. Minona Mining Co., the district's chief gold and silver producer in 1951, did not operate its Esperance placer mine in 1952. Development continued at the Boss copper mine near North San Juan.

Grass Valley-Nevada City District.—The Empire Star Mines Co., Ltd., and lessees operated the Empire-Star group, consisting of the Empire, North Star, and Pennsylvania mines, during 1952. Gold ore mined was treated in the company 50-ton amalgamation-flotation-cyanide mill. In addition, gold concentrates from the company Browns Valley group, Yuba County, and custom gold ore and gold concentrates from neighboring mines were beneficiated. Idaho Maryland Mines Corp. operated the Brunswick mine and Idaho Maryland amalgamation and flotation mill throughout 1952. Concentrates were treated in the company cyanide plant until November 15, 1952, but thereafter were shipped to a smelter-refinery. Production for the year totaled 39,731 ounces of gold, 11,942 ounces of silver, and copper recoverable from 1,008 pounds of the metal contained in the concentrates smelted. A. A. Garesio milled 50 tons of Aetna mine dump ore and shipped to a smelter 3,984 pounds of concentrate assaying 7.65 ounces of gold and 6.80 ounces of silver per ton. Willow Valley Mines, Inc., developed the Willow Valley group, which includes the old Bellfontaine, St. Louis, and LeCompton mines; gold ore mined was treated at a custom-cyanide mill. Placer gold and silver production was from small-scale operations, which included: Angus Novak (Atkins Ranch) and W. W. Delameter & Bertha Delameter (Edwards No. 1 and Bertha M. claims).

Meadow Lake District.—Al Ansel and R. J. Dougherty shipped ore containing gold and a trace of silver to a smelter from the Lucky Joe mine.

Washington (North Bloomfield) District.—Shamrock Mining Co. operated the Last Chance mine and milled 50 tons of ore, which yielded 6 ounces of gold and 2 ounces of silver. Robert R. Lewis recovered gold and silver by amalgamating Indian group ore. R. D. Jones made mill tests of Judy mine gold ore. Crescent Pacific Mining Co., largest placer gold and placer silver producer in Nevada County in 1952, operated its nonfloating washing plant at the Middle Yuba

(Eastman) mine. The Philip Carey Mfg. Co. explored the Stark chrysotile asbestos mine at Washington.

You Bet District.—Waxner Bros. worked the Gold Star placer-drift mine. Oak Hill Mines recovered gold from gravel sluiced at the Oak Hill group. J. L. Nielson recovered gold and silver from placer tailing at the Quaker Hill mine.

ORANGE

Gladding McBean & Co. shipped fire clay to its own plants from the Tropico and Claymont pits and common clay from the Capistrano property. I. P. Arnold and W. A. Schoeppe produced kaolin near El Toro; the former also produced sand for refractory use. Pacific Clay Products developed a new deposit of clay shale on the Irvine Ranch in the Santa Ana Mountains. D. D. Lamhead & Sons produced decomposed granite at Buena Park, and Sully Miller Contracting Co. crushed stone for concrete aggregate at El Modena. Reed and sedge peat was dug by R. W. McClellan & Sons at Costa Mesa, and Peat Sales Co. produced peat humus at Huntington Beach. Western Salt Co. recovered salt by solar evaporation near Newport Beach. Great Western Division, Dow Chemical Co., produced iodine at Seal Beach. Graham Bros. produced aggregate material on Trabuco Creek. In the Orange-Anaheim-Fullerton area, sand and gravel were produced by California Rock Co., Consolidated Rock Products Co., A. E. Fowler & Sons, and R. J. Noble Co. Sand for aggregate was produced by Geo. T. Calhoun, Foster Sand and Gravel Co. and McClellan & Sons. Petroleum and natural gas were produced in Orange County.

PLACER

Auburn District.—Commercial sand and gravel were produced by Joe Chevreaux.

Foresthill District.—W. E. Wilson hydraulicked the Paragon mine and produced gold and silver. Albert Beyer prospected the Pioneer placer property and produced gold and silver from gravel samples. Carl W. Doherty operated the Marigold mine and recovered gold and silver by amalgamation from 20 tons of ore milled in a 3-ton plant. J. Delmue & E. A. Stone shipped chromite ore averaging 52.2 percent Cr_2O_3 from the Bear Wallow mine and Earyl Cummings produced chromite ore averaging 47.7 percent Cr_2O_3 at the Twin Shafts mine.

Iowa Hill District.—Occidental Mining Co. developed the Occidental drift mine and produced some gold and silver from the gravel. Alvin Watts and Mike Capurro recovered gold and silver from Strawberry mine gravel worked by underground methods. O. F. Goodwin and W. E. Thompson worked the Twenty One placer mine.

Last Chance District.—W. B. Pendleton hydraulicked the American Hill mine and recovered gold and silver.

Lincoln District.—Gladding McBean & Co. produced fire clay, largely for its own plants, from the Atkinson, Towle and Lincoln pits. Lincoln Clay Products Co., Inc., shipped fire clay from Lincoln.

Michigan Bluff District.—Oro Mining Co. developed the Oro drift mine and produced gold and some silver from the gravel.

Rocklin (Loomis) District.—Wm. J. Bade recovered gold from the Murdoch (Lee) drift-mine gravel. Union Granite Co. produced granite at Rocklin principally for dressed stone.

Rubicon District.—Rubicon River Mining Co. explored the Rubicon tungsten property in 1952.

PLUMAS

Butte Valley (Seneca) District.—Anton Buscoy sluiced the Dutchman No. 1 mine on Rush Creek and recovered gold from the gravel. Frank Schultz developed the Come Back group of placer claims on Rush Creek Mountain.

Greenville (Crescent Mills) District.—H. O. Ellis recovered gold from the Pioneer and Caribou claims gravel by sluicing and drifting. I. W. Hoeffler produced gold and silver from 52 tons of L & L mine ore amalgamated at the 25-ton mill. Lakeview Manganese Mines shipped manganese ore from the Star mine to a Government Purchase Depot. F. A. Smith operated the Arlington mine and shipped manganese ore averaging 37 percent Mn. Barium Products, Ltd., produced barite at its Almanor mine; the crude material was treated at the company Modesto (Stanislaus County) plant.

Quincy District.—B. F. Shinn sluiced Plumas National mine gravel and recovered gold.

RIVERSIDE

Riverside Cement Co. operated its cement plant at Crestmore throughout 1952. Raw material was obtained from the Crestmore mine and the Jensen quarry. Fire clay was produced by the following: Gladding McBean & Co. at its Sloan and Harrington pits; Los Angeles Brick & Clay Products Co. and Alberhill Coal & Clay Co., near Elsinore; Pacific Clay Products at Corona; and Temescal Clay Co. at Temescal. Liston Brick Co. produced common clay near Corona. Guy F. Atkinson Co. produced granite for riprap at the Ormand quarry, Riverside. Haven Granite Corp. crushed granite for poultry grit at West Riverside. Owens-Illinois Glass Co. produced colored sand and flint sand at its Corona deposit. United States Gypsum Co. produced gypsum at its Midland deposits for calcining at the company plant. Sand and gravel for aggregate were produced by the following: Desert Rock Co. and Massey Rock & Sand Co., Indio; Palm Springs Builders Supply Co., Ltd., Palm Springs; San Gorgonio Rock Products, Banning; Service Rock Co., Riverside; Transit Mix Concrete Co., Corona; and Valley Rock & Sand Corp., Moreno.

Chuckawalla District.—Sweeney Tungsten Co., Ltd., developed the Rainbow-Lucky Penny group of tungsten claims.

Dale District.—Earl Geiger recovered gold from Duplex mine ore by amalgamation.

Eagle Mountain District.—Kaiser Steel Corp. operated its Eagle Mountain mine, which comprised the Bald Eagle and North-Side pits. The latter was opened in May 1952. Magnetite-hematite ore shipped (1,391,189 long tons averaging 56.27 percent iron) was consumed at the company Fontana (San Bernardino County) blast furnaces. W. S. Horner milled Black Eagle mine ore and produced lead-copper concentrates containing gold and silver. The concentrates, along with a

small tonnage of lead-copper ore, were shipped to lead smelters. Scott & Lindsay shipped copper ore containing silver, lead, and traces of gold and zinc to a smelter from the Winfield No. 2 claim.

Ironwood District.—Dan Figueroa shipped manganese ore averaging 40 percent Mn to a Government Purchase Depot from the Black Canyon mine. Western Development Co., successor to Calrado Development Co., produced wollastonite near Midland.

Pinacate District.—William W. Woodruff milled a small quantity of Centennial mine ore and recovered gold and silver by amalgamation.

SACRAMENTO

The Sacramento Brick Co. produced common clay for its Sacramento plant. Harrison Fait operated an adobe clay pit at Sacramento and Cannon & Co. shipped fire clay from Michigan Bar. Asta Construction Co. produced sand and gravel for aggregate near Rio Vista. Natural gas was produced in Sacramento County.

American River District.—The Natomas Co., largest producer of gold in California and a producer of silver and crude platinum, operated its fleet of six bucketline dredges continuously on land near Folsom throughout 1952. According to the company annual report the decrease in gross returns amounted to 9.4 percent owing largely to a lower recovery per cubic yard. Unit operating costs continued to increase, but to a lesser extent than during 1951. Capital Dredging Co. ranked sixth among the State gold producers and worked 1 bucketline dredge 5 miles south of Folsom; dredging was discontinued July 15, 1952. Gold and silver were recovered incidental to sand and gravel preparation at plants of Brighton Sand & Gravel Co., Del Paso Rock Products Co., Perkins Gravel Co. (A. Teichart & Son, Inc.), Fair Oaks Gravel Co., and the Haggin Gravel Co. (J. R. Reeves). A. R. Vincent produced gold and silver from ore mined on the Wilson property. Pacific Coast Aggregates, Inc., operated its aggregate plants 108 and 111; McGillivray Construction Co. prepared sand and gravel.

SAN BENITO

San Benito Bentonite Co. shipped bentonite from Tres Pinos. Pacific Portland Cement Division, Ideal Cement Co., operated its cement plant at San Juan Bautista. Granite Rock Co. produced crushed granite at Logan. Food Machinery & Chemical Corp. quarried dolomite south of Hollister for use at its Westvaco Chemical Division in Alameda County. Petroleum and natural gas were produced in the county. A small quantity of jade was found at Clear Creek.

Idria District.—New Idria Mining & Chemical Co., largest producer of mercury in California and second in the Nation in 1952, treated 22,971 tons of New Idria mine (including San Carlos) ore, which averaged more than 0.46 percent mercury per ton. Four 5- by 56-foot Gould-rotary furnaces and condensing system were operated. Other producers of mercury were Joe Larios (Wonder mine), Leonard Knepper (North Star mine), and Diaz & Carrillo (Aurora mine).

Panoche District.—Louis Sciocchetti, who operated the Juniper mine, was the principal producer of mercury in the district. Ore was

treated at the New Idria mine. Mercury production was also reported from the Valley View and El Rey mines.

SAN BERNARDINO

Kaiser Steel Corp. operated its blast furnaces and steel mill at Fontana throughout 1952. San Bernardino County ranked first in California cement production by virtue of the combined outputs of California Portland Cement Co. at Colton, Riverside Cement Co., at Oro Grande (the capacity of this plant was increased 1,600,000 barrels in 1952), and Southwestern Portland Cement Co. at Victorville. Riverside Cement Co. also crushed limestone for flux and California Portland Cement Co. produced lime for building material. Gladding McBean & Co. produced kaolin at the P. S. Hart mine, one half mile south of Hart, for use at its own plants. Southern California Minerals Co. shipped kaolin from the C–1 Hart mine in the same area. Inerto Co. and the Baroid Sales Division, National Lead Co., produced bentonitic clay about 4 miles south of Hector, for oil-well drilling mud. The Marter Mining Co. shipped miscellaneous clays from the Marter-White deposit, 3½ miles east of Bryman, and the Hancock Brick Co. produced common clay near the Riverside County line for its Highgrove plant. Southern California Minerals Co. produced talc at the Excelsior mine 25 miles northwest of Valley Wells, the Acme mine 8½ miles southeast of Tecopa, the Calmasil mine 1 mile north of Yucca Grove, and the Superior group 2½ miles northeast of Saratoga Springs. Sierra Talc and Clay Co. shipped talc from its Sheep Creek mine, 20 miles northwest of Baker, the Silver Lake Addenda, Silver Lake No. 1, and Gould Tunnel deposits, 10 miles northeast of Baker, and the Ibex mine, 12 miles southwest of Tecopa. Western Talc Co. worked the Western mine, 7 miles southeast of Tecopa, and ground talc and some pumice at Dunn. Other talc operations in the Baker area were the Saratoga Talc Co., one half mile north of Saratoga Springs, and Desert Talc & Clay Co., 1½ miles northwest of Paso Alto. Minerals Materials Co. shipped pyrophyllite from the Victorite deposit, 12 miles northeast of Victorville. Gladding McBean & Co. produced potash feldspar for ceramics at its White Butte (Beck Spar) mine, 18 miles southeast of Atolia. Searles Lake brines were treated by American Potash & Chemical Corp., which produced boron compounds, soda ash, sodium sulfate, potassium salts, bromine, and dilithium sodium phosphate (an important source of lithium) and West End Chemical Co., producer of boron compounds, soda ash, and lime; limestone quarried in Searles Valley was the source of carbon dioxide and lime used in the West End Chemical Co. process. W. H. Johnson & Co. produced granite for dressed stone 2½ miles northwest of Negro Butte. California Dolomite Co., Inc., which has properties 14 miles north of Adelanto, produced dolomite for refractory material. Minerals Materials Co. quarried quartzite, a source of silica for special cements and refractories, at the Atlas property 1 mile northeast of Oro Grande. Sharp & Fellows Construction Co. quarried stone for concrete aggregate and railroad ballast at Newberry. Crushed limestone was produced by Victorville Lime Rock Co. 4 miles northeast of Victorville, and by White Lime

Rock Co. northeast of Big Bear City. Agate was produced in the Mojave Desert region. H. F. Heather opened the Bright Outlook tungsten mine 6 miles northeast of Kelso in 1952. Mill tests produced scheelite concentrate averaging 57 percent WO_3. Geo. Kaebelitz produced tungsten ore that averaged 0.5 percent WO_3 from the Mary Ann mine, leased from Adelanto Mining Co., Inc. Just Tungsten Quarries shipped scheelite ore from the Princess Pat (Shadow Mountains) mine, 8 miles northwest of Adelanto, to a custom mill.

Calcium chloride was produced from Bristol Lake brines by National Chloride Co. of America, Hill Bros. Chemical Co., and California Salt Co. The last company also produced rock salt. Salt was produced by solar evaporation at Dale Lake by Dale Chemical Industries, Inc., and on Searles Lake by Pacific Salt & Chemical Co. The More-Lite Co. quarried crude perlite in the Castle Mountains, which supplied its Riverside County plant. Nu-Lite Insulated Homes, Inc., at Fontana, expanded perlite trucked from Nevada. Pumice was produced by Williams Bros., 18 miles northeast of Hinkley. Harry Heather shipped volcanic cinder from Mount Pisgah, 12 miles west of Ludlow. Sand and gravel for aggregate were produced by the following: Consolidated Rock Products Co., Claremont; Fontana Gravel Co., Fontana; Fourth Street Rock Crusher, Geo. Herz & Co., Edwin E. Hill, and Triangle Rock & Gravel Co., San Bernardino; Tri City Rock Co., Redlands; and Holliday Rock Co., Upland and Colton. Petroleum was produced in San Bernardino County.

Barstow District.—Golden Witch Mining Co. operated the Pedry (San Antonio) mine. Ore milled at a Barstow plant yielded lead concentrate containing gold, silver, and copper. Pacific Coast Mill & Mining Co. beneficiated the Hoffman estate tailings at Barstow, which were largely derived from Bagdad Chase mine ore. Flotation copper concentrates containing gold, silver, and lead were shipped to a smelter. Lighthouse Mining Corp. operated the 80-ton gravity Jaylite custom mill at Barstow on tungsten ore. Parker Mining & Milling Co. concentrated tungsten ore on a custom basis 2 miles west of Barstow. Brubaker Mann Co. quarried and crushed stone for roofing granules.

Baxter District.—Minerals Materials Co., contractor, worked the Cave Canyon mine and shipped hematite-magnetite to cement plants. The Union Pacific Railroad Co. produced gravel for track ballast.

Black Hawk District.—Frank Czerwonka shipped 79 tons of ore containing 95 ounces of gold and 83 ounces of silver to a custom cyanide mill from the Rambler and Hilltop claims.

Buckeye District.—Donald F. Love shipped siliceous copper ore containing gold and silver to a smelter from the Bagdad Chase mine.

Calico (Alvord) (Paradise) District.—Roy Waughtel operated the Alvord mine and recovered gold and silver by amalgamation. Gold concentrate containing silver was shipped to a smelter. Harvey F. Vice shipped tungsten ore from the Craig and Celestial claims, 24 miles northeast of Barstow, to a custom mill.

Clark Mountain District.—Molybdenum Corp. of America operated the Mountain Pass mine and produced rare-earth metals concentrates. Mohawk Mines, Inc., worked the Mohawk mine and Alexander & Fuel operated the Wilshire mine of the Mohawk group. Lead ore

containing silver, copper, and some gold was shipped from both properties to a smelter. Frank Rathburn produced sandstone for building material at the Hard Rock quarry.

Dale District.—Iron Age Mines Co. and Edward Hedstrom shipped a hematite-magnetite mixture that averaged over 63 percent Fe from the Iron Age mine.

Holcomb (Bear Lake) District.—Red Corral Mining Co. shipped zinc-lead ore containing silver from the Old Rose mine to a smelter-fuming plant. J. S. Burbridge milled 78 tons of Shooting Star scheelite ore which yielded 299 pounds of concentrate averaging 48.28 percent WO_3.

Lane Mountain District.—Minerals Materials Co. worked the Starbright mine and milled a substantial tonnage of scheelite ore averaging 0.78 percent WO_3. The deposit was described.[13]

Lava Bed District.—J. F. Miller shipped zinc-lead ore containing silver and copper from the Double Eagle mine to a concentrator-smelter.

Lead Mountain District.—Mining Development Co. shipped lead ore with values in gold, silver, and copper from the War Eagle group dumps to a smelter.

Lytle Creek District.—R. B. Lyttle developed the Blew Jordam zinc mine in 1952.

Morongo District.—Shooting Star Tungsten Co. reactivated the United Tungsten mine and shipped scheelite ore to a custom mill.

New York Mountains District.—Claremont Mining Co. developed ore in the Sagamore mine (Alpha claims) that contained silver, lead, copper, zinc, and tungsten.

Old Woman Mountains District.—Hidden Value Tungsten Co. shipped tungsten concentrate averaging 64.45 percent WO_3 from the Hidden Value mine. Walter Zindell produced scheelite concentrate which averaged 57.74 percent WO_3 from Section 9 (Howe) mine ore.

Ord Mountain (Bellville) District.—Andrew Derenzo shipped lead ore containing silver from the Last Chance and Lucky John claims to smelters. Alan Kissock & Co. operated the Shining Star mine and shipped tungsten ore averaging 0.25 percent WO_3 to a custom mill. Parker Mining & Milling Co. shipped tungsten concentrate averaging 60.09 percent WO_3 from the White Dollar mine.

Providence (Clipper) District.—Pinnacle Tungsten Co. shipped 65 tons of tungsten ore from the Clipper Mountain mine to custom mills.

Randsburg (Atolia) District.—Charles Chamberlin worked the O. K. group. Ore amalgamated at the King Solomon mill yielded gold and silver. Surcease Mining Co., second largest producer of tungsten concentrates in California in 1952, operated the Atolia-group lode and placer deposits and milled ore averaging 0.76 percent WO_3. V. T. Bowald worked the Tanana tungsten mine. Cole & Swift worked the Cole & Swift property by dry-land dredge; 800 cubic yards of gravel washed yielded scheelite concentrate containing 15 units of WO_3 and, in addition, 11 ounces of gold and 2 ounces of silver. The high cost of water ($1.00 per thousand gallons) caused cessation of operations. The property was controlled by West America Tungsten Co. after August 1952.

[13] Hazenbush, G. C., Geology of the Starbright Tungsten Mine, San Bernardino County, California: California Jour. Mines and Geol., July 1952, vol. 48, No. 3, pp. 201-206.

SAN DIEGO

Westvaco Chemical Division, of Food Machinery & Chemical Corp., recovered magnesium chloride from sea-water bitterns at Chula Vista for use in magnesium oxychloride cement. Western Salt Co. recovered salt by solar evaporation at Chula Vista. Union Brick Co. produced shale at Rose Canyon for use at its plant and La Jolla Canyon Clay Products operated a kiln at La Jolla. California Cut Stone Granite Works, Vista; Escondido Quarries, Inc., Escondido; Clemens Granite Co., El Cajon; Southern California Granite Co., San Diego; and Valley Granite Co. and National Quarries, Escondido, produced granite largely for dressed stone. Canyon Rock Co. quarried stone for riprap and produced aggregate at San Diego; Nelson & Sloan produced similar material at Otay. Valley Limestone Production Co. produced crushed limestone at its Dos Cabezas quarry. Harborlite Corp. operated a perlite-expanding plant at Chula Vista. The following prepared sand and gravel for the construction industry: Caudell & Johnson, Mission Valley and Powoy Valley; Daley Corp., Mission Valley; Escondido Sand & Gravel Co., Escondido; H. C. Fenton Material Co., San Diego; Monarch Materials Co., Santee; and H. W. Rohl Co., Inc., Oceanside. American Sand Co. and Woodward Sand Co., San Diego; Carl Nieman, Del Mar; Wiley Bros., Fall Brook; Lakeside sand plant, Lakeside; and Denton's sand plant, El Cajon, produced aggregate sand exclusively. Crystal Silica Co., Oceanside, and C. R. Guthridge Sand Plant, La Jolla, prepared special sands. Tourmaline was produced at the Himalaya mine near Mesa and at the Reynolds and Ashley mines near Pala.

SAN JOAQUIN

Kaiser Magnesium Co. operated the Manteca magnesium plant. No gold or silver production was reported from the county, as all dredging operations terminated in 1951. Teekay Mines, Inc., produced synthetic battery ore by gravity-magnetic milling from manganese ore mined at the Ladd property 13 miles southwest of Tracy. Stockton Building Materials Co. produced clay products from illite near Stockton, and Stockton Brick & Tile Co. produced common clay for its plant on Roberts Island. Pacific Coast Aggregates, Inc., produced stone, sand, and gravel for concrete at its Kerlinger plant. Other producers of sand and gravel included: P. F. Sievers (Mokelumne pit) and Claude C. Wood Co., Clements; Putnam Sand & Gravel Co., Riverbank; and Tracy Rock & Gravel Co., Tracy. Natural gas was produced in the county.

SAN LUIS OBISPO

H-J Chrome Co. and International Metallurgical Chrome Corp., the State's second largest producers of chromite in terms of quantity and third in value in 1952, jointly operated the Sweetwater and Norcross mines near San Luis Obispo. Ore was milled at San Luis Obispo and concentrate averaged 47.5 Cr_2O_3 with a chromium-iron ratio of 2.3 : 1. Pierce Bros. milled Hard Face group ore at Morro Bay and produced chromite concentrate which averaged 46.3 percent Cr_2O_3; the chromium-iron ratio was 2.3 : 1. All county chromite

shipments went to the Grants Pass, Oregon, Government Purchase Depot. George Bell retorted mercury at the Rinconada mine, 11 miles southeast of Santa Margarita. Henry C. Dalessi worked the Lime Mountain quarry and produced crushed limestone. Agricultural gypsum was quarried by Superior Gypsum Co. at Carriso Plain and by Shandon Gypsum Co. at Shandon. Harold Guiton prepared molding sand at Oceano, and Walter B. Roselip produced sand and gravel at Atascadero. Petroleum and natural gas were produced in the county.

Adelaide District.—Woodrow Osborne and Wm. Stephenson produced mercury at the La Libertad mine.

SAN MATEO

Bethlehem Steel Co. operated open-hearth furnaces and rolling mills at South San Francisco in 1952. The Pacific Portland Cement Division, Ideal Cement Co., produced cement from oystershell-bearing mud dredged from San Francisco Bay near Redwood City. A. W. Paine worked 90 cubic yards of ocean beach sand near Pescadero and produced 3 ounces of gold and 1 ounce of silver. In addition, crude platinum recovered contained 0.13 ounce of fine platinum, 0.24 ounce of fine iridium, 0.18 ounce of fine osmium, and 0.12 ounce of fine ruthenium. Marine Magnesium Division, Merck & Co., Inc., prepared special magnesias of pharmaceutical grade from raw seawater bitterns and calcined dolomite at South San Francisco. California Aggregates produced crushed limestone for building material, and Rockaway Quarry, Inc., prepared sand at Rockaway Beach. Skyline Quarries crushed stone near Belmont. Peter Sorenson quarried red rock at Belmont and Pacific Coast Aggregates, Inc., produced crushed stone for concrete at Brisbane.

SANTA BARBARA

Johns-Manville Products Corp. and Great Lakes Carbon Corp. produced diatomite in the Lompoc area. Harry L. Roberts shipped chromite ore which averaged 46.3 percent Cr_2O_3 and had a chromium-iron ratio of 3.35 : 1 from the Cachuina mine near Los Olivos to the Grants Pass, Oreg., Government Purchase Depot. McNeil Building Materials manufactured clay products at Santa Barbara from local shale. Airox Co. utilized diatomaceous shale containing bituminous material to produce lightweight aggregate at Lompoc. G. Antolini & Sons produced dressed limestone at their Santa Maria quarry. Sand and gravel were produced by Buell Flat Rock Co., Solvang; Southern Pacific Milling Co., Santa Maria; and Valley Sand & Gravel Co., Lompoc. Petroleum and natural gas were produced in Santa Barbara County.

SANTA CLARA

Permanente Cement Co. operated a cement plant on Permanente Creek near Permanente throughout 1952. Some of the Leslie salt operation, centered in Newark, for the production of salt from marsh water by solar evaporation is carried on in Santa Clara County. Westvaco Chemical Division of Food Machinery & Chemical Corp. mined magnesite at Red Mountain for use in its Newark magnesia

plant. Gladding Bros. Mfg. Co., Remillard-Dandini Co., and San Jose Brick & Tile Co. produced common clay locally for use at their respective plants in San Jose. Bahr & Ledoyen, Inc., crushed stone at its Page Mill quarry at Los Altos. Sondgroth Bros. worked the Neary quarry at Los Altos and produced decomposed granite. Bay Shell Co. utilized oystershells dredged from San Francisco Bay and San Benito County granite to prepare poultry grits at Alviso. Saratoga quarry, operated by Santa Clara County, produced noncommercial crushed limestone. Aggregate material was prepared by Los Gatos Construction Co. and Los Gatos Sand & Gravel Co., Los Gatos; Leo Piazza Paving Co. and A. J. Raisch Paving Co., San Jose; A. Voss, Cupertino; Western Gravel Corp., Campbell; and Western Tile & Supply Co., Gilroy. Petroleum was produced in the county.

New Almaden District.—Arthur S. Burrell produced mercury at the Guadalupe mine. A Rossi retort was used. Cordero Mining Co. did extensive exploration for new cinnabar ore bodies at the New Almaden mine during 1952. Lessees worked the mine dumps on a small scale.

SANTA CRUZ

Santa Cruz Portland Cement Co., the principal mineral industry of Santa Cruz County, operated its portland-cement plant at Davenport in 1952. Flue dust recovered in the Cottrell precipitators contained, in addition to calcium carbonate and magnesium carbonate, 2.94 to 6.14 percent water-soluble potash and was distributed for soil fertilizing.[14] The company also produced crushed limestone at its San Vicente quarry as did Pacific Limestone Products Co. near Santa Cruz. Aggregate material was prepared by Henry J. Kaiser Co. and Pacific Coast Aggregates, Inc., at Olympia; and by Hansen, Silvery & Sinnot, and Santa Cruz Aggregates Co. at Felton.

SHASTA

Johns-Manville Products Corp. explored the Andreatta and Boito chrysotile asbestos property 4 miles northwest of Gibson. Bert Peeler produced gravel at Fall River Mills.

Cow Creek (Ingot) District.—Coronado Copper & Zinc Co. operated the Afterthought mine until August 31, 1952, when ore depletion caused cessation of operations. Zinc ore milled in the 100-ton flotation mill yielded zinc concentrate containing gold, silver, copper, lead, and cadmium, which was shipped to a Montana zinc plant, and zinc-lead-copper bulk concentrates containing gold and silver, which were consigned to a Utah lead smelter-fuming plant.

Flat Creek District.—Mountain Copper Co., Ltd., operated the Hornet mine throughout 1952. Iron pyrites was produced, and some copper precipitates were recovered from mine water. The pyrites treated at sulfuric acid plants yielded cinder, which is used as a source of iron in portland cement at some California plants and as a soil conditioner. International Smelting & Refining Co. shipped an accumulation of flue dust from abandoned Shasta County copper smelters to its Utah lead smelter-fuming plant. The material contained substantial quantities of zinc and lead, and some silver, copper, and gold.

[14] State of California Department of Agriculture, Bureau of Chemistry: Spec. Pub. 244, Fertilizing materials, 1951, p. 156.

Igo (Centerville) District.—Clinton Hightower worked the Black Rock and Plain View lode claims on a small scale and recovered gold and silver by amalgamation.

LeMoine District.—Castle Crags Chrome Co. operated a mill on Costa Ranch ore and custom ore. Chromite concentrates produced were shipped to the Grants Pass, Oreg., Government Purchase Depot. Orsini, Parke & King worked the Forest Queen (North Star) mine and shipped chromite ore averaging 48.6 percent Cr_2O_3 and chromium-iron ratio 2.5 : 1.

Redding District.—Oaks Sand, Gravel & Cement Products Co. produced crushed stone, sand, and gravel for aggregate. J. H. Hein Co. prepared sand and gravel and Redding Lime Products (H. C. Waddell) produced crushed limestone.

Shasta District.—Whiskey Hill mine and James E. Leonard worked the Whiskey Hill mine and recovered gold and silver at the company mill by amalgamation.

SIERRA

Alleghany District.—The Original Sixteen to One Mine, Inc., the principal mineral producer in Sierra County and fifth ranking gold producer in California in 1952, worked the Original Sixteen to One mine. Gold and silver were recovered by amalgamation and from gravity concentrate shipped to a smelter. The Dickey Exploration Co. reported a new ore discovery in 1952 at the Oriental mine and produced gold and silver by amalgamation. In addition, concentrates and crude ore direct-smelted yielded gold and silver. Other producers of lode gold and silver included the Yellow Jacket Consolidated Gold Mines, Inc., Red Star mine; John O'Donnell, Kate Hardy mine; and George Hyland, Irelan mine. Placer gold and silver were produced by Donald Reed & Louis Suponch at the Gold Channel drift mine. Esten Wolden recovered gold and silver by sluicing the Hard Work mine gravel.

Downieville District.—Best Mines Co., the largest producer of gold in the Downieville district, worked the Brush Creek mine in 1952. Gold and silver were recovered from ore amalgamated at the company 100-ton mill and from flotation concentrates cyanided at a custom mill. Cecil McCalister worked the Craycroft mine gravel by bulldozer and trommel and recovered gold and silver.

Pike (Indian Hill) District.—Joseph G. Brown reopened the Depot Hill (Joubert) placer mine after several years inactivity and produced gold and silver by ground sluicing. H. L. Sorensen worked the Alaska mine and recovered gold and silver by amalgamating the ore.

Poker Flat (Table Rock) (Port Wine) District.—W. G. Edwards recovered gold and silver from Four Hills mine tailings by amalgamation in sluice boxes. The concentrator was destroyed by snow in 1951. Sunshine Partnership hydraulicked the Pioneer mine and recovered gold and silver.

SISKIYOU

Pumice was produced in the Glass Mountain area by Glass Mountain Volcolite Co., Boorman Pumice Products, U. S. Pumice Supply Co., Inc., and John Madsen. Shastalite Cinder Block Co. produced

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pumice 6 miles northeast of Weed. Mount Shasta Mining Co. explored the Mount Eddy chrysotile-asbestos prospect 5 miles southwest of Weed. The Southern Pacific Co. quarried miscellaneous stone at Kegg. Jensen & Thompson produced sand and gravel at Mount Shasta.

Cottonwood District.—J. R. Walters sluiced the Little Eva mine gravel in 1952 and recovered gold and silver.

Gazelle District.—Chromite ore was shipped from the following mines to the Grants Pass, Oreg., Government Purchase Depot in 1952: Black Bear (L. J. Conley); Masterson (J. A. Richter et al.); Cameron-Sappington (C. B. Sappington); Opportunity (James I. Scott et al.). The Black Bear mine ore contained 50.33 percent Cr_2O_3, and the chromium iron ratio was 3.09:1.

Klamath River District.—Chromite ore produced from the Riverview mine at Hamburg by Ray Johnson et al. averaged 47.9 percent Cr_2O_3. S. H. & S. Mining Co. worked the Blue Eagle mine near Seiad and shipped chromite ore that averaged 48.4 percent Cr_2O_3 to the Grants Pass, Oreg., Depot. Price Mining Co. worked the Boyle mine tailing at Humbug by small-scale placer methods and recovered gold. L. C. Crow operated the Deer Trail mine on Humbug Creek; ore amalgamated at the 10-ton mill yielded gold and silver. Idocrase was produced at Happy Camp.

Moffett Creek District.—Hatcher & Aseltine shipped 55 long tons of chromite ore from the Black Jack mine averaging 53.9 percent Cr_2O_3 with chromium-iron ratio of 2.70–3.68:1. E. P. Merrick operated the Allison mine and the High Divide mine; chromite ore produced from the two properties was shipped to the Grants Pass, Oreg., Depot.

Preston Peak District.—Ruth Robertson worked the Cyclone Gap mine, leading California producer of chromite in quantity and value in 1952; 2,289 tons of lump ore averaging 49.6 percent Cr_2O_3 was consigned to the Grants Pass, Oreg., Depot.

Salmon River District.—The following placer mines were worked on a small scale in 1952: Little Klondyke (Daniel M. Cope); Riverside (Ted Muth); and Starbout (L. Sutherland). Francis George shipped 26 tons of chromite ore averaging 52.4 percent Cr_2O_3 from the Black Hawk mine at Cecilville. W. R. George worked the Dry Gulch mine at Sawyers Bar; chromite ore produced was shipped to Grants Pass.

Scott River District.—M. C. DeFario et al. shipped chromite ore from DeFario ranch near Callahan. Small placer mines worked for gold and silver included the Alexander (Verne Alexander) and Golden Eagle-Goodenough (Charles McCoy). E. C. Wyatt & G. A. Milne made a small shipment of ore containing gold, silver, and some lead from the Spencer mine to a smelter.

Yreka District.—A. G. Fledderman and Hugh Vettle hydraulicked the Fledderman mine on Greenhorn Creek from February through April 15, 1952; gravel washed yielded gold and silver.

SOLANO

Cordelia Quarries, Parrish Bros., and Frederickson Bros. quarried basalt for concrete at Cordelia, Goodyear, and Winters, respectively. Natural gas was produced in the county.

SONOMA

Stone was quarried by the following: Hein Bros. Basalt Rock Co., Petaluma (basalt); Thomas Graham, Occidental (miscellaneous stone); Talbert Rock Quarry, Cotati (basalt); and, at Glen Ellen, Gordenker Bros. (miscellaneous stone), and Sylvain Cabrol (sandstone). Producers of sand and gravel were: Basalt Rock Co., Inc., Healdsburg; Maxwell Bros., Santa Rosa, and L. T. Willig, Jenner. Petroleum was produced in Sonoma County.

Guerneville District.—Sonoma Quicksilver Mines, second largest producer of mercury in California in 1952, worked the Mount Jackson-Great Eastern mine.

Mayacmas District.—Baumeister, Hulbert & Muffly operated the Culver-Baer mine, and 1,640 tons of ore treated in the 20-ton rotary furnace yielded a substantial quantity of mercury. Buckman Laboratories, Inc., produced mercury at the Buckman open-pit mine (formerly the Dewey-Buckman). Work was completed on a rotary furnace plant that will handle 60 tons in 24 hours. Vincent Harrison worked the Ella B. Eureka mercury mine a few days in 1952.

STANISLAUS

Lester Raggio and Harry Chase produced fire clay in the Knights Ferry district. Simon Newman Co. quarried and prepared diatomite at its Crow mine 6 miles southwest of Crows Landing. Barium Products, Ltd., manufactured barium chemicals at Modesto, treating Plumas County barite. Sand and gravel were produced by Frank B. Miller, Jr., at Newman and the Hughson gravel plant at Hughson. Natural gas was produced in Stanislaus County.

Tuolumne River District.—All dredging ceased in 1951, but some gold and silver were recovered in 1952 during cleanup operations. In the Modesto area aggregate material was produced by the following: Graystone Tile, Modesto Sand & Gravel Co., Inc., Santa Fe Rock & Sand, and Chas. D. Warner & Son, Inc.

SUTTER

Gladding McBean & Co. produced miscellaneous clays at Nicolaus. Natural gas was produced in the county.

TEHAMA

Allen & Reddy produced gravel at Red Bluff.

Beegum District.—Tedoc Mining Co. operated the Sunshine, Blue Sky, and Segraves et al. claims and shipped chromite ore averaging 47.4 percent Cr_2O_2 and having a chromium-iron ratio of 2.99 : 1.

Kleinsorge District.—Conconully Mining & Milling Co. milled Grau mine dump ore and shipped chromite concentrate to the Grants Pass, Oreg., Government Purchase Depot.

TRINITY

Lincoln Gold Dredging Co. shipped manganese ore containing 52 percent Mn from the Bluejay mine east of Hoaglin. Adkisson & Webb operated the Stockton mine west of Zenia and shipped man-

ganese ore containing 40 percent Mn. The Philip Carey Mfg. Co. explored the chrysotile asbestos deposit on the Virginia Bruce claim in the Mad River area.

Cinnabar District.—Clayton Kalbaugh hydraulicked the Thursday No. 1 mine on Crow Creek in 1952. Material mined was largely overburden, but 3 ounces of gold was produced. Chromite recovered in the operation was not marketed.

Hayfork District.—T. C. Kelly recovered gold and silver from Kelly mine ore by amalgamation. Herb Fraseur worked the Sunset placer claim.

Island Mountain District.—The Northwestern Pacific Railroad Co. quarried miscellaneous stone at Island Mountain.

New River District.—George Schnitker sluiced the Know Nothing mine and recovered gold and silver.

Peanuts District.—Jess Lattin shipped chromite ore averaging 55.4 percent Cr_2O_2, with a chromium-iron ratio of 3.70 : 1, from the Cotten property.

Trinity River District.—Fairview Placers, principal mineral producer in Trinity County, operated a Yuba-bucketline dredge equipped with seventy-five 10½-cubic-foot buckets at Minersville throughout 1952; gold and silver were recovered. Hydraulic mines that produced gold and silver were the Bennett, Browns Creek, Big Flat, and Hickey. E. R. Brewer and W. R. Cherry operated the Three B's mine in the South Fork area and shipped chromite ore averaging 49.8 percent Cr_2O_3, with a chromium-iron ratio of 3.59 : 1 to the Grants Pass, Oreg., Government Purchase Depot.

TULARE

Pacific Coast Aggregates, Inc., produced crushed stone and sand and gravel at Lemon Cove, Lindsay, and Terminus. Sand was produced by Middletons-Sequoia Rock Co. at Porterville, and Terminus Beach Rock Co. prepared sand and gravel at Lemon Cove. The S. P. Brick & Tile Co. quarried shale for its own use at Exeter. Tulare County Tungsten Mines, fifth largest producer of tungsten concentrates in California in 1952, operated the Big Jim mine, 6 miles northeast of Exeter. Sherman Peak Mining Co. produced scheelite concentrate from ore mined at the Sherman Peak mine north of Kernville in the Brush Creek area. J. B. Huston milled custom tungsten ore at Lindsay. Consolidated Tungsten Mine Division of Kennametal, Inc., milled 6,200 tons of ore averaging 0.32 percent WO_3 from the Harrel Hill mine located near Orosi. Good Hope Mining Co. produced 6,749 pounds of concentrate averaging 67.67 percent WO_3 from the Pioneer mine and Good Hope claim ore mined near Three Rivers. Natural gas was produced in Tulare County.

TUOLUMNE

George France consigned dolomite produced near Columbia to a local lime plant. Sonora Marble Aggregates Co. quarried marble chiefly for terrazzo; some dimension limestone for rough construction and crushed limestone also were produced. United States Lime Products Corp. crushed limestone at its Sonora quarry and produced lime at the company plant. Gravel was produced by Beerman &

Jones at Jamestown and by R. E. Maxwell near Sonora. Tuolumne Tungsten Co. developed the Montezuma tungsten mine 1 mile northeast of Snow Lake.

East Belt District.—Jack S. Piper worked the Mack mine in 1952 and produced gold and silver by amalgamation.

VENTURA

Petroleum and natural gas were the principal minerals produced in Ventura County in 1952. Rocklite Products, Inc., expanded previously crushed and screened shale near Ventura for use as lightweight aggregate. Shell Oil Co. operated its Dent clay pit near Ventura and Tide Water Associated Oil Co. produced clays in the same area; the miscellaneous clays were used in well-drilling mud. Saticoy Rock Co. quarried sandstone at Saticoy, and Western Lime Products Co. crushed limestone at its Tapo Alto quarry at Santa Susanna. Monolith Portland Cement Co. produced gypsum at its Quatal Canyon quarry in Cuyama Valley. Sand and gravel were produced by Montalvo Rock Co., Montalvo; Santa Paula Rock Co., Santa Paula; and Saticoy Rock Co., Saticoy.

YOLO

Pacific Coast Aggregates, Inc., produced crushed stone, sand, and gravel for aggregate, at Yolo. Gravel was prepared at Woodland by W. C. Railing, Schwarzgruber & Sons, and Lucy Woods. Natural gas was produced in Yolo County.

Knoxville District.—A small quantity of mercury was recovered at the Reed mine from cleanup operations.

YUBA

Browns Valley District.—Empire Star Mines Co., Ltd., and lessees operated the Browns Valley group through the Dannebroge shaft in 1952. Gold and silver were recovered from concentrate cyanided at the company Grass Valley mill.

Yuba River District.—Yuba Consolidated Gold Fields Yuba unit, second largest producer of gold in California in 1952, operated 5 bucketline dredges equipped with 18-cubic-foot buckets and 1 dredge with 6-cubic-foot buckets in the Yuba River Basin. The company continued deep dredging with two boats throughout the year. In addition to gold and silver, crude platinum was recovered. Sand and gravel were produced at Marysville by Rice Bros., Inc., and Yuba River Sand Co.

The Mineral Industry of Colorado

By A. J. Martin[1]

THE TOTAL value of the mineral production of Colorado, excluding uranium, rose to a new record high of $187,589,000 in 1952 despite a sharp drop in prices and some decrease in production of lead and zinc and appreciable declines in output of coal and cement. The 5-percent gain in value over 1951 was due mainly to increases in output of petroleum, molybdenum, tungsten, vanadium, fluorspar, natural gas, and sand and gravel. Although the production of gold and silver was a little larger than in 1951, it was still much less than before World War II. Great activity continued in uranium exploration, development, and mining; the 5 Colorado mills, 3 of which were enlarged during the year, operated at capacity. Under regulations of the Atomic Energy Commission, figures on production of uranium cannot be published.

Lead and zinc mining, including the mining of complex ores of gold, silver, copper, lead, and zinc, experienced a severe setback with the decline in prices of lead and zinc, and a number of the mines, mostly small producers, closed. A few important-producing straight gold mines continued to operate in the Cripple Creek district, but other straight gold and gold-silver districts remained idle or had only small outputs. The Arkansas Valley custom smelter at Leadville, principal market for Colorado lead and gold-silver-lead-copper concentrates and direct-smelting ores, operated one of its furnaces on a 6-day basis per week; receipts declined 32 percent from 1951.

Molybdenum, tungsten, and uranium mining and exploration were stimulated by Government emergency programs designed to increase production of these and other minerals essential for national defense. No iron ore was mined in Colorado in 1952, but the steel mill of the Colorado Fuel & Iron Corp. at Pueblo is an important part of the State's mineral and associated industries. Recent expansions of the mill include a rod mill completed in 1949 and a new seamless tube mill to be put in operation in 1953. The plant is a large consumer of coal and limestone mined in Colorado.

Demand for nonmetallic (industrial) minerals was sustained by the continued high level of construction, business, and industrial activity. Fluorspar shipments rose 41 percent over 1951, as output in Boulder and Chaffee Counties increased, and a new flotation concentrator was completed and put in operation at Northgate in Jackson County. The average price of fluorspar, based on the value reported by the producers, was 30 percent higher than in 1951. Prices of the other important nonmetallic minerals, except cement and stone, were slightly or moderately higher. Production of sand and gravel and stone increased, but that of cement, clays, feldspar and perlite decreased.

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Cement led in value of the industrial minerals; the output came from 3 plants—2 at Portland in Fremont County and 1 at Boettcher in Larimer County.

Coal production has declined each year since 1944 except 1947, and the output of 3,623,000 tons in 1952 was the lowest since 1897. On the other hand, natural-gas production rose sharply, and petroleum output continued to increase and established a new record high of 30,381,000 barrels compared with the previous high of 27,823,000 barrels in 1951. Colorado has 7 petroleum refineries and cracking plants, of which 5 are at Denver and 1 each at Alamosa and Rangely.

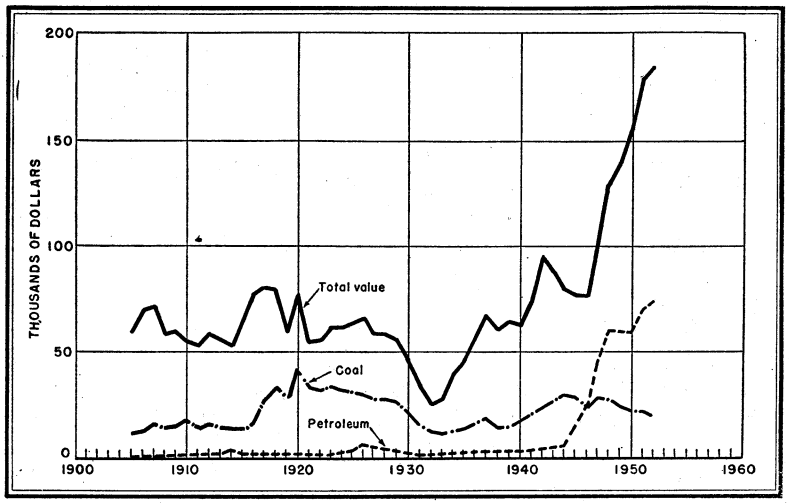

FIGURE 1.—Total value of all minerals produced in Colorado, excluding uranium, 1941–52, and value of coal and petroleum, 1905–52.

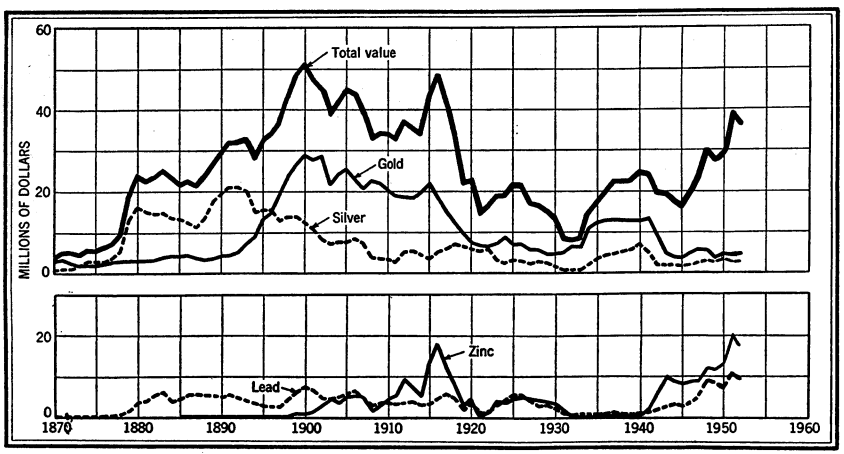

FIGURE 2.—Value of mine production of gold, silver, lead, and zinc and total value of gold, silver, copper, lead, and zinc in Colorado, 1870–1952. The value of copper has been less than $2,000,000 annually, except in a few years.

TABLE 1.—Mineral production in Colorado, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate—gross weight	97	$32,339	54	$24,588
Clays (except for cement)	443,403	958,115	413,386	931,810
Coal	4,102,639	21,165,518	3,623,015	19,215,657
Copper (recoverable content of ores, etc.)	3,212	1,554,608	3,606	1,745,304
Feldspar (crude)—long tons	50,451	283,153	38,268	224,385
Fluorspar	20,661	820,322	29,185	1,505,968
Gold (recoverable content of ores, etc.)—troy ounces	116,503	4,077,605	124,594	4,360,790
Lead (recoverable content of ores, etc.)	30,336	10,496,256	30,066	9,681,252
Manganiferous ore (5 to 35 percent Mn)—gross weight			76	(2)
Mica (scrap)	1,882	32,901	(2)	(2)
Molybdenum (content of ore and concentrate)—pounds	22,911,949	(2)	24,557,149	(2)
Natural gas—thousand cubic feet	14,128,000	608,000	34,260,000	1,884,000
Peat	2,241	19,611	2,312	20,230
Petroleum (crude)—42-gallon barrels	27,823,000	70,670,000	[3] 30,381,000	[3] 77,470,000
Sand and gravel	6,916,631	4,452,489	8,461,039	6,268,367
Silver (recoverable content of ores, etc.)—troy ounces	2,787,882	2,523,174	2,813,643	2,546,489
Stone (except limestone for cement and lime)	1,470,123	2,334,376	1,708,872	2,566,401
Tin (content of ore and concentrate)—long tons	18	54,033	13	33,723
Tungsten concentrate—60-percent WO_3 basis	336	1,092,780	625	2,354,664
Zinc (recoverable content of ores, etc.)	55,714	20,279,896	53,203	17,663,396
Undistributed: Cement, carbon dioxide, columbium-tantalum ores, gem stones, gypsum, natural-gas liquids, perlite, pumice and pumicite, pyrites, vanadium, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)		[4] 37,980,248		39,091,485
Total Colorado		179,435,000		187,589,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels, gypsum, and pyrites are strictly production. Excludes uranium ores.
[2] Value included with "Undistributed."
[3] Final figure. Supersedes preliminary figure given in commodity chapter.
[4] Revised figure.

TABLE 2.—Average prices of certain mineral commodities, 1951–52 [1]

Commodity	Unit	1951	1952
Beryl	Short ton	$333.361	$451.63
Clays:			
Fire	do	2.484	2.621
Other	do	1.180	1.273
Coal	do	5.159	5.304
Copper [2]	Recoverable content of ores, pound	.242	.242
Feldspar	Short ton	5.612	5.864
Fluorspar	do	39.704	51.601
Gold [3]	Recoverable content of ores, troy ounce	35.000	35.000
Lead [2]	Recoverable content of ores, pound	.173	.161
Petroleum [4]	42-gallon barrel	2.540	2.550
Sand and gravel (commercial)	Short ton	.883	1.01
Silver [5]	Recoverable content of ores, troy ounce	.905	.905
Stone:			
Dimension	Short ton	10.695	10.672
Crushed and miscellaneous	do	1.487	1.397
Tungsten	Short ton unit, contained in 60-percent WO_3 concentrate.	54.130	62.756
Zinc [2]	Recoverable content of ores, pound	.182	.166

[1] Prices are based on average value f. o. b. mines or mills reported by the producers except as otherwise noted. More detail on prices by grades and markets will be found in the commodity chapter in Volume I of this series.
[2] Yearly average weighted price of all grades of domestic refined primary metal sold in the United States by producers.
[3] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[4] Value at wells.
[5] Treasury buying price for newly mined silver July 1, 1946, to date—$0.9050505 ($0.905 used in 1947 for calculating purposes).

Government assistance in financing exploration in search of strategic and critical minerals, administered by the Defense Minerals Exploration Administration, was continued in 1952. The Government provided funds for approved projects on a modified matching basis, advancing the operator for 50, 75, or 90 percent of the cost, depending upon the minerals sought. The projects undertaken in Colorado covered beryl, copper-platinum, fluorspar, lead, lead-zinc, lead-zinc-copper, tungsten, and uranium. The contracts from the beginning in 1951 through December 31, 1952, involved a total of $1,850,000 in combined Government and private capital. Table 3 shows the amount of Government and private participation in each project. Repayment of the Government's contribution, without interest, through a royalty on net returns from products sold, is required if ore is discovered or delineated and the ore is mined within 10 years of the date of the contract.

TABLE 3.—DMEA contracts from the beginning in 1951 through December 31, 1952

Name of commodity and contractor	Property	County	Date of contract	Participation	
				Government	Private
Beryl					
Joseph C. Wild and William Frandson.	Hide A Way	Larimer	Aug. 19, 1952	$2,250	$250
Copper-platinum					
Ute Mining Co		La Plata	May 13, 1952	1,500	1,500
Fluorspar					
Empire Mining & Engineering Co.	Orion Claim and Saddle No. 6.	Boulder	Sept. 8, 1952	2,713	2,713
Lead					
Outlet Mining Co	Phoenix lode and Palo Alto lode.	Mineral	Sept. 3, 1952	5,619	5,619
Lead-zinc					
Bachelor Development Co	Portion of Bachelor mine	Ouray	July 27, 1951	36,252	36,252
Cadwell Mining Co	Hayden shaft	Lake	June 28, 1951	44,961	44,961
Callahan Zinc-Lead Co., Inc	Victor, Morning Star, and Akron.	Gunnison	May 25, 1951	85,994	85,994
Do	Lelia, Etta, Sedalia, Silvery Bayonet, Nest Egg, Eureka, and A. M. Lehigh claims.	do	Jan. 11, 1952	15,305	15,305
Defender Mining Co	Blue Eagle and Defender	Custer	Sept. 10, 1952	2,400	2,400
East Ridge Co	Andrus mines	San Miguel	June 29, 1951	30,090	30,090
Erickson & Baer	Badger and Sunflower group.	Dolores	July 18, 1951[1]	1,600	1,600
Shelby Johnson	10 diamond-drill holes	Park	June 27, 1951	4,900	4,900
Lead-Carbonate Mines, Inc	Lead Carbonate	San Juan	June 21, 1951	17,500	17,500
Leadville Lead Corp	7 patented claims	Park	Feb. 1, 1952	51,300	51,300
Lupton Mining Co., Inc	Grizzly	Clear Creek	June 7, 1951	41,181	41,181
Montana Mining Development Co.	Ben Harrison-Croesus	do	Feb. 19, 1952	7,500	7,500
Silver Bay Mines	Black Hawk and Occidental.	San Juan	June 27, 1951	10,750	10,750
John A. & Ben A. Smith	Burleigh, Seven Thirty, Dives-Pelican, Phillips, and Dunkirk.	Clear Creek	June 28, 1951	12,500	12,500
Treasure Mountain Gold Mining Co.	5 patented claims	San Juan	Sept. 6, 1951	37,600	37,600
U. S. Metals Corp	Henrietta	do	June 27, 1951	23,825	23,825
Do	3 patented and 5 unpatented claims.	do	May 1, 1952	19,300	19,300
United Mining & Leasing Corp.	Gilpin-Eureka-Essex	Gilpin	Aug. 13, 1951	17,101	17,101
The Utze Lode Co	Madonna	Chaffee	Nov. 17, 1952	24,750	24,750
Do	do	do	June 28, 1951[1]	10,000	10,000

[1] Project completed in 1951

TABLE 3.—DMEA contracts from the beginning in 1951 through December 31, 1952—Continued

Name of commodity and contractor	Property	County	Date of contract	Participation	
				Government	Private
Lead-zinc-copper					
The Moreno Cripple Creek Corp.	Silver Queen	San Juan	July 26, 1951	$38,000	$38,000
Silver Bell Mines Co	Carbonero	San Miguel	May 9, 1952	39,560	39,560
Tungsten					
Boulder Tungsten Mines, Inc.	Dorothy Katie and Princess-Gold Coin groups.	Boulder	June 28, 1951	20,869	6,956
A. W. Brown	Blue Jay lode claim No. 19808, Ideal No. 1, lode claim No. 19808.	do	May 29, 1952	7,875	2,625
Cold Spring Tungsten Co., Inc.	Cold Spring and others	do	July 6, 1951	158,310	52,770
Glen Coughlin & E. L. Henderson.	Range View	do	May 23, 1952	3,600	1,200
George Jump	Good Friday	do	May 26, 1952	9,000	3,000
John S. Keifer	Eureka	do	July 6, 1951	15,000	5,000
Stanley L. Larson & R. L. Plummer.	Vasco Nos. 2, 5, and 8 veins and Vasco No. 5 tunnel.	do	Apr. 21, 1952	18,750	6,250
James L. McBroom and L. R. Allen.	Hallie "A"	do	Oct. 6, 1952	9,450	3,150
Robitsch and William Brewster.	Dunmore and Yankee Lad	Ouray	Oct. 3, 1952	7,238	2,413
Joseph M. Smith & Charles R. Rugg.	Rambler	Boulder	Mar. 2, 1952	18,300	6,100
Tom C. Stanford	Forest Home Tungsten	do	July 23, 1951	16,688	5,563
Tungsten Mining Co	Dasie and others	do	Aug. 10, 1951	7,500	2,500
Vasco Tungsten Corp	Vasco No. 5 tunnel and vein.	do	Sept. 10, 1952	13,125	4,375
Uranium					
Anaconda Lead & Silver Co	Ground Hog Nos. 1 and 2 and Mayflower.	Eagle	Sept. 15, 1952	9,000	1,000
Cherokee Mines—T. H. Sackett.	Black Hawk Nos. 1 and 2	Larimer	July 16, 1951	21,600	2,400
Gateway Mining & Development Co., Inc.	12 mining claims	Mesa	Sept. 26, 1952	46,772	5,197
Moreno Cripple Creek Corp	Old Leyden mine	Jefferson	May 21, 1952	56,475	6,275
The Realty Co	Bezant and Wood veins	Gilpin	Oct. 9, 1951	72,000	8,000
Uranium Co. of America	German mine	do	Feb. 25, 1952	22,500	2,500
Uranium Development Corp.	24 mining claims	Montrose	Nov. 24, 1952	19,570	2,174
Total				1,138,073	711,899

REVIEW BY MINERAL COMMODITIES

METALS

Beryl.—The output of beryl in Colorado is derived from small-scale operations on pegmatite deposits in Clear Creek, Fremont, Gunnison, Jefferson, Larimer, and a few other counties. A local market for beryl is provided by the Beryl Ores Co., which has an ore-purchasing office and beneficiation plant in Jefferson County near Arvada. The company supplied the following information regarding its operations.

The Beryl Ores Co. mainly prepares and blends material for the ceramic trade, but also prepares small lots of beryllium compounds on order. Beryl is used often instead of feldspar for more exacting equipment because it gives a notable increase in dielectric strength, resistance to thermal shock, transverse strength, and impact resistance and electrical resistance at elevated temperatures. For certain uses the beryllium oxide is extracted from the beryl before introduction into ceramic bodies.

Production of beryl is encouraged by giving geologic and economic information, by limited financing, and by offering a ready market for domestic beryl and byproducts of beryl mining.

After beryl was exempted from price control on August 10, 1951, the quoted price rose from about $32 per unit of contained beryllium oxide to $45–48 per unit (depending on quantity) as of December 31, 1952.

Cadmium, Indium, and Thallium.—These metals are recovered at the Globe smelter of the American Smelting & Refining Co. in Denver from flue dust, dross, and other byproduct material shipped to it from other company smelters.

Columbium and Tantalum.—Some columbite-tantalite concentrate, mostly from Gunnison County, was recovered from pegmatite deposits worked chiefly for beryl.

Copper.—Colorado's output of copper was 3,606 short tons in 1952 compared with 3,212 tons in 1951. The Idarado Mining Co., which makes a copper concentrate from complex gold-silver-copper-lead-zinc ore mined in San Miguel County, was again the only substantial producer of copper in the State. Most of the lead concentrates shipped from the mills in the San Juan region contain appreciable quantities of copper. The quoted price of copper remained about 24.5 cents a pound throughout 1952.

Gold (and Ores of Gold, Silver, Copper, Lead, and Zinc).—Production of gold in Colorado increased from 116,503 ounces in 1951 to 124,594 ounces in 1952. The Cripple Creek district regained its usual rank as the State's largest gold-producing district, as the new 1,000-ton Carlton custom mill of the Golden Cycle Corp., which treats the ore, operated a full calendar year for the first time; the output, however, was not as large as could be expected owing to a shortage of underground labor and continued economic conditions unfavorable for gold mining. The Carlton mill was the only large mill in Colorado that treated straight gold ore. It employs roasting (in fluosolids reactor) and cyanidation to recover gold in the form of bullion from gold-pyrite flotation concentrate, with cyanidation of the flotation tailings. The increased gold output from the Cripple Creek district more than offset a heavy decrease in Park County caused by the shutdown on January 15, 1952, of the South Platte gold dredge at Fairplay.

Base-metal ores yielded 51 percent of the State total gold in 1952; dry gold and silver ores 47 percent; and placer gravel, old slag, old tailings, and mill cleanups 2 percent. The leading gold-producing properties, in order of rank, were: Ajax group (Golden Cycle Corp.) at Cripple Creek, Treasury Tunnel-Black Bear group (Idarado) in San Miguel County, Resurrection group at Leadville, Smuggler Union group (Telluride Mines) at Telluride, and Cresson group at Cripple Creek. These 5 properties produced 68 percent of the State total gold.

Except in the Cripple Creek district, virtually all the gold-bearing ores of Colorado contain commercial quantities of lead and silver and at many places of zinc and copper also. In recent years the combined value of the zinc, lead, and copper recovered has greatly exceeded that of the gold and silver (see fig. 2). The total value of the 5 metals decreased to $35,997,000 in 1952 from $38,932,000 in 1951. Details of the State output of ore and of each of the five metals, by months and by counties, are given in tables 4, 5, 6, and 7.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc, 1948–52, and total, 1858–1952, in terms of recoverable metals [1]

Year	Mines producing		Material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
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
1951	196	21	1,578,466	116,503	4,077,605	2,787,882	2,523,174
1952	171	20	1,548,815	124,594	4,360,790	2,813,643	2,546,489
1858–1952			[3]	39,855,129	888,806,479	747,984,031	583,460,287

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
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
1951	3,212	1,554,608	30,336	10,496,256	55,714	20,279,896	38,931,539
1952	3,606	1,745,304	30,066	9,681,252	53,203	17,663,396	35,997,231
1858–1952	267,521	73,739,051	2,619,983	289,252,451	1,625,503	287,424,322	2,122,682,590

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings or slimes re-treated, and ore, old slag or tailings shipped to smelters during the calendar year indicated.
[2] Does not include gravel washed.
[3] Figure not available.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in 1952, by months, in terms of recoverable metals [1]

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	8,259	200,048	232	2,330	4,630
February	7,725	239,970	271	2,313	4,494
March	10,427	268,122	335	2,226	4,507
April	9,770	249,497	306	2,372	4,174
May	11,150	259,962	273	2,619	4,517
June	12,063	213,113	288	2,567	4,657
July	13,873	260,922	336	2,729	4,609
August	11,002	256,362	332	2,786	4,566
September	9,543	231,314	326	2,620	4,245
October	11,054	221,304	325	2,798	4,729
November	9,261	195,511	286	2,413	4,179
December	10,467	217,518	296	2,293	3,896
Total	124,594	2,813,643	3,606	30,066	53,203

[1] Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metals (or gross metals as indicated) contained in concentrates, ores, tailings, and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

The impetus to the mining of lead-zinc and complex gold-silver-copper-lead-zinc ores generated by the high prices of lead and zinc during 1951 and the first quarter of 1952 sustained prevailing production rates of the larger mines for several months after lead and zinc prices declined and a number of the small mines had closed. Continuance of the lower metal prices through the last quarter of the year, however, caused one of the important producers to close and made

TABLE 6.—Gold and silver produced at placer mines, 1948–52, in fine ounces, in terms of recoverable metals

Year	Small-scale hand methods [1]		Gravel mechanically handled				Total	
			Nonfloating washing plants [2]		Bucketline and dragline dredges			
	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver
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
1951	30	7	(3)	(3)	[3] 13,563	[3] 2,288	13,593	2,295
1952	28	7	(3)	(3)	2,152	338	2,180	345

[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."
[3] Production by nonfloating washing plants included with that by bucketline dredges; Bureau of Mines not at liberty to publish separately.

operations unprofitable for some of the others, as wage increases and the high cost of supplies and equipment limited the extent to which operating costs could be reduced.

Exploration and development in progress at the larger operating units were generally continued throughout the year despite the decline in prices of lead and zinc. The greatest activity was in the San Juan region and the Battle Mountain (Gilman), Leadville, Elk Mountain (Crested Butte), and White Pine districts. Other exploration was carried on with Government assistance under DMEA contracts. The projects undertaken under these contracts are shown in the foregoing table 3.

Most of the lead-zinc and complex gold-silver-copper-lead-zinc ores produced in Colorado were concentrated in flotation mills; 27 were in operation all or part of 1952. The capacities of 6 of these mills ranged from 600 to 1,200 tons daily, and 21 had capacities ranging from 50 to 300 tons. In addition, there were 4 gravity mills of 5, 15, 30, and 50 tons capacity. Some of the flotation mills use jigs in the ball mill-classifier circuit to recover coarse gold for amalgamation.

The principal market for Colorado lead, lead-copper, and siliceous gold-silver concentrates and direct-smelting ores was the Arkansas Valley smelter of the American Smelting & Refining Co. at Leadville. Markets for custom zinc-lead and other complex milling ores were provided by mills of the Resurrection Mining Co. at Leadville, the Shenandoah-Dives Mining Co. at Silverton, and the American Zinc, Lead & Smelting Co. at Ouray. The mill at Ouray was closed November 1. Several scattered small mills treated custom ore on the basis of a fixed charge per ton, usually $4 for bulk concentration and $5 for selective concentration. Custom mills and smelters in the Salt Lake Valley, Utah, purchased lead-zinc milling ores, bulk concentrates, and lead concentrates from some Colorado areas. Copper concentrates were sold to smelters at Garfield, Utah, and El Paso, Tex. Zinc concentrates were shipped to smelters at Amarillo, Corpus Christi, and Dumas, Tex.; Depue, Ill.; Palmerton, Pa.; and Anaconda and Great Falls, Mont.

The tonnage of ore treated and the yield in metals by class or type of ore and by method of recovery are given in tables 8 to 11.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties, in terms of recoverable metals

County	Mines producing		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Adams		6	1,097	$38,395	158	$143
Boulder	4	1	787	27,545	280,151	253,551
Chaffee	3		33	1,155	569	515
Clear Creek	19		1,049	36,715	30,013	27,163
Conejos	1				27	24
Custer	3		3	105	706	639
Dolores	2		128	4,480	127,446	115,345
Eagle	1		1,700	59,500	348,090	315,039
Fremont	1		7	245	242	219
Gilpin	4	5	30	1,050	78	71
Gunnison	10		280	9,800	107,394	97,197
Hinsdale	4		110	3,850	27,320	24,726
Jefferson		3	339	11,865	53	48
Lake	12		18,405	644,175	322,034	291,457
La Plata	2		33	1,155	147	133
Mineral	3		1,122	39,270	174,219	157,677
Ouray	9		2,443	85,505	95,871	86,768
Park	5	3	2,019	70,665	6,193	5,605
Pitkin	4		8	280	1,043	944
Routt		1	3	105	1	1
Saguache	8		106	3,710	14,745	13,345
San Juan	20		10,203	357,105	363,530	329,013
San Miguel	12		35,868	1,255,380	868,167	785,735
Summit	22	1	294	10,290	36,313	32,865
Teller	22		48,527	1,698,445	9,133	8,266
Total	171	20	124,594	4,360,790	2,813,643	2,546,489

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Adams							$38,538
Boulder	18	$8,712	197	$63,434			353,242
Chaffee	2	968	21	6,762	27	$8,964	18,364
Clear Creek	9	4,356	295	94,990	231	76,692	239,916
Conejos							24
Custer	3	1,452	9	2,898	11	3,652	8,746
Dolores	73	35,332	2,230	718,060	2,734	907,688	1,780,905
Eagle	195	94,380	3,980	1,281,560	26,000	8,632,000	10,382,479
Fremont			3	966	20	6,640	8,070
Gilpin			1	322			1,443
Gunnison	29	14,036	1,045	336,490	1,177	390,764	848,287
Hinsdale	12	5,808	748	240,856	156	51,792	327,032
Jefferson							11,913
Lake	163	78,892	5,624	1,810,928	8,487	2,817,684	5,643,136
La Plata			1	322			1,610
Mineral	24	11,616	1,513	487,186	1,024	339,968	1,035,715
Ouray	197	95,348	1,161	373,842	957	317,724	959,187
Park	15	7,260	32	10,304	228	75,696	169,530
Pitkin			19	6,118			7,342
Routt							106
Saguache	24	11,616	278	89,516	182	60,424	178,611
San Juan	595	287,980	4,223	1,359,806	1,471	488,372	2,822,276
San Miguel	2,244	1,086,096	7,947	2,558,934	9,841	3,267,212	8,953,357
Summit	3	1,452	739	237,958	657	218,124	500,691
Teller							1,706,711
Total	3,606	1,745,304	30,066	9,681,252	53,203	17,663,396	35,997,231

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1952, by classes of ore or other source materials, in terms of recoverable metals

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	35	156,101	49,327	11,336	470	9,065	----------
Dry gold-silver	12	184,840	7,618	309,095	981,120	4,655,360	1,084,000
Dry silver	16	28,444	1,834	475,115	381,313	856,068	775
Total	63	369,385	58,779	795,546	1,362,903	5,520,493	1,084,775
Copper	4	73	1	251	8,610	285	----------
Lead	54	24,145	714	101,888	69,185	3,949,110	387,120
Lead-copper	1	8	2	111	835	2,555	----------
Zinc	5	292,240	1,938	202,354	51,985	7,983,530	52,483,815
Zinc-copper	1	22	1	48	1,400	700	3,800
Zinc-lead [2]	59	859,783	60,821	1,706,069	5,716,767	42,533,292	52,446,490
Total	112	1,176,271	63,477	2,010,721	5,848,782	54,469,472	105,321,225
Other "lode" material:							
Assay sweeps	--------	21	33	93	----------	2,000	----------
Lead mill cleanings	--------	15	107	499	315	7,415	----------
Old slag: Lead	--------	3,123	18	6,439	----------	132,620	----------
Total	--------	3,159	158	7,031	315	142,035	----------
Total "lode" material	171	1,548,815	122,414	2,813,298	7,212,000	60,132,000	106,406,000
Gravel (placer operations)	20	----------	2,180	345	----------	----------	----------
Total, all sources	191	1,548,815	124,594	2,813,643	7,212,000	60,132,000	106,406,000

[1] Detail will not add to totals because some mines produce more than one class of ore.
[2] Includes zinc-lead-copper ore, for which the Bureau of Mines is not at liberty to publish separate figures.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery and types of material processed, in terms of recoverable metals

Method of recovery and type of material processed	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation: [1]					
Ore	17,907	8,278	----------	----------	----------
Cyanidation:					
Ore	48,500	9,133	----------	----------	----------
Assay-office cleanup	28	----------	----------	----------	----------
Total	48,528	9,133	----------	----------	----------
Total recoverable in bullion	66,435	17,411	----------	----------	----------
Concentration, and smelting of concentrates [1]	54,162	2,550,667	6,818,852	57,963,775	106,392,255
Direct smelting:					
Ore	1,687	238,189	392,833	2,026,190	13,745
Lead assay-office cleanup	5	93	----------	2,000	----------
Lead-mill cleanup	107	499	315	7,415	----------
Old slag (lead)	18	6,439	----------	132,620	----------
Total	1,817	245,220	393,148	2,168,225	13,745
Placer	2,180	345	----------	----------	----------
Grand total	124,594	2,813,643	7,212,000	60,132,000	106,406,000

[1] Ore only; no old tailings, etc., processed by this method in Colorado in 1952.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

A. For material treated at mills

	Material treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters [1] and recoverable metals					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES									
Boulder	13,413			[2] 1,004	746	280,010	36,000	393,900	
Chaffee	299	11	4	98	17	511	3,540	38,450	54,000
Clear Creek	14,006	406	162	1,246	586	29,090	17,325	542,650	462,000
Custer	129	1	3	40	2	422	4,665	14,000	22,000
Dolores	44,184			8,806	128	127,446	146,000	4,460,000	5,468,000
Eagle	290,341			64,832	620	196,330	29,585	7,930,080	52,000,000
Fremont	276	3	2	52	4	240		6,000	40,000
Gilpin	60			6	11	36		625	
Gunnison	24,663	39	28	3,994	233	103,863	56,257	1,920,160	2,340,255
Hinsdale	14,497			1,415	108	27,041	23,155	1,493,260	312,000
Lake	191,555	7,789	3,608	29,660	10,206	294,575	321,880	10,373,305	16,974,000
Mineral	39,527			4,025	1,035	129,465	47,860	2,457,700	2,048,000
Ouray	50,325			4,701	2,438	87,222	393,810	2,209,755	1,914,000
Park	1,771	535	50	568	782	5,836	23,100	55,850	456,000
Pitkin	103			42	2	401		14,550	
Saguache	2,335	42	79	751	54	8,765	33,335	343,610	364,000
San Juan	190,544			12,658	10,131	362,721	1,189,850	8,423,695	2,942,000
San Miguel	486,369	8,971	4,210	40,961	26,895	863,572	4,487,655	15,892,965	19,682,000
Summit	8,874	111	132	2,798	164	33,121	4,835	1,393,220	1,314,000
Teller	152,853	48,527	9,133						
Total: 1952	1,526,124	66,435	17,411	177,657	54,162	2,550,667	6,818,852	57,963,775	106,392,255
1951	1,546,801	36,775	11,727	187,047	62,368	2,415,903	5,860,424	58,695,473	111,344,430
BY CLASSES OF MATERIAL TREATED									
Dry gold	156,071	48,984	9,298	82	290	1,843	370	8,965	
Dry gold-silver	184,729			6,915	7,611	308,723	981,120	4,646,900	1,084,000
Dry silver	13,669			470	681	275,871	20,535	220,133	700
Lead	19,592			2,992	243	63,872	46,675	2,570,255	373,450
Zinc	292,240	536	51	65,429	1,402	202,303	51,985	7,983,530	52,483,815
Zinc-copper	22			6	1	48	1,400	700	3,800
Zinc-lead [3]	859,783	16,887	8,062	101,763	43,934	1,698,007	5,716,767	42,533,292	52,446,490
Assay office cleanup (gold)	18	28							
Total: 1952	1,526,124	66,435	17,411	177,657	54,162	2,550,667	6,818,852	57,963,775	106,392,255
BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS [1]									
Dry gold				37	209	666	120	3,980	
Dry gold-silver				28	59	1,016	75	1,615	
Copper				7,136	8,617	178,730	3,226,740	343,540	121,165
Lead				53,899	42,191	2,191,989	2,642,702	55,896,262	46,340
Lead-copper				297	146	7,718	101,300	247,635	
Dry iron (from zinc-lead ore)				317	3	593	1,570	8,145	6,960
Total to copper and lead plants				61,714	51,225	2,380,712	5,972,507	56,501,177	174,465
Zinc concentrates to zinc plants				115,943	2,937	169,955	846,345	1,462,598	106,217,790
Total: 1952				177,657	54,162	2,550,667	6,818,852	57,963,775	106,392,255
1951				187,047	62,368	2,415,903	5,860,424	58,695,473	111,344,430

For footnotes, see end of table.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

B. For material shipped directly to smelters

	Material shipped (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Boulder	21	21	139	----------	100	----------
Chaffee	29	5	54	460	3,550	----------
Clear Creek	64	57	761	675	47,350	----------
Conejos	(4)	----------	27	----------	----------	----------
Custer	34	----------	281	1,335	4,000	----------
Eagle	7,742	1,080	151,760	360,415	29,920	----------
Gilpin	5	2	38	----------	1,375	----------
Gunnison	365	8	3,503	1,743	169,840	13,745
Hinsdale	16	2	279	845	2,740	----------
Lake	10,851	410	23,851	4,120	874,695	----------
La Plata	8	33	147	----------	2,000	----------
Mineral	2,158	87	44,754	140	568,300	----------
Ouray	283	5	8,649	190	112,245	----------
Park	95	2	181	6,900	8,150	----------
Pitkin	102	6	642	----------	23,450	----------
Saguache	468	10	5,901	14,665	212,390	----------
San Juan	55	72	809	150	22,305	----------
San Miguel	22	2	385	345	1,035	----------
Summit	373	15	3,059	1,165	84,780	----------
Total: 1952	22,691	1,817	245,220	393,148	2,168,225	13,745
1951	31,665	3,767	357,957	563,576	1,976,527	83,570
BY CLASSES OF MATERIAL						
Dry gold	30	53	195	100	100	----------
Dry gold-silver	111	7	372	----------	8,460	----------
Dry silver	14,775	1,153	199,244	360,778	635,935	75
Copper	73	1	251	8,610	285	----------
Lead:						
Crude ore	4,553	471	38,016	22,510	1,378,855	13,670
Assay office cleanings	3	5	93	----------	2,000	----------
Mill cleanings	15	107	499	315	7,415	----------
Old slag	3,123	18	6,439	----------	132,620	----------
Total lead materials	7,694	601	45,047	22,825	1,520,890	13,670
Lead-copper	8	2	111	835	2,555	----------
Total: 1952	22,691	1,817	245,220	393,148	2,168,225	13,745

[1] Excludes concentrates treated only by amalgamation and/or cyanidation.
[2] Includes lead-silver-gold-copper concentrates recovered as byproducts in the beneficiation of fluorspar at 2 plants.
[3] Includes zinc-lead-copper ore, for which the Bureau of Mines is not at liberty to publish separate figures.
[4] Less than one-half ton.

Lead.—After five consecutive annual increases which raised the production of lead in Colorado from 17,036 tons in 1946 to 30,336 in 1951, the output decreased slightly to 30,066 tons in 1952. The decrease was due to the closing of a number of mines as a result of the decline in the price of lead. The price remained at the ceiling of 19 cents a pound until April 29 and then began to move downward, was quoted at 15 cents on May 12, reached a low of 13.5 cents on October 22, and advanced to 14.75 cents at the close of the year.

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TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

Class of material	Quantity shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCENTRATES SHIPPED TO SMELTERS						
Dry gold	37	209	666	149	4,272	212
Dry gold-silver	28	59	1,016	89	1,685	----
Copper	7,136	8,617	178,730	3,325,596	572,784	897,512
Lead	53,899	42,191	2,191,990	3,162,845	58,213,578	5,175,484
Lead-copper	297	146	7,718	126,353	257,945	96,557
Dry iron (from zinc-lead ore)	317	3	593	1,780	10,107	17,640
Total to copper and lead plants	61,714	51,225	2,380,713	6,616,812	59,060,371	6,187,405
Zinc concentrate to zinc plants	115,943	4,086	233,875	1,028,355	2,123,906	117,873,292
Total: 1952	177,657	55,311	2,614,588	7,645,167	61,184,277	124,060,697
1951	187,047	63,604	2,486,327	6,840,017	62,016,997	130,381,739
ORES, ETC., SHIPPED DIRECTLY TO SMELTERS						
Dry gold	30	53	195	120	124	240
Dry gold-silver	111	7	372	----	8,812	2,176
Dry silver	14,775	1,153	199,244	391,546	678,060	163,773
Copper	73	1	251	8,987	294	338
Lead:						
Crude ore	4,553	471	38,016	27,320	1,437,745	153,893
Assay office cleanings	3	5	93	168	2,542	----
Mill cleanings	15	107	499	368	7,723	924
Old slag	3,123	18	6,439	----	138,147	----
Total lead materials	7,694	601	45,047	27,856	1,586,157	154,817
Lead-copper	8	2	111	984	2,663	----
Total: 1952	22,691	1,817	245,220	429,493	2,276,110	321,344
1951	31,665	3,767	357,957	654,671	2,083,497	199,374

San Miguel County contributed 26 percent of the total lead in 1952, Lake County 19 percent, San Juan 14, Eagle 13, Dolores nearly 8 percent, and other counties a little more than 20 percent. Base-metal ores, chiefly complex zinc-lead-copper-gold-silver ores, yielded 91 percent of the total lead; the rest was recovered from gold and silver ores. The larger lead-producing mines, in order of output, were: Resurrection group at Leadville, Treasury Tunnel-Black Bear group (Idarado) in San Miguel County, Eagle mine in Eagle County, Smuggler Union (Telluride Mines) at Telluride, and Rico Argentine group at Rico in Dolores County. The Akron-Erie mine of the Callahan Zinc-Lead Co. in Gunnison County, a substantial producer, closed on November 3 because of the drop in prices of lead and zinc. The old Ute & Ulay mine in Hinsdale County, reopened in February 1952 after having been idle since 1944, produced considerable lead, silver, and zinc in 1952 but was closed on November 30 owing to low metal prices.

Manganiferous Ore (5–35 Percent Mn).—Only 68 long tons of manganiferous ore was shipped from Colorado mines in 1952; the ore was mined near Salida in Chaffee County.

Molybdenum.—The Climax mine on Fremont Pass 13 miles north of Leadville, Lake County, is the world's largest producer of molybdenum ore. The mine operated on a 6-day basis throughout 1952, averaging 14,500 tons of ore per working day. Milling facilities were increased 5,000 tons, making the plant capacity 20,000 tons daily. The tailings from the mill are re-treated in a separate plant for recovery of byproducts, including tungsten concentrate, pyrite, and tin concentrate. The output of molybdenum in 1952 increased 7 percent over 1951 and that of tungsten (based on shipments) 86 percent. Further details of the Climax operations are given later in this chapter under Lake County.

TABLE 12.—Climax mine; production of molybdenum in terms of molybdenum contained in concentrate, and average annual price per pound, 1918–52

[Climax Molybdenum Co.]

Year	Pounds	Average annual price per pound	Year	Pounds	Average annual price per pound
1918–19	1,317,272	$1.61	1940	22,782,608	$0.75
			1941	27,751,273	.75
1924	156,935	1.25	1942	41,852,136	.75
1925	821,757	.86	1943	46,133,715	.75
1926	1,057,367	.80	1944	23,608,421	.75
1927	1,858,228	.74	1945	18,525,041	.75
1928	2,957,845	.83	1946	10,816,426	.75
1929	3,529,295	.83	1947	11,512,719	.75
1930	3,083,511	.75	1948	13,172,094	.75
1931	2,644,399	.75	1949	10,752,817	.90
1932	1,913,375	.70	1950	11,903,043	.91
1933	5,028,695	.70	1951	22,538,739	1.00
1934	8,378,683	.70	1952	23,874,408	1.00
1935	10,168,635	.70			
1936	15,216,806	.70	Total	416,144,812	.82
1937	22,750,368	.70			
1938	28,242,085	.75			
1939	21,796,116	.75			

Silver.—Of the 2,813,643 fine ounces of silver produced in Colorado in 1952, base-metal ores, mostly lead-zinc and complex lead-zinc-copper-gold-silver ores, yielded more than 71 percent; dry gold and silver ores 28 percent; and assay sweeps, mill cleanings, old slag, and placer gravel less than 1 percent. The five leading producers of silver, which together contributed 62 percent of the State total, were the Treasury Tunnel-Black Bear (Idarado) group, San Miguel County; Eagle mine at Gilman, Eagle County; Caribou at Nederland, Boulder County; Resurrection group at Leadville, Lake County; and Shenandoah-Dives-Silver Lake Group near Silverton, San Juan County. Except for a relatively small quantity contained in gold bullion shipped to the mint, the silver produced in Colorado is marketed along with lead, copper, gold, and zinc as one of the valuable constituents of concentrates sold to smelters.

Tin.—Since 1949 the Climax Molybdenum Co. plant at Climax, on Fremont Pass near the boundary line of Lake and Summit Counties, has recovered a small tonnage annually of tin concentrate as a byproduct from molybdenum ore.

Tungsten.—Production, as measured by shipments of tungsten concentrate (60-percent WO_3 equivalent), increased from 336 tons in 1951 to 625 tons in 1952. Most of the concentrate was recovered as a byproduct from molybdenum ore at the Climax mill in Lake County.

Production of tungsten ore was reported from 31 mines and prospects, comprising 28 in Boulder County, 2 in San Juan County, and 1 in Larimer County. The larger shippers of ore included the Katie mine (Boulder Tungsten Mines, Inc.), Cold Spring (Cold Spring Tungsten), and the Vanadium Corp. of America properties, all in Boulder County.

Exploration and development were stimulated by the domestic tungsten program of the Government, which provides a market for standard-grade tungsten concentrate at $63 per short ton unit, and the program of financial assistance in exploration administered by the DMEA. Data on exploration projects in Colorado are given in table 3.

Uranium.—Under the stimulus of the guaranteed minimum price schedule for carnotite- and rosceolite-type ores of the Colorado Plateau and other incentives provided in the Atomic Energy Commission's program of encouraging the domestic production of uranium, activity in uranium mining, milling, and exploration continued to expand in 1952. Many operators and miners who had been working lead and zinc mines before the severe decline in the prices of these metals in the second quarter of the year were attracted to uranium mining. The annual report of the Commissioner of Mines, State of Colorado, for 1952 lists 120 uranium-producing mines, including many small-scale operations. In addition, the report lists 11 developing properties. Ore output in Colorado centered chiefly in the Uravan mineral belt in Mesa, Montrose, and San Miguel Counties. Vanadium associated with uranium in the ore enhances the value of the mine output.

The ore is marketed through authorized purchasing agents of the Atomic Energy Commission and is delivered to central mills for treatment. Operating mills in Colorado in 1952 were the United States Vanadium Co. plants at Rifle and Uravan, the Vanadium Corp. of America plants at Naturita and Durango, and the Climax Uranium Co. mill at Grand Junction.

Under regulations of the Atomic Energy Commission, figures showing the production of uranium cannot be published; therefore the value of the uranium output is not included in the total value of the Colorado mineral production shown in table 1 of this chapter.

Besides the expansion in ore output and milling facilities, there was great activity in exploration and development by private companies and in exploration and geological studies by the Atomic Energy Commission and the Federal Geological Survey. Each of the two Government agencies prepares and releases publications showing results of work done. Volume I of Minerals Yearbook, 1952, chapter on Uranium, Radium, and Thorium, contains a general review of the uranium industry in Colorado and other States, with references to literature published. Seven uranium-exploration projects, financed jointly by the Government and private capital under the DMEA program, had been undertaken up to December 31, 1952 (see table 3).

Vanadium.—Before 1923 the southwestern Colorado vanadium-bearing deposits were worked chiefly for radioactive uranium ores, mostly carnotite. Subsequent operations through World War II were directed mainly to the production of vanadium. Since World War II both vanadium and uranium have been produced at an expanding rate as a result of incentives provided in the Atomic Energy Commission's program for encouraging the domestic production of

uranium. Nearly all vanadium ores contain some uranium. For security reasons, because of the close connection in production between vanadium and uranium, figures on production of vanadium have not been published since 1947. The value of the vanadium output in 1951 and 1952 is included in the group value shown for undistributed minerals in table 1 of this chapter and therefore is included in the State total value.

Ore output in 1952 came largely from the Uravan mineral belt in Mesa, Montrose, and San Miguel Counties and the Rifle area in Garfield County. Much of the ore was marketed as uranium ore, settlement being made for the vanadium and uranium content on the basis of the guaranteed minimum prices set by the Atomic Energy Commission. The ore was treated in the central mills mentioned in the foregoing section on Uranium. Some vanadium ore was also treated in mills in Utah.

Zinc.—Despite a 5-percent decrease from 1951, Colorado's output of 53,203 tons of recoverable zinc valued at $17,663,396 in 1952 was larger than that in any of the years from 1918 through 1950. The decrease in production in 1952 from the high level attained in 1951 was due to the shutdown of a number of mines (mostly small producers) caused by the sharp decline in the prices of zinc and lead. The price of zinc in 1952 held at 19.5 cents a pound until June 2, when it dropped to 17.5 cents; further changes, mostly downward, reduced the price to 12.5 cents by October 27, at which level it remained through December. The total number of mines, prospects, and dumps that contributed to the output of recoverable zinc was 74 compared with 100 in 1951.

Eagle County produced 49 percent of the total zinc in 1952, San Miguel County 18 percent, Lake 16, Dolores 5, San Juan 3, Gunnison 2, Mineral 2, and other counties 5 percent. Zinc, lead-zinc, and complex zinc-lead-copper-gold-silver ores yielded 99 percent of the total zinc. The leading zinc-producing mines, in order of rank, were: Eagle mine at Gilman, Resurrection group at Leadville, Treasury Tunnel-Black Bear (Idarado) and Smuggler Union (Telluride Mines) in San Miguel County, and the Rico Argentine group in Dolores County.

NONMETALS

Cement.—The Ideal Cement Co. operated 2 cement plants at Portland, Fremont County, and 1 at Boettcher near Fort Collins, Larimer County. Limestone and clays were obtained from local quarries and pits.

Clays.—The leading clay-producing counties were Jefferson, Fremont, Pueblo, Denver, Larimer, Boulder, Arapahoe, and Douglas. Data on clay deposits of the Denver-Golden area were published.[2] Production was reported in 1952 by 28 companies and individuals, including several that operated more than 1 mine. Ten of the producers sold their output as raw clay; the others used all or part of their clay in their own plants for making brick, tile, sewer pipe, and other products. Fire clay produced totaled 300,874 tons and other clays (excluding that used for cement) 112,512 tons. The larger producers of fire clay were the Robinson Brick & Tile Co. mines in Arapa-

[2] Waage, Karl M., Clay Deposits of the Denver-Golden Area, Colo.: Proc. Colorado Sci. Soc., vol. 15, No. 9, 1952.

hoe, Denver, Douglas, El Paso, and Jefferson Counties; George W. Parfet Estate, Inc., and H. M. Rubey Clay Co. properties in Jefferson County; Pueblo Clay Products Co., Pueblo County; H. G. Johnson in Douglas County; Colorado Fire Clay Co., Pueblo County; and the Denver Sewer Pipe & Clay Co. and Denver Fire Clay Co. in Jefferson County.

TABLE 13.—Production of clays, 1951–52, by counties, in short tons

County	1951		1952	
	Quantity	Value	Quantity	Value
Boulder	28,188	$28,188	33,000	$33,000
Delta	1,416	1,416	5,458	5,458
Fremont [1]	5,849	15,954	3,716	11,902
Jefferson	164,854	328,760	153,512	340,605
Pueblo	86,033	240,179	81,716	226,281
Other counties [2]	157,063	343,618	135,984	314,564
Total	443,403	958,115	413,386	931,810

[1] Excluding clay used in cement manufacture.
[2] Arapahoe, Bent (1951), Denver, Douglas, El Paso, Larimer (excluding clay for cement manufacture), Las Animas (1951), and Mesa.

Large producers of other clays included the Longmont Brick & Tile Co., Boulder County; Summit Pressed Brick & Tile Co., Pueblo County; and George W. Lindsay and the Lakewood Brick & Tile Co., Jefferson County.

The price of the raw clay depends mainly on the type, quantity, and geographic location. The average mine value reported to the Bureau of Mines for fire clay in 1952 was $2.62 a ton and for miscellaneous clays $1.27 a ton compared with $2.48 and $1.18, respectively, in 1951.

Feldspar.—Chaffee County was the principal producer of feldspar in Colorado in 1952. The M&S, Inc., operating the Homestake mine 8 miles east of Salida, was the largest individual shipper in the State. Jefferson County, with 3 producers, ranked second; Teller County, with 4 shippers, ranked third; and Fremont County, with 3 shippers, ranked fourth. Grinding plants for feldspar were operated by the Western Feldspar Milling Co. at Salida and the Consolidated Feldspar Corp. at Denver. The value of the crude feldspar sold from the mines in 1952 averaged $5.86 a ton.

Fluorspar.—Shipments of fluorspar increased 41 percent in 1952 over 1951. The largest part of the output continued to come from Boulder County, and the principal producers, as in 1951, were the mines of the Ozark-Mahoning Co. (mill at Jamestown) and the General Chemical Division, Allied Chemical & Dye Corp. (mill at Valmont). Near Walden in Jackson County the Ozark-Mahoning Co. operated another mine and completed construction of a flotation mill, which was put in operation during the year. The Poncha Springs mine Chaffee County, was also an important producer. The fluorspar produced was shipped to consumers outside the State.

Gem Stones.—In some years turquoise has been mined in substantial quantity in Colorado, and in 1952 some production was reported from the Villa Grove turquoise lode in Saguache County. Other gem stones found in the State include topaz, aquamarine, and amazonstone.

Petrified wood, tourmaline (usually nongem quality), smoky quartz, garnet, and jasper are among the other stones picked up by specimen collectors.

Gypsum.—Gypsum was produced by the Ideal Cement Co. and Nat Senatore and the Colorado Limestone Co. from quarries in Fremont County and by the United States Gypsum Co., which operated its quarry and mill near Loveland, Larimer County.

Mica.—Scrap mica was shipped from several Colorado mines in 1952. The largest producer was the Consolidated Feldspar Corp. in Fremont County. The Western Nonmetallics Co. (International Mineral & Chemical Corp.) operated a mica-grinding plant at Pueblo and provided a market for mica produced at scattered mines in the State.

Perlite.—Most of the Colorado output of perlite has come from the quarries of the AleXite Engineering Division of the Alexander Film Co. at Rosita, Custer County, opened in 1947. The company has a mill and expanding plant at Florence. The chief products of the plant are plaster aggregate (including both finish and acoustical aggregates), concrete aggregate, and an aggregate known as Wellite used to seal fractures that occur during the drilling of oil wells. The total output of perlite decreased moderately from 1951.

Pumice and Pumicite.—Pumice output increased slightly over 1951. The producers included the Colorado Aggregates Co., Inc., in Costilla County and the Scor-Blox Lite-Wate Aggregate Co. in Conejos County.

Pyrites.—Shipments of pyrite concentrate decreased heavily in 1952. Only 2 companies, 1 in Dolores County and 1 in Lake County, reported shipments during the year. The pyrite was recovered as a byproduct in the treatment of lead-zinc and molybdenum ores.

Sand and Gravel.—Output of sand and gravel in Colorado increased sharply in 1952, reflecting the sustained demand for building materials resulting from expanding residential construction, highway improvements, and other building. Among the leading counties in commercial sand and gravel output were Denver, Adams, Pueblo, Arapahoe, Boulder, and Jefferson. Commercial output reported in 1952 totaled 2,095,328 tons, with an average value of $1.01 per short ton, at the pits or washing plants. A large part of the noncommercial output by Federal and State highway and some other departments is not reported by counties; the average value at the pits, partly estimated and nominal for some of the production, was $0.65 per short ton.

Stone.—The total production of all types of crushed and dimension stone reported by Colorado producers in 1952 (except limestone for cement) was 1,708,872 short tons, an increase of 16 percent over 1951. Crushed sandstone, including that sold and the noncommercial stone used on Federal and State projects, comprised 49 percent of the total; Larimer County was the largest producer. Commercial crushed limestone from Chaffee, Fremont, El Paso, and Garfield Counties accounted for 32 percent of the State total of all types of stone. Granite used for riprap, mostly from Jefferson County, represented 14 percent. The remainder included miscellaneous stone, a small tonnage of marble, and about 18,000 tons of dimension sandstone and granite. The average price of the dimension stone, based on the value of the output reported by 7 producers, was $10.67 a short ton; the average for all other stone was $1.40 a ton.

MINERAL FUELS

The Colorado production and value of crude petroleum, coal, and natural gas in 1951 and 1952 are shown in table 1 of this chapter. In 1952 petroleum represented 40 percent, coal 10 percent, and natural gas 1 percent of the total value of the mineral output of the State. Table 13 shows production in 1951 and 1952, by counties, for coal, and table 14 gives production, by fields, for petroleum. Additional statistics and a summarized review covering oil and natural-gas production and well drilling may be found in volume II of this series. Peat was mined near Caribou and Nederland in Boulder County.

TABLE 14.—Production of coal, 1951–52, by counties [1]

County	1951			1952		
	Production (net tons)	Average value per ton	Total value	Production (net tons)	Average value per ton	Total value
Boulder	113,923	$5.35	$609,488	79,989	$5.67	$453,538
Delta	74,935	4.57	342,453	63,936	5.44	347,812
El Paso	89,620	4.58	410,460	72,036	4.52	325,603
Fremont	279,466	4.71	1,316,285	201,641	4.48	903,352
Garfield	38,124	5.26	200,532	42,412	5.39	228,601
Gunnison	341,315	5.50	1,877,233	339,498	5.58	1,892,362
Huerfano	309,760	5.73	1,774,925	246,149	6.61	1,627,045
Jackson	3,354	5.34	17,910	2,415	5.54	13,379
Jefferson	21,119	4.88	103,061	1,593	5.08	8,092
La Plata	38,776	4.03	156,267	37,853	4.06	153,683
Las Animas	991,419	6.44	6,386,238	857,589	6.53	5,603,400
Mesa	89,678	4.72	423,280	95,038	4.94	469,488
Moffat	110,096	4.92	541,672	90,532	5.26	476,198
Montrose	2,419	5.14	12,434	3,083	5.34	16,463
Pitkin	7,730	4.60	35,558	7,328	4.80	35,174
Rio Blanco	35,661	4.82	171,886	40,174	5.56	223,367
Routt	676,021	4.73	3,197,579	686,970	4.84	3,325,395
Weld	879,223	4.08	3,587,739	754,779	4.13	3,112,705
Total	4,102,639	5.16	21,165,000	3,623,015	5.30	19,215,657

[1] Excludes mines producing less than 1,000 tons.

TABLE 15.—Production of crude petroleum, 1951–52, by fields, in thousands of barrels

Field	1951	1952	Field	1951	1952
Iles	447	378	Rangely	22,091	22,443
Merino	455	391	Wilson Creek	2,795	2,851
Mount Hope	239	578	Yenter	420	962
Powder Wash	123	257	Other fields [1]	1,253	2,521
			Total Colorado	27,823	30,381

[1] Includes crude oil consumed on leases and net change in stocks held on leases for entire State.

REVIEW BY COUNTIES

ADAMS

The mineral output of Adams County in 1952 was chiefly sand and gravel dug from gravel bars of Clear Creek northwest of Denver. Several washing and screening plants operated in the area. Placer gold was recovered as a byproduct at the plants of the Brannan Sand & Gravel Co., Cooley Gravel Co., Hehl Engineering Co., Metropolitan Sand & Gravel Co., and Superior Sand & Gravel Co.

TABLE 16.—Value of mineral production in Colorado in 1951–52, by counties,[1] and principal minerals [2] produced in 1952, excluding uranium

County	1951	1952	Principal minerals in order of value [2]
Adams	$968,921	$1,114,555	Sand and gravel, stone, gold.
Arapahoe	123,862	291,293	Sand and gravel, clay.
Bent	(3)		
Boulder	1,745,995	2,369,944	Fluorspar, coal, tungsten, silver.
Chaffee	877,437	1,269,708	Stone, fluorspar, feldspar, sand and gravel
Clear Creek	456,653	244,811	Lead, zinc, gold.
Delta	385,569	353,270	Coal.
Denver	428,464	707,356	Sand and gravel, clay.
Dolores	1,843,525	1,787,258	Zinc, lead, silver.
Douglas	165,958	120,819	Clay, sand and gravel.
Eagle	12,745,943	10,383,527	Zinc, lead, silver.
El Paso	655,059	560,404	Coal, stone, sand and gravel, clay.
Garfield	241,467	264,280	Coal, stone.
Gilpin	161,625	50,139	Sand and gravel.
Gunnison	2,818,970	2,756,303	Coal, zinc, lead, silver.
Hinsdale	8,883	327,032	Lead, zinc, silver.
Huerfano	1,774,925	1,627,045	Coal.
Jefferson	1,125,601	1,085,776	Stone, clay, sand and gravel.
La Plata	162,181	161,281	Coal.
Las Animas	6,438,763	5,607,707	Do.
Mesa	489,081	563,602	Coal, sand and gravel.
Mineral	1,040,742	1,037,257	Lead, zinc, silver.
Moffat	543,172	479,209	Coal.
Montrose	12,434	16,463	Do.
Ouray	1,136,501	959,187	Lead, zinc, copper, silver, gold.
Park	596,822	169,530	Zinc, gold, lead.
Pitkin	75,610	42,516	Coal, lead.
Pueblo	505,942	573,311	Sand and gravel, clay.
Rio Blanco	177,749	243,936	Coal, sand and gravel.
Routt	3,197,579	3,325,147	Coal.
Saguache	277,906	178,611	Lead, zinc, silver.
San Juan	3,265,458	2,839,970	Lead, zinc, gold, silver, copper.
San Miguel	8,920,078	8,953,357	Zinc, lead, gold, copper, silver.
Summit	454,071	504,469	Lead, zinc, silver.
Teller	977,021	1,738,176	Gold, feldspar.
Weld	3,596,330	3,137,267	Coal.
Undistributed [3]	48,636,703	51,033,000	
Total	107,033,000	106,877,516	
Petroleum, natural gas, and natural-gas liquids.	72,402,000	80,711,000	
Total Colorado	179,435,000	187,589,000	

[1] County figures exclude petroleum, natural gas, natural-gas liquids, uranium, vanadium, and some undistributed stone and sand and gravel.
[2] Other than petroleum, natural gas, natural-gas liquids, uranium, and vanadium.
[3] Includes value for vanadium, also value of production for the following counties: Bent (1951), Conejos (pumice), Costilla (pumice), Custer (perlite), Fremont (cement, coal, stone, clay), Jackson (fluorspar), Lake (molybdenum, zinc, tungsten, lead, gold), Larimer (cement, stone, sand and gravel, gypsum).

ARAPAHOE

The Robinson Brick & Tile Co. operated clay pits in Arapahoe County which supplied raw material for the company plant in Denver. Stone and sand and gravel were also produced in the county.

BOULDER

Fluorspar was the mineral of chief value produced in Boulder County in 1952. The output came from the Argo-Blue Jay-Emmett group of mines of the Ozark-Mahoning Co. and the Burlington mine of the General Chemical Co., both in the Jamestown district. The crude fluorspar was shipped to company concentrating mills—the Ozark-Mahoning mill is at Jamestown and the General Chemical mill at Valmont about 20 miles from the mine. Both mills produce lead-silver-gold-copper concentrate as a byproduct.

The output of silver in 1952, largest since 1917, came mostly from the Caribou mine of the Consolidated Caribou Silver Mines, Inc., in

the Grand Island district near Nederland. The Caribou ore, concentrated in the company 100-ton mill, yielded a rich silver-lead-gold concentrate containing a little copper also. Some gold ore was shipped from the Cash mine at Gold Hill. Placer gold was recovered as a byproduct at a sand and gravel washing plant on the George Sawhill ranch in the Boulder area.

Considerable activity in tungsten mining and prospecting resulted from the domestic tungsten program of the Government, which provides a price of $63 a unit for standard-grade tungsten concentrate, and the aid in financing exploration afforded in the program of the Defense Minerals Exploration Administration (DMEA). Exploration contracts in the county approved from the beginning of the program in 1951 to the end of 1952 authorized expenditures totaling $407,607, of which the Government contributed $305,705 and private capital $101,902 (see table 3).

Production of tungsten concentrate (60-percent WO_3 equivalent) totaled 111 tons in 1952 compared with 54 tons in 1951. Output was reported from 28 individual mines, dumps, and prospects in 1952. Most of the ore was treated in the old Wolftongue mill at Nederland, reconditioned and operated by the Vanadium Corp. of America, and the Boulder Tungsten Mines mill on the Sugarloaf road. Both mills treated company and custom ores. Properties shipping substantial tonnages of ore included the Cold Spring, Conger, Holy Cross-Orange Blossom, Hoosier, Katie, and Tenderfoot (Hetzer).

Dimension sandstone used for buildings was quarried in the Lyons area. Peat was produced near Nederland and Caribou. The county continued to be an important producer of coal.

CHAFFEE

Chaffee County was an important producer of nonmetallic minerals, but its output of metals was small. Lead-zinc-silver-gold ore (320 tons) was shipped from the Mary Murphy mine on Chalk Creek. A little gold ore was shipped from the Nelly Bly claim in the Trout Creek district and the Golden Wonder in the Turret district. A small tonnage of manganiferous ore was shipped from the Midway Mining Co. property.

The nonmetallic-mineral output consisted chiefly of limestone, fluorspar, and feldspar. The largest producer of limestone was the Colorado Fuel & Iron Corp. quarry at Monarch, which supplies limestone to the steel mill at Pueblo. Some limestone was mined for making soil conditioners and poultry grits at Salida. The fluorspar came largely from the Brown Canyon mine of the General Chemical Division, Allied Chemical & Dye Corp., and the Poncha Springs mine of the Reynolds Mining Corp. Most of the feldspar was produced by the Homestake mine of the M&S, Inc., near Salida. The Western Feldspar Milling Co. operated a grinding plant at Salida. Monumental granite is produced at quarries in the Ute Trail district.

CLEAR CREEK

The output of gold, silver, lead, and zinc in Clear Creek County was lower in 1952 than in 1951. The Mendota-Frostberg and Terrible-Dunderberg mines at Silver Plume (Griffith district) continued to produce most of the county output of lead and zinc until they cur-

TABLE 17.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties and districts, in terms of recoverable metals

County and district	Mines producing		Material 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		6		1,097	158				$38,538
Boulder County:									
Central (Jamestown)	2			[2] 70	[2] 5,906	[2] 16,000	[2] 188,000		[2] 41,935
Gold Hill	1	1	21	41	141		100		1,579
Grand Island	1		13,413	676	274,104	20,000	205,900		309,728
Chaffee County:									
Chalk Creek	1		320	28	567	3,900	42,000	54,000	18,163
Trout Creek	1		4	1					35
Turret	1		4	4	2	100			166
Clear Creek County:									
Argentine	1		1,713	116	3,087	5,300	155,000		33,092
Empire	1		16		23		500	700	218
Griffith	3		4,443	55	14,342	8,800	331,000	460,800	146,819
Idaho Springs	7		715	485	2,376	1,500	20,000		22,708
Montana	5		124	38	1,369	200	7,000	500	3,827
Trail Creek or Freeland (Lamartine)	2		7,059	355	8,816	2,200	76,500		33,252
Conejos County: Stunner	1		(3)		27				24
Custer County: Hardscrabble	3		163	3	706	6,000	18,000	22,000	8,746
Dolores County: Pioneer	2		44,184	128	127,446	146,000	4,460,000	5,468,000	1,780,905
Eagle County: Red Cliff	1		298,083	1,700	348,090	390,000	7,960,000	52,000,000	10,382,479
Fremont County: Cotopaxi	1		276	7	242		6,000	40,000	8,070
Gilpin County:									
Southern	2	5	7	19	46		1,600		965
Northern	2		58	11	32		400		478
Gunnison County:									
Elk Mountain	4		3,636	20	13,059	26,600	518,000	606,000	202,950
Gold Brick	1		2,120	213	611		2,700		8,443
Rock Creek	2		57	5	410	400	16,500		3,300
Taylor Park (Tin Cup)	1		95	1	1,529		74,800		13,461
Tomichi	2		19,120	41	91,785	31,000	1,478,000	1,748,000	620,133
Hinsdale County: Galena	4		14,513	110	27,320	24,000	1,496,000	312,000	327,032
Jefferson County		3		339	53				11,913
Lake County: Leadville	12		202,406	18,405	322,034	326,000	11,248,000	16,974,000	5,643,136
La Plata County: California	2		8	33	147		2,000		1,610
Mineral County: Creede	3		41,685	1,122	174,219	48,000	3,026,000	2,048,000	1,035,717

For footnotes, see end of table.

TABLE 17.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties and districts, in terms of recoverable metals—Continued

County and district	Mines producing		Material sold or treated (short tons)	Gold[1] (fine ounces)	Silver[1] (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer							
Ouray County:									
Red Mountain	2		240	4	7,078		102,000	200	$23,001
Sneffels	4		49,512	2,411	83,907	391,000	2,088,000	1,861,200	900,074
Uncompahgre	3		856	28	4,886	3,000	132,000	52,600	36,112
Park County[4]	5	3	1,866	2,019	6,193	30,000	64,000	456,000	169,530
Pitkin County:									
Ashcroft	1		1	1	124		800		276
Roaring Fork	2		200	7	917		35,200		6,742
Spring Butte	1		4		2		2,000		324
Routt County: Hahns Peak		1		3	1				106
Saguache County:									
Blake	1		2		14		1,300		222
Cochetopa	1		22	1	48	1,400	700	3,800	1,161
Crystal Hill	1		100	33	21				1,174
Kerber Creek	5		2,679	72	14,662	46,600	554,000	360,200	176,054
San Juan County:									
Animas	11		176,578	9,657	321,308	1,023,700	6,927,000	1,971,000	2,318,963
Eureka	8		13,960	544	41,969	166,000	1,517,000	970,300	502,503
Ice Lake Basin	1		61	2	253	300	2,000	700	810
San Miguel County:									
Iron Springs	4		31,916	1,044	103,646	118,000	578,600	59,900	261,999
Lower San Miguel	1			1	7		100		57
Mount Wilson	3		4	1	36		1,300	100	294
Upper San Miguel	4		454,471	34,822	764,478	4,370,000	15,314,000	19,622,000	8,691,007
Summit County:									
Breckenridge	3	1	5,478	247	14,410		998,000	1,240,000	388,205
Montezuma	13		3,507	32	21,232	6,000	464,000	50,000	104,792
Ten Mile	6		262	15	671		16,000	24,000	7,692
Teller County: Cripple Creek	22		152,853	48,527	9,133				1,706,711
Total Colorado	171	20	1,548,815	124,594	2,813,643	7,212,000	60,132,000	106,406,000	35,997,231

[1] Bureau of Mines not at liberty to show separate figures for placer production by districts in 1952.
[2] Includes amounts recovered from lead-silver-gold-copper concentrates produced as byproduct of beneficiation of fluorspar at 2 plants.
[3] Less than ½ ton.
[4] Bureau of Mines not at liberty to show production figures separately by districts.

tailed operations because of the decline in prices of these metals. The Smuggler mine at Silver Plume also produced both lead and zinc, and all three mines produced silver. In July the Lupton Mining Co. resumed production from its Grizzly mine in the Argentine district. The ore (treated in the company mill at Georgetown) came from the lower levels opened by the new 1,300-foot San Juan crosscut driven after mining was suspended in the upper levels in 1949.

Output from other Clear Creek County districts in 1952 continued to be small. The Montana Mining & Development Co. mill treated dump ore from the Lamartine property on Trail Creek and carried on an exploration project on the Ben Harrison and Croesus claims under a DMEA contract. Some lead-silver ore was shipped from the Crazy Girl mine. The Bard Creek mine near Empire was under development, with some production. In the Idaho Springs area the Dixie mine of LeRoy Giles & Co. continued to produce gold ore, treated in the company mill. The Brighton No. 2, Fairmount tunnel, Kitty Clyde, Lake, Silver Spoon, and Stanley mines shipped some ore. The Silver Spruce mill treated custom ores. In the Montana district (Dumont), the producing mines included the Drummond, Nabob, Red Elephant (Windy Point), and Watt Stembal No. 1.

The Urad molybdenum mine of the Molybdenum Corp. of America was under development during the year.

Some beryl, feldspar, and mica were shipped by individual small-scale operations.

CONEJOS

A small lot of silver ore was shipped from the Chari Lee claim in the Stunner district. Pumice was produced by the Scor-Blox Lite-Wate Aggregate Co.

COSTILLA

Pumice used in the manufacture of building blocks was produced by the Colorado Aggregates Co., Inc.

CUSTER

Ores containing zinc, lead, copper, silver, and some gold were shipped from the Defender, Navajo, and Revely properties. The Defender Mining Co. carried on an exploration project at the Defender mine under a DMEA contract.

Output of perlite from the quarry of the AleXite Engineering Division of the Alexander Film Co. near Rosita was not as large as in 1951; the perlite rock was trucked to the company mill and expanding plant at Florence.

DELTA

Coal is the chief mineral product of Delta County.

The Delta Brick & Tile Co. mined clay for use in the company plant at Delta.

DENVER

Manufacturers of brick and tile, concrete and cinder blocks, concrete and clay sewer pipe, and other construction materials in Denver provided a market for several nonmetallic minerals mined in Denver and other counties. The Consolidated Feldspar Corp. operated its

feldspar-grinding plant, purchasing crude feldspar from producers in various counties. The Globe byproducts smelter of the American Smelting & Refining Co. recovered cadmium, indium, and thallium from flue dust, dross, and other material shipped to it from other company smelters. The General Chemical Division, Allied Chemical & Dye Corp., purchased pyrite concentrate from Colorado operators for use in its Denver plant.

DOLORES

The Rico Argentine Mining Co. operated its group of mines and 150-ton flotation mill at Rico continuously in 1952; the output of lead-silver and zinc concentrates was larger than in 1951. Pyrite was recovered in the mill as a byproduct. Development in the mine in 1952 included 370 feet of shaft, 2,285 feet of drifts, and 6,938 feet of diamond drilling. The Knickerbocker Mining Co. shipped several hundred tons of lead-zinc-silver ore from the Union Carbonate property.

DOUGLAS

Clay was produced in 1952 by the Robinson Brick & Tile Co. near Littleton and H. G. Johnson near Castle Rock. Other output included sand and gravel and some feldspar.

EAGLE

In 1952 Eagle County again ranked first among Colorado counties in zinc production and in total value of the output of gold, silver, copper, lead, and zinc. The production of metals decreased moderately from the high levels of 1951. The total value of the output decreased 18 percent, owing in part to the decline in prices of zinc and lead.

The Red Cliff (Battle Mountain) district contributed the entire Eagle County output of the five metals in 1952 and 1951. The large Eagle mine of the New Jersey Zinc Co., Empire Zinc Division, at Gilman operated continuously in both years. The mill is completely underground, in an excavation cut in granite in Eagle Canyon, and has a capacity of 1,200 tons daily. The principal ore bodies occur as replacements in a flat-dipping bed of limestone. They are generally massive, with a core of iron-copper-silver-gold ore surrounded by an outer layer of zinc-lead ore. The zinc-lead ore is treated in the mill, and the iron-copper-silver-gold ore is shipped crude to smelters. The mine is opened by a main haulage tunnel on the 16th level (with its portal at the ore bins in Eagle Canyon), a vertical shaft bottomed on the 16th level, raises from the 16th level, and a series of inclines from the 16th to the 24th level. The entire operation is completely mechanized. Electric-battery motors are used for underground haulage.

EL PASO

Although coal continued to be the principal mineral mined in El Paso County, sand and gravel, stone, and clay were also important. The Golden Cycle Corp. was a large producer of limestone. Clay was mined by several companies, including the Robinson Brick & Tile Co., National Clay Products Co., Nixon Bros., and Standard Fire Brick Co.

FREMONT

The metal output from Fremont County in 1952 was derived from zinc ore shipped by the Adolph Poston Mining Co. from the Cotopaxi-Gumaer (or Monarch-Galena) mine in the Cotopaxi district.

Large tonnages of limestone, clay, and gypsum were produced in the county for making cement in the plants of the Ideal Cement Co. at Portland, and considerable dolomite was quarried for use in the Colorado Fuel & Iron Corp. steel plant at Pueblo. Limestone was quarried, crushed, and sized for shipment to sugar plants. Building stone, including travertine and some marble, was produced. Clay was mined by the Standard Fire Brick Co., Freeman Fire Brick Co., and the Laclede Christy Co. for use in their plants; the Laclede Christy brick plant in Canon City was destroyed by fire, causing a shutdown of several clay pits and a decrease from 1951 in the county output of clay. Feldspar output also decreased, owing to the closing early in the year of the Parkdale mill of the Consolidated Feldspar Corp. The scrap-mica production came largely from the Consolidated Feldspar properties, although there were several other small producers. Coal ranked second in the county (cement ranked first) in value of output; production of both coal and cement was less than in 1951.

GARFIELD

The mill of the United States Vanadium Co. near Rifle operated on vanadium-uranium ores. The operating mines included the East Rifle Creek and Enterprize. The Glenwood Springs limestone quarry was operated by the Frank H. Norberg Co. The Bureau of Mines continued to operate the Oil-Shale Mine and Engineering Experiment Station at Rifle; this station was authorized by the Congress to conduct an experimental program to develop the technology for obtaining oil from oil shale. Coal production increased over 1951.

GILPIN

Metal mining in Gilpin County, formerly one of Colorado's leading gold-producing counties, has been confined to small-scale intermittent operations since World War II. The value of the gold produced in 1952 was only $1,050 compared with the peak of $3,237,345 in 1871 and the more recent output value at $789,943 in 1936. In 1952 small tonnages of ore were produced from the Ivanhoe, Mackey, Walter Perkins, and We Got Em Lode properties, and a little gold was recovered from placers on North Clear Creek. Exploration projects under DMEA contracts were carried on for lead and zinc at the Gilpin-Eureka-Essex property and for uranium at the Realty Co., Bezant & Wood, and Uranium Co. of America properties.

GUNNISON

Because of the low prices of lead and zinc, the Callahan Zinc-Lead Co. suspended ore production and milling at its Akron-Erie group of mines at White Pine on November 14, 1952. This group was the principal producer of metals in Gunnison County from 1943 through 1952. The products of the mill were lead-silver and zinc concentrates. Development in 1952 included 1,253 feet of drifts, 821 feet of raises, and 114 feet of shaft.

In the Elk Mountain district near Crested Butte, the Crested Butte Mining & Milling Corp. Daisy group and the Slate River Mining Co. Macawber mine each shipped about 1,700 tons of zinc-lead-silver ore. The American Smelting & Refining Co., continuing development of the Keystone mine, drove 4,348 feet of drifts and raises and did 2,446 feet of diamond drilling in 1952. Ore removed in development was stockpiled, except for sample lots shipped for testing. A site was prepared for a mill to be constructed on the property. John Lambertson shipped 95 tons of high-grade lead-silver ore from the Star mine in the Tin Cup district. At the old Carter mine near Ohio, acquired by the Kanarado Mining & Development Co. in 1951, gold ore from dumps was treated in the amalgamation-concentration mill. Other small producers included the Domingo and Undine No. 1 mines in the Rock Creek district and the Pyrite claim in the Tomichi district.

Feldspar was produced from the Colorado Feldspar Corp. quarry at Sapinero. Coal was the mineral of chief value mined in the county. Exploration and some mining were done at the Brown Derby and New Anniversary-Bucky pegmatite properties near Ohio, which are on pegmatite dikes reported to contain deposits of beryl, columbite-tantalite, lepidolite, and microlite.

HINSDALE

The Colorado Standard Lead Zinc Mines, Inc., completed reconditioning the Ute & Ulay 100-ton mill in February 1952 and operated the mine and mill until December 7. Ore treated totaled 14,497 tons. The mill products were silver-lead and zinc concentrates. On December 8 the property was leased to the Idarado Mining Co. Small tonnages of ore were shipped from the Fanny Fern, View of the Park, Yankee Boy, and Yellow Medicine properties.

JACKSON

The Northgate fluorspar mine of the Ozark-Mahoning Co. was one of the larger producers in 1952. Steady shipments of acid-grade fluorspar were made after the flotation mill built at the mine was put in operation early in the year.

JEFFERSON

Jefferson County continued to be a large producer of clay, sand and gravel, and crushed stone. The most extensive clay workings are in the Golden area. Among the clay producers were the George W. Parfet Estate, Inc., Denver Fire Clay Co., H. M. Rubey Clay Co., Fred S. Caldwell, Denver Sewer Pipe & Clay Co., Denver Terra Cotta Co., Geo. W. Lindsay, Lakewood Brick & Tile Co., Golden Clay Mining Co., Overland Pressed Brick Co., Coors Porcelain Co., Robinson Brick & Tile Co., and Western Tile Manufacturing Co. The bulk of the clay was used by the producer or sold to local clay-products companies. Crushed rock was shipped by the Denver Crushed Stone, Inc., and the Cass Co., mostly for use in constructing dams and for riprap. There were a number of gravel-washing plants on bars of Clear Creek, some of which recovered gold as a byproduct. W. B. Kerkling operated a placer mine on Clear Creek, using a

stationary washing plant and bulldozer. Feldspar and beryl were produced at the Biggers mine near Tiny Town. The Beryl Ores Co. has a purchasing office and beneficiation plant near Arvada and assists some beryl miners by limited financing or rental of equipment.

LAKE

The output of silver, copper, and zinc in Lake County increased moderately in quantity in 1952 from 1951, and that of gold and lead decreased. The total value of the 5 metals declined 7 percent owing largely to the drop in prices of lead and zinc.

Leadville District.—The entire Lake County output of gold, silver, copper, lead, and zinc in 1952 came from the Leadville district. The Resurrection Mining Co. group of mines contributed the bulk of the production. The ore, mined by the company and lessees, was concentrated in the company 600-ton mill at the mine. The mine is opened by a 1,323-foot vertical shaft, 6 levels, and a 4-mile tunnel (old Yak) that intersects the shaft. A recent changeover in mining methods from square sets to top slicing and sublevel caving has greatly reduced mining costs per ton of ore.[3]

According to published information,[4] the Resurrection Mining Co. expanded its holdings in 1952 by acquiring a lease and option on the Ibex Mining Co. property on Breece Hill, comprising 10 claims and including the Little Jonny mine. Extensive development of the property was planned. Ore milled from the Resurrection group in 1952, comprising company, custom, and lease ores, totaled 200,000 tons compared with 180,000 in 1951. The company ore came largely from the Resurrection No. 2 and White Cap operations. Exploration in the Resurrection No. 2 was discontinued, and production of ore by the company in the lower levels will probably cease early in the spring of 1953; the mine will then be turned over to lessees. The Dolly B winze has been extended from the 800- to the 1,300-foot level. The most important current development, which was expected to make available a large quantity of ore, was on the 4th and 8th levels of the White Cap shaft at the Yak tunnel.

A separate unit of the Resurrection mill treated custom ore purchased from mines in Lake, Summit, Park, Pitkin, Clear Creek, Chaffee, Fremont, Saguache, and Custer Counties.

The Arkansas Valley smelter of the American Smelting & Refining Co. purchased lead, lead-copper-gold-silver and gold and silver ores and concentrates from operators in the various Colorado mining districts and concentrates, residues from zinc smelters, and other material from outside the State. Receipts of purchased material in 1952 totaled 74,626 tons compared with 110,160 in 1951. Besides operating its smelter, the company carried on a development campaign in the Ibex-Sunday area and shipped considerable ore from the properties.

The Dolly B, Fortune, New Monarch, and Valley mines and several dumps shipped ore to the Leadville smelter and the Resurrection mill. The Cadwell Mining Co. drove 800 feet of drifts on the property opened by the Hayden 500-foot vertical shaft and shipped some ore

[3] Stout, C. N., and Wright, John S., Resurrection Cuts Mining Costs—Makes Lower Grade Ore Economic: Min. Eng., January 1953, pp. 45–48.
[4] Leadville Herald Democrat, Dec. 31, 1952.

removed in development. Exploration was carried on under a DMEA contract. The small Cloud City mill made a test run on ore from the Ibex dump.

Work by the Bureau of Mines on extending the Leadville drainage tunnel, begun September 20, 1950, was completed in February 1952. The tunnel, which was 6,600 feet long at the beginning of the project, was extended to a point 11,299 feet from the portal. In addition, the Bureau drove 291 feet on the Downtown lateral, 191 feet on a lateral connecting the tunnel with the Hayden shaft, and 60 feet on the Robert Emmet lateral. The flow of water from the tunnel averaged about 2,160 gallons per minute in December 1952.

During the past 20 years molybdenum has been the metal of chief value mined in Lake County. The Climax mine on Fremont Pass is the largest metal-mining operation in Colorado; it produced an average of 14,500 tons of ore per working day (6-day week) in 1952. Production of molybdenum was 6 percent above that in 1951. The tailings from the mill are re-treated in a separate plant for recovery of byproducts, including tungsten concentrate, pyrite, and tin concentrate. The following data are abstracted from the company annual report to stockholders for the year ending December 31, 1952:

The mill treated 4,453,328 tons of ore during 1952, which was substantially at its rated capacity of 15,000 tons per day. The increase in molybdenum production over 1951 was the result of mining somewhat higher grade ore. Production and sales were practically in balance.

Our byproducts plant expansion was completed in February 1952; with its increased capacity your company produced approximately 524,000 pounds of tungsten contained in concentrate as compared with 259,000 pounds in 1951. Sales of other byproducts—pyrite, tin concentrate and monazite—continue to be profitable but, because of low volume, of little consequence to your company's earning power.

You have been informed previously of the contract with the Government which required Climax to open and prepare large ore reserves of the new Storke level; to increase the capacity of the mill from 15,000 to 20,000 tons of ore per day; and to increase correspondingly our byproducts plant capacity. The contract also assured us of operations of these facilities at capacity until 1956.

After execution of this contract, the Government requested Climax to review the possibility of a further substantial increase in molybdenum production. * * * After extensive negotiations, Climax entered into an additional contract with the Government on July 2, 1952. * * * The contract provides that:

1. Climax will prepare for mining, from designated peripheral areas or hitherto abandoned drawpoints of the Phillipson Level, sufficient reserves to support a mining rate of 5,000 tons of ore per day.
2. Climax will provide new surface facilities to be used exclusively for the treatment of low-grade ores at a rate of 5,000 tons per day from about January 1954 to June 1962, or until 50,000,000 pounds of molybdenum from such ores have been delivered to the Government, whichever first occurs.

Production is scheduled to commence early in 1954. A price in excess of the current market price of $1.00 per pound of molybdenum contained in concentrate is expected for the first 6 months. Thereafter, in each successive six-month period, the price may increase or decrease; barring inflation it is expected to decrease.

Nonmetallic mineral production in Lake County included ganister shipped by Dale Hoover to the Standard Fire Brick Co. at Pueblo.

LA PLATA

Small lots of gold-silver and gold-silver-lead ore were shipped to the Leadville smelter from the Lucky Moon property and a cleanup of the Root-Norton assay office. The Zodomok Mines, Inc., which

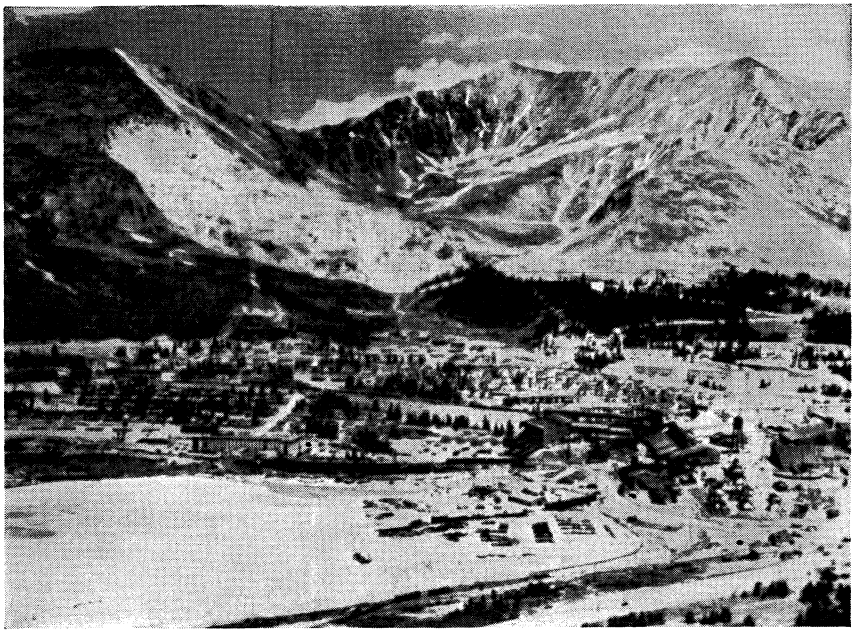

FIGURE 3.—Climax, Colo. Background shows caving on Bartlett Mountain caused by withdrawal of ore.
[Courtesy, Climax Molybdenum Co.]

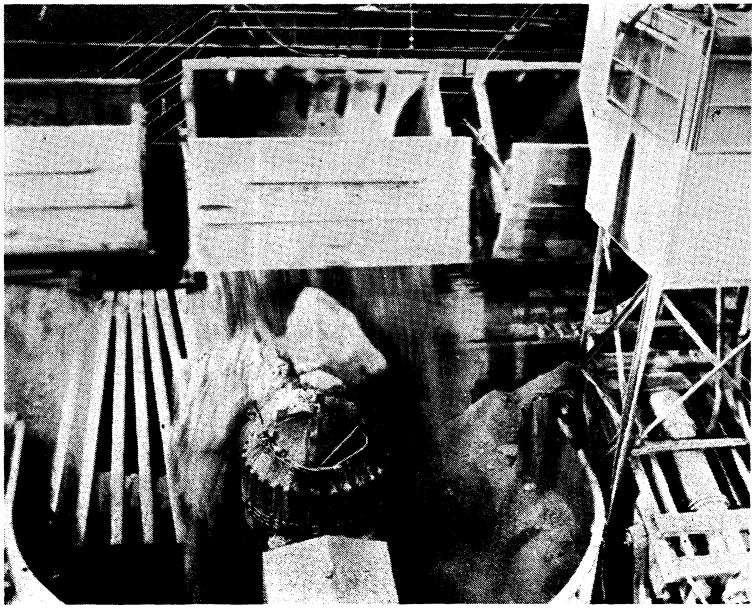

FIGURE 4.—Cars dumping ore into crusher, Climax, Colo.
[Courtesy, Climax Molybdenum Co.]

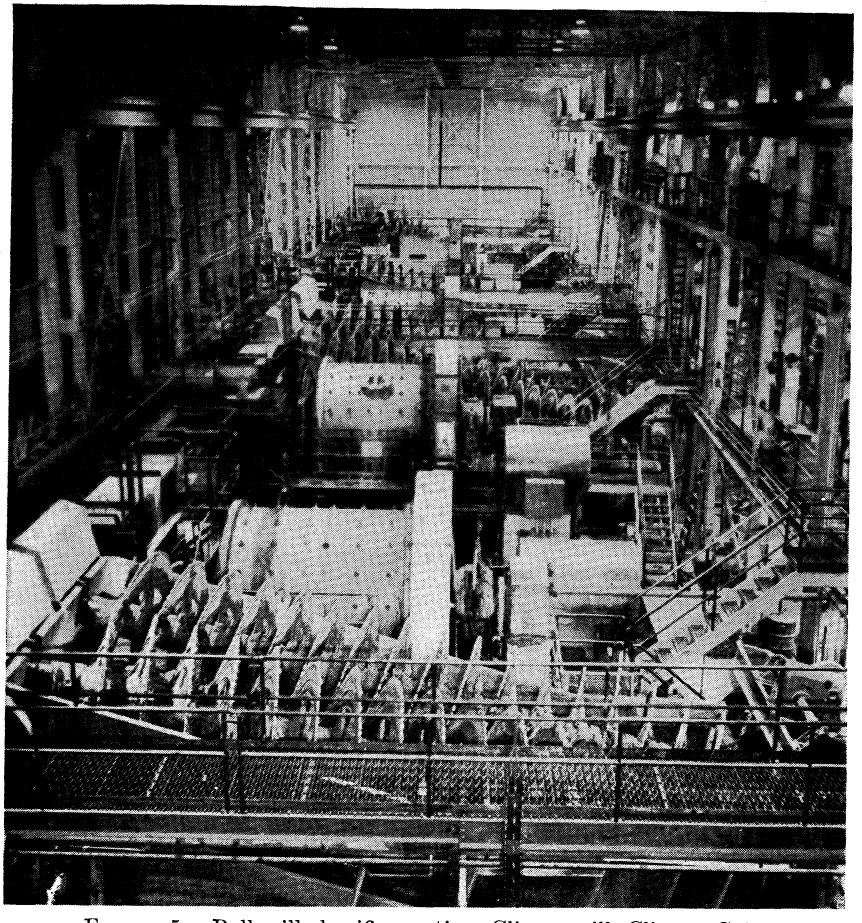

FIGURE 5.—Ball mill-classifier section, Climax mill, Climax, Colo.
[Courtesy, Climax Molybdenum Co.

acquired the Bessie G. mine on June 1, 1952, shipped 2 tons of high-grade gold ore and prepared to construct a gravity-concentration mill.

The Vanadium Corp. of America operated its mill at Durango on uranium and vanadium ores from outside the county.

Coal output was approximately the same as in 1951.

LARIMER

Larimer County's mineral output in 1952 comprised chiefly limestone from the La Porte quarry of the Ideal Cement Co., used in the company cement plant at Boettcher; gypsum for the United States Gypsum plant at La Porte; crushed sandstone produced under a Government contract for construction of Carter Lake reservoir; and sand and gravel used on various construction projects. Some dimension sandstone was quarried for use on buildings. The Fort Collins Brick & Tile Co. mined clay for its plant. A little tungsten was produced from the Lookout claim of the Buckhorn Mining Co. northwest of Fort Collins.

LAS ANIMAS

This county is among the larger suppliers of coal to the steel works of the Colorado Fuel & Iron Corp. at Pueblo. The company's large, newly developed and equipped Allen mine west of Trinidad began producing coal in 1952. Alabaster and sand and gravel also are produced in the county.

MESA

Activity in uranium-vanadium mining in Mesa County continued to expand in 1952. The annual report of the Colorado Commissioner of Mines shows 27 individual producing mines in the county, many of them worked by lessees on the Climax Uranium and United States Vanadium properties. Mining and exploration centered in the Calamity Mesa, Outlaw Mesa, and Gateway areas in the southwestern part of the county. At Grand Junction the Climax Uranium Co. operated its mill, the capacity of which was increased during the year, and the Atomic Energy Commission maintained an operations office covering all the Colorado Plateau activities.

The county output of coal increased over 1951. Clay was produced and used in the manufacture of brick at Grand Junction.

MINERAL

The output of gold, lead, and zinc in Mineral County increased in 1952 from 1951, but that of silver and copper decreased. The Emperius Mining Co. continued to operate its group of mines, including the Amethyst, Commodore-Wedge, New York-Volunteer-Del Monte-Aspen, and Equinox properties. Ore produced totaled 40,085 tons, of which 39,527 tons was treated in the company 120-ton selective flotation mill and 558 tons was shipped crude to the Leadville smelter. The Emperius operations have produced the bulk of the county output of metals during the past 12 years. The Outlet Mining Co. (Phoenix mine) shipped 1,292 tons of ore averaging 7.66 ounces of silver per ton and 18.46 percent lead. The TOC Development Co. (Holy Moses-Solomon-Ethel) shipped 308 tons of lead-silver-gold ore.

MOFFAT

Coal and sand and gravel were produced in Moffat County in 1952.

MONTROSE

Montrose County ranked first among Colorado counties in extent of uranium-vanadium mining and milling. The annual report of the Colorado Commissioner of Mines lists 56 producing and 6 developing mines in 1952, with operations in the Bull Canyon, Naturita, Uravan, Carpenter Ridge, Long Park, Hydraulic, East Paradox, Club Mesa, West Paradox, and Monogram districts. Milling capacity was expanded greatly at the mill of the United States Vanadium Co. (a division of the Union Carbide & Carbon Corp.) at Uravan, and the Vanadium Corp. of America mill at Naturita operated at capacity.

OURAY

The Camp Bird mine in the Sneffels district, operated by King Lease, Inc., continued to be the largest producer of metals in Ouray County. The output of ore, treated in the company mill, was about the same in 1952 as in 1951. Equipment added to the mill increased its daily capacity from 125 to 150 tons. The products of the mill were lead-gold-silver-copper concentrate and zinc concentrate. The mine has more than 7 miles of underground workings. Revenue Mines rehabilitated the 7,500-foot Revenue Tunnel and did exploration work from August 1 through December. The Yellow Rose Leasing Co. cleaned out old workings at the Yellow Rose mine and shipped 221 tons of ore; the property was still in the development stage. The Queen Anne mine produced some ore.

Other small shippers included the Lost Day-Patsy in the Red Mountain district and the Bachelor, Mineral Farm, and Monarch in the Uncompahgre district. The American Zinc, Lead & Smelting Co. continued to buy ore for treatment in its custom flotation mill at Ouray until November 1 and then closed the mill.

The 1,000-ton mill of the Idarado Mining Co. at the portal of the Treasury tunnel near Red Mountain Pass operated on ore mined from company properties in San Miguel County.

PARK

The connected-bucket dredge of the South Platte Dredging Co. near Fairplay, one of Colorado's leading gold producers since removal of wartime restrictions on gold mining in 1945, was shut down for an indefinite period on January 15, 1952. As a result, output of gold from Park County decreased from 13,266 ounces in 1951 to 2,019 ounces in 1952. The Buckskin Joe Mines, Ltd., continued to work the Phillips group in Buckskin Gulch near Alma, and shipped gold-zinc-lead-silver ore to the Resurrection mill at Leadville. This mine was the principal shipper of ore in the county. Other small producers included the Harrisburgh and Mineral Park (Otis shaft) near Alma, the Betty Lode in the Freshwater (Guffey) district, and the Shirley May at Garo, which shipped 24 tons of 5-percent copper ore removed in exploring for uranium.

PITKIN

Herron Bros. did some exploration work on the Smuggler-Henry Clay group at Aspen and treated dump ore in the company gravity-concentration mill for a short period before the sharp drop in the price of lead. A little ore was shipped from the Egg Nest, Antimony, Molly Gibson dump, and McLean properties.

PUEBLO

The Pueblo Steel Works of the Colorado Fuel & Iron Corp. is an important factor in the economy of Pueblo County and the State. The mill has expanded greatly during the past 10 years and is now among the larger producers of steel in the United States. It employs several thousand men at the steelworks and the company coal mines and limestone quarries in Colorado. Iron ore is obtained from company mines in Wyoming and Utah.

Large tonnages of clay and sand and gravel are produced in the county. Producers of clay in 1952 included the Colorado Fire Clay Co. (Stone City), Pueblo Clay Products Co., Standard Fire Brick Co., and Summit Pressed Brick & Tile Co. The Western Non-Metallics Co. operated a mica-grinding plant at Pueblo.

RIO BLANCO

The Rangely oil field in the northwestern part of Rio Blanco County continued to produce the bulk of the Colorado output of crude petroleum. A summarized State review of petroleum production and well drilling may be found in Minerals Yearbook, 1952, volume II.

The county output of coal in 1952 was larger than in 1951. Some uranium ore was mined in the vicinity of Meeker.

ROUTT

Routt County continued to be one of the larger coal producers. A little placer gold was recovered from the Kelly placer in the Hahn's Peak district.

SAGUACHE

S. E. and W. E. Burleson continued to ship lead-zinc-silver ore from the Antoro mine at Bonanza to the Resurrection mill at Leadville until October 15, 1952, when operations were suspended because of the decline in the prices of lead and zinc. Ore shipped totaled 2,186 tons. Other producers, all shipping to smelters or custom mills outside the county, included the Rawley (Wm. J. Costello), Cora, and Little Jenny mines and the Empire dump in the Bonanza district, the Queen of Sheba in the Crystal Hill district, Alaska-Yukon Bell in the Cochetopa district, and Mountain Lion in the Blake district. The Villa Grove Turquoise Co. produced some turquoise from its property near Villa Grove.

SAN JUAN

The important metal-producing area of San Juan County comprises the Animas and Eureka districts. The boundary line between these districts was never definite. Before the large Sunnyside mine at

Eureka shut down in 1930, the Eureka district usually predominated in credited metal production, but from 1931 through 1952 the Animas district predominated. The following review pertains to the county as a whole.

The Shenandoah-Dives Mining Co., principal operator in San Juan County for more than 20 years, maintained production from the Shenandoah Dives-Mayflower-Silver Lake group throughout 1952. The ore was treated in the company 700-ton flotation mill. Since the company began large-scale mining in 1928 it has mined and milled 4,184,601 tons of gold-silver-lead-copper-zinc ore on company account (to the end of 1952) and in addition has milled 185,272 tons of custom ore mined by other operators. Company ore milled in 1952 totaled 149,804 tons and custom ore 37,500 tons.

The larger shippers (more than 1,000 tons) of custom ore to the Shenandoah-Dives mill in 1952 were the Pride of the West, Gary Owen-Old Hundred group, Great Eastern, Caledonian, Galena Queen, Lead Carbonate, Columbus, and Henrietta mines. The mill also received ore from 13 shippers of less than 1,000 tons during the year. Some of the mines also shipped ore to the American Zinc custom mill at Ouray. The Bonita Mining & Development Co. operated the Lead Carbonate mill part of the year on ore from company mines.

DMEA project contracts were in force at the following properties as the year ended: Lead Carbonate, Black Hawk & Occidental, Treasure Mountain, Silver Queen, and 2 U. S. Metals Corp. properties (Henrietta and another group of 8 claims).

Tungsten ore (hübnerite) was shipped from the Ohio mine by Williams and Walby. Some uranium mining and prospecting were reported on Hermosa Creek.

SAN MIGUEL

The quantity of copper produced in San Miguel County increased 25 percent in 1952 from 1951, silver increased 23 percent, zinc 7 percent, and gold 2 percent; lead production declined 2 percent. The county continued to rank first among Colorado counties in production of silver, copper, and lead and second in zinc; it dropped to second rank in gold, as the Cripple Creek district was in production a full year for the first time since 1948 and regained first rank.

In the Upper San Miguel district the Idarado Mining Co. increased the tonnage of ore mined from its Treasury Tunnel-Black Bear-Ajax group of mines for the seventh consecutive year and produced more each of gold, silver, copper, lead, and zinc than in 1951. The sustained yearly increases have raised this mine to second rank in the State in total value of output of the five metals. The company also continued its extensive exploration and development campaign; it has lengthened the old 2,500-foot Meldrum tunnel (west section), the portal of which is near Telluride, and has driven crosscuts and raises connecting the tunnel with the Black Bear-Ajax workings, which in turn are connected with the mill in Ouray County by the 12,000-foot Treasury tunnel. The mill products are zinc concentrate, lead concentrate, and copper concentrate (all enriched by gold and silver), and gold-silver bullion (obtained by amalgamating a jig hutch product). The mine was among the leading producers of each of the five metals and was the only substantial producer of copper in the State.

Telluride Mines, Inc., operated its Smuggler Union-Montana group of mines and mill in 1952 at about the same crude-ore tonnage rate as in the 2 preceding years. Completion of the ore pass connecting the new mill-level tunnel with the mine workings 1,100 feet above permitted underground transportation of ore to the mill. The aerial tram was still being used to transport men and supplies, pending completion of the service raise. The company nearly completed installing another unit in the mill, which will increase the capacity from 600 to more than 800 tons daily. The products of the mill are lead-copper-gold-silver concentrate, high-grade gold-silver-lead jig concentrate, zinc concentrate, and gold-silver bullion.

In the Iron Springs (Ophir) district the Silver Bell Mines Co. operated the Silver Bell and Carbonero groups of mines, treating the ore output in the company 175-ton flotation mill. The company also carried on exploration under a DMEA contract. The mill products comprised chiefly bulk gold-silver-lead-copper concentrate, but some zinc concentrate was made when Carbonero ore was being treated along with Silver Bell ore. A unit to recover tungsten as a byproduct from the Silver Bell ore was installed in the mill and operated late in 1952. The East Ridge Co. shipped lead-zinc-silver ore from the Andrus mine and also carried on an exploration project under a DMEA contract. Belisle, Reed & Crandell shipped some silver-gold-lead ore from the New Dominion mine. Several small lots of ore were shipped from other scattered mines and prospects. In September the Mariposa Mining Co. began work at the Butterfly mine, an important silver-gold producer before the mill was destroyed by fire on December 6, 1940. Surface buildings were erected, development work was done, and one shipment of ore was made in 1952.

Uranium mining became increasingly important in the county. The annual report of the Colorado Commissioner of Mines shows 29 producing mines in 1952, most of which were in the Slick Rock district; some were in the Lower San Miguel, Upper San Miguel, Bull Canyon, Egnar, and other areas.

SUMMIT

In the Breckenridge district W. L. Davenport continued to ship zinc-lead-silver-gold ore from the Wellington mine, operated steadily since 1947. The Carbonate and Mountain Pride lode mines and the Bemrose-Bostwick placer had a small output.

At Montezuma the producing mines included the Allen Emory (B. R. & C. Mining Co.), Bullion, Chautauqua, General Teller, Ida Belle, Manerva, National Treasury, Paymaster, Quail, Queen Bee, Radical (or Mohawk), and Sts. John (Florado group). Part of the district output of ore was treated locally in the Plymouth and Teller Basin mills, and part was shipped to custom plants at Leadville. Construction of another mill, near the Silver Wing property and designed to treat lead-zinc-silver and tungsten ores, was nearly completed in 1952 by the Silicate Reduction Co. (first organized as the Glacier Mill Co.).

In the Ten Mile district lessees shipped several lots of zinc-lead-silver ore from the Colonel Sellers mine, and the York Investment Co. shipped small tonnages from the Kimberly and Wilfley properties.

A little silver-lead ore was shipped from the Groff, Silver Cloud, and Yukon claims.

TELLER

Cripple Creek District.—Production of gold in the Cripple Creek district rose to 48,527 ounces in 1952 compared with 27,699 ounces in 1951. The mines operated a full year in 1952 and only about 8 months in 1951.

The new Carlton custom mill of the Golden Cycle Corp., which began commercial operation early in April 1951, treated the entire district output of ore in 1952. The mill operated with improved efficiency as progress continued in testing and adjusting equipment and making changes and additions found necessary to obtain the best results throughout the mill. Work on installing additional dust-collecting equipment at the fluosolids reactor was completed. The treatment process includes flotation concentration; roasting (in a fluosolids reactor) and cyanidation of the gold-pyrite concentrate (which contains 85 to 90 percent of the original gold content of the crude ore), with zinc-dust precipitation of the gold in cyanide solutions; and cyanidation of the flotation tailings in a low-grade circuit, using carbon precipitation. Enough ore to operate the mill at capacity was not received, as there was a shortage of underground labor in the mines that were operating, and many potential producers remained idle. With no increase in the price of gold to offset the greatly increased cost of labor and materials in recent years, only exceptionally rich ore could be mined.

The larger producers of gold in 1952 were the Ajax group (Golden Cycle Corp.), Cresson group, LeClair (Mary McKinney) dump, United Gold Mines group, and Tenderfoot group (Markley Mining & Exploration Co.). Other producers included the El Paso, Gold King, Stratton Estate Proper mine (Globe Hill Mining Co.), Free Coinage, Forest Queen, Jerry Johnson, Rubie, and Empire Lee mines and several dumps.

Feldspar was produced at the Limber Pine quarry of Spielman & Earhart on the Rampart Range road, the Snow Flake quarry, and the Hilltop Mining Co. quarry near Woodland Park.

WELD

Weld County continued to be an important producer of coal.

The Mineral Industry of Connecticut

By Richard H. Mote [1]

MINERAL output in Connecticut in 1952 was valued at $7,124,697, the highest level since 1928 and a 14-percent increase over the 1951 figure of $6,246,843. Eight commercial mineral substances were produced in the State during 1952, and 7 of the 8 counties contributed to this output. Quarrying of stone continued to be the principal mineral industry; virtually all the production consisted of crushed stone. Sand and gravel ranked second to stone in value of output. Production increased 11 percent in quantity and 13 percent in value compared with 1951. Lime production continued to be an important factor in the State's mineral industry, with output exceeding that of 1951.

TABLE 1.—Mineral production of Connecticut, 1951–52

Product		1951		1952	
		Quantity	Value	Quantity	Value
Clays [1]	short tons	275,900	$252,725	157,500	$157,500
Feldspar (crude) [1]	long tons	13,811	107,083	10,929	87,432
Lime [1]	short tons	(2)	(2)	(2)	(2)
Mica [1]	do	(2)	(2)	11	7,073
Peat	do	5,586	33,702	(2)	(2)
Quartz from pegmatites and quartzite [1]	do	29,273	175,638	(2)	(2)
Sand and gravel [1]	do	2,321,715	1,708,910	2,581,247	1,933,214
Stone (except limestone for lime) [1]	do	2,278,466	3,360,378	2,837,045	4,101,060
Undistributed [3]			608,407		838,418
Total value			6,246,843		7,124,697

[1] Sold or used.
[2] Value included under "Undistributed."
[3] Includes products indicated by footnote 2.

REVIEW BY MINERAL COMMODITIES

METALS

Ores of iron, copper, tungsten, bismuth, lead, silver, and other metals occur at a number of localities in Connecticut, but most of the occurrences have not proved to be economic. There was no mine output of metals in the State in 1952.

NONMETALS

Clays.—Connecticut's principal clay resources occur in the Connecticut River Valley. Exploitation is largely for the manufacture of heavy clay products. In 1952 5 pits were in operation, all in Hartford

[1] Chief, Mineral Industry Division, Bureau of Mines, Region VIII, Pittsburgh, Pa.

County, compared with 9 in 1951—6 in Hartford County, 1 in Middlesex County, and 2 in New Haven County. Output in both years was limited to miscellaneous clays.

Feldspar.—The Worth-Spar Co. and Eureka Mining & Milling Co. were the sole producers of feldspar in Connecticut in 1952. Production came from the pegmatite area northeast of Middletown, Middlesex County.

TABLE 2.—Crude feldspar sold or used by producers in Connecticut, 1943–47 (average) and 1948–52

Year	Quantity (long tons)	Value	
		Total	Average per ton
1943–47 (average)	13,335	$85,039	$6.38
1948	12,110	78,772	6.50
1949	12,659	95,044	7.50
1950	13,580	101,851	7.50
1951	13,811	107,083	7.75
1952	10,929	87,432	8.00

Mica.—A small quantity of mica was recovered from granite pegmatites near Branchville, Fairfield County, by the Branchville Mining Co. The Worth-Spar Co. continued to recover byproduct mica from its feldspar operation near Cobalt, Middlesex County.

Lime.—The New England Lime Co. was Connecticut's only producer of lime in 1952. The product was marketed as both quicklime and hydrated lime and for a wide variety of uses.

Peat.—The only active peat producer in Connecticut in 1952 was the Shaler Humus Co. The peat, recovered from bogs near Manchester, Hartford County, was marketed in the local area for agricultural purposes.

Sand and Gravel.—Sand and gravel deposits are worked at numerous localities in Connecticut. In 1952 commercial production was reported from the following counties, listed in order of decreasing output: Hartford, New Haven, Fairfield, Litchfield, New London, and Middlesex. In all, 29 plants were active during the year.

Silica (Quartz).—Silica was produced in 1952 by the Lantern Hill Silica Co. at Lantern Hill and Long Hill near North Stonington, New London County. Output of this property is used for glass and foundry sands.

Stone.—In terms of both quantity and value, stone quarrying is the most important mineral industry in Connecticut. A number of rock types occur within the State boundaries, but the most significant economically include basalt, limestone, and granite. The bulk of the output is crushed stone, largely basalt, which is used for railroad ballast and in highway construction. The basalt quarries of the Connecticut River Valley represent one of the principal producing areas of crushed stone in the New England States. In addition to basalt, the State output of crushed stone in 1952 included limestone and some granite.

Dimension stone, quarried for construction purposes and memorials, was virtually all granite in 1952 but also included small tonnages of basalt and limestone.

TABLE 3.—Stone sold or used by producers in Connecticut, 1951–52, by uses

Use	1951		1952	
	Quantity	Value	Quantity	Value
Dimension stone:				
Building stone:				
Rough construction, short tons	[1] 2,604	[1] $8,076	[1] 2,316	[1] $1,177
Cut stone, slabs, and mill blocks, cubic feet	17,444	55,694	[2] 11,460	[2] 36,626
Approximate equivalent in short tons	1,448		[2] 951	
Rubble, short tons	1,741	21,606	1,348	13,928
Monumental stone, cubic feet	11,870	103,028	[2] 10,563	[2] 83,415
Approximate equivalent in short tons	985		[2] 877	
Curbing and flagging, cubic feet	5,328	13,488	[3]	[3]
Approximate equivalent in short tons	442		[3]	
Undistributed, short tons			405	38,155
Total dimension stone (quantities approximate) short tons	[1] 7,220	[1] 201,892	[1] 5,897	[1] 179,301
Crushed and broken stone:				
Riprap, do	[1] 25,810	[1] 22,974	[1] 23,631	[1] 29,537
Crushed stone, do	2,168,037	2,829,609	2,682,843	3,476,223
Furnace flux (limestone), do	[3]	[3]	[3]	[3]
Agricultural (limestone), do	56,646	212,656	64,146	245,772
Other uses, do	[3]	[3]	[3]	[3]
Undistributed, do	19,935	90,263	59,986	168,665
Total crushed and broken stone, do	[1] 2,270,428	[1] 3,155,502	[1] 2,830,606	[1] 3,920,197
Grand total (quantities approximate), do	2,278,466	3,360,378	2,837,045	4,101,060

[1] To avoid disclosing confidential information certain totals are incomplete, the portion excluded being included in the grand total.
[2] Incomplete. The portion not included is combined with "Undistributed."
[3] Included with "Undistributed."

REVIEW BY COUNTIES

FAIRFIELD COUNTY

Fairfield County ranked fifth among Connecticut counties in the value of mineral output in 1952. Production included sand and gravel, which accounted for most of the value, stone, and a small quantity of mica. Sand and gravel was produced by L. Delucas Sons, Cos Cob; Bernard J. Dolan, Bethel; and Grasso Construction Co., Bridgeport. Crushed limestone, largely for agricultural purposes, and a small quantity of rough construction limestone was produced by The Connecticut Agstone Co. at Danbury. Mica was quarried from granite pegmatites near Branchville by the Branchville Mining Co.

HARTFORD COUNTY

Hartford County was the largest producer of minerals in Connecticut in 1952. Mineral products, in order of decreasing value, included stone, sand and gravel, clays, and peat. Stone production was limited to the output of crushed basalt, and in 1952 there were six quarries in operation. The principal producer was Edward Balf Co., of Hartford. Other producers of crushed basalt in the county during the year included New Haven Trap Rock Co., Inc., which operated a quarry at Plainville; Arborio & Sons, Farmington; Material Service, Inc., Windsor Locks; Sherman Sand & Stone Co., New Britain; and Angelo Tomasso, Inc., Plainville.

Eleven commercial sand and gravel plants were active in Hartford County in 1952, the largest of which included Dunning Sand & Gravel

Co., Farmington; Russak Bros., Inc., Plainville; The Edward Balf Co., Hartford; and Farmington Sand & Gravel Co., West Hartford.

Donnelly Brick Co., biggest clay producer in the county, worked its clay open pit near Kensington during the year. Pola Brick Co., Inc., produced clay at its open pit near New Britain. The Eastern Brick Co. continued to work its clay open pits in the Hartford area during 1952. About two-thirds of the company output was recovered from the Berlin pit, 11 miles south of Hartford, the balance coming from the pit near South Windsor, 4 miles northeast of Hartford. Edward W. Mack & Son mined common clay from an open pit near Windsor.

Peat was recovered from bogs near Manchester by the Shaler Humus Co.

LITCHFIELD COUNTY

Mineral products of Litchfield County, third ranking county in 1952, included limestone and sand and gravel. The New England Lime Co. produced hydrated lime and quicklime at its Canaan plant. Stone production consisted of crushed limestone and basalt. Producers of crushed limestone included the United States Gypsum Co., New England Lime Co., and The Conklin Limestone Co., Inc., Canaan. Crushed basalt was produced by Woodbury Trap Rock Co., Inc., at Torrington.

Three firms operated sand and gravel plants during the year. Benvenuti & Favali Construction Co. and Oneglia & Gervasini, Inc., worked plants at Torrington; and State Line Sand & Gravel Co. operated a plant at Canaan.

MIDDLESEX COUNTY

The Worth-Spar Co. operated its No. 1 mine near Cobalt during the year and produced crude feldspar and mica. Feldspar was also produced at the Eureka Mining & Milling Co. Hale mine near Portland. Sand and gravel plants were operated at Middletown by Lindemark Sand Service, Middletown Sand Service, and Sebastian Ortise.

NEW HAVEN COUNTY

Stone and sand and gravel were the only mineral products produced in New Haven County in 1952. The county ranked second among Connecticut counties in mineral output and first among five Connecticut counties producing stone during the year. The bulk of the production was crushed basalt, but some basalt and granite dimension stone was also quarried. Principal producer of crushed basalt was the New Haven Trap Rock Co., which operated quarries at North Branford and near Middlefield. Other producers of crushed basalt included C. W. Blakeslee & Sons, Inc., A. N. Farnham, Inc., and Foxon Trap Rock Co., Inc., all in New Haven; and York Hill Trap Rock Quarry Co., Meriden. Dimension granite was produced by the Ansonia Granite Quarries at Seymour and the Stony Creek Granite Quarry, Inc., at Milford.

Seven companies in New Haven County prepared sand and gravel in 1952. The largest were A. N. Farnham, Inc., New Haven; D. J. Carten Sand & Gravel Co., Stratford; The Iron Ledge Co., Bridgeport; and Elm City Construction Co., Hamden.

NEW LONDON COUNTY

Crushed silica rock was produced by the Lantern Hill Silica Co. at its Lantern Hill and Long Hill quartz deposits near North Stonington. Producers of granite dimension stone in New London County in 1952 included the Millstone Granite Quarry, Inc., at Millstone Point; Golden Pink Granite Quarry, Inc., New London; and E. Locarno & Sons, Niantic. John J. Doyle Sand & Gravel Co., Inc., and Southern New England Contractors Supply Co., Inc., worked sand and gravel plants at New London.

WINDHAM COUNTY

Mineral production in Windham County in 1952 was limited to dimension granite quarried by R. B. Marriott & Sons at Oneco.

The Mineral Industry of Delaware

By Richard H. Mote [1]

MINERAL industries of Delaware had a near-record year in 1952 as the aggregate value of production reached the highest level since 1909. Sand and gravel continued to be the principal mineral commodity; output in 1952 rose 13 percent in quantity and 26 percent in value over the 1951 level. Quarrying of stone ranked second in value and volume of output during the year, and production of miscellaneous clays for brick manufacture was third. Eight mining establishments were active in the State in 1952.

TABLE 1.—Mineral production in Delaware, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	35,950	$35,450	(2)	(2)
Sand and gravel	454,563	303,643	515,399	$382,484
Stone	99,201	245,002	94,911	251,759
Undistributed: Nonmetallic minerals, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)				42,805
Total Delaware		[3] 584,000		677,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production.
[2] Value included with "Undistributed."
[3] Revised figure.

REVIEW BY MINERAL COMMODITIES

METALS

Iron ore occurs to a minor extent as bog-type deposits of limonite at several localities in Delaware. This material supplied local iron furnaces before 1890, but since then has not been economic. There was no mine output of metals in the State in 1952.

NONMETALS

Clays.—Most of the clays produced in Delaware in 1952 came from pits in New Castle County; output was utilized for manufacturing building brick. Three pits were in operation during the year.

[1] Chief, Mineral Industry Division, Bureau of Mines, Region VIII, Pittsburgh, Pa.

Sand and Gravel.—The production of sand and gravel continued in 1952 to be the principal mineral industry in Delaware. Output was reported from New Castle, Sussex, and Kent Counties, listed in order of decreasing production. A total of four commercial plants were active during 1952; production was used chiefly for road construction, concrete aggregate, and other building purposes.

Stone. Stone output in Delaware in 1952 was limited to the output of crushed gabbro produced at one quarry in New Castle County.

REVIEW BY COUNTIES

KENT

Mineral production credited to Kent County in 1952 consisted of sand and gravel reported by the Delaware State Highway Department.

NEW CASTLE

New Castle County ranked first among Delaware counties in 1952, accounting for over 86 percent of the total value of minerals recovered in the State during the year. Commodities produced included sand and gravel, stone, and clay. Gabbro, a basaltic-type rock, was quarried and crushed north of Wilmington for use as road metal and stone sand. Miscellaneous clays were produced by the Delaware Brick Co. from its pit near New Castle and the Oberly Brick Co. at its pit near Arden. Petrillo Bros., Inc., operated its sand and gravel plant near Minguadale one shift a day throughout most of the year and produced material for highway construction. Thomas D. Whittington worked his pit and plant west of Bear during part of 1952 and recovered building and paving sand and gravel.

SUSSEX

Paving sand and engine sand recovered from dune deposits on Cape Henlopen were the principal mineral products of Sussex County in 1952. Paving sand was mined at the pit of Henry G. Graves & Sons, Lewes; engine sand was recovered at Lewes by the Lewes Sand Co. A small tonnage of miscellaneous clays for heavy clay products was produced by J. H. Wilkerson & Son at Milford.

The Mineral Industry of Florida

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Florida

By Avery H. Reed, Jr.[1] and James L. Calver[2]

THE MINERAL INDUSTRY of Florida consists of the production of clays, limestone, natural gas, peat, petroleum, phosphate rock, sand and gravel, and titanium minerals as primary crude materials and the manufacture of cement and lime. Garnet, monazite, and zircon are produced as byproducts from ilmenite and rutile mining.

1952 was a record year for Florida's mineral output. New alltime highs were recorded in the cement, lime, and phosphate-rock industries. The total value of the mineral production of Florida increased 2 percent over 1951, the previous record year.

DMEA activity in Florida in 1952 involves a single project for rutile exploration near Jacksonville, Duval County.

Table 1 shows the mineral production in Florida, 1951–52:

TABLE 1.—Mineral production in Florida, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays (including fuller's earth) [2]	132,563	$2,288,855	112,113	$1,985,587
Natural gas 1,000 cu. ft.	10,000	1,000	15,000	1,000
Peat	25,748	161,417	23,729	154,164
Petroleum (crude) 42-gal. barrels	596,000	(3)	[4] 591,000	(3)
Phosphate rock long tons	8,496,831	50,262,562	8,781,125	51,541,799
Sand and gravel	4,418,573	4,300,682	4,154,613	3,848,077
Stone (except limestone for cement and lime)	8,032,966	9,419,682	7,836,634	9,577,541
Undistributed: Cement, abrasive garnet, lime, titanium concentrate, zirconium concentrate, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		12,113,358		13,226,587
Total Florida		78,548,000		80,335,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production. Excludes monazite.
[2] Except clays sold or used for cement.
[3] Value included with "Undistributed."
[4] Final figure. Supersedes preliminary figure given in commodity chapter.

[1] Assistant chief, Mineral Industry Division, Region VII, Knoxville, Tenn.
[2] Geologist, Florida Geol. Survey, Tallahassee, Fla.

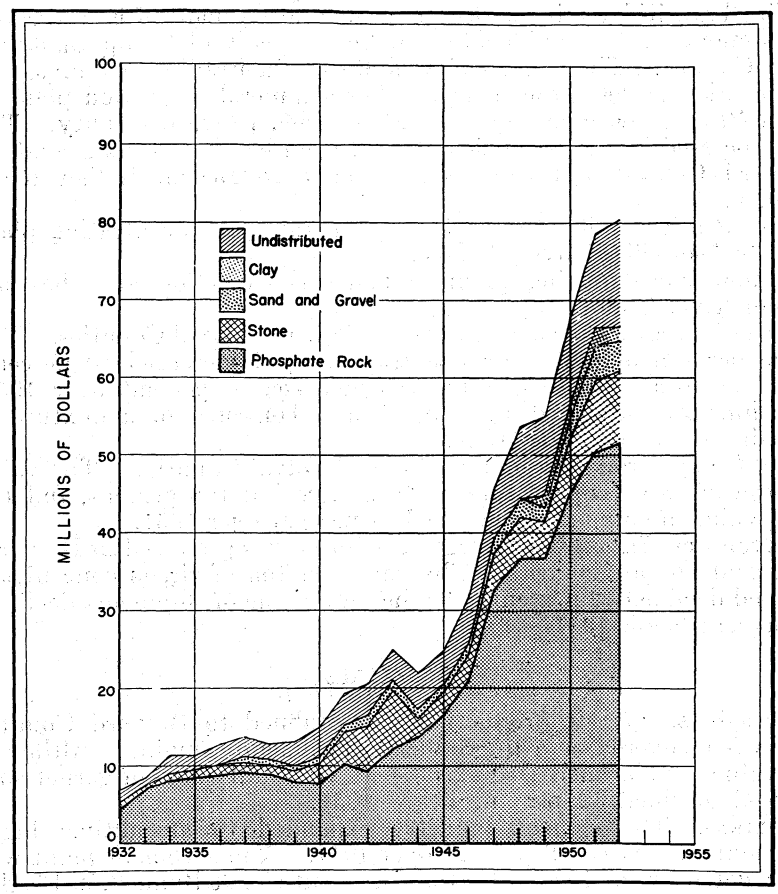

FIGURE 1.—Total value of mineral production of Florida, 1932–52.

REVIEW BY MINERAL COMMODITIES

METALS

Titanium (Ilmenite and Rutile Concentrates).—There are no known primary metalliferous deposits in Florida. Deposits of dune and beach sands that contain titanium and zirconium minerals are mined in Brevard, Clay, Duval, and Indian River Counties. The quartz grains are removed by gravity methods, and the resulting concentrate is separated into its mineral components by use of the magnetic and electrical properties of the minerals. The mineral-separation plants are located in Brevard, Clay, and Duval Counties, and ore that originates in Indian River County is processed in Brevard County. Production data are based on the output of the mineral-separation plants.

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The Trail Ridge mine and mineral-separation plant of E. I. duPont de Nemours & Co. are located on the property of Camp Blanding, Clay County. The nearest city is Starke, in Bradford County.

The Florida Ore Processing Co. has a mineral-separation plant at Palm Bay, a few miles south of Melbourne, Brevard County. The ore processed by this plant is obtained from beach and dune sands in Brevard County and from a mine at Vero Beach, Indian River County.

The Rutile Mining Co. of Florida operates a concentrating plant near Jacksonville, Duval County.

A new concentrating plant is under construction at Sebastian, Indian River County.

Ilmenite was produced in Brevard, Clay, and Duval Counties. The value per ton of ilmenite concentrate shipped increased 10 percent, and the total value of shipments increased 4 percent over 1951. The ilmenite produced in Clay County consisted of a mixture of ilmenite, rutile, and leucoxene.

Rutile was produced in Brevard and Duval Counties. The value per ton of rutile concentrate shipped increased 108 percent, and the total value of shipments increased 31 percent over 1951.

Zirconium (Zircon Concentrate).—*Zircon* was produced in Brevard, Clay and Duval Counties. The value per ton of zircon concentrate shipped declined 12 percent, and the total value of shipments declined 21 percent below 1951.

NONMETALS

Abrasives.—*Garnet* production was confined to Brevard County, and was recovered as a byproduct from ilmenite mining. Although the value per ton increased 22 percent, the total value of garnet sold or used declined 12 percent below 1951.

Cement.—The cement industry expanded to an alltime high; shipments increased 18 percent over 1951. A new cement plant was constructed by the Lehigh Portland Cement Co. at Bunnell, in Flagler County. This is the first plant in the country to manufacture portland cement from coquina and the first to utilize staurolite as a source of alumina. The staurolite residue is obtained from the Trail Ridge mineral-separation plant at Starke, and the required iron is supplied in high-iron slag from Copperhill, Tenn.

Portland cement was produced in Flagler and Hillsborough Counties. The value per barrel of cement shipped remained the same, but the total value of shipments increased 17 percent over 1951.

Clays.—The clay-mining industry, except for that clay sold or used for cement manufacture, was not as active as in 1951; the quantity sold or used declined 15 percent to the lowest level since 1949. However, clay sold or used for cement was the largest recorded, increasing 23 percent over 1951, resulting in an overall decrease of 2 percent.

Fuller's earth was produced by one company in Gadsden County. The value per ton sold or used increased 4 percent, but the total value decreased 13 percent below 1951.

Kaolin was produced in Putnam County by two companies. The value per ton sold or used increased 4 percent, but the total value decreased 15 percent below 1951.

Miscellaneous clays were produced by one operator in Gadsden County and mined elsewhere in the State for use in manufacturing cement. Although the value per ton sold or used remained the same, the total value of miscellaneous clays mined increased 20 percent over 1951.

Lime.—The lime industry expanded to an alltime high; production increased 4 percent over 1951. Lime was produced in Dade and Marion Counties. The value per ton of lime sold or used increased 3 percent, and the total value increased 7 percent over 1951.

Limestone.—The limestone industry, except for cement and lime use, was not as active as in 1951; production declined 2 percent below 1951, the record year. Ten new quarries were opened or added to the list of producers during the year—1 in Broward County, 1 in Citrus County, 1 in Dade County, 1 in Lafayette County, 3 in Manatee County, 2 in Monroe County, and 1 in Suwannee County. Four quarries were reopened—1 in Citrus County, 2 in Dade County, and 1 in Levy County. However, 4 quarries that were active in 1951 did not operate—2 in Broward County, 1 in Dade County, and 1 in Volusia County.

Twenty-nine companies produced crushed limestone; 2 companies produced dimension limestone, and noncommercial crushed limestone was produced by the county highway department in Palm Beach County.

Crushed limestone was produced in Alachua, Broward, Citrus, Dade, Hernando, Lafayette, Levy, Manatee, Marion, Monroe, Palm Beach, Sumter, and Suwannee Counties. Table 2 shows crushed limestone sold or used by producers in Florida, 1943–47 (average) and 1948–52.

TABLE 2.—Crushed limestone sold or used by producers, 1943–47 (average) and 1948–52 (exclusive of limestone used for cement and lime)

Year	Short tons	Value	Year	Short tons	Value
1943–47 (average)	4,097,100	$4,159,100	1950	5,313,400	$6,885,394
1948	4,154,920	5,115,974	1951	8,032,966	9,419,682
1949	4,215,090	4,748,253	1952	7,836,124	9,572,575

Dimension limestone was produced in Monroe and Manatee Counties. The total value of production was $4,966.

Monazite.—Monazite was produced in Duval County. All production figures are classified.

Phosphate Rock.—The phosphate-rock-mining industry, which represents about 65 percent of the total value of Florida mineral production, expanded to an alltime high; mine production increased 12 percent over 1951. Additional expansion is planned for 1953: Amco Exploration, Inc., subsidiary of American Metal Co., Ltd., is planning to conduct exploratory drilling for phosphate-rock deposits in Duval County. Plans for mining phosphate rock near Bartow are being completed by Armour Fertilizer Works. The plant expansion of International Minerals & Chemical Corp. near Bartow is estimated to cost approximately $10,000,000 and is designed to produce phosphate chemicals and fertilizers and byproduct uranium. Coronet Phosphate Division, Smith-Douglass Co., is expanding its Tenoroc mine. The American Cyanamid Co. is investing approximately $2,500,000 to expand its Brewster plant and Saddle Creek mine.

Several other plants are under construction or are planned for the byproduct recovery of uranium minerals from phosphate rock.

Land-pebble phosphate rock was mined by 7 companies in Hillsborough and Polk Counties; hard phosphate rock was mined by 1 producer in Citrus County; and soft phosphate rock was produced by 5 companies in Alachua and Citrus Counties. Table 3 shows phosphate rock sold or used by producers in Florida.

TABLE 3.—Phosphate rock sold or used by producers, 1943–47 (average) and 1948–52, in long tons

Year	Hard rock		Soft rock[1]		Land pebble		Total	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
1943–47 (average)	60,100	$429,300	77,700	$304,345	4,475,600	$18,438,000	4,613,400	$19,171,645
1948	48,198	368,586	69,335	293,927	6,421,725	37,070,381	6,539,258	37,732,894
1949	23,804	173,211	77,088	344,787	6,715,097	37,339,985	6,815,989	37,857,983
1950	71,319	538,601	81,542	408,595	7,933,009	44,430,646	8,085,870	45,377,842
1951	75,615	582,247	92,183	495,243	8,329,033	49,185,072	8,496,831	50,262,562
1952	81,086	625,175	75,853	433,203	8,624,186	50,483,421	8,781,125	51,541,799

[1] Includes material from waste-pond operations.

Sand and Gravel.—The sand and gravel industry was not as active as in 1951. Twenty-six companies produced sand or gravel, and noncommercial sand was produced by the Bureau of Forestry.

Sand production was reported in Bay, Dade, Duval, Escambia, Gadsden, Lake, Manatee, Marion, Palm Beach, Pinellas, Polk, Putnam, and St. Lucie Counties.

Gravel production was reported in Dade, Escambia, Gadsden, and Palm Beach Counties. The "gravel" from Palm Beach and Dade Counties was limestone or shell and not material ordinarily considered to be gravel.

Table 4 shows sand and gravel sold or used by producers.

TABLE 4.—Sand and gravel sold or used by producers, 1943–47 (average) and 1948–52, in short tons

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	(1)	(1)	(1)	(1)	1,617,000	$1,396,800
1948	1,427,345	$1,189,734	884,786	$1,242,841	2,312,131	2,432,575
1949	1,532,931	1,190,753	710,967	688,980	2,243,898	1,879,733
1950	1,850,448	1,687,713	943,417	1,118,718	2,793,865	2,806,431
1951	2,986,862	2,512,282	1,431,711	1,788,400	4,418,573	4,300,682
1952	(2)	(2)	(2)	(2)	4,154,613	3,848,077

[1] Data not available.
[2] Figure withheld to avoid disclosure of individual company operations.

MINERAL FUELS

Natural Gas.—Natural gas produced and marketed in the Sunniland Oil Field in Collier County increased 50 percent in quantity and 38 percent in value compared to 1951.

Peat.—The production and value of peat produced in the state declined 8 and 4 percent, respectively, below 1951. Although peat is classed as a fuel, all peat produced in Florida is used for agricultural purposes.

Petroleum.—The marketed production of petroleum decreased 1 percent below 1951, while the value remained the same.

REVIEW BY COUNTIES

ALACHUA

The Newberry Corp. and the Williston Shell Rock Co. continued to produce crushed limestone, although the total sold or used declined 16 percent below 1951.

The Loncala Phosphate Co. continued to produce soft phosphate rock; total mine production has increased each year since 1948.

The total value of the mineral production of the County was $751,419, an increase of 1 percent over 1951.

BAY

The only mineral production reported in Bay County was a small quantity of sand sold or used by the Brewton Engineering Co.

BREVARD

The Florida Ore Processing Co. continued to operate its Palm Bay concentrating plant and produced garnet, ilmenite, rutile, and zircon concentrates. Total shipments were about the same as in 1951.

BROWARD

Crushed limestone was the only mineral commodity produced in Broward County. A new quarry was opened during the year by the Hallandale Rock Corp. C. Meekins and S. P. Synder & Son, Inc., continued to operate their quarries. The Broward County Highway Dept. did not report any production. The Pruitt & Boyd limestone quarry was sold to the Deerfield Rock Corp. and did not operate during the year.

The total quantity of crushed limestone sold or used declined 20 percent below 1951.

CITRUS

Connell & Shultz reopened its Inverness quarry and produced crushed limestone. A new limestone quarry was opened by John S. Nangle, doing business as the Golden Dolomite Co.

Kibler-Camp Phosphate Enterprises continued to mine hard phosphate rock at the Sec. 12 mine; mine production has increased each year since 1948.

Four companies continued to produce soft phosphate rock: The Kellogg Co., Soil Builders, Inc., Seaboard Phosphate Co., and the Superior Phosphate Co.

Table 5 shows the mine production of phosphate rock in Citrus County.

TABLE 5.—Mine production of phosphate rock in Citrus County, 1948–52, in long tons

Year	Total phosphate rock [1]			Year	Total phosphate rock [1]		
	Rock	P_2O_5 content	Value [2]		Rock	P_2O_5 content	Value [2]
1948	93,617	26,341	$543,566	1951	(3)	(3)	(3)
1949	82,631	21,835	439,112	1952	(3)	(3)	(3)
1950	124,896	36,604	776,015				

[1] Includes material from waste-pond operations.
[2] Value estimated from value of "sold or used."
[3] Figure withheld to avoid disclosure of individual company operations.

CLAY

E. I. duPont de Nemours & Co. continued to operate the Trail Ridge mine and concentrating plant at about the same rate, producing a mixed product containing ilmenite, rutile, and leucoxene and recovering zircon as a byproduct.

COLLIER

The Humble Oil & Refining Co. produced natural gas and crude petroleum in the Sunniland field, Florida's only producing oil field. Total marketed production was 15,000,000 cubic feet of natural gas and 591,000 barrels of crude petroleum.

DADE

The City of Miami continued to recover lime as a byproduct of water purification.

Production of crushed limestone was continued during the year by 5 companies: T. J. James Construction Co., Inc., Maule Industries (2 quarries), the Miami Crushed Stone Co., Murphy & Mills, and the Peffer Construction Co. Quarries were reopened by the Oolite Rock Co. and by Troup Quarries, Inc. A new quarry was opened by E. A. Pynchon. The limestone quarry of the Naranja Rock Co. was idle during the year.

Table 6 shows crushed limestone sold or used by producers in Dade County.

TABLE 6.—Crushed limestone (exclusive of limestone used for cement and lime) sold or used by producers in Dade County, 1948–52, in short tons

Year	Short tons	Value	Year	Short tons	Value
1948	2,151,361	$2,531,184	1951	3,347,326	$3,914,231
1949	2,383,260	2,250,435	1952	3,579,192	3,793,305
1950	2,513,490	2,922,624			

Three companies continued to produce sand or gravel: The Alfred Destin Corp., Maule Industries, and Murphy & Mills Corp. New mines were opened by the Des Rochers Sand Co., Inc., and by the Florida Silica Sand Co. The Seminole Rock Products Co. did not operate during the year.

Table 7 shows sand and gravel sold or used by producers in Dade County.

TABLE 7.—Sand and gravel sold or used by producers in Dade County, 1948–52, in short tons

Year	Short tons	Value	Year	Short tons	Value
1948	1,364,359	$1,843,336	1951	2,638,462	$3,100,510
1949	1,213,123	1,229,328	1952	1,701,574	2,104,776
1950	1,513,469	1,946,578			

DUVAL

The Rutile Mining Co. of Florida continued to operate its mine and concentrating plant near Jacksonville and produced ilmenite, monazite, rutile, and zircon.

A small quantity of sand was produced by the Florida East Coast Railway.

The National Lead Co. completed a DMEA contract for rutile exploration on the skinner property near Jacksonville. The total spent on the project was $20,278, of which the Government's participation was $15,209.

ESCAMBIA

Production of sand and gravel was continued by Rufus Campbell and by the Ward Gravel Co.; Campbell opened a second mine and operated both during the year. The total quantity of sand and gravel sold or used increased 161 percent over 1951.

FLAGLER

The Lehigh Portland Cement Co. completed a new cement plant at Bunnell and operated it during the year.

GADSDEN

The Floridin Co. continued to mine fuller's earth at its Jamieson and Quincy mines. Miscellaneous clays were again produced by the Florida State Hospital. Total clays sold or used declined 15 percent below 1951.

The Florida Gravel Co. continued to produce sand and gravel at the same rate as in 1951.

HERNANDO

Crushed limestone production was continued by the Camp Concrete Rock Co. and by the William P. McDonald Corp. The total quantity sold or used declined 11 percent below 1951.

HILLSBOROUGH

The General Portland Cement Co. operated its cement plant at Tampa during the year. Shipments were 17 percent greater than in 1951.

The American Cyanamid Co. continued to mine land-pebble phosphate rock at the Sydney mine. Mine production increased 5 percent over 1951.

LAFAYETTE

The Williston Shell Rock Co. opened a new quarry and produced crushed limestone.

LAKE

The Central Sand Co. continued the production of sand; the quantity sold or used was 16 percent more than in 1951.

LEVY

Crushed limestone production was continued by Connell & Schultz, the Dixie Lime Products Corp., and the Levy County Lime Rock Corp. The United Limerock Corp. reopened its limestone quarry, which had been idle since 1949.

Table 8 shows crushed limestone sold or used by producers in Levy County.

TABLE 8.—Crushed limestone (exclusive of limestone used for cement and lime) sold or used by producers in Levy County, 1948–52, in short tons

Year	Short tons	Value	Year	Short tons	Value
1948	124,619	$188,897	1951	387,353	$539,772
1949	165,330	299,133	1952	400,543	684,073
1950	(1)	(1)			

[1] Figure withheld to avoid disclosure of individual company operations.

MANATEE

Three new limestone quarries were opened during the year; crushed limestone was produced by the Manatee Dolomite Co. and by the Southern Dolomite Co., and dimension limestone was produced by the Alclaries Travertine Co. Total limestone sold or used was 10,394 short tons valued at $42,050.

F. A. Edwards started producing sand during the year.

MARION

The Dixie Lime Products Co. continued to produce lime; total quantity sold or used increased 2 percent over 1951.

Three companies continued to produce crushed limestone: The Cummer Lime & Mfg. Co., the Dixie Lime Products Co., and the Ocala Lime Rock Corp.

Table 9 shows crushed limestone sold or used by producers in Marion County.

TABLE 9.—Crushed limestone (exclusive of limestone used for cement and lime) sold or used by producers in Marion County, 1948–52, in short tons

Year	Short tons	Value	Year	Short tons	Value
1948	403,137	$413,583	1951	1,033,506	$1,207,439
1949	245,642	315,165	1952	748,760	1,010,099
1950	453,300	546,952			

The Cummer Lime & Mfg. Co. continued to produce sand; total quantity sold or used increased 34 percent over 1951.

MONROE

Alonzo Cothron opened a new quarry and produced crushed limestone.

The Cutler Cut Rock Co. opened a new quarry and produced dimension limestone.

PALM BEACH

The Belle Glade Rock Co. operated its crushed-limestone quarry at about the same rate. Noncommercial crushed limestone was produced by the Palm Beach County Highway Department.

Burnup & Sims started producing sand and gravel.

The total value of the mineral production of the county was $210,907.

PINELLAS

The Largo Washed Sand Co. continued to produce sand; the total quantity sold or used declined 17 percent below 1951.

POLK

Six companies continued to produce land-pebble phosphate rock. The American Agricultural Chemical Corp. operated the Boyette and South Pierce mines and the Pierce mill; total mine production increased 14 percent over 1951. The Coronet Phosphate Co. operated the Tenoroc mine and mill; mine production increased 162 percent above 1951. The Davison Chemical Corp. operated the Bonny Lake and Pauway No. 4 mines and the Ridgewood mill; total mine production declined 4 percent below 1951. The International Minerals & Chemical Corp. continued to operate the Achan, Noralyn, and Peace Valley mines and the Noralyn-Mulberry mill; total mine production increased 13 percent above 1951. Swift & Co. continued to operate the Varn and Watson mines and the Agricola mill; total mine production declined 8 percent below 1951. The Virginia-Carolina Chemical Co. continued to operate the Clear Springs and Homine mines and the Nichols mill. Total mine production of phosphate rock in Polk County was 14 percent more than in 1951.

Four companies continued production of sand: The Davenport Sand Co., Inc., the Lake Wales Concrete Sand Co., the Lake Wales Independent Sand Co., and the Standard Sand & Silica Co. The Oak Ridge Sand Co. began the production of sand during the year.

Table 10 shows sand sold or used by producers in Polk County.

TABLE 10.—Sand sold or used by producers in Polk County, 1951–52, in short tons

Year	Short tons	Value
1951	698,101	$451,527
1952	1,010,744	703,744

PUTNAM

The Edgar Plastic Kaolin Co. and the United Clay Mines Corp. continued to mine kaolin; the total quantity sold or used declined 18 percent below 1951.

Five companies continued to produce sand: The All-Florida Sand Co., Unincorporated, the Diamond Interlachen Co., the Keuka Sand Co., the Keystone Sand Co., and the United Clay Mines Corp.

Table 11 shows sand sold or used by producers in Putnam County.

TABLE 11.—Sand sold or used by producers in Putnam County, 1948–52, in short tons

Year	Short tons	Value	Year	Short tons	Value
1948	283,115	$173,169	1951	422,268	$249,362
1949	261,110	183,909	1952	595,473	362,323
1950	389,705	234,788			

ST. LUCIE

A small quantity of sand was produced by the Florida East Coast Railway.

SUMTER

Central Quarries, Inc., continued to produce crushed limestone; the quantity sold or used increased 54 percent over 1951.

SUWANNEE

The Suwannee Limerock Co. opened a new quarry and produced crushed limestone.

VALUES

The values of mineral production shown in the tables are the values as reported at the mine or plant. Table 12 shows the average unit values of all commodities produced in Florida, 1948–52.

TABLE 12.—Average unit values of mineral production, 1948–52, in dollars per unit of quantity [1]

Commodity	Unit	1948	1949	1950	1951	1952
Cement, portland	376-pound bbl	2.65	2.65	2.65	2.80	2.80
Clays:						
Fuller's earth	Short ton	17.79	17.60	16.70	16.78	17.37
Kaolin	do	19.43	23.07	23.74	23.60	24.55
Miscellaneous	do	.80	.55	.75	1.00	1.00
Garnet	do				38.07	46.44
Ilmenite	do	8.04	17.35	15.56	14.81	16.35
Lime	do	14.78	12.95	12.55	12.56	12.93
Limestone:						
Crushed	do	1.23	1.13	1.30	1.17	1.22
Dimension	do					9.74
Marl	do		.40			
Natural gas	1,000 cu. ft	.04	.04	.05	.07	.07
Peat	Short ton	2.27	5.85	6.57	6.27	6.50
Petroleum	42-gallon bbl	(2)	(2)	(2)	(2)	(2)
Phosphate rock	Long ton	5.77	5.55	5.61	5.92	5.88
Rutile	Short ton	58.00	44.22	50.00	50.17	103.77
Sand	do	.83	.78	.91	.84	.75
Gravel	do	1.40	.97	1.20	1.25	1.34
Zircon	do	54.75	44.75	47.04	43.63	38.57

[1] For greater detail on prices by grades and markets, see volume I, Minerals Yearbook, 1952.
[2] Data not available.

The Mineral Industry of Georgia

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Georgia.

By James L. Vallely [1] and Garland Peyton [2]

MINERAL production in Georgia in 1952 was valued at $52,398,000, a 10-percent increase over 1951 and a 19-percent gain over 1950. In each instance production of barite, bauxite, cement, coal, sand, gravel, slate, and stone was greater than the previous year. Clay production was substantially the same as in 1951, but iron ore, lime, scrap and flake mica, and talc declined.

The principal minerals in the State, in the order of their production value in 1952, were: Clay, stone, cement, sand, gravel, iron ore, barite, talc, slate, bauxite, and scrap and flake mica.

Under the Defense Minerals Exploration Administration program to aid in exploration for strategic minerals, 3 properties were explored, 1 for mica in Upson County, 1 for beryl in Troup County, and 1 for manganese in Bartow County. DMEA advanced $20,241 as its share of the total amount ($25,645) expended in 1952.

TABLE 1.—Mineral production in Georgia, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays (including fuller's earth) [2]	2,528,599	$23,090,280	2,490,167	$23,033,977
Coal	(3)	(3)	32,100	160,500
Gold (recoverable content of ores, etc.) troy ounces	3	105		
Iron ore (usable) long tons, gross weight	357,754	1,339,248	319,959	1,439,251
Lime (open-market)	10,616	104,626	7,854	87,587
Mica (sheet) pounds	(3)	(3)	13,010	18,852
Peat	2,250	41,000	2,150	38,000
Sand and gravel	1,226,231	1,041,561	2,133,970	2,029,367
Sand and sandstone (ground)	1,874	18,740	1,765	17,650
Stone (except limestone for cement and lime)	4 5,234,131	4 14,813,413	7,141,923	18,114,604
Talc and ground soapstone	77,895	823,133	56,491	653,144
Undistributed: Asbestos, barite, bauxite, beryllium concentrate (1952), cement, feldspar (1951), mica, slate, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		6,282,755		6,805,259
Total Georgia		4 47,555,000		52,398,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels and bauxite are strictly production.
[2] Except clays sold or used for cement.
[3] Value included with "Undistributed."
[4] Revised figure.

[1] Mining engineer, Mineral Industry Division, Region VII, Bureau of Mines, Knoxville, Tenn.
[2] State geologist, Georgia Geological Survey, Atlanta, Ga.

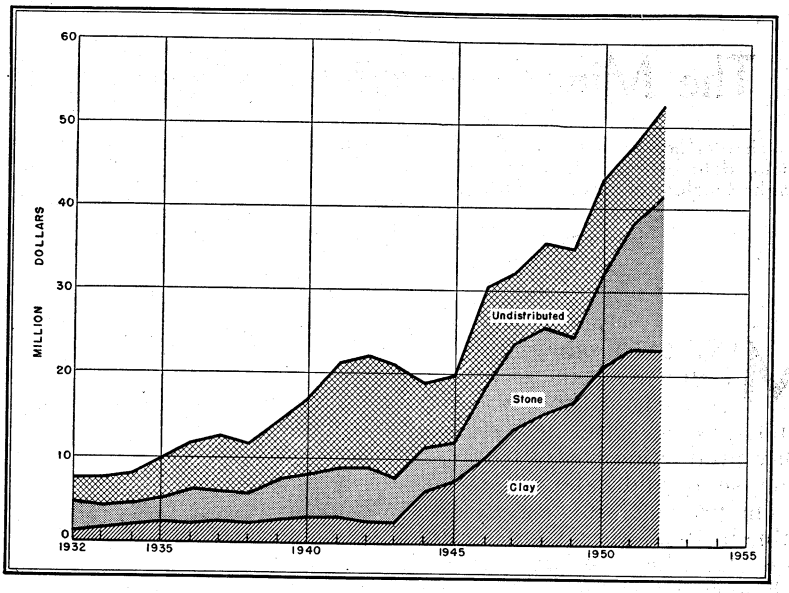

FIGURE 1.—Value of clay, stone and total value of mineral production in Georgia, 1932–52.

REVIEW BY MINERAL COMMODITIES

METALS

Bauxite.—American Cyanamid Co. was the only producer in the State in 1952; crude bauxite, from its mines in Bartow, Macon, and Sumter Counties, was dried at the Halls Station plant in Bartow County for shipment to the chemical industry.

Beryl.—Production of beryl in 1952 was reported from the Foley mine in Upson County and the Hogg mine in Troup County, possibly the first commercial production of this mineral in the State.

The Georgia-Carolina Mica Mining Co., Inc., conducted exploration for beryl under the DMEA program at the Hogg mine during the year. The Government's share of the exploration cost was $1,779 of the $1,977 spent in 1952.

Gold and Silver.—Minor quantities of gold and silver have been produced in Georgia in recent years, but only 3 ounces of gold was produced in 1951 and neither gold nor silver in 1952.

Iron Ore.—Brown-iron-ore shipments in 1952 were 319,959 long tons, an 11-percent decrease below 1951. Production came from the Cartersville district in Bartow County and the Cedartown district in Floyd and Polk Counties. A small tonnage of red iron ore was produced in Walker County.

Manganese Ore.—No manganese ore as such has been reported produced in Georgia since 1945 although some iron ores have contained small quantities of manganese. During 1952 the DMEA advanced $14,195 out of a total of $18,927 spent in cooperation with the Hale-Georgia Minerals Corp., to explore its property in Bartow County for manganese ore.

TABLE 2.—Shipments of usable brown iron ore, 1943–47 (average) and 1948–52

Year	Long tons	Value	Year	Long tons	Value
1943–47 (average)	288,110	$666,652	1950	[1] 202,427	[1] $677,248
1948	273,735	746,818	1951	[1] 357,754	[1] 1,339,248
1949	228,689	692,649	1952	[1] 319,959	[1] 1,439,251

[1] Includes a small amount of hematite.

NONMETALS

Asbestos.—A small tonnage of amphibole asbestos was produced in Georgia in 1952. Production was reported by only one company—Powhatan Mining Co.—from Meriwether and Rabun Counties.

Barite.—Crude-barite production increased 22 percent over 1951, and shipments increased 32 and 37 percent, respectively, in tonnage and value over the previous year. All barite produced came from Bartow County.

Cement (Portland).—Cement production and value in 1952 were approximately 2 percent greater than in 1951. There were two producers in the State—Southern States Portland Cement Co. at Rockmart and the Penn-Dixie Cement Corp. at Clinchfield.

Clays.—Production, as measured by shipments of clays (including fuller's earth), constitutes nearly 44 percent of the value of the State mineral production. Total clay sold or used by producers in 1952 was 2,490,200 tons valued at $23,034,000, decreases of approximately 2 percent in both quantity and value below 1951. Kaolin production was substantially the same as in 1951, but its value increased 1 percent. Fuller's earth declined approximately 5 percent in quantity and value, and miscellaneous clays decreased 3 percent in quantity but increased 4 percent in value.

TABLE 3.—Clays [1] sold or used by producers, 1943–47 (average) and 1948–52

Year	Short tons	Value	Year	Short tons	Value
1943–47 (average)	[2] 1,258,675	[2] $8,579,352	1950	2,325,292	$20,937,991
1948	[2] 2,125,179	[2] 15,377,757	1951	2,528,599	23,090,280
1949	1,983,001	16,653,426	1952	2,490,167	23,033,977

[1] Except that used for cement.
[2] Does not include fuller's earth.

TABLE 4.—Kaolin sold or used by producers 1943–47 (average) and 1948–52, by uses

Year	China clay, paper clay, etc.		Refractory uses		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	698,805	$7,754,121	113,023	$479,402	811,828	$8,233,523
1948	1,006,325	13,866,799	129,115	775,899	1,135,440	14,642,698
1949	902,433	13,229,888	100,958	576,448	1,003,391	13,806,336
1950	1,087,174	16,533,582	133,481	806,946	1,220,655	17,340,528
1951	1,147,865	17,615,634	175,945	1,084,101	1,323,810	18,699,735
1952	1,227,756	18,155,248	100,499	646,945	1,328,255	18,802,193

TABLE 5.—Miscellaneous clays sold or used by producers, 1943–47 (average) and 1948–52

Year	Short tons	Value	Year	Short tons	Value
1943–47 (average)	619,464	$456,283	1950	1,024,095	$804,190
1948	1,081,225	829,412	1951	1,083,952	978,727
1949	929,138	753,761	1952	1,050,792	1,020,132

Feldspar.—No feldspar has been reported in Georgia since the destruction by fire of the Appalachian Minerals Co. mill late in 1951.

Iron Oxide Pigments.—New Riverside Ocher Co., Cartersville, the only producer in the State, reported production of 3,047 tons of yellow ocher valued at $83,635.

Lime.—Ladd Lime & Stone Co. (at Cartersville, Bartow County) is the only producer of lime in the State. Production in 1952 was 7,854 tons valued at $87,587, decreases of 26 and 16 percent, respectively, in quantity and value from 1951.

Mica.—Sheet mica sold or used by producers in 1952 was 13,010 pounds valued at $18,852, production being reported from 10 counties—Cherokee, Elbert, Franklin, Hall, Hart, Jasper, Madison, Monroe, Pickens, and Upson.

Production of scrap and flake mica declined for the second consecutive year. Except for one shipment from Upson County, all production was from Hart and Pickens Counties.

DMEA advanced $4,267 of a total of $4,741 expended on one mica-exploration project in Upson County.

Sand and Gravel.—Production of sand and gravel totaling 2,134,000 short tons and valued at $2,029,000 was reported from 17 counties in 1952. Tonnage increased 74 percent and value 95 percent over 1951; sand represented 90 percent of the total production.

Sand and Sandstone (Ground).—Production of ground sand was 1,765 tons valued at $17,650 in 1952, a 6-percent decrease in both tonnage and value from 1951. There was only one producer in the State during the year.

Slate.—Production of slate flour and granules increased 14 percent in quantity and 16 percent in value over 1951. The Funkhouser Co., at Fairmont, was the only producer.

Stone.—Stone is the second most important of Georgia's mineral commodities; it is first in tonnage produced and second in value (surpassed only by clay). Granite, limestone, miscellaneous stone (both crushed and dimension), and dimension marble were produced in Georgia in 1952. Tonnages and values of granite and limestone were substantially higher than in 1951. Dimension-marble production increased 3 percent, but its value decreased 4 percent below that in the previous year. The total stone production was 7,141,923 tons valued at $18,114,604, increases of 36 and 22 percent, respectively, in quantity and value above 1951.

TABLE 6.—Sand and gravel sold or used by producers, by classes of operation and uses, 1950–52, in short tons

	1950		1951		1952	
	Short tons	Value	Short tons	Value	Short tons	Value
COMMERCIAL						
Sand:						
Glass	21,617	$43,234	(1)	(1)	(1)	(1)
Molding	74,078	128,156	(1)	(1)	(1)	(1)
Building	671,376	367,876	557,170	$299,779	994,498	$717,529
Paving	260,586	154,563	324,461	201,003	449,712	278,130
Grinding and polishing	59,234	119,415	69,215	147,073	94,010	195,242
Engine	10,128	5,820	39,860	16,767	29,018	13,202
Filter	3,470	17,350	(1)	(1)	(1)	(1)
Railroad ballast					31,061	18,637
Other	109,993	96,312	109,449	119,318	209,843	238,709
Total	1,210,482	932,726	1,100,155	783,940	1,808,142	1,461,449
Gravel:						
Building	1,300	4,000			59,880	101,190
Paving					(1)	(1)
Other					37,126	35,910
Total	1,300	4,000			97,006	137,100
Government-and-contractor	(2)	(2)	7,000	1,000	33,792	45,938
Total gravel	1,300	4,000	7,000	1,000	130,798	183,038
Sand and gravel:						
Commercial total	1,211,782	936,726	1,100,155	783,940	1,905,148	1,598,549
Government-and-contractor total	(2)	(2)	7,000	1,000	33,792	45,938
Undistributed			119,076	256,621	195,030	384,880
Grand total	1,211,782	936,726	1,226,231	1,041,561	2,133,970	2,029,367

[1] Included with "Undistributed."
[2] Bureau of Mines not at liberty to publish.

TABLE 7.—Stone sold or used by producers, 1950–52, in short tons

	1950		1951		1952	
	Short tons	Value	Short tons	Value	Short tons	Value
Crushed stone:						
Granite	[1] 4,583,920	[1] $5,882,458	[1] 4,123,385	[1] $6,038,886	5,746,901	$8,880,139
Limestone	806,490	2,171,355	956,443	3,014,190	1,218,515	3,498,420
Marble	(2)	(2)	9,851	75,748		
Sandstone			2,000	3,000		
Miscellaneous	15,720	15,180	2,500	3,750	14,751	3,680
Total crushed stone	5,406,130	8,068,993	5,094,179	9,135,574	6,980,167	12,382,239
Dimension stone:						
Granite	127,310	3,087,249	122,567	3,230,887	139,358	3,357,150
Marble	(2)	(2)	17,385	2,446,952	17,953	2,345,979
Miscellaneous	250	1,000			[3] 4,445	[3] 29,236
Total dimension stone	127,560	3,088,249	139,952	5,677,839	161,756	5,732,365
Grand total	[4] 5,533,690	[4] 11,157,242	[1] 5,234,131	[1] 14,813,413	7,141,923	18,114,604

[1] Revised figure.
[2] Bureau of Mines not at liberty to publish.
[3] Includes limestone.
[4] Excludes marble.

Talc.—Ground and sawed talc and soapstone production in 1952 was 56,500 tons valued at $653,100, decreases of 27 percent in quantity and 21 percent in value from 1951.

MINERAL FUELS

Coal.—Bituminous-coal production in 1952 was 32,100 tons valued at the mine at $160,500, representing the highest annual production since 1946, when 114,000 tons was produced. Dade and Walker Counties in the extreme northwestern corner of the State are the only coal-producing area.

Peat.—Production of peat decreased from 2,250 tons valued at $41,000 in 1951 to 2,150 tons valued at $38,000 in 1952, 4 and 7 percent, respectively, lower in quantity and value than in the previous year.

TABLE 8.—Production of peat, 1948–52, in short tons

Year	Short tons	Value	Year	Short tons	Value
1948	2,500	$50,000	1951	2,250	$41,000
1949	1,870	56,000	1952	2,150	38,000
1950	1,750	41,000			

REVIEW BY COUNTIES

BALDWIN

General Refractories Co. produced kaolin for refractory uses at the Wood mine near Milledgeville.

BARTOW

Bartow County produced a greater variety of mineral products than any other county in Georgia in 1952 and ranked sixth in the State in the value of its minerals. Production value in 1952 was $3,110,581, a 34-percent increase over 1951. Barite, iron ore, limestone, and slate were the four most important minerals produced, and bauxite, lime, and iron oxide pigments made up the balance of the mineral production.

Four barite producers were active during the year—B. R. Cain Mining Co., J. W. Cox, New Riverside Ocher Co., and Paga Mining Co., all operating in the vicinity of Cartersville.

The American Cyanamid Co. mined bauxite from the Fountain and Julia mines; it was dried at the company Hall Station plant for shipment to the chemical industry.

Production of brown iron ore in 1952 was 195,632 long tons valued at $777,746, increases of 21 and 27 percent, repectively, in tonnage and value over 1951. Hodge Mining Co. was the largest producer and operated the Iron Hill mine near Taylorsville. Other producers were Bartow Mines, Hale-Georgia Minerals Corp., Lake Mining Co., and Mosteller Bros.

The New Riverside Ocher Co. was the only producer of natural yellow oxide (ocher) in Georgia in 1952. Production totaled 3,047 tons valued at $83,635.

A single operator mined dolomite for the manufacture of lime and mortar cements.

TABLE 9.—Production of lime in Bartow County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	6,141	$58,150	1951	10,616	$104,626
1949	7,028	67,252	1952	7,854	87,587
1950	11,998	121,556			

A single operator mined and crushed limestone in the northern part of the county.

Hale-Georgia Mineral Corp., in cooperation with DMEA, explored the company property in the Cartersville district for manganese. The Government share of the $18,927 expended was $14,195. No manganese ore was produced during the year.

One operator mined slate just south of Fairmont and shipped slate granules and flour for use in the manufacture of roofing materials.

BERRIEN

Bannockburn Sand Co. of Valdosta was the only mineral producer in 1952.

BIBB

Production of fuller's earth, granite, and sand each increased over 25 percent in both quantity and value above 1951; miscellaneous clays production decreased 42 percent in quantity but increased 13 percent in value.

Burns Brick Co. and Cherokee Brick & Tile Co., both of Macon, mined clay for use in the clay-products plants, and the Diversey Corp. produced fuller's earth. Macon Stone Co. operated its quarry near Macon for crushed granite. Cornell-Young Co., Macon Brick & Block Co., and H. G. Tinker, all of Macon, operated sand pits in the county.

CHATHAM

Sand, produced by J. W. Fitzgerald Co., Inc., of Savannah, was the only mineral reported from the county during the year.

CHATTOOGA

P & E Mining Co. mined brown iron ore near Summerville in 1952.

CHEROKEE

No brown-iron production was reported in 1952. Hodge Mining Co. suspended operations at the Inman mine in 1951. A. W. Amphlett and Arthur T. Anderson produced sheet mica from the Amphlett mine during the year.

CLAYTON

K. H. & H. C. Phillips' sand pit was the only mineral producer in 1952.

COBB

Two operators produced crushed granite from quarries north of Marietta. Gravel production was also reported by Cobb County Highway Department.

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COLQUITT

Baxter & Sanders reported the production of sand in 1952.

CRAWFORD

Middle Georgia Pottery mined clay from the Lizella mine, and the Atlantic Sand & Supply Co. produced sand in 1952.

DADE

Coal production in 1952 was 4,500 tons valued at $22,500 at the mine.

DECATUR

Fuller's earth was mined and processed by the Attapulgus Clay Co. near Attapulgus.

DE KALB

Granite, both crushed and dimension, was the only mining operation in the county. Four operators were active.

DOUGHERTY

Albany Lime & Cement Co. and Garrett Base Materials Co. produced sand in the vicinity of Albany, Ga.

EFFINGHAM

Dowes Silica Mining Co. Inc., producing sand, was the only mining operation in the county.

ELBERT

Elberton is the center of the dimension-granite industry in the southeast with over a dozen quarries producing rough and dressed monumental stone in the county. One operator produced crushed granite. H. F. Alexander mined a small quantity of sheet mica.

TABLE 10.—Dimension granite sold or used by producers, in Elbert County 1948–52

Year	Short tons	Cubic feet	Value	Year	Short tons	Cubic feet	Value
1948	46,751	563,267	$2,308,784	1951	46,864	564,625	$2,151,687
1949	43,250	521,062	2,124,578	1952	44,844	540,287	2,178,309
1950	44,990	542,043	2,040,937				

FANNIN

The Fannin County Highway Department quarried miscellaneous crushed stone for its own use in highway construction.

FAYETTE

One operator produced crushed granite in the northern part of the county.

FLOYD

Oconee Clay Products Co. and Rome Brick & Tile Co. mined shale for the manufacture of clay products, Oconee shipping to its plant at Milledgeville. Cedar Creek Mining Co. operated its brown-iron-ore pit near Cave Springs in the southwestern part of the county, and Floyd County produced crushed limestone at the Bluff Road quarry west of Rome.

FRANKLIN

C. M. Wacaster produced sheet mica and Payne Bros., sheet and scrap mica, in 1952. E. E. Purcell operated a sand pit near Bowersville.

FULTON

Clays were mined by the Atlanta Brick & Tile Co. and the Chattahooche Brick Co. for use in the manufacture of brick and other clay products. C. J. Ross and Norton Quarries operated sand pits near Atlanta.

GILMER

One operator produced crushed limestone.

GLASSCOCK

Harbison-Walker Refractories Co. mined kaolin for refractory purposes at the Gibson mine.

GORDON

Shale is mined and used in manufacturing brick by the Plainville Brick Co. in the southwestern part of the county.

GWINNETT

Miscellaneous crushed stone quarried by the Gwinnett County Highway Department for road construction was the only mineral production reported in 1952.

HALL

A new operator reported the initial production of crushed granite from a quarry south of Gainesville. Sheet mica mined by C. F. Connor was the only other mineral produced in the county in 1952.

HANCOCK

One operator produced crushed granite in 1952.

HART

The Funkhouser Co. operated its mine and plant at Hartwell for the production of flake mica from mica schist. Payne Bros. also reported the production of sheet and scrap mica during the year.

HENRY

A single operator produced crushed granite.

HOUSTON

The county ranked fifth in the State in 1952 in the value of mineral production.

Penn-Dixie Cement Corp. operates its Clinchfield plant throughout the year and increased its production approximately 3 percent above 1951. Unit prices for cement remained the same as in 1951. A single operator produced crushed limestone, principally for agricultural uses.

JASPER

There has been no production of feldspar or mica in the county since the destruction by fire of the mill of Appalachian Minerals Co. in 1951.

LONG

Sand produced by the Dawes Silica Mining Co. was the only mineral production reported in the county in 1952.

MACON

American Cynamid Co. continued operation of the Lane-McMichoels bauxite mine during the year. Crude bauxite was shipped to the Halls Station drying plant near Kingston in Bartow County.

MADISON

Two operators produced granite, principally monumental stone. Payne Bros. produced sheet and scrap mica during 1952.

MERIWETHER

Powhatan Mining Co. of Baltimore, Md., produced a small tonnage of amphibole asbestos from the Gay mine in the eastern part of the county.

MONROE

Dixie Mining Co. and O. H. Howell produced sheet mica during 1952.

MURRAY

Murray is the only county in the State in which talc and soapstone are mined, they were the only minerals produced in the county in 1952. Cohutta Talc Co., Georgia Talc Co., and Southern Talc Co. operate mines on the west side of Fort Mountain, with sawing and grinding plants at Chatsworth.

TABLE 11.—Production of talc and soapstone in Murray County, 1943–47 (average) and 1948–52

Year	Crude	Sales (sawed and ground)		Year	Crude	Sales (sawed and ground)	
	Short tons	Short tons	Value		Short tons	Short tons	Value
1943–47 (average)	[1]	36,784	$421,853	1950	70,749	70,749	$774,148
1948	53,640	53,602	624,694	1951	78,500	77,895	823,133
1949	49,338	49,338	580,405	1952	58,411	56,491	653,144

[1] Data not available.

MUSCOGEE

A new operator opened a quarry 6 miles north of Columbus for the production of crushed granite. Ferguson Sand & Gravel Co. continued to operate its sand pit south of Columbus during the year.

OGLETHORPE

Production of dimension granite, chiefly monumental stone, in 1952 was 208,000 cubic feet (17,265 short tons) valued at $368,655. Quarries were operated by three producers. One company produced crushed granite also.

PICKENS

Pickens County ranked fourth in the State in the value of its mineral production. Dimension marble and crushed and ground marble were produced by one company. Flagstone was quarried by two operators. O. H. Howell mined sheet mica and Thompson-Weinman Co. of Cartersville produced flake mica.

POLK

Cement, brown iron ore, and limestone were produced in Polk County in 1952. Southern States Portland Cement Co. operated its cement plant at Rockmart throughout the year. Five companies operating in the vicinity of Cedartown produced brown iron ore, namely, Albea-York Mining Co., Arrington Mining Co., E. L. Gammage, Graves & Acree, and Woodward Mines. A single operator produced crushed limestone.

TABLE 12.—Shipments of brown iron ore in Polk County, 1948–52

Year	Long tons	Value	Year	Long tons	Value
1948	155,531	$510,352	1951	140,355	$541,929
1949	107,025	350,676	1952	165,522	822,802
1950	96,272	317,420			

RABUN

Amphibole asbestos from the Cornelia mine of Powhatan Mining Co. near Dillard was the only mineral produced in the county in 1952.

RANDOLPH

A single operator crushed limestone principally for agricultural use.

RICHMOND

Richmond County ranked 10th in value of mineral production in the State in 1952. Crushed granite, kaolin, clay, and sand, listed in order of their value, were produced during the year. Albion Kaolin Division of Interchemical Corp. mined kaolin at Hepzibah, and three companies at Augusta produced clay for the manufacture of brick and clay products. They were: Georgia-Carolina Brick & Tile Co.,

Georgia Vitrified Brick & Clay Co. and Merry Bros. Brick & Tile Co. One operator produced crushed granite, and Augusta Sand & Gravel Co. and Richmond Sand Co. operated sand pits in 1952.

SUMTER

American Cyanamid Co. operated the Hattan-Thigpen bauxite mine near Andersonville in 1952.

TALBOT

Brown Sand Co. and Taylor Sand Co. produced sand from pits near Junction City in the southeastern part of the county.

TAYLOR

Interstate Mining & Refining Corp. producing kaolin near Butler went out of business during the year.

THOMAS

Clay for use in making brick was mined by the Arnold Brick Co. at Thomasville and Dawes Silica Mining Co., Inc., produced washed sand and ground silica sand. Production of ground silica sand in 1952 was 1,765 tons, a 6-percent decrease from 1951.

TABLE 13.—Production of ground sand in Thomas County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	1,909	$17,183	1951	1,874	$18,740
1949	771	7,712	1952	1,765	17,650
1950	1,176	11,760			

TROUP

Georgia-Carolina Mica Mining Co. operated the Hogg mine south of La Grange and produced some beryl. DMEA aided the company in its exploration for beryl in the pegmatite deposit, contributing $1,779 of the $1,977 expended on the property under the DMEA agreement in 1952.

TWIGGS

Twiggs County, producing kaolin only, ranked first in the value of mineral production in the State in 1952. Kaolin sold or used by producers totaled 521,077 tons valued at $7,487,877, decreases of 4 percent in tonnage and 2 percent in value from 1951. Mines and plants were operated by the Georgia Coating Clay Co., Macon, Ga.; Georgia Kaolin Co., Dry Branch; and the J. M. Huber Co., Huber, Ga.

TABLE 14.—Kaolin sold or used by producers in Twiggs County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	477,974	$5,869,989	1951	541,974	$7,611,121
1949	419,919	5,520,784	1952	521,077	7,487,877
1950	496,256	6,888,008			

UPSON

Barren Mica Mining Co. and Arthur T. Anderson were the only mica producers in 1952. Under the DMEA program, Arthur T. Anderson explored the Carter mine for strategic mica. The Government advanced $4,267 of the $4,741 spent in 1952 on the project.

WALKER

Production of coal in 1952 was 27,600 tons valued at $138,000. S. M. Chapman mined a small tonnage of red hematite iron ore from the Estell mine, and one operator produced dimension limestone, principally for residential construction.

WARREN

One operator continued the production of crushed granite.

WASHINGTON

Washington County, producing only kaolin, ranked third in the State in the value of its mineral production. Six companies operated kaolin pits near Sandersville in 1952; Champion Paper & Fibre Co., Edgar Bros. Co., Georgia Kaolin Co., Georgia Pigment Co., Thiele Kaolin Co., and United Clay Mines Corp.

Kaolin sold or used by producers in 1952 was 259,977 tons valued at $4,069,357, increases of 2 and 3 percent, respectively, in tonnage and value over 1951.

TABLE 15.—Kaolin sold or used by producers in Washington County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	233,585	$3,138,565	1951	255,334	$3,952,849
1949	200,783	2,859,730	1952	259,977	4,069,357
1950	237,995	3,606,656			

WHITE

The Helen Sand & Rock Co. produced a small tonnage of sand and gravel in 1952.

WHITFIELD

Clay was mined by the Dalton Brick & Tile Co. near its clay-products plant a few miles south of Dalton. Two producers operated crushed-limestone quarries northeast of Dalton.

WILKINSON

Wilkinson County, producing only kaolin, ranked second in value of mineral production in Georgia in 1952. Kaolin sold or used by producers was 435,528 tons valued at $6,639,300, an increase of 8 percent in tonnage and 3 percent in value over 1951. Companies operating in 1952 were: Edgar Bros. Co., Evans-Smith & Co., and M & M Clays, Inc., all at McIntyre; and Harbison-Walker Refractories Co., D. C. Hardie, Oconee Clay Products Co., Savannah Kaolin Co., and

Southern Clays, Inc., the latter group near Gordon. Harbison-Walker Co., D. C. Hardie, and Savannah Kaolin Co. produced refractory kaolin, and the other companies mined and manufactured china, coating, and filler kaolin.

TABLE 16.—Kaolin sold or used by producers in Wilkinson County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	327,884	$5,091,986	1951	402,328	$6,465,212
1949	311,340	4,852,544	1952	435,528	6,639,300
1950	392,357	6,338,763			

UNDISTRIBUTED

Mineral production, unsegregated as to county in which it was produced, included the following:

Beryl	9 tons.
Mica, sheet	5,333 lbs.
Peat	2,150 tons.
Sand and gravel	56,666 tons.

VALUES

The values of mineral production shown in the tables are those reported at the mine or plant. Table 17 shows the average unit value of all commodities produced in Georgia, 1948–52:

TABLE 17.—Average unit values of mineral commodities produced in Georgia, 1948–52, in dollars per unit [1]

Commodity		1948	1949	1950	1951	1952
Asbestos	short ton	100.00	100.00	100.00	100.00	100.00
Barite	do	10.43	9.26	10.70	11.34	11.75
Bauxite (crude)	long ton	6.24	6.13	5.15	3.99	10.30
Beryl	short ton					596.00
Cement	376-pound barrel	2.23	2.33	2.35	2.53	2.54
Coal	short ton	6.19	5.93	5.57	4.00	5.00
Clay (fuller's earth)	do	16.83	17.53	17.57	18.00	18.11
Clay (kaolin)	do	12.90	13.76	14.21	14.13	14.16
Clays (miscellaneous)	do	.77	.81	.88	.90	.97
Feldspar	long ton	5.00	5.21	4.79	4.94	
Gold	troy ounce	35.00	35.00		35.00	
Gravel	short ton	1.18		3.08		1.57
Iron	long ton	2.73	3.03	3.35	3.75	4.50
Lime	short ton	9.47	9.57	10.13	9.86	11.15
Mica (scrap)	do	19.98	28.23	21.84	23.47	25.88
Mica (sheet)	pound	.18	.21	.21	.26	1.45
Ocher	short ton	22.87		24.61	22.18	27.45
Peat	do	20.00	30.00	23.50	18.25	17.70
Sand (ground)	do	9.00	10.00	10.00	10.00	10.00
Sand	do	.72	.77	.77	.85	.89
Slate (flour and granules)	do	6.26	6.33	6.92	7.23	7.41
Stone:						
Granite (crushed)	do	1.30	1.27	1.28	1.46	1.55
Granite (dimension)	do	21.45	32.78	24.25	26.36	24.09
Limestone (crushed)	do	1.92	2.17	2.69	3.15	2.87
Marble (crushed)	do	7.24	5.00	5.01	7.69	
Marble (dimension)	do	119.99	124.68	119.74	140.75	130.67
Miscellaneous (crushed)	do	5.00	1.17	.97	1.50	.25
Miscellaneous (dimension)	do	5.00	4.00	4.00		10.78
Talc	do	11.66	11.77	10.94	10.57	11.56

[1] For greater detail on prices by grade and markets, see Vol. I, Minerals Yearbook, 1952.

The Mineral Industry of Hawaii and Pacific-Island Possessions

By R. B. Maurer [1]

HAWAII

HAWAII'S mineral industry in 1952 consisted of stone quarrying; the preparation of lime, sand, and gravel; and the production of clay and salt. The aggregate value of this output was a small percentage of the islands' total income from all industries. This minor mineral yield, nevertheless, is noteworthy in the Territory's economy.

The core and mass of the islands consists of volcanic rocks built up from the ocean floor in comparatively recent geological times. The rocks range from basalt to trachyte but are predominantly basic. The geological conditions are against the occurrence of deposits of ores of the precious metals and other heavy metals and preclude the formation of coal beds. Besides predominating basalts of eruptive rocks, there are heavy fringing and barrier coral reefs, some elevated above sea level, and in their disintegration and compaction a calcare-

TABLE 1.—Mineral production in Hawaii and Pacific-Island possessions, 1951–52

Area and mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Canton: Stone (crushed) [1]	360	$900	150	$375
Guam: Stone (crushed) [1]	720,000	[2] 675,000	948,000	870,000
Hawaii:				
Lime (open-market)	8,740	236,052	8,894	240,786
Sand and gravel	2,561	5,710	1,069	936
Stone	[3] 650,094	[3] 1,337,474	705,994	1,545,301
Undistributed: Other nonmetallic minerals	----------	147,063	----------	17,164
Total Hawaii	----------	1,726,299	----------	1,804,187
Midway: Stone (crushed) [1]	(4)	(4)	7,200	[5] 6,000
Wake: Stone (crushed) [1]	240	600	4,260	8,000

[1] Quantities are estimated equivalents of cubic yards reported.
[2] Revised figure.
[3] Excludes certain stone, value for which is included with "Undistributed."
[4] Data not available.
[5] Estimate.

[1] Chief, Mineral Industry Division, Region III, Bureau of Mines, San Francisco, Calif.

ous sandstone was formed in addition to coral limestone of the reefs in place.[2]

The Hawaiian volcanoes furnished strong decomposing agencies of acid, steam, and high temperature, and these combined with rainfall and sea infiltration have produced numerous secondary decomposition products, including, gypsum, alum, and clay.

Soils are the dark-red, yellow and light-red, and sedimentary types that are derived from volcanic lavas and may have the composition of original basalts or the composition of altered lavas. Some of the soils have varying contents of iron oxide and titanium oxide, but no commercial separation of these minerals for iron and titanium use has been attempted.

CONSUMPTION AND MARKETS

The entire mineral production of Hawaii is consumed in the Territory. The position of the islands as a military base with attending construction and supply requirements plus the maintenance of its normal economy, which includes the basic industries—sugar and pineapple—requires the importation of mineral fuels, minerals for construction, and mineral fertilizers. Although the complete statistics on the 1952 imports of minerals are not available, the scope of these imports is shown by data compiled in a survey of the movement of all materials between Hawaii and ports of California, Oregon, and Washington in 1950.[3] In that year, Hawaii received, from these sources, alone, 668,985 tons of petroleum and petroleum products; 105,180 tons of building cement; 33,823 tons of potash and other fertilizer material; 2,896 tons of natural bitumen asphalts; 1,490 tons of clay and earths; 1,104 tons of miscellaneous nonmetallic minerals; 850 tons of sand and gravel; 649 tons of salt; and 63 tons of limestone. During that same period 26,004 tons of steel, iron, tinplate, and terneplate scrap were shipped to the Pacific mainland ports from Hawaii.

EMPLOYMENT IN THE MINERAL INDUSTRY

In the first quarter of 1952 the average number of persons employed in Hawaii's mineral industries was 268. There were 183,254 wage earners in the Territory's entire agricultural and industrial activities in 1952. The average weekly wages of mineral-industry employees in 1952 was $63.01, compared to $65.98 in 1951 and $55.06 in 1950.[4]

REVIEW BY MINERAL COMMODITIES

Basalt.—Basalt was quarried for concrete and road metal on Oahu in Honolulu County, by the following companies: James W. Glover, Ltd., Hawaiian Rock & Supply Co., Ltd., and Honolulu Construction & Drayage Co. On Maui, Maui County, the Kahului Railroad Co. quarried basalt for riprap, concrete and road metal, and railroad ballast.

Clays.—Wilsonite Brick Co., Ltd., produced miscellaneous clays at Honolulu, Honolulu County, Oahu, for brick and floor and roof tile.

[2] Geol. Survey, Mineral Resources of Hawaii: 19th Ann. Rept., 1898, pp. 681–686.
[3] Data, courtesy of San Francisco Chamber of Commerce.
[4] Chamber of Commerce of Honolulu ,Hawaii Facts and Figures: 1951 and 1952 Supplement.

Hawaiian Gas Products, Ltd., also produced miscellaneous clays on Oahu for tile and pottery.

Lime.—Hawaiian Gas Products, Ltd., at Honolulu, prepared mason's quickline and hydrated lime and produced hydrated lime for chemical use. Carbon dioxide gas and "dry ice" were byproducts of the kiln operation.

Limestone.—Limestone was produced at Waianae on Oahu, Honolulu County, for the preparation of lime and carbon dioxide. In addition, some limestone was crushed for miscellaneous use.

Miscellaneous Stone.—Corps Construction Co., Ltd. produced miscellaneous stone for concrete and road metal in Hawaii County, Hawaii.

Salt.—Chun Mew Ting Co. produced salt from sea water by solar evaporation at Honoulili, and Wun Sung Wong prepared salt at Fort Weaver near Ewa Beach in open pans. Both operations are in Honolulu County, Oahu.

Sand and Gravel.—The National Park Service prepared sand and gravel for paving and roads in Hawaii County on the island of Hawaii. On Oahu, building sand was produced by Walker-Moody Construction Co., Ltd., at Makiki Heights and by Honolulu Construction & Drayage Co. at Kahuku.

PACIFIC-ISLAND POSSESSIONS

AMERICAN SAMOA

Basalt rock and coral are present on this group of islands; however, no information on the production of these materials or other minerals in 1952 is available.

CANTON

Coral aggregate was prepared for use in concrete and asphalt paving work by the Civil Aeronautics Administration.

ENDERBURY

No mineral production was reported in 1952; the island was uninhabited.

GUAM

Coral was quarried by contractors for concrete aggregate, road base, fills, etc., in connection with military construction projects.

MIDWAY

Bank-run coral, the only stone on the island, was produced by dragline operation for concrete aggregate by the military forces. Sand conglomerate (coral and shell mixture) also is available on the island, but there was no recorded production.

WAKE

Graded coral for use in concrete and asphalt paving was produced by Trans-Ocean Engineering Co. and the Civil Aeronautics Administration.

The Mineral Industry of Idaho

By Albert J. Kauffman, Jr.,[1] Kenneth D. Baber,[2] Frank B. Fulkerson,[2] and Paul F. Yopes[2]

SILVER, lead, and zinc represented 80 percent of the total value of mineral production in Idaho during 1952. Although recovery of silver gained slightly, curtailment in lead and zinc production, accompanied by falling market prices, reduced the value of output of these metals 11 and 13 percent, respectively. The restricted output caused a 7-percent decrease in the value of the State's mineral production, reversing a series of annual gains that had been uninterrupted since 1949. Idaho maintained its position as the largest silver-producing State, a rank held since 1933, and continued as the second largest producer of lead and zinc (Missouri and Montana were first in lead and zinc output, respectively).

About 87 percent of the total value of mineral output was supplied by metal mining and 13 percent by production of nonmetallic minerals. Zinc contributed 32 percent of the total value; lead, 31 percent; silver, 18 percent; sand and gravel, 4 percent; and stone, 3 percent. Zinc-lead ore continued to exceed the tonnage output of any other mineral commodity in Idaho by a wide margin. Other values in excess of $1 million were credited to tungsten, copper, gold, phosphate rock, and cement.

The Defense Minerals Exploration Administration (DMEA) approved 24 strategic mineral exploration projects, making a total of 48 contracts approved in Idaho since the program was begun. Loans made covered part of the cost of exploratory work and were repayable from royalties on ore discovered and subsequently mined. The accompanying table lists projects active during 1952; 24 of these were active at the end of the year.

Shoshone County, noted for lead, zinc, and silver production, supplied 76 percent of the total mineral value of ores mined during the year. Lemhi, Blaine, Valley, and Custer were other leading counties; however, none of them exceeded $3 million in value of output. Reports of mineral production were received from all but 6 of the State's 44 counties.

Major developments in the State mining industry during the year included suspension of operations at the Bradley Mining Co. Yellow Pine mine owing to unfavorable marketing conditions. Tungsten ore and concentrate output from the Ima mine in Lemhi County continued throughout the year; the value of its products contributed substantially to the State total. Increasing interest in the alluvial deposits, containing thorium, rare earths, and titanium, in Valley County led to establishment of two additional dredging operations during the summer. The Calera Mining Co. Blackbird mine, although in limited production because of operational difficulties at the new cobalt refinery in Garfield, Utah, was the leading domestic producer

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of cobalt concentrates during the year. A number of important deep-level exploration projects were underway in the Coeur d'Alene mining region during the year. Most significant results were additional discoveries of ore at depth by the Sunshine Mining Co. and Polaris Mining Co. in the Silver Belt and the exposure of a wide mineralized zone on the 3,000 level of the Galena mine by the American Smelting & Refining Co. Shaft sinking was begun on the Hecla-Atlas project near Mullan, where exploration at the 2,400 level was planned.

Installation of enough furnace capacity to double the previous output of elemental phosphorus and a corresponding increase in mining activity gave further importance to the phosphate-rock industry in the southern part of the State. Growing interest in other nonmetallic minerals also was reflected by an increased output of fluorite, barite, and mica and by reports of investigation of industrial mineral deposits by mining companies.

In addition to the mineral values credited to Idaho in table 1, some are omitted owing to lack of information.

Many ores contain valuable minor constituents, such as arsenic, bismuth, cadmium, selenium, tellurium, and some minor metals, including gallium and germanium. These quantities sometimes are not known and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages or credited to mine or origin. These minor constituents are recovered at plants that frequently treat mixtures of materials from many sources, including residues obtained from the refining of such metals as copper

TABLE 1.—Mineral production in Idaho, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Antimony ore and concentrate---gross weight	8,805	(2)	4,173	(2)
Clays (except for cement)	28,281	$42,545	23,533	$24,683
Cobalt---pounds			196,516	(2)
Copper (recoverable content of ores, etc.)	2,160	1,045,440	3,213	1,555,092
Gold (recoverable content of ores, etc.)---troy ounces	45,064	1,577,240	32,997	1,154,895
Gypsum (crude)	65	293	400	1,200
Lead (recoverable content of ores, etc.)	76,713	26,542,698	73,719	23,737,518
Mercury---76-pound flasks	357	75,016	887	176,602
Mica: Scrap			170	5,100
Sheet---pounds			20,020	115,572
Phosphate rock---long tons	694,446	1,748,074	(2)	(2)
Pumice and pumicite	83,528	133,192	88,085	141,253
Sand and gravel	4,057,391	2,971,264	3,925,863	2,745,201
Sand and sandstone (ground)	11,968	107,738	9,500	80,000
Silver (recoverable content of ores, etc.)---troy ounces	14,753,023	13,352,231	14,923,165	13,506,218
Stone (except limestone for cement)	1,457,182	1,811,422	[3] 1,630,034	[3] 2,441,236
Tungsten concentrate---60-percent WO_3 basis	377	1,402,866	333	1,245,499
Zinc (recoverable content of ores, etc.)	78,121	28,436,044	74,317	24,673,244
Undistributed: Barite, cement, abrasive garnet, fluorspar (1951–52), stone (crushed limestone, 1952), titanium concentrate (1951), vanadium, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)		3,548,945		5,456,623
Total Idaho		82,795,000		77,060,000

[1] Production as measured by mine shipments or mine sale (including consumption by producers) except that fuels and the following additional minerals are strictly production: Gypsum and mercury. Some minerals that originated in Idaho are omitted owing to lack of information (see above).

[2] Value included with "Undistributed."

[3] Excludes certain stone, value for which is included with "Undistributed."

and lead or other ways. It is not possible in many such instances to distribute the mineral products by States of origin, and sometimes it is even difficult to obtain an accurate separation as to domestic and foreign sources. Another mineral product of value, the production of which usually cannot be separated as to source, is byproduct sulfuric acid. The value of monazite produced cannot be credited, inasmuch as such information is not available under existing regulations of the Atomic Energy Commission.

During 1952, the program of the DMEA continued to encourage the systematic investigation of strategic and critical mineral occurrences. Financial assistance extended under the Government contracts was repayable from royalties on ore discovered and subsequently mined. The following projects were active under the program during part or all of 1952.

County	Name of operator	Name of property	Mineral	Total contract	Government participation, percent	Contract number
Blaine	Paymaster, Inc	Paymaster	Pb-Zn	$52,020	50	E59
	Silver-Star Queen Mines, Inc.	Silver-Star Queen	do	133,837	50	E152
	Snoose Mining Co	Snoose	Zn	135,000	50	E120
	Sun Valley Lead-Silver Mines, Inc.	Blue Kitten	Pb-Zn	28,384	50	E160
	United Minerals, Inc	Homestake	do	104,000	50	E18
Bonner	Funnell & Majer Mining Co.	Conjecture	do	53,228	50	E267
	Hope Silver-Lead Mining Co.	Hope	do	36,000	50	E130
	Compton I. White	Clarinda	Cu	57,310	50	E142
	Whitedelf Mining & Development Co.	Whitedelf	Pb	120,250	50	E189
Boundary	Chief Joseph Mines, Inc	Chief Joseph	W	7,440	75	E297
Custer	Joseph L. Ausich	Champion	Pb-Zn	31,650	50	E361
	Bleazard and Shirts	Silver Streak	do	8,400	50	E92
	Louis Buchman, L. S. Breckon, J. A. Norden, a partnership.	Red Bird	Pb-Ag	58,990	50	E266
	Buckskin Mines, Inc	Roosevelt	Pb-Zn	12,200	50	E287
	Enderlin & Connolly	Meadow View	Zn	27,120	50	E294
	Wylie Gardner and L. R. Vance.	Hoodoo	Pb-Zn	46,270	50	E223
	Holtermans & Spor	Open Question	CaF_2	7,793	50	E73
Elmore	Hermada Mining Co	Hermada	Sb	44,100	75	E22
	Oscar V. Svensson	Black Warrior	Sb	2,445	75	E148
Idaho	Mullin Mines, Inc	Tungstar	W	12,400	75	E394
	Ruby Meadows Mining Co.	Ruby Meadows	Monazite	14,052	90	E118
Latah	Idaho Beryllium & Mica Corp.	Muscovite	Mica	28,700	90	E426
Lemhi	Bradley Mining Co	Ima	W	122,400	75	E41
	do	do	do	112,000	75	E427
	Defense Metals, Inc	Wonder or Quinn	Th-U	68,265	90	E384
	Montana Coal & Iron Co	Black Pine	Co-Cu	88,850	70	E329
	Northfield Mines, Inc	Stevenson	do	233,150	70	E334
	J. R. Simplot Co	Chamac	CaF_2	57,900	50	E347
Owyhee	South Mountain Mining Co.	South Mountain	Pb-Zn-Cu	36,260	50	E177
Shoshone	Bunker Chance Mining Co.	Bunker Chance	Cu-Pb	152,530	50	E283
	Day Mines, Inc	National	Cu-Pb-Zn	348,640	50	E31
	Jack Etherton and Walter Schmittroth, partners.	Big It	W	24,000	75	E343
	Highland-Surprise Consolidated Mining Co.	Highland-Surprise	Pb-Zn	282,110	50	E63
	Hypotheek Mining & Milling Co.	East Hypotheek	do	70,410	50	E380
	Idaho Mining Co	Washington-Idaho	do	122,572	50	E88
	Nabob Silver-Lead Co	Nabob	do	143,450	50	E184
	Rhode Island Mining Co	Black Prince & Homestake.	Pb-Zn-Ag	23,900	50	E101
	Sidney Mining Co	Sidney	Pb-Zn	200,290	50	E367
	Signal Mining Co	New Hilarity	do	21,000	50	E421
	Sunset Minerals	Sunset	do	91,045	50	E102

County	Name of operator	Name of property	Mineral	Total contract	Government participation, percent	Contract number
Valley	Bradley Mining Co	Yellow Pine	Sb	175,368	75	E173
	do	do	do	53,000	75	E453
	Cosumnes Gold Dredging Co.	White Hawk basin	Monazite-Cb-Ta.	20,004	90	E350
	do	Paddy Flat	do	28,825	90	E351
	Lee S. Heller	Warm Springs	Pb-Zn	600	50	E75
	McRae Tungsten Mining Co.	Snowbird	W	20,351	75	E133
	McRae Tungsten Corp	Red Bluff	do	53,800	75	E406

In addition to exploration assistance rendered to the mining industry by the DMEA, the Government continued a program designed to encourage and aid the establishment and growth of mineral-processing facilities and of mining operations on known mineral deposits. The contract of this nature in force at the close of 1952 was:

County	Contractor	Name of property	Commodity	Government purchase commitment		Government financing	Type of financing	Tax amortization
				Tons	Cost			
Shoshone	Gibbonsville Mining & Exploration Co.		Lead	2,460	$738,000	$77,000	RFC Loan	
			Zinc	790	$245,000			

REVIEW BY MINERAL COMMODITIES

METALS

Antimony.—Production of antimony ores and concentrates in 1952 was less than half the total produced the preceding year and the lowest since before the beginning of World War II. Bradley Mining Co. and Hermada Mining Co. again were the only producers in the State. Antimony was recovered in antimonial lead from ores processed at the Bunker Hill & Sullivan Mining & Concentrating Co. smelter at Kellogg, Idaho.

Cessation of mining activities by Bradley Mining Co. at its Yellow Pine mine (Stibnite, Valley County) in June 1952 was responsible to a large extent for the decreased output. Closing of the mine, mill, and smelter was attributed to poor marketing conditions. The mine, established in 1932, had become the principal domestic source of antimony.

During the portion of the year that operations were in progress, the company recovered 4,000 short tons of concentrates containing 1,900 short tons of antimony.

Beryllium.—Preparations were completed during the year by the Idaho Beryllium & Mica Corp. for resuming operations at the Muscovite mine near Deary, Latah County. Sheet and scrap mica was produced, but no recovery of beryl was reported. The Reconstruction Finance Corp. granted the company a $125,000 loan to install milling equipment at the mine.

Cadmium.—Cadmium metal was produced as a byproduct from lead and zinc ores processed in the Bunker Hill & Sullivan Mining & Concentrating Co. smelter and the Sullivan Mining Co. electrolytic zinc plant in Shoshone County. Company annual reports for 1952 record production of 117,688 pounds of cadmium at the smelter and 547,720 pounds of the metal at the electrolytic zinc plant.

Cobalt.—Calera Mining Co. was the largest domestic producer of cobalt ore in 1952 despite curtailed operations. Output of cobalt ore from the Blackbird mine in Lemhi County was on a reduced scale pending resolution of technical difficulties encountered in the operation of the new refinery at Garfield, Utah. The concentrator at Cobalt reportedly operated at about 40 percent of capacity during the last half of the year.

According to the 1952 annual report of the Howe Sound Co., parent company of Calera Mining Co., all major construction at the project, under development since 1945, has been completed. Enlargement of the daily concentrator capacity from 600 to 1,000 tons of ore was accomplished.

Difficulties at the Garfield refinery involved mechanical failures due to the corrosive action of certain chemicals used in the process. The plant was designed and built for Calera Mining Co. by the Chemical Construction Corp., a subsidiary of American Cyanamid Co.

Investigation of other cobalt occurrences in Lemhi County was undertaken by Montana Coal & Iron Co. and Northfield Mines under contracts with the DMEA.

Copper.—An advance of nearly 50 percent in copper output compared to 1951 brought the annual production to the highest level since 1942. The gain was credited to the Blackbird cobalt-copper mine in Lemhi County, which was opened in 1951 by the Calera Mining Co. Copper was recovered also as a byproduct from treatment of silver ore and zinc-lead ore from Coeur d'Alene mines.

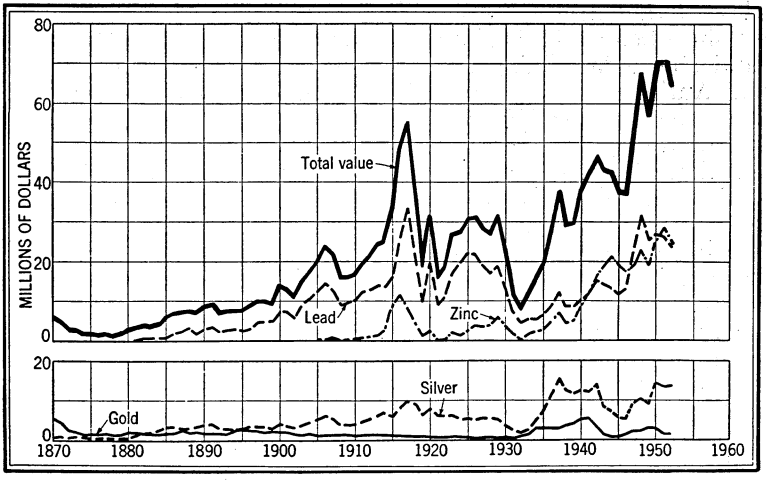

FIGURE 1.—Value of mine production of gold, silver, lead, and zinc, and total value of gold, silver, copper, lead, and zinc in Idaho, 1870–1952. The value of copper has been less than $2,000,000 annually, except in a few years.

TABLE 2.—Mine production of gold, silver, copper, lead, and zinc in 1952, by months, in terms of recoverable metals [1]

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	3,448	1,391,953	235	6,927	6,533
February	2,746	1,324,136	226	6,847	6,574
March	3,016	1,322,301	225	6,315	6,262
April	3,925	1,283,511	218	6,282	6,086
May	4,062	1,333,996	233	5,979	6,394
June	3,660	1,119,243	204	5,500	5,349
July	3,812	1,148,009	243	5,570	5,638
August	1,734	1,145,130	290	5,607	5,670
September	1,853	1,123,387	280	6,027	6,392
October	1,962	1,294,663	369	6,237	6,713
November	1,421	1,218,365	348	6,220	6,356
December	1,358	1,218,471	342	6,208	6,350
Total	32,997	14,923,165	3,213	73,719	74,317

[1] Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metal contained in concentrates, ore, tailings and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

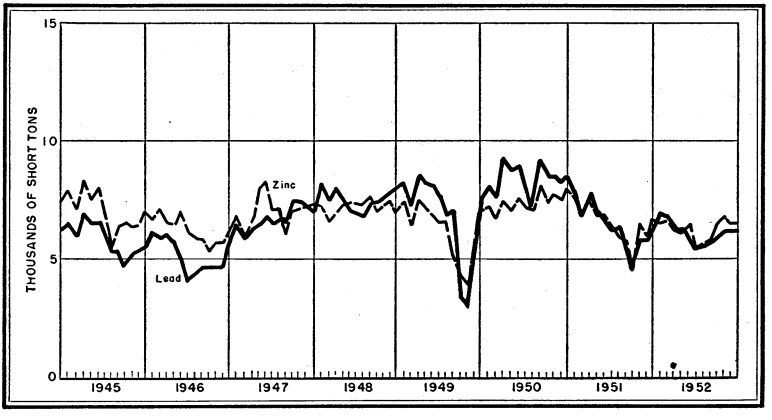

FIGURE 2.—Mine production of lead and zinc in Idaho, 1945–52, by months, in terms of recoverable metals.

TABLE 3.—Mine production of gold, silver, copper, lead, and zinc, 1948–52, and total, 1863–1952, in terms of recoverable metals [1]

Year	Mines producing		Material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1948	194	78	3,981,846	58,454	$2,045,890	11,448,875	$10,361,810
1949	171	82	3,057,075	77,829	2,724,015	10,049,257	9,095,085
1950	155	75	3,300,215	79,652	2,787,820	16,095,019	14,566,805
1951	157	52	3,254,791	45,064	1,577,240	14,753,023	13,352,231
1952	132	29	3,008,230	32,997	1,154,895	14,923,165	13,506,218
1863–1952			[3]	8,199,727	190,129,848	598,100,530	429,277,072

See footnotes at end of table.

TABLE 3.—Mine production of gold, silver, copper, lead, and zinc, 1948–52, and total, 1863–1952, in terms of recoverable metals [1]—Continued

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
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
1951	2,160	1,045,440	76,713	26,542,698	78,121	28,436,044	70,953,653
1952	3,213	1,555,092	73,719	23,737,518	74,317	24,673,244	64,626,967
1863–1952	119,969	38,394,311	6,437,628	812,658,342	1,779,891	351,334,033	1,821,793,606

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings and old slag re-treated; and ore shipped to smelters during calendar year indicated.
[2] Does not include gravel washed.
[3] Figure not available

TABLE 4.—Gold produced at placer mines, 1948–52, by classes of mines and 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:					
Bucketline dredges:					
1948	5	3,139,168	14,969	$523,915	$0.167
1949	4	2,332,576	10,234	358,190	.154
1950	4	2,005,000	13,549	474,215	.237
1951	4	1,729,500	10,665	373,275	.216
1952	3	458,146	2,359	82,565	.180
Dragline dredges:					
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
1951	5	137,000	938	32,830	.240
1952	6	434,990	1,769	61,915	.142
Suction dredges:					
1948	3	1,200	20	700	.583
1949	2	11,765	54	1,890	.161
1950	1	500	15	525	1.050
1951–52					
Nonfloating washing plants: [1]					
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
1951–52					
Gravel hydraulically handled:					
Hydraulic:					
1948	4	32,600	189	6,615	.203
1949	5	14,800	87	3,045	.206
1950	10	37,085	292	10,220	.276
1951	9	17,250	93	3,255	.189
1952	5	10,080	101	3,535	.351
Small-scale hand methods: Wet:					
1948	54	11,087	307	10,745	.969
1949	60	20,866	218	7,630	.366
1950	49	17,028	182	6,370	.374
1951	34	7,261	154	5,390	.742
1952	15	2,910	92	3,220	1.107
Underground placers: Drift:					
1948	5	620	16	560	.903
1949	3	1,330	12	420	.316
1950–52					
Grand total placers:					
1948	78	4,042,245	20,776	727,160	.180
1949	[2] 82	3,046,837	15,078	527,730	.173
1950	75	2,560,730	17,561	614,635	.240
1951	52	1,891,011	11,850	414,750	.219
1952	29	906,126	4,321	151,235	.167

[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] A mine using more than 1 method of recovery is counted but once in arriving at total for all methods.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in 1952, by classes of ore or other source material in terms of recoverable metals

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	12	321,977	20,625	72,053	441	1,007	
Dry gold-silver	2	6,995	3,480	58,136		84	
Dry silver	11	283,597	837	9,803,382	2,547,285	6,638,900	723,183
Total	25	12,569	24,942	9,933,571	2,547,726	6,639,991	723,183
Copper	5	100,800	729	7,816	2,470,521		
Lead	46	131,163	372	461,369	110,840	14,653,960	962,834
Lead-copper	2	46,488	14	75,345	122,681	228,091	
Zinc	1	324	1	1,366	10,000	2,000	100,000
Zinc-lead	52	1,730,972	2,380	4,173,662	1,073,159	116,899,383	135,276,262
Total	106	2,009,747	3,496	4,719,558	3,787,201	131,783,434	136,339,096
Other "lode" material:							
Dry gold: Old tailings	1	50	15	62		200	
Lead:							
Mill cleanings	1	11		113		3,641	1,237
Old tailings	2	27,667	21	35,967	13,311	1,174,648	187,885
Old slag	1	124	1	106	261	14,150	4,000
Zinc: Old slag	1	58,482		36,197		2,127,699	5,842,969
Zinc-lead: Old tailings	9	299,580	201	196,004	77,501	5,694,237	5,535,630
Total	15	385,914	238	268,449	91,073	9,014,575	11,571,721
Total "lode" material	132	3,008,230	28,676	14,921,578	6,426,000	147,438,000	148,634,000
Gravel (placer operations)	29		4,321	1,587			
Total	161	3,008,230	32,997	14,923,165	6,426,000	147,438,000	148,634,000

[1] Detail will not necessarily add to totals because some mines produce more than one class of ore.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery and types of material processed, in terms of recoverable metals

Method of recovery and type of material processed	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation	2,675	2,108			
Cyanidation	2,271	137			
Total recovered in bullion	4,946	2,245			
Concentration, and smelting of concentrate:					
Ore	22,833	14,498,945	6,269,570	136,364,002	136,947,437
Old tailings	222	221,671	88,412	6,586,610	5,723,515
Total	23,055	14,720,616	6,357,982	142,950,612	142,670,952
Direct smelting:					
Ore	659	152,052	65,357	2,063,064	116,079
Old tailings	15	10,362	2,400	282,475	
Old slag	1	36,303	261	2,141,849	5,846,969
Total	675	198,717	68,018	4,487,388	5,963,048
Placer	4,321	1,587			
Grand total	32,997	14,923,165	6,426,000	147,438,000	148,634,000

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

A. *For material treated at mills*

BY COUNTIES

	Material treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters [1] and recoverable metals					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds	Zinc (pounds)
Blaine	100,190			10,189	393	654,568	51,997	7,329,273	4,603,943
Boise	63	1		11	20	71		200	
Bonner	3,210			311	79	15,133	5,772	144,310	131,000
Custer	58,362	1		4,692	111	107,804	28,000	2,030,998	2,489,815
Gem	1,007	4	2	162	123	4,250	1,600	74,000	44,000
Idaho	55	31	10						
Lemhi	173,953			9,011	818	97,175	2,537,168	977,082	523,811
Owyhee	324			104	1	1,366	10,000	2,000	100,000
Shoshone	2,268,679			239,345	2,467	13,712,501	3,723,445	132,391,939	134,778,383
Valley	313,823			11,014	17,635	71,564			
Other counties.[2]	14,544	4,909	2,233	163	1,408	56,184		810	
Total: 1952	2,934,210	4,946	2,245	275,002	23,055	14,720,616	6,357,982	142,950,612	142,670,952
1951	3,172,257	5,693	2,804	289,886	26,392	14,527,391	4,263,694	148,062,266	147,877,123

BY CLASSES OF ORE AND OLD TAILINGS TREATED

Dry gold	321,910	2,877	200	11,020	17,677	71,668	41	953	
Dry gold-silver	6,988	2,069	2,045	156	1,406	55,966			
Dry silver	274,824			19,168	529	9,731,663	2,547,285	6,617,066	723,183
Copper	100,641			5,132	729	7,773	2,427,040		
Lead	125,847			11,468	108	386,580	95,925	12,809,135	939,675
Lead-copper	46,443			1,605	12	74,540	117,355	203,845	
Zinc	324			104	1	1,366	10,000	2,000	100,000
Zinc-lead	1,730,463			210,911	2,371	4,169,389	1,071,924	116,731,003	135,184,579
Dry gold old tailings	50			10	15	62		200	
Lead old tailings	27,140			3,388	6	25,605	10,911	892,173	187,885
Zinc-lead old tailings	299,580			12,040	201	196,004	77,501	5,694,237	5,535,630
Total: 1952	2,934,210	4,946	2,245	275,002	23,055	14,720,616	6,357,982	142,950,612	142,670,952

BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS [1]

Dry gold	11,030	17,692	71,730	41	1,153	
Dry gold-silver	156	1,406	55,966			
Dry silver	7	2	218		810	
Copper	7,505	1,023	1,729,005	3,185,305	10,061	
Lead	105,643	1,568	4,664,137	840,055	130,020,593	11,017,517
Lead-copper	16,541	217	7,677,442	1,809,467	5,303,266	548,485
Zinc	130,949	1,010	483,930	516,185	6,715,810	130,226,658
Zinc-lead	2,757	94	34,579	5,621	881,189	864,249
Dry iron [3]	414	43	3,609	1,308	17,730	14,043
Total: 1952	275,002	23,055	14,720,616	6,357,982	142,950,612	142,670,952
1951	289,886	26,392	14,527,391	4,263,694	148,062,266	147,877,123

[1] Excludes concentrates treated only by amalgamation and/or cyanidation.
[2] Includes Camas, Cassia, and Elmore counties for which the Bureau of Mines is not at liberty to publish separate figures.
[3] From lead, and zinc-lead material.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

B. *For material shipped directly to smelters*

BY COUNTIES

	Material shipped (short tons)	Recoverable-metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Bear Lake	3		4		2,000	
Blaine	133	2	2,075	6,003	30,727	57
Boise	129	36	729		17,800	
Bonner	8,788	305	71,195	228	23,690	3,000
Custer	3,883	39	60,959	8,000	1,319,002	56,185
Gem	58	37	131	400		
Lemhi	1,846	245	18,725	52,832	566,918	42,189
Shoshone	58,857	2	39,578	555	2,268,061	5,853,617
Washington	37		108		18,000	
Other counties [1]	286	9	5,213		241,190	8,000
Total: 1952	74,020	675	198,717	68,018	4,487,388	5,963,048
1951	82,534	1,129	217,993	56,306	5,363,734	8,364,877

BY CLASSES OF MATERIAL

Dry gold	67	71	185	400	54	
Dry gold-silver	7	5	125		84	
Dry silver	8,773	308	71,719		21,834	
Copper	159		43	43,481		
Lead-copper	45	2	805	5,326	24,246	
Lead:						
Crude ore	5,316	264	74,789	14,915	1,844,825	23,159
Mill cleanings	11		113		3,641	1,237
Old tailings	527	15	10,362	2,400	282,475	
Old slag	124	1	106	261	14,150	4,000
Total lead material	5,978	280	85,370	17,576	2,145,091	28,396
Zinc-lead	509	9	4,273	1,235	168,380	91,683
Zinc old slag	58,482		36,197		2,127,699	5,842,969
Total: 1952	74,020	675	198,717	68,018	4,487,388	5,963,048

[1] Includes Boundary, Butte, and Camas counties for which the Bureau of Mines is not at liberty to publish separate figures.

Gold.—Recovery of gold from Idaho's mines was the smallest since 1945. About 87 percent of the output came from lode mines and 13 percent from placer operations. Valley County supplied 53 percent of the State total. Production from lode mines decreased 14 percent compared to 1951, owing chiefly to Bradley Mining Co. suspending operations at the Yellow Pine antimony-gold mine in Valley County. Although active for only half of 1952, the Yellow Pine mine continued to be the leading source of gold in the State. The Boise-Rochester group in Elmore County and the Virginia group in Cassia County were also substantial producers. Recovery of gold from placer mines declined 64 percent from 1951 to 1952. Discontinuance of gold-dredging operations by two companies was the principal cause of the sharp drop in production. The Idaho-Canadian Dredging Co. terminated dredging in Boise County at the end of July 1951 and moved its equipment to Valley County to work a monazite deposit. In July 1952 the Warren Dredging Corp. closed its operations in the Yankee Fork district of Custer County. At the end of 1952 the dredge was

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

CONCENTRATE SHIPPED TO SMELTERS

Class of material	Quantity shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Dry gold	11,030	17,692	71,730	55	1,203	
Dry gold-silver	156	1,406	55,966			
Dry silver	7	2	218		1,296	
Copper	7,505	1,023	1,729,005	3,294,777	10,235	
Lead	105,643	1,568	4,664,137	990,435	132,975,140	13,814,987
Lead-copper	16,541	217	7,677,442	2,145,192	5,396,683	694,285
Zinc	130,949	1,039	490,560	537,130	7,110,266	135,109,829
Zinc-lead	2,757	94	34,579	6,509	898,738	1,020,709
Dry iron [1]	414	43	3,609	1,479	22,788	45,266
Total: 1952	275,002	23,084	14,727,246	6,977,577	146,416,349	150,685,076
1951	289,886	26,392	14,527,567	4,789,857	150,855,071	160,540,764
MATERIAL SHIPPED DIRECTLY TO SMELTERS						
Dry gold	67	71	185	468	90	
Dry gold-silver	7	5	125		88	
Dry silver	8,773	308	71,719		39,045	
Copper	159		43	44,722		
Lead-copper	45	2	805	7,067	25,265	
Lead:						
Crude ore	5,316	264	74,789	19,107	1,900,188	28,791
Mill cleanings	11		113		3,704	1,566
Old tailings	527	15	10,362	3,342	294,242	
Old slag	124	1	106	323	14,727	5,232
Total lead material	5,978	280	85,370	22,772	2,212,861	35,589
Zinc-lead	509	9	4,273	1,536	172,809	115,915
Zinc old slag	58,482		36,197		2,164,496	7,396,163
Total: 1952	74,020	675	198,717	76,565	4,614,654	7,547,667
1951	82,534	1,129	219,961	65,255	5,531,030	10,537,672

[1] From lead and zinc-lead material.

reported to be idle pending selection of a good site for monazite dredging. The Warren Dredging Corp., Tyee Mining Co., and Clearwater Dredging Co. were the largest producers of gold from placers in 1952; both of the last-named firms operated dredges in the Elk City district of Idaho County.

Lead.—Production of lead decreased by nearly 3,000 tons, a decline of about 4 percent. A sharp drop in both lead and zinc prices in 1952 was the principal factor causing the lowered production. The Bunker Hill mine of Bunker Hill & Sullivan Mining & Concentrating Co. was by far the largest producer of the metal in Idaho. Other leading mines, all of which produced more than 2,500 tons of recoverable lead, were the Page mine, Federal Mining & Smelting Co.; Star mine, Sullivan Mining Co.; Morning mine, Federal Mining & Smelting Co.; Triumph mine, Triumph Mining Co.; and Dayrock mine, Day Mines, Inc. The six mines, all in Shoshone County except the Triumph, which is in the Warm Springs district, Blaine County, had a combined lead output of over 47,000 short tons and produced 65 percent of the State's total. Over 79 percent of the lead was recovered from zinc-lead ore; most of the remainder came from lead ore, silver ore, old zinc-lead tailings, and old zinc slag.

Mercury.—The Hermes mine, operated by the United Mercury Mines Co., was the only mercury producer in the State during 1952. Ore was processed in two Gould rotary furnaces and yielded 887 flasks of mercury. Operation of the mine and furnaces was unscheduled and varied daily according to local conditions.

According to a company report, about 1,200 feet of tunnel development was completed during the year. Mercury produced at the mine was flown to a nearby railhead for transshipment to the East.

The Hermes mine, in the Yellow Pine district, near Stibnite, has a production record extending back to World War I.

Rare-Earth Metals.—Growing interest in monazite, a thorium-bearing rare-earth phosphate, stimulated dredging activity in Long Valley, in the southwestern part of Valley County, Idaho. Dredges were operated by Baumhoff-Marshall, Inc., Idaho-Canadian Dredging Co., and Warren Dredging Co. About 10,000 cubic yards of monazite-bearing sand and gravel reportedly was processed daily. The resulting concentrates were shipped to the sand plant at Boise, where the monazite was separated from the other constitutents into a marketable product. Monazite-production statistics cannot be released because the mineral contains thorium, a fissionable element, and accordingly is classified for security purposes by the Atomic Energy Commission.

During the latter part of the year, it was reported that Gem Monazite Mines, Inc., was carrying out exploratory work preparatory to beginning dredging in the Long Valley area. Further activity was indicated when the Oregon and Idaho State Land Boards approved an application by S. K. Atkinson to dredge the Snake River near Weiser, and the DMEA issued a certificate of discovery to the Ruby Meadows Mining Co., covering claims in Idaho County. Defense Metals, Inc., with Government assistance, reportedly began exploratory work on the Wonder property south of Salmon, Lemhi County.

Silver.—Production of silver was slightly greater (1 percent) in 1952, and Idaho continued as the Nation's leading silver producer. It was unique that the greater part (66 percent) of Idaho's silver was derived from silver ores; virtually all the remainder of the United States output was recovered as a byproduct of base-metal ores and gold ores. Recovery from silver ore increased 17,090 ounces in 1952. Production from zinc-lead ore and old tailings and from lead ore, which supplied most of the remaining silver produced in Idaho, gained 200,445 ounces and 69,382 ounces, respectively. The 5 largest silver-producing mines, all in Coeur d'Alene mining region, produced 73 percent of the State's silver in 1952. They were, in order of output, Sunshine and Polaris, both operated by the Sunshine Mining Co.; Bunker Hill, owned by Bunker Hill & Sullivan Mining & Concentrating Co.; Silver Summit, Polaris Mining Co.; and St. Germaine-Purim, worked by Sunshine Mining Co. The Bunker Hill mine produced zinc-lead ore; the other four leading mines yielded silver ore.

Titanium.—Ilmenite, a titanium-bearing mineral, is one of the potentially valuable constituents in the alluvial sands being dredged for monazite near Cascade, Valley County. Ilmenite is recovered in the initial concentration process at the dredge, separated from the monazite at a plant in Boise, and stockpiled. A local market is needed for the product because high freight rates preclude competition with production from other areas. (See also Rare-Earth Metals.)

Tungsten.—Production and value of tungsten concentrates decreased 12 and 11 percent, respectively, from 1951. Ores and concentrates were shipped from Yellow Pine mine, Valley County, and Ima mine, Lemhi County, by Bradley Mining Co.; Tungstar mine, Idaho County, owned by Mullin Mines Co. and leased by James Collard; Big It mine, Shoshone County, owned by Big It Mining & Milling Co. and leased by Schmittroth and Etherton; and Stevens claims, Adams County, by R. C. Scriven.

Operations at the Yellow Pine mine, where tungsten was recovered as a byproduct from antimony-gold ore, were discontinued in June owing to unfavorable antimony-marketing conditions. The Ima mine, near Patterson in the Blue Wing district of Lemhi County, was the major producer. Hübnerite, scheelite, and silver-bearing base-metal sulfide concentrates were shipped from the property.

Attention was called early in the year to new occurrences of tungsten mineralization in the Blue Wing district.[3] According to the report, promising tungsten-bearing veins had been uncovered in an area of complex faulting. Extensive exploration will be needed to establish the economic character of the mineralization because of the separate fault systems, which make mineralized-vein continuity uncertain.

Zinc.—Mine production of zinc declined almost 5 percent in 1952. Shoshone County (Coeur d'Alene region) continued to be the predominant source, contributing 95 percent of the 1952 total. The Triumph mine in Blaine County was the only mine outside of the Coeur d'Alene region to produce over 2,000 tons of recoverable zinc during the year. Eight properties, listed in order of output (Star, Bunker Hill, Page, Morning, Sidney, Frisco Group, Tamarack, and Bunker Hill smelter slag dump), produced over 2,500 tons of recoverable zinc each and accounted for 77 percent of the State total. The Star mine supplied about 21 percent of the State production of the metal. Over 90 percent of the zinc was recovered from zinc-lead ore and nearly all the rest from old zinc slag and old zinc-lead tailings.

NONMETALS

Barite.—Ground barite for drilling mud was processed by J. R. Simplot Co. at Pocatello from rock mined at the company-operated Sun Valley property in Blaine County. A large portion of the mine output was stockpiled.

Cement.—The Idaho Portland Cement Co. plant at Inkom, near Pocatello, Bannock County, used raw materials quarried locally. Although materials for portland cement are distributed widely in the State, this plant was the only producer.

Clays.—Output of clays decreased somewhat from 1951. Four structural brick plants in southern Idaho and a fire-brick producer in Latah County operated in 1952; all used locally mined clays. The quantity of clays reported used by 4 of the 5 active companies was 23,158 tons valued at $23,733. An additional 375 tons of fireclay valued at $950 was reported sold.

There are large potential resources of high-grade clays in Idaho that probably will be utilized in the future. Locations of some industrial clay deposits were given in a recent publication.[4]

[3] Mining World, Tungsten Found on DMA Loan: Vol. 14, No. 2, February 1952, pp. 33-37.
[4] Sohn, I. G., Industrial Clays, Other Than Potential Sources of Alumina of the Columbia Basin: Geol. Survey Circ. 158, 1952, 18 pp.

Fluorspar.—Fluorspar Mines, Inc., a subsidiary of J. R. Simplot Co., continued production and milling operations, begun late in 1951, at the Chamac deposits in Lemhi County. Crude ore was beneficiated by flotation to an acid-grade product. The first commercial production of fluorspar ever recorded in Idaho was made by this company in 1951. The bulk of the fluorspar marketed in 1952 was purchased by the General Services Administration for the National Stockpile. Smaller quantities were used in the steel and glass industries and for other purposes.

The fluorine content of western phosphate rock and its possible utilization received attention in a report published during the year.[5]

Garnet.—Idaho continued as one of the leading garnet-producing States, with all output coming from Benewah County. The quantity and value of production increased substantially over 1951. The garnet was used for sand blasting and other abrasive purposes.

Gypsum.—Small production of gypsum was reported from Washington County.

Mica.—Idaho's output of mica, all from Latah County, was valued at $120,672, a record high. This was the first substantial production since 1945, when output totaled $114,186. The mica was obtained from pegmatite dikes mined by surface methods. The General Services Administration purchased 94 percent of the total produced.

TABLE 9.—Mica sold or used by producers in 1952

Type	Pounds	Value
Sheet:		
Uncut, etc.	7,491	$2,745
Half trim	859	4,433
Full trim	11,670	108,394
Scrap mica	340,000	5,100
Total	360,020	120,672

Phosphate Rock.—The quantity of Idaho phosphate rock used in 1952 decreased 11 percent from 1951; however, because the average grade was higher, the total value increased over 23 percent to establish a record high. Tonnage mined also reached a new high level, owing primarily to initial production from the Ballard lease by Monsanto Chemical Co. Output from this property was stockpiled pending completion of the company electric-furnace plant in December. The unit value of rock consumed increased from $2.52 to $3.49 per ton, as a greater proportion of high-grade phosphate rock compared to lower grade phosphatic shale was used.

Electric-furnace-plant capacity for producing elemental phosphorus more than doubled during the year, and plans for further expansion were being made. Industrial developments were reviewed in two magazine articles.[6] [7] Phosphate rock mining or processing operations were active in Bannock, Bear Lake, Bingham, Caribou, and Gooding Counties, and further details are given under the county headings.

[5] Banning, Lloyd H., Defluorination Studies on Western Phosphate Rock: Proc. 3d Ann. Northwest Fertilizer Conference, 1952.
[6] Miller, J. G., Idaho Phosphorus and Its Ultimate Usage: Mines Mag., vol. 42, No. 8, August 1952, p. 25.
[7] Gordon, Joseph, Phosphorus: Shifting, Growing, Changing: Chem. Week, vol. 71, No. 5, Aug. 2, 1952.

TABLE 10.—Phosphate rock sold or used by producers, 1943–47 (average), and 1948–52

Year	Idaho [1]		
	Long tons	Value at mines	
		Total	Average
1943–47 (average)	300,505	$1,540,529	$5.13
1948	434,375	2,122,089	4.89
1949	471,305	1,915,125	4.06
1950	573,044	2,125,065	3.71
1951	694,446	1,748,074	2,52
1952	620,551	2,163,608	3.49

[1] Idaho includes Utah in 1946–48, 1950 and Wyoming in 1949–50.

TABLE 11.—Value of mineral production in Idaho by counties, 1951–52 [1]

County	1951	1952	Minerals produced in 1952, in order of value
Ada	$424,355	$445,260	Sand and gravel, stone.
Adams	4,636	(2)	Tungsten.
Blaine	2,402,307	2,678,094	Lead, zinc, silver, barite, copper, gold, sand and gravel, pumice.
Boise	176,567	6,008	Lead, gold, silver.
Bonner	138,132	419,817	Sand and gravel, silver, lead, zinc, gold, copper.
Bonneville	248,403	269,286	Pumice, sand and gravel, clay, gold.
Butte	(2)	996	Lead, silver.
Camas	----------	2,338	Lead, silver, gold.
Canyon	157,087	89,667	Sand and gravel.
Cassia	132,561	144,082	Gold, sand and gravel, clay, silver.
Clearwater	440,035	86,000	Stone.
Custer	1,503,629	1,193,901	Lead, zinc, silver, gold, copper.
Elmore	310,904	195,122	Gold, silver, sand and gravel, antimony.
Franklin	9,300	16,354	Sand and gravel.
Gem	118,837	109,409	Silica, lead, zinc, gold, silver, copper.
Gooding	10,216	15,380	Sand and gravel.
Idaho	157,262	124,368	Gold, sand and gravel, silver.
Jerome	1,841	----------	
Kootenai	237,958	388,352	Stone, sand and gravel.
Latah	122,501	127,105	Mica, clay.
Nez Perce	180,711	290,206	Stone, sand and gravel, gold, silver.
Owyhee	7,235	20,613	Zinc, copper, silver, lead, gold.
Shoshone	65,126,601	58,534,097	Zinc, lead, silver, copper, gold, sand and gravel, tungsten.
Twin Falls	177,698	110,107	Sand and gravel.
Valley	2,854,778	1,579,641	Antimony, gold, mercury, silver, tungsten.
Undistributed [3]	7,851,454	10,213,733	
Total	82,795,000	77,060,000	

[1] Exclusive of monazite production.
[2] Included with "Undistributed" to avoid disclosure of individual output.
[3] Includes value of production for the following counties: Bannock (cement, stone, sand and gravel), Bear Lake (phosphate rock, sand and gravel, lead, silver), Benewah (garnet), Bingham (phosphate rock, sand and gravel), Boundary (lead, silver, zinc), Caribou (phosphate rock), Clark (sand and gravel), Lemhi (tungsten, copper, fluorspar, lead, cobalt, silver, zinc, gold), Lewis (stone, gold, silver), Lincoln (1951), Madison (stone), Minidoka (sand and gravel), Payette (clay), Power (sand and gravel), Washington (lead, gypsum, gold, silver), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2).

Pumice.—Four companies in Blaine and Bonneville Counties produced 88,085 tons of pumice valued at $141,253 compared with 83,528 tons worth $133,192 in 1951. Over 98 percent of the output was used as lightweight aggregate for concrete, with small quantities used for insulating, acoustic plaster, and traction granules.

Sand and Gravel.—The tonnage and value of the sand and gravel output decreased slightly from 1951. Twenty noncommercial and 30 commercial operations reported production in 20 of the 44 counties in the State. Distribution of commercial production, by value, was

building sand and gravel, 72 percent; road gravel, 22 percent; miscellaneous, 6 percent. Over 98 percent of the noncommercial output was used for road building.

Silica.—A large deposit of silica sand containing about 30 percent feldspar was mined by the Gem Silica Co. in Gem County. The sand is washed to remove clay and sold as an abrasive and for plaster sand.

Stone.—The value of stone sold or used by producers in 1952 increased 50 percent over 1951. This does not include stone made into abrasives or material used in making lime and cement. The advance was due to the value ($1,155,600) of stone used for the Bureau of Reclamation's Palisades project in the southeastern part of the State. By classification, output was traprock, 71 percent; sandstone, 18 percent; limestone, 10 percent; and granite and miscellaneous, 1 percent. Production was reported from 6 counties by commercial operations and from 5 counties by county, State, or Federal agencies.

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties, in terms of recoverable metals

County	Mines producing		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Bear Lake	1				4	$4
Blaine	11		395	$13,825	656,643	594,295
Boise	7	5	68	2,380	807	730
Bonner	5		384	13,440	86,328	78,131
Bonneville		1	11	385		
Butte	1				33	30
Camas	3		11	385	735	665
Custer	15	2	1,983	69,405	169,933	153,798
Gem	3		164	5,740	4,383	3,967
Idaho	2	13	2,415	84,525	401	363
Lemhi	19		1,063	37,205	115,900	104,895
Lewis		2	25	875	4	4
Nez Perce		1	15	525	2	2
Owyhee	1		1	35	1,366	1,236
Shoshone	58	2	2,476	86,660	13,752,081	12,446,328
Valley	1	2	17,638	617,330	71,564	64,769
Washington	1	1	33	1,155	119	108
Other counties [1]	4		6,315	221,025	62,862	56,893
Total	132	29	32,997	1,154,895	14,923,165	13,506,218

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Bear Lake			1	$322			$326
Blaine	29	$14,036	3,680	1,184,960	2,302	$764,264	2,571,380
Boise			9	2,898			6,008
Bonner	3	1,452	84	27,048	67	22,244	142,315
Bonneville							385
Butte			3	966			996
Camas			4	1,288			2,338
Custer	18	8,712	1,675	539,350	1,273	422,636	1,193,901
Gem	1	484	37	11,914	22	7,304	29,409
Idaho							84,888
Lemhi	1,295	626,780	772	248,584	283	93,956	1,111,420
Lewis							879
Nez Perce							527
Owyhee	5	2,420	1	322	50	16,600	20,613
Shoshone	1,862	901,208	67,330	21,680,260	70,316	23,344,912	58,459,368
Valley							682,099
Washington			9	2,898			4,161
Other counties [1]			114	36,708	4	1,328	315,954
Total	3,213	1,555,092	73,719	23,737,518	74,317	24,673,244	64,626,967

[1] Includes Boundary, Cassia, and Elmore Counties.

REVIEW BY COUNTIES AND DISTRICTS

ADA

Sand and gravel and stone used for general construction and road building were valued at $445,260. Two sand and gravel washing plants were operated.

ADAMS

Tungsten ore was shipped from the Stevens claims by R. C. Scriven.

BANNOCK

The Idaho Portland Cement Co. operated a quarry and plant at Inkom. Nearly half a million tons of sandstone was quarried by Morrison-Knudsen Co. for use as railroad ballast. Production of building sand and gravel was reported by two operators, and gravel also was mined for highway and railroad use. At Pocatello, a fourth electric furnace for producing elemental phosphorus was put into operation in November by the Westvaco Chemical Division, Food Machinery & Chemical Corp.[8] This installation increased plant capacity to 41,000 tons a year. Raw material was obtained from J. R. Simplot open-pit mines in Bingham County. A mineral-development division was established by Westvaco in 1952 to conduct investigations of western mineral resources and deposits for the company.

BEAR LAKE

Production of phosphate rock was reported from the Waterloo open-pit mine of the San Francisco Chemical Co. during the second half of the year. The mine was operated under contract by Peter Kiewit Sons, Co.[9] Mill crushing capacity was expanded, and shipments of rock increased. Chemical companies and fertilizer outlets in the West and Midwest were the principal markets.[10] The Central Farmers Fertilizer Co. drove a crosscut to explore the phosphate beds at a property about 8 miles from Georgetown in Georgetown Canyon. The Western Construction Co. produced gravel for roadwork.

Bear Lake District.—Carlyle Gambling and Chester Skinner worked the Leone Marie lead mine, 11 miles northwest of Ovid, for 2 months on a part-time basis.

BENEWAH

The Idaho Garnet Abrasives Co. bought the Garnet Mines, Inc., interests and was the sole mineral producer in Benewah County during 1952. Garnet-bearing sands from Emerald Creek were concentrated in the plant at Fernwood, sacked, and shipped. The garnet was used for abrasive purposes, chiefly sand blasting.

BINGHAM

The J. R. Simplot Co. open-pit Gay mine, about 18 miles east of Fort Hall, continued to be the largest producer of phosphate rock in the western field. Low-grade phosphatic shale was used in the production of elemental phosphorus at the Pocatello plant of Westvaco

[8] Work cited in footnote 6.
[9] Mining Congress Journal, vol. 38, No. 11, November 1952, p. 77.
[10] Chemical Engineering, vol. 59, No. 10, October 1952, p. 365.

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties and districts, in terms of recoverable metals

County and district	Mines producing		Material sold or treated (short tons)	Gold (fine ounces)			Silver (fine ounces)			Copper	Lead	Zinc	Total value
	Lode	Placer		Lode	Placer	Total	Lode	Placer	Total	Pounds	Pounds	Pounds	
Bear Lake: Bear Lake	1		3				4		4		2,000		$326
Blaine:													
Galena	1		20				19		19	5,674			1,390
Little Wood River (Muldoon)	2		428	7		7	3,970		3,970	910	74,490	30,760	21,157
Mineral Hill and Camas	5		2,247	15		15	21,768		21,768	3,714	376,210	289,361	129,729
Warm Springs	3		97,628	373		373	630,886		630,886	47,702	6,909,300	4,283,879	2,419,104
Boise:													
Boise Basin	6	2	153	57	3	60	771		771		16,576		5,467
Grimes Pass	1	2	39		6	6	29	7	36		1,424		471
South Fork Payette River		1			2	2							70
Bonner:													
Clark Fork	1		450				1,624		1,624		67,410	9,000	13,817
Lakeview	3		11,524	384		384	84,661		84,661	5,772	97,875	122,000	127,469
Pend Oreille	1		24				43		43	228	2,715	3,000	1,029
Bonneville: Mount Pisgah		1			11	11							385
Butte: Dome	1		29				33		33		6,000		996
Camas:													
Beaver Creek	1		38	9		9	496		496		7,000		1,891
Little Smoky and Carrietown	2		39	2		2	239		239		1,000		447
Custer:													
Alder Creek and Alta [1]	4		1,858	6		6	2,815		2,815	5,041	167,460	129,501	52,436
Bayhorse	6		23,504	43		43	121,482		121,482	17,075	2,181,000	434,151	538,794
Boulder	1		36,320	63		63	36,749		36,749	11,008	908,975	1,852,331	491,961
Seafoam	1		532	33		33	7,496		7,496	2,562	88,218	128,210	44,045
Yankee Fork	3	2	31	6	1,832	1,838	221	1,170	1,391	314	4,347	1,807	66,665
Gem: West View	3		1,065	164		164	4,383		4,383	2,000	74,000	44,000	29,409
Idaho:													
Burgdorff-Marshall Lake		1			56	56		9	9				1,968
Elk City and Ten Mile [1]	2	7	55	31	2,095	2,126	10	345	355				74,731
Florence or French Creek		1			3	3		1	1				106
Lower Salmon River		1			44	44		7	7				1,546
Orogrande		1			180	180		27	27				6,325
Simpson		1			1	1							35
Warren		1			5	5		2	2				177
Lemhi:													
Birch Creek	2		37				136		136		13,801	3,000	2,843
Blackbird, Spring Mountain, and Texas [1]	7		128,964	1,047		1,047	39,633		39,633	2,428,420	1,275,453	558,886	958,316
Blue Wing	1		46,443	12		12	74,540		74,540	117,355	203,845		129,101
Indian Creek	2		54	2		2	807		807	5,326	27,801		6,565
Junction	4		38	1		1	654		654	831	8,950	114	2,288
Mackinaw	2		139				24		24	37,807			9,171
Nicholia	1		124	1		1	106		106	261	14,150	4,000	3,136

For footnotes, see end of table.

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties and districts, in terms of recoverable metals—Con.

County and district	Mine producing		Material sold or treated (short tons)	Gold (fine ounces)			Silver (fine ounces)			Copper	Lead	Zinc	Total value
	Lode	Placer		Lode	Placer	Total	Lode	Placer	Total	Pounds	Pounds	Pounds	
Lewis: Salmon River		2			25	25		4	4				$879
Nez Perce: Snake River		1			15	15		2	2				527
Owyhee: South Mountain	1		324	1		1	1,366		1,366	10,000	2,000	100,000	20,613
Shoshone:													
Beaver	4		70,727	59		59	49,267		49,267	50,620	2,476,801	5,373,000	1,349,587
Coeurd' Alene and Eagle [1]	1	2	346	9	(2)	9	457	(2)	457	3,500	35,950	1,253	7,572
Evolution	11		314,897	559		559	9,799,944		9,799,944	2,585,290	7,981,527	2,625,029	11,235,430
Hunter	7		363,662	472		472	843,183		843,183	277,314	27,125,405	45,356,301	12,743,089
Lelande	11		123,359	97		97	215,676		215,676	144,959	9,275,404	9,691,934	3,335,874
Placer Center	5		152,615	156		156	289,689		289,689	61,731	11,083,200	9,873,543	3,705,985
Summit	1		497	2		2	686		686	1,222	103,651	58,560	27,396
Yreka	18		1,301,433	1,122		1,122	2,553,179		2,553,179	599,364	76,578,062	67,652,380	26,054,435
Valley: Yellow Pine	1	2	313,823	17,635	3	17,638	71,564		71,564				682,099
Washington:													
Heath	1		37				108		108		18,000		2,996
Snake River		1			33	33		11	11				1,165
Other counties [3]	4		14,724	6,315		6,315	62,862		62,862		228,000	8,000	315,954
Total Idaho	132	29	3,008,230	28,676	4,321	32,997	14,921,578	1,587	14,923,165	6,426,000	147,438,000	148,634,000	64,626,967

[1] Combined to avoid disclosure of individual output.
[2] Combined with lode production to avoid disclosure of individual output.
[3] Includes Boundary County, Port Hill district; Cassia County, Blackpine district; and Elmore County, Bear Creek and Featherville, and Middle Boise districts.

Chemical Division, Food Machinery & Chemical Corp. Higher grade phosphate rock was used by the J. R. Simplot Co. in manufacturing superphosphate fertilizers at its plant in Pocatello. Details of the open-pit operation were described in an article.[11]

Gravel was produced for county roads.

BLAINE

The Sun Valley mine, an open-pit operation of J. R. Simplot Co., produced crude barite that was ground in Pocatello and used for drilling mud. Western Construction Co. reported a small production of road gravel. Five hundred tons of pumice for use as lightweight aggregate was mined by the Sun-ite Corp.

Little Wood River District.—Lessees operated the Eagle Bird, John Logan mine, owned by Garfield Silver-Lead Mines, Inc., and shipped about 430 tons of zinc-lead ore. John W. Larson shipped some lead ore from the High Mountain mine, which was developed during August and September.

Mineral Hill and Camas District.—The Queen group, an old zinc-lead property being developed by Silver Star-Queen Mines, Inc., was the largest metal producer in Mineral Hill and Camas district. The output of 111 tons of zinc-lead ore from the Snoose mine near Hailey was incidental to development. The Snoose Mining Co. completed construction of a new building and installed a new compressor after a fire in October destroyed the compressor, blacksmith shop, and storage building. Some lead ore was shipped to smelters from the Comet, Ohio, and Westlake mines.

Warm Springs District.—Triumph Mining Co. increased ore production from the Triumph mine, one of the principal sources of lead and zinc in Idaho in 1952, by 29 percent compared to 1951. Development in 1952 comprised 2,843 feet of drifting. The new Triumph mill, which was built in 1951 to replace one destroyed by fire in 1947, processed 93,653 tons of ore and produced 4,961 tons of lead concentrates and 3,668 tons of zinc concentrates. Total metal content of the mill products was 6,986,645 pounds of lead, 4,044,182 pounds of zinc, 620,079 ounces of silver, and 237 ounces of gold. The mill was operated 7 days per week on a 3-shift basis. The company also shipped 955 tons of ore to custom mills. The T. V. Williams lease in the Triumph mine supplied 2,402 tons of ore in 1952; Lowell Thompson shipped a small lot of zinc-lead dump ore from the Triumph property. Ore taken from the Blue Kitten mine during development by Sun Valley Lead-Silver Mines, Inc., was stockpiled at the mine. John H. McKinney worked the Silver Star mine in September and October.

BOISE

Boise Basin District.—On May 1, Richland Recoveries leased the Mayflower property, consisting of 7 unpatented and 2 patented lode claims, and the Dot and Duffy placer location of approximately 160 acres on West Fork Creek. Test-plant equipment was operated intermittently during the summer; some concentrates containing gold, silver, and copper were produced from old tailings and material

[11] Sweetwood, Charles W., Western Phosphate Mining—a Growing Industry: Min. Eng., vol. 4, No. 9, September 1952, p. 863.

from surface crosscuts. The Comeback and Homestake mines (gold ore), the Harper claim (silver ore), and the Oro mine (lead ore) were active for varying periods in 1952. Idaho-Canadian Dredging Co., which recovered most of the gold produced in Boise County in 1951, moved its equipment from Idaho City to Cascade, Valley County, to dredge monazite-bearing gravels.

BONNER

Discovery of a deposit of high-grade tungsten at the old Vulcan property in the Pend Orielle district was reported in the latter part of the year.

Curtis Gravel Co. of Spokane, Wash., produced building sand and gravel. A small quantity of gravel for railroad ballast was mined by Spokane International Railroad Co.

Clark Fork District.—The 200-ton flotation mill at the Hope mine, owned by Hope Silver-Lead Mines, Inc., was operated intermittently on lead ore mined by lessees.

Lakeview District.—Silver ore was produced from the Weber mine, operated June through December by the New Rainbow Mining Co., and from the Conjecture (Lakeview Silver) property, an old mine that was reactivated in 1952 by Donald Majer and Lyle Funnel; zinc-lead ore was taken from the Keep Cool mine.

BONNEVILLE

Clark Concrete Construction Co. and Pumice, Inc., open-pit-mined pumice for use chiefly as lightweight aggregate. Common brick and building tile were manufactured by the Idaho Falls Brick & Tile Co. from locally mined clay. Building sand and gravel and road gravel were produced at three commercial operations. The county produced road gravel.

BOUNDARY

Port Hill District.—Metal-mining activity in Boundary County reportedly was confined to the Idaho-Continental mine, operated by lessees during the last half of 1952; some lead ore was shipped to the Bunker Hill smelter at Kellogg.

CAMAS

Beaver Creek District.—The Princess Blue Ribbon supplied a small quantity of lead ore.

Little Smoky and Carrietown District.—Two small lead mines, the Carrietown and the Betty, were reported active during part of 1952.

CANYON

The Baker Gravel Co. and S. E. Bean & Son produced building and road sand and gravel. Paving sand and gravel were mined for county road construction.

CARIBOU

Mineral-industry activities based upon phosphate-rock resources attained increased importance during 1952 because Monsanto Chemical Co. became both a producer and processor. In December the

company started operation of the initial furnace of a $5 million elemental phosphorus plant at Soda Springs. The annual capacity of the furnace, believed to be the largest in the world, was reported to be 25,000 tons.[12] It was estimated that this furnace could supply 8 to 10 percent of the Nation's current output of elemental phosphorus. Phosphatic shale for the plant was mined, under contract by Morrison-Knudsen Co., Inc., by open-pit methods at the Ballard lease. A large stockpile was accumulated during the year.[13]

The Anaconda Copper Mining Co., active in the county since 1920, continued mining the foot- and hanging-wall beds at the No. 3 mine at Conda and increased production from an open pit started in 1951. The company also operated the washing, crushing, and drying plant. Production was shipped by rail to the company plant at Anaconda, Mont., where 101,199 tons of treble-superphosphate, phosphoric acid, and mixed fertilizers was manufactured, using byproduct sulfuric acid from the base-metal smelter. Vanadium was extracted from the rock also. Western Fertilizer Association reported producing a small quantity of phosphate rock in the county.

CASSIA

The Burley Brick & Tile Co. produced brick and building tile from locally mined clay. Coal was used for fuel. Bishop Sand & Gravel Co. produced building sand and gravel and road gravel. Gravel also was mined for county road work.

Blackpine District.—The Duvall Co. of Ogden, Utah, operated the Virginia group, one of the principal sources of gold in Idaho in 1952. No other metal mines were reported active.

CLARK

Road gravel was produced by the county.

CLEARWATER

F. H. De Atley & Co., Lewiston, produced 80,000 tons of crushed stone.

CUSTER

Reports indicated that tungsten occurrences were found at the Meadowview claims near Fourth of July lake.

Alder Creek District.—Lessees worked the Homestake zinc-lead mine, owned by the White Knob Mining Co., and lead ore was taken from the Champion mine.

Alta District.—Zinc-lead ore was mined by Taylor & Parks from the Old Glory fraction.

Bayhorse District.—Production from the Clayton mine totaled 20,518 tons of zinc-lead ore, a reduction of 3,044 tons from the 1951 output. In the 1952 stockholders' report, Clayton Silver Mines indicated that the reduced output resulted from lower lead and zinc prices during the last half of 1952 and a 3½-month strike at the mine. The Clayton mine has yielded to date 33,622,737 pounds of lead, 8,518,631 pounds of zinc, 317,641 pounds of copper, 1,944,807 ounces of silver, and 704 ounces of gold. Ore reserves were estimated to be

[12] Chemical Engineering, vol. 59, No. 10, October 1952, p. 364.
[13] Work cited in footnote 5.

108,500 tons at the end of 1952. Buchman, Breckon & Norden worked their Red Bird mine on Squaw Creek throughout 1952, producing 2,437 tons of ore which was shipped to the lead smelter at Selby, Calif. La Florecita Mining Co. of Salt Lake City, Utah, leased the Turtle mine in September and continued development begun in 1951 by the owners, Leo D. Ivie and Elray Kimball; lead-ore production in 1952 totaled 125 tons. The South Butte and Last Chance mines also produced lead ore.

Boulder District.—Idaho-Custer Mines, Inc., operated the Livingston concentrator from January through October, processing mostly zinc-lead tailings from the Livingston dump.

Seafoam District.—Fred and Earl Shirts produced 532 tons of zinc-lead ore from the Mountain King mine on Sharp Mountain.

Yankee Fork District.—Principal output was placer gold recovered by a bucketline dredge operated for 3 months by the Warren Dredging Corp. at the Yankee Fork placer mine; operations were terminated in July. Two small lode mines, the Harry Ann and Lucky Boy, were reported active during part of 1952.

ELMORE

The value of antimony ore produced by the Hermada Mining Co. amounted to less than 20 percent of the value reported in 1951. The sharp dip was attributed to the continued decline in price during the year.

One commercial producer and the county reported output of sand and gravel.

Middle Boise District.—Talache Mines, Inc., operated the Boise-Rochester group of claims and 400-ton amalgamation and concentration mill the entire year. The property was one of the largest producers of gold in the State in 1952.

FRANKLIN

Sand and gravel production was reported by two companies and by the county.

GEM

The Gem Silica Corp. produced, from deposits near Emmett, 9,500 tons of washed and ground silica sand valued at $80,000, compared with 11,968 tons worth $107,738 in 1951.

West View District.—Most of the small quantity of metal credited to Gem County came from zinc-lead ore produced by Earl Moosman from the Checkmate mine during the first half of the year. The Gem State (Dewey group) and the Mormon City mines were reported active also.

GOODING

The only mineral production reported from the county was sand and gravel valued at $15,380. Gates Bros., Inc., made wet-process phosphoric acid and 30,000 tons of treble superphosphate at its Wendell plant. Raw phosphate rock, mined at the Leefe mine in Wyoming, was purchased from the San Francisco Chemical Co.[14]

[14] Work cited in footnote 10.

IDAHO

Production of tungsten was recorded from the Tungstar group of claims in the Nez Perce Mountains near Golden. Building and road gravel was produced by J. Ben Luehrs, Grangeville.

Elk City District.—Clearwater Dredging Co. operated a bucketline dredge at the Crooked River placer location from September through December. The Tyee Mining Co. operated a dragline dredge on Red River, 10 miles east of Elk City, from April to December.

Ten-Mile District.—Amalgamation of ore from the Bob mine yielded a small quantity of gold.

KOOTENAI

Crushed stone and sand and gravel having a gross value of $388,352 were produced. Five commercial operations and the county road department reported output.

LATAH

Mica production from the mica- and beryllium-bearing pegmatite deposits near Deary was recorded for the first time since 1945. Mica valued at $120,672 was sold by the Idaho Beryllium & Mica Corp. The company received a Reconstruction Finance Corp. loan during the year and installed new mill equipment for recovering scrap and sheet mica and beryl. An article reported that 35 women were employed in sorting and trimming and that production was to be raised from 70 to 200 pounds of sheet mica daily.[15] Ownership of Troy Firebrick Co. was acquired by the Washington Brick & Lime Co., Spokane. This company operates at Troy, the only refractory plant in Idaho and markets high-heat-duty firebrick throughout the Northwest. Clay was mined at the nearby Benson pit and coal was used for fuel. Production of 4,908 tons of clay valued at $5,483 was reported.

LEMHI

Exploration of cobalt-copper occurrences was conducted by the Montana Coal & Iron Co. and by Northfield Mines.

Fluorspar was mined from the Chamac deposits and treated in the mill at Myers Cove by Fluorspar Mines, Inc.

Birch Creek District.—Roger Rising and Harold Balstad shipped 33 tons of zinc-lead ore from the Cabin mine.

Junction District.—Lead ore was shipped by lessees from the Buck Horn mine on Little Eight Mile Creek, 37 miles east of Salmon. The Digmore, Little Jim, and Owl mines produced a small quantity of ore.

Mackinaw District.—Shipments of copper ore were reported from the Blue Jay and Valley View mines.

Spring Mountain District.—Lead ore was produced in 1952 from the Silver Consolidated mine.

Texas District.—Principal metal producers in Texas district were the United Idaho and Latest Out mines (zinc-lead ore) and the Hill Top property (lead ore).

Blackbird District.—Operation of the Calera Mining Co. Blackbird mine and concentrator at Cobalt was curtailed during the year.

[15] Mining World, vol. 14, No. 9, August 1952, p. 92.

Copper concentrates recovered from the cobalt-copper ore were marketed as produced, and cobalt concentrates were stockpiled pending solution of operating problems at the new refinery at Garfield, Utah. The mill was operated 6 days per week on a 1-shift basis. Underground development consisted of 6,591 feet of drifting and raising and 6,987 feet of diamond drilling. Additional housing was completed and construction begun on a recreation hall.

Blue Wing District.—Bradley Mining Co. operated the Ima mine, 1 mile east of Patterson, throughout 1952. Tonnage of ore milled in the Ima 150-ton concentrator increased from 41,132 tons in 1951 to 46,443 tons in 1952. The mill produced 1,605 tons of copper-lead-silver concentrates, 275 tons of hübnerite concentrates, and 9 tons of scheelite concentrates. (See also Tungsten.)

Indian Creek District.—The Twin Peaks, Golden Copper mine (lead-copper ore), and the Oregon group (lead ore) were active during part of 1952.

LEWIS

The Lewiston Lime Co. quarried high-purity limestone sold for use as a smelter flux and in sugar factories and paper mills. Crushed basalt for county roadwork was produced.

MADISON

Crushed-stone production for county roads was reported.

MINIDOKA

Road gravel was produced by the county.

NEZ PERCE

Crushed basalt was produced by the Idaho State Highway Department and by Tony Marrazo, Boise. Dunclick, Inc., Lewiston, reported output of sand and gravel.

OWYHEE

South Mountain District.—All metal produced in Owyhee County came from the Golconda zinc mine, which was operated continuously in 1952 by the South Mountain Mining Co.

PAYETTE

The Jensen Brick Co. made common brick from clay mined locally and used coal as fuel for the kiln.

POWER

A small production of road gravel was reported.

SHOSHONE

The Coeur d'Alene region of Shoshone County remained the largest silver-producing area in the United States and the second largest lead and zinc producing area; it produced over 90 percent of the silver, lead, and zinc and 58 percent of the copper recovered from Idaho mines in 1952. There were no interruptions of mining operations during 1952 because of labor disputes; however, the decline in lead and zinc prices during the last half of 1952, a shortage of miners,

particularly in the summer months, and a curtailment of hydroelectric power consumption throughout the Pacific Northwest in the latter part of the year were factors adversely affecting mine development and production activity.

During 1952 the Bunker Hill lead smelter and cadmium plant recovered from ores, concentrates, and slag processed in the slag-fuming plant a total of 59,229 tons of lead, 13,642 tons of zinc, 642 tons of antimony in antimonial lead, 1,491 tons of copper, 117,688 pounds of cadmium, 12,626,290 ounces of silver, and 4,738 ounces of gold. Production of high-grade slab zinc and cadmium at the Sullivan electrolytic zinc plant comprised 54,340 tons and 274 tons, respectively. In addition, the plant recovered 8,477 tons of zinc, 3,883 tons of lead, 168 tons of copper, 610,393 ounces of silver, and 3,679 ounces of gold in residues, dross, and other byproducts.

The following excerpts from the Bunker Hill & Sullivan Mining & Concentrating Co. annual stockholders' report for 1952 describe the year's operations at the Bunker Hill lead smelter and refinery and the Sullivan Mining Co. electrolytic zinc plant.

The entire Bunker Hill Smelter plant operated satisfactorily throughout the year without interruption. Production of lead was somewhat increased over the previous year, but yet considerably below the record year of 1950. Production again was affected by reduced manpower in the mines in the District—especially during the summer months. Because the smelter at Trail was unable, at the time, to process as much custom material as formerly, we were able to contract for a substantial tonnage of Canadian lead concentrates toward the end of the year. This additional tonnage should, in the present year, more than offset the usual reduction because of the manpower situation.

Smelter improvements again progressed quite satisfactorily during the year, although hampered somewhat by lack of skilled craftsmen. Continuous lead softening in the second year showed improved results over the initial year. Completion of the installations of Vacuum Dezincing in the Lead Refinery and the 50,000-c. f. m. Wheelabrator Baghouse, for a portion of the D&L gases, has been delayed but both units should be in operation prior to the middle of the year. The Zeolite Water Softening Unit, to condition well water for boiler use, is being used with satisfactory results, when required.

Of the three units in the program for improved D&L charge preparation—the first—the new Crushing and Fine Grinding plant, was completed during the year and put into operation early in June. Fine grinding is being satisfactorily accomplished, as anticipated. Construction of the second unit—Charge Preparation and Bedding Plant—has progressed to a point where, presently, equipment is being installed. The Contractor's schedule calls for completion about June 1st, when this unit will be placed in operation. Construction of the third, and smaller of the three units—Pelletizing Plant—will get under way as soon as weather conditions permit. Completion is anticipated in October.

* * * * * * *

Mr. W. G. Woolf, Superintendent of the Sullivan Electrolytic Zinc Reduction Plant, reports that operations of the plant were at full capacity until September 8, 1952, when it was forced to reduce output due to curtailment of electric power ordered by the Defense Electric Power Administration, which condition continued throughout the remainder of the year. Full power supply was again made available in January, 1953. The plant's entire capacity, 620 cells, was in operation 94.64% of the year 1952.

Notwithstanding power shortages, the Zinc Plant production almost exactly equaled that of the year 1951.

* * * * * * *

Construction of the 250-ton per day sulphuric acid plant was commenced, together with accompanying other plant modifications and improvements. In order to efficiently produce sulphuric acid at lower capital and operating costs from the sulphur available in exhaust gases of the roaster operation, four suspension-type roasters are being installed to replace the present eight wedge-type roasters. To properly blend and dry the concentrates received from various

sources, concentrate storage bins are being built and a concentrate dryer will be installed. This will permit of suspension-type roasting and subsequent efficient zinc plant processing of the resulting roasted product. A pretreatment plant, to remove objectionable impurities from certain type concentrates containing lime and magnesia, is also being built. Placement of necessary concrete is well advanced, major equipment is on order and completion of these projects is scheduled for January 1954.

Schmittroth & Etherton, operating under lease from the Big It Mining & Milling Co., shipped tungsten concentrates from the Big It mine, on Trapper Creek near Pinehurst.

The Bunker Hill & Sullivan Mining & Concentrating Co. produced sand and gravel for building, road paving, railroad ballast, and other uses valued at $65,994. A sand-washing plant was operated.

TABLE 14.—Mine production of gold, silver, copper, lead and zinc in the Coeur d'Alene region, Shoshone County, 1948–52, and total, 1884–1952, in terms of recoverable metals

Year	Mines producing		Material sold or treated (short tons)	Gold, lode and placer (fine ounces)	Silver, lode and placer (fine ounces)
	Lode	Placer			
1948	65	7	3,165,780	3,362	10,598,338
1949	61	1	2,282,614	2,438	9,146,146
1950	57	2	2,542,169	3,416	15,056,131
1951	67	-------	2,393,939	2,684	13,639,808
1952	58	2	2,327,536	2,476	13,752,081
1884–1952	-------	-------	[1]	410,250	503,714,834

Year	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
1948	2,775,000	165,174,000	167,601,000	$62,168,955
1949	2,341,000	148,304,000	148,739,200	50,699,924
1950	3,791,000	189,394,000	172,205,000	64,555,947
1951	3,748,000	141,140,000	149,978,000	65,058,887
1952	3,724,000	134,660,000	140,632,000	58,459,368
1884–1952	[2] 74,867	[2] 5,994,463	[2] 1,665,696	1,473,095,395

[1] Figure not available.
[2] Short tons.

Beaver District.—Day Mines, Inc., reported that operations at the Monitor group and the Carlisle 300-ton flotation plant were terminated on November 30 owing to low metal prices. Another sizable lead-zinc mine, the Sunset property, was operated continuously in 1952. The Sunset mine, owned by the Anaconda Copper Mining Co., is leased by a partnership called the Sunset Lease, in which Day Mines, Inc., has a 70-percent interest. Sunset Lease did not operate the mine during 1952 but subleased portions to Zanetti Bros. and Korsage-Smith. Ore mined by the sublessees was concentrated at the Rex and Golconda custom mills near Wallace. The Blue Grouse mine was operated intermittently by Roy Smith, lessee.

Eagle District.—The Eagle lead mine was operated during part of 1952 by Slosson & Bush, lessees.

Evolution District.—The Sunshine Mining Co. 1,350-ton flotation mill treated 114,467 tons of silver ore from the Sunshine mine and produced 8,085 tons of lead-silver concentrates containing 3,993,044 ounces of silver, 1,151,220 pounds of copper, and 2,859,354 pounds of lead. Ore was processed also from the properties of Polaris Mining

Co.; Silver Syndicate, Inc.; Silver Dollar Mining Co.; Sunshine Consolidated, Inc.; and Big Creek Apex Mining Co. During the year, the mill treated 222,577 tons of ore, which yielded 17,142 tons of concentrates containing 8,197,085 ounces of silver, 2,192,205 pounds of copper, and 6,720,414 pounds of lead. The mill was operated 6 days a week, 2 shifts a day.

The Sunshine Mining Co. continued to operate the lower workings of the Polaris mine under an operating agreement with the Polaris Mining Co. (the upper levels of the mine are closed). Active operation of the Silver Summit mine was taken over by the Polaris Mining Co. after the Silver Summit Mining Co. was merged with the Polaris firm effective September 30. The Sunshine Mining Co. also operated the St. Germaine-Purim mine, the Silver Syndicate property, the Rockford group, and the Big Creek Apex mine. Development reported by the Sunshine Mining Co. included 157 feet of shaft work, 2,548 feet of drifting, 1,960 feet of raising, 2,461 feet of crosscutting, and 2,517 feet of diamond drilling.

Zanetti Bros. processed 9,183 tons of old zinc-lead tailings from the Big Creek tailings deposit in the tailings mill at Osburn. The mill treated similar material from the DeBlock tailing deposit, at the mouth of Lake Gulch, and from the Osburn deposit.

Development at the Mineral Point mine by Coeur d'Alene Mines Corp. included 203 feet of drifting at the 2,400 level to explore a vein carrying small amounts of radioactive material for the Atomic Energy Commission.

Hunter District.—The Star mine at Burke continued as the largest zinc producer and third largest lead producer in Idaho. Output was at a somewhat reduced rate, primarily due to a labor shortage, according to the Sullivan Mining Co. The 234,819 tons of ore produced in 1952 assayed 7.25 percent zinc, 2.90 percent lead, and 0.86 ounce of silver to the ton. The company 1,000-ton mill produced 7,545 tons of lead concentrates and 31,311 tons of zinc concentrates. Federal Mining & Smelting Co. operated the Morning mine throughout 1952, producing 82,908 tons of ore (88,817 tons in 1951), which assayed 8.08 percent zinc, 5.85 percent lead, and 2.04 ounces of silver per ton. An offset shaft was deepened 200 feet to open the 5,200 level. The Morning orebody has been found to be shorter at each lower level; and, according to the 1952 report to shareholders, it is expected that at the 5,200 level it will be approximately 325 feet long. The Morning 1,200-ton flotation mill produced 11,393 tons of zinc concentrates and 6,062 tons of lead concentrates in 1952.

Another important producer in Hunter district, the Lucky Friday mine, was operated by Lucky Friday Silver-Lead Mines Co. and yielded 23,290 tons of zinc-lead ore.

The Golconda 200-ton mill treated 40,000 tons of custom ore in addition to Golconda-mine production of 9,778 tons. A failure of one of the ball-mill trunnions and heads caused a 2-month's shutdown. During this time Golconda Lead Mines installed new lead and zinc flotation cells ordered in 1951. Other active operations in Hunter district included the Ed Small tailings lease, operated by Zanetti Bros., and Day Mines, Gold Hunter property.

Lelande District.—Federal Mining & Smelting Co. reported that production from the Frisco group (Black Bear and Gem veins) was nearly identical to the output in 1951. A total of 51,845 tons of ore was mined and shipped to the Morning mill for treatment; the ore

contained 6,569,600 pounds of zinc, 3,921,200 pounds of lead, and 64,104 ounces of silver. Ore production from the Hull lease and the Carlson & Erickson lease in the upper workings of the Frisco mine totaled 26,214 and 858 tons, respectively.

Day Mines, Inc., increased lead-ore production from the Hercules mine. The ore was treated at the company 300-ton flotation plant at the Sherman mine. About 40 percent of the ore came from stoping and the rest from development. Extraction at the Sherman mine was confined to small, high-grade blocks in the upper part of the mine. Other metal-producing properties in Lelande district included the Hercules dump and millsite, Canyon Creek tailings, Black Bear, Benton, Mace, and Tiger-Poorman mines.

Placer Center District.—Day Mines, Inc., operations in the Tamarack lead-zinc mine supplied the largest metal output in Placer Center district. The principal development at the Tamarack mine in 1952 was deepening the Watson (offset) shaft to the 3,300 level. Mine operations at the No. 5 level in the Tamarack mine were conducted throughout 1952 by Corbin Neville and Stanley Clem, lessees. The Tamarack mill processed the ore produced from the Tamarack mine and a small tonnage from the Hercules mine dump. Day Mines, Inc., also operated the Dayrock mine and flotation mill at Bunn throughout 1952. The Dora vein, discovered in 1950, was developed farther on the 300 and 400 levels. The average ore grade from the Ohio vein, which supplied the bulk of the ore produced in 1952 at the Dayrock property, was improved over 1951. Nearly 15,000 dry tons of sand fill, reclaimed from mill tailings, was placed in Dayrock stopes. Wylie Gardner operated the Success group the entire year; the ore was concentrated at the Rex custom mill operated by Zanetti Bros. About 12,700 tons of lead ore from the Galena mine, which was developed by American Smelting & Refining Co., was treated in the Zanetti Bros. custom mill adjacent to the mine.

Summit District.—About 500 tons of zinc-lead ore from the Orofino mine was shipped to the Golconda mill.

Yreka District.—The Bunker Hill mine of Bunker Hill & Sullivan Mining & Concentrating Co. continued to be the largest producer of lead and second largest producer of zinc in Idaho. Ore from the Bunker Hill mine treated at the Bunker Hill 3,000-ton concentrator in 1952 yielded concentrates containing 23,044 tons of lead, 11,118 tons of zinc, and 1,770,580 ounces of silver, according to the 1952 report to shareholders. Concentrates produced from old tailings in the tailings treatment plant contained 1,861 tons of lead, 560 tons of zinc, and 94,415 ounces of silver. Mine development comprised raising, 2,526 feet; drifting, 2,083 feet; and diamond drilling, 6,435 feet. John George continued leasing operations in the upper levels of the Bunker Hill mine.

The Page mine of the Federal Mining & Smelting Co. ranked second in lead production and third in zinc output in Idaho in 1952. A total of 139,973 tons of ore was treated in the company 500-ton flotation mill, a substantial increase over 1951. The company reported that development during the summer months was hampered by a shortage of experienced miners. About 5,787 cubic feet of station work was completed, plus 1,795 feet of drifts and 178 feet of crosscuts. An ore-grinding unit was added to the mill.

Highland-Surprise Consolidated Mining Co. operated its property on Stewart Creek throughout 1952. The Highland-Surprise 300-ton

mill processed 25,503 tons of ore from company operations and produced 985 tons of lead concentrates and 2,146 tons of zinc concentrates with a total metal content of 1,267,637 pounds of lead, 2,419,008 pounds of zinc, 23,817 ounces of silver, and 73 ounces of gold. A total of 376 tons of ore was shipped crude to a smelter. The Surprise shaft was sunk 450 feet, drifts were driven 2,000 feet, and exploratory diamond drilling totaled 3,540 feet. Three hundred and seventy-seven tons of ore from the Nevada Stewart mine was treated at the Highland-Surprise mill. The Sidney Mining Co. operated the Sidney group and 300-ton flotation mill continuously, milling 67,844 tons of ore and producing 2,190 tons of lead concentrates and 9,530 tons of zinc concentrates which together had a gross metal content of 10,416,236 pounds of zinc, 3,061,316 pounds of lead, and 56,029 ounces of silver. Development consisted of shafts, 150 feet; drifts, 527 feet; and diamond drilling, 606 feet. The Spokane-Idaho Mining Co. reported that the decline in market prices caused a cut in production at the Constitution mine from 5,210 tons in January to 3,015 in December; total ore production during 1952 was 48,806 tons compared to 62,280 tons in 1951. The company also operated the Douglas mine. The Liberal King mine, operated by Sunset Minerals, Inc.; the Little Pittsburgh mine, worked by Mascot Mines, Inc.; and the Nabob mine, of Nabob Silver-Lead Mines, were other substantial sources of lead and zinc in Yreka district.

TWIN FALLS

Sand and gravel for road paving and building were produced by the Sumner Sand & Gravel Co., Inc., Twin Falls. The county reported output of road gravel from several pits.

VALLEY

Dredging operations by Baumhoff-Marshall, Inc., Idaho-Canadian Dredging Co., and Warren Dredging Co. were continued near Cascade. Valuable constituents of the alluvial material being mined are monazite, ilmenite, zircon, and garnet.

Yellow Pine District.—Mining operations at the Yellow Pine open-pit mine at Stibnite were suspended in June because of the depressed market for antimony. Work was halted at the 2,200-ton flotation mill on July 31, and the Yellow Pine antimony smelter was closed about August 15. In 1952 the mill processed 310,201 tons of ore and 3,622 tons of waste materials from metallurgical operations; the concentrates produced contained values in gold, silver, antimony, and tungsten. At the end of 1952, although no plans to resume production at the mine had been announced by the Bradley Mining Co., exploration work continued with DMEA assistance. Mercury was produced at the Hermes mine during 1952. The mine, owned by the United Mercury Mines Co., produced over twice the reported 1951 total of 357 flasks.

WASHINGTON

The Northwest Gypsum Co. mined 400 tons of gypsum valued at $1,200. Deposits in the county were described in a publication.[16]

Heath District.—Some lead ore was shipped from the Lead Zone mine.

[16] McDivitt, James F., A Report on Gypsum Deposits in Washington County, Idaho: Idaho Bureau of Mines and Geology, Pamph. 93, February 1952.

The Mineral Industry of Illinois

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Illinois State Geological Survey.

By Richard H. Mote[1] and Alvin Kaufman[2]

THE TOTAL VALUE of mineral production from the mines and quarries of Illinois in 1952 decreased 6 percent as compared with 1951. This decline resulted from a 9-percent drop in fuel production and a 16-percent slump in metal output. Of the many mineral commodities produced in 1952, coal, petroleum, limestone, cement, and sand and gravel were major products. In addition, Illinois was the principal fluorspar-producing area in the United States.

On the basis of both quantity and value, fuels were the major commodity group produced. The fuels comprises more than 78 percent of the aggregate value of 1952 mineral output; coal and petroleum contributed the largest share. Metals, production of which was concentrated in Hardin and Jo Daviess Counties, comprised nearly 2 percent of the total value of all mineral products. Nonmetals other than fuels, which contributed approximately 20 percent of the total mineral value in 1952, were the only group to show an increase as compared with the previous year. The largest increment was in the limestone industry.

The major producing counties in Illinois in 1952, arranged by decreasing value, were Franklin, Williamson, La Salle, and Fulton. Except for La Salle County, all these demonstrated the importance of solid fuels to the economy of the State. In each of these counties the production of coal and oil provided the large dollar income that enabled it to exceed its neighbors. La Salle County owes its predominant position to concentration of the Illinois cement industry within its borders and to its 6-million-dollar annual output of sand and gravel.

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TABLE 1.—Mineral production in Illinois, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement—376-pound barrels	8,377,387	$19,853,132	8,710,621	$20,600,347
Clays (including fuller's earth)[2]	2,399,787	3,836,617	2,156,071	3,690,099
Coal	54,199,875	220,547,562	45,789,982	187,827,712
Fluorspar	204,328	9,294,703	188,293	9,481,223
Lead (recoverable content of ores, etc.)	3,160	1,093,360	4,262	1,372,364
Lime (open-market)	462,690	5,878,289	460,775	5,917,038
Natural gas—thousand cubic feet	11,425,000	1,748,000	10,183,000	1,650,000
Natural-gas liquids: LP-gases—42 gallon barrels	2,071,000	4,727,000	(3)	(3)
Petroleum (crude)—do	60,243,000	166,870,000	[4] 60,089,000	[4] 165,850,000
Sand and gravel	20,130,567	19,146,502	19,584,308	19,214,195
Sand and sandstone (ground)	262,488	2,300,102	267,180	2,342,549
Silver (recoverable content of ores, etc.—troy ounces	3,465	3,136	3,781	3,422
Stone (except limestone for cement and lime	19,298,968	23,474,516	22,334,887	28,326,060
Zinc (recoverable content of ores, etc.)	21,776	7,926,464	18,816	6,246,912
Undistributed: Natural gasoline, peat, tripoli, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	----------	[5] 3,235,087	----------	7,483,497
Total Illinois	----------	489,934,000	----------	460,005,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production.
[2] Except clays sold or used for cement.
[3] Value included with "Undistributed."
[4] Final figure. Supersedes preliminary figure given in commodity chapter.
[5] Revised figure.

REVIEW BY MINERAL COMMODITIES

METALS

Zinc, lead, and silver continued to be the only metals recovered from mines in Illinois. The State's mine output of lead in 1952 was the greatest in its history and surpassed by a substantial margin, the production of any previous year on record. The 1952 output was over 35 percent greater than the 1951 figure and 10 percent larger than the previous record high of 3,865 tons in 1946. Coincident with the gain in lead production was a rise in silver yield; mines in the State turned out a total of 3,781 fine ounces during the year. Zinc production fell, however, as a result of labor strikes at mines in southern Illinois in June and July, a general decline in the grade of ore mined, and a drop in market price. Metal output was also adversely affected by the Nation-wide steel strike in midsummer which temporarily reduced demand for fluorspar and forced curtailment of mining at southern Illinois fluorspar properties from which byproduct or coproduct lead, zinc, and silver are recovered.

In addition to the mineral values credited in table 1, some are omitted owing to lack of information.

Many metallic ores contain valuable minor constituents, such as arsenic, antimony, cadmium, and other metals. These quantities sometimes are not known and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages or credited to mine or origin. These minor constituents are recovered at smelting plants (which frequently treat mixtures of materials from many sources, including residues from the refining of such metals as copper, lead, and zinc) and in other ways. It is not possible in many

such instances to distribute the mineral products by States of origin, and occasionally it is even difficult to obtain accurate separation as to domestic and foreign sources. Another valuable mineral product, the production of which usually cannot be separated as to sources, is byproduct sulfuric acid.

In all, 21 metal mines were active in Illinois in 1952. The principal source of zinc was Jo Daviess County, where mines also yielded a small accessory production of lead. Lead, zinc, and silver were produced in Hardin County as byproducts or coproducts of fluorspar mining. The State's leading producer of zinc and second largest producer of lead in 1952 was Tri-State Zinc, Inc., Galena, Jo Daviess County. Ozark-Mahoning Co., which operated several fluorspar mines and a custom flotation mill at Rosiclare, Hardin County, was the major producer of lead and silver.

NONMETALS

Cement.—Portland-cement plants active in 1952, in order of decreasing production, were Marquette Cement Manufacturing Co. and Lehigh Portland Cement Co., Oglesby; Alpha Portland Cement Co., La Salle; and Medusa Portland Cement Co., Dixon. Output increased less than 1 percent, but shipments rose 4 percent. The differential between output and apparent consumption, as measured by shipments, resulted in a 24-percent decline in stocks at the mills at the end of the year.

Clays.—The quantity of clay sold and used in Illinois in 1952 decreased approximately 10 percent compared with 1951. Fire and miscellaneous clays output declined 8 and 10 percent, respectively. The latter, which was produced in 27 counties, was used for common brick and other heavy clay products. Cook, St. Clair, La Salle, and Vermilion Counties were the major producing areas. Of the 34 miscellaneous clay pits, major producers were Illinois Brick Co., Brisch Brick Co., and Carey Brick Co., all of Cook County; and Western Brick Co., Vermilion County.

Fire clay was produced in La Salle, Greene, Grundy, Marshall, McDonough, Madison, Jackson, and Rock Island Counties. Major uses for this material were heavy clay products, fire-brick manufacture, pottery, and stoneware. Of the 14 fire-clay pits operating in 1952, Conco-Meier Co., Laclede-Christy Co., both of La Salle County; Illinois Clay Products Co., Grundy County; and Hydraulic Press Brick Co., Marshall County, were the largest producers.

TABLE 2.—Finished portland cement produced, shipped, and in stock, 1943–47 (average) and 1948–52

Year	Active plants	Production (barrels)	Shipments from mills			Stocks at mills on Dec. 31 (barrels)
			Barrels	Total value	Average value	
1943–47 (average)	4	5,140,253	5,149,481	$8,787,762	$1.68	[1] 654,311
1948	4	7,570,536	7,573,404	15,200,723	2.01	[1] 478,666
1949	4	8,127,656	7,976,972	16,645,730	2.09	[1] 629,380
1950	4	7,924,079	7,857,969	16,920,234	2.15	695,490
1951	4	8,483,783	8,377,387	19,853,132	2.37	801,886
1952	4	8,514,443	8,710,621	20,600,347	2.36	605,708

[1] Revised figure.

TABLE 3.—Clays (except clay for cement) sold or used by producers in 1952, by counties

County	Short tons	Value	County	Short tons	Value
Bond	39,885	$36,664	Madison	51,387	$99,274
Boone	2,000	2,000	Marshall	33,000	77,028
Cook	685,833	685,833	Menard	10,000	10,000
Edwards	30,700	21,500	Mercer	34,324	34,324
Fayette	6,979	6,979	Rock Island	5,715	17,145
Greene	51,929	128,671	St. Clair	188,271	206,839
Grundy	194,090	903,734	Saline	69,362	208,086
Jackson	6,094	15,235	Sangamon	46,543	64,835
Knox	48,563	48,563	Scott	13,142	47,000
Lake	60,762	60,762	Tazewell	22,000	22,000
La Salle	264,843	394,649	Vermilion	131,370	412,017
Livingston	16,020	16,020	Alexander, Brown and Kankakee	110,037	108,557
McDonough	32,922	62,084			
Macoupin	300	300	Total	2,156,071	3,690,099

TABLE 4.—Clays sold or used by producers, 1943–47 (average) and 1948–52, by kinds

Year	Fuller's earth		Fire clay		Miscellaneous	
	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	39,263	$370,209	291,022	$647,658	1,312,669	$995,362
1948	37,942	410,678	399,206	1,188,378	2,087,426	1,859,147
1949	9,104	118,647	355,963	1,083,765	1,826,851	1,669,650
1950			433,423	1,431,372	2,086,008	1,966,336
1951			492,127	1,774,870	2,097,013	2,249,324
1952			450,444	1,544,668	1,886,299	2,324,583

Fluorspar.—Despite an approximate 8-percent decline in fluorspar output in 1952, Illinois remained the largest producer of this commodity in the United States. Production was from steeply dipping veins in eastern Pope and western Hardin Counties in the vicinity of Rosiclare, as well as from bedding-replacement ore bodies in east central Hardin County, north of Cave in Rock.

Mining activity was curtailed in midsummer by the nationwide steel strike, which temporarily reduced demand for fluorspar in metallurgical uses.

Fluorspar produced in 1952 was used as a flux in steelmaking (39 percent), as a chemical raw material for the manufacture of hydrofluoric acid (42 percent), in the production of glass and enamel (13 percent), and various miscellaneous uses (6 percent).

The value depended upon use. Average value for acid spar was $61.59 in 1952, ceramic fluorspar was valued at $48.74, and metallurgical material was sold for $38.47. The average value for all grades in Illinois in 1952 was $50.35 as compared with $45.49 the previous year, thus continuing the steadily rising price trend that began in 1943.

Of an estimated 57 active mines operated by approximately 46 companies in 1952, major producers were Ozark-Mahoning Co., Aluminum Co. of America, Minerva Oil Co., and Rosiclare Lead & Fluorspar Mining Co.

Field teams of the Defense Minerals Exploration Administration, made up of Bureau of Mines engineers and geologists of the Federal Geological Survey, examined a number of Illinois mining properties for eligibility under the Federal Government program of assisting

exploration of unknown or undeveloped sources of strategic and critical minerals and metals. As a result of this activity, 2 exploration contracts totaling $110,565 were approved for fluorspar properties.

TABLE 5.—Fluorspar shipped from mines, 1943–47 (average) and 1948–52

Year	Quantity (short tons)	Value	
		Total	Average per ton
1943–47 (average)	168,796	$5,780,977	$34.37
1948	172,561	6,322,246	36.64
1949	120,881	4,621,733	38.23
1950	154,623	6,110,765	39.52
1951	204,328	9,294,703	45.49
1952	188,293	9,481,223	50.35

Iron-Oxide Pigments.—In 1952 the manufacture of iron oxide pigments in Illinois increased 24 percent over the previous year. Output of this commodity was from Kane, St. Clair, and Sangamon Counties. The major pigment materials produced were various red oxides, yellow oxides, and mineral blacks. The major producer in 1952 was C. K. Williams & Co., St. Clair County. Other producers included Tamms Industries, Inc., and Solomon Grinding Service, both of Sangamon County, and George B. Smith Chemical Works, Inc., Kane County.

Lime.—Lime output in 1952 in Illinois was essentially the same as in the previous year. This commodity, which was utilized for building (5 percent) and dead-burned dolomite and chemical purposes (95 percent), was produced in Cook, Adams, and St. Clair Counties. Producers were Marblehead Lime Co., Adams and Cook Counties; Standard Lime & Stone Co., La Grange, Cook County; Aluminum Co. of America, St. Clair County; Menke Stone & Lime Co., Quincy, Adams County.

Perlite.—Considerable quantities of crude perlite were imported from southwestern United States for use in manufacturing expanded perlite in Illinois in 1952. Producers of expanded material were Ryolex Corp. of Illinois, Champaign County; American Bildrok Co., Cook County; Lake Zurich Concrete Products, Inc., Lake County; F. E. Schundler & Co., Inc., Will County; and Silbrico Corp., Cook County. Expanded perlite was used as a lightweight aggregate in plaster and concrete and as a filter aid.

Production increased from 11,978 short tons in 1951 to 15,545 short tons in 1952, a 30-percent gain. The quantity of expanded perlite sold or used in 1952 was 14,562 short tons valued at $776,728 compared with 11,967 short tons valued at $692,073 in 1951.

Sand and Gravel.—Illinois sand and gravel output in 1952 declined 3 percent compared with 1951. Sand comprised 63 percent of the total value of production and gravel the remainder. The largest use for these commodities was as building sand and gravel, with paving material ranking second. Major producing counties were La Salle, Will, and Peoria. An estimated 156 pits were active in 1952. The largest operators were, in order of decreasing tonnage, Material Serv-

TABLE 6.—Sand and gravel sold or used by producers, 1951–52, by classes of operations and uses

	1951		1952	
	Short tons	Value	Short tons	Value
COMMERCIAL OPERATIONS				
Sand: Glass	(1)	(1)	1,097,684	$2,428,304
Molding	1,315,753	$2,698,109	1,366,684	2,912,595
Building	4,536,449	3,355,565	4,389,300	3,261,431
Paving	2,229,892	1,682,674	2,312,853	1,741,341
Grinding and polishing	140,224	486,724	130,745	474,452
Fire or furnace	(1)	(1)	35,158	122,604
Engine	119,536	116,099	112,421	109,359
Filter	9,803	28,934	9,058	30,288
Railroad ballast	130,318	81,525	63,363	46,730
Other	385,353	638,134	376,865	870,313
Undistributed	1,201,727	2,680,500		
Total commercial sand	10,069,055	11,768,264	9,894,131	11,997,417
Gravel:				
Building	4,722,169	3,930,203	4,799,964	3,947,694
Paving	3,791,025	2,621,023	3,292,323	2,366,448
Railroad ballast	1,014,124	546,136	916,141	514,509
Other	31,060	15,637	197,999	103,955
Total commercial gravel	9,558,378	7,112,999	9,206,427	6,932,606
Total commercial sand and gravel	19,627,433	18,881,263	19,100,558	18,930,023
GOVERNMENT-AND-CONTRACTOR OPERATIONS				
Sand:				
Building	13,471	4,041		
Paving	10,560	8,486	28,690	27,221
Total Government-and-contractor sand	24,031	12,527	28,690	27,221
Gravel:				
Building	90,393	38,775	10,730	1,533
Paving	388,710	213,937	444,330	255,418
Total Government-and-contractor gravel	479,103	252,712	455,060	256,951
Total Government-and-contractor sand and gravel	503,134	265,239	483,750	284,172
ALL OPERATIONS				
Sand	10,093,086	11,780,791	9,922,821	12,024,638
Gravel	10,037,481	7,365,711	9,661,487	7,189,557
Grand total	20,130,567	19,146,502	19,584,308	19,214,195

[1] Included with "Undistributed."

TABLE 7.—Sand and gravel sold or used by producers in 1952, by counties

County	Short tons	Value	County	Short tons	Value
Bond	15,397	$16,470	Peoria	1,771,756	$1,239,445
Bureau	475,017	635,985	Rock Island	347,724	323,608
Carroll	46,321	77,251	Sangamon	393,575	296,636
Cook	660,814	499,516	Tazewell	666,545	481,970
Kane	789,946	537,507	Wabash	206,250	172,546
Lake	185,287	99,756	Whiteside	111,716	77,441
La Salle	3,043,218	6,576,975	Will	2,900,092	2,428,563
Lawrence	274,914	147,811	Winnebago	1,164,945	885,930
McHenry	1,404,718	791,923	Woodford	129,249	97,378
McLean	359,670	247,381	Undistributed [1]	3,694,263	2,885,007
Madison	256,441	216,904			
Ogle	686,450	478,192	Total	19,584,308	19,214,195

[1] Includes Adams, Alexander, Boone, Calhoun, Champaign, Clinton, Coles, Crawford, Cumberland, De Kalb, De Witt, Du Page, Fayette, Fulton, Grundy, Henderson, Henry, Jersey, Kankakee, Kendall, Knox, Lee, Livingston, Logan, Macon, Marshall, Mason, Massac, Montgomery, Pike, Pope, Randolph, St. Clair, Scott, Stephenson, Vermilion, and White Counties to avoid disclosure of individual company operations.

ice Corp., Chicago; Ottawa Silica Co., Ottawa; and McGrath Sand & Gravel Co., Inc., Lincoln.

Stone.—The Illinois stone industry in 1952 increased total production approximately 15 percent compared with the preceding year. This resulted predominantly from a 37-percent rise in the use of limestone for concrete aggregate and road construction.

The State's small output of dimension stone declined sharply in 1952 compared with 1951; however, the value of rough and dressed construction stone exceeded that of the preceding year as a result of the very high unit value of dressed stone.

Excepting for a very small output of crushed sandstone for refractory use by Western Fire Brick Co., Granite City, Alexander County, limestone was the only rock produced in Illinois.

Seventy percent of the crushed- and broken-limestone output was utilized for concrete and road material. Agricultural stone ranked second in importance. The Chicago district, comprising Cook, Will, and Kankakee Counties, was the largest stone-producing area in the State (47 percent); this was the result of proximity to a large market ather than to the type of rock found in the area.

Major stone producers in Illinois in 1952 were, in order of decreasing production, Material Service Corp., Consumer Co. of Illinois, Columbia Quarry Co., Lehigh Stone Co., and Dolese & Shepard Co.

Illinois also had a substantial production of silica (ground sand and sandstone); output in 1952 advanced 2 percent over 1951. Production was from properties in La Salle and Ogle Counties. The former was by far the larger producer.

TABLE 8.—Stone sold or used by producers, 1951–52, by uses

Use	1951		1952	
	Quantity	Value	Quantity	Value
Dimension stone: Building stone:				
Rough construction, short tons	9,357	$9,443	(1)	(1)
Finished cut and sawed, cubic feet			(1)	(1)
Rubble, short tons	7,303	26,431	719	$3,812
Flagging, cubic feet	19,360		6,659	
Approximate equivalent in short tons	1,646	14,541	566	4,656
Undistributed			580	10,492
Total dimension stone, approximate short tons	18,306	50,415	1,865	18,960
Crushed and broken stone:				
Riprap, short tons	394,173	490,174	324,124	413,333
Fluxing stone, do	1,105,728	1,456,409	862,992	1,193,933
Concrete and road metal, do	11,463,190	13,084,901	15,702,331	18,929,697
Railroad ballast, do	1,194,639	1,174,315	1,172,642	1,214,646
Agriculture, do	3,536,027	4,479,613	3,258,578	4,208,143
Refractory stone (ganister), do	656	12,375	536	8,576
Miscellaneous, do	1,586,249	2,726,314	1,011,819	2,338,772
Total crushed and broken stone, do	19,280,662	23,424,101	22,333,022	28,307,100
Grand total, approximate short tons	19,298,968	23,474,516	22,334,887	28,326,060

[1] Included with "Undistributed" to avoid disclosure of individual company operations.

TABLE 9.—Stone sold or used by producers in 1952, by counties

County	Short tons	Value	County	Short tons	Value
Adams	295,735	$550,781	McDonough	175,979	$217,709
Clark	306,839	438,627	Ogle	179,092	195,025
Cook	7,616,646	9,461,805	Peoria	695,770	701,353
Greene	107,697	144,538	Rock Island	458,685	575,509
Hancock	245,696	264,917	St Clair	2,259,166	2,788,903
Hardin	293,572	362,322	Stephenson	151,672	117,201
Henderson	49,312	70,491	Whiteside	300,735	331,466
Jo Daviess	33,278	42,436	Will	1,249,950	1,713,938
Kankakee	1,647,018	1,722,898	Undistributed [1]	5,246,437	7,319,063
La Salle	236,208	265,336			
Lee	150,280	153,640	Total	22,334,887	28,326,060
Livingston	635,120	888,102			

[1] Includes Alexander, Boone, Brown, Calhoun, Clinton, Coles, De Kalb, Du Page, Effingham, Fulton, Jackson, Jersey, Johnson, Kane, Kendall, Logan, McHenry, Madison, Menard, Mercer, Monroe, Pike, Pulaski, Randolph, Schuyler, Scott, Stark, Union, Vermilion, Warren, Washington, and Winnebago Counties to avoid disclosure of individual company operations.

Miscellaneous Minerals.—In 1952 peat, tripoli, and magnesium compounds were also produced in Illinois. The output of peat was reported from Tazewell County. Tripoli, from nearly horizontal, unconsolidated beds of silica, was mined in northern Alexander County. The deposits are greatly altered and are comprised of alternate pure white beds up to about 6 feet in thickness and dark red or bluish gray material. Mining is by a modified room-and-pillar system, sometimes called a checkerboard or squarework pattern. Precipitated magnesium carbonate was produced in the Lake County plant of Johns-Manville Co.

MINERAL FUELS

Coal.—Illinois bituminous-coal deposits decrease in volatility from north to southeast, the highest volatile coal occurring in the northwest and the lowest in the Eagle Valley region of southern Gallatin County. Coal beds were mined in 36 counties in 1952 compared with 38 the previous year. Greene and Woodford Counties reported no production in 1952.

The major producing counties, in order of decreasing tonnage, were Williamson, Franklin, Fulton, Christian, and Perry.

In 1952 there was a 16-percent decline in output as compared with the previous year and a 10-percent decrease in the number of active mines.[3] This lowered output was comparable to the national situation, as shown by the fact that the State remained fourth largest producer of soft coal.

Illinois solid-fuel mines had one of the highest national productivity rates (11.72 tons/man/per day)[4] because of the important percentage of strip-mined coal and the high proportion of large mines. Approximately 17 percent of the State's active mines in 1952 produced 500,000 tons or more annually compared to a national average of 3.2 percent. Nearly 37 percent of the State soft-coal output is from strip pits.

During the year the average value of Illinois solid fuel increased from $4.05 to $4.10.

[3] Bureau of Mines, Bituminous Coal and Lignite in 1952: Mineral Market Summary 2222, 96 pp.
[4] Work cited in footnote 3.

Petroleum and Natural Gas.—Illinois remained in seventh place among petroleum-producing States despite a 154,000-barrel decrease in crude-oil output. The 1952 wellhead value was $2.76 per barrel compared with $2.77 the previous year. Average production per well per day remained 6 barrels, or approximately half of the United States average of 13 barrels. Crude-oil output is concentrated mostly in the southeastern part of the State. In addition to petroleum, the State natural-gas industry had a minor decline in production compared with the previous year.

In 1952 Illinois had a substantial production of natural-gas liquids. Six operators utilized both compression and absorption methods; the latter method yielded 2,788,000 barrels compared to 38,000 barrels by compression. Approximately 12 billion cubic feet of natural gas was treated for an average yield of 3 gallons per million cubic feet, excluding LP-gases.

REVIEW BY COUNTIES

ADAMS

Sand and gravel, stone, and lime were produced in Adams County in 1952. The most important of these commodities was limestone and dolomite quarried for use as riprap, flux, concrete aggregate, road material, and agricultural purposes. Major producers of this material were Black-White Limestone Co. and Menke Stone & Lime Co. both of Quincy, and Marblehead Lime Co. The latter two companies also produced lime for building and chemical purposes. Sand and gravel for use in building construction and for railroad ballast were produced by Chicago, Burlington & Quincy Railroad Co. and Quincy Sand Co., Quincy.

ALEXANDER

The mines and quarries of Alexander County yielded clays, sand and gravel, stone, and tripoli in 1952. Producers of tripoli were Ozark Minerals Co. and Tamms Industries, Inc. Sand and gravel were produced by H. H. Halliday Sand Co., Cairo. Products of the company included building, paving, and engine sand as well as building gravel. The county was the only area in the State that produced sandstone. This material was crushed and sold as a refractory for furnace or converter linings by Western Fire Brick Co., Granite City. A small quantity of kaolin was mined from the Ozark Minerals Co. pit at Fayville.

BOND

In 1952 the major mineral commodities produced in Bond County were sand and gravel. These materials were sold for building and paving uses by Greenville Gravel Co., Inc., Greenville, and Harris Sand & Gravel Co., and Linsey Eliza Hart, both of Keyesport. Shale for use in the manufacture of heavy clay products was mined by Richards Brick Co., New Douglas, and Sheffield Shale Products Co., Sheffield.

BOONE

Sand and gravel for paving and road material were the principal mineral commodities produced in Boone County in 1952. Largest producers were Christensen Smith Co., Capron, and Boone County Highway Department, Belvidere. Limestone for concrete, road material, and agricultural purposes was quarried at Belvidere Lime Quarry, Belvidere. The county's sole producer of clay was Munson Bros. & Co., Capron.

BROWN

Miscellaneous clays for the manufacture of heavy clay products was produced in Brown County in 1952 by Frederick Brick & Tile Co., Mount Sterling. Crushed limestone output was obtained from the quarry of the Western Illinois Stone Co.

BUREAU

A total of 712,631 short tons of soft coal having an average value of $4.25 per ton and 475,017 tons of sand and gravel worth $635,985, was reported from Bureau County in 1952. Seven sand and gravel pits were active during the year; operators included Western Sand Gravel Co., Spring Valley; Frank J. Poscharscky, Wyanet; Floyd Clapp, Walnut; Mertel Gravel Pit, Peru; Strunk Bros., Tiskilwa; and City of Princeton and Bureau County Highway Department, Princeton.

CALHOUN

There were only two mineral producers in Calhoun County in 1952. Ellis Inman and Stanley Sievers & Sons, both of Batchtown, produced building gravel and limestone for concrete aggregate and agricultural purposes, respectively.

CARROLL

Pits in Carroll County in 1952 yielded 46,321 tons of sand and gravel valued at $77,251. The two commercial producers were Howard Nelson, Lanark, and Nicol Sand Co., Savanna.

CHAMPAIGN

Expanded perlite and sand and gravel were the only mineral commodities produced in Champaign County in 1952. Gibson Bros., Champaign, and W. H. Troike, and C. R. Plakenhorn, Mahomet, produced building and paving sand and gravel. Sole producer of expanded perlite was Ryolex Corp. of Illinois, Champaign.

CHRISTIAN

Christian County in 1952 ranked fourth in Illinois as a source of bituminous coal. Output totaled 5,070,070 short tons worth $3.49 per ton. Mines in the county produced coal at an average rate of 13.24 tons per man per day during the year, despite the absence of strip mine production.

CLARK

Casey Stone Co., Casey, Ralph E. Montgomery, Marshall, and Quality Lime Co., Marshall, quarried 306,839 tons of limestone valued at $438,627 in 1952. This material was used for concrete aggregate, road metal, and agricultural purposes.

CLINTON

Mineral commodities produced in Clinton County in 1952 included coal, stone, and sand and gravel. Clinton County Highway Department, Carlyle, was sole producer of the latter. Limestone and dolomite for concrete, road metal, and agricultural purposes was quarried and crushed by Huelsman Quarry, Inc., Carlyle. Mines in the county yielded 260,590 tons of bituminous coal with an average value of $4.39 per ton.

COLES

Stone and sand and gravel were produced in Coles County in 1952. Olen Humphres Stone Quarry, Ashmore, and Langs Stone Quarry, Charleston, yielded limestone for riprap and agricultural purposes. Luther Martin Co. recovered sand and gravel for building purposes from its pit at Charleston.

COOK

In 1952 Cook County ranked first in Illinois in the production of stone and lime and second in the production of clays and expanded perlite. Limestone and dolomite were produced from seven stone quarries by Consumers Company of Illinois, Dolese & Shepard Co., both of Chicago, and Material Service Corp., Lyons. Output, which totaled 7,716,646 tons valued at $9,461,805, was sold for concrete aggregate, road material, and agricultural purposes. Standard Lime & Stone Co., La Grange, and Marblehead Lime Co., Chicago, produced substantial quantities of lime for building, chemical, and refractory purposes. In 1952 the 6 producers of common clay in Cook County reported an output of 685,833 tons valued at $1 per ton. Producers were Alexander Burkes Sons, Cicero; Brisch Brick Co., Stickney; Carey Brick Co., Chicago; Chicago Brick Co., Dolton; Illinois Brick Co., Chicago; and Tuthill Building Materials Co., Riverdale. In addition, there were four commercial sand and gravel pits active during the year. These produced 660,814 tons of sand and gravel valued at $499,516. Output was used as engine sand, railroad ballast, and building and paving sand and gravel. Producers were Chicago & Northwestern Railroad, Chicago Gravel Co., and South Beloit Sand Co., all of Chicago. Expanded perlite for use as building material was produced in Chicago by American Bildrok Co.

CRAWFORD

The only mineral commodities produced in Crawford County in 1952 were building and paving sand and gravel. Producers were Merom Illinois Co., Palestine, and William J. Wyke, Robinson.

CUMBERLAND

M. D. Coslet and George Spence, both of Greenup, reported production of building and paving sand and gravel in Cumberland County in 1952.

DE KALB

Four sand and gravel pits were active in De Kalb County in 1952. Principal producers were Kirkland Gravel Yard, Kirkland; Elmer Larson, Inc., Malta; and De Kalb County Highway Department, Sycamore. Commercial production was used for building and paving sand and gravel.

DE WITT

In 1952 Oscar Fortune, Kenney, and H. M. Rickgauer, Clinton, produced paving gravel in De Witt County.

DOUGLAS

Mines in Douglas County in 1952 yielded 179,529 short tons of soft coal. There was no other mineral production.

DU PAGE

Elmhurst-Chicago Stone Co., Elmhurst, was the sole producer of limestone in Du Page County in 1952. This organization and Henry Van Acker, Wayne, also produced sand and gravel for use as building and paving material.

EDGAR

In 1952 Edgar County mines produced 5,034 tons of soft coal valued at $6.23 per ton.

EDWARDS

Production of miscellaneous clays for use in the manufacture of common brick was reported from Edwards County in 1952 by Albion Brick Co., Albion.

EFFINGHAM

In 1952 M. G. Winter & Sons reported production of limestone for use as concrete aggregate, road material, and agricultural purposes. No other mineral production was reported from Effingham County during the year.

FAYETTE

In 1952 clays and sand and gravel were produced in Fayette County. The latter materials were produced by Mulberry Grove Sand Co., Mulberry Grove, and D. L. Burtschi, Vandalia. The bulk of production was sold as molding sand, the rest being utilized for building purposes. St. Elmo Brick & Tile Co., Inc., St. Elmo, reported production of clay for use in manufacturing heavy clay products.

FRANKLIN

Franklin County in 1952 ranked second in the production of bituminous coal in Illinois. Output, all from underground workings, totaled 5,279,097 tons, with an average value of $4.75 per ton. Mine employment was reported as 3,665 men underground with another 1,533 working outside. Average production per man per day was 7.14 tons.

FULTON

Fulton County in 1952 ranked third in the production of soft coal. Aggregate output (96 percent of which came from strip mines) was 5,093,307 tons valued at $3.75 per ton. The 384 men employed in the pits produced, on an average, 21.70 tons per day. Sand and gravel ranked second to coal and were produced by Duck Island Sand & Gravel Co., Canton, and Liverpool Materials Co., Liverpool, for building and paving use. Limestone for agricultural purposes was quarried at Chipman Limestone Quarry, Farmington.

GALLATIN

The only mineral commodity produced in Gallatin County in 1952 was bituminous coal. Production totaled 141,963 tons, with an average value of $3.73 per ton.

GREENE

Clay was produced in Greene County in 1952 by John V. Wyatt and Whitehall Sewer Pipe & Stoneware Co., both of White Hall. This fire clay was utilized for chemical and common stoneware as well as heavy clay products. Limestone and dolomite for use as concrete aggregate, road material, railroad ballast, and agricultural purposes was produced by Chester Castleberry, White Hall; Oran Orton, Hillview; and Martin Valstad, Carrollton.

GRUNDY

Mines and quarries in Grundy County in 1952 yielded clay, coal, sand and gravel. The county ranked first in Illinois in the value of clay production. Sole producer was Illinois Clay Products Co., Joliet. This fire clay was utilized for fire and ladle brick, as well as refractory cements. Paving sand was produced by Material Service Corp., Grundy. An output of 257,069 short tons of bituminous coal valued at $5.31 per ton was reported in 1952.

HANCOCK

Gray Quarries, Hamilton, W. F. Hanna, Nauvoo, and R. L. O'Neill & Sons, Carthage, quarried limestone in Hancock County in 1952. Output was used for riprap, concrete aggregate, road metal, and agricultural purposes. Mines in the county yielded 31,586 tons of bituminous coal with an average value of $5.89 per ton.

HARDIN

Hardin County continued in 1952 to be the principal source of fluorspar in the United States. The 20 active fluorspar operators made 99 percent of the State shipments in 1952. Lead, zinc, and silver were produced as byproducts or coproducts of fluorspar operations at 14 mines. The fluorspar ore also contains minor quantities of cadmium, which are recovered in smelting zinc concentrates. This ore is probably higher in cadmium content than ores from any other district in the United States. Principal producers of fluorspar in 1952 were Aluminum Co. of America, Rosiclare Lead & Fluorspar Mining Co., and Ozark-Mahoning Co., all at Rosiclare, and Minerva Oil Co., Cave in Rock.

The major producer of lead and silver in Illinois in 1952 was Ozark-Mahoning Co., which operated several fluorspar mines and its all-flotation custom mill at Rosiclare continuously throughout the year. Minerva Oil Co., the State's third largest zinc producer, operated its fluorspar-zinc mine and 275-ton-per-day mill at Cave in Rock without interruption, except during a labor strike June 1 to 21. In midyear the company purchased the mining properties and equipment of Crystal Fluorspar Co.; the Crystal and Jefferson mines were included in the sale.

J. L. Bean Stone Co., and P. R. Brown Stone Co., both of Golconda; Okerson Quarry Co., and Rigsby & Barnard, both of Cave in Rock; quarried 293,572 tons of limestone valued at $362,322 for riprap, concrete, road material, and agricultural purposes.

HENDERSON

Limestone was produced in Henderson County in 1952 by H. B. Graham Quarry Co., Gladstone, and Charles J. Moore, and Olson Bros., Dallas City. This rock was utilized for riprap, concrete aggregate, road material, and agricultural purposes. Sand and gravel production in the county, predominantly noncommercial, was from the Henderson County Highway Department pit at Stronghurst. Sole commercial producer was H. B. Graham Quarry Co. This material was sold for paving and road gravel.

HENRY

Collinson Bros., Moline, and Schadt Service Co., Silvis, produced sand and gravel in Henry County in 1952. In addition, 90,975 tons of coal was produced, with an average value of $4.52 per ton.

JACKSON

The mines and quarries of Jackson County in 1952 yielded clay, stone, and bituminous coal. Coal production totaled 1,233,770 tons and was the major mineral product in 1952. Illinois Quarry Co., Ava, was the sole producer of limestone. This rock was used for riprap, concrete aggregate, road material, and agricultural purposes. Jackson County Brick Co., Campbell Hill, produced fire clay for use in the manufacture of drain tile.

JEFFERSON

Mines in Jefferson County produced 1,253,500 tons of soft coal in 1952. Considering the fact that there was no strip-pit production, the 14.71 tons of coal produced, on an average, per man per day was an exceptionally high productivity figure. In all, 389 men were employed by the mines, 71 percent of them underground.

JERSEY

Substantial tonnages of limestone and sand and gravel were produced in Jersey County in 1952. The latter commodity was produced by Jersey County Highway Department, Jerseyville. Limestone, which was sold as riprap, concrete aggregate, and road material and for agricultural purposes was quarried by Jersey Quarry, Inc., Fieldon, and Phil's Limestone & Rock Quarry, Grafton.

JO DAVIESS

Lead and zinc were the principal mineral products of Jo Daviess County in 1952. Seven mines were active during the year. Tri-State Zinc, Inc., Galena, was the State's leading zinc producer and second largest producer of lead. The company operated its group of mines and 850-ton jig and flotation mill at a slightly higher rate than in 1951. Second in State zinc output in 1952 was Eagle-Picher Mining & Smelting Division, which worked throughout the year its Graham and Snyder mines and 75-ton-per-hour jig and flotation mill a few miles north of Galena. As a result of falling lead and zinc prices during the latter part of 1952, operations at the Graham and Snyder mines were reduced to one shift per day.

W. E. Broege Quarry, Warren, and Elmer G. Wienen Sons, Galena, were the only active commercial producers of limestone in 1952. The bulk of the rock output came from the noncommercial operation of Jo Daviess County Highway Department, Galena.

JOHNSON

Charles Stone Co., Cypress, and Southern Illinois Stone Co., Buncombe, were the only mineral producers in Johnson County in 1952. These firms produced limestone for concrete aggregate, road material, railroad ballast, and agricultural purposes.

KANE

Mines and quarries of Kane County yielded sand and gravel, stone, and iron oxide pigments in 1952. H. D. Conkey & Co., Mendota, Material Service Corp., South Elgin, and Fox Valley Gravel Co., Aurora, were commercial producers of building and paving sand and gravel. City of Aurora and Kane County Highway Department, Geneva, also produced this material. Fox River Stone Co., Elgin, was sole producer of limestone. Products included dimension stone sold as rough construction stone, irregular shaped material, rubble, and flagging, and crushed and broken limestone sold predominantly for flux, concrete aggregate, road material, and agricultural purposes. Natural red oxides utilized for mineral pigments were produced by George B. Smith Chemical Works, Inc., Maple Park.

KANKAKEE

In 1952 soft coal, stone, clays, and sand and gravel were produced in Kankakee County. Coal output exceeded 650,000 tons, with an approximate value of $3 million. Second to coal in value was limestone produced for rubble, cut stone, flagging, riprap, concrete aggregate, road metal, railroad ballast, and agricultural purposes. Major producer of this commodity was Lehigh Stone Co., Kankakee. Other limestone producers in Kankakee County were Manteno Limestone Co., Manteno, and Bourbonnais Stone Quarry, Bradley. Clays for use in manufacturing brick, drain, and building tile were produced by Kankakee Clay Products Co., Eastern Illinois Clay Co., and St. Anne Brick & Tile Co., all in St. Anne. Portage-Manley Sand Co. of Rockton produced molding sand.

KENDALL

Pits and quarries of Kendall County in 1952 yielded limestone and sand and gravel. The limestone produced was utilized for flux, concrete aggregate, road material, and agricultural purposes. Sole output was from Morris Limestone Co., Morris. Sand and gravel were produced by Kendall Highway Department, Yorkville.

KNOX

Bituminous coal was the major mineral commodity produced in Knox County in 1952. The 1,718,895 short tons of soft coal mined had an average value of $3.99 per ton. Purington Brick & Tile Co. mined clay at its pit at Galesburg. Sole producer of sand and gravel in the county in 1952 was L. K. Bandy Construction Co., Maquon; output was used primarily as paving and road gravel.

LAKE

The mineral industries of Lake County in 1952 produced sand and gravel, clay, magnesium compounds, and perlite. This county was the only one in Illinois having an output of magnesium compounds; all were produced by Johns-Manville Corp. In terms of value, the most important mineral commodity was expanded perlite produced by Lake Zurich Concrete Products Co., Lake Zurich, for use as a building material. Sand and gravel utilized for building and paving material ranked second. Commercial producers included B. & J. Sand & Gravel Co., Spring Grove; Elgin, Joliet & Eastern Railway Co., Chicago; Olson Bros., Waukegan; Marvin Walker, Lake Villa; and Wauconda Sand & Gravel Co., Wauconda. Lake County Highway Department, Waukegan, largest producer in the county, also reported an output of sand and gravel for street and highway purposes. Clay for use in brick manufacture was mined by National Brick Co. from its pit at Deerfield.

LA SALLE

La Salle County in 1952 ranked first in Illinois in output of sand and gravel, ground sand and sandstone, and portland cement, as well as fourth in the production of clays. In addition to these commodities the county produced stone and bituminous coal. Coal production totaled 15,226 tons, with an average value of $5.98 per ton.

Major mineral product was portland cement from plants of Alpha Portland Cement Co., La Salle, and Lehigh Portland Cement Co., and Marquette Cement Mfg. Co., both of Oglesby. Sand and gravel pits in the county in 1952 yielded 3,043,218 tons of sand and gravel valued at $6,576,975; output was used as glass, molding, blast, fire, furnace, and engine sand and as building sand and gravel. Of the 16 pits in operation in 1952, major producers were Ottawa Silica Co., Ottawa; Wedron Silica Co., Wedron; and Standard Silica Corp., Ottawa. These 3 companies also produced 247,420 tons of ground sand and sandstone for use in preparing cleansing and scouring compounds, enamels, fillers, glass, pottery, porcelain, and tile.

Seven clay producers were active in La Salle County in 1952. Conco-Meier Co., Lowell; Laclede-Christy Co., Ottawa; Monmouth

Stone Co., Lowell; and Matthiessen & Hegeler Zinc Co., La Salle, all produced fire clay. Producers of miscellaneous clays were Streator Drain Tile Co., and Hydraulic Pressed Brick Co., Streator, and National Fireproofing Corp., Ottawa.

LIVINGSTON

Limestone and dolomite, sand and gravel, bituminous coal, and clay were produced in Livingston County in 1952. Limestone and dolomite were produced by 4 companies operating 5 quarries. These organizations, in order of declining output, were Pontiac Stone Co., Wagner Stone Co., Livingston Stone Co., and Ocoya Stone Co., all of Pontiac. Output was employed for concrete aggregate, road metal, agricultural purposes, and various miscellaneous uses. In addition to this commercial production, a small quantity of noncommercial crushed limestone was produced by the Pontiac Township Highway Commission, Pontiac. The county mines reported an output of 2,416 tons of bituminous coal, with an average value—the highest in Illinois—of $7.12 per ton. Clay for brick and drain tile was mined by Diller Tile Co., Chatsworth. Fred Downs of Fairbury reported production of paving gravel.

LOGAN

In terms of value, sand and gravel used for building and paving material and for engine sand, was the most important mineral product in Logan County in 1952. The sole producer was Lincoln Sand & Gravel Co., Lincoln. Limestone and dolomite, utilized for concrete aggregate, road material, and agricultural purposes, were produced by Rockyford Limestone Co., Lincoln. Bitumionus coal totaling 34,308 tons with an average value of $5.76 per ton was produced in 1952.

MACON

Decatur Sand & Gravel Co., Inc., worked its pit at Decatur and produced sand and gravel for use in building and paving.

MACOUPIN

The major mineral commodity produced in 1952 in Macoupin County was 1,714,873 tons of bituminous coal with an average value of $4.00 per ton. Mt. Olive Brick & Tile Co., Mount Olive, reported an output of clay for use in brick manufacture.

MADISON

Bituminous coal, stone, sand and gravel, and clays were mined in Madison County in 1952, but the major commodity was bituminous coal; mines in the county yielded 1,228,392 tons averaging $4.09 per ton. Limestone and dolomite, sold as riprap, concrete aggregate, and road material, and for agricultural purposes, as well as for various miscellaneous uses, was quarried by Mississippi Lime Company of Missouri, and Reliance Whiting Co., both of Alton. Sand and gravel for building and paving was produced from pits of Guth Sand Co., Granite City; Mississippi Lime Company of Missouri, Alton; and Stocker Gravel & Construction Co., Highland; and Alton Brick Co., North Alton.

National Clay Products Co., Collinsville, reported outputs of clay which was utilized in manufacturing face brick.

MARION

Marion County mines in 1952 yielded 70,650 tons of bituminous coal with an average value of $3.80.

MARSHALL

The major mineral products of Marshall County in 1952 were sand and gravel, all produced by Consumers Company of Illinois. Output was utilized for building and paving. The Peoria pit of Hydraulic Press Brick Co. yielded fire clay for use in manufacturing face brick.

MASON

The sole mineral commodities produced in Mason County in 1952 were sand and gravel from pits of the Mason County Highway Department, Havana.

MASSAC

Sand and gravel were recovered in 1952 from pits of the Massac County Highway Department, Metropolis.

McDONOUGH

Colchester Stone Co., Moline, John McClure, Colchester, and Phillip Lewis & Sons, Macomb, produced limestone in McDonough County in 1952. This commodity was used for riprap, concrete aggregate, road material, and agricultural purposes. Clays for use in manufacturing face brick, common brick, and drain tile was mined by Colchester Brick & Tile Co., Western Stoneware Co., J. R. Purtscher, and Baird Clay mine, all of Colchester.

McHENRY

Sand and gravel were the principal mineral products of McHenry County in 1952. Output was utilized for building and paving material as well as various miscellaneous uses. Major producers were Consumers Company of Illinois, in both Algonquin and Cary; Chicago & North Western Railroad, and Crystal Lake Trucking & Excavating Co., Crystal Lake; and Grove Gravel & Excavating Co., Fox River Grove. Limestone and dolomite was also produced in 1952. Output was sold for flagging, concrete aggregate, road material, and agricultural purposes. Major producers were Christensen & Smith, Capron, and Garden Prairie Stone Co., Inc., Marengo.

McLEAN

The only mineral commodities produced in McLean County in 1952 were sand and gravel. Producers were B. W. Livengood, Heyworth, and McGrath Sand & Gravel Co., Inc., and Rowe Construction Co., Bloomington.

MENARD

Limestone, clay, and a small tonnage of bituminous coal were produced in Menard County in 1952. Limestone for use in concrete aggre-

gate, road material, and agricultural purposes was reported from the quarries of Athens Stone Quarry, Athens, and Indian Point Limestone Products Co., Mason City. Springfield Clay Products Co. mined a substantial quantity of clay for brick from its pit at Petersburg.

MERCER

Independent Materials Co. produced a substantial quantity of limestone and dolomite for use as concrete aggregate and road material from its quarry at Viola. Pits of the Hydraulic Press Brick Co. in Shale City yielded shale for manufacture of brick.

MONROE

Columbia Quarry Co., the only mineral producer in Monroe County in 1952, quarried crushed and broken limestone for use as a flux, concrete aggregate, road material, and agricultural purposes.

MONTGOMERY

Over 1 million tons of bituminous coal with an average value of $3.79 was produced in Montgomery County in 1952. The Montgomery County Highway Department, Hillsboro, produced a small quantity of sand and gravel.

OGLE

In 1952 sand and gravel, stone, and silica were produced in Ogle County. The largest of the seven producers of sand and gravel was McGrath Sand & Gravel Co., Inc. Noncommercial output was from the pit of Leaf River Township Highway Department, Leaf River. Sand and gravel produced in Ogle County were utilized as building and paving material, engine sand, and railroad ballast. The National Silica Co. reported production of silica in 1952 for use in pottery, porcelain, and tile manufacture. In addition to the above products, the county had a substantial output of crushed and broken limestone and dolomite which was utilized for riprap, concrete aggregate, road material, and agricultural purposes. Major producers of this rock were William Seitz and Ogle County Highway Department, Oregon, and Charles D. Willrett, Malta.

PEORIA

Peoria County in 1952 ranked third in Illinois in the production of sand and gravel. Six companies were active during the year; the largest was McGrath Sand Gravel Co. Inc. Production was used for building and paving material. Sand and gravel were also produced by the city of Peoria. Six companies quarried limestone and dolomite for riprap, concrete aggregate, road material, and agricultural purposes. Major producers were Lamar Stone Co., Long Rock Co., and Princeville Stone Co., all of Princeville. Bituminous-coal output from mines in the county totaled 369,631 tons, with an average value of $4.51 per ton.

PERRY

Perry County ranked fifth in the production of bituminous coal in Illinois in 1952. A total of 4,531,537 tons was produced, with an average value of $3.74 per ton.

PIKE

Sand and gravel were produced in Pike County in 1952 by Victor Callender, and Pittsfield & Missouri Gravel Co., Moline, and Pike County Highway Department. Output was utilized for building and paving material as well as railroad ballast. Limestone and dolomite for concrete aggregate, road material, and agricultural purposes was quarried by Pearl Stone Co. and Sanderson & Bauer, both in Pearl.

POPE

Fluorspar and sand and gravel were the only mineral commodities produced in Pope County in 1952; fluorspar was the most important. Aggregate output of the seven producers active in 1952 totaled 24,567 tons of crude fluorspar. Major producers were Egyptian Mining Co., Hicks Creek Fluorspar Mining Co., and P. M. T. Mining Co. Sand and gravel were produced by the Pope County Highway Department, Golconda.

PULASKI

Columbia Quarry Co., sole mineral producer in Pulaski County in 1952, quarried crushed and broken limestone for use as riprap, concrete aggregate, road material, railroad ballast, and agricultural purposes.

RANDOLPH

Bituminous coal, limestone and dolomite, and sand and gravel were produced in Randolph County in 1952. Soft-coal output totaled 911,549 tons valued at $3.70 per ton. The second most important mineral commodities produced in the county were limestone and dolomite for use as concrete aggregate, road material, and agricultural purposes. Commercial producers included Allied Chemical & Dye Corp., Solvay Process Division, and Al Stotz, Waterloo. The Illinois State Penitentiary at Menard also reported an output of crushed limestone and dolomite. Southern Illinois Sand Co., Chester, was sole producer of sand, which was sold for building, paving, engine, and railroad-ballast purposes.

ROCK ISLAND

The most important mineral products of Rock Island County in 1952 were crushed limestone and dolomite for use as concrete aggregate, road material, railroad ballast, agricultural purposes, and various other uses. Producers active during the year were Collinson Stone Co., and Cordova Quarry, Inc., Moline, and Midway Quarry, Inc., Geneseo. Paving and building sand and gravel were produced by Blackhawk Aggregates and Builders Sand & Gravel Co., Rock Island; Moline Consumers Co., Moline; and Rock Island Sand & Gravel Co., Rock Island. Brick and drain tile were manufactured from clay mined by Blackhawk Clay Products, Inc.

ST. CLAIR

St. Clair County in 1952 ranked first in Illinois in the production of iron oxide pigments, second in the production of lime and stone, and sixth in the production of coal. In addition to these commodities the county produced substantial quantities of clays, sand, and gravel.

C. K. Williams & Co. was sole manufacturer of iron oxide pigments in St. Clair County in 1952. Output was quite varied, ranging through red oxides, brown oxides, venetian red, yellow oxides, and ochers. Aluminum Co. of America reported an output of lime for building and chemical purposes.

Clays for brick and other heavy clay products were produced by Hill Brick Co. and Hydraulic Press Brick Co., both in Edgemont. In 1952 the county produced a substantial amount of dimension limestone for use as rough construction stone, irregular stone, rubble, and flagging. Crushed and broken production for riprap, concrete aggregate, road material, and agricultural limestone was also produced. The major stone producer was Columbia Quarry Co. Other operators of quarries included East St. Louis Stone Co., East St. Louis; Hecker Quarry, Inc., New Athens; and Casper Stolle Quarry & Construction Co., East St. Louis. The output of soft coal from mines in the county totaled 3,401,268 tons, with an average value of $3.80. Sand and gravel for building and paving, engine and filter purposes, were mined by Missouri Illinois Materials Co.

SALINE

Mines in Saline County in 1952 yielded 2,745,617 tons of bituminous coal with an average value of $4.51. Ford Brick & Tile Co., Harrisburg, reported an output of shale for use in manufacturing brick, drain tile, and various other heavy clay products.

SANGAMON

In 1952 the mines and quarries of Sangamon County produced by tuminous coal, clays, and sand and gravel. Soft-coal output totaled 287,706 tons with an average value of $5.07. Sand and gravel were produced from pits of Buckhart Sand & Gravel Co., Mechanicsburg, and Clearlake Sand & Gravel Co., and Springfield Sand & Gravel Co., Springfield. Clays produced by Poston Brick & Concrete Products Co. and Springfield Clay Products Co., both in Springfield, were utilized in the manufacture of brick, drain tile, and various other heavy clay products.

Solomon Grinding Service and Tamms Industries, Inc., both of Springfield, manufactured red oxides and mineral blacks in 1952. The county was the only area in the State to produce mineral blacks.

SCOTT

Crushed and broken limestone and dolomite taken from Krueger Quarry and Thomas Quarry, Winchester, were the major mineral products in Scott County in 1952. Output was utilized for concrete aggregate, road material, and agricultural purposes. MacLaughlin Mining Co., with a pit at Alsey, was the only producer of fire clay in 1952. Production was sold to Alsey Brick & Tile Co. for manufacture of various heavy clay products, such as brick. A small tonnage of sand and gravel was produced from the Homer E. Grady Co. pit at Exeter.

STARK

The sole mineral producer in Stark County in 1952 was Osceola Township Highway Commission, Bradford. This organization produced crushed and broken limestone and dolomite for use as concrete aggregate and road material.

STEPHENSON

Limestone and dolomite, and sand and gravel, were produced in Stephenson County in 1952. Limestone and dolomite, the more important commodities, were utilized for concrete aggregate, road material, and agricultural purposes. Commercial producers included Tri-County Quarries, Polo; Arthur Zimmerman, Pecatonica; Ray Askey, Orangeville; and Elmer Fortner, Freeport. The largest producer was Stephenson County Highway Department, Freeport. An output of sand and gravel by Loran Township Highway Department, Pearl City, and Westpoint Township, Lena, was also reported.

TAZEWELL

Tazewell County in 1952 was a major producer of sand and gravel These commodities were utilized for building, paving, engine, and railroad-ballast purposes. Producers were Hoffer Construction Co., East Peoria; McGrath Sand & Gravel Co., Inc., Pekin, and Mackinaw; and Peoria Concrete Construction Co. Peoria Brick & Tile Co. mined clay from its pit at East Peoria for use in manufacturing heavy clay products. Mines in the county also yielded a small tonnage of soft coal. Tazewell County held the distinction in 1952 of being the only area in Illinois in which peat was produced.

UNION

The sole mineral product of Union County in 1952 was limestone. This rock was used as rough construction stone and irregular stone, as well as being crushed and broken for sale as riprap, concrete aggregate, road material, and agricultural purposes. Producers in 1952 were Anna Quarries, Inc., and Jonesboro Stone Co., both at Anna.

VERMILION

Vermilion County ranked third in the State in the value of clay production in 1952. Producers were Western Brick Co. and General Refractories Co., both with pits at Danville. In addition, the Material Service Corp. Fairmont quarry yielded limestone and dolomite for use as concrete and road material. Blakeney Gravel Co., Danville; Vanderpoorten Bros., Westville; and Elton Wagner Co., Danville, reported production of gravel for building and paving use. Output of soft coal from mines in Vermilion County totaled 959,110 tons valued at $4.19 per ton.

WABASH

Wabash County sand and gravel pits in 1952 yielded 206,250 tons of material valued at $172,546. Output, which was utilized for building, paving, railroad ballast, and engine purposes, came from pits worked by Mount Carmel Sand & Gravel Co., Mount Carmel; Allen-

dale Gravel Co., Allendale; Dunobar Sand & Gravel Co., Bellmont; and The Southern Railway System.

WARREN

Crushed and broken limestone for use as riprap, concrete aggregate, and road material and for agricultural purposes was produced in Warren County in 1952 by Monmouth Stone Co., Monmouth. Production of a small tonnage of soft coal was also reported.

WASHINGTON

Crushed and broken limestone and dolomite for use as concrete aggregate, road material, and agricultural purposes were quarried by Radom Quarry Co. at Radom. Mines in the county produced 22,404 tons of soft coal.

WHITE

The only mineral production reported in White County in 1952 was building and paving sand and gravel produced by Maunie Sand & Gravel Co.

WHITESIDE

A substantial quantity of crushed and broken limestone and dolomite was produced in Whiteside County in 1952. Output was used for concrete aggregate, road material, railroad ballast, and agricultural purposes. The four commercial producers, in order of decreasing tonnage, were Fred R. MacKenzie & Co., Galesburg; Alldritt Bros., Morrison; Cordova Quarry, Moline; and Minor Bros., Rock Falls. Mount Pleasant Township and Whiteside County Highway Department, Morrison, also reported a substantial production of crushed stone. An output of 111,716 tons of sand and gravel valued at $77,441 was reported by the six county commercial producers. The largest of these were Rein & Dahl and Harry Vohn, Lyndon. Other producers included Jordan Township, Sterling, and Prophetstown Township, Prophetstown.

WILL

In 1952 Will County ranked second in Illinois in production of sand and gravel and expanded perlite, as well as fourth in output of stone. The major mineral commodities were sand and gravel for use as building and paving materials. These commodities were produced by Chicago Gravel Co. with plants at Plainfield and Rockdale, and Material Service Corp., Lockport. Quarries in the county yielded 1,249,950 tons of crushed and broken limestone valued at $1,713,938. Production was used for riprap, flux, concrete aggregate, road material, railroad ballast, and agricultural purposes. A small quantity of dolomite was sold as refractory material. Lincoln Crushed Stone Co., National Stone Co., Material Service Corp., and F. E. Schundler, Inc., all of Joliet, were the commercial producers of this material. Noncommercial stone was produced by the Joliet Branch of the Illinois State Penitentiary.

F. E. Schundler, Inc., produced expanded perlite for use as a lightweight aggregate and plaster, as well as a filter aid. Bituminous coal

totaling 101,725 tons, with an average value of $5.71 per ton, was mined in the county in 1952.

The Atomic Energy Commission announced during the year that the Joliet plant of Blockson Chemical Co. would recover uranium from phosphate rock. This was the first commercial unit to practice recovery of this type.

WILLIAMSON

Williamson County, with an output of 6,215,567 tons of bituminous coal valued at $27,286,339, ranked first among coal-producing counties in Illinois in 1952. Approximately 3,036 men were employed by the coal companies, 2,120 of them underground. An average of 11.62 tons per man was produced each day. Approximately 21 percent of the 1952 output was from strip mines, which accounts in part for the high productivity rate.

WINNEBAGO

Seven sand and gravel operators were active in Winnebago County in 1952. Major producers were Consumers Company of Illinois, Illnois-Wisconsin Sand & Gravel Co., and Larson Bros. Sand & Griavel Co., Rockford. Output, which totaled 1,164,945 tons valued at $885,930, was utilized for paving sand and gravel as well as for railroad ballast and engine sand. Crushed and broken limestone and dolomite were produced by William Nordhop, Rockford, and Porter Bros., Roscoe. Noncommercial production of this commodity, however, was by far the more important. Producers were the City of Rockford and Winnebago Highway Department.

WOODFORD

Gravel, produced by John Keller & Sons, Eureka, Timberline Gravel Co., Congerville, and the Woodford County Highway Department, was the sole mineral product of Woodford County in 1952.

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The Mineral Industry of Indiana

By Richard H. Mote [1] and Alvin Kaufman [2]

THE AGGREGATE VALUE of Indiana mineral production in 1952 decreased approximately 7 percent from the record high of $174,388,000 reached in 1951. This resulted from substantial declines in the value of coal, stone, and clay outputs. Thirteen mineral commodities were produced in the State during the year; the most important economically were coal, petroleum, cement, limestone, and sand and gravel. Indiana continued in 1952 to be a major producer of sharpening stones and calcareous marl and was again the Nation's leading producer of dimension limestone. Fuels comprised 61 percent and nonmetals 39 percent of the total value of mineral output. No metals were produced in 1952.

The major producing counties, exclusive of petroleum and natural-gas output, were: Vigo, Lake, Warrick, Lawrence, Pike, and Clark. Vigo, Warrick, and Pike Counties owe their paramount position in the State mineral economy to the production of bituminous coal. Cement manufacture provided the large dollar volume that placed Lake and Clark Counties among the leading mineral-producing areas in Indiana, and dimension limestone and cement were important factors in the mineral output of Lawrence County.

TABLE 1.—Mineral production in Indiana, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays (except for cement)	1,267,159	$1,656,885	1,020,840	$1,389,751
Coal	19,450,445	78,617,530	16,350,202	64,977,328
Marl, calcareous (except for cement)	12,960	18,129	16,414	9,021
Natural gas—thousand cubic feet	845,000	83,000	836,000	79,000
Peat	5,699	22,824	10,115	49,775
Petroleum (crude)—42-gallon barrels	11,100,000	30,530,000	[2] 12,037,000	[2] 33,100,000
Pyrites—long tons	[3]	[3]	[3]	[3]
Sand and gravel	11,030,814	8,763,936	11,546,014	9,279,908
Stone (except limestone for cement and lime)	[4] 8,641,670	[4] 23,729,433	9,126,837	21,965,454
Undistributed: Abrasive stones, cement, lime, stone (dimension sandstone, 1951), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		30,966,381		31,074,713
Total Indiana		174,388,000		161,925,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production.
[2] Final figure. Supersedes preliminary figure given in commodity chapter.
[3] Value included with "Undistributed."
[4] Excludes certain stone, value for which is included with "Undistributed."

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REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Indiana output of bituminous coal in 1952 declined 16 percent compared with the previous year and was approximately 47 percent below the 1918 record year. This decrease paralleled the national trend in the coal industry. Despite the decline, bituminous coal continued in 1952 to be Indiana's foremost mineral commodity in point of value. The value of soft-coal production was twice that of petroleum, the second major mineral.

Ninety-three mines were active during the year, including 39 strip pits. Thirty-nine percent of these mines yielded over 100,000 tons a year. The 175,809 tons average production per mine in 1952 far exceeded the United States average of 64,171 tons. The high output in Indiana results from the large size of its mines, the substantial percentage (60 percent) of strip production, and virtual 100-percent mechanization of underground operations. In 1952 approximately 99 percent of Indiana's subsurface coal production was machine-cut and 97 percent was mechanically loaded.[3]

TABLE 2.—Production of bituminous coal, 1951–52, by counties

County	1951		1952	
	Production (net tons)	Average value per ton	Production (net tons)	Average value per ton
Clay	1,304,993	$4.11	1,101,056	$4.08
Daviess	447,032	4.35	444,325	4.26
Dubois	52,508	3.69	27,371	3.62
Fountain	66,821	5.76	58,237	5.82
Gibson	710,687	4.43	844,956	4.14
Greene	414,408	4.44	578,354	4.13
Knox	2,821,935	3.83	2,323,287	3.79
Martin	1,600	4.55	1,468	4.48
Owen	159,625	4.71	132,829	4.86
Parke	14,464	5.18	11,804	5.50
Pike	3,209,952	3.81	2,609,250	3.69
Spencer	53,748	4.76	43,741	4.67
Sullivan	2,625,216	4.12	1,994,683	4.03
Vermillion	257,994	4.22	198,525	4.12
Vigo	4,023,249	4.24	3,237,891	4.21
Warrick	3,286,213	3.85	2,742,425	3.80
Total	19,450,445	4.04	16,350,202	3.97

Productivity in the surface mines was approximately double the underground rate of 8.68 tons per man per day. Average for both types of mines was 12.52 tons per man per day. Major producing counties in 1952 were Vigo, Warrick, Pike, and Knox. Mines in these four counties produced over two-thirds of the State total coal output during the year. Retrievable reserves, assuming 80-percent recovery for strippable coal and 50 percent recovery for nonstrippable coal, on January 1, 1951, were 18,778,593,000 tons.[4]

Peat.—Output of peat in Indiana in 1952 increased 77 percent compared with 1951. Production was reported from 8 counties

[3] Bureau of Mines, Bituminous Coal and Lignite: MMS 2222, 1953.
[4] Geological Survey, Coal Resources of Indiana: Circ. 266, 1953, p. 42.

compared to 4 the previous year. Major producing areas were Wells, Grant, Allen, and Blackford Counties, with output also from Marion, De Kalb, Noble, and Kosciusko. The peat bogs occur in old glacial lake beds, basins between sand dunes, and "bayous or oxbow" lakes.

TABLE 3.—Production of peat, 1945–52

Year	Short tons	Value	Year	Short tons	Value
1945	514	$2,545	1949	7,949	$28,537
1946	676	3,124	1950	5,793	18,966
1947	3,957	14,760	1951	5,699	22,824
1948	2,288	11,576	1952	10,115	49,775

Petroleum and Natural Gas.—The value of marketed petroleum and natural gas increased 9 percent in 1952 compared with the previous year. Of the 7.4 billion cubic feet of natural gas produced in 1952, 6.5 billion cubic feet was vented and wasted, 48 million cubic feet was utilized for repressuring, and 836 million cubic feet was sold.

Reserves, as of December 31, 1952, estimated by the American Petroleum Institute and the American Gas Association, were 56 million barrels of petroleum and 36.7 billion cubic feet of natural gas. The latter figure includes 1.8 billion cubic feet added to underground storage during the year and 1.5 billion cubic feet resulting from new discoveries. Petroleum reserves increased nearly 5 million barrels in 1952 despite the State output of 12 million barrels.

In 1952, 408 oil wells, 18 gas wells, and 843 dry holes were drilled. A total of 3,840 wells were producing in that year compared to 3,600 in 1951. The former figure includes 600 gas wells, a decrease of 50 from the previous year. Drilling activity in 1952 resulted in 18 new oil and 4 new gas pools, as well as 28 additional pays in already established pools. Most of the drilling activity was concentrated in the southwestern part of the State, with half the completions in Posey, Gibson, Knox, and Pike Counties. The most important discovery—the Riley-South pool—was made in Vigo County. This pool had an estimated reserve of 750,000 barrels. Crude oil sold for the same price in 1952 ($2.75) as in 1951. The wellhead price of natural gas, however, declined 0.3 cent to 9.5 cents per 1,000 cubic feet.

NONMETALS

Cement.—Lone Star Cement Corp. (Limedale), Lehigh Portland Cement Co. (Mitchell), Louisville Cement Co., Inc. (Speed), and Universal Atlas Cement Co. (Buffington), produced general use, high-early-strength, and air-entrained portland cements in Indiana in 1952. Universal Atlas Co. utilized blast-furnace slag as raw material, while the other three companies, in the southern part of the State, used limestone.

Production in 1952 declined approximately 5 percent compared to the previous year. Apparent consumption, as measured by shipments, exceeded output. Consequently, stocks at the end of the year decreased approximately 33 percent. The price per barrel of cement increased from $2.42 in 1951 to $2.47 in 1952.

Natural cement was produced by Louisville Cement Co. in Clark County from the Silver Creek limestone.

Clays.—Clay output in Indiana in 1952 declined approximately 19 percent compared to 1951. Fire clay was 39 percent of the tonnage and 53 percent of the value in 1952. Miscellaneous clays were the only other type produced. Approximately 57 pits were worked in 27 counties in 1952. Of these, 22 yielded fire clay and 35 miscellaneous material. Major producing counties were Clay, Morgan, Greene, and Lake. Bloomfield Brick Co. (Bloomfield), G. & F. Coal Co. (Brazil), and Cayuga Brick & Tile Co. (Cayuga), were the largest producers.

Terre Haute-Brazil and Cannelton-Huntingburg areas were the major fire-clay-producing sections of Indiana. Clay output, consisting of a moderately refractory, plastic, white or gray material, was predominantly from the coal measures. Next in importance were the Lower Mississippian shales, which were produced from a belt extending from Attica to New Albany. Glacial clay output was obtained from pits in northern Indiana. This area became a clay-manufacturing center because of the former abundance of a cheap fuel (natural gas) and the local demand for farm drainage tile. Today the plants manufacture building brick, as well as drain and hollow building tile.

TABLE 4.—Clays sold or used by producers, 1943–47 (average) and 1948–52

Year	Fire clay		Miscellaneous clays		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	216,615	$348,247	440,214	$320,990	656,829	$669,237
1948	318,097	586,713	891,928	699,338	1,210,025	1,286,051
1949	379,677	656,829	916,062	744,965	1,295,739	1,401,794
1950	503,661	801,118	909,072	804,301	1,412,733	1,605,419
1951	499,723	821,672	1,025,008	1,092,785	1,524,731	1,914,457
1952	397,336	732,025	933,962	968,184	1,331,298	1,700,209

TABLE 5.—Clays (except for cement) sold or used by producers, 1952, by counties

County	Short tons	Value	County	Short tons	Value
Allen	900	$900	Montgomery	25,928	$32,392
Clay	258,890	359,967	Morgan	129,697	129,697
Dubois	13,432	49,591	Perry	47,608	93,084
Fountain	41,868	58,795	Pulaski	4,300	4,300
Franklin	1,000	1,000	Spencer	4,000	4,000
Greene	100,000	100,000	Undistributed	279,445	442,253
Huntington	4,280	4,280			
Jackson	26,995	26,995	Total	1,020,840	1,389,751
Lake	82,497	82,497			

Lime.—Louisville Cement Co., Inc., sole producer of burnt lime in Indiana in 1952, produced quick and hydrated lime for mason's and chemical purposes at its plant at Milltown, Harrison County. Raw material for the lime kilns was obtained from the company quarry

near Milltown. Limestone utilized was from the Ste. Genevieve and St. Louis formations.

Marl, Calcareous.—Production of calcareous marl in Indiana in 1952 increased 27 percent compared to the previous year. Output was from Noble, Fulton, DeKalb, and Starke Counties, in order of decreasing value. The Indiana calcareous marl was formed in lakes and swamps in the northern part of the State left by the melting of the great glacial ice sheet that once covered this area. Producers reporting to the Bureau of Mines in 1952 were M. E. Zellers, Kewanna; Weber & Luther, Albion; Sylvan O. Shull, Rome City; Marion J. Benjamin, Waterloo; and Sylvester Harness, Knox. Output was used for agricultural purposes.

TABLE 6.—Production of calcareous marl, 1943–47 (average) and 1948–52

Year	Short tons	Value	Year	Short tons	Value
1943–47 (average)	22,119	$11,762	1950	20,380	$13,977
1948	15,839	17,031	1951	12,960	18,129
1949	44,026	49,543	1952	16,414	9,021

Perlite.—Perlite Processing Corp., Scottsburg, and U. S. Gypsum Co., East Chicago, produced expanded perlite in Indiana in 1952 from crude material imported from southwestern United States. The finished product was used as a lightweight aggregate in plaster and concrete.

Pyrites.—Snowhill Coal Corp. was sole producer in 1952 of pyrite ore in Indiana. This commodity was produced as a byproduct of bituminous-coal output from the company Talleydale mine in Vigo County.

Sand and Gravel.—Sand and gravel output in Indiana in 1952 increased 5 percent compared with the previous year. Gravel production increased 10 percent and comprised 62 percent of the total. This increase, however, was partly offset by a 3-percent drop in sand production. Major uses of sand and gravel in Indiana were for paving (56 percent) and building (30 percent). A substantial tonnage of molding sand, predominantly from Lake, La Porte, and Porter Counties, along the shores of Lake Michigan, and Spencer County near the Ohio River, was also produced. In 1952 approximately 135 pits were active in 50 counties. Of these, Standard Materials Corp. (Indianapolis), American Aggregates Corp. (Greenville, Ohio), and Terre Haute Gravel Co., Inc. (Terre Haute), were the largest. Major producing counties were Marion, Vermillion, Tippecanoe, and Vigo.

TABLE 7.—Sand and gravel sold or used by producers, 1951–52, by uses

	1951		1952	
	Short tons	Value	Short tons	Value
COMMERCIAL OPERATIONS				
Sand:				
Molding	570,934	$745,659	480,378	$663,568
Building	1,755,367	1,344,643	1,531,819	1,148,778
Paving	1,737,845	1,329,185	2,040,634	1,494,408
Engine	131,732	83,768	113,421	80,794
Railroad ballast	207,335	126,591	(1)	(1)
Other	(1)	(1)	24,257	16,827
Undistributed [2]	173,136	106,849	225,640	144,729
Total commercial sand	4,576,349	3,736,695	4,416,149	3,549,104
Gravel:				
Building	1,816,338	1,582,430	1,887,053	1,572,947
Paving	3,483,783	2,705,934	4,061,966	3,382,895
Railroad ballast	761,531	574,518	702,331	527,348
Other	69,616	55,015	74,747	62,934
Total commercial gravel	6,131,268	4,917,897	6,726,097	5,546,124
Total commercial sand and gravel	10,707,617	8,654,592	11,142,246	9,095,228
GOVERNMENT-AND-CONTRACTOR OPERATIONS				
Sand: Paving	12,738	4,128	16,679	8,367
Gravel: Paving	310,459	105,216	387,089	176,313
Total Government-and-contractor sand and gravel	323,197	109,344	403,768	184,680
All operations:				
Sand	4,589,087	3,740,823	4,432,828	3,557,471
Gravel	6,441,727	5,023,113	7,113,186	5,722,437
Grand total	11,030,814	8,763,936	11,546,014	9,279,908

[1] Included with "Undistributed" to avoid disclosure of individual company operations.
[2] Includes fire or furnace and other sand indicated by footnote 1.

Stone.—Virtually all output of stone in Indiana in 1952 was limestone; production increased 6 percent compared with 1951. Sandstone for the manufacture of natural whetstones and building stone was quarried from the Mansfield formation in Lawrence County by Indiana Sandstone Co.

Indiana has long been famous for its output of building limestone, which was 5 percent of total stone tonnage for the country in 1952. As a result of its high unit value, this commodity was responsible for 49 percent of total dollar output of stone during the year. The major formation exploited for building material was the Salem limestone of Mississippian age, which is quarried primarily in Monroe and Lawrence Counties. These two counties supplied 60 percent of the total value of stone produced in Indiana in 1952. The average price of dimension limestone declined from $27.79 in 1951 to an average of $23.80 per ton.

Of the 74 stone producers operating in 31 counties in 1952, the largest were Indiana Limestone Co., Bedford, and B. G. Hoadley Quarries, Inc., Bloomington Limestone Corp., and Ralph Rogers & Co., all of Bloomington. Of these, only the Rogers Co. is primarily a crushed-stone producer.

Crushed and broken stone, which was 95 percent of the rock tonnage in Indiana in 1952 but only 51 percent of value, is produced predominantly in the southern section of the State. Excessive glacial overburden in other parts of Indiana restricts quarrying activity. The major producing formation was the Ste. Genevieve (Mississippian) limestone, which occurs in an area extending from the Ohio River north into Putnam County. Virtually all of the largest crushed-stone-producing counties in Indiana in 1952 were in this area and include Lawrence, Putnam, and Crawford Counties. Limestones of Devonian and Silurian age are quarried in a belt from southern Clark County northward into Rush County.

Use for concrete aggregate and road metal consumed 66 percent of the crushed-stone output in 1952; agricultural stone contributed an additional 24 percent.

TABLE 8.—Stone sold or used by producers, 1951–52, by uses

	1951		1952	
	Quantity	Value	Quantity	Value
Limestone (dimension stone):				
Building:				
Rough construction, short tons	192	$571	(1)	(1)
Rough architectural, cubic feet	2,517,714	2,591,339	2,220,698	$2,417,319
Finished (cut and sawed), do	4,136,524	10,891,953	3,397,036	8,238,750
Rubble, short tons	2,795	5,825	(1)	(1)
Flagging, cubic feet	3,185	6,237	(1)	(1)
Undistributed, short tons			44,159	89,331
Total, short tons (approximate)	485,650	13,495,925	451,445	10,745,400
Sandstone (dimension stone):				
All uses, do	(2)	(2)	2,000	60,000
Limestone (crushed and broken):				
Riprap, short tons	59,484	81,020	201,971	318,788
Fluxing stone, do	223,504	267,313	41,669	48,572
Concrete and road metal, do	5,414,774	6,339,623	5,682,691	6,910,201
Railroad ballast, do	371,882	434,376	483,047	571,383
Agriculture, do	1,905,034	2,519,747	2,118,185	2,737,675
Miscellaneous, do	162,154	583,587	145,829	573,435
Total, do	8,136,832	10,225,666	8,673,392	11,160,054
Sandstone (crushed and broken): All uses, do	438	342		
Miscellaneous (crushed and broken): All uses, do	18,750	7,500		
Grand total, do	[3] 8,641,670	[3] 23,729,433	9,126,837	21,965,454

[1] Included with "Undistributed" to avoid disclosure of individual company operations.
[2] Figure withheld to avoid disclosure of individual company operations.
[3] Incomplete figure. Excludes dimension sandstone, Bureau of Mines not at liberty to publish.

REVIEW BY COUNTIES

ADAMS

John W. Karch Stone Co., Bryant, and Meshberger Bros. Stone Co., Linngrove, produced dolomite from the Huntington formation for use as agricultural stone, concrete aggregate, and road metal. Meshberger Bros. operated 2 pits, 1 near Linngrove and the other at Pleasant Mills. R. D. Jones, Berne, and Krick Tyndall, Decatur, produced clay from glacial till for use in manufacturing tile.

ALLEN

W. W. Gravel Co., Inc., and May Sand & Gravel Corp., Fort Wayne, produced sand and gravel during the year for use as building and paving materials. Miscellaneous clay for use in manufacturing pottery and tile was recovered from deposits of glacial till by Walter Bolyard Tile Co., Monroeville, and Klopfenstein Tile Co., Grabill. The Klopfenstein pit and plant operated from May to November.

BARTHOLOMEW

Sole mineral producer in Bartholomew County was Meshberger Bros. Stone Co., operators of a quarry near Columbus. This organization produced limestone from the Beechwood and Jeffersonville formations which was broken for use as riprap, and crushed for concrete aggregate, road metal, agricultural stone, and metallurgical purposes.

BENTON

Mount Gilboa Gravel Co., Fowler, was the only mineral producer in Benton County in 1952. This organization reported an output of unwashed paving gravel.

BLACKFORD

Limestone, clay and peat were produced in Blackford County. Montpelier Stone Co., Montpelier, produced limestone from a fossil reef in the Liston Creek formation. Output was utilized for production of flagging, concrete aggregate, road metal, agricultural stone, and stone sand. Inman Tile Co., Hartford City, reported production of clay from its pit at Millgrove.

BOONE

O. J. Pearcy, the only mineral producer reporting to the Bureau of Mines from Boone County, recovered unwashed paving gravel.

CARROLL

Stuntz Yoeman Co., Inc., Delphi, reported a substantial output of dolomite for use as concrete aggregate, road metal, and agricultural stone.

CASS

The France Stone Co. operated a quarry near Keeport in the Kokomo and Jeffersonville limestones. Output was utilized for concrete aggregate, road metal, and railroad ballast. Greenville Gravel Co., Logansport, produced sand and gravel for building purposes.

CLARK

Sand and gravel, limestone, shale, and cement were produced in Clark County. Louisville Cement Corp. operated a plant at Speed for producing both portland and natural cements. Raw material for portland cement was quarried from the Speed and Jeffersonville limestones and the New Providence shale. Mixing and grinding were done by the dry process. Stone for natural cement was obtained from

the Silver Creek formation, which averages approximately 16 feet in the vicinity of the quarry. Atkins & Co., Inc., Jeffersonville, Sellersburg Stone Co., Sellersburg, and Tri-County Stone Co. reported output of crushed limestone for use as concrete aggregate, road metal, and agricultural purposes. These organizations operated quarries in the Silver Creek and Jeffersonville limestones. The sole producer of sand and gravel in Clark County was Yoder Same of Jeffersonville. This organization produced building sand and gravel.

CLAY

Clay County was the major producer of clay in the State. Most of this output was fire clay from the Brazil area. Production was utilized for structural clay products and facing tile. Seven producers were active, and most of the output was a byproduct of coal-mining operations. Hydraulic Press Brick Co., Brazil, produced fire clay for its own use. Other producers sold their output. Companies operating, in order of decreasing production, were G. & F. Coal Corp., Quality Coal Corp., Big Bend Collieries Co., Inc., E. & K. Clay Co., Maumee Collieries Co., and Irwin Coal & Clay Co., all of Brazil. In addition to the refractory material, a substantial quantity of miscellaneous clay was produced by Big Bend Collieries Co., Inc., and G. & F. Coal Corp.

Clay County was also one of the leading producers of bituminous coal in Indiana. Eleven strip pits active during the year yielded over 1 million tons of coal, with an average value of $4.08 per ton. The largest of these were the Chinook mine of Ayrshire Collieries Corp., and the Big Bend mine of Big Bend Collieries, Inc., Brazil. The Number III and Block seams were mined. Clyde Bullerdick Gravel Co., Poland, and Clark & Sons, Brazil, produced building and paving sand and gravel.

CLINTON

Jesse Bailey, Colfax, produced unwashed gravel for building purposes in Clinton County. There was also a substantial output of washed gravel from noncommercial sources.

CRAWFORD

Hy-Rock Products Co. operated an underground limestone mine in the Ste. Genevieve formation near Marengo and Mulzer Bros., Eckerty, produced crushed and broken stone from the Glen Dean limestone. Output of these two operations was utilized for riprap, concrete aggregate, road metal, railroad ballast, filter beds, and agricultural purposes.

DAVIESS

The major mineral product of Daviess County was 444,325 tons of bituminous coal valued at $4.26 a ton. As a result of its high percentage (94 percent) of strip mining, this county has the highest coal output per man per day in Indiana in 1952. Largest producers were Central Indiana Coal Co., Hicks Coal Co., Chesser Coal Corp., and Simonas Bros. Coal Co., Washington, and Emkoff Coal Co., Montgomery. Production of building and paving sand and gravel was

reported by Charles England Gravel Co., Plainville, and John E. Mize, Elnora.

DEARBORN

Dearborn Gravel Co., Lawrenceburg, and Laughery Gravel Co., Aurora, produced building and paving sand and gravel in Dearborn County.

DECATUR

Harris City Stone Corp., Greensburg, and New Point Stone Co. produced crushed and broken limestone from the Laurel formation. Output of these quarries was utilized for concrete aggregate, road metal, and agricultural purposes. New Point Stone Co. also produced a small quantity of rubble.

De KALB

Sand and gravel were produced in De Kalb County by Stonestreet & Burtzner Bros. Co., and Irving Bros. Gravel Co. The former organization operated pits in both Garrett and Waterloo. Output of the three pits was utilized for paving and building material. Marion J. Benjamin was the only producer of calcareous marl in De Kalb County reporting to the Bureau of Mines in 1952. This pit had not operated in 1950 or 1951.

DELAWARE

Park Sand Gravel & Ready-Mix Concrete Co., Leonard Shick Co., and J. & K. Stone & Gravel Co., Inc., all of Muncie, produced building and paving sand and gravel in Delaware County. The latter organization also operated a dolomite quarry near Eaton; output was crushed and sold for concrete aggregate, road metal, and agricultural stone.

DUBOIS

A small quantity of bituminous coal was produced in Dubois County by 20 men employed in underground mines. There was no surface production. Louisville Firebrick Works, Louisville Pottery Co., and Huntingburg Brick Co., all of Huntingburg, produced a small quantity of fire and miscellaneous clay for use in the manufacture of face brick and pottery. Louisville Pottery Co. output was shipped to Kentucky.

ELKHART

The sole commercial producer of sand and gravel in Elkhart County was Christner Gravel Co., Goshen. The city engineer in Elkhart also reported a substantial output of sand and gravel.

FAYETTE

Building and paving sand and gravel were produced in Fayette County by Connersville Gravel Co., Inc., and Park Road Gravel Co., both of Connersville.

FOUNTAIN

Mines of Fountain County yielded a relatively minor tonnage of soft coal. Production during the year commanded the highest average value per ton ($5.82) in the State. Brudi Stone & Gravel Co. and Neal Gravel Co., Attica, operated pits for the production of building and paving sand and gravel. Poston-Herron Brick Co., Attica, and Veedersburg Clay Products Co., Inc., Veedersburg, produced substantial quantities of miscellaneous clay for use in the manufacture of face brick and tile.

FRANKLIN

The only mineral production reported from Franklin County was from the clay pit operated by Herman H. Wessel Co.

FULTON

Calcareous marl for agricultural purposes was produced at Kewanna by M. E. Zellers, the only mineral producer in Fulton County.

GIBSON

Coal mines in Gibson County yielded 844,956 tons of soft coal with an average value of $4.14 per ton. Jewell Guller and Short-Garrett-Higginbotham produced building and paving sand and gravel from pits at Owensville.

GRANT

Pipe Creek Stone Co., Marion, operated a limestone quarry for the production of blast-furnace flux, concrete aggregate, road metal, and agricultural purposes. Irving Bros. Gravel Co., Inc., and S. & L. Gravel Co., both of Marion, reported substantial production of building and paving sand and gravel.

GREENE

Mines and quarries of Greene County yielded bituminous coal, clay, and sand and gravel. Over half a million tons of soft coal, with an average value of $4.13 per ton, was produced during the year. Bloomfield Brick Co., Bloomfield, reported a substantial output of miscellaneous clays for use in manufacturing brick. Building and paving sand and gravel were produced by Concrete Silo Co., Inc., Bloomfield, and Hart Gravel Co., Worthington.

HAMILTON

Beaver & Son produced building and paving sand and gravel at its pit and plant at Noblesville. This organization was the only Hamilton County mineral producer reporting to the Bureau of Mines in 1952.

HANCOCK

Irving Materials, Inc., Delbert L. Reeves, and Eglert G. Stroubbe & Sons, all of Greenfield, reported substantial outputs of building and paving sand and gravel in Hancock County.

HARRISON

Corydon Crushed Stone Co., Corydon, and Davis Bros. Crushed Stone & Lime Co., Ramsay, quarried the St. Louis and Ste. Genevieve limestones, respectively, for use as concrete aggregate, road metal, and agricultural purposes. Louisville Cement Co., Inc., operated a limestone pit in Harrison County in the lower Ste. Genevieve and upper St. Louis formation to produce limestone for use in manufacturing burned lime at its kiln in Milltown.

HENDRICKS

Unwashed building and paving gravel was produced from the Wendell Loy pit near Plainfield.

HENRY

Paving gravel was produced in Henry County by John F. Lednam and Robert Hall, both of Lewisville, and Paul Craig, Knightstown. In addition to this commercial output, the Henry County Highway Department, New Castle, produced unwashed sand and gravel for highway purposes.

HUNTINGTON

Crushed stone for concrete aggregate, road metal, railroad ballast, and agricultural purposes was quarried from a reef in the Liston Creek limestone near Huntington by the Erie Stone Co. The Majenica Tile Co. and Simpson Clay Works, both of Huntington, operated pits near Majenica and Simpson, respectively, to produce miscellaneous clay. This commodity was utilized for tile manufacture.

JACKSON

Two producers of shale for use in manufacturing building, partition, and drain tile and brick reported to the Bureau of Mines from Jackson County. Medora Brick Co., Medora, and Jackson Brick & Hollow Ware Co., Brownstown, both produced from the Borden shale. Lehigh Portland Cement Co. produced from the New Providence shale for use in cement manufacture.

JASPER

W. C. Babcock Construction Co., Rensselaer, produced crushed and broken dolomite for use as riprap, concrete aggregate, road metal and agricultural stone.

JAY

Rockledge Products Co., Portland, quarried dolomite in Jay County for use as concrete aggregate, road metal, and agricultural purposes. Martin Bros. tile factory worked its clay open-pit in glacial till at Dunkirk during the year. Miscellaneous clay produced was utilized for manufacture of drain tile.

JENNINGS

Sole mineral producer in Jennings County was Paul Frank quarries, which worked its North Vernon quarry and produced limestone and dolomite from the Beechwood, Speed, Jeffersonville, and Geneva formations for use as concrete aggregate, road metal, and agricultural stone.

KNOX

Knox County ranked fourth among Indiana coal-producing counties, with an output of approximately 2 million tons valued at $3.79 a ton. Major production was from underground mines; only one strip pit reported during the year. In all, 905 men were employed in county coal mines in 1952, 672 of them underground. Major producers of coal in Knox County were Enoco Collieries, Bruceville; Shasta Coal Corp. Shasta strip mine near Bicknell; and Standard Coal Co. Julian No. 1 property near Wheatland. Sand and gravel pits in the county yielded building and paving material. Principal producers were Lenahans & Konen, Inc., and White River Materials Co., both of Vincennes.

KOSCIUSKO

Building and paving sand and gravel and railroad ballast were produced from the pits of Sturm & Dillard Gravel Co., Inc., Syracuse, and Western Indiana Gravel Co., Leesburg. In addition to this commercial production, Kosciusko County Highway Department, Warsaw, reported a substantial output of sand and gravel for highway use.

LAGRANGE

Washed sand and gravel were produced in Lagrange County by Northern Indiana Sand & Gravel Co., which operated a dredge northeast of Wolcottville. The Lagrange County Highway Dept. produced sand and gravel for highway purposes.

LAKE

Lake County was the largest cement-producing area in Indiana and ranked among the State's major sources of miscellaneous clay. Universal Atlas Cement Co. worked its plant at Buffington throughout the year. Limestone from Calcite, Mich., and blast-furnace slag were used as a source of raw materials. Producers of miscellaneous clay included The Natco Corp., with a pit near Hobart, and National Brick Co. near Munster. Output during the year was used in manufacturing hollow and drain tile.

Construction Aggregates Corp., John N. Bos Sand Co. (Miller), and Elgin, Joliet & Eastern Railway Co. operated pits for the production of sand and gravel. Substantial quantities of unwashed molding sand from the dunes near the city of Gary, as well as building, paving, and engine sand and gravel, were produced by these organizations. Expanded perlite was prepared by U. S. Gypsum Co., East Chicago, from crude material imported from southwestern United States. This commodity was used as an aggregate in plaster.

LA PORTE

Portage-Manley Sand Co. and Producers Core Sand Corp. produced substantial quantities of molding and engine sand from the dunes along the Lake Michigan shore near Michigan City.

LAWRENCE

Lawrence County ranked as one of the foremost mineral-producing areas in Indiana. Dimension limestone for building purposes continued to be the principal mineral commodity. Largest producers were: Indiana Limestone Co., Inc., and Ingalls Stone Co., Bedford; and Heltonville Limestone Co., Heltonville. Virtually all output of dimension stone was from the Salem limestone formation. A substantial output of crushed and broken limestone for use as riprap, blast-furnace flux, concrete aggregate, railroad ballast, and road metal and for agricultural purposes was also produced. Ralph Rodgers & Co., Bedford, and Nally-Ballard & Cato, Inc., were major producers. Limestone for use in glass manufacture was crushed from mill scrap by Bedford Ground Limestone Co., Bedford.

Lawrence County was the only area in the State from which sandstone was produced. The Bedford quarry of The Indiana Sandstone Co., Inc., yielded sandstone for use in natural whetstones and colored building stones. The rock was quarried from the basal portion of the Mansfield sandstone, which at the pit was estimated by the company to be approximately 60 feet thick. Overburden averaged 10 feet in depth. Two gangsaws and a splitting machine were utilized in quarrying the sandstone.

Lehigh Portland Cement Co. worked its 10-kiln plant at Mitchell throughout the year and produced portland, early-strength, mortar, and air-entrained cements. Raw material for use in the cement manufacture was quarried nearby from the Harrodsburg, Salem, and lower part of the St. Louis limestones.

MADISON

The Myers Gravel & Sand Co., Inc., pit at Anderson and the Dundee and Anderson pits of Western Indiana Gravel Co. yielded building and paving sand and gravel. Limestone was produced by Indiana Reformatory, Pendleton.

MARION

Five producers of sand and gravel reported to the Bureau of Mines from Marion County. The largest—Standard Materials Corp. and American Aggregates Corp., both with offices in Indianapolis—produced material utilized for building and paving construction.

MARSHALL

A substantial quantity of miscellaneous clay for use in the manufacture of brick and tile was produced by Breman Clay Products Co. near Breman. Burns Gravel Co., Culver, was the sole producer of sand and gravel in the county during the year.

MARTIN

The mines and quarries of Martin County produced a relatively small quantity of bituminous coal and a substantial tonnage of miscellaneous clays. The latter commodity, produced by Loogootee Clay Products Co., Loogootee, was utilized in manufacturing drain tile.

MIAMI

Sand and gravel for building, paving, and various miscellaneous purposes were produced in Miami County by J. C. O'Connor & Sons, Inc., and Kickapoo Sand & Gravel Co., both of Peru.

MONROE

Monroe County ranked as one of the major mineral-producing counties of Indiana. This predominant position in the State mineral economy results from its output of dimension limestone for building purposes. Principal producers during the year were: Bloomington Limestone Co., Bloomington, and Indiana Limestone Co. Output was sold predominantly as sawed and cut stone. A substantial quantity of limestone was crushed and utilized for agricultural purposes, concrete aggregate, road metal, and railroad ballast. Major producer of this commodity was Bloomington Crushed Stone Co., Bloomington. A large percentage of output for dimension purposes was obtained from the Salem formation, while the Harrodsburg limestone was the major source of crushed and broken material.

Limestone was quarried for other uses in 1952. Indiana Calcium Co., Bloomington, crushed mill-scrap limestone for use as a paint filler, and B. G. Hoadley Quarries, Inc., Bloomington, in addition to a very substantial output of dimension stone, sold limestone for chemical use by calcium carbide plants. Many other companies in the area produced limestone riprap.

MONTGOMERY

Miscellaneous clays for use in manufacturing face brick were produced in Montgomery County by Oriental Brick Corp. and Hydraulic Press Brick Co., both of Crawfordsville. Kitts Gravel Co., Crawfordsville, was sole producer of sand and gravel.

MORGAN

Adams Clay Products Co., Martinsville, and Brooklyn Brick Co. and Indiana Drain Tile Co., Inc., both of Brooklyn, ranked among the largest producers of miscellaneous clay in Indiana in 1952. These three organizations mined shale for use in manufacturing brick and drain tile. Building and paving gravel were produced during the year by Hill gravel plant and Kivett Gravel Co., both in Martinsville, as well as by Anderson Gravel Co.

NEWTON

Newton County Stone Co., Inc., Kentland, sole mineral producer in Newton County in 1952, quarried limestone for use as concrete aggregate, road metal, and agricultural stone.

NOBLE

Sylvan O. Shull, Rome City, and Weber & Luther operated calcareous marl pits in Noble County. The latter organization produced this commodity from the Grace E. King, J. C. Roscoe, and John Scoufe properties. A small quantity of miscellaneous clays was produced by Albion tile factory, Albion.

ORANGE

Radcliff & Berry, Inc., Orleans, and Elza Thacker, French Lick, operated pits in the Ste. Genevieve and Paoli limestones. Output of these two organizations was utilized for concrete aggregate, road metal, and agricultural purposes.

OWEN

Dunn Limestone Co., Inc., and The France Stone Co., both of Spencer, operated pits in the Ste. Genevieve limestone for the production of riprap, flux stone, concrete aggregate, road metal, railroad ballast, and agricultural stone. Gosport Gravel Co., Inc., produced building and paving sand and gravel from its pit at Gosport.

PARKE

Clay City Pipe Co., Uhrichsville, Ohio, and S. L. Turner Coal & Clay Co., Brazil, operated pits for the production of fire clay near Mecca and Carbon, respectively, in 1952. The Turner Co. produced its clay for sale, whereas the Clay City Pipe Co. output was for its own use. Butterman Mining Co., Rockville, was the county's major producer of bituminous coal during the year. Western Indiana Gravel Co. operated a pit near Montezuma for producing paving gravel and railroad ballast.

PERRY

Cannelton Sewer Pipe Co., Cannelton, mined fire clay and shale from the No. 1 coal seam underclays for use in the manufacture of tile. U. S. Brick Co., Tell City, produced alluvial clay for use in manufacturing drain tile and common brick. In addition, Lutgring & Sons Stone Co., Tell City, produced crushed and broken limestone for use as riprap, concrete aggregate, road metal, and agricultural stone at its quarry near Branchville. Production was from the Glen Dean limestone formation.

PIKE

Pike County ranked third among Indiana coal-producing areas. Virtually 99 percent of the county's soft-coal production came from the 5 strip-pit operations reporting to the Bureau of Mines. As a result of this high percentage of surface production, the coal mines of Pike County had the second highest production per man per day (18.16 tons) in Indiana. Major producing properties, in order of decreasing output, were: The Enos Coal Mining Co., Enos mine; Ayrshire Collieries Corp., Patoka mine; and Blackfoot Coal & Land Corp., Blackfoot mine, near Kerwin. All of these were strip operations working in the No. 4 and 5 seams.

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PORTER

Washed molding, fire, and furnace sand were produced in Porter County by Crisman Sand Co., Inc., and Portage-Manley Sand Co. These organizations operated pits near Willow Creek and Dune Park, respectively. Charles H. Schrock and J. S. Robbins-McCool reported production of fire clay and miscellaneous material in Porter County during the year.

POSEY

Building and paving sand and gravel was the only nonfuel mineral commodity produced in Posey County in 1952. Producers were Hageman Sand & Gravel Co., Koch Sand & Gravel Co., both of Mount Vernon, and Mumford Farms, Griffin.

PULASKI

Francesville Drain Tile Co. and Medaryville Tile Co., in Francesville and Medaryville, respectively, produced miscellaneous clays for use in manufacturing of tile and brick. Francesville Stone Co., Francesville, quarried dolomite for concrete aggregate, road metal, and agricultural purposes. Sole producer of sand and gravel in Pulaski County in 1952 was Charles C. Engel, Monterey.

PUTNAM

The Lone Star Cement Co. continued to operate its cement plant near Limedale. France Stone Products, Inc., operated quarries in the Ste. Genevieve formation near Greencastle owned by Midwest Rock Products Corp. and Ohio & Indiana Stone Co. Other producers in the vicinity of Greencastle in 1952 included Indiana State Farm and Manhattan Crushed Stone Co. Russelville Stone Co., Russelville, also produced limestone. Major uses of crushed and broken limestone produced during 1952 were for riprap, concrete aggregate, railroad ballast, road metal, and agricultural stone. Substantial tonnages were also utilized in open-hearth furnaces for whiting, fertilizer filler, coal-mine dust, and mineral food. Aside from its limestone output, Indiana State Farm also reported a production of miscellaneous clay for use in manufacturing face brick. Fire clay was produced by Log Cabin Coal Co.

RANDOLPH

H. & R. Stone Co., Ridgeville, produced crushed and broken dolomite for use as concrete aggregate and road metal and for agricultural purposes. George Hutchens and George Bascom recovered pit-run gravel from a pit near Lynn.

RIPLEY

Ripley County Construction Co. quarried limestone at Osgood for use as concrete aggregate, road metal, and riprap and for agricultural purposes. Vern L. Bultman at Versailles produced irregular stone for facing buildings, bridges, and other structures. Output of this material was from the Laurel limestone.

RUSH

McCorkle Stone Co., 4 miles west of Milroy, and Rush County Stone Co., Inc., Moscow, produced dolomite for use as concrete aggregate and road metal and for agricultural purposes. A gravel pit near Rushville was worked during the year by W. P. Wolfal Co.

ST. JOSEPH

Building and paving sand and gravel were produced by South Bend Sand & Gravel Corp., South Bend; and by John G. Yerington, C. D. Smelser Co., Inc., and Concrete Products Corp., all of Mishawaka. Sand and gravel production was also reported by the city engineer of Mishawaka and St. Joseph County Highway Department, South Bend.

SCOTT

Crushed and broken limestone was produced in Scott County by Scott County Stone Co., Inc., Scottsburg. Output was utilized as concrete aggregate and road metal and for agricultural purposes. Operations were conducted on a 70-foot base with ledges up to 96 inches thick. Expanded perlite from material imported from Southwestern States was produced by Airlite Processing Corp., Scottsburg. This material was utilized in the production of lightweight plaster and concrete.

SHELBY

Cave Stone Co., Inc., Flat Rock, and St. Paul Quarries, Inc., produced limestone in Shelby County for concrete aggregate, road metal, and agricultural purposes. Output of building and paving gravel was reported by E. T. Burnside, Shelbyville.

SPENCER

Coal production in Spencer County totaled 43,741 short tons, with an average value of $4.67 per ton. Rockport Brick & Tile Co. produced a small tonnage of alluvial clay for use in the manufacture of tile. Bedford-Nugent Co., Inc., recovered building and paving sand and gravel from its pit at Rockport. Hardy Sand Co. produced molding sand.

STARKE

The Bruce Fletcher paving-gravel pit and the calcareous marl plant of Sylvester Harness were the only mineral industries active in Starke County in 1952.

SULLIVAN

Sullivan County ranked fifth among Indiana coal-producing counties in 1952, with a total output of 1,994,683 tons. Total employment by the coal industry was 1,145 men. Approximately 236 men worked on the surface; 182 of these were employed in the county's 4 strip pits. Major producers in 1952 were Sherwood-Templeton Coal Co., Friar Tuck and Robinhood mines near Linton; Central Indiana Coal Co., Nottingham mine near Midland; and Hickory Grove Coal Mining Co. Minnehaha 6 near Sullivan. Merom Gravel Co. worked its

pit near Riverton and recovered, as its major product, building and paving sand and gravel.

TIPPECANOE

Western Indiana Gravel Co., Lafayette, operated two plants in Tippecanoe County for producing sand and gravel. Output was used for paving and building purposes, as well as railroad ballast.

VANDERBURGH

Standard Brick & Tile Corp. operated two plants near Evansville for the production of face brick. Building and paving sand and gravel were produced from the Ohio River by the Bedford-Nugent Co. dredge and from a pit near Evansville by Koch Sand & Gravel Co.

VERMILLION

Mines and quarries of Vermillion County in 1952 yielded bituminous coal, sand and gravel, and clay. Miscellaneous clays for producing drain tile were mined at Dana by Arketex Ceramic Corp. and at Cayuga by Cayuga Brick & Tile Co. Clay City Pipe Co. (with a pit near Montezuma) and Arketex Ceramic Corp. produced fire clay for manufacturing facing, ceramic glaze, and structural tiles. Neal Gravel Co., Thornton Quarries Corp., and Materials Service Corp. operated sand and gravel pits near Cayuga. Standard Materials Corp. produced this commodity from its operation near Clinton. The output of all these pits was utilized for building and paving material, as well as for railroad ballast. Coal mines in the county yielded 198,525 tons of bituminous coal in 1952 valued at $4.12 per ton.

VIGO

Vigo County was the largest coal-producing area in the State. Output during the year totaled 3,237,891 tons, with an average value of $4.21 a ton. The coal-mining industry employed 2,024 men in 1952, including 1,518 employed underground, 110 in strip pits, and 396 in various surface positions. The mines operated 188 days in 1952, for a total 380,512 man-days worked. The average Vigo County miner produced 8½ tons of coal a day. Major producers in 1952 were: Bledsoe & Co. Dresser mine in West Terre Haute, and Saxton and Viking mines north of Terre Haute; Snow Hill Coal Corp., Talleydale, Green Valley, and Wabash mines northwest of Terre Haute; Maumee Collieries Co. Chieftain No. 20 mine near Keller; and Pyramid Coal Corp. Victory mine near Brazil. In addition to soft coal, the county produced sand and gravel, pyrite, and clay. Shale for building tile was produced during the year by Terre Haute Vitrified Brick Works, Inc., Terre Haute. Snow Hill Coal Corp. produced pyrites as a byproduct of its Talleydale coal mine. Sand and gravel for use as building, paving, and engine material were produced by G. A. Monninger, Terre Haute Gravel Co., Inc., and Wabash Sand & Gravel Co., all of Terre Haute.

WABASH

The sole mineral producer in Wabash County in 1952 was Wabash County Highway Department, which mined sand and gravel for highway use.

WARREN

The only mineral commodities produced in Warren County in 1952 were sand and gravel for building and paving purposes from the Neal Gravel Co. pits near Covington.

WARRICK

Warrick County ranked second to Vigo County in coal output during 1952. Mines of the county yielded 2,742,425 tons of bituminous coal with an average value of $3.80 per ton. Underground mines employed 394 men underground and 415 in various surface positions. Four strip pits active in 1952 employed an additional 209 men. The average production per man per day for all mines was 15.64 tons. Major producers of coal in Warrick County in 1952 were: Sunlight Coal Co. Sunlight No. 11 mine, Boone Township; Tecumseh Coal Corp., Tecumseh mine, Land and Owen Townships; and Ingle Coal Corp. Ditney Hill mine near Elberfeld. All of these except the Ingle Coal slope-mine operation were strip pits. Miscellaneous clay was produced from a pit near Boonville by Boonville Brick & Tile Co.

WAYNE

Building and paving sand and gravel were produced in Wayne County by American Aggregates Corp. and Debolt Gravel Co., both of Richmond; Fisher Gravel Co., Hagerstown; and Kirkpatrick Gravel Co., Cambridge City. The city engineer of Richmond reported a small production of sand and gravel for city use.

WELLS

Erie Stone Co., Bluffton, and Heller Stone Co., Rockford, quarried limestone and dolomite for use as stone sand, agricultural stone, concrete aggregate, and road metal.

WHITE

Monon Crushed Stone Co., Monon, reported an output of crushed and broken limestone for use as concrete aggregate, road metal, railroad ballast, and agricultural purposes. This was the only mineral commodity produced in White County in 1952.

WHITLEY

Whitley County Gravel Co., Inc., produced a substantial quantity of building and paving sand and gravel from a pit near Columbia City.

The Mineral Industry of Iowa

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Iowa.

By Samuel A. Gustavson [1]

MINERALS produced in Iowa in 1952, in order of value, were cement, stone, sand and gravel, coal, gypsum, and clay.

The total mineral production was valued at $52,481,000 in 1952 compared with $47,706,000 in 1951, an increase of 10 percent.

Of the metallic minerals, Iowa mines—chiefly in Dubuque County—have produced a small tonnage of lead and zinc. No production, however, has been recorded since 1917.

Figure 1 shows the total value of the mineral output of Iowa from 1910 through 1952. The data from which the chart was drawn are not adjusted to any dollar index and represent dollar value for the year indicated.

Table 1 shows the production and value of minerals produced in Iowa 1951–52.

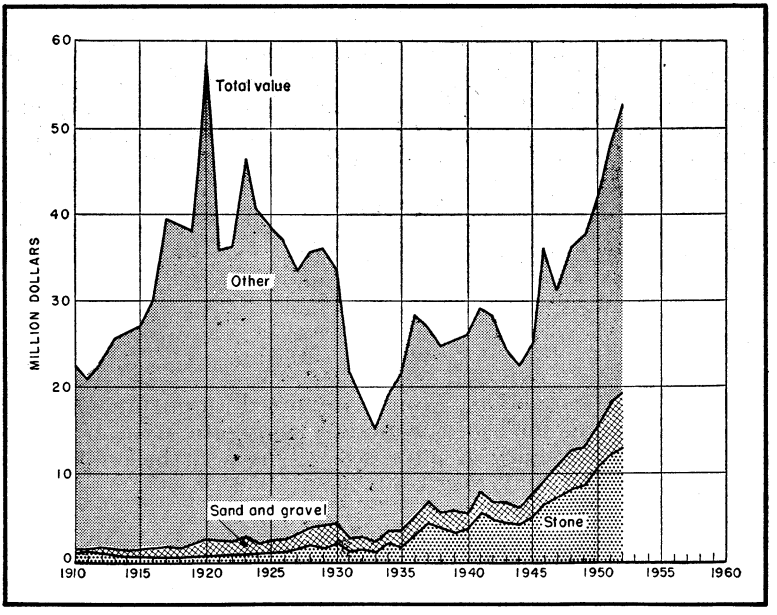

FIGURE 1.—Value of all minerals, sand and gravel, and stone (all types—separate data for stone not available, 1910–18) produced in Iowa, 1910–52.

[1] Chief, Mineral Industry Division, Region V, Bureau of Mines, Minneapolis, Minn.

TABLE 1.—Mineral production in Iowa, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement-----376-pound barrels	8,024,492	$19,800,084	9,336,727	$22,849,597
Clays (except for cement)	576,955	719,785	519,918	2,332,283
Coal	1,630,298	6,109,776	1,380,733	5,297,074
Gypsum (crude)	1,127,705	2,881,150	1,122,409	2,797,704
Peat	13,545	107,909	14,500	110,334
Sand and gravel	9,943,372	5,916,950	10,796,979	6,032,898
Stone (except limestone for cement)	9,261,317	12,170,082	9,899,404	13,036,726
Undistributed				24,750
Total Iowa		47,706,000		52,481,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers) except that fuels and gypsum are strictly production.

REVIEW BY MINERAL COMMODITIES

METALS

Iowa is not now a producer of metals. In past years, however, lead, zinc and iron were produced from mines, chiefly in Dubuque County. Some output or prospects of possible production also has been reported or noted in Allamakee, Clayton, and Jackson Counties. First production of lead was reported to have been in 1788. Production records, however, are incomplete or not available for years earlier than 1907. From 1907 through 1917, in terms of recoverable metals, Iowa mines produced 585 short tons of lead valued at $59,362 and 710 short tons of zinc valued at $77,688. Production was reported in the years 1907 through 1913, 1916, and 1917. There has been no production since 1917. Information concerning lead and zinc operations before 1907 may be found in Federal Geological Survey Bulletin 294, Zinc and Lead Deposits of the Upper Mississippi Valley (pp. 81–148) and Iowa Geological Survey volume VI, Lead and Zinc Deposits of Iowa, by A. G. Leonard, 1896 (66 pp.).

During 1951–52, 83 holes totaling 18,427 feet were drilled on lead-zinc property near Dubuque, Dubuque County, in the Upper Mississippi field under a contract between J. E. and L. M. Miller, Oak Park, Ill., operating under the name Durango Mining Co., and the Defense Minerals Exploration Administration. Drilling began in November 1951 and was completed the following August. The work involved a total expenditure of $29,700. The Government share of the cost was 50 percent or $14,850. A notice of discovery was made on the property on April 27, 1953. As a result of the exploration, lead concentrates containing about 8 tons of lead were produced but not sold. Production will be credited in the year when this material is marketed. On December 8, 1952, a fire destroyed the headframe and hoist at the mine. Mining was resumed on December 18, following repairs.

NONMETALS

Cement.—Shipments of cement by Iowa producers totaled 9,336,700 barrels in 1952, a 16-percent increase over 1951. The average mill value per barrel in 1952 was $2.45. The average value in 1951 was

$2.47. Production in 1952 was only 9,028,350 barrels, resulting in a net reduction of stocks by 308,377 barrels to an inventory of 868,596 barrels on December 31, 1952.

Clays.—Clay production was reported for 19 counties in 1952. Its chief use is in the manufacture of cement or for building brick and vitreous clay pipe and tile. The production of clay for use other than in cement manufacture decreased 10 percent in 1952 from 1951. Production for use in cement increased about 3 percent. In 1952, 25 companies were producing clay for use other than in cement manufacture. The leading 10 were: Mason City Brick & Tile Co., Lehigh Sewer Pipe & Tile Co., Sioux City Brick & Tile Co., Kalo Brick & Tile Co., Sheffield Brick & Tile Co., Rockford Brick & Tile Co., United Brick & Tile Co., Adel Clay Products Co., Des Moines Clay Co., and Redfield Brick & Tile Co.

During 1952 the average value of miscellaneous clays produced in Iowa, excluding those used in cement manufacture, was $4.49 per short ton. This value represents values reported by producers and includes in 1952 a value for some semiprocessed material, which results in a sharp increase over the average used in calculating the value of crude clay for the State in 1951. The average value in 1951 was $1.25; it represented chiefly an estimate for crude clay mined.

In addition to the major uses, some calcined and fine ground clay is sold as mortar mix. Addition of this material to plaster or cement aids in obtaining a very smooth surface finish. Also, some clay was used by the Des Moines Clay Co., What Cheer Clay Products Co., and Adel Clay Products Co. in manufacturing refractory brick.

Mortar mix sold at an average value of $19.87 per ton in 1952, an increase of $2.01 per ton over 1951. The clay used by producers has no established market value, and in order that a valuation for mineral production of the State may be made, clay is estimated at about $1.00 per ton unless a company, when reporting production, includes a sales value for it.

Gypsum.—All production of gypsum in Iowa is centered in Webster County near Fort Dodge. There are gypsum deposits near Centerville in Appanoose County; however, no output has been reported for many years. Tonnage output of crude gypsum in 1952 was 1,122,409 short tons, only slightly less than in 1951. In 1952 there were 4 producing companies, whereas there were 5 in 1951. Several kinds of plaster as well as plasterboard are manufactured in plants adjacent to the mines. See further discussion under Webster County in the section, Review by Counties.

Gypsum producers valued crude gypsum at an average of $2.49 in 1952. The average in 1951 was $2.55 a short ton. Calcined gypsum was valued at $7.46 per short ton in 1952. In 1951 the average value was $7.87.

Sand and Gravel.—Sand and gravel production in Iowa in 1952 exceeded that of 1951 by about 9 percent, and the value increased 2 percent. In total value of primary minerals produced in Iowa, sand and gravel ranked third. Output was reported by commercial producers from 58 of the 99 counties in the State. Noncommercial production by Federal, county, or municipal agencies was reported in 34 counties. The State operated no plants but purchased sand and gravel from contractors.

Table 2 shows the quantity and value of sand and gravel sold and used in Iowa in 1951 and 1952 by use and also gives average values.

The marked increase in production of sand and gravel for building and paving reflects expanded construction of buildings and improvement or replacement of highways. The increased production of gravel for paving, road surfacing, and bridges and culverts, by both commercial and noncommercial producers, accompanied by a decrease in total value, suggests an increased percentage use in this category of unprepared pit-run material as road surfacing and possibly stronger competition for road contracts.

TABLE 2.—Sand and gravel sold or used by producers, 1951–52, by classes of operations and uses

	1951			1952		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Building	1,445,921	$1,155,281	$0.80	1,562,413	$1,274,391	$0.82
Engine	41,006	47,168	1.15	30,117	38,622	1.28
Filter	(1)	(1)	4.44	(1)	(1)	4.29
Grinding and polishing	(1)	(1)	2.18	(1)	(1)	2.30
Molding	(1)	(1)	2.35	(1)	(1)	2.25
Paving [2]	474,178	348,492	.73	812,692	605,829	.75
Railroad ballast	19,884	11,010	.55	19,743	9,582	.49
Undistributed [1]	155,948	397,045	-------	126,135	314,877	-------
Other	167,737	89,402	.53	28,752	32,583	1.13
Total commercial sand	2,304,674	2,048,398	.89	2,579,852	2,275,884	.88
Gravel:						
Building	693,955	994,802	1.43	908,622	1,341,116	1.48
Paving [2]	2,089,910	1,482,671	.71	2,168,638	1,363,509	.63
Railroad ballast	88,318	46,932	.53	151,826	84,780	.56
Other	26,586	38,410	1.44	13,027	59,346	4.56
Total commercial gravel	2,898,769	2,562,815	.88	3,242,113	2,848,751	.88
Total commercial sand and gravel	5,203,443	4,611,213	.89	5,821,965	5,124,635	.88
GOVERNMENT-AND-CONTRACTOR						
Sand:						
Building	410	328	.80	-------	-------	-------
Paving [2]	592,252	243,543	.41	346,021	19,534	.06
Total Government-and-contractor sand	592,662	243,871	.41	346,021	19,534	.06
Gravel: Paving [2]	4,147,267	1,061,866	.26	4,628,993	888,729	.19
Total Government-and-contractor gravel	4,147,267	1,061,866	.26	4,628,993	888,729	.19
Total Government-and-contractor sand and gravel	4,739,929	1,305,737	.28	4,975,014	908,263	.18
ALL OPERATIONS						
Sand	2,897,336	2,292,269	.79	2,925,873	2,295,418	.78
Gravel	7,046,036	3,624,681	.51	7,871,106	3,737,480	.47
Grand total	9,943,372	5,916,950	.60	10,796,979	6,032,898	.56

[1] Bureau of Mines not at liberty to publish. Items under footnote 1 are compiled and shown as "Undistributed."

[2] Paving and road sand and sand used in bridges, culverts, etc.

Of the total commercial production in the State, 15 companies with 20 operations produced nearly 72 percent. One company produced unprepared material, while the others washed, screened, or prepared the material to some degree. Government operations and contractors producing for Government (Federal, State, or local) commonly produce chiefly unprepared sand and gravel. This fact is reflected in a lower unit value. The average value of commercial sand and gravel in 1952 was $0.88 per ton, whereas noncommercial material averaged $0.18 per ton.

The following list gives company name, location of home office and counties operated in, in 1952 for the 15 leading producers:

Producer:	*Production areas (counties)*	*Home office*
Concrete Materials Co.	Clayton, Mahaska, Polk, Woodbury.	Waterloo.
Northern Gravel Co.	Muscatine	Muscatine.
L. G. Everist, Inc.	Sioux	Sioux Falls, S. Dak.
Coon Valley Gravel Co.	Polk	Des Moines.
Concrete Materials Const. Co.	Linn, Marshall	Cedar Rapids.
Automatic Gravel Products Co.	Muscatine	Davenport.
Place Brothers	Greene	Scranton.
Cedar Lake Sand & Gravel Co.	Cerro Gordo	Clear Lake.
Central Sand & Gravel Co.	Johnson	Iowa City.
Peters Construction Co.	Polk	Des Moines.
Maudlin Construction Co.	Hamilton	Webster City.
Beu & Sons Co.	Grundy, Hardin	Grundy Center.
Empire Sand & Materials Co.	Marshall	Marshalltown.
Hahn Brothers Sand & Gravel Co.	Muscatine	Muscatine.
Fred R. McKenzie Co.	Clinton	Galesburg, Ill.

Plants operated ranged in size from 100 to 2,300 tons capacity per day. The operating season ranged from 100 to 330 days and averaged 240 days. The number of persons employed ranged from 3 to 35 and averaged 15. The length of shift was 8 to 11 hours, with a majority working 9 and 10 hours. The average output was 50.4 tons per man-shift and 5.3 tons per man-hour.

Stone.—Limestone formations outcrop in many parts of Iowa, and except for a small quantity of "river boulders" limestone is the only type of stone produced in the State. In 1952 production was reported from 50 counties. The chief uses are as agricultural lime, concrete aggregate, and road metal and in the manufacture of cement, All limestone for use in cement is produced and used by the cement manufacturers. To avoid duplication, the production and value of the limestone used in the manufacture of cement are excluded from tables listing data on limestone.

Tables 3 and 4 contain salient statistics on limestone.

Producers of limestone for road surfacing usually employ portable crushing plants and move to the source closest to the work at hand. Some companies operating 2 or 3 portable plants may operate in as many as 30 or 40 different quarries in a single year. Operators

normally contract with the land owner for limestone on a basis of payment for stone removed at a tonnage by cubic yard rate. Only quarries in key locations are held longer than needed for a particular project.

Dimension stone is produced from quarries in Hardin, Linn, and Scott Counties. Production is not large, and the market area is chiefly within the eastern portion of the State.

TABLE 3.—Production of dimension limestone, 1951–52, by types

Year	Building stone				Curbing and flagging		Total	
	Rough construction and rubble		Dressed (cut)		Cubic feet	Value	Short tons (approximate)	Value
	Short tons	Value	Cubic feet	Value				
1951	2,000	$5,350	5,880	$15,000	23,525	$7,350	4,499	$27,700
1952	6,952	22,887	2,650	8,000	3,000	2,000	7,432	32,887

TABLE 4.—Limestone sold or used by producers, by uses in Iowa, 1951–52

[Exclusive of limestone used in the manufacture of cement]

	1951		1952	
	Short tons	Value	Short tons	Value
Commercial:				
Agricultural	1,568,222	$2,235,474	1,760,676	$2,496,307
Dimension	4,499	27,700	7,432	32,887
Railroad ballast	4,000	4,500	3,500	5,250
Riprap	109,921	157,550	121,789	176,654
Road metal and concrete aggregate	6,328,477	8,064,610	[1] 6,771,687	[1] 8,614,538
Other (blast furnace flux, filter beds, fertilizer filler, mineral food, railroad ballast)	106,172	495,538	81,435	440,381
Total commercial	8,121,291	10,985,372	8,746,519	[1] 11,766,017
Noncommercial, all uses (concrete aggregate, road metal and riprap)	1,140,026	1,184,710	1,152,885	1,270,709
Total commercial and noncommercial	9,261,317	12,170,082	9,899,404	[1] 13,036,726

[1] Includes small tonnage of crushed rock.

The 10 leading commercial producers of limestone, in order of rank by value of production in 1952, were: Concrete Materials Construction Co., Cedar Rapids; B. L. Anderson, Cedar Rapids; Beu & Sons Co., Grundy Center; Kaser Construction Co., West Des Moines; Missouri Valley Limestone Co., Des Moines; E. F. Schildberg, Greenfield; Iowa Limestone Co., Des Moines; River Products Co., Iowa City; Sargent Bros., Inc., Des Moines; and Dubuque Stone Products Co., Dubuque.

MINERAL FUELS

Coal.—Bituminous coal was produced from mines in 14 Iowa counties. Of these, 12 counties had mines with an annual output of 1,000 tons or more in 1952. The production of coal from mines yielding over 1,000 tons in 1952 was 1,380,733 tons valued at

TABLE 5.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous coal mines in Iowa, 1952, by counties

[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 worked	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				
Appanoose	33,353	86,936	10,460	130,749	$5.26	266	----------	33	299	171	51,276	2.55
Boone	----------	6,196	9,233	15,429	6.11	29	----------	8	37	122	4,532	3.40
Davis	42,853	52,254	410	95,517	3.44	15	15	10	40	208	8,335	11.46
Jasper	----------	7,800	----------	7,800	4.65	----------	3	2	5	264	1,320	5.91
Lucas	6,559	10,994	353	17,906	5.50	33	----------	9	42	115	4,824	3.71
Mahaska	60,151	40,565	32	100,748	3.30	13	38	10	61	207	12,654	7.96
Marion	448,813	265,589	3,920	718,322	3.53	87	114	72	273	243	66,235	10.85
Monroe	89,699	53,308	3,086	146,093	4.20	133	5	24	162	193	31,327	4.66
Page	----------	2,412	----------	2,412	8.04	14	----------	1	15	80	1,200	2.01
Van Buren	3,531	42,911	----------	46,442	4.02	12	20	14	46	167	7,702	6.03
Wapello	46,955	45,009	50	92,014	3.62	12	31	12	55	247	13,560	6.79
Warren	----------	7,301	----------	7,301	4.66	9	----------	2	11	205	2,251	3.24
Total Iowa	731,914	621,275	27,544	1,380,733	3.84	623	226	197	1,046	196	205,216	6.73

[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, coal transported to point of use by conveyor or tram, coal 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 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 mechanicl loading underground.

$5,297,074, a decrease of 15 and 13 percent in tonnage and value, respectively, from that of 1951. The general trend of coal production in the State has been downward since the peak production year 1917. Coal reserves have been estimated at 14,236,838,000 tons, as of January 1, 1950.[2] All reserves are of bituminous coal. The data in the present report, as in those published for many years by the Bureau of Mines, relate only to bituminous and lignite 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.

Iowa is the only State where the longwall method is used in mining coal. This method is employed in underground mines in Appanoose, Page, and Wayne Counties.

Peat.—Peat deposits exist in several counties in Iowa, but production for several years has been reported by only two companies operating in Worth County—the Colby Pioneer Peat Co. and the Eli F. Colby Co. Both companies are at Hanlontown, Iowa, and are operated by brothers.

Peat is sold for use chiefly as a soil conditioner. The companies class their products as "Black Cultivated Peat" and "Hypnum Peat Moss." Both products have an acidity value of pH 6.5–7.0, or nearly neutral. Sphagnum peat produced in Minnesota and Wisconsin is more acidic, with a pH of 3–4. This higher acid content also applies to most peats imported from Europe.

Both producers in Iowa sell their product in various sizes of containers or in bulk. Price quoted f.o.b. Hanlontown, in bulk carlots or trucklots, is $3.25 per cubic yard. Bulk-milled Black Cultivated Peat will weigh about 800 to 825 pounds per cubic yard and Hypnum Peat Moss about 700 to 725 pounds per cubic yard, depending on moisture content.

Petroleum and Natural Gas.—There was no production of petroleum or natural gas in Iowa.

REVIEW BY COUNTIES

ADAIR

Limestone was produced in the county by E. F. Schildberg, Greenfield.

ADAMS

Missouri Valley Limestone Co. produced limestone, chiefly for road metal.

ALLAMAKEE

Roverud Construction Co., Spring Grove, Minn., and H. L. Leas, Monona, produced limestone from quarries in the county for use in road construction.

[2] Averitt, Paul, and Berryhill, Louise R., Coal Resources of the United States, a Progress Report Geol. Survey Circ. 94, Nov. 1, 1950, 33 pp.

APPANOOSE

Minerals produced in Appanoose County include clay (chiefly for vitreous tile and brick), limestone, and coal. Total value of mineral production for 1952 was $1,244,989, an increase of 41 percent over 1951.

Iowa Clay Products Co. was the only producer of clay.

L & W Construction Co., Porter & Magnall Construction Co., and Appanoose County Highway Department, all at Centerville, produced limestone.

Coal in this county and in Page and Wayne Counties is mined by the longwall mining system. This system requires little or no explosives. The area is the only one in the United States known to be using this mining method.

TABLE 6.—Value of mineral production in Iowa, by counties, 1951–52

County	1951	1952	Minerals produced, in order of value
Allamakee	$116,138	$103,704	Stone.
Appanoose	885,892	1,244,989	Coal, stone, clay.
Benton	42,841	133,004	Stone, clay.
Black Hawk	2,828,210	612,257	Stone, sand and gravel.
Boone	137,165	120,714	Coal, sand and gravel.
Bremer	38,000	67,556	Stone, sand and gravel.
Buena Vista	40,740	17,843	Sand and gravel.
Butler	164,083	261,476	Stone, sand and gravel.
Calhoun	26,563	17,408	Sand and gravel.
Carroll	34,634	58,956	Do.
Cedar	197,779	704	Stone.
Cerro Gordo	9,116,692	11,715,706	Cement, clay, sand and gravel, stone.
Cherokee	105,348	110,700	Sand and gravel.
Chickasaw	13,870	24,827	Stone (1952), sand and gravel (1951).
Clarke	3,324	----------	Stone.
Clinton	502,618	466,338	Stone, sand and gravel.
Crawford	33,607	----------	Sand and gravel.
Dallas	115,038	92,875	Clay, sand and gravel.
Davis	303,205	328,379	Coal.
Decatur	270,688	574,017	Stone.
Delaware	110,238	100,000	Stone, sand and gravel (1951).
Dubuque	444,853	869,204	Stone, sand and gravel (1952).
Emmet	68,241	22,787	Sand and gravel.
Fayette	51,544	234,928	Stone, sand and gravel (1952).
Floyd	198,424	607,561	Clay, stone, sand and gravel.
Franklin	99,006	81,517	Sand and gravel, clay, stone (1951).
Greene	139,976	249,785	Sand and gravel, coal (1951).
Grundy	93,519	74,388	Sand and gravel, stone.
Guthrie	(1)	----------	Coal.
Hancock	16,000	27,521	Sand and gravel.
Hardin	957,664	1,748,114	Stone, sand and gravel
Harrison	106,895	14,036	Sand and gravel.
Howard	24,500	20,589	Sand and gravel, stone (1951).
Jefferson	----------	20,047	Stone.
Johnson	484,456	629,408	Stone, sand and gravel.
Jones	38,495	40,393	Sand and gravel.
Keokuk	610,502	733,154	Stone, clay.
Kossuth	114,328	77,385	Sand and gravel.
Lee	270,450	361,956	Stone, lime.
Linn	1,140,231	503,257	Stone, sand and gravel.
Louisa	90,730	438,458	Stone.
Lucas	132,201	98,423	Coal.
Lyon	40,983	108,856	Sand and gravel.
Madison	124,950	275,518	Stone.
Mahaska	851,468	968,524	Sand and gravel, coal, stone, clay.
Marion	3,301,458	3,070,803	Coal, stone, sand and gravel.
Mitchell	212,659	285,815	Stone, sand and gravel.
Monona	15,998	10,554	Sand and gravel.
Monroe	571,949	613,220	Coal, stone (1951).
Montgomery	----------	(1)	Stone.
Muscatine	526,809	608,022	Sand and gravel, stone.
O'Brien	26,000	19,286	Sand and gravel.
Osceola	12,889	4,994	Do.
Page	45,926	19,380	Coal.
Pocahontas	309,907	321,320	Stone, sand and gravel.
Polk	7,542,905	8,567,535	Cement, sand and gravel, clay.
Sac	66,600	66,560	Sand and gravel.
Scott	5,404,758	5,849,193	Cement, stone, sand and gravel.

[1] Included with "Undistributed."

TABLE 6.—Value of mineral production in Iowa, by counties, 1951–52—Con.

County	1951	1952	Minerals produced, in order of value
Story	$266,900	$363,035	Stone, sand and gravel, clay.
Tama	180,641	252,863	Stone, sand and gravel.
Union	54,854	20,773	Sand and gravel, stone.
Van Buren	480,308	424,267	Stone, coal, sand and gravel.
Wapello	499,622	485,247	Coal, stone, clay, sand and gravel.
Warren	56,752	43,602	Coal, clay.
Washington	58,637		Stone.
Webster	3,352,109	3,222,425	Gypsum, stone, clay, sand and gravel.
Winnebago	66,146	61,657	Sand and gravel.
Winneshiek	74,876	92,266	Stone, sand and gravel.
Woodbury	285,156	230,953	Sand and gravel, clay.
Wright	28,250	54,078	Sand and gravel.
Undistributed	[2] 3,077,538	3,536,256	
Total	47,705,736	52,481,366	

[2] Includes value of mineral production and principal minerals produced as indicated in footnote 1 and in the following counties: Adair (stone); Adams (stone, 1952 only); Audubon (sand and gravel, 1952 only; clay); Buchanan (stone); Clay (sand and gravel; stone, 1952 only); Clayton (sand and gravel, stone); Des Moines (stone); Fremont (sand and gravel); Hamilton (sand and gravel); Henry (stone, clay); Humboldt (sand and gravel); Jasper (coal); Marshall (sand and gravel); Mills (stone); Palo Alto (sand and gravel; stone, 1951 only); Plymouth (stone, 1952 only; sand and gravel); Pottawattamie (stone); Sioux (sand and gravel, 1952 only); and Worth (peat, stone).

The following companies or mines produced coal in 1952: Battle Creek Coal Co., Blue Flame Coal Co., Clarke Coal Co., D. C. Coal Co., Dennis mine, Fenton Coal Co., K & K Coal Co., Long Branch Coal Co., Monitor Coal Co., New Block Coal Co., New Diamond, New Gladstone, New Relay Coal Co., Old King Coal Co., Ragona Coal Co., Raskie Coal Co., Riverside Coal Co., Shamrock Coal Co., Sunshine Coal Co. No. 3, and Sunshine Coal Co. No 4. Of these, the Dennis mine at Bloomfield was a strip operation. All others were underground mines in which the longwall method was used.

AUDUBON

Clay was produced by the Roxy Clay Works and sand and gravel by the Audubon County Highway Department.

BENTON

Clay was produced by Garrison Brick & Tile Works, and limestone by Vinton Lime & Rock Co. at Vinton and the Benton County Highway Department.

BLACK HAWK

Limestone was produced by Pint Soft Lime Products Co., Raymond, and Waterloo Dredging Co., Waterloo. Sand and gravel were produced by Jay B. Bagenstos & Son of Laporte City, Martin & Earl Hanson of Waterloo, B. L. Larson & Son of Cedar Falls, and G. W. Smirey Co. of Waterloo.

BOONE

Sand and gravel and some coal were produced in this county; producers of sand and gravel were: Chicago & Northwestern Railroad, Dan Leininger, Boone; and William Mills, Madrid. Producers of coal were the Jensen Coal Co., Boone; and the Ogden Superior Coal Co., Ogden.

BREMER

Limestone was produced by the Schield Soft Lime Quarry at Waverly. Sand and gravel were produced by Reisner Sand & Gravel Co. at Summer and the Bremer County Highway Department at Waverly.

BUCHANAN

Limestone was produced by E. F. Patton of Independence.

BUENA VISTA

The only mineral production noted in the county was sand and gravel by the county highway department.

BUTLER

Mineral products were limestone and sand and gravel. Limestone producers were: Greene Limestone Co., Greene, and Neymeyer Lime Co., Aplington. Sand and gravel producers were Meyer and Muller, Aplington; Waverly Gravel & Tile Co., Shell Rock; and Chas. Willeke & Sons, Aplington.

CALHOUN

Sand and gravel were produced by the Calhoun County Highway Department.

CARROLL

Sand and gravel were produced by Lloyd Otto and Frank Tigges, both of Carroll, and the Carroll County Highway Department.

CEDAR

Limestone was produced by the Cedar County Highway Department.

CERRO GORDO

Cerro Gordo County produces cement, clay, sand and gravel, and limestone. The county has 2 cement plants, 1 operated by Lehigh Portland Cement Co. and the other by Northwestern States Portland Cement Co.; both are at Mason City. Material used in cement manufacture is not included in the total value of mineral production for the State. Companies used clay or shale, limestone, and some gypsum, iron ore, and other materials. The value used is the value of total barrels of finished cement shipped.

Heavy clay products are produced by the Mason City Brick & Tile Co.

Limestone was produced in the county by the Ideal Sand & Gravel Co., Inc., of Mason City; Frank H. Norberg Co. of Denver, Colo.; and R. W. Phillips of Hampton.

Sand and gravel were produced by the Clear Lake Sand & Gravel Co. of Clear Lake, Green Limestone Co. of Greene, the Ideal Sand & Gravel Co. of Mason City, and the Cerro Gordo County Highway Department.

CHEROKEE

Sand and gravel were the only minerals produced in Cherokee County. The producers were Multman & Son of Meriden and Shea Sand & Gravel Co. of Cherokee. The Cherokee County Highway Department also reported production.

CHICKASAW

Limestone was produced by the county highway department.

CLAY

Clay County Highway Department produced limestone and sand and gravel for highway work. Sand and gravel and stone were produced by the Stolley Sand & Gravel Co. of Spencer.

CLAYTON

H. L. Leas of Monona operated various limestone quarries in the county. Concrete Materials Co., Waterloo, produced sand and gravel.

CLINTON

Nichols & Schrader at Charlotte, the county highway department, and the city of Clinton produced limestone or sand and gravel, chiefly for road use. Fred R. McKenzie & Co. of Galesburg, Ill., produced sand and gravel for use in building and road construction and a considerable quantity of engine sand.

DALLAS

Clay, chiefly for heavy clay products, was produced by Adel Clay Products Co., United Brick & Tile Co., and Redfield Brick & Tile Co. Some clay was used in manufacturing refractories.

Sand and gravel were produced by the county highway department.

DAVIS

Coal was the only mineral reported for the county in 1952. Producers were: Big 4 Coal Co. and Davis County Coal Co. of Ottumwa, Haines Coal Co. of Elbon, Shute & Lewis (Green Ridge Fuel Co.) and South Iowa Coal Co. of Bloomfield and Tillotson Coal Co. of Des Moines.

DECATUR

Limestone production was reported by the Grand River Limestone Co. of Grand River and Sargent Bros., Inc., of Des Moines.

DELAWARE

The county highway department reported production of limestone.

DES MOINES

Limestone was produced by the J. T. Leonhard Construction Co. at Columbus Junction.

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DUBUQUE

Limestone, chiefly for highway purposes, was produced by Dubuque Stone Products Co. of Dubuque, V. E. Dzaboff of Cascade, and Dubuque County Highway Department. Dyersville Sand & Gravel Co. of Dyersville produced sand and gravel for building and road construction, and limestone for highway and agricultural purposes.

EMMETT

Sand and gravel, chiefly ballast for railroads, were produced by Chicago, Rock Island & Pacific Railroad and Minneapolis & St. Louis Railroad. The Emmett County Highway Department produced sand and gravel for road construction.

FAYETTE

Limestone was produced by the Fayette Stone Co. and Fayette County Highway Department, and sand and gravel were produced by Oelwein Sand & Gravel Co. at Oelwein.

FLOYD

Minerals produced in Floyd County were clay, limestone, and sand and gravel. Clay was produced by the Rockford Brick & Tile Co. and sand and gravel or limestone by Ed Becker and the county highway department of Charles City.

FRANKLIN

Heavy clay products were produced by Sheffield Brick & Tile Co. and sand and gravel by Louis C. Toft at Dows and the Franklin County Highway Department at Hampton.

FREMONT

Some limestone was produced by Fred Wenke of Thurman.

GREENE

Sand and gravel were produced by Minneapolis & St. Louis Railroad at Greene and Place Bros. and N. W. Pound at Scranton.

Some coal was produced in 1951, but none was reported in 1952.

GRUNDY

Rieken Limestone Co. at Ackley produced limestone. Ben Ankes of Wellsburg and Beu & Sons Co. of Grundy Center reported production of sand and gravel.

HAMILTON

Sand and gravel were produced by Litchfield Realty Co. of Des Moines and Maudlin Construction Co. of Webster City.

HANCOCK

Sand and gravel were produced by the county highway department.

HARDIN

Limestone and/or sand and gravel were produced by the following companies: Beu & Sons Co. of Grundy Center, Clary Concrete Materials Co. of Eldora, Iowa Falls Sand & Gravel Co. of Iowa Falls, Iowa Limestone Co. of Des Moines, and Weaver Construction Co. of Iowa Falls.

HARRISON

The only production from Harrison County was sand and gravel reported by the county highway department.

HENRY

Winfield Brick & Tile Co. produced heavy clay products. The county highway department produced limestone for road construction.

HOWARD

Production of sand and gravel was reported by George Frana at Lime Springs, Ed Kubik at Elma, and the Howard County Highway Department.

HUMBOLDT

Sand and gravel for use in road construction were produced by the Iowa Sand & Gravel Co. at Humboldt and the Humboldt County Highway Department at Dakota City.

JASPER

Coal was produced by the Hopkins Coal Co. at Colfax. The mine is an open-pit stripping operation.

JEFFERSON

The county highway department reported production of limestone.

JOHNSON

Rivers Products Co., Iowa City, produced limestone, and the Central Sand & Gravel Co. produced sand and gravel.

JONES

Sand and gravel production was reported by the county highway department and by Reichart Sand & Gravel Co. of Monticello.

KEOKUK

John Nelson & Sons and What Cheer Clay Products Co. reported production of heavy clay products. What Cheer Clay Products Co. also used some clay in manufacturing refractory brick. Kaser Construction Co. produced limestone.

KOSSUTH

Sand and gravel were produced by the county highway department.

LEE

Limestone chiefly for road use was produced by Raid Brothers Construction Co. and the county highway department. Edward H. Groene produced hydrated lime for agricultural use. He was Iowa's only producer of hydrated lime in 1952.

LINN

Limestone production was reported by L. Crawford Lime-Quarry Co., Cedar Rapids; C. B. Dewees, Marion; the county highway department; and B. L. Anderson, Cedar Rapids.

Sand and gravel and limestone production was reported by the Concrete Materials & Construction Co., and sand and gravel only by Kings Crown Plaster Co.

LOUISA

The county highway department reported production of limestone. Limestone, chiefly for road purposes or railroad ballast, was produced by Dillion Stone Co. and Louisa County Lime Products Co. The latter company also produced lime for agricultural purposes.

LUCAS

Coal production was reported by the Chariton Coal Co. and the Powell Coal Co., both at Chariton, and Ritchey Coal Co. of Melrose.

LYON

Sand and gravel were produced by Rock Valley Cement Block Co. Rock Valley, and Lyon County Highway Department at Rock Rapids.

MADISON

Sargent Brothers, Inc., at Des Moines produced limestone for use as riprap, road metal, concrete, railroad ballast, and agricultural purposes.

MAHASKA

Mineral products in 1952 include clay, coal, limestone, and sand and gravel. Heavy clay products were produced by Oskaloosa Clay Products Co. Limestone was produced by the county highway department and sand and gravel by the Concrete Materials Co., Waterloo, and E. Groenendyk Sand & Gravel Co., Mahaska.

Coal, chiefly from stripping operations, was produced by the following companies or mines: Angus Coal Co., Edwards Coal Co., Given Coal Co., Kemp Coal Co., Memmelarr & Ludwick, Mitch & Lewis, Patik, and Prothers, all of Oskaloosa; Carbon Hill Coal Co., and Star, of Pella; and Spring Creek, of University Park.

MARION

Limestone was produced chiefly for concrete or road material by Hess & Lynch Rock Materials Co., Knoxville; Kibbey Limestone Co., Carlisle; and McCabe Lime Quarry, Knoxville.

Sand and gravel were produced by the Pella Construction Co., Pella.

Of the several coal-producing counties in Iowa, Marion County produces the most. Twenty-six companies or mine operations produced coal during 1952. About half of them were operated as open-pit strip mines, and half were underground room-and-pillar mines. Companies or mines producing in 1952 were: Ver-Steeg Coal Co., Beard, Big Ben, Husted Bros., Liberty Coal & Mining Co.—No. 1 and No. 2, Liter, Anderson-Versteeg, Mesecher, Pershing Fuel, and Vanceunebrock, all of Knoxville; Denicola, of Oskaloosa; Cedar Creek and Kraber & Ballatack, of Lovilia; Ellis Coal Co., Kirkville; Loel Riggen and Weldon, Harvey; Jude Coal Co. and Lovilia No. 3, Bussey; C. N. Knox, Hamilton; Newton, and Monroe Block, Pella; Moon & Son, Attica; New Standard Construction and Twin City, Dallas; and Ruby Coal Co., Otley.

MARSHALL

Sand and gravel were produced by the Concrete Materials & Construction Co. at Cedar Rapids and the Empire Sand & Material Co. at Marshall.

MILLS

Limestone chiefly for construction and road purposes was produced at Thurman by Jack Stanley. He also sold a small quantity of limestone for agricultural purposes.

MITCHELL

L. R. Falk, St. Ansgar, and Grupp Bros. Lime Products Co., Mason City, produced limestone for construction and agricultural purposes. Sand and gravel were produced by Lawrence H. Decklever, Osage; L. R. Falk, St. Ansgar; and Irwin C. Wheeler, Riceville.

MONONA

Sand and gravel for road purposes were produced by the county highway department.

MONROE

Coal was produced by the following companies or mines, chiefly by underground room-and-pillar method: Acme, at Lovilia; Avery No. 3 and Story & Smith, at Avery; Karpan, Maple, O'Brien, Union, and White Oak, at Albia; Lovilia No. 2, at Bussey; and Sylian Oleson, at Forest City.

MONTGOMERY

Missouri Valley Limestone Co., Des Moines, produced limestone for road purposes.

MUSCATINE

The county highway department reported production of limestone and Automatic Gravel Products Co., Davenport, and Hann Brothers Sand & Gravel Co. and Northern Gravel Co., Muscatine, reported production of sand and gravel.

O'BRIEN

Sand and gravel were produced by the county highway department.

OSCEOLA

Sand and gravel were produced by the Osceola County Highway Department.

PAGE

Coal was reported produced at the McKinley mine (Pearson), at Villisca, by the longwall mining method.

PALO ALTO

Sand and gravel production was reported by Bauck Construction Co., Emmetsburg, and also by the Palo Alto County Highway Department.

PLYMOUTH

Fort Dodge Limestone Co. produced limestone for concrete and road material and a small quantity for agricultural purposes. The county highway department produced sand and gravel.

POCAHONTAS

Midwest Limestone Co., Gilmore City, produced limestone for agricultural and road purposes. The county highway department produced sand and gravel.

POLK

The mineral products of Polk County include cement, clay, and sand and gravel. Hawkeye Portland Cement Co. of Iowa, a subsidiary of Marquette Manufacturing Co., and the Penn Dixie Cement Corp. have cement plants, the first in Des Moines and the latter in West Des Moines.

Producers of heavy clay products, brick, vitreous clay pipe, and tile include Goodwin Tile & Brick Co., Des Moines Clay Co., Iowa Pipe & Tile Co., and United Brick & Tile Co.

Sand and gravel producers in the county include I. J. Bishop, Runnels; Concrete Materials Co., Waterloo; Coon Valley Gravel Co. and Peters Construction Co., Des Moines; J. W. Lehman, Sheldahl; and West Des Moines Sand Co., West Des Moines.

POTTAWATTAMIE

Missouri Valley Limestone Co., Des Moines, produced limestone, chiefly for concrete aggregate or road purposes and a small quantity of lime for agricultural use.

SAC

The county highway department reported production of sand and gravel.

SCOTT

Dewey Portland Cement Co., Kansas City, operates a cement plant at Davenport. The company also produces limestone. Other

limestone producers in the county include LeClaire Quarries, Inc., LeClaire, and Rollie Schneckloth, McCausland. Builders Sand & Gravel Co., Davenport, produced building sand.

SIOUX

L. G. Everist, Inc., Sioux Falls, S. Dak., produced some sand and gravel in the county.

STORY

Nevada Brick & Tile Co. produced heavy clay products. Ray Cook, of Ames, produced limestone for road and agricultural use. Cook Construction Co. produced sand and gravel.

TAMA

Limestone was produced for agricultural and road purposes by Joseph Wenke of Toledo. Chicago Northwestern Railroad, Tama and Flint Crushed Gravel Co., Des Moines, produced sand and gravel.

UNION

Union County Highway Department produced limestone and sand and gravel for road purposes.

VAN BUREN

Douds Stone, Inc., operated an underground limestone quarry. Valley Limestone Gravel, Inc., Farmington, produced limestone and sand and gravel. The county highway department produced limestone. Coal production was reported by Hamlin Bros., Bonaparte; Laddsdale, Eldon; and Wiley & Morrow, Douds, from opencut stripping operations, and the New Globe mine was operated by an underground room-and-pillar method.

WAPELLO

Wapello County had production of clay, limestone, sand and gravel, and coal. The Ottumwa Brick & Tile Co. produced heavy clay products. Wapello Stone Quarries produced limestone for concrete aggregate, road construction, and agricultural use. The city of Ottumwa reported production of sand and gravel. Coal was produced by four strip-mining operations. Mines producing were the Engness, Lanning, Munterville, and New Black Diamond.

WARREN

Carlisle Brick & Tile Co. produced heavy clay products, and the S & R Coal Co. operated an underground coal mine using the room-and-pillar method.

WEBSTER

Gypsum is the chief mineral commodity produced in Webster County. During 1952, 4 firms were producing and processing crude gypsum, and 1 firm was processing only. U. S. Gypsum Co. was the largest producer, followed by the National Gypsum Co., Certain-Teed

Products Corp., Celotex Corp., and Otto Wasem. Wasem only processed gypsum, buying the crude material used from U. S. Gypsum Co. He operated the plant formerly owned by the Cardiff Gypsum Products Co. from January to November 1952, when all activity ceased. All plants use natural gas for calcining and have standby LP-gas for emergency use. U. S. Gypsum Co., National Gypsum Co., and Certain-Teed Products Corp. have plants for manufacturing gypsum board. All make a variety of types and grades of plaster. U. S. Gypsum Co. operated a perlite expansion plant for the manufacture of lightweight plaster mixes.

Clay, third in rank of value of mineral commodities in the county, chiefly for manufacture of brick and vitreous clay pipe and tile, is produced in the county by Johnston Clay Works, Inc., and Vincent Clay Products Co., both in or near Fort Dodge; Kalo Brick & Tile Co., with mine at Coalville and plant at Otho; and Lehigh Sewer Pipe & Tile Co., at Lehigh.

Crushed limestone, chiefly for use in road construction, is the second-ranking mineral of the county in value and sand and gravel fourth. Fort Dodge Limestone Co., Fort Dodge, was the chief producer of limestone. Sand and gravel were produced by the Fort Dodge Sand & Gravel Co., Fort Dodge, Casey Estate, Lehigh, and the county highway department.

WINNEBAGO

Sand and gravel were produced by the county highway department.

WINNESHIEK

Bruening Rock Products, Inc., at Decorah, produced limestone for agricultural use. The county highway department produced limestone and sand and gravel for road purposes, and Carlson Materials Co., Inc., produced sand and gravel.

WOODBURY

Sioux City Brick & Tile Co. and Ballon Brick Co. produced heavy clay products. Chicago, St. Paul, Minneapolis & Omaha Railroad, Woodbury, and Concrete Materials Co., Waterloo, produced sand and gravel.

WORTH

Limestone Products Co., Fertile, produced limestone and crushed rock for agricultural and road use. Peat was produced by the Colby Pioneer Peat Co. and the Eli Colby Co., both of Hanlontown.

WRIGHT

Sand and gravel were produced by Oscar Nelson, at Belmond, and the Wright County Highway Department, at Clarion.

No mineral production was recorded for other counties.

The Mineral Industry of Kansas

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the State Geological Survey of Kansas.

By F. F. Netzeband [1] and Walter H. Schoewe [2]

KANSAS, the 13th largest State, with an area of 82,276 square miles, was the 8th ranking State in the production of mineral wealth in 1952. Mineral production in Kansas in 1952 amounted to $403,370,000 (table 1). Twenty-one minerals are produced annually in Kansas; five others are available but currently are not exploited. Table 1 shows mineral production of Kansas, 1951–52.

TABLE 1.—Mineral production in Kansas, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement [2]—376-pound barrels	8,163,916	$19,413,144	8,811,762	$20,956,886
Clays (except for cement)	373,365	370,326	349,418	473,129
Coal	1,961,101	7,734,478	2,028,601	7,902,590
Helium (shipments)—cubic feet	26,280,000	327,000	38,509,000	491,000
Lead (recoverable content of ores, etc.)	8,947	3,095,662	5,916	1,904,952
Natural gas—thousand cubic feet	417,538,000	33,821,000	412,544,000	34,241,000
Natural-gas liquids:				
Natural gasoline—42-gallon barrels	2,645,000	6,931,000	2,743,000	7,286,000
LP-gases—do	1,621,000	2,445,000	1,843,000	3,116,000
Petroleum (crude)—do	114,522,000	294,320,000	[3] 114,807,000	[3] 293,910,000
Salt (common)	900,917	6,639,343	911,744	6,850,027
Sand and gravel	7,676,888	4,747,544	8,380,065	5,023,593
Stone (except limestone for cement)	7,191,483	9,058,512	8,830,871	12,051,740
Zinc (recoverable content of ores, etc.)	28,904	10,521,056	25,482	8,460,024
Undistributed: Natural cement, gypsum, and pumicite	----------	662,541	----------	703,011
Total Kansas	----------	400,087,000	----------	403,370,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels and gypsum are strictly production.
[2] Excludes natural cement, value for which is included with "Undistributed."
[3] Final figure. Supersedes preliminary figure given in commodity chapter.

Metal mining (zinc and lead) was confined to Cherokee County in southeastern Kansas, whereas nonmetallic minerals were produced from localities throughout the entire State. The zinc and lead ores, largely in the form of sphalerite and galena, were mined 150 to 400 feet beneath the surface and occurred mainly in the Keokuk and Reeds Spring limestones and cherts of the Osagian series and, to a smaller degree, in the Warsaw limestone of the Meramecian series of the Mississippian age.

In 1952 oil and gas were produced in 78 Kansas counties. Oil was produced in 1,074 fields in 73 counties; natural gas was derived from

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70 fields in 55 counties. Ninety-two percent of the total State natural-gas output came from the Hugoton field, the world's largest gas-producing area, comprised of Finney, Grant, Hamilton, Haskell, Kearny, Morton, Seward, Stanton, and Stevens Counties. During 1952, 157 oil and 9 gas pools were discovered and 8 previously abandoned oil or gas pools were revived. Gas, crude-oil, and products pipeline mileages increased in 1952 from those reported in 1949.[3] Oil, gas, and related hydrocarbon commodities produced in 1952 supplied over 86 percent of the total State mineral value.

CONSUMPTION AND MARKETS

Growing population trends in the past few years in Kansas—the result of increased activity of established industries and new industries locating in the State—created additional markets for many Kansas mineral commodities. Many of the State's minerals were processed or consumed by local industries, such as oil refineries, sand and gravel producers, stone producers, clay-products manufacturers, a lead smelter, and two zinc-pigment plants, as well as the numerous manufacturing industries using natural gas as a fuel. However, Kansas mineral production was greater than State demand, so a large part was shipped out of the State for consumption elsewhere.

TRENDS AND DEVELOPMENTS[4]

During 1952 there was extensive expansion in the Kansas oil industry. The Derby refinery at Wichita completed a $2,000,000 expansion program, which included addition of a Thermofor catalytic cracking unit, a catalytic polymerization unit, and a gas-concentration unit that doubled the capacity to 15,000 barrels of crude daily. Likewise the Standard Oil Co. refinery at Neodesha started expansion by constructing a large catalytic cracking unit. The cracking unit and still of the Arkansas City refinery of the Kanotex Refining Co. were converted to use steam in place of the previous fuel. The company also added auxiliary equipment, including an air blower, capable of supplying 15,000 cubic feet of air per minute, for regenerating the catalyst; a product-fractioning tower; a waste-heat steam generator; catalyst storage hoppers; stripper columns; condensers; coolers; and pump. The new Kanotex unit included a new gas-compressor plant. The Socony-Vacuum Co. started a construction program at its Augusta refinery, thus increasing the Nation's supply of high-octane-number gasoline by the Thermofor catalytic re-forming process. The El Dorado Refining Co. began a $3,000,000 modernization program of its plant facilities. At Wichita the Bareco Oil Co. closed and dismantled its plant. The Cities Service Gas Co. constructed 5 new compressor stations and increased the facilities of the 5 existing compressor stations by 8,210 horsepower.

The Sinclair Pipeline Co. laid a 24-inch pipeline across eastern Kansas. Pumping stations were built at Caney and Humboldt. A new 12-inch gasline was built into the new McKinney gas field in Clark and Meade Counties. The Socony-Vacuum Oil Co. constructed

[3] Coumbe, A. T., and Avery, I. F., Crude Oil and Refined Products Pipeline Mileage in the United States, January 1, 1953: Bureau of Mines Inf. Circ. 7671, 1953, 10 pp.
[4] Kansas Business, 1952.

20 miles of 8- to 10-inch line near Hutchinson for crude oil and the Derby Oil Co. built 30 miles of 4-inch line from Wichita to Bell for crude oil.

At Coffeyville a new commercial fertilizer firm processed Kansas coal as a basic humus for rebuilding depleted soils. In addition to the pulverized coal, salt from Hutchinson was used as part of the fertilizer ingredient. Kansas natural gas provides fuel for heat-breaking the mixtures. Three varieties of fertilizers were produced.

At Great Bend the Great Bend Brick & Tile Co. expanded and added equipment to increase the quality and output of its new product, a golden-brown brick. In July a sixth kiln was added to increase capacity. The Salina Concrete Products Co. of Salina expanded its production capacity by installing a new multiple block machine that stamps 3 or 4 blocks at a time.

The Pittsburg-Midway Coal Co. erected a new coal tipple near Pittsburg. Its heavy media plant, capable of processing 500 tons of coal per hour, cleaned and sized marketable coal.

Custom Mills and Smelters.—The Kansas lead-zinc mining industry operated 3 custom mills, 1 mine mill, and 1 tailings mill during 1952. The Ballard No. 8 mill of the National Lead Co., with a daily capacity of 2,100 tons, was the largest, followed by the Beck No. 3 of the Beck Mining Co. and the Wade mill of the Wade-Rea Mining Co. Dines Mining Co. treated ore from its two Oklahoma properties over its Blue Mound mill. The C. S. & W Milling Co. treated mostly slimes at its old Webber mill.

The Galena lead smelter of the Eagle-Picher Co. treated concentrates from Illinois and the Tri-State district. Two mineral-pigment plants—the Coffeyville plant of the Ozark Smelting & Mining Co. and the Cherryvale plant of the National Zinc Co., Inc.—in Montgomery County were active throughout the year.

Mineral Brokers.—Five smelting companies maintained mineral brokers or ore buyers in the Tri-State district, purchasing ores and concentrates from Oklahoma, Missouri, and Kansas. Ore purchases from this district differ from those made in western mining districts in that the concentrates are bought f. o. b. the mill, all handling and freight charges being assumed by the buyer. District ore prices are quoted on the basis of 60 percent zinc-metal content and 80 percent lead-metal content, subject to adjustments based on assays.

DMPA CONTRACTS IN KANSAS

The Defense Materials Procurement Agency, created by Executive order in August 1951, was responsible for procuring metals, minerals, and other materials and encouraging the production of such materials. The agency purchased metals, minerals, and other materials for Government use or resale; encouraged exploration, development, and mining of strategic minerals and metals; installed facilities and improvements in Government-owned plants and Government equipment in privately owned plants; and guaranteed loans to contractors, subcontractors, and others to expedite production and delivery under Government contract.

DMPA entered into a contract with the MacArthur Mining Co. for delivery of 1,500 tons of zinc in 1½ years. The Government

advanced $45,000 toward the purchase cost of $525,000. Operations were to begin in May 1952.

EMPLOYMENT IN THE MINERAL INDUSTRIES

Employment.—The nonmetallic industry increased its employment slightly in 1952, in line with the national trend. The number of workers in the lead-zinc-mining industry declined during the latter half of the year, when lower metal prices resulted in curtailment of production or closing of some mines. About 2,450 men were employed in January 1952, rising to 2,560 in June, then dropping about 16 percent to around 2,150 in December.

Wages.—Wages and annual incomes of all mineral-industry workers except lead-zinc miners increased during the year, a trend similar to those of other industrial workers in the State and Nation.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Coal production increased both in quantity and value in 1952 compared with 1951. Crawford County had the largest production of the six counties reporting, followed by Linn, Cherokee, Osage, Bourbon, and Coffey (table 2).

TABLE 2.—Coal production 1943–47 (average) and 1948–52

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton			Total	Average per ton
1943–47 (ave.)	3,054,470	$8,335,990	$2.73	1950	2,124,980	$8,233,527	$3.87
1948	2,538,040	9,653,566	3.80	1951	1,961,101	7,734,478	3.94
1949	2,031,117	7,968,140	3.92	1952	2,028,601	7,902,590	3.90

Natural Gas.—Marketed production of natural gas in 1952 declined 1 percent, and its value increased 1 percent compared with 1951. This value was second only to the State petroleum value (table 3).

TABLE 3.—Marketed production of natural gas, 1943–47 (average) and 1948–52

Year	Million cubic feet	Value	Year	Million cubic feet	Value
1943–47 (average)	162,093	$8,226,000	1950	364,024	$24,026,000
1948	245,189	12,235,000	1951	417,538	33,821,000
1949	294,078	15,910,000	1952	412,544	34,241,000

Natural Gasoline and LP-Gases.—Production and value of natural gasoline and LP-gases both increased in 1952 over 1951. The gain by LP-gases was the more marked of the two—27-percent increase in value and 14-percent rise in quantity (table 4).

Petroleum (Crude).—Production of petroleum in 1952 was approximately the same as in 1951. Petroleum was the principal mineral in Kansas as to value, accounting for 73 percent of the total (table 5).

TABLE 4.—Natural gasoline and LP-gases produced 1943–47 (average) and 1948–52, in 42-gallon barrels

Year	Natural gasoline		LP-gases		Total	
	Barrels	Value	Barrels	Value	Barrels	Value
1943–47 (average)	1,526,000	$2,921,000	436,000	$566,000	1,962,000	$3,487,000
1948	1,847,000	6,561,000	714,000	1,716,000	2,516,000	8,277,000
1949	1,880,000	4,772,000	768,000	1,164,000	2,648,000	5,936,000
1950	2,572,000	6,146,000	1,115,000	1,487,000	3,687,000	7,633,000
1951	2,645,000	6,931,000	1,621,000	2,445,000	4,266,000	9,376,000
1952	2,743,000	7,286,000	1,843,000	3,116,000	4,586,000	10,402,000

TABLE 5.—Production of petroleum (crude), 1943–47 (average) and 1948–52 in 42-gallon barrels

Year	Barrels	Value		Year	Barrels	Value	
		Total	Average per barrel			Total	Average per barrel
1943–47 (ave.)	100,741,000	$141,634,000	$1.41	1950	107,586,000	$276,500,000	$2.57
1948	110,908,000	288,360,000	2.60	1951	114,522,000	294,320,000	2.57
1949	101,868,000	262,820,000	2.59	1952	114,807,000	293,910,000	2.56

METALS

Minor metals, such as cadmium, germanium, indium, and gallium occur as traces or minute quantities in the zinc ores of Kansas and are recovered in part as byproducts in the flue dusts collected from zinc smelting. It is impractical to determine their State origin, since smelters commingle ores from both domestic and foreign sources and do not report detailed analyses of the concentrates by source.

Lead.—Declining metal prices of lead and zinc resulted in drastic curtailment of mining operations the last 6 months of 1952. Whereas 1,091,823 tons of crude ore and 69,500 tons of tailings, yielding 3,640 tons of recoverable lead, were produced in the first 6 months, only 353,059 tons of crude ore and 32,500 tons of tailings, yielding 2,276 tons of recoverable lead, were produced in the last 6 months of the year (table 6). Eighty-four mining companies operated 53 mines during the year.

Kansas contributed 22 percent of the Tri-State district lead production.

Zinc.—Production of recoverable zinc in Kansas dropped sharply the latter half of 1952. In the January-June period, 16,436 tons of recoverable zinc (65 percent of the State's total output) was produced, while only 9,046 tons was produced in the July-December period (table 6). There was an annual net loss of 12 percent in 1952 zinc production compared with 1951. Kansas was the second largest zinc producer in the Tri-State district and the 11th ranking State in the Nation.

Metal prices of lead and zinc fluctuated downward from April through December, resulting in a 22-percent loss for lead and a 36-percent loss for zinc. Economic forces contributing to these declines were the prolonged steel strike, which permitted domestic zinc stocks to increase sharply, a similar rise in foreign metal stocks, and the added production from new foreign developments.

TABLE 6.—Mine production of lead and zinc in Kansas, 1943–47 (average), 1948–52, and total, 1876–1952, in terms of concentrates and recoverable metals [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
1943–47 (average)		10,490	$1,465,700	95,490	$10,002,360	7,940	$1,531,150	51,650	$11,927,320
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	72,176	7,717,984
1951	78	11,920	2,582,335	53,281	6,651,855	8,947	3,095,662	28,904	10,521,056
1952	84	7,747	1,582,699	47,077	5,685,236	5,916	1,904,952	25,482	8,460,024
1876–1952		803,768	66,655,719	5,266,358	247,396,849	613,360	80,387,113	2,735,533	386,917,112

[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 7.—Mine production of lead and zinc, by months, in 1952, in terms of recoverable metals

Month	Lead (short tons)	Zinc (short tons)	Month	Lead (short tons)	Zinc (short tons)
January	716	3,011	August	376	1,498
February	553	2,603	September	309	1,302
March	568	2,691	October	336	1,557
April	552	2,806	November	332	1,331
May	603	2,876	December	354	1,337
June	647	2,449			
July	570	2,021	Total	5,916	25,482

TABLE 8.—Tenor of lead and zinc ore and old tailings milled and concentrates produced, 1951–52

	1951		1952	
	Crude ore	Old tailings	Crude ore	Old tailings
Total material milled—short tons	1,733,827	80,150	1,444,882	102,000
Total concentrate produced:				
Galena—do	11,920		7,747	
Sphalerite—do	51,520	1,761	45,898	1,179
Ratio of concentrate to material milled:				
Lead—percent	0.69		0.54	
Zinc—do	2.97	2.20	3.18	1.16
Metal content of material milled: [1]				
Lead—do	0.52		0.41	
Zinc—do	1.61	1.17	1.72	0.58
Average lead content of galena concentrates—do	76.59		77.85	
Average zinc content of sphalerite concentrates—do	60.32	59.11	60.25	55.47
Average value per ton:				
Galena concentrates	$216.64		$204.30	
Sphalerite concentrates	$124.99	$120.63	$120.62	$126.56

[1] Figures represent metal content of the crude ore ("dirt") only insofar as it is recovered in the concentrates, data on tailing losses not available.

TABLE 9.—Weekly quoted prices for 60-percent zinc concentrates and 80-percent lead concentrates at Joplin in 1952

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. 5–May 31	$135.00	Sept. 13–20	$96.50	Jan. 5–Apr. 26	$245.95	Oct. 25–Nov. 1	$166.50
June 7	115.00	Sept. 27–Oct. 18	92.50	May 3–10–17	217.35	Nov. 8	173.70
June 14–21	107.50	Oct. 23–Nov. 1	90.00	May 24–June 14	188.55	Nov. 15–22	180.90
June 28–Aug. 2	100.00	Nov. 8–Dec. 31	84.00	June 21	195.75	Nov. 29–Dec. 20	173.70
Aug. 9–Sept. 6	92.50			June 28–Oct. 4	202.95	Dec. 27–31	184.50
				Oct. 11–18	188.10		

TRI-STATE DISTRICT

The 6,140,155 tons of crude ore and 604,350 tons of old tailings treated in the Tri-State district yielded 36,333 tons of lead concentrates and 167,474 tons of zinc concentrates, containing 27,356 tons of recoverable lead and 90,512 tons of recoverable zinc (table 10).

Twenty mine mills and 2 tailings mills were in operation during the year. Nine of the mine mills treated only the ores from company mines; the other 11 accepted custom ores. These mills ranged in capacity from the large Central mill of the Eagle-Picher Co., with a daily capacity of 15,000 tons, to the smaller mills, with a daily capacity of about 1,000 tons. The larger part of the ores from Kansas and Oklahoma was sent to custom mills, and the Central mill received the greater portion of this custom ore. Zinc recovery from re-treatment of old tailings and slimes continued to decline during the year to the degree that both tailings mills discontinued operations by the end of the year.

There were 319 mines in operation in the district during the year; 84 of them were in Kansas. Many of these mines began closing during the latter half of the year, when lead prices dropped from 19 cents to 14¾ and zinc prices from 19½ cents to 12½. This was a 22-percent loss for lead and a 36-percent loss for zinc and eventually resulted in the closing of 107 district mines and 5 mills.

TABLE 10.—Mine production of lead and zinc in the Tri-State district, 1943–47 (average) and 1948–52, in terms of concentrates and recoverable metals

Year	Lead concentrates (galena)		Zinc concentrates (sphalerite)		Recoverable metal content			
					Lead		Zinc	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	35,500	$5,016,630	290,680	$31,044,500	26,790	$5,164,670	155,690	$35,822,130
1948	35,862	8,302,564	159,609	13,929,151	26,901	9,630,558	84,839	22,567,174
1949	41,471	7,824,788	147,178	11,445,018	30,883	9,759,028	78,628	19,499,744
1950	40,714	6,245,660	150,019	13,934,927	31,157	8,412,390	80,558	22,878,472
1951	36,300	7,720,550	170,263	21,023,818	26,906	9,309,476	91,553	33,325,292
1952:								
Kansas	7,747	1,582,699	47,077	5,685,236	5,916	1,904,952	25,482	8,460,024
SW. Missouri	8,113	1,701,121	18,671	2,138,108	6,303	2,029,566	10,114	3,357,848
Oklahoma	20,473	4,104,934	101,726	11,714,605	15,137	4,874,114	54,916	18,232,112
Total 1952	36,333	7,388,754	167,474	19,537,949	27,356	8,808,632	90,512	30,049,984

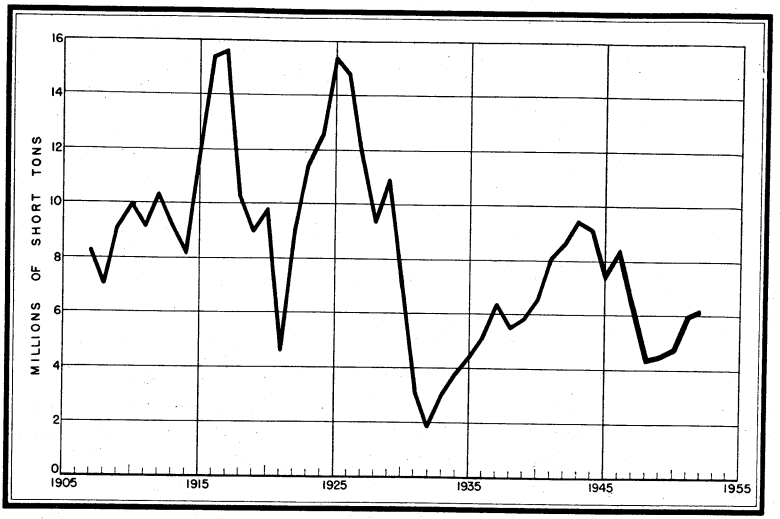

FIGURE 1.—Quantity of crude ore (rock) milled in the Tri-State district, 1907–52.

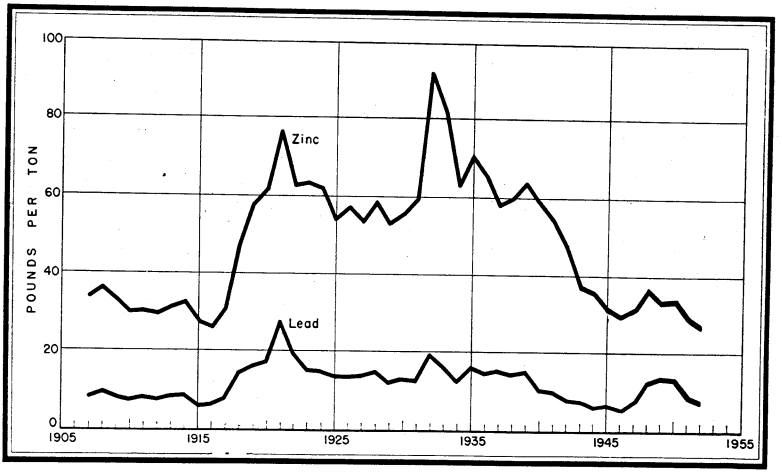

FIGURE 2.—Metal recovered per ton of crude ore (rock) milled in the Tri-State district, 1907–52.

TABLE 11.—Tenor of ore and concentrates in Tri-State district, 1948–52

	1948	1949	1950	1951	1952
Total material milled:					
Crude ore—short tons	4,314,190	4,470,778	4,700,698	5,990,100	6,140,155
Tailings and slimes—do	2,595,903	1,602,620	967,926	746,673	604,350
Ratio of concentrates to material milled:					
Lead—percent	0.52	0.68	0.72	0.54	0.54
Zinc—do	2.31	2.42	2.65	2.53	2.48
Metal content of material milled:					
Lead—percent	0.39	0.51	0.55	0.40	0.41
Zinc—do	1.23	1.29	1.42	1.36	1.34
Average lead content of galena concentrates—do	76.53	75.98	78.08	75.62	76.79
Average zinc content of sphalerite concentrates—do	59.04	59.36	59.66	59.74	60.04
Average value per ton:					
Galena concentrates	$231.51	$188.68	$153.40	$212.69	$203.36
Sphalerite concentrates	87.27	77.76	92.89	123.48	116.66

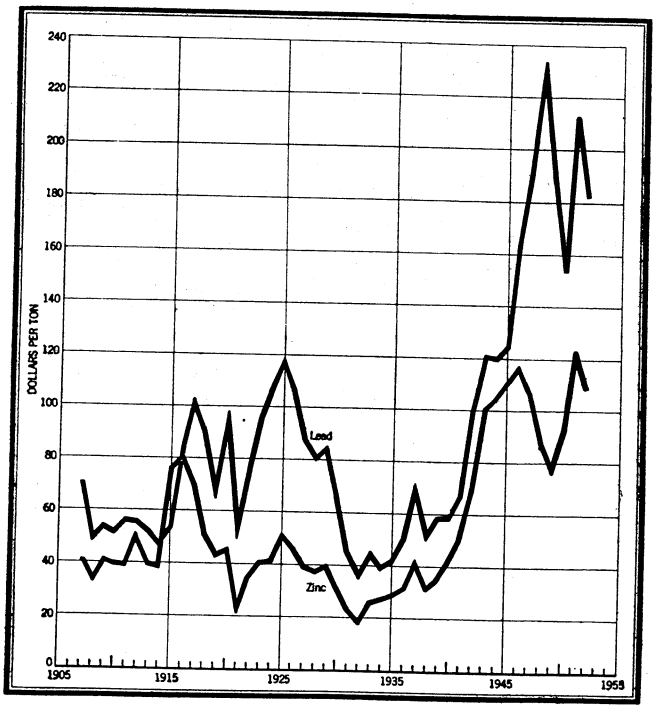

FIGURE 3.—Average prices received by sellers per ton of concentrate in the Tri-State district, 1907–52.

NONMETALS

Cement.—In 1952 Kansas produced 8,672,883 barrels of portland cement and shipped 8,811,762 barrels valued at $20,956,886, an increase in dollar value of approximately $1,544,000 over that of 1951 (table 12). Stocks, as of December 31, 1952, totaled 524,860 barrels compared to 663,739 barrels of the previous year. The average value of portland cement ranged from $2.35 to $2.42 per barrel at the various plants. Six companies, operating in five eastern counties, continued to produce portland cement, as in former years.

All cement produced in the State was obtained from limestones and shales of the Pennsylvanian age. Natural gas was used as fuel in the cement mills.

The cement industry in Kansas expanded steadily during the past 5 years. The growth of the industry may be ascertained from table 12, which gives the production, shipments, value of shipments, and average price per barrel of cement for 1948–52.

In addition to portland cement, natural cement was produced by the Fort Scott Hydraulic Cement Co. at Fort Scott in Bourbon County.

TABLE 12—Production and shipments of portland cement, 1943–47 (average) and 1948–52, in 376-pound barrels

Year	Production (barrels)	Shipments			Year	Production (barrels)	Shipments		
		Barrels	Value				Barrels	Value	
			Total	Average per bbl.				Total	Average per bbl.
1943–47 (ave.)	5,083,000	5,114,800	$8,448,000	$1.65	1950	8,616,357	8,759,103	$19,400,068	$2.21
1948	7,933,899	7,930,965	16,188,379	2.04	1951	8,514,521	8,163,916	19,413,144	2.38
1949	7,824,620	7,640,540	16,880,156	2.21	1952	8,672,883	8,811,762	20,956,886	2.38

Clays.—Kansas produced 642,250 tons of clays valued at $738,481 in 1952, a 9-percent decrease in quantity from 1951 but a 9-percent increase in value. Miscellaneous-type clays accounted for the major portion of this production. Production originated in 13 counties; Crawford County was the leading producer, followed by Wilson, Montgomery, Allen, and Cloud. Most of the clays were used in manufacturing brick and tile.

TABLE 13.—Clays sold or used by producers, 1943–47 (average) and 1948–52, in short tons

Year	Short tons	Value	Year	Short tons	Value
1943–47 (average)	393,040	$248,570	1950	706,615	$563,670
1948	583,338	438,672	1951	708,910	680,821
1949	600,216	455,181	1952	642,250	738,481

Gypsum.—Gypsum was produced by two companies, The National Gypsum Co. of Buffalo, N. Y., and the Certain-teed Products Corp. of Ardmore, Pa. The National Gypsum Co. operated west of Medicine Lodge in Barber County, whereas the Certain-teed Products

Corp. operated at Blue Rapids in Marshall County. Although the tonnage of crude gypsum greatly exceeded the tonnage of calcined gypsum produced, the value of the latter was much greater.

Perlite.—Expanded perlite was produced at Kansas City for use as a lightweight aggregate in concrete and plaster. The crude material was shipped from deposits in other Western States; no production of crude perlite was reported from Kansas.

Pumicite.—Pumicite (volcanic ash) was produced in three counties in 1952—Lincoln, Meade, and Norton. Output has continued to decline for the past several years; however, the value of 1952 production was over twice that of 1951.

Salt.—Salt was produced by 5 companies operating in three counties—Ellsworth, Reno, and Rice. Production in 1952 amounted to 911,700 short tons valued at $6,850,000 (table 14). The 1952 production exceeded the 1951 output by approximately 11,000 tons valued at $210,000. Kansas was the ninth largest salt producer in the country in 1952, and its value was the third largest. Salt is obtained by shaft mining and the evaporation process, which includes both the open and vacuum-pan methods. Most of the salt produced in the State is obtained by shaft mining; however, the value of the evaporated-produced salt is over double that of the shaft-mined product.

The outstanding uses of salt are for meat packing, livestock, and hide and leather treatment. Kansas salt is shipped to 36 of the 48 States and Canada.

TABLE 14.—Salt sold or used by producers, 1943–47 (average) and 1948–52, in short tons

Year	Evaporated salt		Rock salt		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	354,840	$2,895,450	535,710	$1,292,930	890,550	$4,188,380
1948	321,812	3,255,070	509,944	1,705,758	831,756	4,960,828
1949	334,611	3,616,344	497,831	1,601,500	832,442	5,217,844
1950	344,751	4,066,310	501,623	1,848,204	846,374	5,914,514
1951	360,785	4,659,036	540,132	1,980,307	900,917	6,639,343
1952	358,887	4,775,741	552,857	2,074,286	911,744	6,850,027

Sand and Gravel.—Sand and gravel were produced in virtually every county in the State. As compared to 1951, total sand and gravel production increased 9 percent and value 6 percent. Sand and gravel production and value within recent years have, like most Kansas minerals, shown a marked increase. These increases—for the 5-year period, 1948–52—are shown in table 15.

In 1952, 95 commercial producers and over 50 noncommercial producers were operating. The value of commercial sand and gravel produced in 1952 totaled $4,675,216. Of this amount, over 40 percent came from Wyandotte County, where production value was approximately double that of Sedgwick County, the second largest producer of sand and gravel in Kansas. It is noteworthy that the two counties producing the largest amounts of sand and gravel—Wyandotte and Sedgwick—contain the two largest cities in the State—Kansas City and Wichita. In both counties the sand and gravel were derived from stream beds rather than high river terraces.

TABLE 15.—Sand and gravel sold or used by producers, 1943–47 (average) and 1948–52

Year	Commercial		Noncommercial		Total sand and gravel		
	Short tons	Value	Short tons	Value	Short tons	Value	Average value per ton
1943–47 (average)	2,803,040	$1,724,650	852,830	$318,720	3,655,870	$2,043,370	$0.56
1948	4,271,837	2,520,567	811,246	228,198	5,083,083	2,748,765	.54
1949	4,860,975	2,943,733	1,325,744	384,187	6,186,719	3,327,920	.54
1950	4,987,710	3,246,970	4,793,413	3,535,315	9,781,123	6,782,285	.69
1951	6,167,690	4,234,173	1,509,198	513,371	7,676,888	4,747,544	.62
1952	6,797,975	4,675,216	1,582,090	348,377	8,380,065	5,023,593	.60

Stone.—Stone production in Kansas in 1952 exceeded that of 1951 by 23 percent in quantity and 33 percent in value. Limestone output in 1952 increased 29 percent and sandstone 6 percent over 1951, whereas miscellaneous-stone production decreased 10 percent over 1951. Most of the stone produced in the State was for concrete and road construction, with the greatest increase in the use of stone as riprap. The only decrease in 1952 stone production and value over 1951 was stone produced for railroad ballast.

Like most trends in mineral output and value in Kansas, stone production and value have steadily increased (table 16).

Stone in Kansas was produced by over 70 commercial producers and at least 25 noncommercial county highway departments. Most of the 1952 commercial stone produced in the State was quarried and crushed in Wyandotte County, followed by Elk, Johnson, and Atchison Counties.

TABLE 16.—Stone sold or used by producers, 1948–52, by kinds

Year	Limestone		Sandstone		Miscellaneous stone		Total stone	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1948	3,373,110	$4,670,567	167,920	$247,544	1,774,650	$565,079	5,315,680	$5,481,190
1949	4,427,530	7,242,558	175,610	253,045	1,375,280	455,887	5,978,420	7,951,490
1950	5,594,790	7,673,016	612,220	793,331	1,423,290	453,860	7,630,300	8,920,207
1951	5,824,103	8,284,559	277,446	444,108	1,089,934	329,845	7,191,483	9,058,512
1952	7,551,061	11,204,877	295,246	485,871	984,564	360,992	8,830,871	12,051,740

REVIEW BY COUNTIES[5]

ALLEN

Allen County's contribution to the State mineral output was increased greatly by oil and gas. The Lehigh Portland Cement Co. at Iola and the Monarch Cement Co. at Humboldt produced portland cement, and the Humboldt Brick & Tile Co. at Humboldt and the United Brick & Tile Co., located at Iola, manufactured brick and tile. The Monarch Cement Co. also produced crushed limestone.

[5] Oil and gas data taken from the States published report. Ver Wieb, W. A., Goebel, E. D., Jewett, J. M., and Hornbaker, A. L., Oil and Gas Developments in Kansas during 1952: State Geol. Survey of Kansas, Bull. 103, p. 187.

ANDERSON

Anderson County produced sand and gravel and crushed limestone plus oil from seven fields and a small amount of gas.

BARBER

Barber County produced oil, gas, gypsum, sand, and gravel. Three new oil pools were discovered in the county during the year.

BARTON

Barton County ranked first in the production of oil in Kansas and also first in the total value of all minerals produced; 17 new oil pools were discovered during the year. The Great Bend Brick & Tile Co. produced clay and manufactured brick and tile. Sand and gravel were produced by Moos Bros., Harry Henery, and Gruber sand plant, all of Great Bend, and by Charles Hardesty and Vernon Savely of Ellinwood.

BUTLER

Butler County was the fifth most important oil county in Kansas. The oil was obtained from 62 fields, 3 of which were discovered in 1952. Limestone was produced by Walt Keeler of Wichita and George M. Myers of El Dorado. The limestone was used primarily for concrete work, agricultural lime, and riprap and as dimensional stone.

CHAUTAUQUA

Chautauqua County produced oil, gas, limestone, sand, and gravel.

CHEROKEE

Cherokee County, the third largest coal producer in the State, also produced a greater variety of minerals than any other county in Kansas. Minerals produced in 1952 included coal, lead, zinc, chat, sand and gravel, limestone, and clay.

The larger coal companies were the Apex-Compton, Black Diamond, Boyd, Flannigan, Markley, Mason, Pittsburg-Midway, Semple, and Wilkinson. Of the coal companies, the Pittsburg-Midway Coal Co. is the largest, having produced practically 85 percent of all coal mined in the county.

Miscellaneous stone in the form of "chats"—the waste material resulting from milling Kansas lead-zinc ores—was produced by the Baxter Chat Co. and the Eagle Picher Co. This material was used as railroad ballast, as road surfacing, and as aggregate in concrete mixes. Cherokee County continued to be the single locality in the State where lead and zinc were produced. The 10 principal mining companies, in the order of their output, and the properties they operated were: Eagle-Picher Co. (Grace B, Big John, Foley, Jarrett, Mullen, Webber, West Side, and Wilbur), National Lead Co., St Louis Smelting & Refining Division (Estes, Hartley, Moore, Mount Hope, Shanks, Slaughter, and Swalley), Bilharz Mining Co. (Muncie), Helen H. Mining Co. (Stebbins and Karcher), S. S. & C. Mining Co. (Blue Mound, Lindsey, and Webber), Little Ben Mining Co. (Clark and Keith), Harris Mining Co. (Golden Rod), MacArthur Mining Co.

(MacArthur Nos. 1 and 3), Mark Twain Mining Co. (Jarrett and Naylor), and Bob White Mining Co. (Cherokee and Chubb).

The Eagle-Picher Co. operated its lead smelter and pigment plant at near capacity in 1952, treating lead ores from Kansas, Oklahoma, Missouri, and Illinois.

COWLEY

Cowley County was one of the important oil- and gas-producing counties of eastern Kansas. Fourteen new oil pools were discovered during the year. Sand and gravel were produced by five commercial sand and gravel companies and by the county. Limestone was produced by three companies. The Cities Service Oil Co. operated a natural-gasoline plant at Arkansas City. The value of all minerals produced in the county in 1952 was $6,547,000. The Silverdale Cut Stone Co. of Silverdale was one of the few large companies in the State that produced dimension stone. The stone quarried is the Silverdale or Fort Riley limestone of Permian age.

CRAWFORD

Crawford County was one of the principal coal-producing counties in the State and ranked first in 1952. The county produced 861,479 tons of coal during 1952 with an average value of $3.84 per ton. Crawford County also produced crude oil, as well as gas, from seven oil fields. The J. J. Stark Co. of Girard was the only limestone producer in the county in 1952, and the W. S. Dickey Clay Manufacturing Co. of Pittsburg was the only producer of clay and shale.

ELK

Elk County produced oil, gas, limestone, sand, and gravel. Of the oil produced from the 23 fields, 17,042 barrels of oil was obtained from secondary-recovery projects. In addition to oil and gas, Elk County also produced limestone and sand and gravel.

ELLIS

Ellis County was the third most important oil county in Kansas in 1952. This oil came from 75 pools, 16 of which were discovered during the year. A small quantity of sand and gravel was produced by one sand and gravel company.

ELLSWORTH

In addition to its 14 oil pools, Ellsworth County produced gas. Two new oil pools were discovered during the year. Ellsworth County is also a salt producer. The Independent Salt Co., with headquarters in Chicago, Ill., mined rock salt at its plant at Kanopolis. One operator and the county produced some sand and gravel during the year.

FRANKLIN

Franklin County produced oil, coal, sand and gravel, and limestone. Limestone was produced by four operators. The county highway department produced a small quantity of sand and gravel. Coal was mined by two companies.

GRAHAM

Graham County was primarily an oil producer. In 1952 the county had 33 pools, 9 of which were discovered during the year.

GRANT

In addition to the gas produced in Grant County (Hugoton gas area) in 1952, natural gasoline was produced by the Standard Oil & Gas Co., whose plant is at Ulysses. The value of the gas and natural gasoline produced in the county in 1952 exceeded several million dollars.

GREENWOOD

Greenwood County is an important oil county. In 1952 oil was obtained from 52 fields. The Cities Service Oil Co. operated two cycle plants, manufacturing natural gasoline, in the county. The company plant at Madison was destroyed by fire in February and, hence little natural gasoline was produced at that plant. The other company plant is at Hamilton. The Greenwood County Highway Department produced crushed limestone for various purposes.

KINGMAN

Kingman County produced oil from 11 pools, 2 of which were discovered in 1952. Natural gasoline was produced by the Skelly Oil Co. at its plant at Cunningham, and one sand and gravel company produced sand near Kingman.

LINCOLN

Pumicite (volcanic ash) was produced near Wilson by Ernest Hanzlicek.

LINN

Linn County produced coal, oil, gas, limestone, sand, and gravel. Oil was produced from 9 areas in 3 fields. Limestone was produced by one operator, and the county highway department produced some sand and gravel.

MARION

Marion County produced oil, gas, and limestone. Two new oil pools were discovered in 1952. Limestone was produced by one operator.

MARSHALL

The Certain-teed Products Corp., of Ardmore, Pa., quarried crude gypsum in Marshall County, processing the material into building products in a plant at Blue Rapids.

McPHERSON

McPherson, one of the important oil-producing counties in Kansas, also produced some gas.

MEADE

The Cudahy Packing Co. produced pumicite near Meade.

MIAMI

Miami County produced oil, gas, and limestone. Oil was produced from 15 areas in 3 fields.

MONTGOMERY

Montgomery County produced cement, oil, limestone, gas, and clay. The value of all minerals produced in the county amounted to several million dollars. Cement was produced by the Universal Atlas Cement Co. at Independence. In 1952 oil was produced from 49 areas in 10 fields. Three brick and tile companies manufactured brick and tile in the county, and one commercial operator and the county highway department produced crushed limestone.

Two zinc-pigment plants—the Coffeyville plant of the Ozark Smelting & Mining Co. and the Cherryvale pigment plant of the National Zinc Co., Inc.—were active throughout 1952. Both plants use natural gas as fuel.

NEOSHO

Neosho County produced cement, oil, limestone, and gas. Cement is produced by the Ash Grove Lime & Portland Cement Co. at Chanute. Oil was produced from 23 areas in 9 fields. Limestone was produced by three operators in the county. The mineral fuels, as well as the nonfuel minerals produced in the county, are each valued at over $1,000,000.

NORTON

Pumicite was produced near Calvert by the Wyandotte Chemicals Co.

PAWNEE

Pawnee County produced oil, gas, sand, and gravel. In 1952 the county had 15 pools, 1 of which was discovered during the year. Sand and gravel was produced by three commercial operators and by the county.

PHILLIPS

Phillips County produced oil from 15 pools, 2 of which were discovered in 1952. Gravel was produced by D. G. Hansen of Logan.

PRATT

Pratt County produced oil from 20 pools, 4 of which were discovered during 1952. Gas was also produced. One commercial company and the county highway department produced some sand and gravel.

RENO

Reno County produced oil, gas, salt, sand, and gravel. Oil was produced from 17 pools, of which 3 were new. The Barton, Carey, and Morton salt companies, with plants at Hutchinson, produced salt in 1952. Sand and gravel were produced by seven commercial sand and gravel companies.

RICE

Oil, gas, sand and gravel, salt, and limestone were produced in Rice County. Oil was produced from 55 pools, of which 5 were new discoveries during the year. Five operators produced sand and gravel. In addition, 2 salt companies—the American Salt Co. and the Carey Salt Co.—operated plants at Lyons, and 1 limestone producer quarried limestone.

ROOKS

Rooks County rated among the upper 10 oil-producing counties in Kansas. In 1952 its 82 pools (of which 15 were discovered during the year) produced 7,287,132 barrels of oil valued at $18,728,000.

RUSSELL

Russell County was the second most important oil producer in Kansas. In addition, a small quantity of sand and gravel was produced by the county. Oil was produced from 26 pools, one of which was discovered during the year. Gas was also produced.

SALINE

Saline County produced oil, clay, sand, and gravel. Fourteen pools, of which 4 were discovered in 1952, produced oil. The Salina Brick & Tile Co. of Salina uses the Dakota clay for manufacturing brick and tile. Sand and gravel were produced by three commercial companies.

SEDGWICK

Sedgwick County produces oil, natural gasoline, gas, sand, and gravel. Three new oil pools were discovered in the county in 1952. The Cities Service Oil & Gas Co. operated its cycle plant at Wichita. Sand and gravel were produced by 10 commercial companies.

SHERIDAN

Sheridan County produced oil from 5 oil pools, of which 2 were discovered during 1952. In addition, some sand and gravel were produced in the county.

STAFFORD

Stafford County was one of the principal producers in the State. In 1952 oil was produced from 123 pools, of which 25 were discovered during the year. Two new gas pools were discovered in 1952. Two commercial companies produced a small quantity of sand and gravel.

SUMNER

Sumner County produced oil primarily, although a small quantity of sand and gravel was also produced in the county. In 1952 oil was obtained from 31 pools of which 2 were new. Sand and gravel were produced by two commercial operators and by the county highway department.

TREGO

Trego County produced oil and some sand and gravel. In 1952 the county had 14 producing oil pools. During the year five new oil pools were discovered. Sand and gravel were produced by the county highway department and one commercial operator.

WILSON

The Consolidated Wilson Cement Corp. operated a portland-cement plant at near capacity in 1952.

WOODSON

Woodson County produced oil from 19 fields, 1 of which was discovered in 1952.

WYANDOTTE

Wyandotte County produced sand, gravel, cement, limestone, and gas. In 1952 Wyandotte County had 5 operators that produced limestone and 9 commercial sand and gravel companies. Expanded perlite was produced at the Kansas City plant of the Panacalite Perlite, Inc.

HUGOTON GAS AREA

The Hugoton gas area, the largest gas-reserve area known in the world, is in southwestern Kansas, Oklahoma, and Texas. The Kansas portion of the area comprises 2,433,560 acres, has 2,945 producing wells, and produces about 50 percent (375,081,748,000 cubic feet) of gas of the total production for the entire area. The Kansas area includes 2 entire counties (Grant and Stevens) and part of 7 counties (Finney, Hamilton, Haskell, Kearny, Morton, Seward, and Stanton). The producing area of the Hugoton gas area has been limited by the Kansas Nomenclature Committee to only that gas produced from the formations in the Chase group of rocks of the Permian system. The Hugoton gas area furnishes 92 percent of all gas produced in the State.

The Mineral Industry of Kentucky

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Kentucky Geological Survey.

By Richard H. Mote[1] and Alvin Kaufman[2]

LARGELY as a result of its output of bituminous coal, Kentucky, ranked among the 10 leading mineral-producing States in 1952. The Commonwealth was second in the production of fluorspar and ball clay and fourth in native asphalt. However, despite the importance of those commodities to its mineral economy, coal, petroleum, natural gas, and stone represented 95 percent of the value of production.

Dollar output declined 10 percent compared with 1951 because of the 11- and 14-percent decrease, respectively, in output of fuels and metals. Nonmetal value, which contributed 6 percent of the total, increased 9 percent. Natural-gasoline value showed the largest percentage increment (174 percent) in 1952. The largest dollar rise ($2 million), however, was in the stone industry.

Major coal-producing counties—Hopkins, Harlan, Pike, Floyd, and Letcher—were responsible for approximately 60 percent of the value of Kentucky mineral output.

In addition to the mineral values credited to Kentucky in table 1, there are some that are not listed owing to lack of information.

Many metallic ores contain valuable minor constituents, such as arsenic, antimony, cadmium, and other metals. These quantities sometimes are not known and sometimes, though known by analyses, are not accounted for metallurgically in the early processing stages or credited to mine or origin. These minor constituents are recovered at smelting plants, frequently treating mixtures of materials from many sources, including residues from refining such metals as copper, lead, and zinc, and in other ways. It is impossible in many such instances to distribute the mineral products by States of origin, and in some instances it is even difficult to obtain an accurate separation as to domestic and foreign sources.

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TABLE 1.—Mineral production in Kentucky, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays (except for cement)	816, 585	$5, 210, 630	782, 099	$5, 002, 491
Coal	74, 972, 335	366, 686, 901	66, 114, 341	317, 386, 725
Fluorspar	68, 635	2, 334, 485	48, 308	1, 863, 262
Lead (recoverable content of ores, etc.)	107	37, 022	60	19, 320
Natural gas—thousand cubic feet	76, 097, 000	16, 513, 000	73, 427, 000	15, 934, 000
Natural-gas liquids:				
Natural gasoline—42-gallon barrels	265, 000	799, 000	730, 000	2, 191, 000
LP-gases—do	1, 901, 000	2, 129, 000	3, 719, 000	3, 963, 000
Petroleum (crude)—do	11, 622, 000	32, 190, 000	[2] 11, 918, 000	[2] 32, 890, 000
Sand and gravel	2, 801, 639	2, 434, 799	3, 334, 261	2, 656, 053
Stone (except limestone for cement)	7, 048, 771	8, 609, 609	[3] 8, 817, 859	[3] 10, 816, 707
Zinc (recoverable content of ores, etc.)	3, 457	1, 258, 348	3, 280	1, 088, 960
Undistributed: Native asphalt, cement, stone (dimension sandstone, 1952)		4, 060, 716		4, 634, 339
Total Kentucky		442, 264, 000		398, 446, 000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production.
[2] Final figure. Supersedes preliminary figure given in commodity chapter.
[3] Excludes certain stone, value for which is included with "Undistributed."

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Asphalt.—The bituminous sandstones that can be utilized for recovery of native asphalt in Kentucky occur in Edmonson, Breckinridge, Grayson, and Hardin Counties. These rocks are found in the Chester (upper Mississippian) and Pottsville formations (lower Pennsylvanian). The bituminous material is considered a derivative of petroleum altered by oxygen in circulating ground water.

The only producer of native asphalt in Kentucky in 1952 was Kentucky Rock Asphalt Co., Brownsville. This organization mined, by open-pit methods, the Pottsville sandstone at Kyrock, Edmonson County. The bituminous material was prepared and floated by barge down the river to Bowling Green or Rockport for marketing. Processed native asphalt contains 7-percent bituminous material and was utilized for surfacing highways, railroad platforms, bridge floors, and tennis courts. Production in 1952 was greater than in the previous year as a result of increased activity in highway construction.

Coal.[3]—During an exploratory trip through the Kentucky wilderness in 1750, Dr. Thomas Walker made the first coal discovery. From this beginning the mines of the State have grown into prolific producers. In 1952, despite a 13-percent decline in output compared with 1951, and a 22-percent drop over 1947 (Kentucky's greatest coal-producing year), the Commonwealth maintained its position as the third largest producer of soft coal in the United States for the sixth consecutive year. Coal output comes from the Eastern and Western Kentucky fields, which underlie large sections of the Allegheny Plateau. Esti-

[3] Statistical data for coal production in Kentucky adapted from Bureau of Mines Mineral Market Summary 2222, Bituminous Coal and Lignite in 1952.

mated recoverable reserves for both of these areas, as of January 1, 1950 (assuming 50-percent retrieval), were 59.7 billion tons. This was believed to be adequate for at least 100 years at the present rate of mining.

Eastern Kentucky, the largest producing section in 1952, contains within its borders Harlan, Pike, Floyd, and Perry Counties, 4 of the 5 major coal counties. Hopkins, the largest producing county, is in the Western field.

Ten bituminous coal seams were utilized in the Eastern field, virtually all output coming from underground operations; only 5 percent of production was attributable to strip mining. This contrasted rather sharply with the practice in the Western field, where 42 percent of the output was derived from open-pit operations. The difference in mining method was reflected in the productivity rate between these sections. The average miner in Western Kentucky produced approximately 15 tons per day as compared to 6 tons in the Eastern field. The average for the State as a whole was 7.33 tons per man per day. This compares favorably with the United States average of 7.47 tons per day.

Of the 1,865 active mines reporting in 1952, approximately 92 percent produced less than 100,000 tons annually compared to a United States average of 86 percent. The average output per Kentucky mine was 35,450 tons, whereas the United States average was 64,171 tons.

In 1952 Kentucky coal was sold for an average of $4.80 per ton, with underground coal commanding $0.24 more.

TABLE 2.—Production of bituminous coal, 1951–52, by counties (exclusive of mines producing less than 1,000 tons)

County	1951		1952	
	Short tons	Average value per ton	Short tons	Average value per ton
Bell	2,211,650	$5.63	1,711,869	$5.49
Boyd	410,933	4.49	332,009	4.14
Breathitt	1,155,632	5.46	937,969	5.46
Butler	107,280	3.93	99,483	3.83
Carter	304,419	5.09	194,289	5.04
Christian	51,635	4.16		
Clay	610,835	5.13	840,777	4.91
Clinton	53,500	4.22	54,012	4.18
Daviess	482,527	3.68	616,094	2.62
Elliott	380,581	4.68	170,155	4.72
Floyd	6,513,227	5.73	5,568,927	5.74
Grayson	4,000	4.09		
Greenup	236,208	4.69	100,664	3.79
Hancock	48,308	3.53	60,000	3.49
Harlan	11,160,967	5.86	9,592,450	5.97
Henderson	371,984	3.16	267,080	3.54
Hopkins	12,683,565	3.74	13,122,620	3.64
Jackson	498,557	5.09	242,430	5.02
Johnson	904,040	5.54	460,721	4.72
Knott	1,114,061	4.69	839,687	4.47
Knox	506,366	5.54	223,012	5.21
Laurel	112,220	5.02	157,563	4.95
Lawrence	85,512	4.17	84,804	4.53
Lee	287,096	5.34	252,050	5.34
Leslie	2,376,216	4.85	2,353,362	4.84
Letcher	4,809,189	5.85	4,698,496	5.77
Madison	1,400	4.79		
Magoffin	135,918	3.82	181,696	3.93
Martin	191,097	4.86	92,465	4.96
McCreary	836,604	5.95	480,300	5.03

TABLE 2.—Production of bituminous coal, 1951–52, by counties (exclusive of mines producing less than 1,000 tons)—Continued

County	1951		1952	
	Short tons	Average value per ton	Short tons	Average value per ton
McLean	34,145	$4.09	12,447	$4.05
Menifee	9,100	5.60		
Morgan	218,076	5.01	169,366	4.88
Muhlenberg	5,078,474	3.30	4,455,744	3.29
Ohio	2,238,150	3.69	1,629,803	3.62
Owsley	10,905	5.73	16,290	5.55
Perry	6,170,240	5.24	5,302,662	5.25
Pike	10,584,873	4.98	8,843,444	4.99
Pulaski	481,491	4.72	279,742	4.64
Rockcastle	213,631	4.66	168,333	4.58
Rowan			21,991	5.33
Union	522,674	3.65	631,384	3.62
Wayne	46,904	3.83	40,436	3.79
Webster	267,870	3.78	287,039	4.22
Whitley	412,935	5.50	512,182	4.85
Wolfe	37,340	5.18	8,494	5.39
Total	74,972,335	4.89	66,114,341	4.80

Natural Gas.—Production of natural gas ranked as the third major mineral industry in the Commonwealth in 1952, despite a 4-percent decline compared with 1951. Gross production of 74,800 million cubic feet was achieved; 70,000 million cubic feet was obtained from gas wells and 4,800 million cubic feet was a byproduct of oil wells. Of the total output, 73,427 million cubic feet was marketed and 1,373 million cubic feet burned or wasted. The average wellhead value remained at 21.7 cents per thousand cubic feet in 1952. Production was obtained from 3,797 gas wells compared to 3,570 in 1951. A total of 227 new producing wells was drilled in 1952; an additional 13 wells resulted in dry holes. Reserves of natural gas on December 31, 1952, were estimated at 1,313,523 million cubic feet. This minus 13,564 million cubic feet placed in underground storage for future delivery represented an approximate 1-percent decline from 1951. Discoveries during 1952 added 11,360 million cubic feet to reserves. Extension and revisions to previous reserves added another 46,696 million cubic feet. These exploratory activities resulted in the extension of production from the Big Sandy field into Letcher and Perry Counties. Big Sandy had been concentrated in Floyd, Martin, Pike, Knott, Johnson, and Magoffin Counties before the new pool was discovered. The only other field of any consequence was in Clay, Knox, and Bell Counties.

Natural-Gas Liquids.—Natural-gas liquids were produced by 4 operators utilizing 5 plants in 1952; 2 of these were compression units, and 3 used the absorption process. Production during the year more than doubled as a result of the first full 12 months of operation of the Tennessee Gas Transmission Co. plant. The output of natural gasoline in Kentucky was particularly affected by the opening of this unit and resulted in more than a threefold increase in this commodity. Production of liquefied petroleum gases (LP-gases) was approximately doubled. A total of 268,096 million cubic feet of natural gas was treated in Kentucky to produce natural-gas liquids. The average

yield was reported to be 0.11 gallon of natural-gas liquids (except LP-gases) per thousand cubic feet and 0.70 gallon of all natural-gas liquids per thousand cubic feet. The American Gas Association Committee on Reserves, reported that reserves, as of December 31, 1952, were 9,158,000 barrels. This figure included 156,000 barrels resulting from new discoveries during 1952, and 311,000 barrels from extensions and revisions of older reserves.

Petroleum.—Kentucky is one of the oldest oil-producing States. The first well was drilled for salt in 1819 and abandoned because the drillers struck oil, which at that time had no commercial value. The initial recorded output of oil took place in 1860, 1 year after Drake's discovery of petroleum in Pennsylvania. In 1952 production of this commodity ranked as the second largest mineral industry in the State. Kentucky was 14th in the Nation in quantity of petroleum produced. Production in 1952 was 3 percent higher than in 1951. The higher output was accompanied by an increase of 50 in the number of wells to 16,950 producers. The average production per well per day declined slightly to 1.9 barrels. Crude producers received $2.76 per barrel in 1952 compared to $2.77 the year before.

METALS

The only metals mined in Kentucky in 1952 were lead and zinc. Of the seven metal-producing mines, only Alcoa Mining Co. Hutson mine was worked primarily to recover metal. Other operations produced lead and zinc as byproducts of fluorspar. Producers in 1952 were Davenport Mines, Inc., U. S. Steel Corp. Tabb No. 1 and Ozark Mahoning Co. Babb and Commodore mines, all in Crittenden County; Alcoa Mining Co. Hutson, Inland Steel Co. Keystone, and Rosiclare Lead & Fluorspar Mining Co. Pigmy mine all in Livingston County. In all instances the zinc and lead were produced as concentrates in company milling operations. Livingston County was the major producer of zinc, and Crittenden County had the largest output of lead in 1952. Production of the latter declined 44 percent compared to the previous year. Zinc output declined 5 percent relative to the 1951 record year. Labor strikes following expiration of union contracts, with a reduced market for fluorspar resulting from the nationwide steel strike, were the principal factors in limiting output.

NONMETALS

Cement.—Kosmos Portland Cement Co., Inc., with offices at Louisville and plant at Kosmosdale, Jefferson County, produced a general-use and masonry cement from the Ste. Genevieve limestone quarried in Meade County. This rock is combined with local clays by the dry-grinding process.

Clays.—Kentucky clay pits produced ball, fire, and miscellaneous clays and shales in 1952. Production of ball and fire clays declined 4 and 10 percent, respectively, whereas miscellaneous clay output increased 33 percent. The total decrease for the State clay industry was 4 percent in 1952.

Fire clay comprised 60 percent of the clay tonnage, miscellaneous clays 28 percent, and ball clay 12 percent. Compared by value, fire clay remained in first place, but ball clay moved into second position; miscellaneous clays dropped to third.

Miscellaneous clays were recovered at 15 pits, production coming predominantly from Hardin, Boyd, and Jefferson Counties. Major producers were West Point Brick Co., West Point; Big Run Coal & Clay Co., Ashland; and Southern Brick & Tile Co., Louisville. Miscellaneous clay output was utilized for manufacturing heavy clay products.

Kentucky production of fire clay was concentrated in Carter and Rowan Counties, with a small output from Fayette, Hancock, Jefferson, and Greenup Counties. Twenty-five pits were in operation in 1952; the largest were operated by General Refractories Co., Harbison-Walker Refractories Co., and North American Refractories Co. Virtually all output was used for manufacturing refractories.

The Commonwealth ranked second in the Nation in ball-clay output in 1952. This commodity was used for whiteware, art pottery, high-grade tile, kiln furniture, and refractories. Ball clay was produced by Kentucky Tennessee Clay Co., Pryorsburg; Old Hickory Clay Co., Hickory; and Kentucky Clay Mining Co., Viola. Output centered predominantly in Graves County.

TABLE 3.—Clays sold or used by producers, 1943–47 (average) and 1948–52

Year	Ball clay		Fire clay		Miscellaneous clays		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	84,331	$819,766	428,324	$1,434,940	126,956	$95,699	639,611	$2,350,405
1948	103,426	1,155,530	516,169	2,210,342	182,493	143,590	802,088	3,509,462
1949	89,281	1,076,531	373,637	1,727,056	161,463	125,551	624,381	2,929,138
1950	105,690	1,325,161	422,898	2,090,094	189,624	180,710	718,212	3,595,965
1951	111,215	1,411,175	583,291	3,660,626	185,734	202,484	880,240	5,274,285
1952	107,211	1,372,695	526,238	3,450,046	247,425	278,525	880,074	5,101,266

Fluorspar.—Kentucky remained the Nation's second largest fluorspar producer in 1952. In keeping with the national trend, output of this commodity declined 30 percent compared to 1951 as a result of a strike in June and July, coupled with labor difficulties in the steel industry that curtailed consumption of spar for metallurgical purposes. Production came from Crittenden, Livingston, and Caldwell Counties; 125 mines were in operation. Major producers were U. S. Steel Corp. Tabb No. 1, Yandell No. 2, and Big Four mine; Roberts & Fraser Co.; Ozark-Mahoning Co. Commodore and Babb mines; and Inland Steel Co. The average value of fluorspar increased from $34.01 per ton in 1951 to $38.57 in 1952.

TABLE 4.—Fluorspar shipped from mines, 1943–47 (average) and 1948–52

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average			Total	Average
1943–47 (average)	94,236	$2,784,442	$29.55	1950	80,137	$2,554,668	$31.88
1948	84,889	2,663,377	31.37	1951	68,635	2,334,485	34.01
1949	63,438	2,018,209	31.81	1952	48,308	1,863,262	38.57

Sand and Gravel.—As a result of increased activity in the building- and road-construction industries, output of sand and gravel in Kentucky in 1952 was 19 percent greater than in the previous year. Production of these commodities comes predominantly from the slightly glaciated northern border of the State. Although considerable deposits of gravel occur west of the Cumberland River, the best source of supply is the Ohio River. Virtually all the major sand and gravel companies obtain their greatest production from the river, rather than from shore deposits. Cumberland and Tennessee River gravels are not suitable for use as aggregate because of a high percentage of chert.

TABLE 5.—Sand and gravel sold or used by producers, 1951–52

	1951		1952	
	Short tons	Value	Short tons	Value
Sand:				
Building	704,898	$646,214	840,110	$771,761
Paving	346,852	315,110	425,481	365,677
Engine	96,093	86,339	95,632	83,131
Undistributed	117,368	113,323	100,432	94,072
Total sand	1,265,211	1,160,986	1,461,655	1,314,641
Gravel:				
Building	489,606	578,253	395,236	469,012
Paving	606,294	331,227	1,049,860	551,254
Railroad ballast	440,528	364,333	343,906	241,503
Other			83,604	79,643
Total gravel	1,536,428	1,273,813	1,872,606	1,341,412
Total sand and gravel	2,801,639	2,434,799	3,334,261	2,656,053

Stone.—Kentucky in 1952 produced substantial quantities of limestone and a small quantity of dimension sandstone. The stone industry, comprising 14 companies with activities in 46 counties, was the fourth largest in the State in 1952. Limestone output was predominantly from the Ste. Genevieve, Gasper, and Tyrone formations. Dimension stone, which comprised a very minor portion of the total output, was quarried in Logan County by Kentucky Flagstone Co., Lewisburg; Colorstone Quarries, Russellville; and C. B. Peart, Auburn. Crushed rock, the major stone commodity in Kentucky in 1952, was produced principally in the following counties, listed in order of decreasing output; Jefferson, Christian, Rockcastle, Caldwell, and Ohio. Major producing companies were Kentucky Stone Co., Inc., and Louisville Crushed Stone Co., Louisville; Hopkinsville Stone Co., Inc., Hopkinsville; and Cedar Bluff Stone Co., Inc., Princeton. The output of crushed stone in 1952 increased 25 percent as compared with 1951. Utilization as concrete aggregate and road metal consumed 81 percent of the total production. This use increased 22 percent relative to the previous year. All other stone uses showed significant increases in output in 1952.

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TABLE 6.—Stone sold or used by producers, 1951–52, by uses

Uses	1951		1952	
	Quantity	Value	Quantity	Value
Dimension stone:				
Building stone:				
Rough construction, short tons	300	$600	[1] 1,000	[1] $3,000
Rough architectural, do			(2)	(2)
Rubble, do	120	138		
Flagging, cubic feet			(2)	(2)
Total dimension stone	420	738	[1] 1,000	[1] 3,000
Crushed stone:				
Riprap, short tons	27,084	35,691	(3)	(3)
Concrete and road metal, do	5,847,847	7,203,539	7,131,284	8,911,758
Railroad ballast, do	377,955	407,190	535,346	465,526
Agriculture, do	792,465	958,851	925,516	1,119,886
Miscellaneous, do	3,000	3,600	(3)	(3)
Undistributed, do			224,713	316,537
Total crushed stone	7,048,771	8,609,609	[1] 8,817,859	[1] 10,816,707

[1] Incomplete to avoid disclosure of individual company totals.
[2] Bureau of Mines not at liberty to publish.
[3] Included with "Undistributed" to avoid disclosure of individual company totals.

REVIEW BY COUNTIES

ADAIR

Shamrock Stone Co., Inc., Columbia, leased the Adair quarry of Cumberland Construction Co. in August 1952. Production from this pit was utilized for concrete, road metal, and agricultural purposes.

ANDERSON

Kentucky Stone Co., Louisville, was the only mineral producer in Anderson County in 1952. Crushed limestone for use as concrete aggregate, road base, and railroad ballast and for agricultural purposes was produced at the company Tyrone quarry.

BARREN

J. F. Pace Construction Co., Marrowbone, produced a high-calcium limestone for use as concrete aggregate and road metal and for agricultural purposes from its pit near Glasgow.

BELL

The sole mineral commodity produced in Bell County in 1952 was bituminous coal. The mines of the county yielded nearly 1¾ million tons of soft coal, with an average value of $5.49 per ton. The principal producing mines were the Crockitt property at Field; Balkan and Amru mines of Southern Mining Co., Williamsburg; and C. & C. Coal Co. Nugym mine, Pineville.

BOONE

Sand and gravel for maintenance of county roads were produced by the Boone County Road Department in 1952.

BOYD

The major mineral commodity produced in Boyd County in 1952 was bituminous coal. Approximately 332,000 tons of soft coal was mined, with an average value of $4.14 per ton. The largest producers included Chas. E. Yates, Coalton; and the Ellington Run Coal Co. No. 1; Ferguson Coal Co.; and Big Run Coal & Clay Co., all of Ashland. The last company reported an output of miscellaneous clays from its underground operations.

BOYLE

In 1952 Caldwell Stone Co., Danville, was sole commercial producer of limestone in Boyle County. This material was utilized for concrete aggregate, road metal, and agricultural purposes. Boyle County Road Department also reported a substantial output of crushed stone, and pit or bank run paving and road gravel for street and highway purposes.

BRACKEN

Bracken County Highway Department, Brooksville, produced crushed limestone in 1952.

BREATHITT

The sole mineral commodity produced in Breathitt County in 1952 was bituminous coal. The mines of the county yielded nearly 1 million tons of soft coal valued at $5.46 per ton. Breathitt County was one of the largest strip-mine areas in the State, producing approximately 43 percent of its 1952 output by this method of mining. Despite the relatively lower costs of surface mining, the average value of Breathitt County coal was one of the highest in the State in 1952. The major producer was Pond Creek Pocahontas Co., Evanston.

BRECKINRIDGE

In Breckinridge County in 1952 there were three producers of mineral commodities. Two of these—Hardinsburg Stone Co., Hardinsburg, and Kentucky Stone Co., Inc., Louisville—produced limestone for riprap, concrete aggregate, road metal, agricultural purposes, and railroad ballast. Murray Tile Co., Inc., Cloverport, reported an output of miscellaneous clays from its open pit for use in the manufacture of roofing tile.

BUTLER

Butler County mines yielded a small output of soft coal from the western Kentucky field in 1952.

CALDWELL

Limestone and fluorspar were mined in Caldwell County in 1952. Eleven fluorspar mines were active in the county. Major producers were Cardinal Fluorspar Co., Princeton, and J. W. Crider Fluorspar Co., Crider. These two organizations, in conjunction with several smaller companies, produced 3,684 tons of crude material. Cedar Bluff Stone Co., Princeton, produced limestone from underground and open quarry for riprap, concrete aggregate, road metal, railroad screenings, and agricultural purposes.

CAMPBELL

Campbell County was the only area in Kentucky in which molding sand was produced in 1952. Output was from the pit of Newport Sand Bank Co., Inc.

CARROLL

Carrollton Gravel Sand Co., Inc., Carrollton, was sole producer of sand and gravel in 1952. Output was sold for use in building construction and as railroad ballast.

CARTER

Carter County produced approximately 71 percent of Kentucky's fire-clay output in 1952. Most of this output was from 13 underground mines; however, there were also 5-open-pit operations. Major producers were General Refractories Co., Hitchins and Olive Hill; Harbison-Walker Refractories Co., Brinegar and Olive Hill; North American Refractories, Lowe Bailey, Hayward, and Taylor; and Ironton Fire Brick Co., Soldier. Standard Slag & Stone Co. of Youngstown, Ohio, produced limestone from its Lawton mine, Lawton. This commodity was utilized for concrete aggregate and road metal. A small production of soft coal was reported in 1952. A major producer of this commodity was Joyce Coal Co., Hitchins.

CASEY

The sole mineral producer in Casey County in 1952 was Casey Stone Co., Liberty. This organization produced high-calcium rock at its underground limestone mine near Bethelridge. Output was utilized for concrete aggregate, road base, and agricultural purposes.

CHRISTIAN

Clay and limestone were the only mineral commodities produced in 1952 in Christian County. Hopkinsville Stone Co., Inc., and Christian Quarriers, Inc., produced a high-calcium limestone from open quarries for use as concrete aggregate and road metal and for agricultural purposes. Clay for the manufacture of brick was produced by Dalton Bros. Brick Co., Hopkinsville.

CLAY

Bituminous coal was the sole product of Clay County in 1952. Output totaled approximately 840,000 tons. Major producer was Eagle Branch Coal Co., Manchester.

CLINTON

Caldwell Stone Co., Danville, operated a limestone quarry near Albany in 1952. Output of this mine was utilized for concrete aggregate, road metal, and agricultural purposes. In addition to stone, a small output of bituminous coal was reported.

CRITTENDEN

Crittenden County in 1952 produced fluorspar, lead, zinc, and stone. The county continued to be one of the major fluorspar-producing

areas in the United States. There were approximately 100 operators who, in all, produced 89,376 tons of crude fluorspar ore from the vein deposits near Marion. Production was less than in 1951, predominantly because of a strike in June and July. The largest producers were U. S. Steel Corp., with 3 mines (Tabb No. 1, Yandel No. 2, and Big Four) at Mexico and Marion; Ozark-Mahoning Co., with 2 mines (Commodore, Delhi-Babb) near Marion; and Inland Steel Co., Marion. Inland Steel Co. reworked the tailings from the closed Keystone mine. U. S. Steel Corp., Ozark-Mahoning Co., and Davenport Mines, Inc., produced zinc and lead as byproducts of the fluorspar operations. U. S. Steel operated one 700-foot shaft. Ozark-Mahoning produced finished concentrates at the company mill at Rosiclare, Ill., and utilized 3 shafts at the Babb and 2 shafts at the Commodore mine for producing crude ore. Limestone was produced by Alexander Stone Co., Marion, in 1952. This organization operated 2 quarries for producing concrete aggregate, road metal, and agricultural stone.

CUMBERLAND

Cumberland Construction Co., Burkesville, produced limestone in Cumberland County in 1952. This commodity was used for concrete aggregate and road metal.

DAVIESS

The mines of Daviess County in 1952 produced clay, sand and gravel, and coal. Owensboro Clay Products and Joseph L. Clark Tile Co., both with headquarters at Owensboro, produced common clay for use in manufacturing face brick, building tile, and drain tile. Owensboro River Sand & Gravel Co., Inc., Owensboro, and Koch Sand & Gravel Co., Evansville, reported an output of sand and gravel for building, paving, and highway use. A substantial quantity of coal was produced in Daviess County in 1952. This commodity received the lowest average price ($2.62) per ton in Kentucky. Green Coal Co., Owensboro, was the major producer.

EDMONSON

The only mineral commodity produced in Edmonson County in 1952 was native asphalt. Kentucky Rock Asphalt Co., Louisville, mined the bituminous Pottsville sandstone in large open pits at Kyrock. The rock was crushed, pulverized, and mixed by machinery and then delivered by conveyor belts to barges for the trip down the river to Bowling Green or Rockport for marketing.

ELLIOTT

Bituminous coal was the only mineral commodity produced in Elliott County in 1952. Output was relatively minor compared with the State total.

FAYETTE

In 1952 Big Run Coal & Clay Co. produced substantial quantities of fire clay in Fayette County for use in brick and tile manufacture. Production was from an underground mine near Lexington. Central Rock Co. and Blue Grass Stone Co., both of Lexington, operated an

underground mine and an open quarry, respectively, for producing limestone. The output of these operations was sold for concrete aggregate, road metal, and agricultural purposes.

FLEMING

Gorman Construction Co., Flemingsburg, was the only mineral producer in Fleming County in 1952. This organization produced limestone for concrete aggregate, road metal, and agricultural purposes.

FLOYD

Floyd County in 1952 was the fourth largest producer of bituminous coal in Kentucky. The mines of the county reported production of over 5½ million tons, with an average value of $5.74 per ton. Major producers were Inland Steel Co., Wheelwright; Princess Elkhorn Coal Co., David; and Elkhorn Coal Co., Wayland.

FRANKLIN

Frankfort Builders Supply Co. and Blanton Stone Co., Inc., both of Frankfort, operated underground limestone mines in 1952. Rock produced by these two organizations was sold for concrete aggregate, road metal, railroad ballast, and agricultural purposes. In addition to this commercial production, Kentucky Highway Department reported an output of crushed and broken stone near Frankfort.

GARRARD

The only mineral commodities produced in Garrard County in 1952 were sand and gravel from the pit of the Garrard County Highway Department, Lancaster.

GRAVES

Graves County in 1952 was the only area in Kentucky in which ball clay was produced. This material was mined by open-pit methods from the Holly Springs formation of Tertiary age. The ball clay occurs in large lenses associated with other refractory clays. Kentucky-Tennessee Clay Co. (Pryorsburg), Old Hickory Clay Co. (Hickory), and Kentucky Clay Mining Co. (Viola), were active during the year.

GRAYSON

Rodgers & Brunnhoeffer, Louisville, and Raglan Bros., both with quarries near Leitchfield, produced crushed limestone for concrete aggregate, road metal, and agricultural purposes.

HANCOCK

Owensboro Sewerpipe Co., inactive in 1950 and 1951 because of fire damage, resumed operations in 1952 at its fire-clay pit near Lewisport. Hancock County mines also reported a relatively minor output of soft coal. The county had the highest percentage (100 percent) of strip-mined coal in the State; average productivity rate was 14.16 tons per man per day.

HARDIN

Waters Construction Co., Elizabethtown, and Kentucky Stone Co., Upton and Stephensburg, produced limestone for riprap, concrete aggregate, road metal, and agricultural purposes. Waters Construction Co. operated an open pit, whereas Kentucky Stone Co. produced from both underground and surface operations. West Point Brick Co., West Point, mined common clay for use in manufacturing brick.

HARLAN

Harlan County was the leading producer of bituminous coal in the Eastern Kentucky field and ranked second in the State. The mines of the county produced over 9½ million tons of bituminous coal with an average value of $5.97 per ton, the highest of any county in the State. Major producers were U. S. Steel Corp., Lynch; International Harvester Co., Benham; and Peabody Coal Co., Kenvir.

HARRISON

Genet Stone Co., Cynthiana, quarried limestone in 1952 for concrete aggregate, road metal, and agricultural purposes.

HART

McClellan Stone Co. produced limestone for use as concrete aggregate, road metal, and agricultural stone at its quarry at Horse Cave.

HENDERSON

Bedford-Nugent Co., Inc., with offices in Evansville, Ind., worked a sand and gravel pit in Henderson County in 1952. This operation produced building and paving material as well as railroad ballast and gravel for miscellaneous use. The mines of Henderson County also reported a soft-coal output exceeding 250,000 tons, all from underground operations.

HOPKINS

The only mineral commodity produced in Hopkins County in 1952 was bituminous coal. Output totaled 13 million tons and made the county the top-ranking coal producer in Kentucky. The mines of the county also produced the greatest tonnage of strip-mine coal, despite the fact that only 38 percent of the total output was from this method of mining. The productivity rate (16.11 tons per man per day) was among the highest in the State. Major producers were West Kentucky Coal Co., Madisonville; Homestead Coal Co., Earlington; and Miners Coal Co., Madisonville.

JACKSON

Coal was the only mineral commodity produced in Jackson County in 1952. There were 56 mines in operation during the year; the largest was Daniels Bros. Coal Co., McKee.

JEFFERSON

Jefferson County was one of the leading mineral producing areas in Kentucky in 1952. The mineral industries of the county included limestone, cement, sand and gravel, and clays. In 1952 Jefferson County was the only area in Kentucky in which cement was produced. Kosmos Portland Cement Co., Inc., Louisville, operated six kilns for the production of portland and masonry cements at the Kosmosdale plant. Output was shipped by truck, railroad, and boat to nearby points, such as Evansville, Ind., and Cincinnati, Ohio. Jefferson County in 1952 ranked first in the State in limestone output. The principal producers were Louisville Crushed Stone Co., Louisville; Jefferson County Stone Co., Anchorage; Derby Stone Co., Buechel; W. T. Litter, Prospect; and Okolona Stone Quarry, Okolona. Output was used for concrete aggregate, road metal, and agricultural purposes.

Ohio River Sand Co., Inc., was the major producer of sand and gravel in Kentucky as well as in Jefferson County. Output was recovered by floating dredges operating in the Ohio River channel adjacent to Jefferson, Oldham, Trimble, Carroll, and Crittenden Counties. Inasmuch as the dredges float up and down the river, there is no way of assigning actual production to the various counties. Consequently, the total production of this company has been assigned to Jefferson County, the location of its home office. Other producers of sand and gravel in the county in 1952 were Louisville Sand & Gravel Co. and Humpich Sand Co., both of Louisville. These organizations produced a minor quantity of unwashed molding sand, as well as sand and gravel for building and engine use.

Clay was produced by Southern Brick & Tile Co., Louisville, and Coral Ridge Brick & Tile Co., Coral Ridge. These companies mined a substantial tonnage of miscellaneous clays for use in manufacturing face brick and structural and building tile.

JESSAMINE

Kentucky Stone Co., Inc., the only mineral producer in Jessamine County in 1952, worked its underground and surface mines and produced high-calcium limestone for use as concrete aggregate, road metal, and railroad ballast and for agricultural purposes.

KENTON

Franxman Bros. Co. produced limestone for concrete and road base in its quarry at Covington.

KNOTT

The only mineral commodity produced in Knott County in 1952 was approximately 1 million tons of soft coal valued at $4.47 per ton. Knott Coal Corp., Anco, was by far the largest producer in the county.

KNOX

Barbourville Brick Co., Barbourville, produced clay for use in face and load-bearing tile. The major mineral commodity produced in

the county, however, was bituminous coal, which sold for an average of $5.21 a ton. The major producer was Kentucky Jellico Coal Co., Kayjay.

LAUREL

The only mineral commodity produced in Laurel County in 1952 was bituminous coal. Twenty-three mines were in operation; the largest was owned by Bates & Gibson Coal Co., Isom.

LAWRENCE

Tug River Sand & Salvage Co., Inc., and Elkhorn Sand Co., Inc., both of Louisa, produced substantial quantities of sand and gravel in 1952. In addition, a small output of soft coal was reported. Webbville Strip Mining Co. and Wents Coal Co., both of Webbville, furnished 50 percent of the county production.

LEE

A small quantity of soft coal was produced in Lee County in 1952. Limestone was recovered at the Yellow Rock quarry of Kentucky Stone Co., Inc.

LESLIE

Approximately 2,400,000 tons of soft coal, with an average value of $4.84 per ton, was produced in Leslie County in 1952; 75 mines were active during the year. The largest were Mary Gail Coal Co. No. 3 mine and Smith Coal Co., both at Wooton.

LETCHER

Letcher County in 1952 ranked sixth in the production of bituminous coal in Kentucky. Mines of the county reported an output exceeding 4½ million tons, with an average value of $5.77 per ton. Major producers were Consolidated Coal Co., Jenkins; Elkhorn Coal Co., Jackhorn; and South-East Coal Co., Seco. Levisa Stone Corp. operated its open quarry near Jenkins. Rock produced was sold for concrete aggregate, road metal, and screenings.

LIVINGSTON

Approximately 12 mines yielded an aggregate 23,856 tons of crude fluorspar ore in Livingston County in 1952. A high percentage of this material was mined from vein deposits near Carrsville. Production was interrupted by a labor strike in June and July. The major producer was Roberts & Fraser. In addition to fluorspar, the county ranked first in zinc output. Companies active during the year were Alcoa Mining Co., Inland Steel Co., and Rosiclare Lead & Fluorspar Mining Co. The Alcoa Co. Hutson mine was the only zinc mine in the State; other zinc and lead output was a byproduct or coproduct of fluorspar mining. The Hutson property was worked continuously in 1952, except for the period June 1 through July 7, when labor and management were negotiating a new working agreement. As part of its fluorspar-mining expansion program Alcoa Mining Co. began

development during the year of the Klondike and Silver-Royal mines, from which byproduct lead and zinc will be recovered. Work at these properties included extension of the Klondike mine's Bailey shaft from 220 feet to 500 and construction of a new shaft to replace the partly caved and otherwise inadequate entry at the Silver-Royal. Inland Steel Co. and Rosiclare Lead & Fluorspar Mining Co. produced byproduct zinc and lead from the Keystone and Pigmy mines, respectively. Limestone for concrete aggregate, road construction, and agricultural purposes was quarried by Ward & Montgomery at Verna.

LOGAN

In 1952 Logan County was the only area in Kentucky in which dimension stone was quarried. Dimension sandstone was produced by Kentucky Flagstone Co., Lewisburg, and Colorstone Quarries, Russellville. The latter organization operated a quarry near Epleys. C. B. Peart, Auburn, and Kentucky Stone Co., Inc., Louisville, operated quarries near Russellville for the production of rough dimension limestone and crushed material. The crushed limestone was utilized for concrete aggregate, road material, railroad ballast, and agricultural purposes.

MADISON

The only mineral producer in Madison County in 1952 was Kentucky Stone Co., Inc., Louisville. This organization operated a limestone quarry near Boonesboro for producing concrete aggregate, road base, railroad ballast, and agricultural stone.

MAGOFFIN

Bituminous coal was the only mineral product of Magoffin County in 1952. The largest producers were United Electric Co., Evanston, and Buchanan Coal Co., Tip Top.

MARION

Lebanon Stone Co. and Ward & Montgomery Co., both of Lebanon, produced crushed and broken limestone in 1952. Marion County Road Department reported an output of screened, and crushed sand and gravel for building purposes.

MARTIN

Bituminous coal was the only mineral product of Martin County in 1952. Most of the output came from the Earlston mine of Earlston Coal Co., Kermit.

MASON

Spahr Brick Co. mined common clay from its open pit near Maysville. This material was used in manufacturing brick. Mason County road engineer, Maysville, was the sole producer of crushed and broken stone in 1952.

McCRACKEN

Federal Materials Co., Inc., and Newbert Mines, both of Paducah, produced sand and gravel in 1952. These materials were utilized for building construction, railroad ballast, and miscellaneous purposes. Paducah Brick & Supply Co., Inc., Paducah, reported production of a small tonnage of common clay.

McCREARY

McCreary County mines in 1952 yielded 480,300 tons of bituminous coal with an average value of $5.03 per ton. Stearns Coal & Lumber Co. was the major producer, operating mines at Worley, Co-Operative, and Blue Heron.

McLEAN

A relatively minor tonnage of soft coal, all from underground mines, was produced in McLean County in 1952. Nine mines operated in the vicinity of Island.

MEADE

The sole producer of limestone in Meade County in 1952 was Kentucky Stone Co., Inc., Guston.

MENIFEE

A. W. Walker & Son, Mount Sterling, was the only producer of limestone in Menifee County in 1952. This organization operated a quarry near Frenchburg for producing crushed and broken stone, which was sold for concrete aggregate, road material, and agricultural purposes.

MERCER

The county road department, Harrodsburg, was the sole producer of limestone in Mercer County in 1952.

METCALFE

Montgomery & Co., Knob Lick, operated the Chapman quarry for producing high-calcium limestone. This organization was the only producer of a mineral material in Metcalfe County in 1952.

MONROE

Monroe-Cumberland Crushed Stone Co., Tompkinsville, was the only producer of limestone in Monroe County in 1952. Most of this rock was sold for concrete aggregate and road material. A small percentage was utilized for agricultural purposes.

MORGAN

Licking River Limestone Co., West Liberty, operated the Licking River quarry near Zag, Morgan County, in 1952. Production was sold for concrete aggregate, road base, and agricultural purposes. The county also has a relatively minor production of soft coal.

MUHLENBERG

Bituminous coal and limestone were the only mineral commodities produced in Muhlenberg County in 1952. Coal production totaled nearly 4½ million tons, 32 percent of it as a result of strip mining. Crescent Coal Co. (Central City), Terteling Bros., Inc. (Madisonville), and Duncan Coal Co. (Greenville), were the largest producers in the county. Luzerne Limestone Co., Greenville, produced limestone in conjunction with coal stripping. The limestone was used for concrete aggregate, road material, and agricultural purposes.

OHIO

In 1952 the mines and quarries of Ohio County yielded limestone and bituminous coal. Over 1½ million tons of soft coal was produced, 97 percent as a result of strip mining. By far the largest producer of this commodity was Ken Coal Co., Beaver Dam. State Contracting & Stone Co. and Fort Hartford Stone Quarry, both of Hartford, quarried limestone in 1952. The latter organization operated a quarry near Olaton for producing concrete aggregate, road base, and railroad ballast. The State Contracting & Stone Co. operated its quarry near Sulphur Springs. Production was utilized for asphalt filler, concrete aggregate, and road metal and for agricultural purposes.

OWSLEY

The only mineral commodity produced in Owsley County in 1952 was soft coal. Nine mines were worked in the Conklin-Booneville area.

PERRY

Perry County in 1952 ranked as one of the major producers of bituminous coal in Kentucky. Output totaled over 5 million tons with an average value of $5.25 per ton. Blue Diamond Coal Co. was the largest producer in the county. This organization operated mines at Leatherwood, Tilford, and Blue Diamond.

PIKE

Output of soft coal from the mines of Pike County in 1952 was enough to rank this area third among the producing counties. Over 8½ million tons of bituminous coal, with an average value of $4.99 per ton, was produced in the county during the year. Norfolk & Western Railway Co. (Pond Creek), Eastern Coal Corp. (Stone), and Republic Steel Corp. (Elkhorn City), were the major producers.

POWELL

A. W. Walker & Sons, Mount Sterling, recovered limestone from the White Rock quarry near Clay City in 1952. Production of this material was utilized for concrete aggregate, road metal, and agricultural purposes. H. B. Sipple Brick Co., Stanton, produced clay.

PULASKI

Somerset Stone Co., Inc., produced limestone for concrete aggregate, road metal, and agricultural purposes at its quarry near Somerset in 1952. Strunk Construction Co., Somerset, operated the Strunk

quarry near Tateville for the same purposes. A small output of bituminous coal was also reported in the county. This commodity had an average value of $4.64 per ton.

ROCKCASTLE

Kentucky Stone Co., Inc., in 1952, produced limestone from the Mount Vernon and Mullins quarries near Mount Vernon and Withers, respectively. Both of these operations yielded crushed and broken limestone for concrete aggregate, road metal, railroad ballast, and agricultural purposes. In addition, Rockcastle County mines reported a small output of soft coal.

ROWAN

In 1952 the clay pits of Rowan County yielded a substantial quantity of fire clay. Active producers were General Refractories Co., Haldeman, Lee Clay Products Co., Inc., Clearfield, and Kentucky Fire Clay Co., Morehead. A minor production of bituminous coal from mines in the county was also reported.

SIMPSON

The only mineral producer in Simpson County was Southern Stone Co., Inc., Franklin. This organization produced limestone.

TODD

In 1952 D. W. Dickenson (Trenton) and Kentucky Stone Co., Inc. and Todd County Stone Co. (both of Elkton), produced limestone for use in concrete aggregate and road metal and for agricultural purposes.

TRIGG

Cerulean Stone Co., Inc., Cerulean, operated an open quarry in Trigg County, in 1952, for producing limestone. Output was utilized for riprap, concrete aggregate, road metal, railroad ballast, and agricultural purposes.

UNION

Union County mines produced in 1952 approximately 632,000 tons of soft coal with an average value of $3.62. Poplar Ridge Coal Co., Sturgis, was the major producer. In addition, Clark Clay Products Co., Uniontown, produced clay for utilization in manufacturing brick.

WARREN

McClellan Stone Co. was the only producer of stone in Warren County in 1952. This company operated a dolomite quarry near Bowling Green. Output was sold for concrete aggregate, road material, and agricultural purposes.

WAYNE

The mines of Wayne County produced a small quantity of coal in 1952. In addition, Bassett Products Co. reported an output of limestone for use as concrete aggregate and road metal and for agricultural purposes.

WEBSTER

In 1952 Webster County produced 96 percent of its coal output from strip mines. This resulted in a 29-ton man-day productivity rate, the highest in the State.

WHITLEY

Whitley County mines in 1952 were among the largest producers of strip coal in Kentucky. Of the 512,182 tons mined in the area, approximately 57 percent resulted from strip mining. The coal produced sold at an average price of $4.85 per ton. Corbin Brick Co., Corbin, produced shale for use in the manufacture of heavy clay products.

WOLFE

Wolfe County was the smallest producer of bituminous coal in Kentucky. Mines in the county yielded 8,494 tons, with an average value of $5.39, in 1952.

The Mineral Industry of Louisiana

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Louisiana.

By F. F. Netzeband[1] and Leo Hough[2]

LOUISIANA, the 30th largest State in area in the Nation, comprises 48,523 square miles and ranked 5th in production of mineral wealth for 1952; this output had a total value of $848,259,000. The State was the 2d largest producer of natural gas and sulfur, the 3d largest producer of petroleum and natural gasoline, the 4th largest producer of LP-gases, and the 5th largest producer of salt. Louisiana also supplied important quantities of cement, gypsum, and clay. Fourteen areas or districts in 20 parishes in the southern part produced most of the State's nonmetallic minerals.

TABLE 1.—Mineral production in Louisiana, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays (except for cement)	152,906	$152,906	157,025	$200,697
Natural gas thousand cubic feet	1,054,199,000	61,143,000	1,237,143,000	82,889,000
Natural-gas liquids:				
Natural gasoline and cycle products 42-gallon barrels	15,643,000	49,202,000	16,001,000	48,579,000
LP-gases do	6,839,000	15,374,000	7,082,000	14,890,000
Petroleum (crude) do	232,281,000	614,680,000	[2] 243,929,000	[2] 645,090,000
Salt (common)	2,737,149	7,662,179	2,553,448	7,807,693
Sand and gravel	6,384,328	7,419,570	6,005,119	6,736,524
Sulfur (Frasch-process) long tons	1,152,821	25,400,000	1,449,668	32,015,000
Undistributed: Cement, gypsum, and stone (except limestone for cement, 1952)		6,644,231		10,051,053
Total Louisiana		787,678,000		848,259,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels and gypsum are strictly production.
[2] Final figure. Supersedes preliminary figure given in commodity chapter.

Petroleum was the most important single natural resource of the State and accounted for 75 percent of the total mineral value for 1952. It was produced in 57 of the 64 parishes in the State. Natural gas was the second most important mineral in value and supplied 10 percent of the total value of minerals produced. Crude-petroleum pipeline mileage increased 17 percent over 1950 to 2,872 miles in 1952, and petroleum-products pipeline mileage increased 13 percent to 616 miles in the same period. The cubic capacities (pipeline fill) of crude-oil pipelines increased 90 percent over 1949 to 2,156,000 barrels, while that of products lines increased 41 percent to 318,000 barrels in the same period.[3]

[1] Commodity-industry analyst, Mineral Industry Division, Bureau of Mines, Region VI, Amarillo, Tex.
[2] Louisiana Geological Survey.
[3] Coumbe, A. T., and Avery, I. F., Crude Oil and Refined Products Pipeline Mileage in the United States, Jan. 1, 1953: Bureau of Mines Inf. Circ. 7671, 1953, 10 pp.

CONSUMPTION AND MARKETS

Most producers of minerals in Louisiana found it necessary to continue developing out-of-State markets for their products in view of the differences in magnitude of their productions in relation to intrastate manufacturing and consumer demands. Industrialization of the State economy has made great strides in the past several years, and the Mississippi River and coastal ports offer attractive transportation inducements.

NEW PLANTS AND PROJECTS

Under the aluminum expansion program initiated by the Defense Production Administration in 1950, the Nation's largest aluminum-reduction plant was being built in 1952 at Chalmette, Orleans Parish, La., by the Kaiser Aluminum & Chemical Corp.[4] This plant, with an annual capacity of 200,000 tons of metal, will have eight potlines with 1,152 electrolytic cells. The first metal from this plant was poured December 11, 1951. Major features of this new plant are:

Potroom Buildings.—Besides being the focus of operations, the potlines form the plant's most massive feature. They comprise 16 potroom buildings—2 for each potline—lined up side by side. Each "room" measures 960 feet long by 59 feet wide and contains 72 Soderberg-type pots, or electrolytic cells, which individually produce aluminum at a rate of 40 pounds an hour.

In this process, each pot shell is insulated with alumina and other material and then lined with carbon to serve as the cathode. A recess in this lining holds the electrolytic bath, made up of cryolite and alumina.

Resting on the cathode shell is a superstructure which supports the anode, initially composed of liquid carbon paste. When the anode is progressively lowered to maintain even immersion in the bath as the carbon is consumed in the continuous reduction process, the paste is baked solid by heat from the pot itself. New paste is added from above at intervals.

Cryolite and alumina are introduced into the bath through hoppers and spouts on the superstructure. Each pot measures about 21½ feet long by 11½ feet wide overall, and stands 13 feet 4 inches high.

The direct electric current required in the aluminum-reduction process is supplied through a system of aluminum bus. For the Chalmette plant, about 12,000,000 pounds of aluminum plate is being fabricated into bus bars.

Elaborate air-exhaust and air-cleaning systems are installed in each potroom.

Metal Service Building.—This building connects the bases of the potrooms and provides facilities for pouring molten aluminum into pigs weighing up to 1,000 pounds and handling their storage and shipping. It is 1,650 feet long and 63 feet wide for most of its length; at one end, the width is more than doubled to house holding furnaces for molten metal and casting equipment.

Power Plants.—To furnish the electric power needed to produce 400,000,000 pounds of aluminum a year, Kaiser Aluminum's new

[4] American Metal Market, Dec. 11, 1951.

Chalmette reduction plant will generate its own electricity in two power installations with a combined capacity of 478,200 kilowatts—a capacity equal to nearly one-half the installed capacity of Hoover Dam.

Natural gas from nearby fields is the fuel for both power plants. Otherwise, they are completely different in design and operation.

One is a steam plant generating alternating current to supply six potlines and general plant requirements. The other uses radial gas engines to drive direct-current generators supplying electricity to the other two potlines.

Rectifier facilities for converting the 13,800-volt alternating current to 700-volt direct current for potline operation will be housed in a building over 1,000 feet long.

A pumping plant will deliver 180 billion gallons of water annually to the steam plant and other facilities from the Mississippi through 66- and 90-inch steel pipelines. Similar piping will return water to the river outlet.

Engine Plant.—Eighty Nordberg radial gas engines supply the direct current for 2 of the 8 potlines. Each engine, developing 1,650 horsepower, is directly connected to a generator having an output of 1,290 kilowatts of direct current at 700 volts—making a total of 132,000 horsepower and 103,200 kilowatts output.

Raw Materials.—Immense quantities of raw materials are used in aluminum production. The Chalmette plant will require each year 378,000 tons of alumina, 88,000 tons of petroleum coke, 34,000 tons of soft pitch, 6,000 tons of cryolite, 5,000 tons of aluminum fluoride, 8,000 tons of anthracite, 50 billion cubic feet of natural gas, and 180 billion gallons of water for both process and domestic use.

Large installations are required to handle these materials.

Alumina.—Alumina, which is the major and basic raw material required in aluminum reduction, is supplied from Kaiser Aluminum's reduction plant at Baton Rouge and delivered by rail.

The rail unloading station handles two hopper-bottom cars at a time. An elevated 24-inch belt conveyor, reaching out nearly 2,000 feet over the potrooms, operates at 300 feet a minute and carries 150 tons of alumina an hour to the 8 alumina bins or silos between the potlines.

The ore bins are 45 feet in diameter and 77 feet high, with a capacity of 3,500 tons of alumina. Cranes deliver ore from the bins to the hoppers feeding the pots.

Cryolite.—Cryolite, used to dissolve alumina and form the electrolytic bath in the pots, is unloaded at the same rail station as alumina and delivered by the same belt conveyor to 12 steel bins, also located between potroom buildings. Each bin is 15 feet in diameter and 77 feet high and holds 500 tons.

Paste Plant.—This plant prepares the carbon paste for anodes and cathode lining in the aluminum reduction cells by blending and mixing petroleum coke, pitch, and anthracite into a plastic product which becomes solid carbon when baked.

Natural Gas.—Gas is delivered by the United Gas Pipe Line Co. through a 16-inch pipeline to a plant station that scrubs and meters the gas and reduces the pressure to plant requirements before distributing it to the power plants.

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Water.—A pumping plant, with a total capacity of approximately 342,000 gallons a minute, draws water from the Mississippi for condenser circulation and industrial and domestic use. A complete water-treatment plant provides clear, sterile, potable water for drinking and other requirements.

Miscellaneous Facilities.—Other buildings and auxiliary facilities include administration, personnel, laboratory, washroom and locker buildings, pot lining, power-plant maintenance, electrical maintenance, garage, carpenter shop, machine shop, and warehouse buildings, in addition to specialized smaller shops and lunchrooms.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Natural Gas and Natural-Gas Liquids.—Marketed production of natural gas in 1952 increased 17 percent and its value 36 percent over that of 1951. Production of natural gasoline and LP-gases increased in 1952 over 1951, but their values decreased in the same period.

Petroleum.—Petroleum production increased 5 percent in volume to 243,929,000 barrels and 5 percent in value to $645,090,000 when compared to 1951 production and value. Petroleum was the major mineral produced in the State in 1952.

TABLE 2.—Production of mineral fuels, 1948–52

Year	Crude petroleum		Natural-gas liquids				Natural gas	
			Natural gasoline		LP-gases			
	Thousand barrels	Thousand dollars	Thousand barrels	Thousand dollars	Thousand barrels	Thousand dollars	Million cu. ft.	Thousand dollars
1948	181,458	485,950	12,562	46,553	4,339	11,346	686,061	26,482
1949	190,826	507,730	13,936	45,259	5,318	9,573	732,845	32,025
1950	208,965	554,520	14,603	44,548	6,165	7,991	831,771	44,084
1951	232,281	614,680	15,643	49,202	6,839	15,374	1,054,199	61,143
1952	243,929	645,090	16,001	48,579	7,082	14,890	1,237,143	82,889

NONMETALS

Louisiana produced significant quantities of nonmetal commodities in 1952, namely, cement, clay, gypsum, salt, sand and gravel, stone, and sulfur. The reported value of these commodities in 1952 was $56,811,000, 20 percent greater than the 1951 value ($47,279,000). Sulfur supplied 56 percent of the nonmetal value.

Cement.—Production of cement in Louisiana in 1952 came from plants near New Orleans and Baton Rouge. Shipments in 1952 were greater than production, so that stocks at mills at the year end had declined from 1951.

Clays.—Virtually all the clay produced in Louisiana in 1952 was used for cement manufacture and for brick and tile. This output originated in 9 of the State's 64 parishes. Larger quantities of clays were used in manufacturing cement than for brick and tile.

Bentonitic clay was produced in Lincoln Parish in 1952.

TABLE 3.—Miscellaneous clays sold or used by producers, 1948–52

Year	Miscellaneous clays sold or used		Year	Miscellaneous clays sold or used	
	Short tons	Value		Short tons	Value
1948	248,870	$194,956	1951	306,542	$306,542
1949	249,912	193,501	1952	390,136	433,808
1950	327,067	273,116			

Gypsum.—Gypsum was produced in Winn Parish in 1952. This material was shipped out of the State for further processing.

Salt.—Production of salt dropped approximately 7 percent in 1952, but the value increased 2 percent. Salt was produced in five parishes in 1952. Most of the output was derived from underground deposits.

TABLE 4.—Salt sold or used by producers, 1948–52

Year	Salt sold or used		Year	Salt sold or used	
	Short tons	Value		Short tons	Value
1948	2,223,249	$6,444,751	1951	2,737,149	$7,662,179
1949	2,030,076	5,837,714	1952	2,553,448	7,807,693
1950	2,278,811	6,902,502			

Sand and Gravel.—Louisiana's output of sand and gravel decreased 6 percent in 1952, when 6,005,000 tons were produced. The material was used principally as an aggregate for concrete mix and for road surfacing. The production originated in more than 15 of the State's parishes.

TABLE 5.—Sand and gravel sold or used by commercial and Government-and-contractor producers, 1948–52

Year	Commercial		Noncommercial		Total sand and gravel		
	Short tons	Value	Short tons	Value	Short tons	Value	Average value per ton
1948	4,319,420	$5,204,096	(1)	(1)	[2] 4,319,420	[2] $5,204,046	$1.20
1949	5,050,148	6,107,311	(1)	(1)	[2] 5,050,148	[2] 6,107,311	1.21
1950	5,245,714	6,187,065	259,648	$123,360	5,505,362	6,310,425	1.15
1951	6,098,898	7,262,749	285,430	156,821	6,384,328	7,419,570	1.16
1952	5,788,098	6,660,994	217,021	75,530	6,005,119	6,736,524	1.12

[1] Bureau of Mines not at liberty to publish.
[2] Incomplete figure, excludes noncommercial operations.

Stone.—Stone was produced in Calcasieu Parish in 1952 by the Mathieson Chemical Corp.

Sulfur.—Shipments of sulfur produced by the Frasch process in 1952 in Louisiana were second only to those of Texas and 26 percent greater in quantity and 26 percent greater in value than in 1951.

Three parishes were responsible for the State's sulfur production—Calcasieu, Plaquemines, and Terrebonne.

TABLE 6.—Sulfur produced and shipped from Frasch mines, 1948–52

Year	Production	Shipments		
	Long tons	Long tons	Value	Average value per ton
1948	1,001,665	1,005,711	$18,100,000	$18.00
1949	1,134,185	1,111,115	20,000,000	18.00
1950	1,243,020	1,256,026	23,700,000	18.87
1951	1,311,293	1,152,821	25,400,000	22.03
1952	1,508,550	1,449,668	32,015,000	22.08

REVIEW BY PARISHES

Metal and nonmetal production (excluding, oil and gas production) was reported from 24 of Louisiana's 64 parishes in 1952.

BEAUREGARD

Moses & Kelley produced sand and gravel from pits near Merryville, La.

BIENVILLE

The Norman Brick Co. continued to produce clay for its brick plant in Bienville Parish.

BOSSIER

Bossier Parish Police Jury produced gravel.

CADDO

Paving sand and gravel and other sand were produced from deposits near Shreveport by the Meriwether Supply Corp. and by the Texas & Pacific Railway Co.

CALCASIEU

The Mathieson Chemical Corp. produced crushed limestone from oystershells near Lake Charles. Clay for building brick was produced by the Price-Dunham Brick Co. Jefferson Lake Sulphur Co. produced sulfur from the Starks dome.

CAMERON

Salt brine was produced by the Mathieson Chemical Corp. at Hackberry, La.

CLAIBORNE

Paving and road gravel was produced by George H. Owens.

EAST BATON ROUGE

Clay for brick and tile was produced by the Baton Rouge Brick & Tile Co., Inc. The Ideal Cement Co. of Baton Rouge operated its

cement plant at capacity during 1952. The State of Louisiana produced paving gravel. Sulfur was recovered by Consolidated Chemical Industries, Inc.

EAST FELICIANA

Sand and gravel were produced by the Flint Sand & Gravel Co., Inc., and by the Holloway Gravel Co., Inc.

EVANGELINE

Building and paving sand and gravel were produced by Gifford-Hill & Co., Inc., in Evangeline Parish.

GRANT

Dunham-Stephens Gravel Co., Inc., produced sand and gravel in Grant Parish.

IBERIA

Sand and gravel were produced by the Iberia Sand & Gravel Co. Important quantities of salt were produced in Iberia Parish by International Salt Co., Inc., Jefferson Island Salt Co., Inc., and Morton Salt Co., Ltd. Clay was produced by Conrad Collins near New Iberia.

IBERVILLE

Salt was mined by the Solvay Process Division, Allied Chemical & Dye Corp.

LAFAYETTE

The Mike-Baker Brick Co. produced clay in Lafayette Parish.

LA SALLE

Glen Drewett produced sand and gravel near Jena.

LINCOLN

Ruston Brick Works and Filtrol Corp. both produced clay in Lincoln Parish.

ORLEANS

Orleans Parish, in which Louisiana's largest city, New Orleans, is located, offered ready markets for important tonnages of cement and sand and gravel. The United States District Engineers produced paving sand. Jahncke Service, Inc., produced some sand and gravel from pits near New Orleans, and Lone Star Cement Co. operated its cement plant in New Orleans. No perlite was produced in Louisiana, but the Alatex Construction Service Co. processed perlite in Orleans Parish.

OUACHITA

Sand and gravel were produced by the Monroe Sand & Gravel Co., Inc., and by the Twin City Gravel Co., Inc.

PLAQUEMINES

Sulfur was mined by the Freeport Sulphur Co. of Plaquemines Parish.

RAPIDES

Sand and gravel were produced near Alexandria by the Alexandria Gravel Co., Inc., Holeman & Reel, Rapides Gravel Co., Inc., and S. M. Stewart. The Enterprise Brick Co., Inc., produced some clay.

SAINT MARTIN

The Gorday Salt Co., Inc., mined salt in St. Martin Parish.

SAINT TAMMANY

Jahncke Service, Inc., and Kivett & Reel, Inc., near Sun, produced sand and gravel in St. Tammany Parish. Clay was produced by the St. Joe Brick Works, Inc., and the Schneider Brick & Tile Co., Inc.

TANGIPAHOA

Sand and gravel were produced in Tangipahoa Parish as well as clay.

TERREBONNE

Freeport Sulphur Co. produced sulfur from the Bay Ste. Elaine dome.

WASHINGTON

Sand and gravel were the only commodities produced to any extent in Washington Parish.

WEBSTER

Gifford-Hill & Co., Inc., produced sand and gravel in Webster Parish, as did Braswell Sand & Gravel Co., Inc.

WEST FELICIANA

Jackson Sand & Gravel Co., Inc., produced sand and gravel in West Feliciana Parish.

WINN

Salt and gypsum were both produced in Winn Parish. The Carey Salt Co., Inc., has salt mines, and Anderson-Dunham Co. was interested in gypsum deposits.

The Mineral Industry of Maine

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Maine.

By Richard H. Mote [1]

SUBSTANTIAL gains in the production of cement, sand and gravel, slate, and feldspar in Maine in 1952 combined to raise the aggregate value of the State mineral output 5 percent over the 1951 level to a new record high of $8,981,000. Mineral production was reported from every county except Lincoln and Somerset. Leading counties, in order of decreasing value of output, were Knox, Kennebec, Hancock, Piscataquis, and Aroostook, which together supplied nearly 87 percent of the total dollar volume of mineral production. Cement manufacture continued to be the leading element in the State mineral economy. Stone, which ranked second in 1951, dropped to third position and was replaced by sand and gravel; the output of the latter advanced 32 percent in quantity and 20 percent in value over the 1951 figures. Slate and lime followed in fourth and fifth places, respectively. There was no mine production of metals in the State in 1952.

TABLE 1.—Mineral production in Maine, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement.....376-pound barrels	1,236,299	$3,182,918	1,457,250	$3,750,483
Clays (except for cement)	21,885	21,885	26,050	26,050
Feldspar (crude).....long tons	19,273	154,695	18,644	147,371
Peat	1,805	36,870	1,695	57,541
Sand and gravel	5,366,694	1,817,317	7,078,078	2,187,531
Stone (except limestone for cement and lime)	644,594	2,582,541	[2] 316,874	[2] 1,795,768
Undistributed: Beryllium concentrate, columbium-tantalum concentrate (1951), gem stones (1951), lime, mica (scrap and sheet), quartz from pegmatites or quartzite, slate, stone (crushed limestone, 1952), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)	----------	[3] 720,095	----------	1,015,827
Total Maine	----------	8,516,000	----------	8,981,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production.
[2] Excludes certain stone, value for which is included with "Undistributed."
[3] Revised figure.

[1] Chief, Mineral Industry Division, Region VIII, Bureau of Mines, Pittsburgh, Pa.

REVIEW BY MINERAL COMMODITIES

METALS

Although metalliferous deposits occur in a number of localities in Maine, metal mining has been virtually nonexistent since 1900. The principal period of development was from 1878 to 1882, during which time mines in the State yielded iron, copper, lead, gold, silver, and zinc. Major producing properties during this period were the Douglas copper mine, Blue Hill; Cape Rozier zinc-lead-copper mine, Harborside; and Deer Isle zinc-lead-copper mine near Deer Isle, all in Hancock County; and the Mount Katahdin iron deposits, Piscataquis County.

The Bureau of Mines reported in 1952 on a drilling program and metallurgical investigation of low-grade manganese ores of Aroostook County.[2] The deposits of this county are estimated to contain 28 million tons of metallic manganese in manganiferous-ferruginous slates averaging about 9 percent manganese. Of this quantity, 22.8 million tons of metal is contained in 256 million tons of ore at 1 locality. These deposits have not been mined because of the difficulty in recovering manganese from the ores.

At Pittsburgh, Pa., the Bureau of Mines process for reclaiming manganese from open-hearth steel-furnace slags was proved technically feasible, and preliminary experiments indicated that the same process can be used to beneficiate the low-grade ores of Aroostook County.[3]

A discussion of the Aroostook County manganese deposits is contained in a comprehensive review of manganese prepared by the Bureau of Mines in cooperation with the National Security Resources Board.[4]

There was no mine output of metals in Maine in 1952.

NONMETALS

Beryl.—Beryl produced in Maine is recovered as a byproduct from the mining of pegmatite rocks exploited primarily for feldspar and/or mica. As the pegmatites are mined, beryl crystals are hand sorted and stored for sale when a few tons have been accumulated. In 1952 two mines, both in Oxford County, yielded beryl concentrate.

A report on exploration and development of a pegmatite deposit near Albany, Oxford County, was issued during the year.[5] Indicated beryl reserves in Maine were increased substantially as a result of this investigation.

Cement.—In terms of value, cement was the major mineral product of Maine in 1952. The sole producer was the Dragon Cement Co., Inc., quarry and plant at Thomaston, Knox County, the only cement mill in the New England States.

Clays.—Clay was produced in the following counties, in order of decreasing output: Androscoggin, Cumberland, Franklin and Penob-

[2] Eilertsen, N. A., Maple Mountain-Hovey Mountain Manganese Project, Central District, Aroostook County, Maine: Bureau of Mines Rept. of Investigations 4921, 1952, 118 pp.

[3] Buehl, R. C., and Royer, M. B.: Production of Spiegeleisen From Open-Hearth Slag in an Experimental Blast Furnace: Jour. of Met., vol. 4, December 1952, pp. 1289–1294. Royer, M. B., and Buehl, R. C., Production of High-Manganese Slags by Selective Oxidation of Spiegeleisen: Jour. of Met., vol. 4, December 1952, pp. 1295–1300.

[4] Parks, Roland D., and Gealy, Edgar J., Materials Survey—Manganese: Bureau of Mines, prepared for National Security Resources Board, October 1952, ch. VII, pp. 8–14.

[5] Neumann, G. L., Bumpus Pegmatite Deposit, Oxford County, Maine: Bureau of Mines Rept. of Investigations 4862, 1952, 15 pp.

scot. Exploitation was limited to miscellaneous clays used for the manufacturing of brick and heavy clay products. In 1952, 7 pits were in operation, 1 each in Franklin and Penobscot Counties, 2 in Cumberland, and 3 in Androscoggin.

Feldspar.—The feldspar quarries of Maine are all in the south-central and southwestern part of the State, principally in Oxford, Sagadahoc, and Androscoggin Counties. In 1952, 25 properties were worked, 5 in Androscoggin County, 2 in Cumberland, 8 in Oxford, and 10 in Sagadahoc.

TABLE 2.—Crude feldspar sold or used by producers, 1943–47 (average) and 1948–52

Year	Quantity (long tons)	Value	
		Total	Average per ton
1943–47 (average)	12,311	$71,927	$5.84
1948	18,774	130,486	6.95
1949	18,286	130,275	7.12
1950	17,487	124,821	7.14
1951	19,273	154,695	8.03
1952	18,644	147,371	7.90

Gem Stones.—Most gem materials produced in Maine are recovered by hobbyists, amateur mineral collectors, and vacationists; only a small percentage of the total output is produced commercially. A small quantity of star-rose quartz was recovered from the Bumpus quarry near Albany, Oxford County.

Lime.—Rockland-Rockport Lime Co. was Maine's only producer of lime in 1952. The product was marketed as both quicklime and hydrated lime and for a variety of uses.

Mica.—Mica produced in Maine is obtained largely as a byproduct of feldspar mining and is principally scrap mica, although some output is suitable for use as sheet mica. Production in 1952 came from seven mines in Oxford County.

Peat.—The principal producing peat bogs in Maine are in Hancock and Washington Counties. Commercial development has not been extensive, however, due to low value of product and the limited local market. Output during the year was marketed largely in the immediate vicinity for agricultural purposes.

Quartz (Silica).—A small tonnage of silica was produced in 1952 at a quarry near Westbrook, Cumberland County.

Sand and Gravel.—Sand and gravel deposits, remnants of the continental ice sheet that once blanketed the area, are widely distributed in the State and are worked at numerous localities. The mining and processing of this material, which ranked second among Maine mineral industries in 1952, produced nearly one-fourth of the total dollar volume of mineral output. The principal producing counties, listed in order of decreasing production, were Kennebeck, Androscoggin, Cumberland, Penobscot, and Aroostook. In all, 22 commercial plants were active during 1952.

Slate.—The slate deposits at Monson, Piscataquis County, are the principal domestic source of slate for switchboards, panels, and other electrical installations. Slate is customarily recovered from open-pit quarries, but at Monson production is from underground mines.

TABLE 3.—Sand and gravel sold or used by producers, 1951–52, by classes of operations and uses

	1951			1952		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Building	35,539	$18,191	$0.51	37,632	$17,872	$0.47
Paving	(1)	(1)	(1)	20,811	22,176	1.07
Engine	(1)	(1)	(1)			
Gravel:						
Building	93,931	57,854	.62	100,267	60,912	.61
Paving	202,260	180,198	.89	380,903	335,211	.88
Railroad ballast	136,273	64,502	.47	115,014	64,541	.56
Other	(1)	(1)	(1)	12,207	4,028	.33
Undistributed	33,386	30,065	.90			
Total commercial sand and gravel	501,389	350,810	.70	666,834	504,740	.76
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building	13,500	2,250	.17	(1)	(1)	(1)
Paving	(1)	(1)	(1)	(1)	(1)	(1)
Gravel:						
Building	(1)	(1)	(1)	(1)	(1)	(1)
Paving	4,384,426	1,291,120	.29	(1)	(1)	(1)
Undistributed	467,379	173,137	.37	6,411,244	1,682,791	.26
Total Government-and-contractor sand and gravel	4,865,305	1,466,507	.30	6,411,244	1,682,791	.26
Grand total	5,366,694	1,817,317	.33	7,078,078	2,187,531	.31

[1] Figures that may not be shown separately are combined as "Undistributed."

Overhead stoping, a mining method in which ore is recovered from the roof of an underground excavation, is used to mine the fine-grained, dense, blue-black slate, which occurs in a bed or layer approximately 10 feet thick. Sole producer in 1952 was Portland-Monson Slate Co.

Stone.—Stone ranked third in value of total mineral output in Maine in 1952. Aggregate production of the 15 quarries active in the State during the year composed 23 percent of the total 1952 dollar volume of Maine's mineral output. The natural resources of the State include a number of rock types, but the most significant economically are granite, limestone, sandstone, and basalt. Dimension stone, quarried for construction purposes and memorials, was all granite in 1952 and constituted nearly 56 percent of the total value of stone produced during the year. Stone crushed to varying sizes for use in highway and railroad construction, concrete, and as riprap included basalt, sandstone, and limestone.

The most important producing counties, in order of decreasing value of output, were: Hancock, Aroostook, Knox, Cumberland, and York.

REVIEW BY COUNTIES

ANDROSCOGGIN

Sand and gravel ranked first among the mineral commodities produced in Androscoggin County in 1952. Six operators were active during the year; the largest was W. H. Hinman, Inc., with a fixed plant and pit at Leeds and a portable plant at Lisbon. Other large producers in 1952 included G. A. Peterson Co., which operated a

fixed plant and pit on Wilson Road near Auburn; Lewiston Crushed Stone Co., Inc., Lisbon; and Philip E. Dunn, Poland.

Five mines in the county yielded crude feldspar in 1952. The largest, the La Flamme property near Center Minot, was worked by United Feldspar & Minerals Corp. which also mined the Phillips and Sturtevant properties near Center Minot. Outputs of these mines were trucked to the company mill at West Paris, Oxford County, for grinding.

Miscellaneous clay for brick manufacture was mined from open pits at Danville and Lewiston by Morin Brick Co. and at Auburn by Joseph F. Dennis & Sons.

AROOSTOOK

Mineral products of Aroostook County in 1952 included crushed basalt (which furnished 96 percent of the total value) and sand and gravel. Basalt for road construction was quarried and crushed by the Bridge Construction Corp. at its plant at Mars Hill and at Limestone by H. E. Sargent, Inc.

Sand and gravel production credited to Aroostook County was produced by Bangor Aroostook Railroad for use in constructing and maintaining railroad trackage.

CUMBERLAND

Crushed sandstone, sand and gravel, feldspar, clay, and quartz (silica) were produced in Cumberland County in 1952. The Blue Rock Quarry at Cumberland Mills yielded sandstone for highway construction and riprap. Two commercial sand and gravel plants were active during the year. Fred H. Jordan operated his fixed plant and pit at South Portland and produced building sand and paving and road gravel. Building gravel was recovered from a pit worked near Brunswick by Andrew Maynard.

David Ponziani shipped crude feldspar from the Divelley and Hobart mines near Brunswick. Miscellaneous clay for brick manufacture was produced by Joseph A. Blais, Jr., and Fred S. Liberty & Son from pits at Portland and North Yarmouth, respectively.

A small tonnage of crushed white quartz was quarried near Westbrook by Cesare Trusiani.

FRANKLIN

Miscellaneous clay was mined by Farmington Brick Yard at its pit near Farmington. Three sand and gravel pits were active in Franklin County in 1952. Producers included Thomas A. Skolfield and O. C. Marchant, with pits at Weld and Sandy River Gravel pit at Farmington.

HANCOCK

Hancock County ranked first among the eight stone-producing counties of the State in 1952 and third among Maine counties in value of mineral output. Stone production consisted entirely of rough and dressed dimension granite for building and monument construction. The largest producer was Deer Island Granite Corp., which worked its quarry at Stonington throughout the year. Granite

quarried during the year was used for alterations and improvements at the United Nations site, New York City, and for an addition to Bancroft Hall, United States Naval Academy, Annapolis, Md. John L. Goss Corp. worked its quarry at Stonington during part of the year. Operations were halted during May and June owing to low demand for dimension granite and during November and December owing to a labor strike of granite workers. Other producing quarries in 1952 were the Hall quarry and Joe's quarry, near Frankfort, worked by Grenci & Sons, Inc., and Joseph Musetti, respectively.

Bogs in Hancock County continued to yield peat, used exclusively for agricultural purposes. T. W. Carlisle worked his gravel pit and fixed plant near Blue Hill during part of the year and produced paving and road gravel for use in highway construction in the area.

KENNEBEC

Virtually all sand and gravel credited to Kennebec County in 1952 consisted of material reported produced by the Maine State Highway Commission for use in construction and maintenance of State highways. The Donald J. Gurney pit at Waterville yielded building sand and gravel for use in the immediate area. A small tonnage of granite was quarried and crushed by the City of Augusta Highway Department for road maintenance.

KNOX

Knox County supplied 48 percent of Maine's total dollar volume of mineral production in 1952 and ranked first among the 14 mineral-producing counties in the State. Abundant deposits of limestone are available in an area extending approximately 5 miles northeastward from Thomaston, and it is upon this natural resource that most of the county's mineral economy is based. Limestone was quarried in 1952 by Dragon Cement Co., Inc., for cement manufacture at its plant at Thomaston, the only such mill in the New England States. During 1952 the company began installing a new 353-foot-long rotary kiln, a new clinker cooler, and an additional finish grinding mill; all are expected to increase the plant's rated annual capacity from 1.2 to 2 million barrels. Crushed limestone was produced at quarries of Rockland-Rockport Lime Co., Inc., and Rockland Knox Lime Co., Union. Quicklime and hydrated lime for chemical, agricultural, and building uses was prepared at the Rockland plant of Rockland-Rockport Lime Co.

Hocking Granite Industries worked its quarry on Clark Island and produced rough dimension granite for building and monument construction and dressed stone for use in buildings, monuments, paving, and curbing.

OXFORD

Oxford County topped all other Maine counties in output of feldspar and continued to be the center of activity in the State's feldspar industry. Eight mines were active at one time or another during 1952. Pechnik Bros. produced feldspar from five properties,

including the Bean, Nutting, and Wardwell mines at Albany, the Foster property at South Paris, and the Merrill mine at Norway. Crude feldspar from the Foster, Cummings, Perham, and Tamminen properties was ground in the United Feldspar & Minerals Corp. mill at West Paris. Principal mines, in order of decreasing output, were the Perham, Tamminen, and Foster properties, which together produced 84 percent of the feldspar output in the county in 1952.

A small tonnage of beryl concentrate was recovered as a byproduct of feldspar production at the Perham and Tamminen mines. In May, Beryllium Development, Inc., began exploration and development of the Newry mine near Bethel for possible production of beryl, feldspar, and mica. The Scotty mine on Plumbago Mountain was worked by this company in 1952 and yielded some beryl, which was stockpiled at the property.

Seven mines yielded mica during the year; the bulk of it recovered as a byproduct of feldspar mining. As in previous years, most of the output was scrap mica suitable only for grinding, although a small quantity of sheet mica was recovered.

Sand and gravel for building and road construction were produced at the Amos Roberts pit at Mexico. Donald E. Wood worked his pit near Norway during part of the year and recovered a small tonnage of building sand and gravel. Gravel for railroad ballast was produced by the Maine Central Railroad Co.

PENOBSCOT

Paving sand and gravel were recovered during the year by Lane Construction Corp. from its pit at Bangor. A small tonnage of bank-run gravel was quarried at the B. J. Striar estate pit near Orrington. The Brooks Brick Co. worked its pit at Brewer during part of the year.

PISCATAQUIS

Portland-Monson Slate Co. continued to produce slate for electrical switchboards, panels, and similar installations at its underground quarry near Monson.

SAGADAHOC

Feldspar was the sole mineral product of Sagadahoc County in 1952. Ten mines were active during the year, the largest being the Consolidated Feldspar Corp. Topsham mine at Topsham. Other properties that yielded significant quantities of feldspar were the Diamond Match, Aldred, and Powers mines, all near Topsham.

WALDO

The Mount Waldo quarry at Frankfort was worked during the year by Grenci & Ellis, Inc., and yielded dressed dimension granite for building and monument construction. Gravel for railroad ballast was produced by the Bangor & Aroostook Railroad.

WASHINGTON

Peat was the major mineral product, in terms of value, in Washington County in 1952. Output, which was used for agricultural purposes, came from bogs in the southern part of the county. A substantial tonnage of railroad ballast was produced by Maine Central Railroad, and bank-run gravel for road construction was mined from a pit near Whitneyville. Granite for monumental purposes was quarried by Fletcher & Butterfield Co.

YORK

The John Swenson Granite Co. worked its quarry at High Pine and produced pink dimension granite for curbing and architectural purposes and crushed granite for concrete and road construction.

The Mineral Industry of Maryland

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Maryland Department of Geology, Mines and Water Resources.

By Richard H. Mote [1]

MINERAL production in Maryland in 1952 was valued at $26,847,000, the highest since 1920 and a 3-percent increase over the 1951 figure of $26,148,000. The gain in value of output was accompanied by a change in its rank among mineral-producing States from 38 in 1951 to 37 in 1952. The production of sand and gravel continued to be the principal mineral industry, although output declined somewhat compared to 1951. Stone, most of which was crushed, ranked second to sand and gravel in value of output. Production advanced 7 percent in quantity and 6 percent in value over 1951. Cement production remained an important factor in the State mineral economy, with output exceeding that in 1951. The reduced market demand for coal was reflected in a drop in output from Maryland coal properties; production in 1952 was the lowest of any year since the early years of the Civil War.

Mineral production was reported from every Maryland County except Caroline, Charles, Dorchester, Queen Annes, St. Marys, Somerset, and Worcester. The principal producing counties, in order of decreasing value of output, were Baltimore, Washington, Prince Georges, Garrett, Carroll, and Frederick. Producers in these counties turned out mineral products in 1952 valued at $21,513,318, over 80 percent of the total dollar volume of State mineral output during the year.

TABLE 1.—Mineral production in Maryland, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays (except for cement)	697,528	$1,354,883	709,248	$1,363,882
Coal	588,639	2,781,343	587,903	2,694,842
Gold (recoverable content of ores, etc.) troy ounces	1	35		
Lime (open-market)	67,684	722,011	72,885	746,893
Natural gas thousand cubic feet	3,422,000	684,000	2,372,000	460,000
Sand and gravel	7,054,488	8,170,851	6,956,640	8,136,697
Stone (except limestone for cement and lime)	3,181,434	5,983,380	[2] 3,391,679	[2] 6,330,443
Undistributed: Cement, potassium salts, quartz (1952), slate, stone, (crushed marble, 1952), talc and ground soapstone		[3] 6,451,707		7,113,819
Total Maryland		[3] 26,148,000		26,847,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers) except that fuels are strictly production.
[2] Excludes certain stone, value for which is included with "Undistributed."
[3] Revised figure.

[1] Chief, Mineral Industry Division, Region VIII, Bureau of Mines, Pittsburgh, Pa.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Activity in coal mining, which for many years ranked among the foremost components of the mining industry in Maryland, continued to decline in 1952. Output dropped slightly from the 1951 level and was at the lowest point since the early years of the Civil War. The 1952 production of 587,903 short tons of bituminous coal was nearly 90 percent under the 5,533,000 tons mined in 1907, the year of peak output.

As in previous years, production came from mines in Allegany and Garrett Counties in the mountainous western part of the State. A total of 174 mines, most of which were small operations yielding less than 1,000 tons annually, were active at one time or another during the year. Principal producing properties in 1952, in order of decreasing output, were the Earl No. 2 mine of Garrett Coal Corp. and E. E. Feller Coal Co. Feller No. 2, both in Garrett County; Consolidated Fuel Co. Ocean No. 10 in Allegany County; Myers Coal Co., Inc., Susanne No. 1 in Garrett County; and Consolidated Fuel Co. Ocean No. 1 and W. & W. Coal Co. No. 2, both in Allegany County. These 6 mines furnished nearly 37 percent of the State total coal output in 1952.

TABLE 2.—Production of coal, 1943–47 (average) and 1948–52

Year	Quantity (short tons)	Value	
		Total	Average per ton [1]
1943–47 (average)	1,924,082	$7,342,380	$3.82
1948	1,661,164	8,733,674	5.26
1949	668,332	3,505,099	5.24
1950	647,923	3,134,704	4.84
1951	588,639	2,781,343	4.73
1952	587,903	2,694,842	4.59

[1] Value received or charged for coal f. o. b. mine, including selling cost. (Includes value for coal not sold but used by producer, such as mine fuel and coal coked as estimated by producer at average prices that might have been received if such coal had been sold commercially.)

Natural Gas.—Natural gas occurs in Maryland in two areas in Garrett County, the Mountain Lake Park field and the Accident field. Total marketed production during 1952, all from the Mountain Lake Park field, dropped to 2,372 million cubic feet from 3,422 million in 1951. In 1950, the first year of production, 373 million cubic feet was marketed. On December 31, 1952, there were 31 producing wells; 18 new wells produced during the year, and 10 wells were abandoned. The principal producing well in the State in 1952, as in 1951, was Columbian Carbon Co. Welch No. 1. This well, with a total depth of 3,388 feet, began producing natural gas in September 1950. Other important producing wells in the county in 1952 were Columbian Carbon Co. Miller No. 1, Snee & Eberly O'Donnell No. 1, Shaw & Smith Harvey No. 1, and Cumberland & Allegheny Gas Co. James Reilly No. 2. Thirty-two deep wells drilled for natural gas were completed in Maryland in 1952, and all were in Garrett County. Of this total, 23 were dry wells, and 9 were producers. At the end of the year Snee & Eberly were drilling the McCullough No. 1 well in the Accident field. Although the existence of natural gas in the

Accident area has been known since 1944, no commercial production has been reported.

METALS

Ores of iron, copper, lead, zinc, gold, silver, chromium, and other metals occur at a number of localities in Maryland. Although many of these deposits have not proved economic, some have yielded significant quantities of ore. During the colonial era and part of the 19th century the iron industry of Maryland was important and flourishing. Iron-ore deposits were worked in Carroll County at the Springfield Mines north of Sykesville and at mines near Mount Airy, Relay, Thurmont, and Point of Rocks, among others. Although limonite, hematite, and magnetite occurred at these mines, most of the production consisted of limonite.[2]

The most productive copper mines were the New London property just west of New London, Frederick County, which was opened in 1835 and worked intermittently from 1855 to 1907 and steadily until 1917; Dolly Hyde, one-quarter mile east of Libertytown, Frederick County; Liberty, 2 miles north of Libertytown; and Bare Hills or Mount Washington mine in Baltimore County.

The lead- and zinc-ore minerals galena and sphalerite are associated with the copper ores of Carroll and Frederick Counties. The only mine in which lead and zinc greatly exceeded copper and in which there was any appreciable production was the Mountain View mine, 2 miles southwest of Union Bridge. Some gold has been recovered from quartz veins in rocks of the Piedmont upland, which embraces the western portions of Montgomery and Carroll Counties and a portion of the eastern part of Frederick County. There was no mine output of metals in the State in 1952.

NONMETALS

Cement.—In terms of value, the production of cement in Maryland ranked third among mineral products of the State in 1952. Two plants, one each in Carroll and Washington Counties, were active during the year. Virtually all the raw materials used for manufacturing cement at these two plants were obtained locally.

Clays.—Maryland clay pits yielded ball clay, fire clay, and miscellaneous clays in 1952. Ball clay for use in pottery manufacture was mined in the Baltimore area. Production of fire clay for preparation of fire brick and block was limited to operations in Allegany, Cecil, Garrett, and Harford Counties. Most of the output came from deposits associated with coal beds in the western part of the State. Clay of 1 type or another was produced in 12 counties in the State in 1952. In all, 21 pits were worked during the year, 4 in Baltimore County, 3 each in Allegany and Prince Georges Counties, 2 each in Cecil and Garrett Counties, and 1 each in Anne Arundel, Frederick, Harford, Kent, Talbot, Washington, and Wicomico Counties.

Gypsum.—Crude gypsum is not mined in Maryland, but gypsum plasters and prefabricated products are manufactured in the Baltimore plant of National Gypsum Co., using crude rock imported from Canada.

Lime.—Lime production in Maryland in 1952 increased 8 percent over the 1951 level. Quicklime and hydrated lime were produced for a variety of uses by 7 operators, 1 each in Anne Arundel and Washington

[2] Singewald, Joseph T., Jr., Report on the Iron Ores of Maryland, With an Account of the Iron-Ore Industry: Maryland Geol. Survey, vol. 9, 1911, pp. 123-327.

Counties and 5 in Frederick County. Principal producer in 1952 was S. W. Barrick & Sons, Inc., at Le Gore, Frederick County.

Perlite.—Expanded perlite was produced at the Baltimore plant of Perma Rock Products, Inc., from crude perlite mined in New Mexico. Expanded perlite was also produced by Atlantic Perlite Co. at its Prince Georges County plant near Washington, D. C. Over four-fifths of the total output in 1952 was utilized as a lightweight plaster aggregate.

Potash.—The North American Cement Corp., the only potash producer in Maryland in 1952 and recent years, produced as a by-product an impure low-grade sulfate of potash at its cement plant at Security, Washington County, near Hagerstown. The product was sold for agricultural uses.

Quartz.—Crude quartz was mined and crushed and ground at two properties in Maryland in 1952. The largest operation was the mine and mill of Clinchfield Sand & Feldspar Corp. north of Marriotsville, Carroll County. Output was sold principally for use as an abrasive-medium filler and for the manufacture of pottery. A small tonnage was produced for use as a filler medium by the Day Maryland Quartz Co. at Sykesville from material mined in Howard County.

Sand and Gravel.—In terms of both quantity and value, the production of sand and gravel is the most important mineral industry in Maryland. Output was reported in 1952 from 11 counties in the State, the foremost of which were Prince Georges, Baltimore, Anne Arundel, and Harford. Pits active in these counties during the year accounted for 87 percent of the State total output. Approximately 57 percent of the total sand and gravel sales in 1952 was for use in highway construction and maintenance and over 42 percent for building construction. Virtually all output was used locally, and production activity was directly related to the tempo of construction in the area. A total of forty commercial plants were active in 1952.

TABLE 3.—Sand and gravel sold or used by producers, 1951–52, by uses

	1951			1952		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
Sand:						
Building	1,318,669	$1,495,992	$1.13	1,542,470	$1,714,224	$1.11
Paving	1,826,982	1,990,110	1.09	1,472,749	1,775,368	1.21
Other	6,000	1,500	.25			
Gravel:						
Building	1,297,636	1,745,366	1.35	1,405,260	1,913,499	1.36
Paving	2,426,188	2,706,917	1.12	2,466,625	2,636,204	1.07
Other	75,975	47,558	.63	(1)	(1)	(1)
Undistributed [2]	103,038	183,408	1.78	69,536	97,402	1.40
Total	7,054,488	8,170,851	1.16	6,956,640	8,136,697	1.17

[1] Included with "Undistributed" to avoid disclosure of individual company operations.
[2] Includes glass and engine sand, grinding and polishing (1951), and fire or furnace sand (1951), which may not be shown separately.

Slate.—Slate-roofing granules continued to be produced by Staso Milling Co. at its mill and quarry near Whiteford, Harford County. The Whiteford deposit is a southward extension of the Peach Bottom slate district of York and Lancaster Counties, Pa.

Stone.—Stone ranked second in value of total mineral output in Maryland in 1952. Compared with 1951, production advanced 7

percent in quantity and 6 percent in value. Rock types quarried during the year included limestone, basalt, gabbro, and marble. Crushed stone, largely limestone, constituted 94 percent of the total value of stone produced. Dimension stone, quarried for construction purposes and memorials, was mostly gabbro but also included some marble and miscellaneous stone. Over half of the State total stone output came from quarries in Baltimore County. Other important producing counties included Frederick, Washington, and Harford. The aggregate output in these counties constituted 95 percent of the total value of Maryland stone production in 1952.

TABLE 4.—Stone sold or used by producers 1951–52, by kinds and uses

Kind and use	1951		1952	
	Quantity	Value	Quantity	Value
Dimension stone:				
Granite:				
Building stone:				
Rough construction, short tons	18,500	$182,000	15,288	$166,350
Rough architectural, cubic feet	48,780	40,000	5,902	6,590
Rubble, short tons	24,500	82,200	27,530	87,575
Curbing, cubic feet	26,829	19,900	20,732	13,800
Total (approximate short tons)	49,200	324,100	45,002	274,315
Marble: Building, short tons	634	58,012	(1)	(1)
Miscellaneous: Building:				
Rough and dressed, short tons	10,895	73,903	11,002	72,843
Rubble, do	150	300	(2)	(2)
Flagging, do	146	2,044	(2)	(2)
Total, do	11,191	76,247	12,155	85,160
Crushed and broken stone: Granite:				
Riprap, do	(2)	(2)	14,400	50,400
Crushed stone, do	(2)	(2)	50,700	109,860
Total, do	95,909	211,050	65,100	160,260
Basalt and related rocks:				
Riprap, do	766	1,205	(2)	(2)
Crushed stone, do	794,236	1,362,489	(2)	(2)
Total, do	795,002	1,363,694	776,936	1,343,325
Marble, all uses, do	9,254	163,044	(1)	(1)
Limestone:				
Riprap, do			22,070	38,600
Crushed stone, do	2,032,683	3,023,281	2,297,843	3,404,411
Agriculture, do	64,567	197,946	57,903	217,429
Miscellaneous, do	122,714	565,726	114,357	806,630
Total, do	2,219,964	3,786,953	2,492,173	4,467,070
Miscellaneous stone:				
Riprap, do			313	313
Other uses, do	280	280		
Total, do	280	280	313	313
Grand total, do	3,181,434	5,983,380	[3] 3,391,679	[3] 6,330,443

[1] Figure withheld to avoid disclosure of individual company operations; not included in total.
[2] Figure withheld to avoid disclosure of individual company operations; included in total.
[3] Excludes certain stone; Bureau of Mines not at liberty to publish.

Talc and Soapstone.—Talc and soapstone were mined in Maryland in 1952 near Marriottsville, Carroll County, and Dublin, Harford County. Two producers were active during the year, the larger of which was Clinchfield Sand & Feldspar Corp. mine and mill 1 mile northwest of Marriottsville. Most of the output was ground in the mill at the property, but a small tonnage of crude material was sold for processing elsewhere.

REVIEW BY COUNTIES

ALLEGANY

The chief product of mines in Allegany County in 1952, as in previous years, was bituminous coal. The output of this commodity represented 66 percent of total value of mineral production in the county during the year. Production was confined to the extreme western part of the county, where the coal seams occur interstratified in the Pottsville, Allegheny, Conemaugh, and Monongahela formations. It was in this area near the present site of Frostburg that coal was discovered in the State in 1804. The principal producing properties in 1952 were, in order of decreasing output, the Ocean No. 10 underground and strip mine of Consolidated Fuel Co., Inc., Frostburg; Ocean No. 1 mine, Consolidated Fuel Co., Inc., Frostburg; No. 2 mine, W. & W. Coal Co., Barton; Waynesburg 3 and 5 mines, The Roaring Ben Coal Co., Lonaconing; and No. 1 mine, Macaneck Coal Co., Knapp Meadow.

Other mineral products of the county in 1952 included sand and gravel, clay, and stone. At its plant at Cumberland the Cumberland Cement & Supply Co. produced silica sand for use as engine sand, for glass manufacture, and for building and paving purposes. The company also produced a substantial tonnage of building and paving gravel. Much of the material mined was utilized by the company for the manufacture of ready-mixed concrete and dry-batched aggregates.

Clay deposits are abundant in the county; the most significant are the fire-clay beds associated with coal-bearing formations. Fire-clay mines active in 1952 included the Mount Savage Refractories Co., Barrelville mine, and Mount Savage strip mine, at Barrelville and Mount Savage, respectively, and the Big Savage Refractories Corp. mine near Frostburg. Miscellaneous clay for the manufacture of brick and heavy clay products was produced by Pen-Mar Brick & Supply Co., Cumberland.

Stone production in the county was limited to limestone crushed for use as a concrete aggregate by Cumberland Cement & Supply Co. and C. C. Sensabaugh, Inc., both in Cumberland.

ANNE ARUNDEL

Mineral commodities produced in Anne Arundel County in 1952 included sand and gravel, clay, and lime. The Arundel Corp. recovered paving sand and gravel from its pits at North Linthicum, Pasadena, and Patapsco. Paving sand and gravel were also produced at the pit of Alan E. Barton, Inc. Fire clay for use in stoneware manufacture was mined during part of the year by the Severn Clay Co. A few tons of quicklime for agricultural purposes was prepared by F. & H. Benning Oyster & Lime Co., Galesville.

BALTIMORE

Baltimore County ranked first among the mineral-producing counties in the State in 1952, supplying 24 percent of Maryland's total value of mineral output during the year. Mineral products, listed in order of decreasing value, were stone, sand and gravel, and clay.

Gabbro dimension stone for use in building construction and rubble and as flagging was produced in Baltimore County in 1952 at the

Butler, Loch Raven, and Gwynn Falls quarries of Harry P. Campbell Sons Corp. Part of the output from the Gwynn Falls quarry was crushed for use as riprap and concrete aggregate. Crushed gabbro for concrete aggregate was also produced by Carl B. Temple, Kingsville.

Using crude gypsum rock from Canada, National Gypsum Co. produced calcined-gypsum products at its Baltimore plant. Expanded perlite, used primarily as a lightweight plaster aggregate, was produced at the Baltimore plant of Perma Rock Products, Inc., from crude perlite mined in New Mexico.

Crushed limestone for a variety of purposes, including riprap, road metal, agricultural stone, and filler, was produced by Harry P. Campbell Sons Corp. at its quarry at Texas. Limestone was also quarried and crushed for use as road metal by The Arundel Corp.

Thirteen commercial sand and gravel pits were worked in Baltimore County in 1952; the largest was the White Marsh pit and plant of Harry T. Campbell Sons Corp. A substantial portion of the output from this pit was used by the company in preparing ready-mixed concrete. Other large producers of sand and gravel included The Arundel Corp., with pits at Baltimore City, Carney, and Lansdowne; the Brooklyn Corp.; Caton Corp.; Clark Certified Concrete Co.; Frederick Link Sons, Halethorpe; and George W. Schwarz and Louis H. Richter, White Marsh. Output from these pits was limited to building and paving sand and gravel for use in the Baltimore area.

Clay was mined at four locations in the county. The largest operation was the pit and plant of Baltimore Brick Co. at Rossville. Other large operations, in order of decreasing output, were Champion Brick Co., United Clay Mines Corp., and Excelsior Brick Co. Production from the United Clay Mines Corp. pit was ball clay; other pits yielded miscellaneous clay for manufacturing brick and heavy clay products.

CALVERT

A small tonnage of paving and road gravel produced at the Barstow pit of Oscar S. Bowen was the only mineral product of Calvert County in 1952.

CARROLL

Mineral products of Carroll County in 1952 included cement and quartz. Lehigh Portland Cement Co. continued to work its plant at Union Bridge on Sams Creek throughout the year. Although the cement plant is in Carroll County, the quarry from which limestone is produced is on the opposite side of Sams Creek in Frederick County. At the quarry the stone is drilled and blasted by conventional methods. The blasted rock is loaded in the quarry by electric shovels and hauled to the plant by diesel-electric locomotives. Primary crushing is done by a roll crusher, followed by secondary crushing in a hammer mill. Power requirements for the operation are supplied from a modern waste-heat power plant.

Ground silica for a variety of uses was produced at the mill of Clinchfield Sand & Feldspar Corp. 1 mile northwest of Marriottsville. Crude quartz for the mill is quarried at the company pit in the Frank Thomas woods on the North Branch of the Patapsco River, 2 miles north of Marriottsville.

CECIL

Sand and gravel were the principal mineral products of Cecil County in 1952. Five commercial pits were worked during the year; the largest

was the Aberdeen pit of Charlestown Sand & Gravel Co. Other producers active during the year included C. Ray Ott, Elkton; Arthur D. Johnston, Rising Sun; Fred S. Russell, North East; and The Arundel Corp., Whitehall. Port Deposit Quarries Co., Inc., worked its quarry at Port Deposit during part of the year and produced rough dimension granodiorite for use in building purposes. Plastic fire clay for the manufacture of refractories was produced in the county by North East Fire Brick Co. and Fred S. Russell.

FREDERICK

The bulk of the lime produced in Maryland in 1952 originated in Frederick County. During the year six plants were active. The largest was the plant and quarry of S. W. Barrick & Sons, Inc., Le Gore. Both quicklime and hydrated lime were produced, virtually all of which was used for agricultural purposes. Le Gore Lime Co. continued to work its plant and quarry at Le Gore in 1952 and produced quicklime and hydrated lime, most of which was sold to the agricultural trade. M. J. Grove Lime Co., Inc., produced quicklime and hydrated lime for agricultural and masonry uses at its quarry and plant one-half mile south of Frederick. Other lime producers in the county in 1952 included Everett V. Moser, with a plant at Bolivar and quarry near Keedysville, Washington County, and Fountain Rock Lime & Rock Co. at Fountain Rock. A considerable tonnage of crushed limestone for use as road metal, railroad ballast, and agricultural stone was also produced by the M. J. Grove Lime Co. The Farmers Cooperative Association, Inc., quarry three-fourth mile southeast of New London was worked during part of the year and yielded crushed limestone for agricultural uses.

Miscellaneous clays for manufacture of brick and heavy clay products was mined by Hudson Supply & Equipment Co. at its pit at Buckeystown.

GARRETT

Mineral products of Garrett County in 1952, in order of decreasing value of output, were coal, natural gas, clay, and limestone. Coal production increased nearly 40 percent compared with 1951. Eighty mines were active at one time or another during the year. Most of these properties, however, were small operations employing only a few people, and many did not yield more than several hundred tons of coal during the year. The largest coal-producing mine in the county and in Maryland in 1952 was the Earl No. 2 underground mine of Garrett Coal Corp. near Vindex, which was worked approximately half the year. The second largest property in the county and in the State was the Feller No. 2 strip mine of E. E. Feller Coal Co., Inc., at Aarons Run. Other large coal-producing operations in the county, listed in order of decreasing output, were Susanne No. 1 mine of Myers Coal Co., Inc., at Deer Park, Ajax No. 1 mine of Gary Coal Co. at Mill Run, and Logan Coal Co. strip mine bear Grantsville.

Marketed output of natural gas dropped 31 percent from 1951. There were 31 producing wells in the county on December 31, 1952, compared with 23 at the end of 1951. New wells drilled in 1952 totaled 18; 10 producing wells, 3 of which yielded natural gas in 1951, were abandoned during the year. By the end of 1952, 90 wells had been drilled in the Mountain Lake Park field; 49 were dry holes, and 41 were producers. According to the Maryland Department of

Geology, Mines, and Water Resources, only 14 of the producing wells were expected to yield enough gas to repay drilling costs. The leading producer in 1952, as in 1951, was the Welch No. 1 of Columbian Carbon Co.

Union Fire Brick Co. continued to mine flint and plastic clay at its Tarkiln Run strip mine for use in manufacturing refractory brick at its plant near Jennings. Vetter Bros., Inc., quarried crushed limestone for use as road metal and agricultural stone at its quarry near Deep Creek Lake.

HARFORD

Sand and gravel, slate, talc, clay, and marble were mined in Harford County in 1952. The largest producer of sand and gravel was Stancills, Inc., which operated pits and plants at Aberdeen, Edgewood, Joppa, and Mountain Road. Output from these pits was used for building and paving construction in the county. Other sand and gravel producers included W. Noble Hamilton, who mined bank run gravel at his pit near Aberdeen, and Maxa Bros., who produced building sand and gravel from a pit also at Aberdeen. Green serpentine marble was quarried for building stone during the year at the Cardiff quarry of the Maryland Green Marble Co. Plastic fire clay for use in manufacturing refractory clay products was produced by Robinson Clay Product Co.

Staso Milling Co. continued in 1952 to produce slate-roofing granules at its quarry and plant near Whiteford. Crude talc was mined near Dublin by Harford Talc & Quartz Co. Most of the material quarried was crushed and ground, but a small tonnage was sawed to specified shapes for industrial uses.

HOWARD

Unwashed bank-run gravel for road maintenance was produced by Cosco Sand & Gravel Co. from its pit near Jessups. T. D. Nichols quarried limestone for flagging and other uses during part of the year at his quarry near Clarksville. The Day Maryland Quartz Co. mined crude quartz in Howard County, which was crushed and sized for use as a filler medium at its mill in Sykesville, Carroll County.

KENT

Kent Concrete Co. produced sand and gravel for use in manufacturing ready-mixed concrete at its pit and plant at Chestertown. Miscellaneous clay for use in the manufacture of brick and heavy clay products was mined during part of the year by the Chestertown Brick Co. at its pit near Chestertown.

MONTGOMERY

Stone for use in rough and dressed building construction, flagging, and riprap was the only mineral product of Montgomery County in 1952. Three quarries were active during the year, the largest of which was Stoneyhurst quarries near Cabin John. Other producers included Segreti Bros. and Albert D. Battista.

PRINCE GEORGES

Sand and gravel were the principal mineral products of Prince Georges County and furnished 94 percent of the total mineral output of the county in 1952. Eight producers were active; the largest was

Smoot Sand & Gravel Corp., which operated a dredge on the Potomac River. Other large producers included Contee Sand & Gravel Co., Inc., Laurel pit and plant; Buffalo Sand & Gravel Corp., Kemp Springs; District Sand & Gravel Co., and Silver Hill Sand & Gravel Co., with pit and plants at Silver Hill; Washington Sand & Gravel Co., Benning and Landover Sand Co., Landover.

A small tonnage of rough building stone and dimension stone for rubble was quarried during the year near Mount Rainier by Frank Pennini. Miscellaneous clay for use in manufacturing brick and heavy clay products was mined during the year by West Bros. Brick Co., Fairmont Heights; Washington Brick Co., Muirkirk; and Gray Brick & Tile Co., Bowie.

Expanded perlite, sold primarily for use as a lightweight plaster aggregate, was produced by Atlantic Perlite Co. at its plant near Washington, D. C.

TALBOT

Clay and a small quantity of noncommercial gravel was produced in Talbot County in 1952. New Brick & Tile Co. mined miscellaneous clays for use in brick manufacture at its pit at Easton.

WASHINGTON

The mineral economy of Washington County is based primarily on the limestones and shales occurring in the area. Approximately four-fifths of the total value of mineral production in the county in 1952 was derived from cement produced at the North American Cement Corp., Security plant and quarry 2 miles east of Hagerstown. The quarry, which is adjacent to the cement plant, is in the Conococheague formation. Quarrying is selective, only those horizons suitable for manufacture of cement being used for that purpose. Other stone quarried is crushed and sold for a variety of uses. As in previous years, both portland and masonry cements were produced. Sulfate of potash, an important byproduct of the cement manufacture, is collected in cyclones and electric precipitators during the burning of the cement material in rotary kilns. This material is sold as potash liming material for agricultural purposes.

The Schetromph Lime Co. continued to produce quicklime at its plant on Conococheague Creek. All output during 1952 was sold for agricultural purposes. The only clay producer in Washington County, and the largest in the State in 1952, was the pit and brick plant of Victor Cushwa & Sons at Williamsport. Miscellaneous clays for use in manufacturing brick sold in large quantities in the Baltimore and Washington, D. C., area was produced during the year.

WICOMICO

Salisbury Brick Co., Inc., produced miscellaneous clays for brick manufacture at its pit near Salisbury. Sand and gravel were mined during the year by the Maryland State Road Commission.

The Mineral Industry of Massachusetts

By Richard H. Mote [1]

MINES, pits, and quarries in Massachusetts in 1952 yielded mineral products whose value totaled $17,719,000, a 5-percent increase over the 1951 figure ($16,951,000) and the highest amount in any year in the history of the Commonwealth. Except for Nantucket County, every county in the State contributed to the mineral economy during the year. Middlesex, Berkshire, Norfolk, and Hampden Counties, in order of decreasing value of output, were the principal centers of activity. Quarrying of stone continued to be the principal mineral industry; 97 percent of the 1952 output consisted of crushed and broken stone, and the remainder was dimension stone for building and monumental uses. Sand and gravel and lime ranked second and third, respectively, in value of output. In all, 116 mines of all kinds were active in the State in 1952.

TABLE 1.—Mineral production in Massachusetts, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	150,370	$167,646	140,148	$160,371
Lime (open-market)	143,316	1,930,225	132,135	1,999,545
Quartz from pegmatites and quartzite	2,186	17,489	(2)	(2)
Sand and gravel	7,232,088	5,592,640	7,645,728	6,128,744
Stone (except limestone for lime)	[3] 3,225,839	[3] 9,172,425	[3] 3,355,819	[3] 9,331,871
Undistributed: Peat, sand and sandstone, and stone, (dimension sandstone), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)		70,461		98,245
Total Massachusetts		16,951,000		17,719,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production.
[2] Value included with "Undistributed."
[3] Excludes certain stone, value for which is included with "Undistributed."

REVIEW BY MINERAL COMMODITIES

METALS

Deposits of nickel, iron, copper, lead, gold, and silver ores occur in Massachusetts, and although most of the occurrences have not proved economic, several, such as the Chipman lead mine near Newburyport, Essex County, and open-pit iron-ore workings in Berkshire County, have yielded small quantities of metals in years past.

[1] Chief, Mineral Industry Division, Region VIII, Bureau of Mines, Pittsburgh, Pa.

It was on the banks of the Saugus River at the present town of Saugus, Essex County, that the steel industry of the United States had its humble beginning in 1646. The output of the Saugus ironworks (which, at its peak before abandonment in 1670, totaled about 150 tons of iron per year) represented the first large-scale iron production in the New World.[2] Metal produced was converted at the plant into iron pots and skillets and forged into bars and rods for use of colonial blacksmiths.

There was no mine production of metals in Massachusetts in 1952.

MINERAL FUELS

Peat.—Many of the undrained lands in Massachusetts are underlain by deposits of peat, but commercial development has been limited, owing to the low value of the product and the small local market. Peat was recovered from bogs in Berkshire and Hampden Counties in 1952. Production was marketed in the immediate vicinity for agricultural purposes.

NONMETALS

Clays.—During 1952 9 clay pits were in operation, 1 each in Bristol, Franklin, Hampshire, Plymouth, and Worcester Counties, and 2 each in Hampden and Middlesex Counties. Production was limited to miscellaneous clays used for manufacturing building brick and other heavy clay products. The principal producing counties, in order of decreasing output, were Middlesex, Plymouth, and Hampden, which together accounted for over four-fifths of the State total clay output.

Lime.—The lime industry of Massachusetts is centered in Berkshire County, where steeply dipping beds of crystalline limestone and dolomite are utilized extensively for the manufacture of quicklime and hydrated lime. Over 60 percent of the lime produced in the State in 1952 was sold or used for chemical processes; the remainder was consumed for building and agricultural purposes.

TABLE 2.—Lime (quick and hydrated) sold by producers, 1943–47 (average) and 1948–52

Year	Quantity (short tons)	Value	
		Total	Average per ton
1943–47 (average)	101,560	$951,885	$9.37
1948	112,271	1,302,251	11.60
1949	107,931	1,360,328	12.60
1950	139,357	1,830,625	13.14
1951	143,316	1,930,225	13.47
1952	132,135	1,999,545	15.13

Perlite.—Expanded perlite was produced at the Roslindale, Suffolk County, plant of The Whitmore Co., Permalite Division, from crude perlite mined in New Mexico, Colorado, and Nevada. About four-fifths of the plant output was used as a lightweight aggregate for plaster; the remainder was utilized in concrete.

Sand and Gravel.—Although sand and gravel ranked second to stone in value of total output in Massachusetts in 1952, it was, in

[2] Steelways, Saugus Reclaims its Past: Vol. 9, No. 5, October 1953, p. 28.

terms of quantity, by far the most important mineral product in the State. Production was reported from every county except Nantucket. Principal producing counties, listed in order of decreasing output, were Norfolk, Suffolk, Middlesex, Worcester, and Bristol. Sand and gravel deposits are widely distributed in the State, either as residual deposits of the glaciers that once covered the area or as flood-plain deposits in lowlands and terraces along the present streams. The principal use of the material is in highway, railroad, and building construction. Virtually all production is consumed locally, and the magnitude of output is directly related to the tempo of construction in the area. In all, 74 commercial plants were active during 1952.

TABLE 3.—Sand and gravel sold or used by producers, 1951–52, by classes of operation and uses

	1951			1952		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Molding	(1)	(1)	(1)	(1)	(1)	(1)
Building	1,944,013	$1,381,625	$0.71	1,798,278	$1,334,299	$0.74
Paving	783,361	538,137	.69	1,000,309	690,038	.69
Engine	30,860	18,513	.60	(1)	(1)	(1)
Filter	23,824	14,390	.60	40,554	14,290	.35
Other	55,659	37,767	.68	27,036	17,300	.64
Gravel:						
Building	2,160,651	1,955,799	.91	1,799,630	1,934,031	1.07
Paving	864,451	621,659	.72	1,389,437	925,236	.67
Railroad ballast	(1)	(1)	(1)	7,411	549	.07
Other	61,519	33,669	.55	129,253	74,712	.58
Undistributed sand and gravel	1 130,056	278,920	2.14	121,639	240,186	1.97
Total commercial sand and gravel	6,054,394	4,880,479	0.81	6,313,547	5,230,641	0.83
GOVERNMENT-AND-CONTRACTOR OPERATIONS [2]						
Sand:						
Building	54,496	100,550	1.85	66,281	159,867	2.41
Paving	187,181	172,197	.92	170,630	205,239	1.20
Total Government-and-contractor sand	241,677	272,747	1.13	236,911	365,106	1.54
Gravel:						
Building	63,265	116,476	1.84	92,765	162,567	1.75
Paving	872,752	322,938	.37	1,002,505	370,430	.37
Total Government-and-contractor gravel	936,017	439,414	0.47	1,095,270	532,997	0.49
Total Government-and-contractor sand and gravel	1,177,694	712,161	0.60	1,332,181	898,103	0.67
ALL OPERATIONS						
Sand	3,199,791	2,541,384	0.79	3,224,727	2,661,219	0.83
Gravel	4,032,297	3,051,256	.76	4,421,001	3,467,525	.78
Grand total	7,232,088	5,592,640	0.77	7,645,728	6,128,744	0.80

[1] Figure withheld to avoid disclosure of individual company operations.
[2] Includes figures for State, counties, municipalities and other Government agencies.

Silica (Quartz).—Outcrops of Cheshire quartzite are numerous in Berkshire County and are the source of fine-grained, colorless quartz rock which is quarried and crushed for use in making glass, plaster, and cleansing and scouring compounds. Two quarries were in operation in 1952, both at Cheshire.

Stone.—In terms of value, stone quarrying continued in 1952 to be the most important mineral industry in Massachusetts. The State is richly endowed with a wide variety of rock types; the most economically significant are granite, basalt, and limestone. Crushed stone constituted over 58 percent of the total value of stone produced in the State in 1952. Rock types crushed to varying dimensions for use in construction of highways and railroads, concrete aggregate, and riprap included basalt, limestone, and granite.

Dimension stone, quarried for construction purposes and memorials, was virtually all granite in 1952. The most important producing area in the State was near West Chelmsford, Middlesex County, where curbing, and building stone, and monumental stone are manufactured. Quincy, Norfolk County, where the granite industry of the State began in 1824,[3] ranked third among Massachusetts counties producing dimension granite. During 1952 29 commercial quarries were in operation.

TABLE 4.—Stone sold or used by producers, 1951–52, by uses

Use	1951		1952	
	Quantity	Value	Quantity	Value
Dimension stone:				
Building stone:				
Rough construction—short tons	5,418	$80,543	7,740	$97,418
Cut stone, slabs, and mill blocks—cubic feet	[1] 337,474	[1] 1,778,177	[1] 325,915	[1] 1,828,134
Approximate equivalent in short tons	27,842		[1] 26,888	
Rubble—short tons	3,976	9,806	1,226	8,085
Monumental stone—cubic feet	1,364	7,197	(2)	(2)
Approximate equivalent in short tons	112		(2)	
Paving blocks—number	65,035	2,837	(2)	(2)
Approximate equivalent in short tons	133		(2)	
Curbing and flagging—cubic feet	691,220	2,133,053	(2)	(2)
Approximate equivalent in short tons	57,025		(2)	
Undistributed—short tons			59,891	1,912,980
Total dimension stone (quantities approximate, in short tons)	[1] 94,506	[1] 4,011,613	[1] 95,745	[1] 3,846,617
Crushed and broken stone:				
Riprap—short tons	69,594	86,432	44,628	44,866
Crushed stone—do	2,816,142	4,010,395	2,990,153	4,372,420
Furnace flux (limestone)—do	24,365	51,880	19,010	39,939
Agricultural (limestone)—do	125,916	446,522	116,334	411,151
Other uses—do	95,316	565,583	89,949	616,878
Total crushed and broken stone—do	3,131,333	5,160,812	3,260,074	5,485,254
Grand total (quantities approximate, in short tons)	[1] 3,225,839	[1] 9,172,425	[1] 3,355,819	[1] 9,331,871

[1] To avoid disclosure of individual company operations data are incomplete.
[2] Bureau of Mines not at liberty to publish; included with "Undistributed."

REVIEW BY COUNTIES

BARNSTABLE

Mineral production in Barnstable County in 1952 was limited to the output of sand and gravel. Producers during the year, listed in order of decreasing output, included Whitehead Bros. Co., Provincetown; Frederick V. Lawrence, Inc., and Concrete Products Co., both in Falmouth; and Jones Construction Co., Hyannis. Most of the sand and gravel produced was utilized for building construction, but the output from dune sands near Provincetown was used for foundry sand.

[3] Dale, T. Nelson, Commercial Granite of New England: Geol. Survey Bull. 738, 1923, 455 pp.

BERKSHIRE

Berkshire County ranked second among Massachusetts counties in value of mineral output in 1952. Products, in order of decreasing value, included lime, stone, sand and gravel, quartz, and peat. Quicklime and hydrated lime, which represented 59 percent of the total value, were produced from limestone quarried at Lee, West Stockbridge, Adams, and Farnam by the Lee Lime Corp., New England Lime Co., and U. S. Gypsum Co.

Although small quantities of crushed basalt and dimension granite were produced in the county in 1952, most of the stone output was crushed limestone. Nearly half of the crushed limestone produced was sold for agricultural purposes; other uses included fillers for rubber and other products, metallurgical fluxes, road metal, and mineral food. Seven stone operations were active during the year. Producers of crushed limestone, in order of decreasing output, included Lee Lime Corp., with operations at Lee and West Stockbridge; Shea Chemical Co., Inc., Adams; U. S. Gypsum Co., Farnam; and New England Lime Co., Adams.

Six sand and gravel plants operated in Berkshire County in 1952, the largest of which included Berkshire Gravel, Inc., Pittsfield; General Sand & Stone Corp., Pittsfield; Mountain Sand & Gravel Co., Inc., Great Barrington; and Berkshire Gravel, Inc., Lenox Dale. All sand and gravel produced during the year were used for building construction and road metal.

Quartz for manufacturing glass, plaster, and cleansing and scouring compounds and for sand blasting was produced at quarries near Cheshire by George E. Emerson, Inc., and Pettinos New England, Inc.

A small tonnage of peat was recovered during the year from bogs near Hinsdale.

BRISTOL

Mineral products of Bristol County in 1952 included sand and gravel (which composed approximately 75 percent of the value), stone, and clay. There were 11 commercial producers of sand and gravel in the county in 1952, the largest of which were Morse Sand & Gravel Co., Attleboro; Joseph Borge & Sons, Inc., Swansea; M. A. Gammino Construction Co.; and Chicoine Sand Pit, South Dartmouth.

Stone production during the year was limited to the output of crushed granite quarried near New Bedford by Blue Stone Quarry, Inc.

Stiles & Hart Brick Co. worked its clay pit at Taunton during the year. Material produced was used for manufacturing heavy clay products.

DUKES

Paving sand and building gravel produced by Colby Construction Co. at Vineyard Haven were the only mineral products of Dukes County in 1952.

ESSEX

Stone output in Essex County in 1952 consisted of crushed basalt produced at three quarries. Operators active during the year included Lynn Sand & Stone Co., Swampscott; Trimount Bituminous Products Co., Everett; and Essex Sand & Gravel Co., West Peabody. Most of

the production was utilized for highway construction; other uses included railroad ballast, roofing granules, and riprap.

Six sand and gravel plants were active in the county during the year; the largest were Videtta Construction Co. and Essex Sand & Gravel Co., both in West Peabody; Yemma Bros., Inc., Haverhill; and Wright Construction Co., Peabody.

FRANKLIN

Mineral products of Franklin County in 1952 included stone, sand and gravel, and clay. Stone production consisted of crushed basalt for highway and railroad production quarried by Greenfield Massachusetts Broken Stone Co., Greenfield. Sand and gravel were produced during the year by Boston & Maine Railroad and Mackin Sand & Concrete Products Co., Greenfield. Miscellaneous clays for manufacturing building brick were recovered by R. E. Pray & Co. from its open pit at Greenfield.

HAMPDEN

Stone, sand and gravel, clay, and peat were produced in Hampden County in 1952. The county ranked fourth among Massachusetts counties in value of mineral output. Stone production consisted of crushed basalt from quarries operated by John S. Lane & Son, Inc., Westfield, and L. Suzio Traprock Co., Meriden, and rough dimension sandstone quarried by McCormick Longmeadow Stone Co., Inc., at East Longmeadow. Virtually all the basalt produced during the year was utilized for highway and railroad construction. There were five sand and gravel producers in Hampden County in 1952. Principal operations included Western Massachusetts Sand & Gravel, Inc., Westfield; North Wilbraham Sand & Gravel & Concrete Co., Inc., Springfield; and Edward N. Christianson Sand Co., East Longmeadow.

Hampshire Brick Co., and Westfield Clay Products Co. continued to work clay pits at Chicopee and Westfield. Miscellaneous clays produced were used in manufacturing building brick.

HAMPSHIRE

Stone ranked first in value among mineral commodities produced in Hampshire County in 1952. Output consisted of crushed basalt for highway construction from a quarry operated by John S. Lane & Son. Three sand and gravel producers were active in the county during the year; these were William H. Willard, Northampton; Eli Quenneville, South Hadley; and A. Girard & Sons, Inc., Ware. Lynch Brick Co., Inc., produced clay at its open pit near South Hadley Falls.

MIDDLESEX

Middlesex County was the largest producer of minerals in Massachusetts in 1952. The county ranked first among the 10 stone-producing counties of the State, first among the 7 counties reporting clay production; and third to Norfolk County in output of sand and gravel. Stone production was reported from four quarries during the year. Crushed basalt for road construction was produced by John P. Condon Corp., Watertown, and Winchester Crushed Stone Co., Winchester. H. E. Fletcher Co. produced mostly dressed architectural granite and curbing granite from its quarry at West Chelmsford. Miscellaneous stone for concrete and road metal was quarried at the Ashland quarry of B. & M. Crushed Stone Corp.

Ten sand and gravel producers were active in the county during the year; the largest were Lexington Sand & Gravel Co., Lexington; Acme Sand & Gravel Co., Inc., Burlington; Riverside Sand & Gravel Co., Newton Lower Falls; Akeson Sand & Gravel Co., Woburn; and William P. Cogger, Lowell. Most of the output was for highway construction and building purposes, but there was some production of engine, filter, and molding sand.

New England Brick Co. and A. D. Hews & Co., Inc., produced common clay from pits near Cambridge in 1952.

NORFOLK

Norfolk County, with 11 plants in operation, was the principal source of sand and gravel in Massachusetts in 1952. Leading producers included the Boston Sand & Gravel Co., Canton; Highland Sand & Gravel Co., Inc. (with pits at Walpole and Dedham); Needham Sand & Gravel Co., Inc., Allston; and Glacier Sand & Stone Co., Inc., Islington.

Stone output during the year consisted of crushed and broken granite, crushed basalt, and dimension granite. Crushed basalt for local highway construction was quarried by Stoughton Crushed Stone Co., Stoughton. Granite quarries at Quincy, operated by Bates Bros. Seam Face Granite Co., Old Colony Crushed Stone Co., and J. S. Swingle, Inc., yielded rough architectural stone and crushed stone.

PLYMOUTH

Eight sand and gravel producers were active in Plymouth County in 1952; the largest included Boston Sand & Gravel Co., Scituate; Thomas Bros., Middleboro; and Whitehead Bros. Co. Bridgewater Brick Co. mined common clay from its open pit at East Bridgewater.

SUFFOLK

Stone production credited to Suffolk County in 1952 consisted of crushed and broken granite, miscellaneous stone, and a small tonnage of crushed limestone, reported by the Commonwealth of Massachusetts, Department of Public Works; West Roxbury Crushed Stone Co.; and Rowe Contracting Co. The U. S. Army, Corps of Engineers, and Massachusetts Department of Public Works reported sand and gravel output.

WORCESTER

Sand and gravel, stone, and clay were produced in Worcester County in 1952. Seven sand and gravel plants were active; the largest were Joseph Rosenfeld, Milford; John Trotto Sand & Gravel Co., Shrewsbury; and DeFalco Concrete, Inc., Worcester. The bulk of the stone produced during the year was crushed basalt quarried by the Holden Traprock Co. H. E. Fletcher Co. reported production of rough architectural stone from its Worcester County granite quarry. Dressed granite for construction purposes was quarried at Uxbridge by the Uxbridge Granite Co. Miscellaneous clays for heavy clay products were mined by Gardner Brick Co., Inc., from its pit at Gardner.

The Mineral Industry of Michigan

By Samuel A. Gustavson[1]

MINERAL production in Michigan for 1952 was valued at $254,532,000, 1 percent below 1951. Much of the decrease was caused by strikes in the iron and copper ranges during the summer months. Decreases also were shown in the production and value of fuels—petroleum, natural gas, and natural gasoline. Coal production in the State ceased when the Swan Creek mine in Saginaw County closed.

Increased production of nonmetallic minerals nearly offset the loss in metal production. New alltime highs were established in the production and value of many of the nonmetallic minerals. Michigan ranks first in the production of gypsum, salt, marl, and calcium-magnesium chloride; second in the production of iron ore, sand, gravel, magnesium compounds, bromine, and peat; fourth in the production of stone; fifth in the production of portland cement; and sixth in the production of copper.

Figure 1 shows the total value of mineral output of the State from 1910 through 1952.

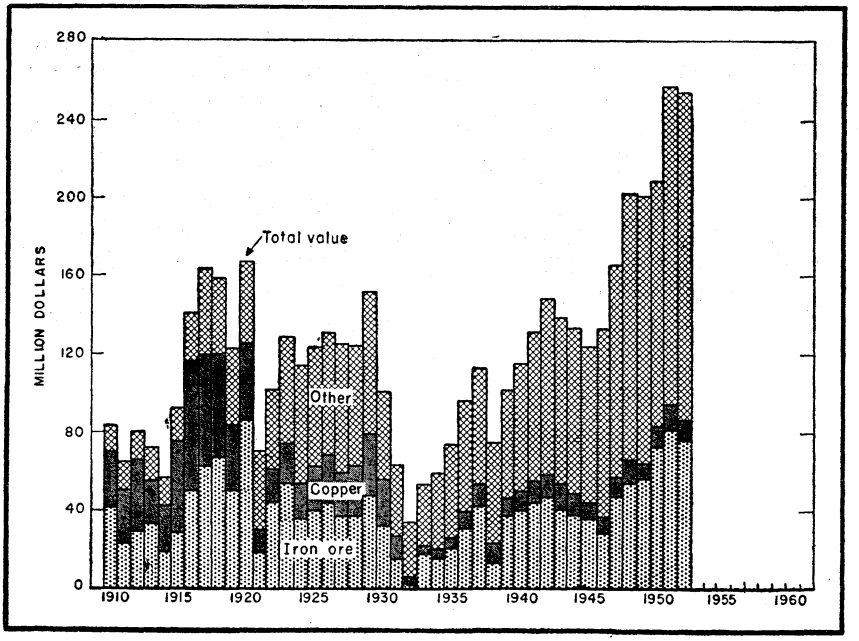

FIGURE 1.—Value of copper and iron ore, and total value of all minerals in Michigan 1910–52.

[1] Chief, Mineral Industry Division, Region V, Bureau of Mines, Minneapolis, Minn.

Table 1 shows production and value of minerals produced in Michigan for 1951–52.

Table 11 shows the value of minerals produced in Michigan for 1951–52, by counties.

TABLE 1.—Mineral production in Michigan, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement—376-pound barrels	14,112,639	$35,121,324	14,760,783	$36,819,042
Clays (except for cement)	391,134	461,862	436,939	471,938
Coal	7,347	74,861		
Copper (recoverable content of ores, etc.)	24,979	12,089,836	21,699	10,502,316
Gypsum (crude)	1,566,276	4,402,725	1,487,642	4,200,418
Iron ore (usable)—long tons, gross weight	13,611,621	81,765,748	11,779,366	76,088,935
Magnesium compounds from well brines (partly estimated)—MgO equivalent	45,692	5,010,674	(2)	(2)
Manganiferous ores (5 to 35 percent Mn)—gross weight			22,095	(2)
Marl, calcareous (except for cement)	178,010	96,639	164,519	86,529
Natural gas—thousand cubic feet	11,194,000	1,657,000	9,052,000	1,322,000
Peat	20,180	320,100	29,304	419,856
Petroleum (crude)—42-gallon barrels	13,927,000	37,880,000	[3] 13,251,000	[3] 35,250,000
Salt (common)	5,137,639	21,221,330	4,778,347	21,446,382
Sand and gravel	27,540,921	20,976,632	29,193,763	22,400,879
Stone (except limestone for cement and lime)	20,851,733	17,514,720	17,973,685	15,770,816
Undistributed: Bromine, calcium-magnesium chloride, lime, natural gas liquids (natural gasoline, LP-gases, 1952), potassium salts, ground sand and sandstone, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)		19,343,326		29,753,153
Total Michigan		257,937,000		254,532,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels and gypsum are strictly production.
[2] Value included with "Undistributed."
[3] Final figure. Supersedes preliminary figure given in commodity chapter.

GOVERNMENT-PRODUCTION EXPANSION PROGRAMS

Under the terms of a contract announced on January 16, 1952, with Calumet & Hecla Consolidated Copper Co., Calumet, Mich.,[2] the Defense Materials Procurement Agency agreed to pay overceiling prices, as follows, for copper from the following mines in Houghton and Keweenaw Counties:

Mine:	*Cents per lb.*
Iroquois	30.5
No. 4 Kearsarge	31
Peninsula	29.6
Allouez No. 3	29.7

The agreement set termination dates on each mine, according to known reserves, extending in the earliest case from December 31, 1952, through May 31, 1953. By mutual agreement, assistance for the Allouez No. 3 mine was suspended on May 1, 1952, owing to discovery of a better grade of ore that made it possible for the company to operate the mine without Government assistance. On September 18, 1952, the Office of Price Stabilization authorized the company to lift

[2] The company name was changed to Calumet & Hecla, Inc., at a special meeting of shareholders on Oct. 21, 1952.

its ceiling price on copper from 24⅝ cents to 27½ cents per pound, under the Capehart amendment to the Defense Production Act.[3]

Calumet and Hecla Consolidated Copper Co. continued work under a Defense Minerals Administration contract signed on August 3, 1951, for underground exploration of 5 drifts in 3 mines: The Centennial mine on the 23d level south and on the 48th level south, Houghton County; the Seneca mine on the 26th level north, Keweenaw County; and the Iroquois mine on the 22d level south and the 18th level north, Keweenaw County; and for surface trenching on the Ashbed lode, Keweenaw County. An amendment dated April 9, 1952, to the original contract also included crosscutting under the Ashbed lode. Proposed total cost of the project was $568,193, of which the Government share was to be 50 percent.

In July 1952 the DMPA announced that arrangements had been completed for reopening the Osceola mine of Calumet & Hecla in Houghton County. DMPA signed a contract that guaranteed the company a floor price of 25.25 cents a pound for refined copper. Production was to proceed at the rate of 7,125 short tons a year until June 30, 1962, or until 53,000 short tons had been produced. Under the contract the company agreed to rehabilitate the mine, including unwatering and retimbering, at its own expense and to provide all necessary facilities for processing the ore. The cost to the company was estimated to be about $6,500,000. The mine had been shut down since 1931.

On March 18, 1952, the DMPA announced that a contract had been signed with the Copper Range Co., Boston, Mass., for the production of up to 6,372,000 pounds of prime Lake copper from the Champion mine, Houghton County, which was to be supported at a price of 33.8 cents a pound because of high cost factors.[4]

On February 25, 1952, the White Pine Copper Co., a subsidiary of the Copper Range Co. entered into a contract with the DMPA whereby the Government agreed to buy up to 243,750 short tons of the first 275,000 short tons of copper produced at the White Pine mine, Ontonagon County. The Government retained an option to buy all copper produced during the term of the contract at 25.5 cents per pound adjusted by index changes. The contract was to terminate December 31, 1961.

Considerable progress was made during 1952 in planning, designing, and constructing necessary facilities to develop the White Pine ore body in Ontonagon County under the $57,185,000 Government loan authorized by the Reconstruction Finance Corporation on November 15, 1951. By the end of 1952 over $8,800,000 had been spent for engineering and construction, and commitments exceeding $12,850,000 had been made for equipment, materials, and supplies needed to open a modern copper mine and build a metallurgical plant and townsite with facilities for 3,500 people. The work of clearing and grading 268.7 acres was begun in April, and initial construction centered about the townsite and nonprocess buildings. Progress was made in building homes, an elementary school, hospital, mill, crushing plant, orebins, smelter, powerhouse, and transformer station. Telephone service,

[3] The Office of Price Stabilization discontinued price control of copper and all mill products on Feb. 25, 1953.
[4] This agreement ended automatically when copper was removed from price controls on Feb. 25, 1953. At that time nearly 1,500,000 pounds of copper had been produced.

power, and lights were provided. The mine tunnel and portal were completed. A 14½-mile railroad connection with the main line of the Duluth, South Shore and Atlantic Railroad at Bergland, Mich., to the mine site, was made. During the year 3,721 tons of ore was mined and sent to the mill for experimental work and testing purposes. The Freda pilot plant operated continuously throughout 1952 on a three-shift basis.

REVIEW BY MINERAL COMMODITIES

METALS

Copper.—Copper was produced from Keweenaw and Houghton Counties in the Upper Peninsula of Michigan. Production was about 13 percent less in 1952 than in 1951. The decrease was chiefly the result of curtailment of operations of the Copper Range Co. during a railroad strike from March 7 to April 28 and curtailment of operations at Calumet & Hecla, Inc., properties during a labor strike from September 9 to November 10. Three operating companies, working 8 mines and 3 tailings-reclamation plants, supplied all the production. Of especial interest to the future of the copper industry in the State was starting of the rehabilitation of the Osceola-mine group by Calumet & Hecla, Inc., in Houghton County and continuation of development of the mine and construction of surface and townsite facilities by the White Pine Copper Co. of the White Pine mine in Ontonagon County. Early in the year the Reconstruction Finance Corporation made a $57,100,000 loan for developing this property. The ore is mainly chalcocite (copper sulfide), with minor quantities of native copper. The State copper production and value for the latest 5-year period are shown in table 2. Output of copper, by months, during 1952 is shown in table 3. Copper ore produced in Michigan normally contains a small quantity of silver, and occasionally, high-grade silver ore is found; however, there has been no report of silver being recovered in 1952. The average annual weighted price used to calculate the value of copper produced was $0.242 per pound in 1951 and in 1952. Prices for copper from United States mines continued to be controlled by provisions of the General Ceiling Price Regulation. This order limited prices for individual sellers to the highest prices received between December 19, 1950, and January 25, 1951.

TABLE 2.—Mine production of copper, 1943–47 (average) and 1948–52, in terms of recoverable metal

Year	Mines producing		Material treated		Copper	
	Lode	Tailings	Ore (short tons)	Tailings (short tons)	Short tons	Value
1943–47 (average)	11	4	2,057,730	2,914,377	33,087	$9,799,334
1948	11	3	2,165,112	2,325,124	27,777	12,055,218
1949	9	3	1,503,358	2,039,510	19,506	7,685,364
1950	9	3	2,148,919	2,237,555	25,608	10,652,928
1951	8	3	2,214,369	2,256,965	24,979	12,089,336
1952	8	3	1,879,131	1,991,051	21,699	10,502,316

TABLE 3.—Mine production of copper in 1952, by months, in terms of recoverable metal

Month	Short tons	Month	Short tons
January	2,323	August	2,112
February	2,036	September	522
March	1,945	October	315
April	2,309	November	1,425
May	2,172	December	2,052
June	2,066		
July	2,422	Total	21,699

Iron Ore.—Iron ore was produced by 10 companies operating 33 underground mines and 8 open pits. Production was recorded from three ranges in the State—Gogebic range in Gogebic County, Marquette range in Marquette and Baraga Counties, and the Menominee range in Iron and Dickinson Counties.

Shipments of usable iron ore in 1952, excluding manganiferous iron ore (5 to 10 percent manganese), were 11,779,000 long tons compared to 13,612,000 in 1951, a decrease of 13 percent. The decrease was the result of a 2-month strike during the peak of the operating season. The loss in output was reduced somewhat by increased production during the operating period, and the addition of new freighters to the Great Lakes carrier fleet. Michigan maintained its position as second in the United States in the production of iron ore and supplied approximately 12 percent of the total.

Shipments in 1952 consisted of 11,710,737 tons of direct shipping ore and 68,629 tons of concentrates, including 21,398 tons used in manufacturing paint pigments. The entire production was classed as hematite ore. The average iron content of "usable" iron ore shipped in 1952 was 51.06 percent, natural. In 1951 the average was 54.13 percent.

Four companies operated 8 mines on the Gogebic Range in Gogebic County, and 1 concentrator processed stockpiled material. Five companies operated 15 mines on the Marquette Range, all in Marquette County except for 1 mine in adjoining Baraga County. Eight companies operated 17 mines on the Menominee Range in Iron and Dickinson Counties. Shipments from the Marquette Range were 4,516,509 tons, or 38 percent of the total, followed by the Menominee Range with 4,250,899 tons (36 percent) and the Gogebic Range with 2,943,329 tons (25 percent). Figure 2 shows the location of the iron ranges with respect to State and county boundaries and lake shipping points.

Ore produced on the Marquette Range was hauled by rail to Marquette on Lake Superior for shipment to lower Lake ports. Ore from the Menominee Range was hauled by rail to Escanaba on Lake Michigan, and ore from the Gogebic Range was hauled to Ashland, Wis., on Lake Superior. Nearly 918,000 tons was shipped all rail to consuming furnaces. Statistical data are shown in tables 4, 5, and 6. The 1952 shipping season for Michigan mines opened at Escanaba on April 2, at Marquette on April 5, and at Ashland, Wis., on April 5. Port closing dates were: Escanaba, December 3; Marquette, December 7; and Ashland, Wis., November 23.

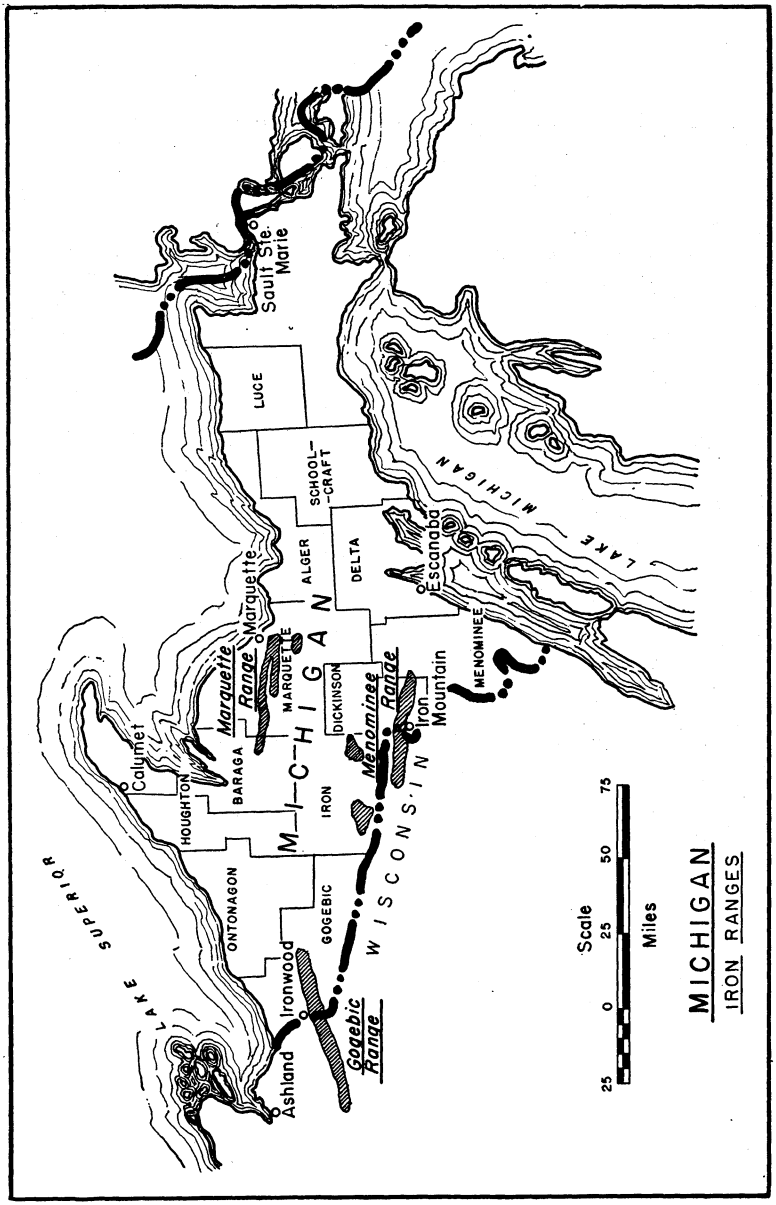

FIGURE 2.—Location of iron ranges in Michigan, showing State and county boundaries and lake shipping points.

Concentration of a shipping product from low-grade iron-bearing formations previously considered noncommercial continued to expand. In addition to the plant at the Ohio mine in Baraga County, a second concentrator was built at Humboldt in Marquette County, and plans were announced for the construction of a third plant at Republic, also in Marquette County.

The average value per gross ton of iron ore, including concentrates and sinter, f. o. b. mines, as reported by producing companies in the State in 1952, was $6.46 compared with $6.01 in 1951.

OPS Ceiling Price Regulation 169, September 12, 1952, established new ceiling prices for sales of ore for ore delivered on or after July 26, 1952, produced in Michigan, Minnesota, or Wisconsin. The new prices were: Old Range Bessemer $9.45, Old Range non-Bessemer $9.30, Mesabi Bessemer $9.20, Mesabi non-Bessemer $9.05, and High-Phosphorus $9.05. These prices are for ore delivered at lower Lake ports, carrying 51.5 percent natural iron content with 0.045 percent (maximum) phosphorus (dry), for Bessemer grades; ore exceeding 0.18 percent phosphorus (dry) are classified as High-Phosphorus.

TABLE 4.—Production, shipments, and stocks of crude iron ore in 1952, by counties and ranges, in gross tons [1]

County or range	Stocks of crude ore, Jan. 1, 1952	Production in 1952		Shipments in 1952		Stocks of crude ore, Dec. 31, 1952
		Underground	Open pit	Direct to consumers	To beneficiation plants	
County:						
Baraga	----------	----------	59,507	59,507	----------	----------
Dickinson	----------	----------	94,027	94,027	----------	----------
Gogebic	397,989	2,473,230	682,662	2,943,329	243,494	367,058
Iron	773,248	4,066,341	10,105	4,156,872	10,105	682,717
Marquette	814,603	4,417,083	191,960	4,457,002	----------	966,644
	1,985,840	10,956,654	1,038,261	11,710,737	253,599	2,016,419
Range:						
Gogebic	397,989	2,473,230	682,662	2,943,329	243,494	367,058
Marquette	814,603	4,417,083	251,467	4,516,509	----------	966,644
Menominee	773,248	4,066,341	104,132	4,250,899	10,105	682,717
	1,985,840	10,956,654	1,038,261	11,710,737	253,599	2,016,419

[1] Exclusive of iron ore containing 5 percent or more manganese.

Manganiferous Iron Ore and Ferruginous Manganese Ore.—Hanna Iron Ore Co. produced some ore from the Cannon mine in Iron County which averaged over 5 percent manganese. This material is not included in data on iron ore but is tabulated separately. Shipments totaled 22,095 short tons (19,728 long tons) of ore averaging 5.27 percent manganese in 1952. Historical data on the production of manganiferous iron ore and ferruginous manganese ore in Michigan, 1910–52, is shown in table 7.

Ores containing over 5 percent of natural manganese are generally priced as Old Range non-Bessemer ore on the combined natural manganese and iron content plus a premium. The Bureau is not at liberty to publish average mine prices for manganese ores.

TABLE 5.—Usable iron ore shipped from mines, 1940–52, by ranges, in gross tons [1]

Year	Marquette Range	Menominee Range (Michigan portion)	Gogebic Range (Michigan portion)	Total
1940	5,920,465	3,101,244	4,730,261	13,751,970
1941	6,346,165	4,036,486	4,818,968	15,201,619
1942	6,540,228	4,897,305	4,691,941	16,129,474
1943	5,602,904	4,812,731	4,094,722	14,510,357
1944	4,790,179	4,835,317	4,067,881	13,693,377
1945	4,585,340	4,239,045	3,008,670	11,833,055
1946	3,270,384	2,589,433	2,617,608	8,477,425
1947	5,543,124	3,712,501	3,709,857	12,965,482
1948	4,896,754	4,085,089	3,914,635	12,896,478
1949	4,249,707	3,587,068	3,156,464	10,993,239
1950	4,958,674	4,035,347	3,827,323	12,821,344
1951	5,647,423	4,767,139	3,197,059	13,611,621
1952	4,516,509	4,258,996	3,003,861	11,779,366
1940–52	66,867,856	52,957,701	48,839,250	168,664,807

[1] Exclusive of iron ore containing 5 percent or more manganese, natural.

TABLE 6.—Usable iron ore produced, 1854–1939 total, and 1940–52, by ranges, in gross tons [1]

Year	Marquette Range	Menominee Range (Michigan portion) [2]	Gogebic Range (Michigan portion) [2]	Total
1854–1939	201,533,822	172,040,043	176,253,087	549,826,952
1940	5,284,194	2,679,364	4,508,890	12,472,448
1941	6,230,612	3,818,451	4,622,129	14,671,192
1942	6,324,307	4,808,866	4,490,988	15,624,161
1943	5,680,727	5,366,595	4,378,466	15,425,788
1944	4,720,253	4,288,830	3,817,157	12,826,240
1945	4,664,816	4,140,239	3,027,438	11,832,493
1946	3,455,961	2,662,308	2,570,335	8,688,604
1947	5,070,631	3,741,217	3,765,614	12,577,462
1948	4,830,341	4,259,378	4,012,367	13,102,086
1949	4,392,732	3,483,375	3,322,917	11,199,024
1950	5,085,500	3,958,408	3,647,193	12,691,101
1951	5,617,935	4,986,290	3,099,676	13,703,901
1952	4,668,550	4,168,465	2,972,930	11,809,945
1854–1952	267,560,381	224,401,829	224,489,187	716,451,397

[1] Exclusive of iron ore containing 5 percent or more manganese, natural.
[2] Distribution by range partly estimated before 1906.

TABLE 7.—Manganiferous iron ore (containing 5 to 10 percent manganese, natural) and ferruginous manganese ore (containing 10 to 35 percent manganese, natural) shipped from mines, 1910–52

[Gross tons]

Year	Gross tons	Year	Gross tons
1910–39	3,102,180	1947	
1940	18,617	1948	
1941		1949	
1942	30,931	1950	105,017
1943	89,368	1951	
1944	40,794	1952	19,728
1945	1,500		
1946	1,743	1910–52	3,409,878

NONMETALS

Cement.—Shipments of portland cement from producing plants in 1952 were 14,760,800 barrels valued at $36,819,000, an increase of 5 percent in quantity and 5 percent in value over 1951. Production was reported from 7 plants in 6 counties. Better utilization of existing plants largely accounted for the increase. The total annual capacity in 1952 exceeded 16 million barrels.

The average mill value per barrel of portland cement in 1951 and 1952 was $2.49. The national average in 1951 and 1952 was $2.54 per barrel.

Clay and Shale.—Production of clay and shale totaled 1,775,900 short tons during 1952, an increase of nearly 18 percent over 1951. The chief use of the clay and shale produced is in the manufacture of portland cement. Most of the remainder is used for manufacturing common brick and vitreous clay tile and pipe. A small quantity of shale is expanded for use as a lightweight aggregate, and some clay is used in manufacturing refractories. During 1952, 11 companies operated plants for the production of heavy clay products (common brick, tile, pottery, etc.). Table 1 shows the output and value of clay, exclusive of that used in manufacturing cement, for 1951–52. Production and value of the clay used in the manufacture of cement are represented by the production and value of cement to avoid duplication. Counties from which clay was produced include: Eaton, Gratiot, Lenawee, Monroe, Ontonagon, Saginaw, Shiawassee, and Wayne.

Most clay is consumed by the producer, and a value of $1.00 a ton is used if the producer fails to report a value. When available, data reported by the producer are used to calculate an average value. In 1952 the average value of all clays sold and used in Michigan was $1.08 compared with $1.18 in 1951.

Gypsum.—Michigan ranks first among the States in production of crude gypsum. Annual production and value of crude gypsum for the period 1951–52 are shown in table 1. The four producing companies were Certain-Teed Products Corp., of Ardmore, Pa.; Grand Rapids Plaster Co., of Grand Rapids; National Gypsum Co., of Buffalo, N. Y.; and U. S. Gypsum Co., of Chicago, Ill. Calcining equipment of all companies in Michigan included 20 kettles and 1 rotary kiln. Certain-Teed Products Corp. and the Grand Rapids Plaster Co. operated mines and calcining plants in Kent County. The plants are situated at the city of Grand Rapids. The U. S. Gypsum Co. also has property and a plant in Kent County, however, no production was reported in 1952. The National Gypsum Co. operated a quarry and calcining plant at National City in Iosco County. United States Gypsum Co. operated a quarry at Alabaster in Iosco County and a calcining plant at River Rouge in Wayne County. The principal products are plaster board, lath, exterior sheathing, and plaster.

Crude gypsum mined in Michigan in 1952 had an average value of $2.82 per short ton compared with $2.81 in 1951.

Lime.—Limestone was processed by three companies in manufacturing lime. All used high-calcium limestone from quarries in northern

Michigan. Limestone Products Co., with a plant at Menominee in Menominee County, produced quicklime and hydrated lime. The plant has 11 shaft kilns and 1 continuous hydrator. Bituminous coal is used as a fuel. The Monitor Sugar Division, Robert Gage Coal Co., operates a plant at Bay City, Bay County. The plant has two shaft kilns and produces quicklime. The Dow Chemical Co. plant at Ludington, Mason County, consists of two rotary kilns and a continuous hydrator. Fuel is natural gas. Only quicklime was produced in 1952.

The average selling value in the United States, f. o. b. plant, per short ton, was: Quicklime, $11.43 in 1952 and $11.42 in 1951; and hydrated lime, $12.99 in 1952 and $12.81 in 1951.

Marl.—Michigan ranks first in the United States in the production of calcareous marl. Output in 1952 was 164,519 short tons valued at $86,529. All marl was used for agricultural purposes.

Natural Salines.—Natural brines from wells were produced in 5 counties by 5 companies. Various chemicals and chemical compounds are extracted from the brines. Elemental bromine was produced by 3 companies in 5 plants in Gratiot, Manistee, Mason, and Midland Counties. Bromine compounds were produced by three companies in Gratiot, Manistee, and Midland Counties. Calcium chloride and calcium-magnesium chloride were produced by three companies in Gratiot, Lapeer, Mason, and Midland Counties. Potassium compounds were produced in Midland County. The value of products, other than sodium chloride and magnesium compounds recovered from the brines, increased 25 percent over 1951.

Perlite.—Crude perlite, produced in Western States, was expanded at a plant in Grand Rapids. The expanded product is used mainly as a lightweight aggregate, replacing heavier materials in plaster and concrete.

Salt.—Salt was produced from well brines by 8 companies, operating 9 plants in Gratiot, Manistee, Midland, St. Clair, and Wayne Counties. One underground mine in Wayne County produces rock salt. Wayne County produced over 70 percent of the State total output, which was 4,778,000 tons valued at $21,446,400.

Sand and Gravel.—Production of sand and gravel was reported from all but 12 counties in the State by 130 commercial and 58 noncommercial operators in 1952. The total output of sand and gravel, both commercial and noncommercial, was 29,193,800 tons valued at $22,400,900, a 6-percent increase in quantity and 7 percent in value over 1951. Table 8 shows the production of sand and gravel, by uses and type of operation, for 1951 and 1952. The 10 largest commercial producers, ranked by value of production, were: American Aggregates Corp., Greenville, Ohio; Construction Aggregates Corp., Chicago, Ill.; Michigan Silica Co., Rockwood; Henry Pickitt, Allegan; Grand Rapids Gravel Co., Grand Rapids; Koenig Coal & Supply Co., Detroit; Foley & Beardslee, Clarkston; Nugent Sand & Gravel Co., Muskegon; I. L. Whitehead, Sault Ste. Marie; and John G. Yerington, Benton Harbor.

TABLE 8.—Sand and gravel sold or used by producers, 1951–52, by classes of operation and uses

Class of operation and use	1951			1952		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Glass	(1)	(1)		(1)	(1)	
Molding	2,398,239	$2,137,963	$0.89	1,932,845	$1,877,446	$0.97
Building	3,703,072	3,013,235	.81	3,297,285	2,575,620	.78
Paving	3,201,993	2,681,402	.84	3,276,527	2,659,318	.81
Grinding, polishing, and blast	242,443	96,940	.40	156,913	67,563	.43
Engine	100,812	58,458	.58	63,622	45,664	.72
Filter				(1)	(1)	
Railroad ballast	(1)	(1)		(1)	(1)	
Other	63,868	23,611	.37	905,282	451,713	.50
Undistributed [1]	301,442	833,796	2.77	277,312	700,472	2.53
Total commercial sand	10,011,869	8,845,405	.88	9,909,786	8,377,796	.85
Gravel:						
Building	3,345,704	3,170,750	.95	3,731,275	3,623,918	.97
Paving	7,332,500	5,786,039	.79	8,997,827	7,340,453	.82
Railroad ballast	534,509	481,721	.90	485,104	409,833	.84
Other	32,164	25,943	.81	63,131	36,221	.57
Total commercial gravel	11,244,877	9,464,453	.84	13,277,337	11,410,425	.86
Total commercial sand and gravel	21,256,746	18,309,858	.86	23,187,123	19,788,221	.85
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand: Paving	446,771	97,600	.22	525,768	112,436	.21
Total Government-and-contractor sand	446,771	97,600	.22	525,768	112,436	.21
Gravel:						
Building	143,784	10,129	.07	142,913	10,227	.07
Paving	5,693,620	2,559,045	.45	5,337,959	2,489,995	.47
Total Government-and contractor gravel	5,837,404	2,569,174	.44	5,480,872	2,500,222	.46
Total Government-and-contractor sand and gravel	6,284,175	2,666,774	.42	6,006,640	2,612,658	.43
ALL OPERATIONS						
Sand	10,458,640	8,943,005	.86	10,435,554	8,490,232	.81
Gravel	17,082,281	12,033,627	.70	18,758,209	13,910,647	.74
Grand total	27,540,921	20,976,632	.76	29,193,763	22,400,879	.77

[1] Bureau of Mines not at liberty to publish, combined with "Undistributed."

Stone.—Stone sold and used by producers in Michigan in 1952 consisted of limestone and dolomite, sandstone, and basalt. Limestone and sandstone were used in manufacturing rough and dressed building stone. Crushed limestone was used principally as a flux in metallurgical plants, for agriculture, and in the production of chemicals. Other uses of crushed stone, limestone, sandstone, and basalt were concrete aggregate, road construction, and railroad ballast. Data on the production and value of dimension stone are shown in

table 9 and on crushed and broken stone in table 10. The 10 largest producers of limestone, ranked by value of production, were: Michigan Limestone Division, U. S. Steel Corp., in Presque Isle County; Inland Lime & Stone Co., Schoolcraft County; Drummond Dolomite, Inc., Chippewa County; Wyandotte Chemicals Corp., Alpena County; Wallace Stone Co., Huron County; France Stone Co., Monroe County; F. G. Cheney Limestone Co., Eaton County; Fiborn Limestone Co., Mackinac County; Metro-Nite Co., Dickinson County; and John C. Jeffrey, Jackson County.

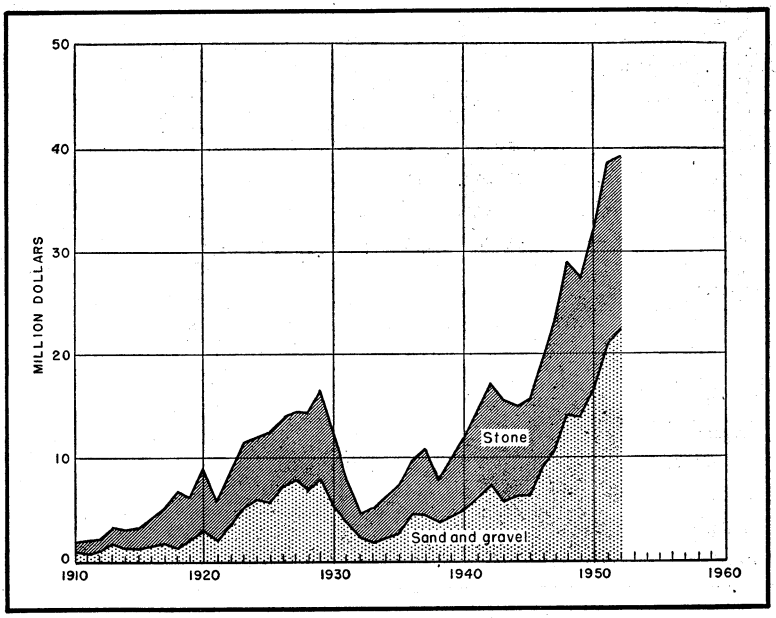

FIGURE 3.—Value of sand and gravel and stone in Michigan, 1910–52.

TABLE 9.—Dimension stone sold or used by producers, 1948–52, by kinds

Year	Limestone		Sandstone		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1948	2,690	$23,162	----------	----------	2,690	$23,162
1949	3,300	26,604	(1)	(1)	[2] 3,300	[2] 26,604
1950	4,430	43,019	----------	----------	4,430	43,019
1951	4,627	43,138	984	$4,776	5,611	47,914
1952	5,322	45,925	908	5,126	6,230	51,051

[1] Figure withheld in order to avoid disclosure of individual company operations.
[2] Excludes sandstone. Bureau of Mines not at liberty to publish.

TABLE 10.—Crushed and broken stone sold or used by producers, 1951–52, by kinds and uses

Kind and use	1951			1952		
	Short tons	Value	Average value	Short tons	Value	Average value
Basalt: Concrete, road metal:						
Noncommercial	----------	----------	----------	28,362	$21,009	$0.74
Total basalt	----------	----------	----------	28,362	21,009	.74
Limestone (except for limestone, used for cement and lime):						
Riprap:						
Commercial	17,849	$19,069	$1.07	9,294	19,241	2.07
Noncommercial	27,830	39,797	1.43	46,595	69,893	1.50
Flux	11,936,581	8,978,302	.75	10,082,920	7,614,149	.76
Concrete, road metal:						
Commercial	2,608,223	2,431,327	.93	3,120,820	3,347,400	1.07
Noncommercial	5,268	3,424	.65	72,930	85,866	1.18
Railroad ballast	334,240	428,252	1.28	169,929	209,512	1.23
Agriculture	701,213	902,502	1.29	722,028	921,084	1.28
Other	5,196,590	4,640,332	.89	3,674,922	3,379,230	.92
Total commercial	20,794,696	17,399,784	.84	17,779,913	15,490,616	.87
Total noncommercial	33,098	43,221	1.31	119,525	155,759	1.30
Total limestone	20,827,794	17,443,005	.84	17,899,438	15,646,375	.87
Sandstone:						
Concrete, road metal:						
Commercial	60	120	2.00	500	1,000	2.00
Noncommercial	----------	----------	----------	9,450	10,500	1.11
Total sandstone	60	120	2.00	9,950	11,500	1.16
Miscellaneous stone: Concrete, road metal:						
Commercial	----------	----------	----------	29,705	40,881	1.38
Noncommercial	18,268	23,681	1.30	----------	----------	----------
Total miscellaneous stone	18,268	23,681	1.30	29,705	40,881	1.38
Total commercial	20,794,756	17,399,904	.84	17,810,118	15,532,497	.87
Total noncommercial	51,366	66,902	1.30	157,337	187,268	1.19
Grand total	20,846,122	17,466,806	.84	17,967,455	15,719,765	.87

MINERAL FUELS

Coal.—Production of coal, once a major industry in the State, became history when operations at the Swan Creek Mining Co. near St. Charles in Saginaw County were abandoned in April. According to the Michigan Department of Conservation, Geological Survey Division, over 46,200,000 tons of coal has been produced in the State from 1860 to 1952. The peak production was 2,035,000 tons in 1907 from 37 mines. Federal Geological Survey Circular 94 shows coal reserves, as of January 1, 1950, totaling 219,900,000 tons. These reserves include 124,870,000 tons of measured reserves, 28,980,000 tons of indicated reserves, and 66,050,000 tons of inferred reserves

Natural Gas.—Natural gas [5] was produced from 1,111 wells in 22 counties. Production in 1952 was 9,052,000 thousand cubic feet valued at $1,322,000, a decline of 19 percent in quantity and 20 percent in value from 1951. Four new gas fields were discovered and 81 producing wells drilled during the year.

[5] Data, except for production, from Michigan's Mineral Industries 1952, and Summary of Operations, Oil, and Gas Fields, 1953, by Michigan Department of Conservation, Geological Survey Division.

Peat.—Peat was produced by five companies in 1952. Its principal use is as a soil conditioner. The State ranks second in production in the Nation. Counties from which production was reported were Kalamazoo, Lapeer, Mason and Shiawassee. The largest producer was the Michigan Peat, Inc., operating a bog in Lapeer County near Capac.

Petroleum.—Petroleum [6] was produced in 37 counties from 3,979 wells. Production in 1952 was 13,251,000 barrels valued at $35,250,000, a decrease of 5 percent in quantity and 7 percent in value below that of 1951. Principal producing formations were the Traverse, Dundee and Detroit River, with minor production from the "Michigan Stray," Berea and Trenton. Eight new oilfields were discovered and 261 producing wells drilled during the year.

REVIEW BY COUNTIES

ALCONA

Gravel was produced by the county road commission for use in road construction.

ALGER

Leonard Johnson of Catham and the county road commission produced gravel, chiefly for road construction.

ALLEGAN

Petroleum ranks first in value of minerals produced in Allegan County and natural gas fourth. Other minerals produced in the county were marl, chiefly for agricultural use, and sand and gravel, chiefly for use as a concrete aggregate and in road construction. Producers of marl include L. Z. Arndt of Fennville and Gerald Arnsman and Emil Pavlak, both of Hopkins. Sand and gravel were produced by Cleo L. Arndt, Fennville; Harry Pickitt, Allegan; Ben Waanders, Allegan; and West Shore Construction Co., Zeeland.

ALPENA

Limestone for use in manufacturing cement, other alkali products, and construction and road purposes was produced in the county. Cement was manufactured by the Huron Portland Cement Co. Wyandotte Chemicals Corp., Wyandotte, produced limestone for use in manufacturing alkali and portland cement and for concrete and road use.

ANTRIM

Gravel, chiefly for road construction, was produced by Harry Pickitt of Allegan and the county road commission.

ARENAC

Petroleum was the chief mineral product of the county. The Deep River Block & Sand Co. at Standish produced sand for building and road purposes. Limestone for use as riprap was produced by the county road commission.

[6] Work cited in footnote 5.

TABLE 11.—Value of minerals produced in Michigan, 1951–52, by counties,[1] and principal minerals produced in 1952

County	1951	1952	Principal minerals in order of value
Alcona	$30,345	$17,044	Sand and gravel.
Allegan	181,168	136,657	Petroleum, sand and gravel, marl.
Antrim	17,086	36,581	Sand and gravel.
Baraga	45,690	493,658	Iron ore (1952), stone, sand and gravel.
Barry	94,494	101,812	Petroleum, sand and gravel, marl.
Benzie		18,511	Sand and gravel (1952).
Berrien	219,833	227,826	Sand and gravel, stone (1952), petroleum.
Branch	75,634	56,924	Sand and gravel, marl.
Calhoun	358,095	385,177	Do.
Cass	67,483	122,481	Do.
Charlevoix	8,599	11,389	Sand and gravel.
Clinton	168,469	247,364	Do.
Crawford	14,100	12,907	Petroleum, natural gas, natural gasoline.
Delta	86,329	193,791	Sand and gravel, stone (1952).
Dickinson	648,081	429,180	Iron ore, stone, sand and gravel.
Eaton	291,745	353,407	Stone, sand and gravel, clay.
Genesee	337,118	494,858	Sand and gravel, petroleum.
Gladwin	20,604	18,883	Petroleum, sand and gravel.
Gogebic	21,103,000	19,277,115	Iron ore, sand and gravel.
Gratiot	2,658,936	2,481,624	Natural salines, sand and gravel, natural gas.
Hillsdale	177,513	130,610	Sand and gravel, marl.
Houghton [2]	12,116,793	10,535,643	Copper, sand and gravel, stone.
Ingham	976,839	1,065,474	Sand and gravel, stone.
Ionia	25,276	132,015	Sand and gravel, petroleum.
Iron	25,936,447	26,373,984	Iron ore, manganiferous ore (1952), sand and gravel.
Jackson	338,764	420,006	Sand and gravel, stone, marl.
Kalamazoo	349,693	565,243	Sand and gravel, marl, peat, petroleum.
Kalkaska	6,221	6,587	Petroleum, natural gasoline, natural gas.
Kent	2,090,774	2,067,408	Sand and gravel, gypsum, stone.
Lake	3,830	10,281	Petroleum, sand and gravel.
Lapeer	378,261	464,000	Peat, sand and gravel.
Leelanau	41,652	14,281	Sand and gravel.
Lenawee	2,775,938	2,219,698	Cement, sand and gravel.
Luce	20,840	27,901	Sand and gravel.
Macomb	1,012,520	1,194,245	Do.
Manistee	5,902,945	6,501,906	Natural salines, sand and gravel.
Marquette	34,639,826	30,325,369	Iron ore, sand and gravel.
Mecosta	10,827	12,721	Petroleum, natural gas, marl, sand and gravel.
Missaukee	210	11,358	Petroleum, natural gas.
Montcalm	74,190	275,205	Petroleum, sand and gravel, natural gas.
Muskegon	733,161	673,324	Petroleum.
Newaygo	17,351	2,247	Petroleum, natural gasoline, natural gas.
Oakland	4,100,727	4,543,940	Sand and gravel.
Oceana	9,120	4,063	Petroleum, natural gas, natural gasoline.
Ogemaw	13,587	48,012	Petroleum, sand and gravel, marl.
Ottawa	1,413,881	1,529,190	Sand and gravel, petroleum, natural gas.
Roscommon	8,922	[3]	Petroleum, natural gas.
Saginaw	159,418	80,270	Clay, petroleum, sand and gravel.
St. Clair	8,519,138	8,047,757	Salt, cement, sand and gravel.
St. Joseph	145,292	73,953	Sand and gravel, marl.
Sanilac	144,125	101,563	Sand and gravel.
Shiawassee	234,554	159,668	Sand and gravel, clay.
Tuscola	1,152,151	967,932	Sand and gravel, petroleum, natural salines.
Washtenaw	623,334	653,989	Sand and gravel, natural gas.
Wayne	20,866,034	21,061,095	Salt, cement, sand and gravel, clay.
Undistributed [4]	106,489,814	109,114,137	
Total	257,937,000	254,532,000	

[1] County figures exclude petroleum, natural gas and natural gas liquids, included with "Undistributed."
[2] Includes value of minerals produced (copper, sand and gravel) in Keweenaw County.
[3] Value included with "Undistributed."
[4] Includes production or value of minerals output which the Bureau of Mines is not at liberty to publish, for the following counties: Alger, sand and gravel; Alpena, cement, stone, sand and gravel (1951); Arenac, petroleum, sand and gravel; Bay, cement, petroleum, lime; Cheboygan, stone, sand and gravel (1952); Chippewa, stone, sand and gravel; Clare, petroleum, natural gas; Emmet, cement, stone (1952); Huron, stone, sand and gravel, petroleum; Iosco, gypsum, sand and gravel (1951); Isabella, petroleum, sand and gravel, natural gas, natural gasoline; Livingston, sand and gravel, natural gas; Mackinac, stone, sand and gravel; Mason, magnesium compounds, lime, calcium-magnesium chloride, petroleum, bromine, sand and gravel, peat (1951); Menominee, lime, sand and gravel; Midland, bromine, calcium-magnesium chloride, magnesium compounds, petroleum, salt, potash, sand and gravel, natural gas, natural gasoline; Monroe, stone, petroleum, clay; Montmorency, sand and gravel, petroleum (1951); Ontonagon, sand and gravel, clay (1952); Osceola, petroleum, sand and gravel, natural gas, marl; Oscoda, limestone, petroleum; Otsego, sand and gravel, petroleum, natural gas; Presque Isle, stone, sand and gravel; Schoolcraft, stone, sand and gravel; Van Buren, petroleum, sand and gravel; Wexford, petroleum.

BARAGA

Iron ore, sand, gravel, and limestone were produced in the county. Cleveland Cliffs Iron Co., of Cleveland, Ohio operated the Webster mine. Limestone, chiefly for riprap, was produced by the county road commission. The county also produced gravel for use on roads. The Duluth, South Shore Atlantic Railway produced gravel, chiefly for use as railroad ballast.

BARRY

Minerals produced in Barry County, ranked by value, include petroleum, sand, gravel, and marl. Producers of sand and gravel for building and road construction include Lancaster Sand & Gravel Co. and H. Steenbock & Son, Hastings; A. D. Pennock, Nashville; Harry Pickitt, Allegan; and John G. Yerington, Benton Harbor. Sand and gravel were produced by and for the Barry County Road Commission. Producers of marl, chiefly for agricultural use, were Baldwin Bros., Hastings; H. A. Carlton Schau, Kalamazoo; and George Zimmerman, Delton.

BAY

The Aetna Portland Cement Co. at Bay City produced portland cement from clay mined in local pits and limestone from Alpena County. Lime was produced by the Monitor Sugar Division of Robert Gage Coal Co. Petroleum also was produced in the county and ranks second in value among the minerals produced.

BENZIE

Gravel was produced by the county road commission.

BERRIEN

Sand and gravel, the chief minerals of value in the county, were produced by Heides Sand & Gravel Co. and Harold Keill, both of Niles; Ireland & Lester Co., St. Joseph; Producers Core Sand Corp., Michigan City, Ind.; Walker Sand & Gravel Co., Buchanan; and John G. Yerington, Benton Harbor. The chief use was for building and road construction. Some sand was produced for use in molding and as engine sand. A small quantity of crushed stone was produced for use as a concrete aggregate or for road construction. Petroleum was produced in the county.

BRANCH

Marl, for agricultural use, was produced by Arthur Waterbury, Quincy, and Reed & Wood, Colon. Sand and gravel were produced by and for the county road commission.

CALHOUN

Marl for agricultural use, sand, and gravel were produced in the county. Producers of marl include Carl Avery, Athens; and Arnie Delebaugh and Clyde M. Reed, both of Union City. Producers of sand and gravel include Battle Creek Gravel Co., Battle Creek;

Emil Combs, Tekonsha; Harry Pickitt, Allegan; West Shore Construction Co., Zeeland; and John G. Yerington, Benton Harbor. Sand and gravel were produced by and for the Calhoun County Road Commission, Marshall.

CASS

Marl is produced by Grant Brizendine, Edwardsburg; Frank R. Hixon, Marcellus; and Joseph Steck, Vandalia. Gravel was produced by John G. Yerington, Benton Harbor, and by and for the Cass County Road Commission, Cassopolis.

CHARLEVOIX

The county road commission produced sand and gravel.

CHEBOYGAN

E. P. Brady & Company, Flint, produced gravel, chiefly for building purposes, and Ralph Tanner & Associates, Afton, produced limestone for use in concrete or as road metal.

CHIPPEWA

The Drummond Dolomite, Inc., Sheboygan, Wis., produced limestone, sand and gravel. Stone is sold for use as flux, for agricultural and chemical uses, and for concrete and road metal. Gravel was produced by I. L. Whitehead Co. and Chippewa County Road Commission, both of Sault Ste. Marie.

CLARE

Petroleum and natural gas were the only minerals for which production was reported in Clare County.

CLINTON

Sand and gravel were the only minerals for which production was reported in this county in 1952. Some molding sand was produced by the Walling Gravel Co. of St. Johns. Other producers of sand and gravel, chiefly for use in construction or as road metal, include Boichot Concrete Products Corp., Lansing; H. L. Martin Gravel Co., Westphalia; Harry Pickitt, Allegan; Tabor-Carmody Co., Grand Rapids; and Clinton County Road Commission, St. Johns.

CRAWFORD

Of the minerals produced in Crawford County, petroleum, natural gas, and natural gasoline rank first, second, and third, in that order. Gravel was produced chiefly for road construction by Tabor-Carmody Co., Grand Rapids, and Crawford County Road Commission, Grayling.

DELTA

Sand and gravel were produced by the following companies: Bichler Bros. and Delta County Road Commission, Escanaba; Cloverland Milling-Supply Co. and Days River Sand & Gravel Co., Gladstone;

Escanaba Lake Superior Railroad; Minneapolis, St. Paul & Sault Ste. Marie Railway; and Van Enkevorts Bros., Bark River. Use was principally for construction and road metal or as railroad ballast. Limestone, for use as a concrete aggregate or road metal, was produced by E. P. Brady Co., Flint.

DICKINSON

Two companies produced iron ore in Dickinson County—the Globe Iron Co., operating the Cornell mine, and the Jackson Iron & Steel Co., operating the Bradley mine; both were headquartered in Jackson, Ohio. The iron ore produced is high in phosphorus, and it was used chiefly in producing high-phosphorus steel. Limestone was produced by Metro-Nite Co., Milwaukee. A considerable portion of the product of this company was sold for use as a putty filler. Other use was as a concrete aggregate or road metal. Superior Rock Products Co. produced limestone, chiefly for use as a concrete aggregate or road metal. Sand and gravel were produced by Champion, Inc., and Dickinson County Road Commission, both at Iron Mountain.

EATON

The American Vitrified Products Co., Cleveland, Ohio, and the Grand Ledge Clay Products Co., Grand Ledge, produced clay, chiefly for manufacturing vitreous clay pipe and tile. The F. G. Cheney Limestone Co., Bellevue, produced dimension limestone for building use and as crushed limestone for use in concrete aggregate, as road metal, and for agricultural purposes. Gravel was produced by the county road commission and the West Shore Construction Co. of Zeeland.

EMMET

Petoskey Portland Cement Co. operated a portland-cement plant at Petoskey. The company also produced limestone for use as an asphalt filler.

GENESEE

Mineral commodities produced in the county were petroleum, sand, and gravel. Producers of sand and gravel include E. P. Brady & Co., Clayton W. and Donald R. Kurtz, and Kurtz Gravel Co., all of Flint; Hansen Gravel Co., Flushing; A. S. Leffler Gravel Co., Davison; and John Post & Sons, Swartz Creek. Most of the sand was for use as concrete aggregate or road construction; however, prepared sand and gravel were marketed for other uses.

GLADWIN

Petroleum ranked first in value of the minerals produced in the county. Some sand and gravel, chiefly for road construction, were produced by Harry Pickitt of Allegan and by and for the county highway department.

GOGEBIC

Iron ore was the principal mineral product of Gogebic County, which is mined on the iron range of the same name. The five operating

companies were: Pickands, Mather & Co., Cleveland, Ohio, producing from the Anvil-Palms-Keweenaw, Newport, Peterson, Plymouth and Sunday Lake mines; Oliver Iron Mining Division, U. S. Steel Corp., Duluth, Minn., the Geneva mine; Republic Steel Corp., Cleveland, Ohio, the Penokee mine; M. A. Hanna & Co., Cleveland, Ohio, the Wakefield mine; Zontelli Bros., Inc., Ironton, Minn., various lean-ore stockpiles. Sand and gravel were produced by Concrete Products Co. Wakefield; Charles R. Hemkes Co., Ironwood; Lake Superior Gravel Co., Ramsay; Gogebic County Road Commission, Bessemer; and Ironwood City Highway Department. The principal uses were as concrete aggregate or for road construction.

GRATIOT

Minerals produced in the county include bromine, calcium chloride, clay, magnesium, salt, natural gas, petroleum, sand, and gravel. Bromine, calcium chloride, and magnesium compounds (magnesium carbonate, magnesium hydroxide, and caustic-calcined magnesia) and salt were produced by the Michigan Chemical Corp., St. Louis, Mich. Vitreous clay pipe and tile were produced by the Clay Products Co., St. Louis, Mich. Sand and gravel were produced by Roy Dayringer, North Star Washed Sand & Gravel, and Gratiot County Road Commission, all at Ithaca, and the Tabor-Carmody Co., Grand Rapids.

HILLSDALE

Marl was produced by Virgil Kintigh of Jonesville and Barnes-Van Antwerp of Horton. Gravel was produced by Elliott Ice & Coal Co. and the Hillsdale County Road Commission, Hillsdale; the Northwest Materials, Inc., Bryan, Ohio; and Hoover Bros., Waldron.

HOUGHTON

Houghton County is best known for its production of copper. For a number of years, however, only three companies have been producing: Calumet & Hecla, Inc., Copper Range Co., and Quincy Mining Co. Production in 1952, including that from Keweenaw County, was 13 percent less than in 1951. In terms of recoverable metal, the output in 1952 was 21,699 tons. The decrease was chiefly the result of curtailment of operations at the Copper Range Co. mine during a railroad strike from March 7 to April 28 and curtailment of operations at Calumet & Hecla, Inc., properties during a labor strike from September 9 to November 10.

Calumet & Hecla, Inc., operated 7 underground mines and 2 tailings-reclamation plants. In July the company decided to dewater and reopen the Osceola mining group, idle since 1931, estimating the cost at $6,500,000. Pumping was begun immediately. Under an agreement with the Defense Minerals Procurement Agency (DMPA), the company was guaranteed a minimum price of 25.25 cents per pound for the copper produced up to 53,000 tons. Dewatering will take about 18 months and rebuilding of surface and underground facilities about 1 year or more. In September a price ceiling of 27½ cents was granted for copper produced by the Calumet Division. However, the first company sale at this rate was not made until December. In

January 1952 overceiling prices were granted for output from specific mines, as follows: Iroquois, 30.5 cents per pound; Kearsarge, 31 cents; Peninsula, 29.6 cents, and Allouez No. 3, 29.7 cents. The agreement for Allouez No. 3 was discontinued effective May 1, when a better grade of ore was found. Exploration for copper ore was continued under the Defense Minerals Exploration Administration (DMEA) contracts in Houghton and Keweenaw Counties. Data on these contracts may be found under the section Government Production Expansion Programs in this chapter. Extracts from the company annual report follow:

At a special meeting of Shareholders on October 21, 1952, our corporate life was extended for thirty years and the Company name was changed to Calumet & Hecla, Inc.

* * *

As a result of exhaustive studies, it was decided in July to unwater and rehabilitate the Osceola lode mines at Calumet, which have been shut down since 1931. This project, costing approximately $6,500,000, will be financed internally by return of capital through depreciation and depletion and by the application of retained earnings. Under an agreement with the Defense Materials Procurement Agency, the estimated production during the next 10 years of 106,000,000 pounds will be sold for a minimum price of 25¼ cents per pound.

* * *

The major production activities of the Calumet Division in 1952 closely paralleled those of the past few years. Our operations included seven mines, two reclamation plants, and the leaching and refining of copper scrap. First steps were taken to unwater and reopen the Osceola lode mines.

* * *

The grade of ore from the mines improved somewhat over 1951. A Government subsidy on three high-cost mines (No. 4 North Kearsarge, No. 4 Peninsula and No. 1 Iroquois) enabled these properties to continue in operation. An improved grade of ore allowed the suspension of a subsidy at No. 3 Allouez, effective in the second quarter.

Both reclamation plants operated profitably until the strike on September 8. The Lake Linden reclamation plant was not reopened after the strike because of the scattered nature of the remaining sands and the difficulty in moving the dredge around in winter months. This plant will be reopened in the spring and should be able to operate profitably for about eight months in 1953 until available tailings are exhausted.

* * *

Explorations for copper and zinc-lead ores continued throughout the year. The Government is assuming half the cost of most of this work, and will be repaid on a royalty basis if production results.

In Michigan, an exploratory drift on the Kearsarge lode, which had reached a point 7,600 feet south of the present workings at the end of the year, continues to look encouraging. Trenching on the Ashbed amygdaloid lode in Keweenaw County showed enough copper to justify underground testing, and the old Meadow Shaft was rehabilitated for the purpose. The test-stoping operations on the Knowlton lode in Ontonagon County revealed fair copper values. These operations are being continued. * * *

Copper Range Co. operated on the east vein of the Champion mine and shipped ore to its Freda mill by rail. Concentrates from this mill are smelted at the Hancock smelter of the Quincy Mining Co. In November, the Copper Range Co. contracted for demolition and removal of its old smelter at Coles Creek. This smelter had been idle for several years. An overceiling price of 33.8 cents per pound for up to 3,186 tons of copper in the Champion mine was contracted for with DMPA. This contract was terminated February 25, 1953, with the Office of Price Stabilization Order discontinuing the price control

of all copper and mill products. Extracts from the company annual report follow:

Operations on the East Vein of the Champion Mine were carried on throughout the year with the exception of the period March 7 to April 28, when the employee strike on the Railroad hauling ore to the mill necessitated suspension of production. Prior to the shutdown and upon resumption of production, the program of expanded development and tonnage was continued in the mine with satisfactory results. On January 1, a contract with Defense Materials Procurement Agency was consummated which granted a premium price of 33.8 cents per pound for copper produced from the East Vein, this premium price period to extend for two years, dependent upon price controls and other provisions of the contract. The added return per pound of copper compensated in part for the increased production cost.

This Contract was terminated on February 25, 1953 with the Office of Price Stabilization Order discontinuing the price control of copper and all mill products.

Exploration drifting on the 14th level was intensified both to the north and to the south from the active No. 4 shaft. The northward exploration was completed with approximately 1,400 lineal feet of stoping area exposed. The southward exploration has exposed approximately 500 lineal feet of stoping ground and is being continued ahead toward additional favorable areas. A total of 204,551 tons of ore was hoisted during the year. Approximately 38 per cent of this ore originated above the 9th level, 46 per cent above the 12th level and 16 per cent on or above the 14th level. Broken ore reserves increased from 133,842 tons on January 1, 1952 to 190,769 tons on January 1, 1953.

Modification of stoping and tramming procedures were made during the latter part of the year and have resulted in increased production per man shift and should continue to improve underground efficiency. * * *

The Freda concentrator operated throughout the year with the exception of the period of the railroad strike and processed 200,598 tons of ore. ------- -------.

* * *

A contract was consummated in November with Klatzky Brothers, Inc., for the sale and removal of all of the plant facilities of the Copper Range Smelter at Coles Creek, excluding specified buildings and all copper remaining in furnaces. This removal or demolition is to be completed within a period of two years.

All of the Copper Range concentrates during the year were refined under an agreement with the Quincy Mining Company. Several improvements in refining technique and slag treatment were initiated which are resulting in improved cost and quality of copper.

The Douglass property, operated by Calumet and Hecla Company, Inc., * * *. Mining operations were curtailed by a strike of approximately two months duration at the lessee's property. Production from the Kearsarge Lode was entirely from stoping operations. Shaft sinking and development work continued with active stoping on the Houghton Conglomerate. The average recovery increased to 27.8 pounds per ton of ore.

The Quincy Mining Co. operated its tailings-reclamation plant at Torch Lake throughout the year. Concentrates were sent to the company smelter at Hancock, Mich. for refining. Extracts from the company annual report follow:

Operation of our Reclamation Plant during 1952 has continued on a satisfactory and profitable basis. * * *. The reduced production, compared with the last two years, when the recovery averaged 5.74 pounds per ton of sands handled, is due entirely to the character of the sands and lower copper contents, because our operations have now reached the cleaning up stage in our No. 1 stamp sands; also a larger percentage of the copper in the sands was in the form of oxidized copper due to an increased tonnage of sands being above the water level of Torch Lake, and copper in this form is more difficult to recover by our method of extraction. Therefore, the copper contents of the waste tailings, discarded after treatment, carried an average copper content of 1.86 pounds per ton. * * * The operating profit for the year, as shown by our financial statement, of $347,512.19, before depreciation and depletion charges, is very good.

A year ago it was thought that it would be necessary to transfer our operations to our No. 2 stamp mill sands in October 1952, but this was found not to be neces-

sary and so we are still handling sands from No. 1 stamp pile, and it will probably be possible to continue operations on these sands until the latter part of 1953. The sands are of lower grade but, at the present price for copper, they are showing a reasonable profit. When we transfer our operations to the No. 2 stamp sands the sands available should be sufficient to keep the Reclamation Plant in operation for approximately five years.

* * *

At the smelter the No. 5 furnace has operated very satisfactorily during the year. We are still handling a small quantity of custom copper which enabled us to keep the furnace going without the necessity of a shut down for lack of copper; therefore, the cost of smelting was lower than during the previous year.

* * *

From the operations of the past year the Company declared two dividends, 25 cents per share payable August 25 and 60 cents per share payable December 22, 1952.

Labor relations between the Company and its employees, who are represented by the Congress of Industrial Organization, have continued on a friendly and satisfactory basis at all times during the year and there has been no idleness due to labor difficulties. Our contract with the Union, which expired on June 30, 1952, was renewed for another year with an increase in the wage rate of approximately eleven cents per hour.

Engine sand was produced by the Copper Range Railroad Co. Keweenaw County Road Commission produced gravel for building and road purposes in Keweenaw County. Crushed stone was produced by Houghton County Road Commission for use as road metal.

HURON

Wallace Stone Co., Bayport, produced dimension limestone for use as architectural and building stone and crushed limestone for riprap, flux, concrete, and road metal, railroad ballast and agricultural use. Gravel was produced by the county road commission. A small quantity of petroleum also was produced.

INGHAM

Sand and gravel were produced by Ferris Co. and by and for the Ingham County Road Commission, Mason; Harry Pickitt, Allegan; Ray Sablain, Inc., Lansing; the city of Lansing; and Michigan State Highway Department. The Michigan State Highway Department also produced limestone for use as road metal.

IONIA

Gravel was the chief mineral produced in the county. Companies operating include Ed. Light, St. Johns; Harry Pickitt, Allegan; John G. Yerington, Benton Harbor; and Ionia County Road Commission. A small quantity of petroleum also was produced in the county.

IOSCO

National Gypsum Co., Buffalo, N. Y., produced crude gypsum and operated a calcining plant at National City. U. S. Gypsum Co., Chicago, Ill., produced crude gypsum at Alabaster.

IRON

Six companies reported production of iron ore and/or manganiferous iron ore from the Menominee Range. These companies were Pickands, Mather & Co., Cleveland, Ohio, producing from the Buck unit,

Davidson Group, and James mine; Republic Steel Corp., Cleveland, Ohio, the Tobin-Columbia-Monongahela group; M. A. Hanna & Co., Cleveland, Ohio, from the Cannon, Groveland, Hiawatha 1 and 2, Homer, and Wauseca mines; Cleveland Cliffs Iron Co., Cleveland, Ohio, from the Spies mine; Inland Steel Co., Chicago, Ill., from the Bristol, Cayia, and Sherwood mines; and North Range Mining Co., Negaunee, from the Book and Warner mines. Gravel was produced by Champion, Inc., Iron Mountain.

ISABELLA

Petroleum, natural gas, and natural gasoline, in that order, were the principal minerals of value produced in the county. Gravel was produced by Otis & Clyde Denslow, Weidman, and C. Utterback, Mount Pleasant, chiefly for use in concrete aggregate or road construction.

JACKSON

Limestone was produced by John C. Jeffrey of Parma for use chiefly as road metal and for agriculture. Marl for agricultural use was produced by Barnes & Van Antwerp of Horton. Ray's Stone Quarry, Napoleon, produced dimension sandstone for use in building construction and as flagging. The company also produced crushed sandstone for use as a concrete aggregate or road metal. Sand and gravel were produced by Klumpp Bros., Chelsea; Edward Palmer & Son, Sager Concrete Products, and Jackson County Road Commission, all of Jackson; and Harry Pickitt, Allegan.

KALAMAZOO

Minerals produced in Kalamazoo County include marl, peat, petroleum, sand, and gravel. Marl was produced by Lawrence Hayward, Scotts; Claude Mastin and Alvin Roe, both of Climax; and Dan Slack, Kalamazoo. Peat was produced by Bud Green's Genuine Peat Co., Kalamazoo. Sand and gravel were produced by American Aggregates Corp., Greenville, Ohio; Amos G. Baker, Gravel Producers, Inc., Albert Peters, and Kalamazoo County Road Commission, all of Kalamazoo; Harry Pickitt, Allegan; and John G. Yerington, Benton Harbor.

KALKASKA

Petroleum, natural gasoline, and natural gas were the principal minerals of value produced in the county. Gravel was produced by the county road commission.

KENT

Certain-Teed Products Corp., Ardmore, Pa., and Grand Rapids Plaster Co., Grand Rapids, produced crude gypsum from the underground mines and operated calcining plants at Grand Rapids. Marl for agricultural use was produced by Harry H. Olthouse, Caledonia. Miscellaneous stone, sand, and gravel, chiefly for concrete aggregate and road use, were produced by Ed. DeVries & Sons, Grand Rapids Gravel Co., Pekaar & Van Doorn, Rocks Sand & Gravel, Harry Zeef Sons Gravel Co., and city of Grand Rapids and by and for the Kent County Road Commission, all of Grand Rapids; Gilbert Geers, Kent

City; and West Shore Construction Co., Zeeland. Gregg Products Co., Grand Rapids, expanded perlite from Western States for use as a lightweight aggregate. Natural gas also was produced in the county.

KEWEENAW

Calumet & Hecla, Inc., produced copper from the Ahmeek, Kearsarge, Allouez No. 3, Douglas, Iroquois, Peninsula and Seneca No. 2 mines in Houghton and Keweenaw Counties. For general discussion on the Calumet & Hecla operation, see Houghton County. Sand and gravel were produced by and for the county road commission.

LAKE

Petroleum is the mineral of greatest value produced in the county, followed by sand and gravel. Sand and gravel producers include Harry Pickitt, Allegan, and Lake County Road Commission, Baldwin.

LAPEER

Peat, chiefly for use as a soil conditioner, was produced by Green Thumb Peat Humus Co. and Michigan Peat, Inc., both of Capac. Michigan Peat, Inc., was the largest producer in Michigan. Wilkinson Chemical Co. of Mayville produced calcium-magnesium chloride from well brines. Sand and gravel were produced by the county road commission.

LEELANAU

The county road commission produced gravel for road and construction use.

LENAWEE

Consolidated Cement Corp. operated a cement plant at Cement City. Sand and gravel were produced by E. P. Brady & Co., Flint; Donald F. Clark, Morenci; Stamm Bros. Gravel Co., and by and for the Lenawee County Road Commission, Adrian; and Tecumseh Gravel Co., Tecumseh.

LIVINGSTON

Minerals produced in the county include sand, gravel, and natural gas, ranked in order of value. Sand and gravel producers include American Aggregates Corp., Greenville, Ohio; E. P. Brady & Co., Flint; and Van E. Bailey, Howell.

LUCE

Gravel was produced by the county road commission for highway use.

MACKINAC

Limestone, chiefly as an aggregate for concrete and for road metal was produced by Fiborn Limestone Co., Sault Ste. Marie, Ontario, Canada. Gravel was produced by E. P. Brady & Co., Flint, and Duluth, South Shore & Atlantic Railway.

MACOMB

Sand and gravel were the only mineral products of the county. Producers include Advance Building Materials Co., Macomb Sand & Gravel Co., Michigan Sand & Gravel, and Morgan Sand & Gravel Co., all at Utica; P. O. Underwood & L. A. Berry, Detroit; Daniel J. Bollig, Louis Marsack & Sons, all at Mount Clemens; John R. Sand & Gravel Co., Lake Orion; Maertens Sand & Gravel Co., Grosse Point; and Sargent Sand Co., Saginaw. Sand and gravel were produced by and for the county highway commission.

MANISTEE

Mineral products of Manistee County include elemental bromine, bromine compounds, magnesium compounds, salt, sand, and gravel. The Morton Salt Co. produced bromine compounds, magnesium compounds, and salt from natural brine at its plant at Manistee. Great Lakes Chemical Corp., with a plant at St. Louis, acquired the plant of the Rademaker Chemical Corp. at Manistee and produced elemental bromine and bromine compounds. Standard Lime & Stone Co., with a plant at Manistee, produced refractory magnesia. Manistee Salt Works, Manistee, produced salt from brine wells. Molding, grinding, and polishing sands were produced by the Sand Products Corp., Detroit. Gravel was produced by the county.

MARQUETTE

The chief mineral product of Marquette County was iron ore. Operating companies and producing mines in 1952 were:

Company:	*Mines operated*
Pickands, Mather & Co., Cleveland, Ohio	Volunteer-Maitland.
M. A. Hanna Co., Cleveland, Ohio	Richmond.
Cleveland-Cliffs Iron Co., Cleveland, Ohio	Athens, Bunker Hill, Cambria-Jackson, Cliffs Shaft, Lloyd, Maas, Mather and Tilden.
Inland Steel Co., Chicago, Ill	Greenwood and Morris.
North Range Mining Co., Negaunee, Mich	Blueberry and Champion.

Sand and gravel were produced by E. P. Brady & Co., Flint; Champion, Inc., Iron Mountain; and Lake Superior Ishpeming Railway Co., A. Lindberg & Sons, Inc., Roy Millimaki, and Marquette County Road Commission, all of Ishpeming.

MASON

Mineral products of Mason County include bromine, calcium, magnesium chloride, other magnesium compounds, lime, peat, petroleum, sand, and gravel. Bromine, calcium chloride and magnesium compounds, and lime were all produced by the Dow Chemical Co. at Ludington. The bromine, calcium, and magnesium produced were from brine wells in the vicinity of the plant. Most of the limestone for the manufacture of lime and used chiefly for agricultural purposes is produced in Presque Isle County and transported to processors by water. Peat was produced from a bog near Scottville by Irving L. Pratt & Son. Some sand and gravel were produced by the county road commission.

MECOSTA

Petroleum and natural gas are the principal mineral products of the county. Marl for agricultural use was produced by Leon Burr, Mount Pleasant; Lawrence Truman, Mecosta; and Leo Speese, Morley. Gravel was produced by Mecosta County Road Commission.

MENOMINEE

Limestone and gravel were the only minerals produced in the county. The Limestone Products Co., Menominee, produced lime, chiefly for chemical use, and the county road commission produced gravel.

MIDLAND

Bromine, calcium, magnesium, potassium, and sodium metals and/or compounds were produced from well brines at the Ludington plant of the Dow Chemical Co., Midland. There are brine wells near the plant in and adjacent to Midland County.

MISSAUKEE

Petroleum, natural gas, marl, and gravel were the mineral products of the county. Marl was produced by C. Stanley Hooker, Cadillac; gravel was produced by Tabor-Carmody Co., Grand Rapids.

MONROE

Heavy clay products were produced by F. W. Ritter Sons Co., Inc., South Rockwood. Limestone was produced by France Stone Co., of Toledo, Ohio. The company products are riprap, agricultural limestone, and crushed stone for concrete, road metal, and railroad ballast. The Monroe County Highway Commission also produced limestone. Petroleum was produced in the county.

MONTCALM

The principal mineral product of the county was petroleum. Other minerals produced include sand, gravel, natural gas, and marl. Marl was produced by Leo W. Speese, Morley. Sand and gravel, principally for building and road construction, were produced by A. L. Dyer & Sons, McBrides; Frank H. Stoerk, Pierson; Tabor-Carmody Co., Grand Rapids; West Shore Construction Co., Zeeland; and John G. Yerington, Benton Harbor; and by and for the Montcalm County Road Commission, Stanton.

MONTMORENCY

Petroleum, sand, and gravel were the mineral products of the county. Sand and gravel were produced by E. P. Brady & Co., Flint, and Montmorency County Road Commission, Atlanta.

MUSKEGON

Mineral products include marl, natural gas, petroleum, sand, and gravel. Producers of marl were Harold Osborne, Montague, and Melvin Woolf & Lee Brandow, Ravenna. Producers of sand and gravel were Bunce Gravel, Ravenna; Nugent Sand Co., Inc., Mus-

kegon; Sand Products Corp., Detroit; and West Shore Construction Co., Zeeland. Some molding and engine sands were produced.

NEWAYGO

The principal mineral products of Newaygo County were petroleum, natural gasoline, and natural gas. Some marl was produced by Leo W. Speese, Morley.

OAKLAND

Sand and gravel were the only mineral products of this county. Production was chiefly for use as concrete aggregate or in road construction. Producing companies include American Aggregates Corp., Greenville, Ohio; Floyd Beardslee, McLane Bros. Sand & Gravel, and Slaters Bald Mountain, all of Pontiac; P. O. Underwood & L. A. Berry, Koenig Coal & Supply Co., and Lyle J. Walker Sand & Gravel, all of Detroit; M. J. Bowers, Farmington; Glenn Comstock, Bay City; Foley & Beardslee, Clarkston; Mickelson Bros., Oxford; and Oakland Sand & Gravel Co., Walled Lake; and F. S. Ward, Clarkston. Sand and gravel were also produced by and for the Oakland County Road Commission, Pontiac.

OCEANA

Petroleum, natural gas, and natural gasoline were the county's chief minerals of value. Marl for agricultural use was produced by Beckman Bros., Shelby, and A. R. Kirk, Hart.

OGEMAW

Petroleum was the principal mineral product, followed by sand, gravel, and marl. Sand and gravel were produced by Ehinger Bros., Walter Rosevear pit, and Ogemaw County Road Commission, all at West Branch; Harry Pickett, Allegan; and Tabor-Carmody Co., Grand Rapids. Marl was produced by Dan Dunn, Alger.

ONTONAGON

Sand and gravel were produced by Richard Francis, Ontonagon, and the county road commission. Clay for pottery and stoneware was produced by the Robinson Clay Products Co., of Akron, Ohio. White Pine Copper Co., a wholly owned subsidiary of Copper Range Co., continued to develop its White Pine ore body and to construct facilities. The company will have, in addition to the mine, a concentration mill, a smelter, refinery, and virtually a complete town to house and serve company employees. A railroad connection from the mine site to the main line of the Duluth, South Shore and Atlantic Railroad connecting at Bergland (14½ miles) was completed. Production of copper is planned for 1954. Extracts from the Copper Range Co. annual report follows:

Negotiations for the development of the White Pine ore body, initiated by the Government in September, 1950 under a project loan were concluded during the year. A summary of these agreements was made a part of our Report for the year 1951. The supporting documents, including the Loan Agreement and Mortgage, required for the closing of the Reconstruction Finance Corporation Loan under its Authorization dated November 15, 1951 were executed July 30, 1952. The contract between the Defense Materials Procurement Agency for the

production and disposition by the Company of its copper was finalized on November 19 and was effective as of February 26, 1952.

The first requisition for funds under the Loan Authorization was cleared on September 10, 1952. Subsequent requisitions were made on a monthly basis covering the estimated requirements of the construction program for the succeeding thirty days. A total of $9,370,000 had been advanced to the Company as of December 31, 1952.

Advances to White Pine Copper Company by Copper Range Company, under its working capital commitment, amounted to $120,000 and in addition $115,000 was advanced under the Loan Agreement for the payment of interest during construction.

At the end of the year, a total of $8,817,383.20 had been expended for engineering and construction and commitments in the amount of $12,850,180.39 were outstanding for equipment, material and supplies.

This project includes and covers every phase of planning, design and construction work necessary to open a modern copper mine, build a metallurgical plant, power plant and townsite with all facilities and utility services for a population of some 3500 people. This report cannot attempt to give more than a brief summary of the magnitude and scope of the work that has been accomplished and is underway.

The decision to begin operations at White Pine was reached early in March and personnel arrived at the job site on March 10. * * *

The work of clearing and grading 268.7 acres began early in April. Initial construction centered about the townsite and non-process buildings. Thirty percent of the time allowed for the project has elapsed, the largest part being consumed by engineering and design now nearing completion. * * *

During the year 3,721 tons of ore were mined and sent to the mill for experimental work and testing purposes.

The Freda Pilot Plant operated continuously throughout the year on a three-shift basis.

OSCEOLA

Petroleum and natural gas ranked first and third, respectively, in value of minerals produced in the county. Sand and gravel were produced by the Hersey Gravel Co., Hersey, and marl by G. Stanley Hooker, Cadillac.

OSCODA

Limestone was produced by E. P. Brady & Co., Flint. A small quantity of petroleum also was produced in the county.

OTSEGO

Sand, gravel, petroleum, and natural gas, in order of value, were produced in the county. Sand and gravel were produced by Hutchins Sand & Gravel, Hugh H. Mason & Sons, and Otsego County Road Commission, all at Gaylord.

OTTAWA

Sand, gravel, petroleum, marl, and natural gas, in order of value, were the minerals produced in Ottawa County. Marl was produced by Ralph Myers, West Olive, and Wierenga Bros., Spring Lake. Molding and engine sands, as well as sand and gravel for building and road construction, were produced.

PRESQUE ISLE

Limestone was the principal mineral product of the county. It was shipped chiefly via the Great Lakes to many other processing plants. The Michigan Limestone Division of U. S. Steel Corp. operated a large open-pit quarry whose product was shipped to many

plants along the Great Lakes. The Onaway Stone Co., Onaway, also mined limestone, making rubble, sawed stone, and flagging. Sand and gravel were produced by E. P. Brady & Co., Flint.

ROSCOMMON

Petroleum and natural gas were the only minerals reported for this county.

SAGINAW

Minerals produced in the county include clay, coal, petroleum, sand, and gravel. Clay, chiefly for heavy clay products, was produced by the Saginaw Clay Products Co., and Minco Products Corp., both at Saginaw. Clay produced by the latter company was used for refractories, fertilizer, and insecticide fillers. Swan Creek Mining Co. operated its Swan Creek mine January through March, when it was abandoned. The company was the only commercial producer of coal in the State in 1952.

ST. CLAIR

Peerless Cement Corp. operated a cement plant at Port Huron. Salt was produced by General Foods Corp., with a plant at St. Clair, and the Morton Salt Co., with a plant at Marysville. Sand and gravel were produced by the Port Huron city engineer.

ST. JOSEPH

Marl was produced by Reed & Wood and Leslie Knox, both at Colon. Sand and gravel were produced by Harry Pickitt, Allegan; West Shore Construction Co., Zeeland; and White Pigeon Gravel Co., White Pigeon; and by and for St. Joseph County Road Commission, Centreville.

SANILAC

Sand and gravel were produced by and for the county road commission.

SCHOOLCRAFT

Limestone was produced by Inland Lime & Stone Co. of Manistique. Gravel was produced by the county road commission.

SHIAWASSEE

Minerals produced in the county include clay, peat, sand, and gravel. Clay, chiefly for vitreous pipe and tile, was produced by Michigan Vitrified Tile Co., Findlay, Ohio. Sand and gravel were produced by E. P. Brady & Co., Flint, and Harry Fuoss and Shenk Gravel Co., both at Durand.

TUSCOLA

Mineral products in the county, in order of value in 1952, were sand, gravel, and petroleum. Sand and gravel were produced by Andersen Sand & Gravel Co. and Sargent Sand Co., both of Saginaw; Berntall Sand & Gravel, Reese; Great Lakes Foundry Sand Co., Detroit; C. R. Hunt and E. L. Schwaderer, both at Cass City; and Tuscola County Road Commission, Caro. Molding and blast sands, as well as sand and gravel for building and road construction, were produced.

VAN BUREN

Petroleum was the chief mineral of value produced in the county. Sand and gravel were produced by James B. Mitchell, South Haven, and John G. Yerington, Benton Harbor.

WASHTENAW

Sand, gravel, and a small quantity of natural gas were the mineral products of the county. Sand and gravel were produced by E. S. Albertson, Killins Gravel Co., and by and for the Washtenaw County Road Commission, all at Ann Arbor; E. P. Brady & Co., Flint; Harry Pickitt, Allegan; Salem Gravel Construction Co., Inc., Salem; and Whittaker & Gooding Co. and Youngs Sand & Gravel, both at Ypsilanti.

WAYNE

The principal minerals produced in Wayne County, in order of value, in 1952 were salt, cement, sand, gravel, and clay. Two cement plants were operating in the county—the Huron Portland Cement Co., Wyandotte, and the Peerless Cement Co., Detroit. Limestone, used in cement manufacture, at both plants was produced chiefly in other counties. Clay producers include Clippert Brick Co., Detroit; Flat Rock Clay Products Co., Flatrock; Daniel Brick Co., Dearborn; and Light Weight Aggregate Corp., Livonia. The products were chiefly common brick and vitreous clay pipe and tile. Salt was produced by International Salt Co., and Solvay Process Division, Allied Chemical & Dye Corp., at Detroit; and Pennsylvania Salt Manufacturing Co. and Wyandotte Chemicals Corp., both at Wyandotte. Of the above, the International Salt Co. was the only company operating an underground salt mine. Salt produced by this company was used chiefly in the chemical industry or was sold to highway departments for de-icing roads. The latter three companies, in addition to salt for chemical use, produced table salt. Production was from well brines.

Ground sandstone and glass, molding, and blast sands were produced by the Michigan Silica Co., Rockwood. Sand and gravel were produced by Chubb Sand & Gravel Co., Manning-Locklin Gravel Co., and Northville Sand & Gravel Co., all at Northville; W. L. Emery Co. and the Corps of Engineers, Detroit; Michigan Silica Co., Rockwood; and Norfolk & Western Railroad Co. and Harry Pickitt, of Allegan. Dimension limestone was produced by the Detroit-Edison Co., Detroit. U. S. Gypsum Co., Chicago, Ill., operated a calcining and gypsum products plant at Detroit.

WEXFORD

A small quantity of petroleum was the only mineral product of the county.

OTHER COUNTIES

Grand Traverse was the only county in the State for which no mineral production was reported. The Kelley Island Lime Transport Co., Sandusky, Ohio, and Dachill Trucking Co., Detroit, reported the production of molding, building, and other sands from various unspecified counties.

The Mineral Industry of Minnesota

By Samuel A. Gustavson [1]

MINNESOTA mineral production in 1952 was valued at $397,441,000, an 8-percent decrease from that of 1951. This decrease chiefly results from a 54-day labor strike that started in the iron-mining industry June 3. Loss in production and consequently, revenue, more than offset increases reported in production and value of other important mineral products of the State.

In 1952 alltime highs for the State were attained in both production and value for sand and gravel and stone. Of the other minerals or mineral commodities mined, lime, grinding pebbles, and manganese ores reported increased output, while clays, cements, and tube-mill liners decreased.

Figure 1 shows the total value of mineral output of the State from 1910–52.

Table 1 shows the production and value of minerals produced in Minnesota, 1951–52.

Table 11 shows the value of mineral production in Minnesota, 1951–52, by counties.

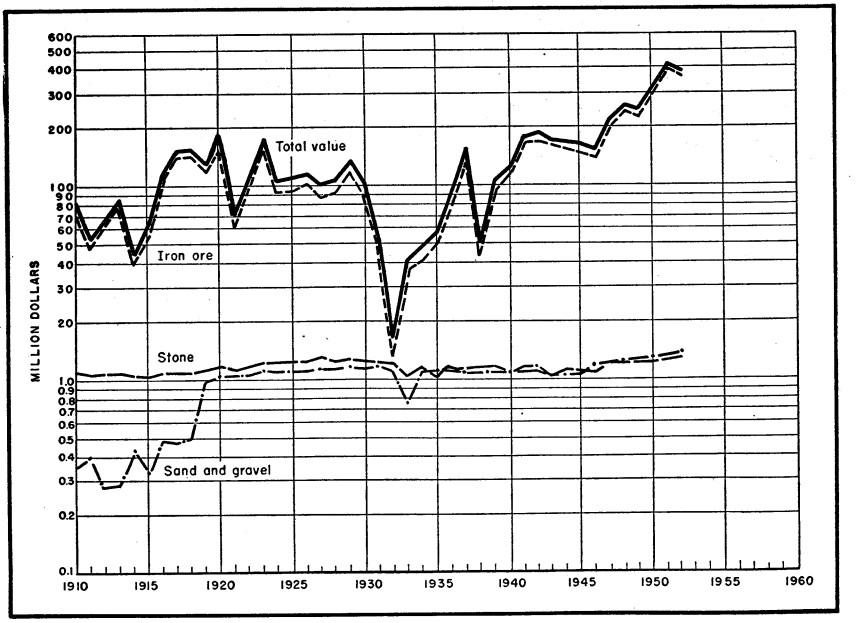

FIGURE 1.—Value of total mineral output, iron ore shipments, sand and gravel, and stone produced in Minnesota, 1910–52.

[1] Chief, Mineral Industry Division, Region V, Bureau of Mines, Minneapolis, Minn.

TABLE 1.—Mineral production in Minnesota, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	129,942	$187,605	113,492	$160,408
Iron ore (usable)—long tons, gross weight	78,164,527	411,468,895	63,906,069	375,765,251
Manganiferous ore (5 to 35 percent Mn)—gross weight	1,132,250	(2)	912,118	(2)
Marl, calcareous (except for cement)	2,925	1,549	1,449	722
Sand and gravel	17,229,526	6,008,994	19,825,157	6,808,763
Stone (except limestone for cement and lime)	[3] 1,906,407	[3] 5,613,157	[3] 2,394,178	[3] 5,498,177
Undistributed: Abrasive stones, cement, lime, stone (crushed sandstone, 1951, and crushed basalt, 1952), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)		9,815,600		9,207,947
Total Minnesota		433,096,000		397,441,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers).
[2] Value included with "Undistributed."
[3] Excludes certain stone, value for which is included with "Undistributed."

REVIEW BY MINERAL COMMODITIES

METALS

Iron Ore.—Iron ore was produced by 28 different companies operating 171 mines—108 mines in St. Louis County, 38 in Itasca County, 23 in Crow Wing County, 1 in Fillmore County, and 1 in Morrison County.

Shipments of usable iron ore in 1952, excluding manganiferous iron ore (5 to 10 percent manganese) and ferruginous manganese ore (10 to 35 percent manganese), were 63,906,100 long tons compared to 78,164,500 long tons in 1951, a decrease of about 18 percent. Much of this decrease can be attributed to the 54-day labor strike that started June 3. Nevertheless, Minnesota supplied approximately 66 percent of the total iron ore produced in the United States in 1952.

Shipments in 1952 consisted of 44,798,400 tons of direct shipping ore, 18,326,200 tons of concentrates, and 781,500 tons of sinter. Hematite constituted 99.08 percent, brown ore 0.75 percent, and magnetite 0.17 percent of the total usable ore shipped. The average iron content of "usable" iron ore shipped in 1952 was 50.16 percent, natural. In 1951 the average was 50.53 percent.

In all, 142 mines were operated on the Mesabi range in Itasca and St. Louis Counties. Shipments of usable iron ore from this range represented 93 percent of the State total shipments in 1952. Shipments from the Cuyuna range in Crow Wing and Morrison Counties, the Vermilion range in St. Louis County, and the Spring Valley District in Fillmore County provided the remaining 7 percent. Figure 2 shows iron ranges in respect to the State and county boundaries.

Most of the ore was hauled from the mines by rail to the ore docks at Duluth and Two Harbors, Minn., and Superior, Wis., for lake shipment to lower Lake ports. Some ore was delivered to the Duluth, Minn., plants of the American Steel & Wire Division of United States Steel Corp. and Interlake Iron Corp. The first company has two blast furnaces; the second has one. The 1952 navigation season was opened

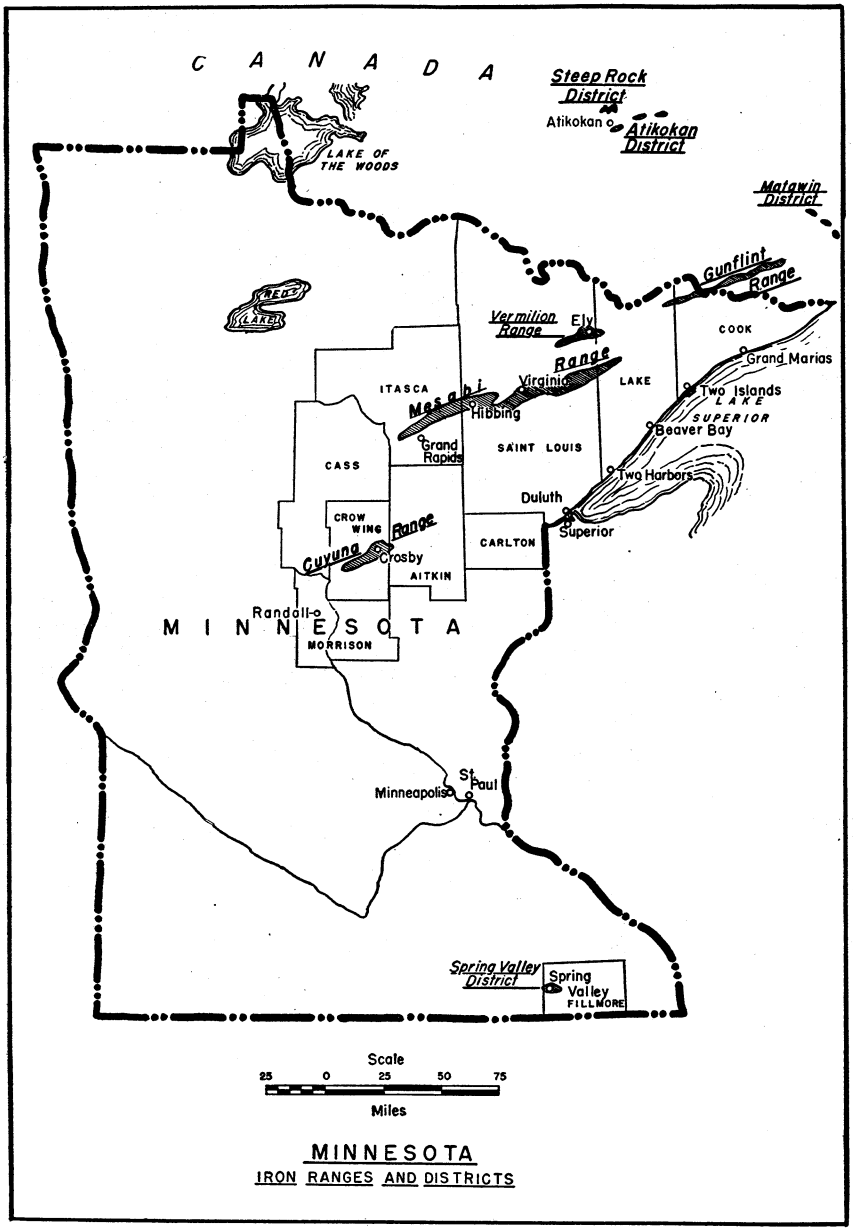

FIGURE 2.—Location of iron-ore ranges in Minnesota, showing State and county boundaries.

at the Duluth-Superior harbor on April 5, approximately 1 week earlier than in 1951. The opening date at Two Harbors was April 4. Lake shipments in 1952 totaled 60,577,517 tons. The rest was shipped all-rail to consuming furnaces at Duluth and lower ports. The 1952

ore-shipping season of Minnesota harbors closed with loading of the last ore boat at Two Harbors on December 4. Port closing dates for Lake shipping were: Ashland, Wis.—Soo Line, November 18; Ashland, Wis.—Chicago & North Western, November 22; Superior, Wis.—Northern Pacific Railroad, November 25; Duluth, Minn.—Duluth, Missabe & Iron Range, December 3; Escanaba, Mich.—Chicago & North Western, December 3; Two Harbors, Minn.—Duluth, Missabe & Iron Range, December 4; Marquette, Mich.—Lake Superior & Ishpeming, December 6; and Marquette, Mich.—Duluth, South Shore & Atlantic, December 7.

Probably the most important work in 1952 on the iron ranges of Minnesota was continuing development of the Mesabi range taconite projects by the Erie Mining Co., Reserve Mining Co., and Oliver Iron Mining Division of United States Steel Corp., all in St. Louis County. Erie Mining Co. is building port facilities at Two Islands, Cook County, and Reserve Mining Co. is building a concentration plant and port facilities at Beaver Bay, Lake County.

An excellent source of detailed information on iron mines in Minnesota is the Mining Directory of Minnesota published annually by the Mines Experiment Station of the University of Minnestota, Minneapolis, Minn.

The average value per gross ton of iron ore, including concentrates and sinter, f. o. b. mines, as reported by producing companies in the State in 1952, was $5.88 compared with $5.26 in 1951. OPS Ceiling Price Regulation 169, September 12, 1952, established new ceiling prices for sales of ore for ore delivered on or before July 26, 1952, produced in Michigan, Minnesota, or Wisconsin. The new prices were: Old Range Bessemer, $9.45; Old Range non-Bessemer, $9.30; Mesabi Bessemer, $9.20; Mesabi non-Bessemer, $9.05; and High-Phosphorus, $9.05. These prices are for ore delivered at lower Lake ports, carrying 51.5 percent natural iron content. The bulk of the tonnage shipped from Minnesota is the non-Bessemer grade.

TABLE 2.—Total usable iron ore produced (direct-shipping, concentrates, and sinter), 1884–1952 [1], by ranges, in gross tons [2]

Year	Cuyuna	Mesabi	Vermilion	Spring Valley district	Total
1884–1939	26,056,085	1,073,242,695	67,135,407	----------	1,166,434,187
1940	721,397	45,483,450	1,531,963	----------	47,736,810
1941	1,209,783	59,688,047	1,853,030	47	62,750,907
1942	1,655,485	70,287,664	1,935,125	59,171	73,937,445
1943	1,747,304	65,334,939	1,782,237	220,427	69,084,907
1944	1,417,256	61,994,023	1,466,816	----------	64,878,095
1945	1,784,010	58,355,320	1,481,007	----------	61,620,337
1946	1,380,120	46,678,679	1,232,008	----------	49,290,807
1947	2,100,846	58,772,404	1,471,879	147,787	62,492,916
1948	2,030,281	64,071,983	1,580,497	352,979	68,035,740
1949	1,826,711	52,551,346	1,381,327	102,158	55,861,542
1950	2,480,843	60,838,025	1,580,217	335,470	65,234,555
1951	2,651,724	73,574,908	1,806,818	452,405	78,485,855
1952	2,369,180	59,370,538	1,573,748	476,242	63,789,708
1884–1952	49,431,025	1,850,244,021	87,812,079	2,146,686	1,989,633,811

[1] Shipments first recorded from the Cuyuna range in 1911, the Mesabi range in 1892, the Vermilion range in 1884, and the Spring Valley district in 1941.
[2] Exclusive after 1905 of iron ore containing 5 percent or more manganese.

TABLE 3.—Production, shipments, and stocks of crude iron ore by counties and ranges, in 1952,[1] in gross tons

County or range	Stocks of crude ore, Jan. 1, 1952	Production in 1952		Shipments in 1952		Stocks of crude ore, Dec. 31, 1952
		Underground	Open pit	Direct to consumers	To beneficiation plants	
County:						
Crow Wing	53, 250	274, 669	2, 922, 476	1, 059, 658	2, 140, 785	49, 952
Fillmore			677, 171		677, 171	
Itasca	36, 626	384, 910	24, 355, 210	1, 256, 491	23, 477, 349	42, 906
Morrison			79, 417	75, 917		3, 500
St. Louis	529, 276	2, 993, 449	49, 755, 451	42, 406, 306	10, 516, 996	354, 874
Total	619, 152	3, 653, 028	77, 789, 725	44, 798, 372	36, 812, 301	451, 232
Range:						
Cuyuna	53, 250	274, 669	3, 001, 893	1, 135, 575	2, 140, 785	53, 452
Mesabi	337, 196	1, 804, 611	74, 110, 661	42, 020, 522	33, 994, 345	237, 601
Vermilion	228, 706	1, 573, 748		1, 642, 275		160, 179
Spring Valley district (Fillmore County)			677, 171		677, 171	
Total	619, 152	3, 653, 028	77, 789, 725	44, 798, 372	36, 812, 301	451, 232

[1] Exclusive of ore containing 5 percent or more manganese.

TABLE 4.—Iron ore beneficiated at concentration plants by counties and ranges in 1952,[1] in gross tons

County or range	Stocks, concentrates, and sinter, Jan. 1, 1952	Concentrates and/or sinter produced in 1952	Shipments of beneficiated ore in 1952		Stocks, concentrates, and sinter, Dec. 31, 1952
			Concentrates	Sinter	
County:					
Crow Wing	177, 908	1, 233, 403	1, 123, 470	77, 779	210, 062
Fillmore	13, 969	476, 242	477, 546		12, 665
Itasca	1, 268, 741	11, 020, 346	11, 063, 056		1, 226, 031
Morrison					
St. Louis	388, 686	6, 431, 399	5, 662, 166	703, 680	454, 239
Total	1, 849, 304	19, 161, 390	18, 326, 238	781, 459	1, 902, 997
Range:					
Cuyuna	177, 908	1, 233, 403	1, 123, 470	77, 779	210, 062
Mesabi	1, 657, 427	17, 451, 745	16, 725, 222	703, 680	1, 680, 270
Vermilion					
Spring Valley district (Fillmore County)	13, 969	476, 242	477, 546		12, 665
Total	1, 849, 304	19, 161, 390	18, 326, 238	781, 459	1, 902, 997

[1] Exclusive of iron ore containing 5 percent or more manganese.

Manganiferous Iron Ore and Ferruginous Iron Ore.—No high-grade manganese for battery or chemical use was produced in Minnesota in 1952; however, a considerable quantity of iron ore containing 5 to 10 percent manganese is produced and shipped. A small quantity of ore containing more than 10 percent manganese, classified as ferruginous manganese ore (10–35 percent manganese), is occasionally shipped. Both manganiferous iron ore and ferruginous manganese

ore are tabulated separately from other iron-ore production. In 1952 Minnesota mines produced and shipped 880,616 short tons, or 786,264 long tons of manganiferous ore. All was from open-pit operations, and all was direct-shipping ore, except for a small quantity produced from the Alstead group of mines and the Section No. 6 mine operated by the Hanna Coal & Ore Corp. This company also produced and shipped 31,502 short tons (28,127 long tons) of ferruginous manganese ore from the Maroco mine, which, when beneficiated, averaged slightly over 10 percent manganese. The average manganese content of all manganiferous iron ore and ferruginous manganese ore shipped in 1952 was about 5.94 percent. The average iron content was 38.33 percent. In 1951 the average manganese content was 6.14 percent and iron content 36.92 percent. Most of the manganiferous ore produced in the State is from the Cuyuna range in Crow Wing County. All recorded production of ferruginous manganese ore has been from the Cuyuna range. Some production of manganiferous iron ore is reported from the Mesabi range.

The Vermilion range has been credited with some production in 1916 and 1917, but since that time no manganiferous iron ore has been produced from this range. The companies producing manganiferous iron ore in the State in 1952 include Oliver Iron Mining Division, United States Steel Corp., Hanna Coal & Ore Corp., Pickands Mather & Co., and Zontelli Bros., Inc. Statistical data are shown in tables 1, 5, 6, and 7.

Manganese Chemicals Corp. began constructing a plant to process Cuyuna range manganiferous iron ore in October 1952. The company is building this plant with assistance of a loan from the Defense Minerals Production Agency. The cost of the plant was estimated at $2 million, with the Government advancing 75 percent or $1.5 million; repayment is to begin when the plant is in operation. The company has a purchase commitment with the Government for sale of 43,750 tons of manganese concentrate, representing $6,238,000 in value. The annual output is expected to be 7,600 tons of manganese carbonate ($MnCO_3$). The plant will have a capacity of 200 tons crude ore input per day, from which it is expected that approximately 36 tons manganese carbonate will be recovered, depending on the grade of ore and other factors. Material for processing is from the Merritt stockpile. An ammonia-leach process is to be utilized. The Northern Pacific and Soo Line Railroads jointly built a spur to the plant. McDonald Construction Co. of Brainerd, Minn., was the contractor for construction.

The Bureau of Mines began to build a pilot plant on its property, formerly part of Fort Snelling. This plant will be used in conducting research to develop a method of recovering manganese from the low-grade carbonate slates and lean oxidized or partly oxidized formations from the Cuyuna iron range. A process initially being studied is one that employs a differential sulfatization roast.

Ores containing over 5 percent natural manganese are generally priced as Old Range non-Bessemer on the combined natural manganese and iron content, plus a premium.

TABLE 5.—Usable [1] manganiferous iron ore (containing 5 to 10 percent manganese, natural) and ferruginous manganese ore (containing 10 to 35 percent manganese, natural) shipped from mines, 1913–52, by ranges, in gross tons

Year	Cuyuna	Mesabi	Vermilion	Total
1913–39	13,972,435	17,196	2,965	13,992,596
1940	1,046,374			1,046,374
1941	1,185,168			1,185,168
1942	1,378,852	39,862		1,418,714
1943	1,297,184	46,614		1,343,798
1944	1,087,196	44,547		1,131,743
1945	1,246,294	9,819		1,256,113
1946	955,977			955,977
1947	930,144	2,857		933,001
1948	1,070,110			1,070,110
1949	884,109			884,109
1950	776,641			776,641
1951	898,974	3,393		902,367
1952	801,387	13,004		814,391
1913–53	27,530,845	177,292	2,965	27,711,102

[1] Direct-shipping plus beneficiated ore.

TABLE 6.—Production, shipments, and stocks of crude manganiferous iron ore (containing 5 to 10 percent manganese, natural) and ferruginous manganese ore (containing 10 to 35 percent manganese, natural) by counties, in 1952, in gross tons

County	Stocks of crude ore Jan. 1, 1952	Production in 1952		Shipments in 1952		Stocks of crude ore Dec. 31, 1952
		Underground	Open pit	Direct to consumer [1]	To beneficiation plants	
Crow Wing (all Cuyuna range)	4,567		839,116	750,401	64,215	29,067
St. Louis (all Mesabi range)			13,004	13,004		
	4,567		852,120	763,405	64,215	29,067

[1] In 1952 all direct-shipping ore averaged less than 10 percent manganese.

TABLE 7.—Manganiferous iron ore (containing 5 to 10 percent manganese, natural) and ferruginous manganese ore (containing 10 to 35 percent manganese, natural), beneficiated at concentration plants, in Crow Wing County, in 1952, in gross tons

Product	Stocks of concentrates Jan. 1, 1952	Concentrates produced in 1952	Concentrates shipped in 1952	Stocks of concentrates Dec. 31, 1952
Concentrates containing 5–10 percent manganese, natural	23,682	17,250	22,859	18,073
Concentrates containing 10–35 percent manganese, natural	22,651	18,425	28,127	12,949
	46,333	35,675	50,986	31,022

NONMETALS

Cement.—The Universal Atlas Cement Co. with a plant at Duluth, St. Louis County, was the only producer of portland and masonry cements. The plant reported production of types I, II, III, V, and air-entrained cement and masonry mixes.

The average mill value per barrel of portland cement was $2.56 in both 1951 and 1952. The national average in both 1951 and 1952 was $2.54.

Clays.—Clays for pottery and stoneware or for heavy clay products was produced commercially in eight counties—Brown, Carlton, Carver, Dakota, Goodhue, Hubbard, Polk, and Winona. Table 1 gives production and value for 1951–52.

Lime.—Cutler-Magner Co. at Duluth was the only producer of hydrated lime and quick lime. Limestone used was shipped from Michigan quarries.

Marl.—Calcareous marl, all for agricultural use, was produced by William Danner in Chisago County, B. J. Rochel in Washington County, and Tweed Bros. in Crow Wing County. Production in 1952 was only half that in 1951. Marl sold in Minnesota at $0.50 per short ton, f. o. b. mine, in 1952, and at $0.53 in 1951.

Perlite.—Crude perlite produced in other States is expanded in three plants in Minneapolis for use as a lightweight aggregate to replace heavier materials in plaster and concrete.

Sand and Gravel.—Output of sand and gravel in 1952 was reported from 62 counties by 85 commercial and 55 noncommercial operators. The total output of these 2 commodities, both commercial and noncommercial, was 19,825,200 short tons, valued at $6,808,800, a 15-percent increase in production, and a 13-percent rise in value over 1951. Table 8 gives production and value data for commercial and noncommercial sand and gravel operations in the State, by use, for 1951 and 1952.

The 10 leading commercial producers ranked by value of product were: Industrial Aggregates Co., Minneapolis; J. L. Shiely Co., Inc., St. Paul; Landers-Norblom-Christianson, Minneapolis; Hedberg-Freidheim & Co., Minneapolis; Biwabik Gravel Co., Biwabik; E. W. Coons Co., Inc., Hibbing; Minnesota Sand & Gravel Co., Minneapolis; Spring Gravel Co., Crookston; Guaranteed Sand & Gravel Co., Mankato; and Cemstone Products Co., St. Paul.

Stone.—Basalt, granite, limestone, and sandstone (quartzite) were produced. Only granite and limestone were used in manufacturing dimension stone, rough and dressed for building purposes. The stone classed as marble in this chapter is a fine-grained limestone, notably a product of the Babcock Co. at Kasota, Minn., and represents production of a highly polished, cut limestone, chiefly a veneer, and used, for example, as a facing stone in constructing fireplaces. Data on the production and value of dimension stone are given in table 9 and on crushed and broken stone in table 10.

Basalt was produced in St. Louis County by the Zenith Dredge Co. of Duluth for use in concrete or as road metal.

Granite was produced in 10 counties—Big Stone, Carlton, Kanabec, Lac Qui Parle, Mille Lacs, Renville, St. Louis, Scott, Stearns, and Yellow Medicine. Output from Carlton, Scott, and Yellow Medicine Counties was crushed and used chiefly for railroad ballast. In addition to some crushed granite, dimension stone for building and monument purposes was produced in the other counties. Both rough and dressed stone is made and marketed throughout the United States. Colors range from light to dark gray and light pink to dark red.

TABLE 8.—Sand and gravel sold or used by producers, 1951–52, by classes of operations and uses

Class of operation and use	1951			1952		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Glass	5,084	$13,369	$2.63	(1)	(1)	
Molding	(1)	(1)		(1)	(1)	
Building	1,849,444	1,383,709	.75	$1,938,027	$1,469,960	$0.76
Paving	638,706	422,713	.66	691,850	459,416	.66
Blast	(1)	(1)				
Engine	53,975	48,334	.90	32,710	30,892	.94
Filter	(1)	(1)		(1)	(1)	
Railroad Ballast	110,520	35,025	.32	35,694	9,857	.28
Other	12,444	6,707	.54	33,196	15,175	.46
Undistributed	9,257	26,269	2.84	13,515	21,638	1.60
Total commercial sand	2,679,430	1,936,126	.72	2,744,992	2,006,938	.73
Gravel:						
Building	1,041,830	1,441,733	1.38	1,199,600	1,705,354	1.42
Paving	2,095,526	1,239,241	.59	2,303,145	1,504,613	.65
Railroad ballast	986,644	460,193	.47	922,732	387,122	.42
Other	150,417	53,942	.36	270,987	62,382	.23
Total commercial gravel	4,274,417	3,195,109	.75	4,696,464	3,659,471	.78
Total commercial sand and gravel	6,953,847	5,131,235	.74	7,441,456	5,666,409	.76
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building	4,092	1,818	.44	595	255	.43
Paving	329,615	28,534	.09	309,387	44,951	.15
Total Government-and-contractor sand	333,707	30,352	.09	309,982	45,206	.15
Gravel:						
Building	5,327	429	.08	293	314	1.07
Paving	9,936,645	846,978	.09	12,073,426	1,096,834	.09
Total Government-and-contractor gravel	9,941,972	847,407	.09	12,073,719	1,097,148	.09
Total Government-and-contractor sand and gravel	10,275,679	877,759	.09	12,383,701	1,142,354	.09
ALL OPERATIONS						
Sand	3,013,137	1,966,478	.65	3,054,974	2,052,144	.67
Gravel	14,216,389	4,042,516	.28	16,770,183	4,756,619	.28
Grand total	17,229,526	6,008,994	.35	19,825,157	6,808,763	.34

[1] Bureau of Mines not at liberty to publish, included with "Undistributed."

Each producing company uses trade names to denote the product of a particular quarry or shade of color from a particular quarry. The principal companies operating both quarries and sawing and finishing plants include The Cold Spring Granite Co., Cold Spring; Delano Granite Works, Inc., Delano; and Liberty Granite Co., Inc., Melrose Granite Co., and North Star Granite Corp., all at St. Cloud.

Limestone produced in the State is used for many purposes. The bulk of the output, however, is crushed for use as a concrete aggregate, road metal or agricultural limestone. Production is chiefly from the south-central or southeastern portion of the State. Dimension lime-

stone was produced from quarries along the Minnesota or Mississippi River in Blue Earth, Dakota, Hennepin, Le Sueur, and Winona Counties. Companies in the State with both quarries and sawing and finishing plants include The Babcock Co., Kasota; Mankato Stone Co., Mankato; J. L. Shiely Co., St. Paul; and Biesanz Stone Co., Winona. Limestone used in manufacturing dimension stone for building purposes ranked second in value to that used as concrete aggregate and road metal.

In 1952 limestone production was reported by 21 commercial firms. The leading 10, ranked by value of product, were: The Babcock Co., Kasota; Bryan Construction Co., Northfield; Landers-Norblom-Christianson Co., Minneapolis; Quarve & Anderson Co., Rochester; J. L. Shiely Co., St. Paul; Hector Construction Co., Caledonia; T. R. Coughlan Co., Mankato; Patterson Quarries, St. Charles; Pederson Bros., Harmony; and Edwin C. Kappers, Spring Valley. Noncommercial production, chiefly for road purposes, was reported by several county road commissions.

Tube-mill liners and grinding pebbles were produced by the Jasper Stone Co. from a quartzite deposit in Rock County in the southwest corner of Minnesota. The company home office is at Sioux City, Iowa.

TABLE 9.—Dimension stone sold or used by producers, 1951–52, by kinds and uses

Kind and use	1951			1952		
	Quantity	Value		Quantity	Value	
		Total	Average		Total	Average
Granite: Building, dressed—cubic feet	36,000	$519,000	$14.42	36,878	$458,988	$12.45
Monumental:						
Rough—do	39,199	90,432	2.31	24,341	81,921	3.37
Dressed—do	151,981	1,756,101	11.55	126,392	1,420,929	11.24
Total granite—equivalent short tons [1]	18,856	2,365,533	125.45	15,572	1,961,838	125.98
Marble, Building:						
Rough:						
Exterior—cubic feet	500	1,000	2.00	500	1,000	2.00
Interior—do	500	1,000	2.00	500	1,000	2.00
Dressed:						
Sawed:						
Exterior—do	1,127	2,600	2.31	1,694	3,500	2.07
Interior—do	1,126	2,600	2.31	1,694	3,500	2.07
Cut:						
Exterior—do	719	9,900	13.77	817	10,000	12.24
Interior—do	719	9,900	13.77	816	10,000	12.24
Total marble—equivalent short tons [1]	345	27,000	78.26	443	29,000	65.46
Limestone, Building:						
Rubble—short tons	5,612	22,269	3.97	5,576	22,204	3.98
Rough architectural—cubic feet	83,766	137,500	1.64	58,437	91,000	1.56
Dressed:						
Sawed—do	124,728	299,870	2.40	100,478	215,650	2.15
Cut—do	51,188	362,450	7.08	51,375	352,500	6.86
Curbing and flagging—do	26,250	18,000	.69	16,250	11,500	.71
Total limestone—equivalent short tons [1]	28,487	840,089	29.49	23,699	692,854	29.24
Total dimension stone—do [1]	47,688	3,232,622	67.79	39,714	2,683,692	67.58

[1] Following average weights per cubic foot used to convert cubic feet to short tons: Granite, 166 pounds; marble, 147 pounds; limestone, 160 pounds.

TABLE 10.—Crushed and broken stone sold and used by producers, 1951–52, by kinds and uses

Kind and use	1951			1952		
	Short tons	Value	Average value	Short tons	Value	Average value
Basalt	50,153	$100,077	$2.00	[1]	[1]	[1]
Sandstone	[1]	[1]	[1]	680	$1,082	$1.59
Granite:						
Riprap	40,784	42,203	1.03	[2]	[2]	[2]
Concrete, road metal	77,580	107,722	1.39	114,560	151,178	1.32
Railroad ballast	399,607	419,746	1.05	500,610	553,913	1.11
Other	8,000	48,000	6.00	[2]	[2]	[2]
Undistributed				200,506	42,194	.21
Total granite	525,971	617,671	1.17	815,676	747,285	.92
Limestone:						
Riprap:						
Commercial	39,935	31,892	.80	119,051	117,592	.99
Noncommercial	2,018	2,018	1.00			
Flux	1,500	2,625	1.75	1,500	2,625	1.75
Concrete, road metal:						
Commercial	959,190	1,179,607	1.23	1,069,946	1,376,659	1.29
Noncommercial	119,990	154,654	1.29	72,854	86,474	1.19
Railroad ballast	1,800	3,150	1.75	2,000	3,500	1.75
Agriculture	119,278	170,898	1.43	243,988	364,821	1.50
Other	38,884	117,943	3.03	28,769	114,447	3.98
Total limestone	1,282,595	1,662,787	1.30	1,538,108	2,066,118	1.34
Total commercial	1,736,711	2,223,863	1.28	2,281,610	2,728,011	1.20
Total noncommercial	122,008	156,672	1.28	72,854	86,474	1.19
Grand total, crushed stone	[3] 1,858,719	[3] 2,380,535	1.28	2,354,464	2,814,485	1.20

[1] Figure withheld to avoid disclosure of individual company operations.
[2] Included with "Undistributed."
[3] Incomplete total; excludes sandstone.

MINERAL FUELS

Peat.—No commercial production of peat has been reported since 1950, when output was 400 tons valued at $13,100.

REVIEW BY COUNTIES

ANOKA

The only mineral production reported for Anoka County during 1952 was sand and gravel. The producer was the county highway department.

BECKER

Sand and gravel were produced by the Northern Pacific Railroad Co. for railroad ballast and by and for the county highway department for road purposes.

BELTRAMI

Sand and gravel for building construction and road purposes were produced by Melvin Samuelson, Kelliher, and by and for the Beltrami County Highway Department.

BENTON

Sand and gravel, chiefly for road purposes, were produced for the Benton County Highway Department.

BIG STONE

Cold Spring Granite Co., Cold Spring, operated the Agate granite quarry, and the Delano Granite Works operated the Odessa quarry. Uses were various, including architectural and monumental purposes. Sand and gravel were produced by Roy Werner, Wheaton.

TABLE 11.—Value of mineral production in Minnesota, in 1951–52, by counties and principal minerals produced in 1952

County	1951	1952	Principal minerals in order of value
Anoka	$2,494	$2,742	Sand and gravel.
Becker	151,054	35,454	Do.
Benton	8,187	21,668	Do.
Blue Earth	593,720	554,196	Sand and gravel, stone.
Brown	77,844	72,598	Clay, sand and gravel.
Carlton	82,888	219,080	Sand and gravel, stone, clay.
Cass	6,773	9,880	Sand and gravel.
Chisago	4,284	6,485	Sand and gravel, marl.
Clay	95,228	90,546	Sand and gravel.
Cook	6,186	8,093	Do.
Cottonwood	72,869	57,022	Do.
Crow Wing	17,156,238	15,944,243	Iron ore, manganiferous ore, sand and gravel, marl.
Dakota	640,890	478,359	Stone, sand and gravel, clay.
Dodge	20,546	24,274	Stone.
Douglas	40,964	14,214	Sand and gravel.
Faribault	11,177	9,021	Do.
Fillmore	2,558,348	3,487,500	Iron ore, stone.
Goodhue	317,579	679,481	Stone, sand and gravel, clay.
Hennepin	2,003,720	2,054,126	Sand and gravel, stone.
Isanti	11,992	3,988	Sand and gravel.
Itasca	83,851,062	75,862,152	Iron ore, sand and gravel.
Jackson	27,203	9,955	Sand and gravel.
Lake	10,053	7,376	Do.
Le Sueur	552,210	458,150	Stone.
Lincoln	7,096	35,636	Sand and gravel.
Lyon	65,737	79,382	Do.
McLeod	2,910	1,823	Do.
Mahnomen	1,892	982	Do.
Martin	24,119	93,040	Do.
Morrison	168,378	265,662	Iron ore, sand and gravel.
Mower	190,688	126,447	Stone, sand and gravel.
Nicollet	10,592	6,592	Sand and gravel.
Nobles	2,784	28,761	Do.
Otter Tail	12,069	50,916	Do.
Polk	164,275	212,037	Sand and gravel, clay.
Pope	54,426	79,751	Sand and gravel.
Ramsey	1,094,895	1,250,941	Do.
Redwood	24,800	----	
Rice	33,734	158,604	Sand and gravel.
Rock	170,704	203,037	Abrasives, sand and gravel, stone.
Roseau	16,923	6,140	Sand and gravel.
St. Louis	318,009,246	290,556,585	Iron ore, cement, sand and gravel, lime, stone, manganiferous ore.
Sibley	1,383	----	
Stearns	1,213,832	1,392,299	Stone, sand and gravel.
Steele	190,094	169,600	Sand and gravel, stone.
Swift	20,169	44,387	Sand and gravel.
Wabasha	54,232	3,868	Do.
Watonwan	6,240	9,348	Do.
Winona	315,041	254,056	Sand and gravel, stone, clay.
Wright	59,026	57,869	Sand and gravel.
Yellow Medicine	301,143	332,044	Stone, sand and gravel.
Undistributed [1]	2,575,863	1,910,858	
Total	433,096,000	397,441,000	

[1] Includes production or value of minerals output, which the Bureau of Mines is not at liberty to publish, for the following counties: Beltrami, sand and gravel, clay (1951); Big Stone, stone, sand and gravel; Carver, clay; Chippewa, sand and gravel; Freeborn, sand and gravel; Grant, sand and gravel; Houston, stone; Hubbard, clay; Kanabec, stone (1952); Kandiyohi, sand and gravel, clay (1951); Lac Qui Parle, stone, sand and gravel; Lake of the Woods, sand and gravel; Marshall, sand and gravel; Mille Lacs, stone; Murray, sand and gravel (1951); Olmsted, stone, sand and gravel; Pine, sand and gravel; Pipestone, sand and gravel (1951); Renville, stone, sand and gravel; Scott, sand and gravel, stone; Todd, sand and gravel; Washington, sand and gravel, marl; Wilkin, sand and gravel. No production was reported for the following counties in either 1951 or 1952: Aitkin, Clearwater, Kittson, Koochiching, Meeker, Norman, Pennington, Red Lake, Sherburne, Stevens, Traverse, Wadena, and Waseca.

BLUE EARTH

Limestone and sand and gravel are the mineral products of this county. Limestone was produced by T. R. Coughlan Co. and Lundin Construction Co., both of Mankato. The first company produces dimension stone and riprap; the latter, riprap and crushed and ground stone for use in concrete aggregate and road construction. Sand and gravel were produced by Guaranteed Gravel & Sand Co., Mankato; Hiniker Gravel & Sand Co., North Mankato; and North Star Concrete Co., Inc., Mankato.

BROWN

Clay, principally for use in common brick and other heavy clay products, is produced by the A. C. Ochs Brick & Tile Co., Springfield. Sand and gravel were produced by the Wallner Construction Co., New Ulm, and the Brown County Highway Department.

CARLTON

The mineral products of Carlton County include clay, granite, and sand and gravel. Clay was produced by the Nemadji Tile & Pottery Co., Moose Lake, and the Wrenshall Brick Co., Duluth. Granite was produced by the Northern Pacific Railway Co. for use as railroad ballast. Sand and gravel were produced by Great Northern Railroad Co.; Minneapolis, St. Paul & Sault Ste. Marie Railroad Co.; Albert Obraski, Moose Lake; White Brothers, Cloquet; and Egerdahl Materials Co., Duluth; and by and for the Carlton County Highway Department.

CARVER

Clay was the only mineral product reported for Carver County. The O. H. Klein Brick Co. produced common brick and other heavy clay products.

CASS

Sand and gravel were produced by Great Northern Railroad Co. and Northern Pacific Railroad Co. and by and for the Cass County Highway Department.

CHIPPEWA

Jay Volden, Milan, produced gravel for use as a concrete aggregate or in road construction.

CHISAGO

Marl for agricultural use was produced by William Danner, Rush City. Sand and gravel were produced by and for the county highway department.

CLAY

Sand and gravel producers in Clay County include Kost Bros., Inc., Moorhead; Rollo Lewis, Fargo, N. Dak.; and the Twin City Sand & Gravel Co., Moorhead.

COOK

The Cook County Highway Department produced gravel for highway construction.

COTTONWOOD

Sand and gravel were produced by the Chicago, St. Paul, Minneapolis & Omaha Railroad Co.; Windom Sand & Gravel Co.; and the county highway department.

CROW WING

The chief mineral products of Crow Wing County include iron ore, manganiferous iron ore, ferruginous manganese ore, marl, and sand and gravel. By far the most valuable mineral product is iron ore. Seven companies operated 23 iron-ore mines; 3 of these companies produced both iron ore and manganiferous iron ore in 1952. Companies producing iron ore were:

Company and location:	*Mines operated*
Pickands, Mather & Co., Duluth, Minn.	Mahnomen and Rabbit Lake.
Inland Steel Co., Ishpeming, Mich.	Armour No. 1 and No. 2.
M. A. Hanna Co., Hibbing, Minn.	Portsmouth Group, Rowe, and Yawkey.
Hanna Coal & Ore Corp., Hibbing, Minn.	Feigh, Louise, Mallen, Mangan Joan, Mangan Stai, Maroco, Section No. 6, Snowshoe, and Waite.
Dates Mining Co., Duluth, Minn.	Pennington.
Rhude & Fryberger, Duluth, Minn.	South Hillcrest lean-ore stockpile.
Zontelli Brothers, Inc., Ironton, Minn.	Hillcrest lean-ore stockpile, Mangan Joan, Manuel, Martin stockpile, Merritt, and Virginia.

Zontelli Bros., Inc., also sold ore from the Merritt stockpile to Manganese Chemicals, Inc. This material will be credited as production when beneficiated by the Manganese Chemicals, Inc.

Manganiferous iron ore (5 to 10 percent manganese) was produced in 1952 by the Hanna Coal & Ore Corp., Pickands Mather & Co., and Zontelli Bros., Inc. Hanna Coal & Ore Corp. also produced some ferruginous manganese ore (10 to 35 percent manganese).

In addition to the 23 iron ore mines mentioned in the preceding paragraph, 3 mines were operated that produced only manganiferous iron ore and 1 mine that produced only ferruginous manganese ore. They were: For manganiferous ore—the Sagamore and Syracuse mines operated by Pickands Mather & Co. and the Alstead group, operated by the Hanna Coal & Ore Corp.; for ferruginous manganese ore—the Maroco mine operated by Hanna Coal & Ore Corp.

Of a special interest in the county was the beginning of construction of a chemical plant for processing manganiferous iron ore to manufacture manganese oxide or manganese carbonate. This plant is being built by the Manganese Chemicals, Inc. near Riverton, Minn.

Marl was produced by Tweed Bros., Pequot Lakes. Sand and gravel were produced by the Crow Wing County Highway Department.

DAKOTA

Clay was produced by the Twin City Brick Co. of St. Paul, chiefly for manufacturing common brick. Limestone, chiefly for use as riprap, flux, concrete, and road metal, was produced by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co. and J. L. Shiely Co., St. Paul. The J. L. Shiely Co. also produced some dimension stone. Sand and gravel were produced by the Standard Building Materials Co., Inc., South St. Paul, and by and for the county highway department.

DODGE

The Dodge County Highway Department produced crushed limestone for road purposes.

DOUGLAS

Sand and gravel were produced by and for the county highway department, chiefly for use as road-surfacing material.

FARIBAULT

Gravel was produced for the county highway department.

FILLMORE

Iron ore is produced by the M. A. Hanna Co. of Cleveland, Ohio. The mine is an open-pit operation. Initial production was in 1941. The ore deposits are scattered and range from 1 to 15 miles from the plant site near Spring Valley. The ore is shipped all rail, chiefly to steel mills in Illinois.

Limestone was produced by the following companies: Hadland & Vreeman, Ostrander; Hector Construction Co., Caledonia; Edwin C. Kappers, Spring Valley; Pederson Bros., Harmony; Roverud Construction Co., Spring Grove; and the Fillmore County Highway Department. Chief uses were as concrete aggregate or road metal or for agricultural limestone.

FREEBORN

Sand and gravel were produced by Emil Olson & Sons of Albert Lea and by and for the Freeborn County Highway Department.

GOODHUE

Clay, limestone, and sand and gravel were the mineral products of this county. The Red Wing Sewer Pipe Corp. produced clay, chiefly for making pottery and stoneware. Limestone, chiefly road-construction and agricultural uses, is produced by Bryan Rock Products, Inc., Northfield; Mann Construction Co., Red Wing; and Valley Construction Co., Zumbrota. Sand and gravel were produced by Harry M. Berktold and Arthur Mikow, Lake City; Frontenac Sand & Gravel Co., Frontenac; Mann Construction Co., and Munson Construction Co., Cannon Falls; city of Cannon Falls; city of Red Wing; and for the Goodhue County Highway Department.

GRANT

Sand and gravel were produced by the Minneapolis, St. Paul & Sault Ste. Marie Railroad Co. and by Sam Olson of Elbow Lake.

HENNEPIN

Minerals produced in Hennepin County include sand and gravel and limestone. Sand and gravel were produced by the following companies: Glacier Sand & Gravel Co., Great Northern Railroad Co., Hedberg, Freidheim & Co., Industrial Aggregate Co., Landers-Norblom-Christianson Co., Minnesota Sand & Gravel Co., and Oscar Roberts Co.; and by and for Hennepin County Road and Bridge Department, all of Minneapolis; and Arthur Kreatz, Wayzata. The chief uses for sand and gravel produced in the county were for road purposes and concrete aggregate, especially the manufacture of concrete blocks. Limestone was produced by the Landers-Norblom-Christianson Co. Its uses include rubble, concrete aggregate, road metal, and agricultural lime and as an asphalt or fertilizer filler. Crude perlite, produced in other States, is expanded by Johnson Manufacturing Co., McArthur Co., and Minnesota Perlite Corp., all at Minneapolis, for use as a lightweight aggregate in plaster and concrete.

HOUSTON

Limestone, chiefly for concrete aggregate, road metal, or agricultural use, was produced by Botcher Bros., Houston, and by Hector Construction Co. and Heintz & Smith, both of Caledonia.

HUBBARD

Clay was the only mineral product reported for the county. Moore & Sons brick works, Akeley, produced clay, chiefly for manufacturing common brick.

ISANTI

Gravel was produced for the county highway department.

ITASCA

The chief mineral product of Itasca County is iron ore. The mines are in the western portion of the Mesabi range. During 1952, 11 companies operated 38 mines. The operating companies, locations of local offices (in some instances, also locations of home offices), and operating mines in 1952 were as follows:

Company and location:	*Mines operated*
Butler Bros., Hibbing	Galbraith, Galbraith Annex, Halobe, Harrison, Harrison Annex, Kevin, North Harrison, Olson, Patrick, Patrick Annex, Patrick Plant Tailings, Quinn, Wyman.
Cleveland Cliffs Iron Co., Hibbing.	Canisteo, Hawkins, Hill-Trumbull, Holman Cliffs, Sargent.
Hanna Coal & Ore Corp., Hibbing.	Argonne, Carlz No. 2, Leach, Perry.
M. A. Hanna Co., Hibbing	Buckeye, Gordon, Jennison, Messabi Chief, Stein.
Jessie H. Mining Co., Crosby	Jessie.
Jones & Laughlin Steel Corp., Virginia.	Hill Annex.
Missco Mining Co., Hibbing	Mississippi No. 1.
Oliver Iron Mining Division, United States Steel Corp., Duluth.	Arcturus Group, Gross Marble Group, King, Walker.
Pacific Isle Mining Co., Hibbing	York.
Pickands, Mather & Co., Duluth	Bennett, Danube.
Republic Steel Corp., Duluth	St. Paul-Day.

Gravel was produced by the Hawkinson Construction Co. of Grand Rapids and the Itasca County Highway Department.

JACKSON

Gravel was produced for the county highway department.

KANABEC

Granite was produced from the Mora Grey quarry by the Cold Spring Granite Co., Cold Spring. The granite produced is cut and polished in the company plant at Cold Spring.

KANDIYOHI

Sand and gravel were produced by the Great Northern Railroad Co.; New London Materials & Construction Co., New London; and Royal Garman, Long Prairie; and by and for the Kandiyohi County Highway Department, Willmar.

LAC QUI PARLE

Granite was produced by the Cold Spring Granite Co. from the Cold Spring red quarry. The sawing and finishing plant is at Cold Spring, Stearns County. The Unique Granite Co., Inc., operated a quarry and a sawing and finishing plant at Bellingham. Sand and gravel were produced by and for the county highway department.

LAKE

Gravel was produced by the Lake County Highway Department.

LAKE OF THE WOODS

Sand and gravel were produced by Richard Donovan of Baudette and the county highway department, chiefly for road construction.

LE SUEUR

The Babcock Co., Kasota, produced limestone from several nearby quarries. The stone is buff to pink. Dimension stone for building purposes was prepared in the plant at Kasota. A highly polished stone, called "marble," used chiefly for facing in fireplace construction, was also produced.

LINCOLN

Sand and gravel were produced by Tyler Cement & Tile Works of Tyler, and by and for the county highway department.

LYON

Sand and gravel were produced by F. J. Crow and Hubert Deutz, Marshall; Chas. Filkins, Tracy; and Marshall Sand & Gravel Co.

MAHNOMEN

Sand and gravel were produced by and for the county highway department.

MARSHALL

The Minneapolis, St. Paul, & Sault Ste. Marie Railroad Co. and Oscar Shenkey produced sand and gravel.

MARTIN

Gravel, chiefly for use as concrete aggregate or in road construction, was produced by Maynard C. Gettler, Sherburn; Art Stade, Fairmont; and Daniel F. Winter, Ceylon; and by and for the Martin County Highway Department.

McLEOD

Sand and gravel were produced by the Minneapolis, Northfield & Southern Railway Co., chiefly for road ballast.

MILLE LACS

Granite was produced by the Cold Spring Granite Co., Inc., Cold Spring, at the Diamond Grey quarry. Sawing and finishing are done in the plant at Cold Spring, Stearns County.

MORRISON

Sand and gravel were produced by the Northern Pacific Railroad Co. and by and for the county highway department. Some iron ore was shipped from the Gorman mine near Randall by Zontelli Bros., Inc., of Ironton in 1952. The ore was actually produced the previous year by the Pacific Isle Co. but was not shipped because of the high moisture content.

MOWER

Limestone was produced by the Osmundson Bros., Adams, and the Mower County Highway Department, Austin. Sand and gravel were produced by Austin Ready Mix Concrete Co., Austin.

NICOLLET

Gravel was produced by A. H. & J. H. Massopust, Minneapolis, and Wilkinson Estate, St. Peter; and for the county highway department.

NOBLES

Gravel was produced by and for the county highway department.

OLMSTED

Limestone was produced by Patterson Quarries, St. Charles; Olmsted County Highway Department; and Quarve & Anderson Co., Rochester. The chief use of limestone produced was for road metal. Some stone, however, is prepared for sale as agricultural limestone. Sand and gravel were produced by the Rochester Sand & Gravel Co., Rochester.

OTTER TAIL

Sand and gravel were produced by Minneapolis, St. Paul & Sault Ste. Marie Railroad Co.; city of Fergus Falls; and by and for the Otter Tail County Highway Department.

PINE

Molding sand was produced by Louis Hultgren & Sons, Kerrick.

POLK

Clay was produced by the Red River Valley Brick Corp., Grand Forks, N. Dak. The product is chiefly common brick. Sand and gravel were produced by the Great Northern Railroad Co.; Spring Gravel Co., Crookston; and L. A. Thorson estate, Fertile.

POPE

Sand and gravel used chiefly for railroad ballast or road purposes were produced by Hancock Sand & Gravel Co., Hancock; Northern Pacific Railroad Co.; Starbuck Cement Products Co., Starbuck; and Pope County Highway Department.

RAMSEY

Sand and gravel were the only mineral products of the county. Cemstone Products Co., St. Paul; Chicago, St. Paul, Minneapolis & Omaha Railway Co.; the Minnesota Highway Department; and the city of St. Paul produced gravel, chiefly for use as railroad ballast or for road construction. The J. L. Shiely Co., Inc., St. Paul, produced sand and gravel for these purposes and also engine sand. Gravel was produced for the city of St. Paul, the Ramsey County Highway Department, and the United States Corps of Engineers. The Twin City glass plant of the Ford Motor Co. at St. Paul produced glass sand.

RENVILLE

Granite was produced by the Cold Spring Granite Co., Inc., Cold Spring, and the Melrose Granite Co., St. Cloud. Granite is cut and polished for dimension stone. Scrap granite is usually sold for riprap or as a concrete aggregate. Sand and gravel were produced by Fairway Construction Co., Hector, and for the village of Sacred Heart.

RICE

Sand and gravel were produced by Faribault Washed Sand & Gravel Co., Faribault; Farrell Construction Co., St. Paul; Herbert Reese, Greenbush; and for the Rice County Highway Department.

ROCK

The Jasper Stone Co., Jasper, produced grinding pebbles and tube-mill liners from a quartzite deposit. Sand and gravel were produced by the Chicago, St. Paul, Minneapolis & Omaha Railway Co., Pronk Bros., Edgerton, and by and for the Rock County Highway Department.

ROSEAU

The county highway department produced gravel for road construction.

ST. LOUIS

Minerals produced in St. Louis County include lime, iron ore, manganiferous iron ore, sand and gravel, basalt, and granite. By far the most important of these is iron ore. Twenty-two companies operated 108 iron-ore mines; some of these companies also produced manganiferous iron ore in the county during 1952. The operating companies, local offices (in some instances also home offices), and operating mines or mine groups in 1952 were as follows:

Company and location:	*Mines operated*
Butler Bros., Hibbing	Agnew No. 2, North Eddy (South Agnew Trespass), South Agnew, South Longyear, Weggum.
Charleson Iron Mining Co., Hibbing.	Charleson Concentrator.
Cleveland Cliffs Iron Co., Hibbing	Agnew, Alworth, Atkins, Wanless.
E. W. Coons Co., Hibbing	Genoa Sparta, Julia, Sidney.
Douglas Mining Co., Minneapolis	Douglas, Duncan.
Haley-Young Mining Co., Hibbing	Elbern.
M. A. Hanna Co., Hibbing	Bray, Enterprise, Impro (Trespass), Norpac, Section 18, Wabigon.
Hedman Mining Co., Hibbing	Croxton-Drew-Syme.
Jones & Laughlin Steel Corp., Virginia.	Columbia, Graham No. 1, Longyear, Missabe Mountain, Schley, Wentworth.
Junior Mining Co., Inc., Virginia	Hector.
R. Maturi Corp., Chisholm	Wheeling LOSP.
W. S. Moore Co., Duluth	Hanna, Judson lease 2050, Judson lease 2057, Margaret, Margaret stockpile, Missouri stockpile, Pilot, Pilot Annex, Prindle stockpile, Prindle, Yawkey.
Oglebay, Norton & Co., Duluth	St. James.
Oliver Iron Mining Division, United States Steel Corp., Duluth.	Auburn group, Burns, Canton group, Canton (St. James), D'Autremont (Shenango), Dormer, Fayal, Fraser, Gilbert, Glen stockpile, Godfrey, Hull Rust group, Knox Extension, Kosmerl (Whiteside), Midway group, Monroe group, Morris group, Mott stockpile, Mountain Iron group, Niles-Douglas, Pillsbury, Pillsbury-Brown (Douglas), Pioneer, Rouchleau group, Sauntry, Sellers (Webb), Sherman group, Sibley, Soudan, Spruce.
Pacific Isle Mining Co., Hibbing	Cyprus-Rust, Dunwoody LOSP, Emmett, Graham LOSP, Kerr, Lamberton, Midget, Missabe Mountain, Missabe Mountain South Lease, Nordine, North Shiras, Pacific Fee, Shiras, Wacootah, Wickey LOSP.
Pickands, Mather & Co., Duluth	Albany, Biwabik, Carmi Carson Lake, Corsica, Embarrass, Mahoning, preliminary taconite plant (Erie), Scranton, Wade, Zenith.
Pioneer Mining Co., St. Paul	Mary Ellen.
Republic Steel Corp., Duluth	Stevenson, Susquehanna.
Reserve Mining Co., Babbitt	Babbitt taconite plant.
Rhude & Fryberger, Hibbing	Seville, Troy.
Snyder Mining Co., Duluth	Shenango, Webb, Whiteside.
E. A. Young, Inc., Hibbing	Minnewas.

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During 1952 three major companies had projects under construction for beneficiating magnetic taconite ores. The Erie Mining Co., owned by Bethlehem Steel Corp., Youngstown Sheet & Tube Co., Interlake Iron Corp., and Pickands, Mather & Co. announced plans for construction of a commercial plant to beneficiate magnetic taconite ores. The mine and plant are near Aurora. The ultimate planned capacity for this plant was 10,500,000 tons per year of finished product. A railroad for transporting finished product is to be built from the plant to a proposed dock and townsite at Two Islands (about 76 miles northeast of Duluth). The company received a certificate of necessity for an accelerated tax writeoff from the Defense Production Administration on about 75 percent of the estimated 300-million-dollar cost of the project, which will permit depreciation in 5 years instead of the usual 25.

Oliver Iron Mining Co., a subsidiary of the United States Steel Corp., now the Oliver Iron Mining Division of the United States Steel Corp., began to construct its Pilotac plant for beneficiating magnetic taconite ores and developing its taconite mine near Mountain Iron on May 17. This plant will have an annual capacity of about 500,000 tons of finished concentrates. The concentrates will be agglomerated at the company experimental agglomerating plant at Virginia.

The Reserve Mining Co. was in an early stage of operations at its preliminary commercial-scale plant at Babbitt, which replaces the plant erected there in 1920–22 by D. C. Jackling and his associates. The plant, which has an annual capacity of 300,000 tons of finished product, is complete from the first crushing stage through the final pelletizing. It is the pilot plant for the planned 10,000,000-ton plant also being erected by the Reserve Mining Co. near Beaver Bay on the North Shore of Lake Superior.

The planned 10,000,000-ton plant will have 32 sections, such as that at Babbitt. The first unit (8 sections) is expected to be completed late in 1955. An additional 4 sections (a half-unit) are to be completed in 1957, bringing the capacity to 3,750,000 tons of finished high-grade taconite concentrates a year. The total investment to the company at this stage is expected to be about $160 million.

The ore body at Babbitt is approximately 9 miles long, 2,800 feet wide, and 175 feet deep at its thickest point. It is virtually free of glacial overburden. It is estimated to contain at least 1 billion tons of magnetic taconite, which can be mined by the open-pit method. This, when beneficiated, will yield concentrate totaling about 500 million tons containing 60 to 63 percent iron. In addition to proved deposits, geological studies indicate the presence of substantial additional tonnages of taconite on the property.

The main ore body will be mined with a series of benches about 35 feet high. The width of the benches will be sufficient to accommodate power shovels and ore cars. Coarse crushing will be done at the mine for both the Babbitt section and the large plant near Beaver Bay. The open-pit mine is already supplying crude taconite to the preliminary plant at Babbitt. About 600,000 tons a year will be treated in this section. When the first 2,500,000-ton unit of the Lakeside project is ready for ore, it will be necessary to mine 7,500,000 tons annually and more, proportionately, as the remaining units are completed.

An agglomerated concentrate of much more uniform consistency than natural ore will be the final product.

The water supply for the Babbitt plant will be provided by a 2-mile, 20-inch steel pipeline from Birch Lake, with a capacity of 4,000 gallons a minute. Two-thirds of the water requirement will be reclaimed at the plant.

It has been estimated that 50 tons of water and 100 kw.-hr. of electrical power will be required to produce 1 ton of concentrate.

The plant under construction near Beaver Bay has a temporary power plant and water and sewage systems. To shelter the ore boats, a huge breakwater is being constructed. It will reach from the shore to a small island known as Pancake Island. Plans also call for facilities to house about 9,500 people at Babbitt and the Lakeside project by 1957.

Cement was produced by the Universal Atlas Cement Co. of Duluth. The raw material is imported chiefly from Presque Isle and Schoolcraft Counties, Mich.

Cutler-Magner Co., Duluth, also prepared agricultural lime and chemical lime. The limestone was purchased from companies operating quarries in Michigan. A small quantity of manganiferous iron ore was produced by the Oliver Iron Mining Division, United States Steel Corp.

The Zenith Dredge Co., Duluth, mined a basaltic material and crushed it for use as concrete aggregate or road metal.

Rough granite for fabricating monuments and other dimension stone was produced by the Mesaba Granite Co., Hibbing. The quarry is near Mountain Iron.

Sand and gravel were produced by the Arrowhead Sand & Gravel Co., Duluth; Biwabik Gravel Co., Biwabik; Duluth Builders Supply Co., Duluth; Missabe Iron Range Railway, E. W. Coons Co., Inc., Enrico Ghilardi, Mesaba Construction Co., and Pioneer Mining Co., all of Hibbing; N. W. Gravel & Excavating Co., Virginia; the Great Northern Railway; and by and for the St. Louis County Highway Department, as well as the division of public works, city of Duluth. Most of the sand and gravel was for building and paving and road purposes, but some engine sand was also produced.

SCOTT

Sand and gravel were produced by Lubansky Bros. of Chaska and by and for the county highway department. Crushed granite was produced for use as railroad ballast by the Minneapolis & St. Louis Railway Co.

STEARNS

Granite and sand and gravel are the mineral products of this county; granite has by far the greatest value. Seven companies quarried granite and produced monumental stone or building stone on order in plants chiefly at Cold Spring and St. Cloud. Producing companies include Cold Spring Granite Co., Inc., Liberty Granite Co., Melrose Granite Co., North Star Granite Corp., Plachecki Bros. Quarrying Co., Royal Granite Co., and Shiely Petters Crushed Stone Co. Granites produced in the county are various shades of pink to red. Sand

and gravel were produced by Al C. Petters Co., St. Cloud, and Osakis Concrete Products Co., Osakis.

STEELE

Limestone for road metal or agricultural use is produced by Klemmer Construction Co., Owatonna. Sand and gravel were produced by George Kohlmier, Owatonna; Medford Washed Sand-Gravel Co., Medford; Owatonna Aggregates Corp., Owatonna; and for the Steele County Highway Department.

SWIFT

Sand and gravel were produced by Chicago, Milwaukee, St. Paul & Pacific Railway Co., Great Northern Railroad Co., and for the Swift County Highway Department.

TODD

Sand and gravel were produced by the Great Northern Railroad Co. and by and for the county highway department.

WABASHA

The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. produced sand and gravel for railroad ballast and gravel for other uses.

WASHINGTON

Marl was produced by B. J. Rochel of Shafer for agricultural use. Sand and gravel were produced for the county highway department.

WATONWAN

Sand and gravel were produced by and for the county highway department.

WILKIN

Behrens Construction Co., Beatrice, Nebr., produced sand and gravel, chiefly for use in road construction.

WINONA

Clay, limestone, and sand and gravel were the mineral products of the county. Clay, chiefly for use in manufacturing common brick, was produced by Biesanz Brick Yards, Winona. Dimension limestone was produced by the Biesanz Stone Co., Winona. The Hector Construction Co., Caledonia, produced riprap from limestone quarries and the county highway department produced and crushed limestone for use on roads. Sand and gravel were produced by Searles Sand & Gravel Co. and Winona Sand & Gravel Co., both of Winona. In addition to road and concrete-aggregate material, both companies produced sand for other uses.

WRIGHT

The Delano Granite Works, Inc., Delano, operated a sawing and finishing plant at Delano. The company quarry is in Big Stone County. Sand and gravel were produced by Charles and Anna

Frank, Delano; Ed Schram, South Haven; and by and for the Wright County Highway Department.

YELLOW MEDICINE

Sand and gravel were produced by Chapman Gravel Co., Echo, and by and for the county highway department. Granite was crushed by the Great Northern Railroad Co. for use as railroad ballast.

The Mineral Industry of Mississippi

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Mississippi.

By J. R. Thoenen[1] and May G. Downey[2]

MISSISSIPPI'S mineral output in 1952, as reported by producers, included fuels and ceramic and construction materials; the total value decreased 1 percent compared with 1951. Fuels claimed the major share of the value of mineral output (93 percent); clays, cement, sand, gravel, and stone absorbed the remaining 7 percent. The value of petroleum produced was nearly 6 times the combined value of all other fuels and represented 79 percent of the total value of the mineral production of the State.

The Marquette Cement Manufacturing Co. completed a new 1-million-barrel-capacity cement mill at Brandon, Miss., in 1951,[3] from which production and shipments were first reported for 1952.

Clay suitable for producing building brick is found in nearly all parts of Mississippi and in 1952 was reported from 12 operations in 10 counties. Smaller quantities of special clays—bentonite, fuller's earth, and ball and fire clays—were also produced.

No production of metallic minerals was reported from Mississippi in 1952. Results of a wartime investigation of high-alumina clays and bauxite deposits were presented in a recent Bureau of Mines report.[4] Most of the known bauxite deposits in Mississippi appear to be so high in iron and silica that the material is neither a chemical nor a metallurgical ore by present standards.

Nonmetallic minerals were produced in 32 of Mississippi's 60 counties in 1952.

Table 1 gives the quantity and value of mineral production in Mississippi, 1951–52.

Figure 1 shows the total value of mineral production in Mississippi, 1932–52.

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[1] Chief, Mineral Industry Division, Region VII, Bureau of Mines, Knoxville, Tenn.
[2] Statistical clerk, Region VII, Bureau of Mines, Knoxville, Tenn.
[3] Nordberg, Bror, Marquette Builds Mississippi's First Cement Plant: Rock Products, vol. 55, No. 8, August 1952, pp. 116–130, 190.
[4] Reed, Donald F., Investigation of High-Alumina Clays and Bauxite of Northeastern Mississippi: Bureau of Mines Rept. of Investigations 4827, 1952, 84 pp.

TABLE 1.—Mineral production in Mississippi, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays (including fuller's earth) [2]	673,062	$4,250,237	504,799	$2,677,263
Natural gas thousand cu. ft.	158,845,000	10,007,000	174,100,000	10,620,000
Natural gas liquids:				
Natural gasoline and cycle products 42-gal. bbl.	729,000	2,503,000	803,000	2,606,000
LP-gases do.	473,000	852,000	467,000	777,000
Petroleum (crude) do.	37,039,000	82,970,000	[3] 36,310,000	[3] 80,970,000
Sand and gravel	3,012,152	2,279,034	2,296,577	1,833,306
Stone	171,131	168,933	90,000	103,500
Undistributed				2,287,612
Total Mississippi		103,030,000		101,875,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production.
[2] Except clays sold or used for cement.
[3] Final figure. Supersedes preliminary figure given in commodity chapter

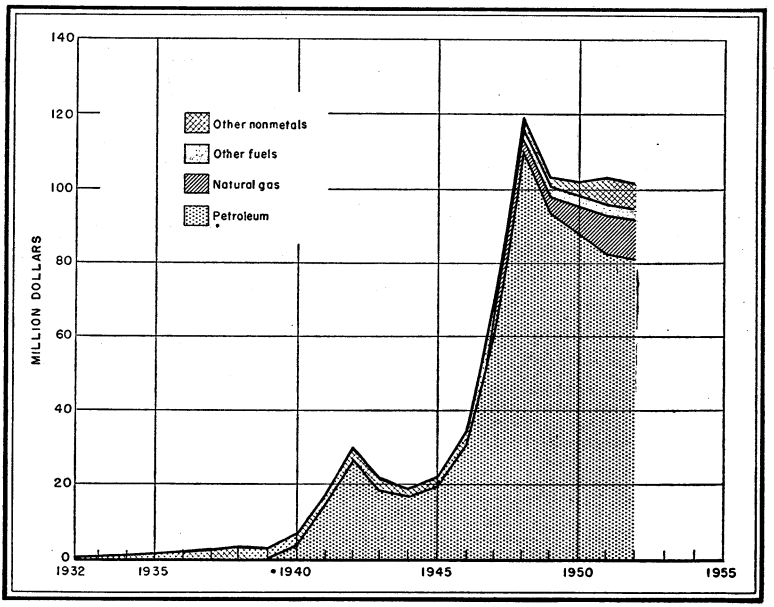

FIGURE 1.—Value of mineral production in Mississippi, 1932–52, in million dollars.

REVIEW BY MINERAL COMMODITIES

Clays.—*Ball clay* was produced from two operations in Mississippi in 1952. Both quantity and value decreased 16 percent compared with 1951, but the decrease in average value per short ton was less than 1 percent.

Bentonite was produced in Itawamba, Monroe, Pearl River, and Smith Counties in 1952. Production was approximately two-thirds of the 1951 tonnage, and the average value dropped 19 percent.

Fire-clay production in 1952 increased 15 percent in quantity and 1 percent in value compared with 1951. The average value per short ton was 12 percent lower.

Fuller's earth production from the Blue Mountain mine of Wyandotte Chemicals Corp. has been the only reportedly active source of this commodity in Mississippi for several years. Both the quantity and value increased in 1952, and the average value was 6 percent greater than in 1951.

Miscellaneous clays output, used in making heavy clay products, decreased 21 percent in quantity and 15 percent in value compared with 1951. The average unit value, however, increased from $1.02 to $1.08 per short ton. In addition, clay used in cement manufacturing was reported.

Table 2 shows quantities and values of miscellaneous clay sold or used by producers, 1948–52.

TABLE 2.—Miscellaneous clays sold or used by producers, 1948–52 [1]

Year	Short tons	Value	Year	Short tons	Value
1948	(2)	(2)	1951	261,722	$266,022
1949	281,763	$252,382	1952	207,468	224,828
1950	268,690	247,467			

[1] Excludes clay sold or used for cement.
[2] Figure withheld to avoid disclosure of individual company operation.

Sand and Gravel.—Sand and gravel production was reported from 15 counties in Mississippi from 15 commercial and 4 noncommercial operations. An additional 134,000 short tons, undistributed as to location of deposit, was reported by the Bureau of Forestry and the Memphis district of United States Engineers. The total tonnage decreased 24 percent and the value 20 percent from comparable 1951 data, while the average value increased 4 cents per short ton.

Table 3 shows sand and gravel sold or used by producers, 1943–47 (average) and 1948–52.

TABLE 3.—Sand and gravel sold or used by producers, 1943–47 (average) and 1948–52

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average) [1]	(2)	(2)	(2)	(2)	1,783,892	$1,143,002
1948	883,567	$400,220	1,995,689	$1,119,710	2,879,256	1,519,930
1949 [3]	641,704	380,723	1,301,237	949,690	1,942,941	1,330,413
1950	947,127	516,202	1,817,317	1,469,706	2,764,444	1,985,908
1951	944,096	607,870	2,068,056	1,671,164	3,012,152	2,279,034
1952	604,698	399,769	1,691,879	1,433,537	2,296,577	1,833,306

[1] Excludes "noncommercial," 1943 and 1947.
[2] Not available.
[3] Excludes "noncommercial" sand and gravel.

Stone.—Limestone for agricultural use was produced in Clay County by the Mississippi State Lime Plant Board. This is the only stone operation in Mississippi reporting continuously for the past 5 years.

Small quantities of miscellaneous stone have been reported intermittently in previous years, but none was reported in 1952.

REVIEW BY COUNTIES

ADAMS

St. Catherine Sand & Gravel Co. produced sand and gravel for building and paving. No output was reported from the C. D. Allen operation.

ALCORN

The tonnage of miscellaneous clay produced by Corinth Brick & Tile Co., Corinth, was 11 percent lower than in 1951. Table 4 shows miscellaneous clay sold or used by producers, 1948–52.

TABLE 4.—Miscellaneous clays sold or used by producers in Alcorn County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	36,300	$27,225	1951	38,808	$38,808
1949	27,100	20,325	1952	34,464	28,744
1950	36,743	27,932			

ATTALA

Miscellaneous clay produced by C. C. Bell, Kosciusko, increased 11 percent in both quantity and value compared with 1951.

CARROLL

A substantial increase in production of fire clay was reported by Delta Brick & Tile Co. from its operation at Carrollton. Table 5 shows fire clay sold or used by producers in the county, 1948–52.

TABLE 5.—Fire clay sold or used by producers in Carroll County, 1949–52

Year	Short tons	Value	Year	Short tons	Value
1949	2,760	$7,176	1951	9,245	$27,735
1950	9,900	19,800	1952	14,355	26,844

CLAY

Limestone for agricultural use was produced by the Mississippi State Lime Plant Board at Cedarbluff. The tonnage of building sand and paving gravel produced by West Point Gravel Co. at West Point increased 37 percent, although the overall value of output was 2 percent lower than in 1951.

COAHOMA

The Coahoma County Highway Department produced 75,221 short tons of paving gravel, 84 percent of 1951 production.

COPIAN

The Gulf Mobile & Ohio Railroad produced gravel for ballast. No production was reported from Green Bros. Gravel Co.

DE SOTO

Memphis Stone & Gravel Co. produced sand and gravel for building and gravel for paving.

FORREST

Clay used in the manufacture of heavy clay products was produced by the Hattiesburg Brick Works, Hattiesburg. The American Sand & Gravel Co., also of Hattiesburg, produced sand and gravel for building and paving, engine sand, and gravel for railroad ballast.

HARRISON

The output of paving sand and gravel for building and unspecified uses by the Coast Gravel Co., plant at Handsboro amounted to somewhat less than half of the 1951 production.

HINDS

Miscellaneous clay was produced from three operations at Jackson: Jackson Brick Co., Johnson-Cone Brick Co., and Tri-State Brick & Tile Co. The Mississippi State Highway Department produced sand and gravel for paving, closely paralleling the 1951 output in tonnage and value.

HOLMES

Hammett Gravel Co., Lexington, produced building sand and building and paving gravel.

ITAWAMBA

Bentonite reported by the Filtrol Corp. of Jackson from the Chisholm mine included production from the Hodo mine in nearby Monroe County. Davis Bros., Tupelo, produced a small quantity of fire clay.

JONES

The tonnage of miscellaneous clay produced by Laurel Brick Works, Laurel, was only slightly lower than the 1951 output.

LAUDERDALE

Miscellaneous clay produced at the Bonita mine of Meridian Brick Co. increased 43 percent in both quantity and value, compared with 1951. Table 6 shows miscellaneous clay sold or used by producers, 1948–52.

TABLE 6.—Miscellaneous clays sold or used by producers in Lauderdale County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	17,200	$25,800	1951	8,600	$12,900
1949	10,400	15,600	1952	12,258	18,387
1950	9,000	13,500			

LEE

Production of miscellaneous clay by the Tupelo Brick & Tile Co., Tupelo, was a few hundred tons lower than in 1951, but the average value per ton was unchanged.

LEFLORE

The tonnage and value of gravel for paving produced by Leflore County Highway Department in 1952 were 8 percent lower than in 1951. Table 7 shows gravel sold or used by producers, 1948–52.

TABLE 7.—Gravel sold or used by producers in Leflore County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	103,200	$35,300	1951	91,125	$67,500
1949	121,500	45,000	1952	83,565	61,900
1950	81,203	30,150			

LINCOLN

Brookhaven Pressed Brick Co., Brookhaven, produced miscellaneous clay for use in the manufacture of heavy clay products.

LOWNDES

Sand and gravel for a variety of uses were produced in Lowndes County from three operations. Columbus Gravel Co. and Fleming Gravel Co., both of Columbus, produced sand and gravel for building and paving. Engine sand and gravel for railroad ballast were reported by Columbus Gravel Co. and by the Columbus & Greenville Railway Co. No clay production was reported by the Lowndes County mine of the Columbus Brick Co. in 1952.

MARION

Paving gravel was produced by the Marion County Office of Chancery Court. Table 8 shows gravel sold or used by producers, 1948–52.

TABLE 8.—Gravel sold or used by producers in Marion County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	108,217	$80,161	1951	108,427	$80,316
1949	106,118	[1] 3,930	1952	108,427	80,316
1950	90,508	67,043			

[1] As reported by county officials.

MARSHALL

A 4-percent increase in the tonnage of fire clay produced by Holly Springs Brick & Tile Co. was reported in 1952. The Holly Springs Stoneware Co. was idle.

MONROE

Bentonite, sand, and gravel were produced in Monroe County in 1952. Bentonite output from the Amory operation of International Minerals & Chemical Corp. and from the Aberdeen mine of American Colloid Co. increased 6 percent in quantity and 4 percent in value compared with corresponding 1951 data. Bentonite from the Filtrol Corp. Hodo mine in Monroe County was included in data for Chisholm mine in Itawamba County. Sand and gravel for building and paving and gravel for railroad ballast were reported by Amory Sand & Gravel Co., Dee Nash reported sand and gravel for building and paving, and Mattox Gravel Co. produced building and paving gravel.

PANOLA

Kentucky-Tennessee Clay Co. produced ball clay at the Crenshaw mine. The total quantity sold or used was 16 percent lower than in 1951.

PEARL RIVER

Bentonite was produced by the Pearl River Clay Co. from its mine at McNeill. Total quantity sold or used was 33 percent lower than in 1951.

PERRY

No production was reported by the Richton Sand & Gravel Co. in 1952. The Gulf Mobile & Ohio Railroad reported gravel for building.

PONTOTOC

The Pontotoc Brick Co. in 1952 resumed operation of the former Southern Brick Co. mine after several years of reported inactivity.

QUITMAN

The Sledge mine of Old Hickory Clay Co. continued operation with a near-normal output of ball clay.

RANKIN

Shipments of cement from Mississippi's first cement mill were reported in 1952 from the Brandon plant of Marquette Cement Manufacturing Co.

SMITH

Bentonite production was reported in Smith County from the Burns deposit of the Filtrol Corp., which also produces bentonite from mines in Itawamba and Monroe Counties. The total quantity sold or used was 45 percent lower than in 1951.

SUNFLOWER

The Delta Brick & Tile Co. produced miscellaneous clay for use in manufacturing heavy clay products. Table 9 shows miscellaneous clay sold or used by producers, 1948–52.

TABLE 9.—Miscellaneous clays sold or used by producers in Sunflower County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	2,362	$1,770	1951	12,750	$12,750
1949	10,040	7,530	1952	12,645	12,645
1950	20,000	15,000			

TIPPAH

Fuller's earth from Blue Mountain mine of Wyandotte Chemicals Corp. was 19 percent greater than the 1951 production.

WASHINGTON

The Greenville Gravel Co. produced building sand and building and paving gravel. Total quantity sold or used was 17 percent lower than in 1951.

WINSTON

A small tonnage of fire clay used for whiteware was produced by Stewart Pottery Co.

UNDISTRIBUTED

The United States Bureau of Forestry produced 16,800 short tons of pit-run gravel for use on roads.

The Memphis district of United States Engineers Office contracted for the production of 117,200 short tons of sand.

VALUES

The values of mineral production shown in tables 4 to 9 are the values as reported at the mine or plant. Table 10 shows the average unit values of all commodities produced in Mississippi, 1948–52.

TABLE 10.—Average unit value of mineral commodities produced in Mississippi, 1948–52 [1]

Mineral commodity	1948	1949	1950	1951	1952
Nonmetals: [2]					
Cement, per 376-lb. barrel					$2.53
Clays:					
Ball clay	$13.04	$14.48	$15.25	$15.01	14.90
Bentonite	4.35	4.91	5.68	9.73	7.89
Fire clay	1.04	2.58	1.68	1.83	1.61
Fuller's earth	21.18	42.76	39.18	41.04	43.65
Miscellaneous clay	.93	.90	.92	1.02	1.08
Clay (for cement manufacture)				1.00	1.00
Gravel	.56	.62	.81	.81	.85
Sand	.45	.52	.55	.64	.66
Stone:					
Limestone (crushed)	1.15	1.10	1.15	1.15	1.15
Miscellaneous (crushed)				.40	
Fuels: [3]					
Natural gas, per 1,000 cu. ft.	.056	.062	.063	.063	.061
Petroleum	2.41	2.46	2.31	2.24	2.23
Natural-gas liquids:					
Natural gasoline and cycle products	2.62	2.92	2.92	3.43	3.25
LP-gases	2.13	1.16	1.62	1.80	1.66

[1] For greater detail on prices by grades and markets, see vol. I, Minerals Yearbook 1952.
[2] Per short ton, except cement.
[3] Per 42-gallon barrel, except natural gas.

The Mineral Industry of Missouri

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Missouri.

By F. F. Netzeband,[1] G. A. Muilenburg,[2] and E. S. Smith[2]

MISSOURI, the 18th largest State in area in the Union, comprising 69,674 square miles, was the 22d ranking State in the production of mineral wealth in 1952 (table 1). This output was valued at $140,977,000, with cement, clays, coal, lead, and lime composing the major portion of the value. Missouri was the largest lead producer in the Nation, a position it has held for 45 consecutive years; the second largest producer of barite; and the third largest producer of lime. Important tonnages of cement, clays, coal, sand, gravel, stone, and zinc were also produced.

TABLE 1.—Mineral production in Missouri, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Barite (crude)	281,895	$2,697,200	304,080	$2,919,795
Cement—376-pound barrels	10,217,421	25,760,473	10,086,850	25,523,038
Clays (except for cement)	1,904,015	10,098,711	2,159,010	11,226,794
Coal	3,269,283	13,405,436	2,954,450	12,048,141
Copper (recoverable content of ores, etc.)	2,422	1,172,248	2,576	1,246,784
Iron ore (usable)—long tons, gross weight	172,466	(2)	268,218	(2)
Lead (recoverable content of ores, etc.)	123,702	42,800,892	129,245	41,616,890
Lime (open-market)	1,122,299	11,285,877	1,130,970	11,326,941
Natural gas—thousand cubic feet	14,000	2,000	16,000	3,000
Petroleum (crude)—42-gallon barrels	24,000	(2)	[3] 21,000	(2)
Sand and gravel	6,809,857	5,969,849	6,790,422	6,122,195
Silver (recoverable content of ores, etc.)—troy ounces	184,424	166,913	517,432	468,302
Stone (except limestone for cement and lime)	11,294,227	15,255,427	15,106,544	20,676,958
Zinc (recoverable content of ores, etc.)	11,476	4,177,264	13,986	4,643,352
Undistributed: Native asphalt, ground sand and sandstone, tripoli, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)		2,456,861		3,155,176
Total Missouri		135,249,000		140,977,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production.
[2] Value included with "Undistributed."
[3] Final figure. Supersedes preliminary figure given in commodity chapter.

There are 2 major metal-mining districts and 4 non-metal-mining districts. Metal mining was carried on in that part of the State south of the Missouri River, centered in the southeast Missouri lead belt in

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[2] Geologist, Missouri Geological Survey, Rolla, Mo.

St. Francois and Madison Counties and in the southwest Missouri section of the Tri-State district in Jasper and Newton Counties. Nonmetallic mining was widely distributed over the entire State, though some individual commodities were concentrated in relatively limited areas; the principal output of the high-grade clays, diaspore, burley, and flint came from Gasconade, Audrain, and Callaway Counties. Barite was produced almost exclusively in Washington County and cement essentially in St. Louis, Ralls, Jackson, and Cape Girardeau Counties.

CONSUMPTION AND MARKETS

Missouri industries processed almost all the production of clays and limestone into finished or semifinished products for Missouri consumption or export. Clays were employed in manufacturing building and refractory brick, structural tile, sewer pipe, drain tile, pottery, earthenware, sanitary ware, ornamental tile, and lightweight aggregate. Limestone was used in making cement, lime, agricultural limestone, and crushed stone for railroad ballast, road material, riprap, metallurgical flux, and glass. Large volumes of sand and gravel were also processed within the State as aggregate in concrete mixes and road material; other volumes found uses outside the State for sand blasting, molding sand, glass sand, and abrasives.

TRENDS AND NEW DEVELOPMENTS

The 1952 trend was toward increasing production. Favorable prices on most commodities stimulated output and, in turn, increased employment. There was an increasing tendency to use larger, heavier equipment wherever possible, thus increasing the output per man, with a subsequent decrease in the unit cost.

The use of agricultural lime fluctuated somewhat in keeping with the support furnished by the Federal Government through the Production and Marketing Administration, but here also the overall tendency was toward greater production.

The demand for a low-phosphorus iron ore by some of the iron furnaces in the Birmingham, Ala., area created a market for southeast Missouri brown iron ore despite high freight costs.

Barite production expanded under favorable market conditions. Fred Hornsey & Co. leased a large acreage northwest of Potosi and erected a new washing plant. A small tonnage of barite was reported from the Central Missouri district; this region had been inactive for several years. A new washing plant was reported under construction in the vicinity of Eldon, Miller County.

METAL MINING

Mine Mills and Smelters.—Fifteen mine mills were operating in Missouri in 1952, 6 in the southeast lead belt and 9 in the southwest

part of the State. Four southwest mills treated custom as well as company ores. They were the Duenweg and Jasper mills of the Federal Mining & Smelting Co., the Dale mill of the Dale Mining Co., and the Good Enuf mill of the Good Enuf Mining Co. Five other mills in southwest Missouri, which operated on company ore alone in 1952, were the Quick Seven mill of the American Zinc, Lead & Smelting Co., the Wild Goose mill of the Wild Goose Syndicate, the Lone Elm mill of the B. F. & H. Mines, Inc., and the Snapp and Sucker Flat mills of Potter-Sims Mines, Inc. In southeast Missouri the St. Joseph Lead Co. operated its four mills—the Federal, Bonne Terre, Leadwood, and Desloge; the Mine La Motte Corp. its Mine La Motte mill; and the National Lead Co. its Madison mill. St. Joseph Lead Co. began construction of a 2,000-ton daily capacity heavy-medium mill at Hayden Creek and completed plans for a gravity-float mill at its Indian Creek development.

The lead smelter and refinery of the St. Joseph Lead Co., at Herculaneum, Jefferson County, Mo., operated at near capacity throughout 1952. Lead ores from Missouri, the Tri-State district, New York, and foreign sources were smelted during the year.

Mineral Brokers.—Several smelting companies maintained mineral brokers or ore buyers who purchased ores from the Tri-State district and surrounding States. Ore purchases from this district differ from those made in western mining districts in that the concentrate or ore is obtained f. o. b. the mill, and all handling and freight charges are assumed by the buyer. Ore prices are quoted on the basis of 60-percent zinc-metal content and 80-percent lead-metal content, subject to adjustments based on assays.

New Plants or Projects.—The extensive exploration projects of the St. Joseph Lead Co. brought in 2 important new lead ore bodies in 1952—the Hayden Creek property, about 4 miles west of Leadwood in St. Francois County, and the Indian Creek property in Washington County approximately 11 miles northwest of Potosi.

The Hayden Creek ore body [3] is composed of lead in the cementing dolomite of a porphyry conglomerate. The conglomerate consists of granite boulders cemented by a sandy dolomite and is entirely different from the typical disseminated dolomitic ore of the southeast Missouri lead belt. A three-compartment shaft was bottomed in May 1950 and stope production begun late in 1952. Counterbalanced skips of 4-ton capacity hoist the ore to the surface. Mine development will be by open-stope methods. Loaders and trucks will handle the ore. A 2,000-ton daily capacity sink-float plant was built at the mine site, with galena used as the medium in the sink-float process. A lead concentrate drawn from the cone as a rougher product will be trucked to the Leadwood mill to be cleaned.

The Indian Creek ore body is the blanket-type disseminated lead in dolomite, typical of the well-known southeast Missouri lead district.[4] Considerable zinc is also present in the form of sphalerite.

[3] Stockett, Norman A., Improvements in Milling Practice in Southeast Missouri: Am. Min. Cong. Denver, Colo., 1952.
[4] Bain, C. Kermer, St. Joseph Lead Co.'s Indian Creek Development: AIME ann. meeting Los Angeles, Calif., February 1953.

TABLE 2.—DMEA contracts active during 1952

Name of operator	Name of property	County	Minera	Total contract	Actual Government participation	Certification of discovery
Bootman & Boswell	Fieker and Jones tracts	Lawrence	Zinc	$9,869	[1] $2,118	None.
National Lead Co	Mill Creek, John Newcum, U. S., Castor River, Liberty, Higdon, and Turkey Creek areas.	Madison and Bollinger	Lead, copper, cobalt, nickel.	391,540	[2] 209,075	Nov. 12, 1953.
American Zinc, Lead & Smelting Co.	Mineral Hills tract	Franklin	Zinc	65,000	[1] 6,378	None.
Shelton Mining Co	Virginia mine	Jasper	do	14,000	[1] 3,331	May 7, 1953.
Amedee A. Peugnet	Owner	St. Francois	Lead	4,200	[1] 1,941	None.
Do	do	St. Francois and Ste. Genevieve.	do	3,600	[1] 746	Do.
Dale Mining Co	Patterson and Clark tracts	Newton	Zinc, lead	15,552	[2] 2,628	
National Lead Co	Mill Creek, John Newcum, U. S., Castor Creek, Liberty, Higdon, and Turkey Creek areas.	Madison and Bollinger	Lead, copper, cobalt, nickel.	[3]391,540	[4] 251,437	Nov. 12, 1953.
Dale Mining Co	Patterson and Clark tracts	Newton	Zinc, lead	15,552	[2] 6,542	Active.

[1] Final total.
[2] In progress.
[3] Completed June 1953.
Final $22,826.64 being withheld

Exploratory drilling had outlined an ore body about 4,000 feet long and 500 to 600 feet wide. The height of the ore body ranges from 8 to 60 feet, with some thicknesses up to 150 feet. A circular 3-compartment shaft, 12 feet 7 inches inside diameter when completed with a 12-inch concrete lining, was sunk to a depth of 930 feet by September 1952. The open-stope method of mining will be used, and production was expected to begin during the latter half of 1953. The mine will be wholly mechanized, using drillmobiles, mobile ramps with scrapers, and trackless haulage. A 2,000-ton daily capacity gravity-flotation mill was being built at the mine site.

National Lead Co. began building a chemical plant to recover cobalt, nickel, and copper contained in an iron concentrate produced at the Madison mill.

Defense Minerals Exploration Administration Contracts.—During 1952 the program of the Defense Minerals Exploration Administration continued to encourage systematic investigation of strategic and critical mineral occurrences. Financial assistance extended under the Government contracts was repayable from royalties on ore discovered and subsequently mined. The projects listed in table 2 were active under the program during 1952.

Defense Materials Procurement Agency.—The Defense Materials Procurement Agency is one of the agencies created under authority of the Defense Production Act of 1950 to be responsible for procuring metals, minerals, and other materials here and overseas and to encourage production of such materials.

The projects listed in table 2 were active under the program during 1952.

EMPLOYMENT IN MINERAL INDUSTRIES

Employment in the nonmetallic industries in 1952 remained the same as in 1951. Serious curtailment of lead-zinc mining in southwest Missouri late in 1952 resulted in unemployment among metal miners. Most of these workers found employment in the defense industries in the surrounding territory.

Accidents.—No major disaster (fatal injury of five or more workers) was reported in the fuel, metal, and nonmetal industries in 1952.

Wages.—Wages and annual incomes of all mineral industry workers in 1952, except lead-zinc miners in southwest Missouri, equaled or exceeded those of 1951 and were in line with the wages of other industrial workers in the State. Incomes of lead-zinc miners decreased in 1952, the result of curtailed overtime and bonus payments and some unemployment.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—The 2,954,450 tons of coal valued at $12,048,141 produced in Missouri in 1952 was 10 percent less in quantity and value than in 1951 (table 3). This output originated in 20 counties, 6 of which had production exceeding 100,000 tons; they were Bates, Callaway, Henry, Macon, Randolph, and St. Clair Counties.

TABLE 3.—Coal production, 1943–47 (average) and 1948–52

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton [1]			Total	Average per ton [1]
1943–47 (ave.)	4,208,050	$11,588,020	$2.75	1950	2,963,081	$12,368,575	$4.17
1948	4,022,488	15,687,700	3.90	1951	3,269,283	13,405,436	4.10
1949	3,647,456	14,919,384	4.09	1952	2,954,450	12,048,141	4.08

[1] Value received or charged for coal f. o. b. mine, including selling cost. (Includes value for coal not sold but used by producer, such as mine fuel and coal coked as estimated by producer at average prices that might have been received if such coal had been sold commercially.)

Natural Gas.—Limited quantities of natural gas continued to be produced in Cass, Clay, and Platte Counties in 1952. Production (16,000,000 cubic feet) was 14 percent greater than in 1951.

Petroleum (Crude).—A small volume of petroleum was produced in Missouri in 1952.

METALS

Source minerals of several minor metals, such as cadmium, germanium, gallium, and indium, occur as trace or minute quantities in the lead and zinc ores of Missouri and are recovered in part as byproducts from the flue dusts collected in the zinc-smelting process. Since smelters commingle ores from numerous sources; and, as an assay is seldom made of these minor metals, it is impossible to determine in what State they originated.

Cobalt.—A processing plant for recovering cobalt from the lead-copper ores in the Fredericktown area of southeast Missouri by a chemical method was being constructed in 1952.

Copper.—Missouri has been a consistent producer of limited quantities of copper obtained from the lead-copper ores of Madison County and, to a smaller extent, from the lead ores of St. Francois County. The 2,576 tons of copper produced in 1952 was 6 percent more than the 1951 output (table 4). The copper concentrates were shipped to a Texas smelter for reduction.

Iron Ore.—The 1952 production of iron ore in Missouri increased 56 percent (to 268,218 long tons of usable ore) from 1951. Production originated in Butler, Howell, and St. Francois Counties. The ore occurs as hematite in St. Francois County and as limonite in Butler County. Decreased production was anticipated from the Iron Mountain open-pit mine of the Ozark Ore Co., as the ore reserves were being rapidly depleted. The ore occurs as a hard, specular hematite in igneous rocks and must be beneficiated for a marketable product. The underground operation was being expanded.

Lead.—The mine production of recoverable lead in Missouri increased 4 percent to 129,245 tons in 1952 compared to 1951, notwithstanding a 3-percent decrease in value to $41,616,890 as metal prices declined steadily the latter half of 1952 (table 4). Southeast Missouri furnished 95 percent of this output, and southwest Missouri was responsible for the remaining 5 percent. St. Joseph Lead Co. was the largest lead producer in the State as well as the Nation in 1952. Production of recoverable lead in southeast Missouri was 122,942 tons in 1952, approximating the 1951 figure (122,318 tons). Declining

lead prices during 1952 did not affect this output, as in other mining regions. Southwest Missouri recoverable lead production showed a marked increase in 1952 to 6,303 tons compared to 1,384 tons in 1951. The increase was due primarily to increased open-pit mining in the southwest region and, to a smaller extent, to the numerous small "gouger" outputs from old mines.

Nickel.—A plant to recover nickel as well as cobalt from southeast Missouri lead-copper ores was being constructed at Fredericktown, Madison County.

Silver.—Production of silver in Missouri depends entirely upon the quantity of lead bullion from southeast Missouri lead concentrates that is desilverized. Thus, in 1952, 517,432 ounces of silver, valued at $468,302 was recovered from the base bullion, while in 1951 only 184, 424 ounces valued at $166,913 was recovered (table 4).

Zinc.—Mine production of recoverable zinc in Missouri increased to 13,986 tons in 1952, a gain of 22 percent over 1951. (table 4). Southwest Missouri supplied 72 percent of the 1952 zinc production, the major portion of which came from open-pit operations, while the remaining 28 percent was recovered from treatment of southeast Missouri lead ores. Mine production in the southwest region dropped during the last six months of 1952, as depressed lead and zinc prices forced many small mines to close. The southwest region is discussed further in the Tri-State district report.

TABLE 4.—Mine production of silver, copper, lead and zinc, 1943–47 (average) and 1948–52 and total 1860–1952, in terms of recoverable metals

Year	Mines producing	Material sold or treated		Silver	
		Crude ore (short tons)	Old tailings (short tons)	Fine ounces	Value
1943–47 (average)		[1] 7,960,580	456,990	92,270	$70,590
1948	90	4,520,103	1,178,751	114,187	103,345
1949	60	5,981,312	1,417,098	123,413	111,695
1950	68	6,384,138	1,036,002	236,273	213,839
1951	54	6,499,122	1,574,379	184,424	166,913
1952	67	7,128,550	1,750,818	517,432	468,302
1860–1952		[2]	[2]	5,431,326	4,055,103

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1943–47 (average)	2,330	$699,700	161,500	$30,893,990	25,700	$5,915,440	$37,579,720
1948	2,370	1,028,580	102,288	36,619,104	6,463	1,719,158	39,470,187
1949	3,670	1,445,980	127,522	40,296,952	5,911	1,465,928	43,320,555
1950	2,982	1,240,512	134,626	36,349,020	8,189	2,325,676	40,129,047
1951	2,422	1,172,248	123,702	42,800,892	11,476	4,177,264	48,317,317
1952	2,576	1,246,784	129,245	41,616,890	13,986	4,643,352	47,975,328
1860–1952	[3] 35,453	12,379,386	8,949,288	1,173,353,880	3,680,456	486,173,079	1,675,961,448

[1] Includes tailings in 1945–47.
[2] Data not available.
[3] Includes small quantity from Wisconsin.

TABLE 5.—Mine production of silver, copper, lead and zinc in 1952, by classes of ore or other sources of material, in terms of recoverable metals

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	8,077,894	517,432	2,576	127,545	3,979
Zinc ore	46	632,524			728	8,217
Zinc-lead ore	3	168,950			972	1,790
Total	67	8,879,368	517,432	2,576	129,245	13,986

[1] Includes lead-copper ore from 1 mine and 1,750,818 tons of old tailings remilled, concentrates from which were mixed with those from crude ore.

TABLE 6.—Tenor of lead and zinc ore, old tailings, and slimes milled and concentrates produced in 1951–52, by districts

	Southeast Missouri		Southwest Missouri	
	1951—Crude ore [1]	1952—Crude ore [1]	1951—Crude ore	1952—Crude ore
Total ore, etc., milled—short tons	7,359,441	7,899,424	714,060	979,944
Total concentrate produced:				
Lead—do	176,764	178,746	1,767	8,113
Zinc—do	4,475	5,703	17,370	18,671
Ratio of concentrate to ore, etc.:				
Lead—percent	2.40	2.26	0.25	0.83
Zinc—do	0.06	0.07	2.43	1.91
Metal content of ore, etc.: [2]				
Lead—do	1.66	1.56	0.19	0.64
Zinc—do	0.03	0.05	1.29	1.03
Average lead content of galena concentrates—do	70.66	70.21	80.08	79.28
Average zinc content of sphalerite concentrates—do	56.54	57.90	58.85	60.21
Average value per ton:				
Galena concentrates	$183.77	$186.44	$239.87	$209.68
Sphalerite concentrates	113.89	111.82	119.45	114.51

[1] Includes old tailings remilled: 1951—1,574,379 tons; 1952—1,750,818 tons.
[2] Figures represent metal content of crude ore ("dirt") only insofar as it is recovered in the concentrate; data on tailing losses not available.

TABLE 7.—Mine production of silver, copper, lead and zinc in 1952, by months, in terms of recoverable metals

Month	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	49,934	266	11,986	1,219
February	43,680	211	11,008	1,330
March	43,438	245	10,561	946
April	45,167	238	11,211	1,039
May	41,404	228	10,542	1,681
June	41,647	202	10,358	982
July	43,228	188	10,861	1,124
August	38,812	189	9,867	817
September	42,032	230	10,527	1,033
October	48,025	188	12,278	1,366
November	40,154	186	10,058	1,267
December	39,911	205	9,988	1,182
Total: 1952	517,432	2,576	129,245	13,986
1951	184,424	2,422	123,702	11,476

TABLE 8.—Weekly quoted prices for 60-percent zinc concentrates and 80-percent lead concentrates at Joplin in 1952

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. 5–May 31	$135.00	Sept. 13–20	$96.50	Jan. 5–Apr. 26	$245.95	Oct. 25–Nov. 1	$166.50
June 7	115.00	Sept. 27–Oct. 18	92.50	May 3–10–17	217.35	Nov. 8	173.70
June 14–21	107.50	Oct. 23–Nov. 1	90.00	May 24–June 14	188.55	Nov. 15–22	180.90
June 28–Aug. 2	100.00	Nov. 8–Dec. 31	84.00	June 21	195.75	Nov. 29–Dec. 20	173.70
Aug. 9–Sept. 6	92.50			June 28–Oct. 4	202.95	Dec. 27–31	184.50
				Oct. 11–18	188.10		

TABLE 9.—Mine production of lead and zinc in southeast and central Missouri, 1943–47 (average) and 1948–52, in terms of concentrates and recoverable metals [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
1943–47 (average)	223,770	$22,742,020	1,820	$67,010	157,520	$30,154,540	750	$172,300
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
1951	176,764	32,484,309	4,475	509,658	122,318	42,322,028	[7] 2,277	828,828
1952	178,746	33,325,589	5,703	637,709	122,942	39,587,324	[7] 3,872	1,285,504

[1] Based on southeast 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 zinc recovered from byproduct matte from lead smelting as follows: 1951, 138 tons; 1952, 900 tons.

TABLE 10.—Mine production of lead and zinc in southwest Missouri, 1943–47 (average) and 1948–52, in terms of concentrates and recoverable metals [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
1943–47 (average)	5,260	$737,230	90	$12,260	46,720	$5,123,350	1,040	$7,670	3,980	$739,450	24,950	$5,743,140
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
1951	1,767	423,857	------	--------	17,370	2,074,867	------	--------	1,384	478,864	9,199	3,348,436
1952	8,113	1,701,121	------	--------	18,671	2,138,108	------	--------	6,303	2,029,566	10,114	3,357,848

[1] Based on southwest 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.

TRI-STATE DISTRICT

The 6,140,155 tons of crude ore and 604,350 tons of old tailings treated in the Tri-State district of Oklahoma, Kansas, and southwest Missouri in 1952 yielded 36,333 tons of lead concentrates and 167,474 tons of zinc concentrates, containing 27,356 tons of recoverable lead and 90,512 tons of recoverable zinc (table 11).

Twenty mine mills and 2 tailings mills were operating during the year. Nine of the mine mills treated only the ores from company mines; the other 11 mine mills handled custom ores. These mills ranged in size from the large Central mill of the Eagle-Picher Co., with a daily capacity of 15,000 tons, to the smaller mills having a daily capacity of around 1,000 tons. The larger part of the ores from Oklahoma and Kansas were sent to custom mills; the Central mill received the greater portion of this custom tonnage. The re-treatment of old tailings and slimes continued to decline during the year, resulting in the closing of both tailings mills by the end of the year.

There were 319 mines operating in the district during the year, of which 67 were in Missouri. Many of these mines began closing during the latter half of the year, when lead-concentrate prices dropped from $246 a ton to $184 and zinc-concentrate prices from $135 a ton to $84, a 22-percent loss for lead and a 36-percent loss for zinc. By the end of the year 107 Tri-State mines and 5 mills had closed.

TABLE 11.—Mine production of lead and zinc concentrates in the Tri-State district, 1943–47 (average) and 1948–52

Year	Lead concentrates (galena)		Zinc concentrates (sphalerite)		Recoverable metal content			
					Lead		Zinc	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	35,500	$5,016,630	290,680	$31,044,500	26,790	$5,164,670	155,690	$35,822,130
1948	35,862	8,302,564	159,609	13,929,151	26,901	9,630,558	84,839	22,567,174
1949	41,471	7,824,788	147,178	11,445,018	30,883	9,759,028	78,628	19,499,744
1950	40,714	6,245,660	150,019	13,934,927	31,157	8,412,390	80,558	22,878,472
1951	36,300	7,720,550	170,263	21,023,818	26,906	9,309,476	91,553	33,325,292
1952:								
Kansas	7,747	1,582,699	47,077	5,685,236	5,916	1,904,952	25,482	8,460,024
Southwest Missouri	8,113	1,701,121	18,671	2,138,108	6,303	2,029,566	10,114	3,357,848
Oklahoma	20,473	4,104,934	101,726	11,714,605	15,137	4,874,114	54,916	18,232,112
Total 1952	36,333	7,388,754	167,474	19,537,949	27,356	8,808,632	90,512	30,049,984

TABLE 12.—Tenor of ore and concentrates in Tri-State district, 1948–52

	1948	1949	1950	1951	1952
Total material milled:					
Crude ore, short tons	4,314,190	4,470,778	4,700,698	5,990,100	6,140,155
Tailings and slimes, do	2,595,903	1,602,620	967,926	746,673	604,350
Ratio of concentrates to material milled:					
Lead, percent	0.52	0.68	0.72	0.54	0.54
Zinc, do	2.31	2.42	2.65	2.53	2.48
Metal content of material milled:					
Lead, percent	0.39	0.51	0.55	0.40	0.41
Zinc, do	1.23	1.29	1.42	1.36	1.34
Average lead content of galena concentrates, do	76.53	75.98	78.08	75.62	76.79
Average zinc content of sphalerite concentrates, do	59.04	59.36	59.66	59.74	60.04
Average value per ton:					
Galena concentrates	$231.51	$188.68	$153.40	$212.69	$203.36
Sphalerite concentrates	87.27	77.76	92.89	123.48	116.66

TABLE 13.—Mine production of lead and zinc in southeast and southwest districts in 1952, by months, in terms of recoverable metals

Month	Southeast Missouri		Southwest Missouri		Month	Southeast Missouri		Southwest Missouri	
	Lead (short tons)	Zinc (short tons)	Lead (short tons)	Zinc (short tons)		Lead (short tons)	Zinc (short tons)	Lead (short tons)	Zinc (short tons)
January	11,496	353	490	866	August	9,192	420	675	397
February	10,545	358	453	972	September	9,715	343	812	690
March	10,270	326	291	620	October	11,359	135	919	1,231
April	10,796	344	415	695	November	9,390	193	668	1,074
May	10,127	270	415	1,411	December	9,594	301	394	881
June	9,933	393	425	589					
July	10,515	436	346	688	Total	123,942	3,872	6,303	10,114

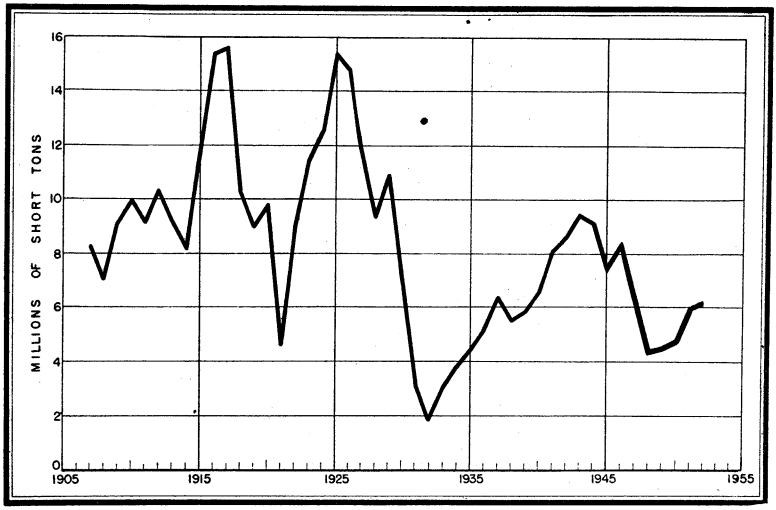

FIGURE 1.—Quantity of crude ore (rock) milled in the Tri-State district, 1907–52.

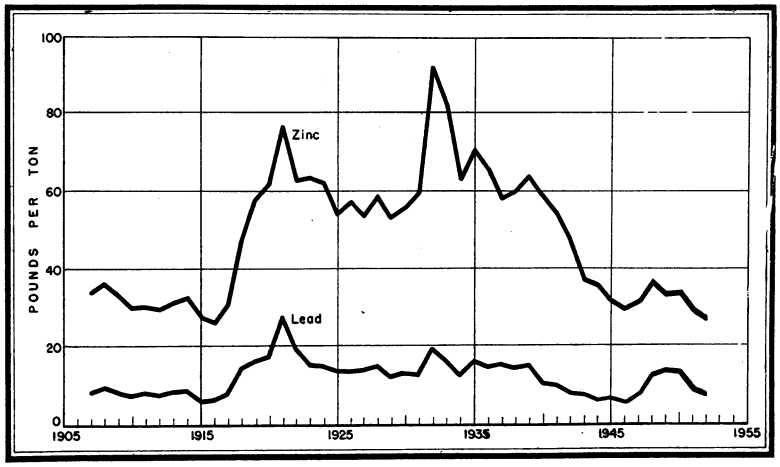

FIGURE 2.—Metal recovered per ton of crude ore (rock) milled in the Tri-State district, 1907–52.

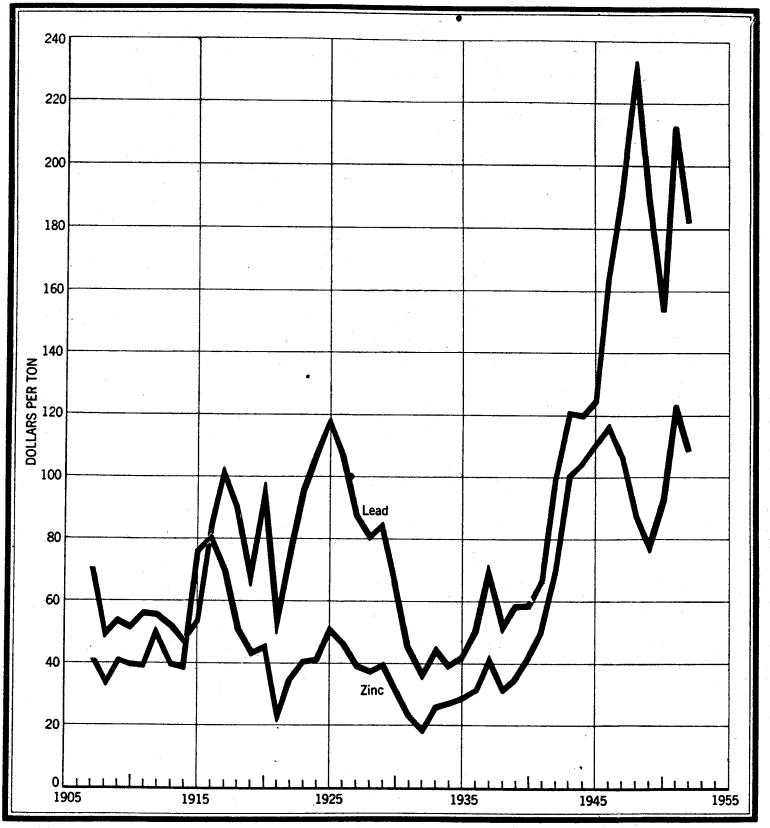

FIGURE 3.—Average prices received by sellers per ton of concentrate in the Tri-State district, 1907–52.

NONMETALS

Barite.—Crude barite production was reported from Hickory and Washington Counties. Barite sold or used in 1952 amounted to 304,080 tons, with an estimated value of $2,919,795 (table 14). Of this quantity, Washington County produced all but 200 tons which came from Hickory County.

During the year Fred Hornsey & Co., a prominent operator in Washington County, leased a large acreage of land north of Potosi and began to erect a new washing plant, which was expected to be ready for operation some time in 1953.

It was also reported that a central washing plant was to be erected near Eldon in the central Missouri area, but construction was delayed. There was no other activity in this area.

In Washington County barite occurs primarily in the residual clay derived by weathering from the Potosi and Eminence formations. It is recovered by removing the clay in log washers and then jigging the washed product to separate the barren rock fragments. In central Missouri barite occurs in residual clays derived from the Gasconade, Jefferson City, and Mississippian formations and also in "filled-sink" and "circle" deposits.

TABLE 14.—Domestic barite sold or used by producers, 1943–47 (average) and 1948–52

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton			Total	Average per ton
1943–47 (ave.)	212,570	$1,681,800	$8.00	1950	212,736	$1,924,520	$9.05
1948	278,071	2,413,802	8.68	1951	281,895	2,697,200	9.57
1949	186,891	1,497,985	8.02	1952	304,080	2,919,795	9.60

Cement.—Cement plants in Cape Girardeau, Ralls, Jackson and St. Louis Counties produced the entire output of portland cement in Missouri; it totaled 10,086,850 barrels valued at $25,523,038 (table 15). St. Louis County, with 2 cement plants within its boundaries, led the others in cement produced.

Crushed limestone used in the manufacture of cement amounted to 2,584,019 short tons. Shale, clays, and other raw mineral products consumed totaled over 400,000 tons.

TABLE 15.—Production and shipments of portland cement, 1943–47 (average) and 1948–52, in 376-pound barrels

Year	Production (barrels)	Shipments			Year	Production (barrels)	Shipments		
		Barrels	Value	Average per barrel			Barrels	Value	Average per barrel
1943–47 (ave.)	5,194,096	5,225,293	$9,049,732	$1.73	1950	9,777,855	9,779,657	$22,751,226	$2.33
1948	8,503,012	8,428,343	17,911,257	2.13	1951	10,230,449	10,217,421	25,760,473	2.52
1949	8,791,943	8,518,636	19,347,814	2.27	1952	10,007,609	10,086,850	25,523,038	2.53

Clays.—Missouri fire clay was produced in two districts, a northern district and a southern district, separated roughly by the Missouri River. The northern district included all, or parts, of the following counties: Audrain, Boone, Callaway, Montgomery, Monroe, and Pike.

TABLE 16.—Clays sold or used by producers 1943–47 (average) and 1948–52, by kinds

Year	Fire clay		Diaspore		Burley		Miscellaneous		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (ave.)	1,161,150	$2,290,260	40,910	$303,230	52,380	$174,220	375,740	$230,110	1,630,180	$2,997,820
1948	1,406,115	4,033,716	52,255	565,163	38,393	225,003	638,784	485,246	2,135,547	5,309,128
1949	1,133,357	3,136,207	35,359	398,885	32,432	204,850	618,914	473,643	1,820,062	4,213,585
1950	1,126,855	3,208,584	40,750	488,464	53,571	334,299	725,551	624,921	1,946,727	4,656,268
1951	1,453,721	8,249,535	45,020	704,151	73,781	745,032	782,335	859,720	2,354,857	10,558,438
1952	1,734,612	9,089,960	44,757	705,269	71,433	664,358	1,140,217	1,638,833	2,991,019	12,098,420

The southern district comprised all, or parts, of the following counties: Cole, Crawford, Franklin, Gasconade, Maries, Miller, Moniteau, Morgan, Osage, and Phelps.

Production for the 2 districts amounted to 1,850,802 tons of fire clay valued at $10,459,587. Audrain County led the northern district, with an output of 460,512 tons of fire clay valued at $2,514,492; Gasconade County produced 372,474 tons valued at $2,294,597 to lead the southern district counties.

Lime.—Lime was produced in Greene, Newton, Marion, St. Francois, and Ste. Genevieve Counties. It is interesting to note that producers have chosen areas where high-calcium limestone is available, regardless of proximity to large centers of industry. St. Francois County produces dead burned dolomite, but the other counties produce a high-calcium lime.

Lime production in 1952 totaled 1,130,970 short tons valued at $11,326,941 (table 17). Ste. Genevieve County was the leading producer, followed by St. Francois, Greene, Marion, Newton, and Barry Counties.

TABLE 17.—Lime (quick and hydrated) sold by producers, 1943–47 (average) and 1948–52

Year	Quicklime			Hydrated lime			Total	
	Short tons	Value		Short tons	Value		Short tons	Value
		Total	Average per ton		Total	Average per ton		
1943–47 (average)	660,070	$4,414,920	$6.70	202,810	$1,552,200	$7.65	862,880	$5,967,100
1948	807,850	6,934,676	8.58	202,143	2,064,015	10.21	1,009,993	8,998,691
1949	723,935	6,371,452	8.80	154,626	1,663,665	10.76	878,561	8,035,117
1950	853,728	7,536,095	8.83	181,448	1,911,574	10.54	1,035,176	9,447,669
1951	930,132	9,120,070	9.81	192,167	2,165,807	11.27	1,122,299	11,285,877
1952	949,572	9,181,801	9.67	181,398	2,145,140	11.83	1,130,970	11,326,941

Mineral Wool.—Mineral wool is manufactured in Missouri by the Eagle-Picher Co. at Joplin from lead-smelter slag, finely crushed flint chats, and waste from the lead and zinc mines.

Columbia Rock Wool Sales, Inc., the only other producer in Missouri, manufactures a product called "rock wool" in its plant at Easley, on the Missouri River, in Boone County. The dolomitic Sedalia limestone formation occurring in that vicinity is well adapted to the manufacture of an almost pure white rock wool product.

The terms "mineral wool" and "rock wool" are generally applied to the products manufactured from natural rock and smelter slag. Glass wool and fiber glass are considered to be in a separate category.

Perlite.—Crude perlite obtained from deposits in Western States was expanded at a plant in St. Louis County.

Sand and Gravel.—Over 30 counties have reported the production of sand and gravel during the year. The types of sand and gravel ranged from common creek-bed material to high-quality sand suitable for glassmaking. Sand and gravel for building and paving purposes are obtained from widely scattered points throughout the State. Sand

used in making glass, and for other special purposes, is obtained from outcrops of the St. Peter formation in St. Charles, Jefferson, and St. Louis Counties. Much of it is produced by underground mining methods. The Pittsburgh Plate Glass Co. has a large manufacturing plant and mine near Crystal City. Chats, which are also included under sand and gravel, are a product of mining operations and are produced as a byproduct of lead, zinc, and iron mining. The chats from lead and zinc mining in the Tri-State district are essentially chert or flint. In the southeast Missouri lead-mining district, the chat is dolomite; and at Iron Mountain, where iron ore is produced, the chat consists of rhyolite of pre-Cambrian age.

Total sand and gravel production amounted to 6,790,422 tons valued at $6,122,195 (table 18).

TABLE 18.—Sand and gravel sold or used by producers, 1943–47 (average) and 1948–52

Year	Commercial operations		Government-and-contractor operations		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	3,618,620	$3,014,400	[1] 391,200	[1] $160,300	4,009,820	$3,174,700
1948	4,290,504	3,895,490	596,107	302,432	4,886,611	4,197,922
1949	4,458,246	3,907,405	735,426	439,276	5,193,672	4,346,681
1950	5,316,073	4,812,518	916,338	455,421	6,232,411	5,267,939
1951	6,027,503	5,419,034	782,354	550,815	6,809,857	5,969,849
1952	5,695,296	5,417,628	1,095,126	704,567	6,790,422	6,122,195

[1] 1944–47 average.

Stone.—The stone produced in Missouri includes sandstone, limestone, marble, and granite. It is marketed as crushed and dimension stone. Crushed stone includes stone used for agricultural purposes, concrete and road metal, railroad ballast, and many other purposes. Dimension stone includes marble, cut stone, rough building stone, and monumental stone.

Approximately 80 counties reported stone production of 1 kind or another. Total production amounted to 15,106,544 short tons valued at $20,676,958 (table 19). Jackson County was the leading county in overall stone production, with 2,408,189 tons valued at $3,464,060. Jasper and Greene Counties marketed cut and polished limestone under the trade name of "marble."

Granite production in Missouri was confined to Iron County.

Asphaltic sandstone used in road surfacing was quarried in Vernon County.

Tripoli.—The American Tripoli Co. processes tripoli in its plant at Seneca, Newton County. Most of the raw material is now quarried across the State line in Ottawa County, Okla. but is ground in the mill at Seneca.

The raw material, a product of weathering of siliceous limestone and chert, is quarried and stored in large, openside sheds for drying. After a period of air drying, it is sorted for color and processed into the final product, which is used extensively for abrasive polishing and buffing compounds in the metal-finishing trades. It is also used as a chemically inert filler and for foundry facings.

TABLE 19.—Stone sold or used by producers, 1948–52, by kinds

Year	Granite		Marble		Limestone		Sandstone		Miscellaneous stone [1]		Total stone	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1948	5,790	$130,945	6,820	$471,895	7,583,620	$10,951,312	[2]	[2]	1,424,350	$766,068	[3] 9,020,580	[3] $12,320,220
1949	6,910	176,902	6,330	672,711	8,379,320	12,444,046	92,800	$241,083	1,077,410	434,266	9,562,720	13,969,008
1950	4,490	161,935	13,170	743,135	8,923,470	12,981,437	1,060	20,315	1,358,210	499,805	10,300,400	14,406,627
1951	7,834	168,607	[4]	[4]	8,856,795	13,532,757	[4]	[4]	2,418,207	909,222	11,294,227	15,255,427
1952	11,618	149,196	[4]	[4]	12,709,705	18,877,717	[4]	[4]	2,372,812	889,254	15,106,544	20,676,958

[1] Chats; also includes small quantity of stone.
[2] Figures withheld to avoid disclosing individual company operations.
[3] Excludes sandstone. Bureau of Mines not at liberty to publish.
[4] Figure withheld to avoid disclosure of individual company operations. Included in total.

REVIEW BY COUNTIES[5]

ADAIR

Crushed limestone for agricultural and road-building purposes was quarried in the vicinity of Kirksville.

ANDREW

Crushed limestone was produced for use in road building and for agricultural purposes. Broken stone was quarried locally for use in riprapping the banks of the Missouri River at various points to prevent erosion.

AUDRAIN

Audrain County produced crushed limestone for agricultural and road-building purposes. The county also produced a substantial quantity of fire clay and finished fire-clay products.

BATES

Producers reported stone quarried for riprap, road construction, and agricultural uses at three widely separated places within the county. Stream-bed gravel was also produced in the county.

BOONE

Producers reported limestone quarried near Columbia and north of Jefferson City for use as riprap, in road construction, and as agricultural limestone. One producer quarried a dolomitic limestone for use in manufacturing rock wool near Easley. Fire clay and shale were produced at several places within the county and then processed locally into such finished products as refractory brick, common building brick, and structural and hollow tile. Gravel for miscellaneous uses was obtained from stream beds within the county.

BUCHANAN

Limestone was quarried near Agency and Rushville for use in road construction and as a soil-conditioning agent. Limestone was quarried at 1 or 2 other points and used for riprapping the banks of the Missouri River.

River sand was obtained for use in building construction and paving work. Shale was quarried and processed in a local plant to produce common building brick and tile.

BUTLER

Sand and gravel from stream beds were produced at several places in the county for use in building and road construction. A small quantity of pottery clay was mined from deposits near Poplar Bluff. Iron ore was reported from the Williamsville area.

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[5] Oil and gas data taken from the State's published reports. Ver Wiebe, W. A., Goebel, E. D., Jewett J. M., and Hornbaker, A. L., Oil and Gas Developments in Kansas during 1952: State Geol. Survey of Kansas, Bull. 103, 187 pp.

CALDWELL

Crushed limestone for agricultural and road-building purposes was quarried near Nettleton and Kingston.

CALLAWAY

Limestone was quarried near Auxvasse for use in road-building and agricultural purposes. Flint and plastic fire clays were mined at several places in the county.

CAPE GIRARDEAU

Limestone was quarried near Old Appleton, Cape Girardeau, and Oak Ridge for use as riprap, concrete mix, road surfacing, agricultural limestone, and in manufacturing cement. Common red clay was mined locally for use in manufacturing common building brick. Sand and gravel for paving and building purposes were obtained near Jackson and Cape Girardeau.

CARROLL

Limestone was quarried at 1 or 2 places for use in riprapping the banks of the Missouri River, which forms the southern boundary of the county.

CASS

Limestone was quarried near Drexel, Harrisonville, Peculiar, and Archie for use in building construction, highway construction, and soil improvement. Common building brick and tile were manufactured at a plant near Harrisonville. Raw clay for that purpose was mined locally.

CEDAR

Limestone was quarried and crushed near Stockton for use as a soil-conditioning agent.

CHARITON

Limestone was quarried for use in agriculture and as a refractory in steel furnaces.

CHRISTIAN

Limestone was quarried near Billings for road-construction purposes, and gravel was obtained locally for the same purpose.

CLARK

Limestone was quarried near Kahoka for agricultural use and road building.

CLAY

Commercial producers quarried limestone at several places in the county for use as riprap and agricultural limestone and in road construction. County crews produced some crushed stone for use on county road projects.

CLINTON

Limestone was produced from quarries near Plattsburg and was used in road construction, as agricultural limestone, and as riprap.

COLE

Some limestone was quarried near Eugene. It was used as riprap and agricultural limestone. Sand and gravel were obtained from deposits near Jefferson City and along the Osage River. They were used chiefly in building and paving and road construction. Common red clay was mined and used in manufacturing building brick.

COOPER

Limestone was quarried near Boonville and Bunceton for use as rough building stone, riprap, agricultural limestone, and in road construction.

CRAWFORD

Agricultural limestone was quarried near Cuba. Stream gravel was obtained locally for paving and building purposes. High-quality fire clay was mined from pits near Cuba and Leasburg. This was shipped out of the county for processing.

DADE

Limestone for concrete, road metal, and agricultural purposes was quarried near Lockwood.

DAVIESS

Limestone was quarried for use as riprap, agricultural limestone, and in road construction.

DE KALB

Crushed limestone for road construction and agricultural purposes was produced from two quarries within the county.

DENT

Dolomite was quarried near Salem and was used for agricultural purposes.

DOUGLAS

Stream gravel was obtained near Ava for use in road-construction purposes.

DUNKLIN

Stream gravel was produced for building purposes.

FRANKLIN

Dolomite was quarried at widely separated points in the county by both commercial producers and county crews. It was used primarily in road construction and maintenance and in agriculture as a soil conditioner. Sand and gravel for use in building construction, road construction, and maintenance were obtained from fluvial deposits in the county.

Franklin County is in the southern clay district and produced clays ranging from flint fire clay to high-alumina diaspore.

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GASCONADE

Gasconade County is also in the southern clay district and produced high-grade fire clays from such widely separated points as Hermann, Bland, Swiss, Rosebud, and Owensville. Dolomite was quarried for use in riprapping the banks of the Missouri River, which forms the northern boundary of the county.

GENTRY

Limestone was quarried near King City for use in road construction and maintenance. Sand and gravel were produced at 1 or 2 points for use in building and road construction.

GREENE

Limestone was quarried near Phenix. It was cut, polished, and marketed under the trade name of "marble." Limestone was quarried near Springfield for use in road construction and maintenance and for soil improvement. Quarries at Galloway and Springfield produced a considerable tonnage of limestone for use in manufacturing quick and hydrated lime.

GRUNDY

Limestone was quarried near Trenton. The bulk of the production was marketed as agricultural limestone. Minor quantities were used as riprap and road surfacing.

HARRISON

Limestone was quarried near Ridgeway and Bethany for use in concrete, road metal, and soil conditioning.

HENRY

Limestone was quarried at several points in the county for use in concrete, road surfacing, and soil conditioning. Minor quantities were sold as blast-furnace flux.

HICKORY

Barite was produced near Hermitage.

HOLT

Limestone was quarried near Oregon for use in stabilizing banks along the Missouri River.

HOWARD

Sandstone for building purposes was quarried near Glasgow. Limestone for agriculture, concrete, and road metal was quarried near Roanoke.

HOWELL

Dolomite for agricultural limestone, concrete, and road surfacing was quarried near West Plains. Brown iron ore was mined eight miles south of West Plains.

IRON

Granite was quarried near Graniteville for use as building and monumental stone. Quarry waste was marketed as rubble and the finer crushed material went for road metal. Dolomite was quarried at 1 or 2 places for use in concrete and road metal.

JACKSON

Limestone was quarried at several places in Jackson County for use in concrete and road metal, and as agricultural stone. Minor quantities went for rough building stone and railroad ballast. One quarry near Independence produced limestone for the manufacture of portland cement. Shale was also quarried locally for this same purpose and for the manufacture of bricks.

Sand for paving work, engine sand, and sand for miscellaneous uses was obtained from deposits near Kansas City.

JASPER

Limestone was quarried, cut, and then polished near Carthage. It was marketed over a wide area under the trade name of "marble." Other quarries produced crushed limestone for concrete, road metal, agricultural limestone and various items such as stock and poultry grit, sugar refining, and glass manufacture.

Zinc and lead ores were mined and milled in the Joplin-Webb City district. Chats from these and former lead-zinc mining operations were utilized mainly as railroad ballast and road metal. Stream sand and gravel were produced to supply the demand for building and paving material.

JEFFERSON

Plate glass was manufactured near Crystal City. Sandlime bricks were manufactured at Pacific. The basic raw material, silica sand, was obtained from the St. Peter formation, which was quarried near Crystal City, Festus, and Pacific. Sand and gravel for paving and miscellaneous uses were obtained locally from creek beds.

Limestone and dolomite were quarried near House Springs and Hillsboro for use in concrete, in road metal, and for use as agricultural limestone.

JOHNSON

Limestone for use in agriculture, concrete, and road building and repair was quarried near Warrensburg.

KNOX

Limestone for concrete, road metal, and agricultural purposes was quarried in the vicinity of Edina.

LAFAYETTE

Limestone for concrete, road metal, and bank stabilization was quarried near Higginsville. Red clay and shale were obtained locally for use in manufacturing common brick, structural and drain tile near Higginsville.

LEWIS

Limestone for agricultural purposes was quarried near Monticello.

LINCOLN

Limestone for bank stabilization, road metal, and agricultural limestone was quarried near Elsberry. Clay was mined locally and then used in the manufacture of tile products near Winfield.

LIVINGSTON

Limestone for riprap, agricultural limestone, concrete, and road metal was quarried near Sampsel and Avalon. Shale was quarried locally and manufactured into building brick and tile at Chillicothe and Utica.

MACON

Limestone for agricultural purposes, concrete, and road metal was quarried near Atlanta.

MADISON

Gravel was obtained from creek beds near Fredericktown for use in paving and road maintenance. Dolomite was quarried near Fredericktown and marketed as terazzo chips.

Lead, copper, cobalt, and nickel ores were mined from properties near Mine La Motte and Fredericktown.

MARIES

Dolomite for agricultural use was quarried near Belle. High-alumina fire clay was produced from several pits near Belle.

MARION

Quicklime and hydrated lime were produced near Hannibal. Limestone for this and other uses was quarried nearby.

MONITEAU

Limestone for riprap, agricultural limestone, concrete, and road metal was quarried near California and Tipton.

MONROE

Limestone for road metal, concrete, and agricultural purposes was quarried near Paris. Fire clay was mined near Paris and Goss.

MONTGOMERY

Montgomery County lies within the northern fire-clay district and plastic and flint fire clays were mined near Montgomery City, New Florence, and Wellsville. The clays were then processed at refractory-brick plants near New Florence and Wellsville.

Gravel was obtained locally by county crews for use in paving and road maintenance. Limestone for use as agricultural limestone and road metal was quarried near Montgomery City.

MORGAN

Dolomite for concrete, road metal, and agricultural limestone was quarried near Syracuse.

NEWTON

Quicklime and hydrated lime were produced from a limekiln near Neosho. The kiln was supplied with limestone quarried nearby. The American Tripoli Co. operated a mill at Seneca, processing tripoli from Oklahoma deposits.

NODAWAY

Limestone for concrete and road metal was quarried near Ravenwood.

OREGON

Dolomite for agricultural purposes, concrete, and road metal was quarried near Alton. Brown iron ore was mined southwest of Thomasville.

OSAGE

Osage County is in the southern clay belt and supplied high-quality fire clay from pits near Linn. Dolomite for agricultural purposes was quarried near Cooper Hill. Limestone and/or dolomite for riprap was quarried at several points along the Missouri River.

PEMISCOT

Sand and gravel for use in building construction, paving, and road metal were mined from deposits near Caruthersville.

PERRY

Limestone for riprap, concrete, road metal, and agricultural limestone was quarried near Wittenberg and Starland.

PETTIS

Gravel for building, road construction, and other purposes was obtained locally from creek beds. Limestone was quarried near Sedalia and Georgetown for use as agricultural limestone, road metal, and concrete construction.

PHELPS

High-alumina fire clay was mined near St. James. Gravel for paving and construction purposes was mined from local creek deposits. Dolomite for agricultural limestone, concrete, and road construction was quarried near Rolla.

PIKE

Gravel for building purposes, road construction, and railroad ballast was mined from stream deposits near Louisiana. Limestone for concrete, road metal, and agricultural limestone was quarried near Louisiana, Bowling Green, Ashley, and Frankford.

PLATTE

Haydite, an artificial lightweight aggregate made from suitable shales, was produced near New Market. Limestone for use in agriculture was quarried near Edgerton. Stone for riprapping the Missouri River banks was obtained from quarries near Parkville.

POLK

Limestone for agricultural use was quarried near Bolivar, Polk County.

PUTNAM

Putnam County produced limestone for agricultural purposes.

RALLS

Cement was manufactured at a plant near Ilasco. The chief raw materials, high-calcium limestone and shale or clay, were quarried near the plant. Limestone for concrete, road metal, and agricultural limestone was quarried near Huntington.

RANDOLPH

Limestone for concrete, road metal, and agricultural limestone was quarried near Huntsville, Moberly, and Roanoke.

RAY

Limestone for riprap, concrete, road metal, and agricultural limestone was obtained from quarries near Richmond and Orrick.

RIPLEY

Sand for building purposes and gravel for railroad ballast and road surfacing were obtained from deposits near Doniphan.

ST. CHARLES

High-purity silica sandstone, used in manufacturing glass, was quarried near Augusta. Common creek-bed sand was obtained from deposits along the Missouri River and sold for building and road-paving purposes.

Limestone was quarried near St. Charles, Augusta, O'Fallon, and Foristell. The bulk of the production was sold as agricultural limestone. Minor amounts went for riprap, rubble, concrete, and road metal.

ST. CLAIR

Limestone for concrete, road metal, and agricultural limestone was quarried near Osceola.

ST. FRANCOIS

Dolomite was quarried and burned near Bonne Terre for use as a refractory in basic open-hearth steel furnaces.

Lead ore was mined and milled in the Bonne Terre-Desloge-Flat River area. Iron ore was mined at Iron Mountain. Tailings from lead-mining operations were used for agricultural limestone and railroad ballast.

STE. GENEVIEVE

Quicklime and hydrated lime were produced at Ste. Genevieve. Limestone for this and for other purposes, such as agricultural limestone and road metal, was quarried near Ste. Genevieve and 1 or 2 other points in the county.

ST. LOUIS

Cement was produced at two plants in the greater St. Louis area. The basic ingredients, limestone and shale, were quarried near the plants. Fire clay was mined near Ellisville. Fire brick and other refractory products were manufactured near Clayton and in St. Louis. Common building brick, sewer pipe, etc., were manufactured at plants near Affton and Creve Coeur and in St. Louis. Red clay and shale for this purpose were obtained locally.

Sand and gravel for building purposes and road construction and repair were obtained at various points in the county. Rough dimension stone was quarried in the city of St. Louis and near Florissant. Limestone for use as riprap, road metal, railroad ballast, and agricultural limestone was obtained from quarries in St. Louis and from quarries near Lemay, Maplewood, Florissant, and Clayton. Expanded perlite for use as a lightweight aggregate in concrete and plastic was produced at the plant of the Precast Slab & Tile Co., Inc.

SALINE

Limestone for use as agricultural limestone and road metal and for use in concrete was quarried near Gilliam and Marshall. Stone for use as riprap was quarried near Waverly and Miami.

SCOTT

Sand for building purposes was obtained near Sikeston.

SHANNON

Dolomite for agricultural purposes was quarried near Ink and a small quantity of iron ore was reported from around Birch Tree.

SHELBY

Limestone for agricultural use and road building was quarried near Shelbina and Bethel.

STODDARD

Sand and gravel deposits were worked at various places in the county to supply material for building and paving purposes.

SULLIVAN

Limestone for use in concrete, road metal, and agricultural limestone was quarried near Reger.

TEXAS

Dolomite for use as agricultural limestone was quarried near Houston and Raymondville.

VERNON

Gravel for road-building purposes was obtained near Bronaugh. Limestone for concrete and road metal was quarried near Nevada.

WARREN

Fire clay for refractory brick was mined near Warrenton. Gravel for road construction was obtained near Warrenton.

Agricultural limestone was quarried near Marthasville, and limestone for use in riprapping the banks of the Missouri River was obtained from several quarries close to the river.

WASHINGTON

Barite was mined near Potosi, Mineral Point, Cadet, Richwoods, and Palmer. A small quantity of galena was recovered during barite mining and washing operations.

WAYNE

Building sand and paving gravel were obtained from stream deposits near Piedmont and Leeper. Brown iron ore was mined from several properties near Williamsville.

WEBSTER

Limestone and dolomite for use in soil improvement, road metal, and concrete were quarried near Marshfield.

WRIGHT

Dolomite for use as road metal and agricultural limestone was quarried near Norwood.

The Mineral Industry of Montana

By Albert J. Kauffman, Jr.,[1] Kenneth D. Baber,[2] Frank B. Fulkerson[2] and Paul F. Yopes[2]

DURING 1952, the first ore produced by block-caving methods from the multi-million-dollar Greater Butte project was raised through the Kelley shaft. As a result, copper regained first place in value of production among Montana's mineral commodities, after relinquishing the leading position to zinc in 1951. The value of zinc production declined sharply in 1952 because of decreased market prices for the metal. The total value of Montana's mineral output declined nearly $4.8 million (4 percent) from the high level reached in 1951. Copper supplied 25 percent of the production value; zinc, 22 percent; and crude oil and natural gas, 19 percent. Other output contributing major values to the State total included manganese ore, lead, coal, silver, cement, sand and gravel, phosphate rock, and vermiculite. The production of sand and gravel decreased 42 percent in value compared to 1951 after completion of concrete work at Hungry Horse Dam.

Developments in the Williston Basin area of eastern Montana, following the initial discovery of oil in the Montana portion of the basin during July 1951, changed entirely the outlook for the State's oil industry. Oil exploration and drilling crews were active in 1952, and several new fields were brought in.

Preliminary construction was begun on a $45 million aluminum reduction plant in Flathead County; activity was resumed at the Stillwater chromite deposits in Stillwater County; and large deposits of strategic tungsten minerals were explored and developed in Beaverhead County. Montana continued to be the leading State in the production of manganese concentrates and nodules. Further expansion of mining and processing facilities for phosphate rock pointed to additional growth in this important industry.

Silver Bow County, with an output of $73 million, accounted for 60 percent of the value of Montana's mineral production in 1952.

In addition to the mineral values credited to Montana in table 1, there are some that are not included owing to lack of information.

Many ores contain valuable minor constituents, such as arsenic, bismuth, cadmium, cobalt, nickel, platinum-group metals, selenium, tellurium, and some minor metals such as gallium and germanium. These quantities sometimes are not known and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages or credited to mine or origin. These minor constit-

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[2] Commodity-industry analyst, Region II, Bureau of Mines, Albany, Oreg.

uents are recovered at plants that frequently treat mixtures of materials from many sources, including residues from the refining of metals such as copper and lead and those obtained in other ways. It is not possible in many such instances to distribute the mineral products by States of origin, and sometimes it is even difficult to make an accurate separation as to domestic and foreign sources. Another mineral product of value, the production of which usually cannot be separated as to source, is byproduct sulfuric acid. The value of uranium produced cannot be credited inasmuch as such information is not available under existing regulations of the Atomic Energy Commission.

TABLE 1.—Mineral production in Montana, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Antimony ore and concentrate, gross weight	29	(2)		
Clays	39,231	$41,631	51,304	$73,601
Coal:				
Bituminous	2,310,348	6,038,638	2,038,808	5,698,778
Lignite	35,070	123,263	30,550	112,953
Copper (recoverable content of ores, etc.)	57,406	27,784,504	61,948	29,982,832
Fluorspar			16,160	(2)
Gold (recoverable content of ores, etc.), troy ounces	30,502	1,067,570	24,161	845,635
Lead (recoverable content of ores, etc.)	21,302	7,370,492	21,279	6,851,838
Manganese ore (35 percent or more Mn), gross weight	100,562	(2)	100,070	(2)
Manganiferous ore (5 to 35 percent Mn), do	7,598	(2)	9,357	(2)
Natural gas, thousand cubic feet	36,424,000	2,003,000	28,714,000	1,752,000
Natural-gas liquids:				
Natural gasoline, 42-gallon barrels	113,000	392,000	(2)	(2)
LP-gases, do	164,000	481,000	(2)	(2)
Petroleum (crude), do	8,958,000	22,130,000	[3] 9,606,000	[3] 21,610,000
Phosphate rock, long tons	304,507	2,353,381	332,299	2,620,764
Sand and gravel	9,582,843	6,201,888	6,765,955	3,579,932
Silver (recoverable content of ore, etc.), troy ounces	6,393,768	5,786,683	6,138,185	5,555,367
Stone (except limestone for cement and lime)	871,508	986,327	[4] 690,081	[4] 792,897
Tungsten concentrate, 60-percent WO_3 basis	1	2,832		
Zinc (recoverable content of ores, etc.)	85,551	31,140,564	82,185	27,285,420
Undistributed: Barite, cement, gem stones, gypsum, lime, pumice and pumicite (1951), pyrites, sodium sulfate (1951), stone (dimension granite 1952), ground talc, vermiculite, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)		12,261,998		14,637,692
Total Montana		126,166,000		121,400,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels, gypsum, and pyrites are strictly production. Some minerals that originated in Montana cannot be credited owing to lack of information (see par. 6 on p. 1).
[2] Value included with "Undistributed."
[3] Final figure. Supersedes preliminary figure given in commodity chapter.
[4] Excludes certain stone, value for which is included with "Undistributed."

During 1952, the program of the Defense Minerals Exploration Administration continued to encourage the systematic investigation of strategic and critical mineral occurrences. Financial assistance extended under the Government contracts was repayable from royalties on ore discovered and subsequently mined. The following projects were active under the program during part or all of 1952.

TABLE 2.—Defense Minerals Exploration Administration contracts active during 1952

County	Name of operator	Name of property	Mineral	Total contract	Government participation, percent	Contract No.
Beaverhead	American Alloy Metals, Inc	Ivanhoe	W	$55,283	75	E105 and E127.
	do	do	W	66,914	75	E247.
	Minerals Engineering Co	Lost Creek	W	111,280	75	E300.
	Elkhorn Mining Co	Last Chance	Th	10,215	90	E144.
	Roberta Wegener	Faithful	Pb-Cu	17,500	50	E434.
Broadwater	Albert & Jewell Dance	Whitehorse	Pb-Zn	17,940	50	E166.
	Edmund E. Pohl et al	January	Pb-Zn-Cu	12,590	50	E246.
Cascade	Bennett Mining Co	Dacotah	Pb-Zn	100,000	50	E81.
	Lewis B. Stark	Galt	Pb-Zn	50,000	50	E197.
Granite	Alps Mining & Milling Co	Argo	W	34,862	75	E17.
	Combination Development Co	Combination	W	70,000	75	E209.
	Double Eagle Tungsten Co	Bear & Float	W	16,382	75	E114.
	Taylor-Knapp Co	True Fissure	Mn	49,602	75	E138.
	do	do	Mn	107,160	75	E9 (amended).
	Western Montana Exploration & Development Co.	Wasa	Pb-Zn	85,850	50	E30.
Jefferson	Albert J. Carlson	North Boulder	Pb-Zn	24,900	50	E313.
	A. H. Eiselein et al	Lone Eagle	U	15,110	90	E299.
	Elkhorn Consolidated Mining Co	Skyline	Pb-Zn	25,800	50	E268.
	Elkhorn Mining Co	Free Enterprise	U	25,695	90	E115.
	do	Forty-niner	U	12,800	90	E123.
	D. A. McNabb	Sylvan	U	22,907	90	E238.
	Wm. Mulcahy	Big Lode, Homestake, and Summit	Pb	5,092	50	E155.
	Alberta K. Romerio	Hope & Bullion	Pb-Zn	21,200	50	E220.
	White Pine Lead Co	White Pine	Pb-Zn	28,700	50	E273.
Judith Basin	Hughesville Silver & Lead Mining Co	Carter	Pb	10,000	50	E117.
Lewis & Clark	Columbia Mining Co	Copper Cliff	Cu	24,317	50	E169.
Madison	Commonwealth Lead Mining Co	Calvin	Pb	61,784	50	E150.
	Madisonian Mining & Milling Co	Little Mile Creek	Asbestos	24,400	90	E272.
Meagher	Castle Lead & Zinc Co	Yellowstone	Pb-Zn	99,850	50	E240.
Mineral	Amador Mining Co	Amador	Cu	72,190	50	E215.
	Pittsburg Silver Mining Co	Little Pittsburg	Pb-Cu-Sb	11,170	50	E128.
Missoula	Linton Mines	Blacktail	Pb	52,540	50	E226.
Powell	Western Mines Co	New Progress	W	20,130	75	E414.
Sanders	Elmer & Jessie Allen	Sepey Creek	Cu	10,800	50	E423.
	Amador Mining Co. (assignee of Kootenay Copper Co.).	Green Mountain	Cu	31,900	50	E251.
	Ambassador Mines Corp	Ambassador	Pb-Zn	23,049	50	E113.
	J. E. Hall	Revais Creek	Cu	21,285	50	E162.
Silver Bow	Standard Ore & Alloys Corp	Birdie	W	10,080	75	E249.

In addition to exploration assistance rendered to the mining industry under the Defense Minerals Exploration Administration program, the Government continued a program designed to encourage and aid the establishment and growth of mineral processing facilities and of mining operations on known mineral deposits. Contracts of this nature in force at the close of 1952 were:

County	Contractor	Name of property	Commodity
Stillwater	American Chrome Co	Mouat	Chromium.
Silver Bow	Irving G. Irving	Norwich-Plutus	Manganese.
Do	North Butte Mining Co	North Butte Grp	Copper.

County	Government purchase commitment		Government financing	Type of financing	Tax amortization
	Tons	Cost			
Stillwater	900,000	$31,273,000	$950,000	Advance	
Silver Bow	30,000	708,060	106,587	do	
Do			60,000	do	

REVIEW BY MINERAL COMMODITIES

METALS

Aluminum.—Further expansion of the Pacific Northwest's aluminum industry was in prospect in 1952 as the initial steps were taken in the construction of a multi-million-dollar aluminum reduction plant in Flathead County near Columbia Falls. The Anaconda Aluminum Co., a subsidiary of Anaconda Copper Mining Co., was formed during the year to construct and operate the $45 million project. The new firm succeeded the Harvey Machine Co. of Montana as a result of agreements entered into late in 1951 by the companies involved.

The plant, the first of its kind in Montana, was to incorporate techniques developed in France for aluminum production. The French methods were reported to have improved control over contamination and also some mechanical improvements in operation. Capacity of the completed installation will be 54,000 tons of aluminum ingots yearly. Production of these ingots, utilizing power from nearby Hungry Horse Dam, is scheduled for early 1954. According to an agreement, the Reynolds Aluminum Co. will provide the annual requirement of more than 100,000 tons of alumina. The Great Northern Railway Co. provided a service siding to the construction site. Clearing and preliminary investigative work were accomplished in the latter part of the year, and construction was scheduled to begin in the spring of 1953.

Chromium.—Production of chromium ore, missing from the Montana mining picture since World War II, was imminent at the end of the year as plans for reopening the Mouat chrome mine in Stillwater County were announced. The American Chrome Co., subsidiary of Goldfield Consolidated Mines Co., with financial assistance from the Defense Materials Procurement Agency, scheduled initial production for early 1953.

According to terms of a contract concluded early in the year, the Federal Government has agreed to purchase 900,000 short tons of chrome concentrates from the company over an 8-year period. The concentrates will be purchased at an initial base price of $34.97 per short ton for a product containing 38 percent Cr_2O_3.

The Stillwater deposit, containing an estimated three-fourths or more of the known chrome reserves in the United States, was developed early in World War II by the Anaconda Copper Mining Co. The project, under a Defense Plant Corporation contract, cost about $12 million. A complete town and mining camp were built, and some 38,000 feet of underground development was done. The mine was closed in 1943 after 8 months of operation because of favorable chrome-ore imports.

The American Chrome Co. plans to produce 1,000 tons of ore from the mine and about 370 tons of chrome oxide concentrate from the mill each day. (See Stillwater County, p. 32.)

Copper.—The production of recoverable copper in Montana in 1952 was more than 4,500 tons above that in 1951 and was the largest since 1945. The increase resulted from ore production by block-caving methods begun in April 1952 at the new Kelley mine of Anaconda Copper Mining Co. at Butte. This marked the first output from the Greater Butte copper-mine development project begun in 1948. At the end of 1952, $29,299,000 had been invested in the

Greater Butte project, of which $7,621,000 was expended during the year. The output of ore from the Kelley mine, which has a projected daily capacity of 15,000 tons, reached 7,000 tons per day by December 31, 1952. This mine supplied 15 percent of the copper produced in Montana during 1952. Anaconda's copper and zinc-lead operations at Butte contributed 98 percent of the State copper output. None of the other producers exceeded 1,000,000 pounds of recoverable copper.

Of the State total, 88 percent was produced from copper ore, 6 percent from mine-water precipitates, nearly 6 percent from zinc-lead ore, and the remainder mostly from gold ore.

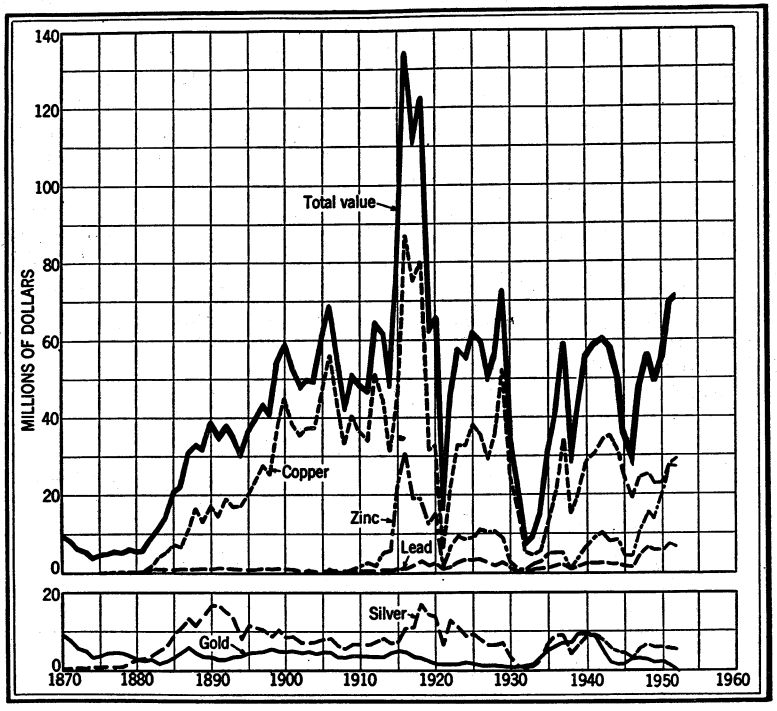

FIGURE 1.—Value of mine production of gold, silver, copper, lead, and zinc in Montana, 1870–1952.

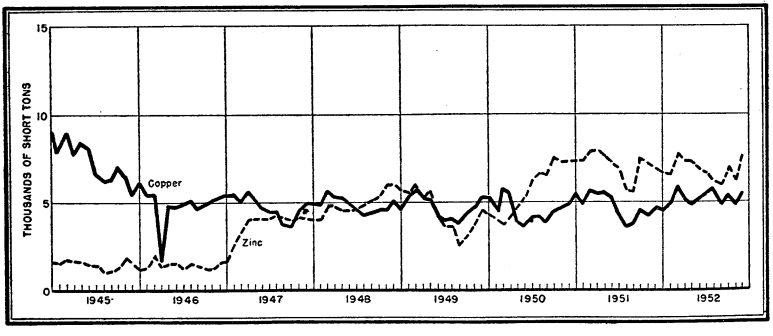

FIGURE 2.—Mine production of copper and zinc in Montana, 1945–52, by months, in terms of recoverable metals.

TABLE 3.—Mine production of gold, silver, copper, lead, and zinc in 1952, by months, in terms of recoverable metals [1]

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	1,621	534,243	4,436	1,835	6,641
February	1,833	508,321	4,909	1,729	6,570
March	1,650	551,523	5,715	2,018	7,749
April	1,790	519,760	5,157	2,023	7,362
May	2,012	539,035	4,820	2,008	7,325
June	2,831	549,100	5,180	1,858	6,839
July	2,206	505,073	5,450	1,718	6,690
August	2,438	530,859	5,813	1,661	6,270
September	2,096	487,687	4,861	1,694	5,972
October	1,932	525,119	5,316	1,713	6,828
November	1,884	443,825	4,850	1,539	6,296
December	1,868	443,640	5,441	1,483	7,643
Total	24,161	6,138,185	61,948	21,279	82,185

[1] Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metals contained in concentrates, ore, tailings, and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc, 1948–52, and total, 1862–1952, in terms of recoverable metals [1]

Year	Mines producing		Material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1948	250	34	3,020,307	73,091	$2,558,185	6,930,716	$6,272,648
1949	281	48	2,595,934	52,724	1,845,340	6,327,025	5,726,277
1950	245	39	3,608,036	51,764	1,811,740	6,590,747	5,964,959
1951	198	16	3,965,875	30,502	1,067,570	6,393,768	5,786,683
1952	164	9	4,625,750	24,161	845,635	6,138,185	5,555,367
1862–1952	----------	----------	[3]	17,374,487	392,560,257	787,856,454	582,107,188

Year	Copper		Lead		Zinc		Total Value
	Short tons	Value	Short tons	Value	Short tons	Value	
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
1951	57,406	27,784,504	21,302	7,370,492	85,551	31,140,564	73,149,813
1952	61,948	29,982,832	21,279	6,851,838	82,185	27,285,420	70,521,092
1862–1952	6,924,948	2,054,134,960	809,713	113,700,534	2,256,671	407,283,326	3,549,786,265

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings retreated; and ore, old slag, and copper precipitates shipped to smelters during calendar year indicated.
[2] Does not include gravel washed.
[3] Figure not available.

Gold.—Production of gold from Montana mines decreased each year from 1947 to 1951. This decline continued in 1952, and the annual yield fell below 30,000 fine ounces for the first time since 1862. The value of output was the lowest since 1932 and the third lowest since 1862. Placer-gold mining became almost nonexistent, and output decreased 93 percent compared to 1951.

In contrast to the decline in Montana as a whole, production of gold in Silver Bow County increased 8 percent, owing to accelerated output by Mitchell Mining Co. from the Marget Ann mine. Gold producers in Montana that produced 1,000 ounces or more in 1952 were

TABLE 5.—Gold produced at placer mines, 1948–52, by classes of mines and by methods of recovery

Class and method	Mines producing	Material treated (cubic yards)	Gold recovered	
			Fine ounces	Value
Surface placers:				
Gravel mechanically handled:				
Bucketline dredges:				
1948	4	3,523,306	13,932	$487,620
1949	2	2,604,905	7,758	271,530
1950	1	1,128,902	2,946	103,110
1951–52				
Dragline dredges:				
1948	3	57,850	299	10,465
1949–50				
1951	3	692,423	996	34,860
1952	1	225	46	1,610
Nonfloating washing plants: [1]				
1948	8	707,700	2,177	76,195
1949	13	409,545	1,855	64,925
1950	6	93,048	287	10,045
1951–52				
Gravel hydraulically handled:				
1948	1	750	48	1,680
1949	2	1,500	53	1,855
1950	1	500	13	455
1951	1	2,500	14	490
1952	1	600	9	315
Small-scale hand methods:				
Wet:				
1948	16	3,805	66	2,310
1949	29	7,395	152	5,320
1950	29	9,765	182	6,370
1951	12	3,400	64	2,240
1952	7	2,480	23	805
Underground placers:				
Drift:				
1948	2	200	19	665
1949	2	27	3	105
1950	2	40	6	210
1951–52				
Grand total placers:				
1948	34	4,293,611	16,541	578,935
1949	48	3,023,372	9,821	343,735
1950	39	1,232,255	3,434	120,190
1951	16	698,323	1,074	37,590
1952	9	3,305	78	2,730

[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."

the Anaconda Copper Mining Co. (copper ore and waste materials, and zinc-lead ore and dump ore) at Butte, McLaren Gold Mines (gold ore) near Cooke, and Mitchell Mining Co. (gold-silver ore) north of Walkerville in the Butte area. These 3 properties produced 77 percent of the State gold in 1952.

Base-metal ores—the principal source of the gold produced in 1952—supplied 70 percent of the State total; siliceous gold and silver ores contributed 29 percent; and small quantities were produced from old tailings, mill cleanings, and placers.

Ore concentrated yielded nearly 79 percent of the total gold; ore of all classes shipped crude to smelters, 20 percent; ore treated at amalgamation mills, 1 percent; and placers, less than 1 percent. Cubic yards of material treated at placer mines decreased from 698,000 in 1951 to only 3,000 in 1952.

Silver Bow County supplied 70 percent of Montana's gold output; Park County, 13 percent; Jefferson County, 5 percent; and 15 other counties, 12 percent.

Lead.—The yield of lead from Montana ores in 1952 was substantially the same as in 1951, when production reached the highest annual rate in 11 years. Small decreases in output of the metal from the

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in 1952, by classes of ore or other source materials, in terms of recoverable metals

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	27	33,727	4,381	10,930	469,784	19,991	23,691
Dry gold-silver	16	9,894	2,134	171,947	7,636	109,655	121,449
Dry silver	13	41,941	486	177,686	30,419	948,267	833,028
Copper	13	2,154,637	3,745	1,541,342	109,430,081	1,455	
Lead	45	27,367	893	93,922	59,881	3,583,828	336,850
Zinc	8	4,027	68	47,882	30,511	108,636	800,377
Zinc-lead	43	2,319,113	12,119	4,062,266	6,873,665	36,891,559	156,522,736
Total	165	4,590,706	23,826	6,105,975	116,901,977	41,663,391	158,638,131
Other "lode" material:							
Dry gold: Mill cleanings	2	21	42	15	43		
Old tailings	1	187	23	89	220		
Dry gold-silver: Old tailings	2	87	8	348	31	1,156	500
Dry silver: Old tailings	3	4,397	97	21,334	24,231	92,040	107,717
Copper: Old tailings	1	20		6	5,234	187	
Precipitates	2				6,959,260		
Copper-lead-zinc: Mill Cleanings	1	89	87	2,755	5,004	43,170	9,033
Zinc: Old slag	1	30,243		7,657		758,056	5,614,619
Total	13	35,044	257	32,204	6,994,023	894,609	5,731,869
Total "lode" material	164	4,625,750	24,083	6,138,179	123,896,000	42,558,000	164,370,000
Gravel (placer operations)	9		78	6			
Total	173	4,625,750	24,161	6,138,185	123,896,000	42,558,000	164,370,000

[1] Detail will not necessarily add to totals because some mines produce more than one class of ore.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery and types of material processed, in terms of recoverable metals

Method of recovery and type of material processed	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation:[1]	254	11			
Concentration, and smelting of concentrates:[1]	19,035	5,707,910	114,915,281	37,815,996	157,689,496
Direct smelting:					
Ore	4,537	398,054	1,986,696	3,847,395	948,635
Mill cleanings	129	2,770	5,047	43,170	9,033
Old tailings	128	21,777	29,716	93,383	108,217
Copper precipitates			6,959,260		
Old slag		7,657		758,056	5,614,619
Total	24,083	6,138,179	123,896,000	42,558,000	164,370,000
Placer	78	6			
Grand total	24,161	6,138,185	123,896,000	42,558,000	164,370,000

[1] Ore only. No old tailings, etc., processed by this method in Montana in 1952.

Butte mines—the principal lead-producing properties in Montana—and the Mike Horse mine at Flesher were offset by gains from several smaller properties. The largest increases were attained at the Maulden mine in Beaverhead County; the Algonquin and Scratch Awl mines in Granite County; Elkhorn Queen, Jefferson County; the Iron Mountain mine, Mineral County; and East Helena old slag dump, Lewis and Clark County. American Smelting & Refining Co. an-

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

A. For ore treated at mills

	Ore treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters [1] 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									
Beaverhead	53			30	1	223	369	8,897	11,873
Cascade	2,000			134	14	8,557		70,823	63,091
Deer Lodge	370	203	8						
Granite	33,535			2,719	150	224,465	31,570	639,843	2,134,474
Jefferson	2,086			256	73	6,587	4,258	79,797	184,891
Lewis and Clark	29,669	16	2	3,869	31	63,418	115,966	2,497,438	2,128,753
Madison	32	3	1	2		24		1,335	1,405
Mineral	9,626			707	25	15,901	10,000	278,000	466,000
Missoula	15,803	27		688		1,759		844,770	6,000
Park	32,000			1,458	3,188	6,706	467,833		
Powell	67			41	13	237	893	1,515	5,059
Ravalli	40	5							
Sanders	9,244			1,583	19	6,542	19,717	1,158,793	869,961
Silver Bow	4,369,923			510,360	15,521	5,373,491	114,264,675	32,234,785	151,817,989
Total: 1952	4,504,448	254	11	521,847	19,035	5,707,910	114,915,281	37,815,996	157,689,496
1951	3,856,554	825	42	515,710	21,747	6,089,719	103,204,588	39,067,111	165,116,761
BY CLASSES OF ORE TREATED									
Dry gold	32,681	254	11	1,458	3,188	6,706	467,833		
Dry silver	27,572			922	52	87,732	5,702	196,784	715,284
Copper	2,105,347			336,715	3,737	1,535,185	107,539,813		
Lead	17,288			802	20	9,249	9,100	956,620	16,076
Zinc	1,653			555	48	34,691	11,551	70,832	402,106
Zinc-lead	2,319,907			181,395	11,990	4,034,347	6,881,282	36,591,760	156,556,030
Total: 1952	4,504,448	254	11	521,847	19,035	5,707,910	114,915,281	37,815,996	157,689,496
BY CLASSES OF CONCENTRATES SHIPPED TO SMELTERS									
Copper				245,501	6,693	1,515,943	106,963,324		
Lead				27,598	4,535	1,519,149	2,834,914	27,808,508	3,816,134
Zinc-lead				206	25	52,333	10,613	155,813	84,279
Dry iron [2]				100,115	564	71,607	1,133,610	75,970	250,047
Total to copper and lead plants				373,420	11,817	3,159,032	110,942,461	28,040,291	4,150,460
Zinc				148,348	7,195	2,527,707	3,967,016	9,711,515	153,505,636
Zinc-lead				79	23	21,171	5,804	64,190	33,400
Total to zinc plants				148,427	7,218	2,548,878	3,972,820	9,775,705	153,539,036
Total: 1952				521,847	19,035	5,707,910	114,915,281	37,815,996	157,689,496
1951				515,710	21,747	6,089,719	103,204,588	39,067,111	165,116,761

[1] Excludes concentrates treated only by amalgamation and/or cyanidation.
[2] From copper, zinc, and zinc-lead ores.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

B. For ore shipped directly to smelters

	Material shipped (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Beaverhead	4,761	424	23,135	39,631	997,103	160,127
Broadwater	1,285	693	12,596	4,000	202,000	176,000
Cascade	149		9,275		23,177	12,909
Fergus	12		282			
Flathead	3	1	50			
Granite	3,434	71	24,996	36,430	108,157	57,526
Jefferson	19,541	1,047	136,286	31,742	1,646,203	341,109
Judith Basin	106	4	2,487		64,000	24,000
Lewis and Clark	32,057	244	26,680	8,034	962,562	5,729,247
Madison	3,430	869	41,113	6,000	164,665	26,595
Meagher	325		1,887		108,000	6,000
Missoula	22	4	71		1,230	
Park	104	14	4,434	167	40,000	10,000
Powell	184	21	1,098	1,107	28,485	6,941
Sanders	207	2	1,165	283	307,207	12,039
Silver Bow	55,682	1,400	144,703	8,853,325	89,215	118,011
Total: 1952	121,302	4,794	430,258	8,980,719	4,742,004	6,680,504
1951	109,321	6,856	303,870	11,607,412	3,536,889	5,985,239
BY CLASSES OF MATERIAL						
Dry gold:						
Ore	1,046	939	4,213	1,951	19,991	23,691
Mill cleanings	21	42	15	43		
Old tailings	187	23	89	220		
Dry gold-silver:						
Ore	9,894	2,134	171,947	7,636	109,655	121,449
Old tailings	87	8	348	31	1,156	500
Dry silver:						
Ore	14,369	434	89,954	24,717	751,483	117,744
Old tailings	4,397	97	21,334	24,231	92,040	107,717
Copper:						
Ore	49,290	8	6,157	1,890,268	1,455	
Old tailings	20		6	5,234	187	
Precipitates				6,959,260		
Total copper materials	49,310	8	6,163	8,854,762	1,642	
Copper-lead-zinc: Mill cleanings	89	87	2,755	5,004	43,170	9,033
Lead	10,079	873	84,673	50,781	2,627,208	320,774
Zinc:						
Ore	447	11	9,400	3,368	20,183	169,946
Old slag	30,243		7,657		758,056	5,614,619
Total zinc materials	30,690	11	17,057	3,368	778,239	5,784,565
Zinc-lead	1,133	138	31,710	7,975	317,420	195,031
Total: 1952	121,302	4,794	430,258	8,980,719	4,742,004	6,680,504

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

Class of material	Quantity shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCENTRATES SHIPPED TO SMELTERS						
Copper	245,501	6,693	1,515,943	112,577,155		
Lead	27,598	4,535	1,519,149	3,336,388	28,918,518	4,716,205
Zinc-lead	206	25	52,333	12,721	162,048	101,540
Dry iron [1]	100,115	564	71,607	1,198,490	79,057	344,860
Total to copper and lead plants	373,420	11,817	3,159,032	117,124,754	29,159,623	5,162,605
Zinc	148,348	7,817	2,605,133	4,025,170	10,820,972	157,177,525
Zinc-lead	79	23	21,205	7,310	67,216	64,765
Total to zinc plants	148,427	7,840	2,626,338	4,032,480	10,888,188	157,242,290
Total: 1952	521,847	19,657	5,785,370	121,157,234	40,047,811	162,404,895
1951	515,710	21,747	6,089,719	105,975,744	40,940,535	171,516,391
MATERIAL SHIPPED DIRECTLY TO SMELTERS						
Dry gold:						
Ore	1,046	939	4,213	2,291	21,046	28,545
Mill cleanings	21	42	15	44		
Old tailings	187	23	89	241		
Dry gold silver:						
Ore	9,894	2,134	171,947	8,970	114,100	147,239
Old tailings	87	8	348	36	1,204	602
Dry silver:						
Ore	14,369	434	89,954	28,883	783,003	141,192
Old tailings	4,397	97	21,334	28,503	96,122	129,759
Copper:						
Ore	49,290	8	6,157	1,938,177	2,100	
Old tailings	20		6	5,396	364	
Precipitates				7,033,112		
Total copper materials	49,310	8	6,163	8,976,685	2,464	
Copper-lead-zinc: Mill cleanings	89	87	2,755	6,015	44,051	10,883
Lead	10,079	873	84,673	59,498	2,736,597	384,863
Zinc:						
Ore	447	12	9,519	5,135	20,693	201,626
Old slag	30,243		15,325		976,171	6,746,720
Total zinc materials	30,690	12	24,844	5,135	996,864	6,948,346
Zinc-lead	1,133	138	31,745	9,233	330,456	234,606
Total: 1952	121,302	4,795	438,080	9,125,534	5,125,907	8,026,035
1951	109,321	6,856	303,870	11,789,249	3,620,407	6,328,205

[1] From copper, zinc, and zinc-lead ores.

nounced that the Mike Horse mine was shut down on November 10 because of low lead-zinc prices, high operating costs, and limited ore reserves. The mine was to be abandoned after removal of usable equipment.

Of Montana's mines, only the Butte Hill mines, the Emma mine (owned by the Butte Copper & Zinc Co.), the Mike Horse mine, and the Jack Waite property in Sanders County supplied over a million pounds of recoverable lead in 1952. These properties supplied 85 percent of the State production. About 87 percent of the lead output was recovered from zinc-lead ore, 8 percent from lead ore, 3 percent from gold and silver ores, and most of the rest from old zinc slag.

Manganese.—The value of manganese and manganiferous ores produced in the State during the year increased 16 percent over 1951. Production of these ores, which came mainly from Silver Bow and Granite Counties, increased 1 percent to 109,427 short tons, gross weight. Anaconda Copper Mining Co. continued to dominate manganese activities in the State through its output of high-grade nodules at its facilities in Deer Lodge County. A considerable quantity of the nodules was used, in turn, to make ferromanganese. Trout Mining Division of American Machine & Metals, Inc., and the Taylor-Knapp Co. continued production of battery ore from mines in Granite County.

Stimulated by the opening of purchasing depots for manganese carbonate ore at Butte and Philipsburg in 1951, in conjunction with the Federal stockpiling program, several smaller producers became active. Additional production was expected as a result of the establishment in July by the General Services Administration of purchasing facilities for oxide ores at Butte.

Silver.—Silver production decreased 4 percent from 1951 to 1952, bringing the annual yield to the lowest point in 7 years. The decline during 1952 was due mainly to the drop in output of silver-bearing zinc ore by the Anaconda Copper Mining Co. at Butte. As in former years, the Anaconda Copper Mining Co. was by far the largest producer of silver in the State. Other important producers, supplying 100,000 ounces or more, were the Marget Ann mine near Butte and the Scratch Awl mine near Philipsburg.

Zinc-lead ore supplied 66 percent of the State total silver; copper ore, 25 percent; and gold and silver ores most of the remainder. Ore treated at concentrating mills yielded nearly 93 percent of the total silver, and smelting ore produced 7 percent; ore amalgamated and placers were minor sources.

About 90 percent of the State production was supplied by Silver Bow County, 4 percent by Granite County, 2 percent by Jefferson County, and 4 percent by 16 other counties.

Tungsten.—Although no tungsten production was recorded in Montana in 1952, development in Beaverhead County by the American Alloy Metals, Inc., at its Brown's Lake property and by Minerals Engineering Co. at the Sugarloaf property progressed rapidly. Reports indicated that the grade of ore was higher than expected. Both properties were being explored under contracts with the DMEA.

Discoveries of deposits of scheelite in Lincoln County south of Libby and in Lewis and Clark County near Marysville were reported during the year.

The importance of these deposits and other tungsten prospects in the Western States was highlighted by a report issued by the Montana State Bureau of Mines and Geology.[3] The study, which included a thorough analysis of tungsten production costs, revealed that high transportation costs, lack of development capital, and the absence of custom milling and chemical refining facilities have been the greatest obstacles to increased production.

Uranium.—A report by the Geological Survey for the Atomic Energy Commission was released early in the year and described uranium-bearing deposits in the Clancey district, south of Helena in

[3] McGlashan, Donald W., and Roys, Perry F., The Tungsten Situation in Montana as a Factor in National Defense: Montana State Bureau of Mines and Geology, Miscellaneous Contributions 12, 1952.

Jefferson County.[4] Mineralization was said to be mostly in the form of secondary uranium minerals concentrated in pockets.

Zinc.—Zinc output continued at a high rate in 1952. Metal production decreased 4 percent compared to 1951; nevertheless, the yearly output was the second highest in 24 years, and as a result Montana retained its position as the leading zinc-producing State in the United States, a rank achieved in 1951. Production of the metal from the Butte Hill mine, the largest producer of zinc in the Nation, decreased slightly in 1952, but this was partly offset by increased output of zinc from the Algonquin and Scratch Awl mines in Granite County, East Helena old slag dump, the Iron Mountain mine in Mineral County, and the Jack Waite mine in Sanders County. Leading producers of zinc in Montana in 1952, each producing over 1 million pounds of recoverable metal and contributing nearly 98 percent of Montana's production, were the Butte Hill mines of Anaconda Copper Mining Co.; the Emma mine, operated by the Anaconda Copper Mining Co. under lease with the Butte Copper & Zinc Co.; East Helena slag dump; Mike Horse mine; and Scratch Awl mine.

About 95 percent of the metal was supplied by zinc-lead ore and most of the remainder by old zinc slag. Silver Bow County mines supplied 92 percent of the State's total.

Miscellaneous Metals.—Byproduct metals from refining operations in the State included arsenic, bismuth, cadmium, indium, paladium, platinum, selenium, and vanadium red-cake precipitates.

NONMETALS

Barite.—Montana's first recorded barite production was in June 1951 from a deposit near Greenough, Missoula County. Increased output was reported from this source in 1952, and a new mill was completed and put into operation.

Cement.—The Ideal Cement Co., Trident, Gallatin County, was the only cement producer in the State. The plant has an annual capacity exceeding 1 million barrels. A magazine article reported that an entirely new plant was to be constructed at Trident and described the finish-mill grinding section,[5] which had been completed.

Clays.—Clay deposits are distributed widely in Montana, but lack of market has limited their development. Fire clay, bentonite, and clay for heavy-clay products were mined in 1952, the latter supplying 86 percent of the total. Five structural-clay-product plants operated. A substantial increase in quantity and value of production over 1950 and 1951 was reported owing in part to renewed mining of bentonite in Big Horn County. Other clay-producing counties were Cascade, Deer Lodge, Fergus, Lewis and Clark, Powell, and Yellowstone. The total output was 51,304 tons valued at $73,601, compared with 39,231 tons valued at $41,631 in 1951.

A survey of the clay resources of the State was undertaken by the Bureau of Mines during the year, and a report is being prepared. Bentonite deposits in Big Horn County were described in a Geological Survey publication.[6] Information on the location of clay deposits

[4] Roberts, Wayne A., and Gude, Arthur J., III, Uranium-Bearing Deposits West of Clancey, Jefferson County, Mont.: Geol. Survey Bull. 988-F, 1953.

[5] Lamont, Harold, Finish-Mill Grinding at Trident, Mont.: Rock Products, vol. 55, No. 8, August 1952, p. 155.

[6] Knechtel, M. M., and Patterson, S. H., Bentonite Deposits of the Yellowtail District, Montana and Wyoming: Geol. Survey Circ. 150, 1952, 7 pp.

in western Montana was given in another Geological Survey circular.[7] Kaolin deposits in Fergus County were being investigated during the year.

TABLE 10.—Clays sold or used by producers, 1951–52

	1951		1952	
	Short tons	Value	Short tons	Value
Used	38,431	$38,431	48,205	$45,205
Sold	800	3,200	3,099	28,396
Total	39,231	41,631	51,304	73,601

Fluorspar.—First commercial production from the Crystal Mountain fluorite deposits, east of Darby in Ravalli County, was shipped in September to the Geneva, Utah, plant of U. S. Steel Co. Shipments for the year from the open-pit mine totaled 16,160 tons. The deposits were discovered in 1951 and are described in a Bureau of Mines publication.[8] No production was reported from the mines in Mineral County; these had made small shipments in the years 1948–50.

Petroleum and Natural Gas.—Crude-oil production increased from 8,958,000 barrels valued at $22,130,000 in 1951 to 9,606,000 barrels worth $21,610,000 in 1953. Glacier, Toole, Carbon, Musseshell, and Blaine Counties were the principal producers. Exploration and drilling were accelerated in the Williston Basin area of eastern Montana, following the initial discovery of oil in the Richey area by Shell Oil Co. on July 13, 1951. This discovery changed the outlook for the Montana oil industry by proving the extension of the basin across the State line from North Dakota. Discoveries continued into 1952, and production was reported from new fields in McCone, Roosevelt, and Wibaux Counties.

Phosphate Rock.—All three major Montana producers reported greater marketed output of phosphate rock in 1952 than in 1951, resulting in a 9-percent increase in the State total. Although the quantity was 23,000 tons short of the record 355,169 long tons marketed in 1949, the total value reached a new high of $2,620,764, compared with $2,353,381 in 1951 and $1,496,537 in 1950.

Entry of the Victor Chemical Works into the field as a buyer of raw rock revived interest in small-scale mining of portions of the phosphate beds having limited reserves, and purchases from several unidentified small mines were reported. Investigation of the Phosphoria formation in southwestern Montana was continued by the Geological Survey, and reports on the findings were being prepared. Blocks of Government-owned land were offered for phosphate leases by the Bureau of Land Management during the year.

Production reported for 1952 was derived from Powell and Silver Bow Counties. In addition, the Victor Chemical Works was reported to be developing the Canyon Creek mine in Beaverhead County, and Williams Phosphate Corp. was developing the Mountain Meadow mine in Madison County.[9] Construction of a second electric furnace at the Victor Chemical Works at Butte was virtually completed during

[7] Sohn, I. G., Industrial Clays, Other Than Potential Sources of Alumina of the Columbia Basin: Geol. Survey Circ. 158, 1952, pp. 5, 14, 17, map.
[8] Taber, John W., Crystal Mountain Fluorite Deposits, Ravalli County, Mont.: Bureau of Mines Rept. of Investigations 4916, 1952, 8 pp.
[9] Mining World, vol. 14, No. 2, February 1952, p. 82

the year, and work was in progress on a $9 million phosphate fertilizer plant at Kimberley, British Columbia; both projects pointed to the increasing importance of the Montana phosphate-rock deposits.

TABLE 11.—Salient statistics of phosphate rock, 1951–52

	1951	1952	Change, percent
Number of companies reporting	3	3	
Production long tons	278,813	361,972	+29.8
Sold or used do	304,507	332,299	+9.1
Value of rock sold or used	$2,353,381	$2,620,764	+11.1
P_2O_5 content of rock sold or used long tons	90,808	95,793	+5.6
Average value at mine per ton	$7.73	$7.89	+2.1

Pyrite.—Pyrite was obtained as a byproduct from the base-metal ores milled by the Anaconda Copper Mining Co. at Anaconda, Deer Lodge County. Production was slightly less than in 1951.

Sand and Gravel.—Completion of major concrete work at Hungry Horse Dam in Flathead County brought about an overall decrease of 42 percent in the 1952 total value of sand and gravel output in Montana compared to 1951. However, the State, excluding Flathead County, showed an increase of 18 percent in value of output. For the entire State, commercial production increased from 1,487,000 tons valued at $1,118,000 in 1951 to 1,873,000 tons valued at $1,429,000 in 1952. Noncommercial (Government-and-contractor) output decreased from 8,096,000 tons valued at $5,084,000 in 1951 to 4,893,000 tons with a value of $2,151,000 in 1952. Production was reported from 27 of the 56 counties in the State. As in the past, the bulk of the output, other than that employed at large hydroelectric and irrigation projects, was used in road building.

Stone.—The value of stone produced in Montana decreased from $986,000 in 1951 to $793,000 in 1952 owing to a large drop in the quantity of crushed rock processed for concrete and road metal, and smaller decreases in stone output for riprap, railway ballast, flux, and miscellaneous uses. Commercial and noncommercial production was reported, respectively, from 9 and 2 counties, noncommercial production representing that from Government-and-contractor operations. The total of 690,000 tons of stone reported quarried consisted of 424,000 tons of sandstone, 152,000 tons of limestone and dolomite, 107,000 tons of basalt, and 6,000 tons of granite. Limestone was used for flux at 2 base-metal smelters and in sugar refining at 1 plant.

Talc.—High-grade talc deposits are found near Ennis and Dillon in Madison and Beaverhead Counties, Mont. Three mines reported production from this area; one was a new open-pit operation. Total shipments decreased from 1951, but substantial exploration was accomplished. Slightly more than half the talc was used for ceramics, and the remainder employed in insecticides, paint, paper, refractories, textiles, and toilet preparations and as foundry facing. The talc was processed at plants in Utah and Nebraska.

Vermiculite.—The open-pit mine of the Zonolite Co. at Libby, Lincoln County, was the principal producer of vermiculite in the United States. Output was about the same as in 1951. Plans were being made for the installation at Libby of a new ore-processing plant of increased capacity, according to the company annual report. The plant will use new separation methods enabling profitable treatment

of large tonnages of available low-grade material, thereby enormously increasing ore reserves.

REVIEW BY COUNTIES AND DISTRICTS

BEAVERHEAD

In an article [10] describing the tungsten deposits of Beaverhead County, the author states that before his investigations began in June 1951, he did not foresee "that in this part of the United States a new major low-grade tungsten area would be discovered." The presence of scheelite or scheelite-powellite in a north-south belt 16 to 18 miles

TABLE 12.—Value of mineral production in Montana by counties, 1951–52

County	1951	1952	Minerals produced in 1952, in order of value
Beaverhead	$302,521	$362,155	Zinc, lead, talc, sandstone, silver, gold, copper.
Big Horn	59,689	49,788	Petroleum, bentonite, sand and gravel.
Blaine	514,239	1,116,331	Petroleum, coal, sand and gravel.
Broadwater	97,000	102,595	Lead, zinc, gold, silver, stone, copper.
Carbon	4,932,839	4,733,454	Petroleum, coal, limestone.
Cascade	530,222	296,186	Sand and gravel, coal, silver, lead, zinc, fire clay, gold.
Chouteau	(1)	52,565	Sand and gravel.
Custer	70,680	47,673	Lignite, sand and gravel.
Dawson and McCone	[2] 35,102	[2] 584,485	Petroleum, sand and gravel, lignite.
Deer Lodge	219,870	261,515	Lime, limestone, sand and gravel, gold, fire clay, silver.
Fallon	(1)	31,390	Petroleum.
Flathead	3,314,174	312,643	Stone, sand and gravel, silver, gold.
Garfield and Petroleum	[2] 860,871	[2] 717,499	Petroleum.
Glacier	7,934,694	7,714,284	Petroleum, sand and gravel.
Jefferson	670,674	644,846	Lead, silver, limestone, zinc, gold, copper, sand and gravel, granite.
Judith Basin	29,389	16,679	Lead, zinc, silver, gold.
Lewis and Clark	2,500,356	2,109,632	Zinc, lead, sand and gravel, silver, copper, clay, gold.
Meagher	11,061	20,092	Lead, silver, zinc.
Mineral	176,471	150,601	Zinc, lead, silver, sand and gravel, copper, gold.
Missoula	342,513	433,887	Sand and gravel, lead, stone, barite, silver, gold, zinc.
Musselshell	4,673,619	3,220,137	Coal, petroleum, stone.
Phillips	392,115	235,622	Sand and gravel.
Pondera and Teton	[2] 2,065,250	[2] 1,808,245	Petroleum, sand and gravel.
Powell	2,057,596	2,056,560	Phosphate rock, lime, lead, zinc, sand and gravel, silver, gold, copper.
Richland	32,287	37,080	Lignite, sand and gravel.
Roosevelt		689,710	Petroleum.
Rosebud	2,491,686	2,959,902	Coal, petroleum.
Sanders	378,951	394,988	Lead, zinc, silver, copper, gold.
Sheridan	81,845	47,542	Lignite, sand and gravel.
Silver Bow	74,595,872	73,026,470	Copper, zinc, manganese ore, lead, silver, phosphate rock, gold, pyrite, sand and gravel.
Stillwater	9,438	4,703	Petroleum.
Toole and Liberty	[2] 3,785,445	[2] 3,782,082	Petroleum, sand and gravel.
Treasure	2,300		
Wibaux		125,758	Petroleum.
Yellowstone	374,699	416,393	Sand and gravel, petroleum, clay.
Undistributed [3]	12,622,303	12,836,217	
Total	126,166,000	121,400,000	

[1] Included with "Undistributed" to avoid disclosure of individual company operations.
[2] Dawson and McCone, Garfield and Petroleum, Pondera and Teton, and Toole and Liberty Counties are combined because of joint oil-field production.
[3] Includes value of mineral production from the following counties: Fergus (gypsum, clay, silver), Gallatin (cement, sand and gravel, stone), Granite (manganese ore, zinc, silver, lead, copper, gold), Hill 1952 (sand and gravel), Lincoln (vermiculite, sand and gravel, gold), Madison (silver, gold, lead, talc, zinc, copper), Park (stone, copper, gold, silver, lead, zinc), Ravalli (fluorspar, sand and gravel, gold, silver), Valley (sand and gravel, and value of petroleum, coal, natural gas, and sand and gravel production that cannot be assigned to specific counties; and value added to talc production by processing in other States ($136,230 in 1951 and $153,668 in 1952).

[10] Waterhouse, J. H., Montana's Beaverhead Tungsten: Mining World, vol. 14, No. 6, May 1952, p. 36.

long later was verified, and it was estimated that tungsten occurrences might extend the length of the production zone to 40 miles. The main tungsten activity in the county centered around exploration and development in the Brown's Lake and Lost Creek areas by American Alloy Metals, Inc., and Minerals Engineering Co. Plans were made for constructing a flotation concentrator and chemical plant.

The Tri-State Minerals Co. shipped talc from the Smith-Dillon mine to its grinding plant at Ogden, Utah. (See Madison County, p. 27, for further activities of this company.) Victor Chemical Works was developing the Canyon Creek phosphate-rock mine near the Silver Bow County line. The Union Pacific Railroad Co. reported production of crushed sandstone for railroad ballast.

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties, in terms of recoverable metals

County	Mines producing		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Beaverhead	14	1	426	$14,910	23,358	$21,140
Broadwater	15	1	695	24,325	12,596	11,400
Cascade	3	-------	14	490	17,832	16,139
Deer Lodge	1	-------	203	7,105	8	7
Fergus	1	-------	-------	-------	282	255
Flathead	1	-------	1	35	50	45
Granite	9	-------	221	7,735	249,461	225,775
Jefferson	36	-------	1,120	39,200	142,873	129,307
Judith Basin	2	-------	4	140	2,487	2,251
Lewis and Clark	23	1	295	10,325	90,100	81,545
Lincoln	-------	1	4	140	-------	-------
Madison	17	-------	872	30,520	41,138	37,233
Meagher	3	-------	-------	-------	1,887	1,708
Mineral	3	2	36	1,260	15,901	14,391
Missoula	3	1	32	1,120	1,830	1,656
Park	3	-------	3,202	112,070	11,140	10,082
Powell	8	-------	34	1,190	1,335	1,208
Ravalli	1	1	51	1,785	3	3
Sanders	1	-------	21	735	7,707	6,975
Silver Bow	20	1	16,930	592,550	5,518,197	4,994,247
Total	164	9	24,161	845,635	6,138,185	5,555,367

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Beaverhead	20	$9,680	503	$161,966	86	$28,552	$236,248
Broadwater	2	968	101	32,522	88	29,216	98,431
Cascade	-------	-------	47	15,134	38	12,616	44,379
Deer Lodge	-------	-------	-------	-------	-------	-------	7,112
Fergus	-------	-------	-------	-------	-------	-------	255
Flathead	-------	-------	-------	-------	-------	-------	80
Granite	34	16,456	374	120,428	1,096	363,872	734,266
Jefferson	18	8,712	863	277,886	263	87,316	542,421
Judith Basin	-------	-------	32	10,304	12	3,984	16,679
Lewis and Clark	62	30,008	1,730	557,060	3,929	1,304,428	1,983,366
Lincoln	-------	-------	-------	-------	-------	-------	140
Madison	3	1,452	83	26,726	14	4,648	100,579
Meagher	-------	-------	54	17,388	3	996	20,092
Mineral	5	2,420	139	44,758	233	77,356	140,185
Missoula	-------	-------	423	136,206	3	996	139,978
Park	234	113,256	20	6,440	5	1,660	243,508
Powell	1	484	15	4,830	6	1,992	9,704
Ravalli	-------	-------	-------	-------	-------	-------	1,788
Sanders	10	4,840	733	236,026	441	146,412	394,988
Silver Bow	61,559	29,794,556	16,162	5,204,164	75,968	25,221,376	65,806,893
Total	61,948	29,982,832	21,279	6,851,838	82,185	27,285,420	70,521,092

TABLE 14.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties and districts, in terms of recoverable metals

County and district	Mines producing		Material sold or treated (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	10		4,749	421		421	22,899		22,899	39,925	989,616	169,500	$232,587
Bannock	1	1	1		1	1	10		10		223	180	110
Chinatown	1		25				271		271		12,166	777	2,333
Medicine Lodge	1		7				21		21		2,890	1,543	740
Polaris	1		32	4		4	157		157	75	1,105		478
Broadwater County:													
Backer		1			2	2							70
Beaver	3		527	358		358	9,364		9,364	3,497	160,000	7,120	48,793
Cedar Plains	7		615	77		77	1,590		1,590	409	37,688	160,531	36,949
Eureka	1		11				23		23		1,106	102	216
Park or Indian Creek	4		132	258		258	1,619		1,619	94	3,206	8,247	12,403
Cascade County: Montana	3		2,149	14		14	17,832		17,832		94,000	76,000	44,379
Deer Lodge County: Georgetown	1		370	203		203	8		8				7,112
Fergus County: Warm Springs	1		12				282		282				255
Flathead County: Hog Heaven	1		3	1		1	50		50				80
Granite County:													
Black Pine	1		2,948	62		62	14,531		14,531	32,000	50,417	19,435	34,408
Boulder and South Boulder	2		189				791		791	1,137	36,962	1,627	7,212
Dunkleberg	1		51				202		202		2,958	902	809
First Chance	1		15				138		138		2,403	1,144	702
Flint Creek	4		33,766	159		159	233,799		233,799	34,863	655,260	2,168,892	691,135
Jefferson County:													
Amazon	4		67	12		12	284		284		4,000	482	1,401
Cataract (Basin)	16		2,835	243		243	9,659		9,659	15,257	79,020	175,760	62,837
Clancy and Lump Gulch	2		71	17		17	413		413	116	6,019	4,832	2,768
Colorado	3		13,109	405		405	74,252		74,252	12,934	745,223	108,590	222,514
Elkhorn	2		3,731	268		268	53,194		53,194	4,417	585,291	170,910	181,195
Golconda	1		2				12		12		429	343	137
Montana City	1		133	3		3	808		808	116	3,863	3,030	1,989
Warm Springs	1		9	1		1	81		81		839	1,042	416
Whitehall	6		1,670	171		171	4,170		4,170	3,160	301,316	61,011	69,164
Judith Basin County: Barker	2		106	4		4	2,487		2,487		64,000	24,000	16,679
Lewis and Clark County:													
Blue Cloud	2		13	5		5	34		34		510	385	352
Canyon Creek		1			4	4							140
Heddleston	3		29,650	33		33	63,557		63,557	115,966	2,501,765	2,131,837	843,410
Helena	2		189	25		25	92		92	220			1,011
Madison Gulch	1		46	16		16	2		2				562
Marysville	3		61	25		25	160		160			610	1,121
Rimini	7		633	52		52	3,854		3,854	843	25,440	5,380	10,501
Scratch Gravel	4		891	135		135	14,744		14,744	6,971	174,229	105,169	65,265
Smelter	1		30,243				7,657		7,657		758,056	5,614,619	1,061,004

TABLE 14.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties and districts, in terms of recoverable metals—Con.

County and district	Mines producing		Material sold or treated (short tons)	Gold (fine ounces)			Silver (fine ounces)			Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total	Lode	Placer	Total				
Lincoln County: Libby		1			4	4							$140
Madison County:													
Cherry Creek	1		4				65		65		4,794	170	859
Norris and Norwegian	2		30	6		6	146		146		3,361	3,506	1,465
Pony and South Boulder	1		3				3		3		111	120	41
Renova	1		25	3		3	1		1				106
Rochester	4		119	43		43	2,064		2,064	161	67,101	9,079	15,722
Sheridan	3		281	95		95	3,309		3,309	5,839	87,838	14,620	24,302
Tidal Wave	1		20	28		28	3		3				983
Virginia City	4		2,980	697		697	35,547		35,547		2,795	505	57,101
Meagher County:													
Castle Mountain	2		321				1,885		1,885		108,000	6,000	20,090
Musselshell	1		4				2		2				2
Mineral County:													
Cedar and Trout Creeks		2			11	11							385
Iron Mountain	2		7,991	5		5	8,876		8,876	1,000	171,595	456,284	111,820
Keystone	1		1,635	20		20	7,025		7,025	9,000	106,405	9,716	27,980
Missoula County:													
Coloma	1		22	4		4	71		71		1,230		402
Copper Cliff	1		15,603				1,759		1,759		844,770	6,000	138,596
Nine Mile	1	1	200	27	1	28							980
Park County: New World	3		32,104	3,202		3,202	11,140		11,140	468,000	40,000	10,000	243,508
Powell County:													
Big Blackfoot	1		4	3		3	8		8				112
Elliston	1		34	1		1	83		83	70	677		236
Nigger Hill	5		205	30		30	1,234		1,234	1,706	25,753	11,934	8,707
Ophir Gulch	1		8				10		10	224	3,570	66	649
Ravalli County: Overwich	1	1	40	5	46	51		3	3				1,788
Sanders County: Eagle	1		9,451	21		21	7,707		7,707	20,000	1,466,000	882,000	394,988
Silver Bow County:													
Melrose	2		148	3		3	3,864		3,864	3,120	18,105		7,272
Rochester Basin		1			9	9		3	3				318
Summit Valley	18		4,425,457	16,918		16,918	5,514,330		5,514,330	123,114,880	32,305,895	151,936,000	65,799,303
Total Montana	164	9	4,625,750	24,083	78	24,161	6,138,179	6	6,138,185	123,896,000	42,558,000	164,370,000	70,521,092

Argenta District.—The Maulden mine, owned by Ida B. Hand, was the largest metal producer in Beaverhead County in 1952. The property was worked continuously and produced 4,066 tons of lead ore (2,294 tons in 1951), which was shipped crude to the East Helena smelter. Other active lode mines included the Capital, East End, Eight Ball, Governor Tilden, Jack Group, Pine Tree, Trader Horn, Tuscarora, and Yellow Band.

Bannock District.—A small lot of zinc-lead ore was shipped from the Rimrock mine.

Chinatown District.—Output of the district consisted of 25 tons of lead ore from the H and S mine, operated by Frank Bjorni from January to March and by Fred Schelino in September and October.

Medicine Lodge District.—A shipment of zinc-lead ore was reported from the S S & R mine.

Polaris District.—Gold-silver ore was shipped from the Silver King mine.

BIG HORN

The Wyotana Mining Co. reported sales of 2,000 tons of bentonite valued at $24,000. Bentonite deposits in the Yellowtail district, which is almost entirely within Big Horn County, were described in a Geological Survey publication.[11] The report estimated reserves of about 90 million tons in the district. Sand and gravel were mined by the county for use as road material. The Soap Creek oil field yielded 15,000 barrels of crude oil, compared with 44,000 in 1951. Oil production from the Hardin area in the northern part of the county was reported for the first time.

BLAINE

The county produced gravel for roadwork. Subbituminous coal was obtained from the Milk River mine near Chinook. The Bowes field more than doubled its crude-oil output and continued as one of the major Montana producing areas, with a yield of 1,025,000 barrels.

BROADWATER

The existence of deposits of titaniferous material in the county was disclosed during the year. The deposits were described as being on the Iron Cross property, where preliminary sampling indicated that the ore contained about 9 percent TiO_2 associated with magnetite. No estimate of tonnage was made.

Limestone was quarried by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co. for riprap. Production was considerably greater than in 1951.

Beaver District.—Output of the January group, the largest producing metal mine in Broadwater County in 1952, consisted of 493 tons of lead ore, containing 247 ounces of gold, 9,200 ounces of silver, 4,166 pounds of copper, 166,683 pounds of lead, and 8,337 pounds of zinc. M. L. Miles operated the Edna mine throughout 1952, shipping 29 tons of gold ore. The Dome mine supplied a small tonnage of gold ore.

Cedar Plains District.—Roy E. Nicolls operated the North Star group continuously in 1952 and shipped a substantial tonnage of zinc ore. Berg & Zimmerman produced 132 tons of zinc-lead ore from the

[11] Knechtel, M. M., and Patterson, S. H., Bentonite Deposits of the Yellowtail District, Montana and Wyoming: Geol. Survey Circ. 150, 1952, 7 pp.

Ruby Silver mine. The other active lode mines were the Cleo, Gopher, Keating, Last Chance, and Santa Anita.

Eureka District.—A shipment was reported from the Leadore mine.

Park or Indian Creek District.—The Marietta mine was operated throughout 1952 by Dance & Anders; 108 tons of gold ore was mined. Production was reported also from the Custer and Little Annie mines.

CARBON

The Great Western Sugar Co. limestone quarry was operated by Peter Kiewit Sons Co. on a scale about equal to that in 1951. Carbon County was the third ranking producer of bituminous coal in Montana, the Foster mine of the Montana Coal & Iron Co. and Brophy mine of Brophy Coal Co. being the principal operations. Crude-oil output was reported from the Clark's Fork, Dry Creek, Elks Basin, and Frannie fields, with production of 1,912,333 barrels, down slightly from 1951.

CASCADE

The mineral industry in Cascade County consisted largely of establishments of the Anaconda Copper Mining Co. at Great Falls. The electrolytic copper refinery processed metal received in the form of anodes from the reduction works at Anaconda. The cathode sheets produced were melted in the furnace refinery and cast into wire bars, cakes and slabs, and ingots. Copper wire was manufactured by the Anaconda Wire & Cable Co. The electrolytic zinc plant treated zinc consentrates shipped from Anaconda and custom material received from mining companies in most of the Western States and in Canada, Mexico, Bolivia, Peru, Argentina, and Japan. The plant produced zinc-cathode sheets, which then were melted and cast into commercial shapes.

The Great Falls Brick Co. manufactured brick, building tile, and flue liners from buff-firing clay mined at Tracy, 13 miles south of Great Falls. Fire clay for the Anaconda Copper Mining Co. refractory plant at Anaconda was produced at the underground Armington mine. Washed and unwashed sand and gravel for roadwork were recovered by the county. The Great Northern Railway Co. produced washed sand and gravel for its own use. Three other companies operated sand and gravel plants. A small quantity of coal was mined also.

Montana District.—William Mahana and Lewis B. Stark, lessees, operated the Hartley mine from January through June, with production totaling 112 tons of zinc-lead ore. Lewis B. Stark operated the Galt zinc-lead mine and mill for 3 months and shipped 78 tons of lead concentrates and 42 tons of zinc concentrates. The collapse of the main hoisting station the last of March caused a complete shutdown the rest of the year. L. C. Hoops operated the Broadwater-Moulton group and 75-ton flotation plant in June and October.

CHOUTEAU

Sand and gravel were mined by the county for road material.

CUSTER

Sand and gravel were produced by the Northern Pacific Railway Co., the Chicago, Milwaukee, St. Paul, and Pacific Railroad Co., and

the county. Lignite was mined at the Storm King and Crow Rock mines.

DAWSON

Knoll & Sons operated a sand and gravel plant, and the Northern Pacific Railway Co. also mined sand and gravel. Crude oil was produced from the Glendive area (164,000 barrels) in the southern part of the county and the Richey field (122,000 barrels) in the extreme north, which extends into McCone County.

DEER LODGE

The Anaconda Copper Mining Co. metallurgical plant for treating base-metal and manganese ores from mining operations in Silver Bow County is at Anaconda. Phosphate rock from the company operation at Conda, Idaho, also is processed here. Modifications of the metallurgical plant are described in the following extract from the 1952 shareholders' report:

> Remodeling of the east mill of the Anaconda concentrator, which included installation of ore bins, rod mills, and flotation machines to treat ore from the Greater Butte Project, has been completed. The leach-precipitation-float plant, developed to recover the appreciable quantities of oxidized copper present in Greater Butte Project ores, was put into operation during the Spring of 1952 and has been operating successfully.
>
> Reconstruction of three sections of the west mill at Anaconda was started during the Summer. Equipment being installed is identical to that successfully operating in the east mill. With completion of the work by the end of 1953, the total concentrator capacity at Anaconda will be sufficient to treat the enlarged production of copper, zinc, and manganese ores from the Butte mines.
>
> To facilitate handling of the increased tonnages a new crushing plant adjacent to the East Anaconda yards of the Butte, Anaconda & Pacific Railway Co. and a conveyor system from the crushing plant to the concentrator bins will be constructed. Overall length of the new conveyor system will be 4,800 feet, about half of which will be in an underground tunnel. A tipple to dump two cars of ore at a time will unload trains from Butte rapidly, cutting the time in transit and minimizing freezing of ore in winter. Excavation is under way and it is expected that the work will be completed in 1954.
>
> Construction of a sixth electrolytic zinc unit at Anaconda, started in 1951, was practically completed at the close of the year. Recovery of zinc has been improved by the completion of the second Cottrell electrostatic dust precipitator and equipment for releaching zinc plant residues.
>
> A fluosolids roasting furnace to roast zinc sulphide ore, together with a 100-ton contact sulphuric acid plant, is being constructed. When completed in 1954, this plant, combined with existing facilities, will provide sufficient acid for the leach-precipitation-float plant and the future capacity operation of the phosphate fertilizer plant.

Limestone and silica were quarried by the Anaconda Copper Mining Co. for use at the metallurgical plant. Production increased about 20 percent (over 1951) owing to requirements of the copper plant. Limestone was used also for road metal and railway ballast, and some was burned to lime. Harold Snow reported an output of 1,099 tons of fire clay valued at $4,396 from an open-pit operation. Washed sand and gravel were produced by the Stuart Sand & Gravel Co.

Georgetown District.—The Acme Co. of Chicago, Ill., worked the Gold Coin mine from January through April. A total of 370 tons of gold ore treated by amalgamation yielded 203 ounces of gold and 7 ounces of silver. This was the only active metal mine in Deer Lodge County.

FALLON

The Little Beaver oil field, on the North Dakota boundary, yielded 22,000 barrels of crude oil.

FERGUS

The underground gypsum mines of the Ideal Cement Co. and U. S. Gypsum Co. supplied the bulk of the mineral output from Fergus County. Both companies operated calcine plants, and U. S. Gypsum produced ground raw gypsum and manufactured wallboard and rock lath in its modern plant at Heath. All U. S. Gypsum production was from the new Shoemaker mine, opened in August 1951. The mining operations of the company at Heath were described in a magazine article.[12] The Lewistown Brick & Tile Co. manufactured structural clay products from locally mined clay. Coal was used for fuel in the operation. Kaolin deposits in the Judith Basin were explored by the Caledonia Silver-Lead Mining Co. of Kellogg, Idaho. The company reported that tests show that a high-grade clay can be produced by beneficiation.[13]

Warm Springs District.—The Silver Dyke mine, owned by W. G. Allen, was the only producing metal mine in Fergus County; 12 tons of silver ore was shipped to the East Helena smelter.

FLATHEAD

Anaconda Aluminum Co. began construction of a $45 million aluminum-reduction plant at a site 2 miles east of Columbia Falls at the base of Teakettle Mountain. (See Aluminum, p. 5.)

The Great Northern Railway Co. reported production of crushed sandstone, used principally for railway ballast, and of a small quantity of gravel. Three other companies reported sand and gravel output, valued at $135,463. The substantially greater value of mineral products from Flathead County in 1951, compared to 1952, was due to sand and gravel, valued at approximately $3 million, produced for the Bureau of Reclamation's Hungry Horse project.

GALLATIN

Montana's only cement plant, at Trident, is the largest industrial establishment in the area. It is owned by the Ideal Cement Co., Denver, Colo. Limestone is quarried by the company at the plant site. Granite and sandstone were quarried by the county for riprap. The Gallatin Sand & Gravel Co. and Chicago, Milwaukee, St. Paul & Pacific Railroad Co. produced washed sand and gravel. The county mined gravel for roadwork.

GARFIELD

The Cat Creek field in Garfield and Petroleum Counties produced 271,000 barrels of crude oil.

GLACIER

The National Park Service reported production of 9,135 tons of washed sand and gravel. The Cut Bank field continued to be Montana's leading crude-oil producer, with 2,632,753 barrels, compared with 2,724,305 barrels in 1951.

GRANITE

The Federal purchasing depot at Philipsburg received shipments of low-grade manganese ores from various producers in the area. Tungsten development work was carried on at a number of properties.

[12] Mathis, Gerald C., The United States Gypsum Co. Mine, Heath, Mont.: Am. Inst. Min. and Met. Eng. Tech. Paper 3483A, Min. Eng., February 1953, pp. 177–180.
[13] Wallace Miner, Nov. 27, 1952.

Black Pine District.—Combination Development Co., lessee, operated the Combination (Black Pine) mine from January through November and shipped 145 tons of copper ore containing 4,036 ounces of silver, 10,425 pounds of copper, and 2,100 pounds of lead. A Government loan was granted to explore tungsten mineralization at the mine. Ben Walkup, sublessee, worked the old tailings dump and shipped 2,803 tons of material containing 61 ounces of gold, 10,493 ounces of silver, 25,805 pounds of copper, 51,002 pounds of lead, and 23,416 pounds of zinc.

Boulder and South Boulder District.—Two lode mines were active, the Nonpareil (lead ore) and the Copper King (copper ore).

Dunkelberg District.—C. R. Albano and Lee James operated the Samuel lode mine from May 1 to August 12.

First Chance District.—Production of lead ore was reported from the Summit mine.

Flint Creek District.—Trout Mining Division of American Machine & Metals, Inc., operated the Algonquin mine and flotation plant and milled 27,572 tons of ore which yielded a substantial quantity of battery-grade manganese concentrates, 182 tons of zinc-lead concentrates (containing 17 ounces of gold, 50,333 ounces of silver, 5,289 pounds of copper, 139,978 pounds of lead, and 78,260 pounds of zinc), and 740 tons of zinc concentrates (containing 35 ounces of gold, 37,399 ounces of silver, 65,005 pounds of lead, and 677,233 pounds of zinc). In 1951, only 84 tons of ore was produced from this mine. The company increased the capacity of its milling facilities by adding a series of flotation cells to concentrate rhodochrosite ore. Two other sizable metal mines were active in the Flint Creek district in 1952. The Contact Mining Co. operated the Scratch Awl zinc-lead-manganese mine and the Taylor-Knapp Co. worked its True Fissure mine the entire year, producing manganese ore that contained varying quantities of gold, silver, copper, lead, and zinc.

HILL

Ed Tangino at Milltown and Fritz Naber at Havre reported sand and gravel operations.

JEFFERSON

Nine distinct occurrences of uranium mineralization reportedly were found in a small area near Clancey. The minerals were identified as pitchblende, torbernite-zeunerite, rutherfordine, and autunite or uranocircite and were described as being concentrated in pockets. Other uranium activity in the county was carried on by the Sylvan Gold Mining Co. on its properties near Basin. Metals Milling Co. operated its custom, 130-ton, selective flotation mill at Basin for brief periods in 1952.

Louis Dumas quarried a small quantity of dimension granite for monuments. The American Smelting & Refining Co. quarried limestone for smelter flux. Gravel for railroad ballast was produced by the Great Northern Railway Co.

Amazon District.—The Hi-ore, Morning Star, and Treasure State lode mines were active during part of 1952.

Cataract District.—Producing metal mines included the Blue Bird, Boulder, Crescent, Hidden Treasure, Jib, Midnite, Morning, Silver Hill, and Wendell Phillips.

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Clancy and Lump Gulch District.—A small production was reported from the Cannon and Nellie Grant lode mines.

Colorado District.—The Alta mine was operated by the Lahey Leasing Co. Other active properties were the Gregory mine (gold-silver ore) and the Minnesota group (gold-silver dump ore).

Elkhorn District.—The New Elkhorn Queen Mining Co. operated the Elkhorn Queen lead mine throughout 1952. Louis Peura worked the Elkhorn dump and shipped 1,461 tons of old silver tailings to the East Helena lead smelter.

Montana City District.—Shipments of old silver tailings from the Overland mine were reported.

Warm Springs District.—The White Pine Lead Co. operated the White Pine group from January 1 to October 1 and shipped milling ore to Basin and smelting ore to East Helena.

Whitehall District.—234 tons of zinc-lead milling ore from the Lucky Hit mine, owned by George W. Wolfe, was shipped to a custom mill at Midvale, Utah. The Carbonate mine yielded 592 tons of lead ore. Lester Lindquist operated the Perhaps mine from January 1 to August 15 and shipped 433 tons of lead ore containing 39 ounces of gold, 1,229 ounces of silver, 724 pounds of copper, 87,292 pounds of lead, and 14,978 pounds of zinc. Other active metal mines included the Minerva, St. Paul, and Whitehall.

JUDITH BASIN

Barker District.—Thorson & Brazee operated the Edwards mine for 6 months and shipped 94 tons of zinc-lead ore containing 4 ounces of gold, 2,381 ounces of silver, 771 pounds of copper, 62,368 pounds of lead, and 28,065 pounds of zinc. Croff and Montague produced 12 tons of lead ore from the Tiger mine.

LEWIS AND CLARK

Work was begun on a tungsten deposit near Marysville. Preliminary testing showed the feasibility of concentrating the scheelite by gravity methods. The discovery is near the old Drumlummon mine, famous for its past production of gold and silver. The lead smelter of the American Smelting & Refining Co. at East Helena treated lead-silver concentrates from mines in Idaho; crude ore, concentrates, and old tailings from Montana mines; residues from the electrolytic zinc plants at Anaconda and Great Falls; and lead-bearing material from several foreign countries. The neighboring zinc-fuming plant of Anaconda Copper Mining Co. processed 162,590 tons of molten slag from the smelter and 30,243 tons of old slag from the smelter dump; 34,491 tons of zinc fume was produced and shipped to the electrolytic zinc plant at Great Falls for further treatment.

The Western Clay Manufacturing Co. operated its open-pit clay mines at Bossburg, 16 miles west of Helena and a structural clay product plant and small pottery and terra cotta plant at Helena. The 1952 production of sand and gravel by the Helena Sand & Gravel Co. was more than double that in 1951.

Blue Cloud District.—A small quantity of gold smelting ore was shipped from the Pearl mine.

Heddleston District.—American Smelting & Refining Co. announced that its operation at the Mike Horse mine was terminated on November 10 owing to low zinc-lead prices and diminishing ore reserves. Mike Horse Mining & Milling Co., a subsidiary of American Smelt-

ing & Refining Co., had operated the mine, one of the largest zinc-lead producers in Montana, since 1940. The company planned to remove all usable equipment and material from the mine and 300-ton flotation mill. Production in 1952 totaled 29,623 tons of ore with a metal content of 79,294 ounces of silver, 227,200 pounds of copper, 2,842,600 pounds of lead, and 2,477,800 pounds of zinc. Three small mines in the Heddleston district were worked part of 1952; these properties were the Consolation, Pass Creek, and Noyau mines.

Helena District.—Louis Peura shipped 187 tons of old gold tailings to East Helena from the Whitlatch Union dump.

Madison Gulch District.—Ray W. Crumb produced 76 tons of gold ore from the Humdinger mine in the course of exploration and development. The ore, treated by amalgamation, yielded 16 ounces of gold.

Marysville District.—A shipment of old gold-silver tailings was made from the Drumlummon property. A small amount of gold ore was produced from the Belmont mine.

Rimini District.—Active metal mines were the Copper Dyke, Evergreen dump, Lee Mountain, Lexington, Little Jimmy, Little Sampson, and O. H. Bassett.

Scratch Gravel District.—Most of the metal output was supplied by zinc-lead ore from the Franklin mine. Production was reported also from the Helena group, Silver Coin, and Scratch Gravel dump.

Smelter District.—The metals credited to the Smelter district came from old slag treated at the East Helena zinc-fuming plant of the Anaconda Copper Mining Co.

LIBERTY

The Sweetgrass Hills oil field in Liberty and Toole Counties increased its petroleum output from 35,000 barrels in 1951 to 104,000 in 1952.

LINCOLN

Discovery of a deposit of scheelite in the Miller Creek district south of Libby was reported early in the year. The vein was described as being 6 to 12 feet wide and over 7,500 feet long. Reports indicated that the ore was amenable to concentration.

The Zonolite Co. open-pit vermiculite mine at Libby was the only large mineral producer in Lincoln County and continued to supply the bulk of vermiculite used in the United States. A few tons of sand and gravel was mined by the Great Northern Railway Co.

MADISON

The Sierra Talc & Clay Co. shipped high-grade talc from its underground Yellowstone mine to the company grinding plant at Grand Island, Nebr. The Stone Creek mine of Tri-State Minerals Co. was being developed during the year, and some talc was shipped to Ogden, Utah, for grinding.

Cherry Creek District.—A small quantity of crude lead ore was shipped from the Lucky Strike mine.

Norris and Norwegian District.—Some zinc-lead ore was produced from the Galena mine.

Renova District.—Marcus D. Pruett produced 25 tons of gold ore from the Mary Ingebar mine.

Rochester District.—Commonwealth Mining Co. shipped 93 tons of lead ore from the Commonwealth mine. Small quantities of lead ore were taken from the Copper Jack, Plainview, and Thistle mines.

Sheridan District.—Arthur Kloos operated the Surprise mine from January 1 to December 12 and shipped 7 tons of zinc-lead ore to a custom mill and 172 tons of lead ore crude to a smelter. The balance of the metal production in the district came from zinc-lead ore from the Occidental mine and old mill cleanings from the Toledo-Buckeye mill.

Tidal Wave District.—Mill cleanings from the Belle Canyon property yielded 28 ounces of gold.

Virginia City District.—R. H. Rogers and H. F. Rogers, owners, operated the Mountain Flower mine intermittently in 1952 and shipped 24 tons of gold-silver ore. Production was reported also from the Cornucopia, Mountain Cliff, and New Silver Crest mines.

McCONE

Petroleum was produced from the Richey (122,000 barrels) and Southwest Richey (7,000 barrels) fields. This was the first production reported from the Southwest Richey field.

MEAGHER

Castle Mountain District.—Production consisted of crude lead ore shipped from the Cumberland and Yellowstone mines.

Musselshell District.—A small quantity of copper ore was produced from the Copperopolis mine.

MINERAL

Sand and gravel for road ballast were mined by the county.

Iron Mountain District.—The number of active lode mines in Mineral County decreased from 6 in 1951 to 3 in 1952, but ore production increased 35 percent. The gain in output was due to the greater production from the Iron Mountain mine, operated intermittently in 1952 by E. G. Smith, lessee. About 7,950 tons of ore from the Iron Mountain mine processed at the Nancy Lee custom mill yielded 170 tons of lead concentrate and 424 tons of zinc concentrate. A small production of lead ore was reported from the Little Anaconda mine.

Keystone District.—Production consisted of lead ore from the Nancy Lee mine.

MISSOULA

The Finlen & Sheridan Mining Co., Butte, increased the output of its barite mine near Greenough, about 30 miles east of Missoula. The mine began operating in June 1951 and supplied the only barite production reported from Montana. A mill built by the Hightower & Lubrecht Construction Co. of Missoula was put into operation in June 1952. Rock crushed to ⅜-inch size was sold in bulk lots, and more finely pulverized material was semiautomatically sacked for marketing. Lyon Construction Co., Clinton, reported 142,214 tons of sandstone quarried for railroad ballast, compared with 92,000 tons in 1951. Chicago, Milwaukee, St. Paul & Pacific Railroad Co. and the Union Construction Co. of Missoula operated sand and gravel plants.

Copper Cliff District.—Linton Mines operated the Blacktail mine and 500-ton sink-float plant from March 1 to December 1 and treated 15,600 tons of lead ore, which yielded 688 tons of lead concentrate.

MUSSELSHELL

This county ranked second in output of bituminous coal and had the largest underground coal mine in the State. The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. quarried limestone for riprap. The Big Wall, Gage, Melstone, and Ragged Point oil fields produced 495,737 barrels of petroleum.

PARK

Basalt used principally for ballast and riprap was quarried by the Northern Pacific Railway Co. near Emigrant.

New World District.—The McLaren Gold Mines Co. worked the open-pit Estelle mine from May to December and treated 32,000 tons of gold ore in the company 150-ton flotation mill. This was 3,000 tons more than was processed in 1951. The ore contained substantial quantities of gold, silver, and copper. Other active mines included the Big Blue and Irma.

PETROLEUM

Output of petroleum from the Cat Creek field in the Petroleum-Garfield County area was 271,000 barrels.

PHILLIPS

The Great Northern Railway Co. produced a large tonnage of sand and gravel for ballast and other uses, and Charles Shannon processed washed gravel for road use.

PONDERA

The Pondera field in Pondera and Teton Counties was a principal crude-oil producer, with an output of 697,000 barrels. The Brady field yielded 872 barrels of petroleum.

POWELL

Phosphate-rock mining in the Garrison district was the principal industry in this county. The Anderson and Graveley mines were operated by the Montana Phosphate Products Co., a subsidiary of the Consolidated Mining & Smelting Co. of Trail, British Columbia. All production was exported to Canada. The Luke mine remained closed. George Relyea produced phosphate rock from his mine near the Anderson mine. Output was sold to the Victor Chemical Works, and to the Consolidated Mining & Smelting Co. The Elliston Lime Co. of Helena processed quick and hydrated lime. A small tonnage of gravel for railway ballast was produced.

Elliston District.—D. L. Jones, developing the Monarch mine from May to November, shipped 34 tons of gold-silver ore.

Nigger Hill District.—Elliston Consolidated Mining Co. shipped 56 tons of zinc ore to a custom mill at Midvale, Utah; the Charter Oak Mining Co. produced 115 tons of lead ore containing 11 ounces of gold, 756 ounces of silver, 20,473 pounds of lead, and 6,516 pounds of zinc; and small shipments of lead ore were made from the Golden Anchor and Hard Luck mines.

Ophir Gulch District.—Production consisted of eight tons of lead ore from the Eldorado mine.

RAVALLI

Fluorite was mined from the Crystal Mountain property owned by A. E. Cumley, R. D. Flightner, and Lester Thompson, all of Darby. The open-pit mining was done by Cummings-Roberts Engineering Co. of Compton, Calif. The county mined sand and gravel for road material.

Overwich District.—Amalgamation treatment of 40 tons of ore from the Washington mine produced 5 ounces of gold. The Hughes Creek Dredging Co. worked its Hughes Creek placer property for 30 days, and produced 46 ounces of gold.

RICHLAND

The county mined sand and gravel for roadwork. Lignite was produced from several mines.

ROSEBUD

One of the largest strip coal mines in the world is operated by Foley Brothers, Inc., at Colstrip. Operating at the record rate of more than 90 tons per man-shift, the mine output for 1952 was 1,406,321 tons, about 70 percent of Montana's total production. The Sumatra oil field increased its yield from 17,156 barrels of crude in 1951 to 79,123 barrels.

ROOSEVELT

The Poplar Area field recorded its first production of crude oil in 1952, with a total of 381,101 barrels.

SANDERS

Eagle District.—Production from the Jack Waite mine, operated by the American Smelting & Refining Co. under a profit-sharing agreement with the Jack Waite Mining Co., totaled 9,244 tons of zinc-lead milling ore and 207 tons of lead smelting ore. The tonnage of ore milled increased 29 percent from 1951 to 1952. The milling ore, treated in the Jack Waite 300-ton flotation plant, which was operated 6 to 10 days per month, depending on mine production, yielded 790 tons of lead concentrates and 793 tons zinc concentrates containing 6,565 ounces of silver, 1,208,256 pounds of lead, 899,008 pounds of zinc, and small quantities of gold and copper. Some development was done despite difficulty in obtaining experienced miners at the isolated property, on the Idaho-Montana border northeast of Wallace, Idaho. A cave-in between the 600- and 800-foot levels in September resulted in damage to equipment and the loss of more than 1 month's production.

SHERIDAN

Lignite was mined by two companies, and sand and gravel were produced by the Great Northern Railway Co. and by the county. The Sodium Corp. of America reported that its operation for the recovery of sodium salts from lake brine was shut down temporarily.

SILVER BOW

The Victor Chemical Works started production of elemental phosphorus in November 1951 in the initial electric furnace in its new $10 million Silver Bow plant near Butte. A second furnace under con-

struction during 1952 was scheduled for completion in early 1953. Each furnace is reported to have a yearly capacity of 14,000 tons of phosphorus.[14] The principal source of raw phosphate rock was the company owned and operated Maiden Rock mine 23 miles south of the plant, an underground mining operation. Victor also was developing the Canyon Creek mine in Beaverhead County just across the Big Hole River from the Maiden Rock mine. Additional phosphate rock was purchased from several small producers in Idaho and Montana. A Government phosphate lease was taken on the Tucker Creek phosphate deposit 15 miles southwest of Butte by Carl C. Martin and Peter Antonioli. The deposit was trenched and sampled; plans were made also for exploration and development. The Pioneer Fuel & Lumber Co. of Butte produced sand and gravel.

Summit Valley (Butte) District.—A total of 1,094,918 tons of copper ore from the new Kelley mine at Butte, which was placed in production during the first half of 1952, was processed at the Anaconda Reduction Works at Anaconda. Ore production from the Kelley mine by block caving was begun on the 400, 500, and 600 levels at the rate of about 600 tons a day. This was increased to 7,000 tons a day by the end of December. Preparation of haulageways, ore pockets, and loading facilities on the 1,300 level proceeded throughout 1952. By the end of the year, the Kelley shaft, which is 38 feet by 9 feet in cross section, reached a depth of 2,182 feet, of which 1,326 feet had been lined with concrete. The tonnage mined and milled from the other Butte Hill copper mines decreased from 1,038,679 tons in 1951 to 959,255 in 1952. Additional company material from Butte processed at the copper concentrator at Anaconda was as follows: Butte Hill special waste, 67,323 tons (67,834 in 1951); Mountain View-Rarus development project, 9,619 tons; and West Colusa copper dump, 4,232 tons. Smelting ore totaled 2,958 tons compared to 8,967 in 1951 and mine-water precipitates 6,338 tons compared to 9,179 in 1951.

Zinc-lead ore from the Butte Hill mines totaled 1,333,385 tons in 1952 (1,189,144 in 1951) and that from the Butte Hill dumps totaled 443,130 tons (955,372 in 1951). The Alice-Lexington tunnel was completed during 1952, providing large-capacity haulage facilities for handling the output of zinc-ore mining operations at the Alice and Lexington properties and tributary areas. Manganese ore also was a substantial source of lead and zinc. The ore was milled in Anaconda to recover manganese concentrates and a zinc-lead middling, which was processed further to obtain zinc and lead concentrates.

The Anaconda Copper Mining Co. supplied the bulk of the manganese ore mined and processed in the State and was responsible for maintaining Montana's position as the leading domestic source. Low-grade carbonate ore, which comes mainly from the Emma and Travona mines at Butte, is treated by the manganese plant at Anaconda. The nodules produced are used locally and in the East to make ferromanganese, an important raw material in the steel industry. According to the company annual report for 1952, production of manganese nodules totaled 80,906 long tons, somewhat less than in 1951, and production of ferromanganese was 39,923 long tons, an increase of 9 percent.

Mitchell Mining Co. of Mount Vernon, Wash., operated the Marget Ann gold-silver property throughout 1952 and shipped 5,708

[14] Gordon, Joseph, Phosphorus: Shifting, Growing, Changing: Chem. Week, vol. 71, No. 5, Aug. 2, 1952, p. 26.

tons of ore (containing 1,266 ounces of gold and 128,896 ounces of silver) compared to 200 tons in 1951. The Marget Ann property was acquired by the company in 1950. Norman Rogers produced 23,250 tons of copper ore from the Rabbit mine and 3,250 tons from the Bullwacker property; both operations are open pit. The Sarsfield copper mine and Granite Mountain (North Butte) zinc mine supplied most of the remaining metal production credited to Summit Valley district. The Bertha, Eagle Bird, Humbolt, Magna Charta, and Rising Star lease were active also. Manganese ores were shipped from the Tzarena and Eagle Bird mines by Peter Antonioli, from the Minnie Jane mine by Butte Mines Merger Corp., and from the Norwich mine by I. G. Irving.

Melrose District.—Production comprised copper ore from the Copper Royal mine and lead ore from the Franklin mine.

TABLE 15.—Production of gold, silver, copper, lead, and zinc in Silver Bow County, Mont., 1948–52, and total, 1882–1952, in terms of recoverable metals

Year	Mines producing	Material (short tons)	Gold (lode and placer) (fine ounces)	Silver (lode and placer) (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
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
1951	14	3,780,943	15,674	5,950,647	113,652,000	33,260,000	161,000,000	68,493,990
1952	21	4,425,605	16,921	5,518,194	123,118,000	32,324,000	151,936,000	65,806,893
1882–1952		[1]	2,136,676	580,365,724	[2] 6,886,945	[2] 318,682	[2] 1,932,067	2,920,333,575

[1] Figure not available.
[2] Short tons.

STILLWATER

Preparations for reopening the Mouat mine near Nye, about 50 miles southwest of Columbus, were begun by the American Chrome Co. Housing facilities for about 350 men and reequipment of the mine and mill were being completed. Initial production of chrome concentrates was planned for early 1953. (See Chromium, p. 5.)

A small quantity of crushed granite was produced for roadwork.

TETON

The Pondera oil field in Teton and Pondera Counties was one of Montana's principal producers, with an output of 697,000 barrels.

TOOLE

Shelby Sand & Gravel was operated by L. Welker and J. Horner, who reported increased output over 1951. The Border, Kevin-Sunburst, and Sweetgrass Hills oil fields reported production. Toole County ranked third in petroleum production in Montana for 1952, with an output of 1,461,000 barrels.

VALLEY

Tampico Gravel Co. at Glasgow and the Great Northern Railway Co. reported production of washed and screened sand and gravel.

WIBAUX

First production was reported from the Pine Unit area oil field and totaled 78,648 barrels during the year.

YELLOWSTONE

Building brick was manufactured by the Lovell Clay Products Co., Billings, from clay mined locally. Five companies and the county produced sand and gravel. Petroleum production from the Mosser field dropped from 15,813 barrels in 1951 to 12,214 in 1952.

The Mineral Industry of Nebraska

By Samuel A. Gustavson [1]

MINERALS produced in Nebraska during 1952 included clays, sand and gravel, limestone, pumice and pumicite, natural gas, and crude petroleum. The total value of mineral production was $20,597,000 in 1952, an increase of 12 percent over 1951.

Although Nebraska is primarily an agricultural State, it is wealthy in the nonmetallic minerals—sand, gravel, clays, and pumicite. In recent years petroleum and natural gas have been produced in the western, south central, and extreme southeastern parts of the State. There is no record of production of metallic minerals in the State. During World War I a considerable quantity of potash salts was produced from saline deposits in Sheridan and Garden Counties. The high cost of production has virtually eliminated these deposits as economic sources of potash. There are occurrences of bentonite, diatomaceous earth, mineral pigments, and fuller's earth. No production of these minerals was reported in 1952. In the southeastern and northeastern parts of the State there are deposits of coal. The seams are deep, low grade or small. No commercial production of coal in Nebraska has been recorded since 1924. Local landowners occasionally mine sufficient coal for their own use.

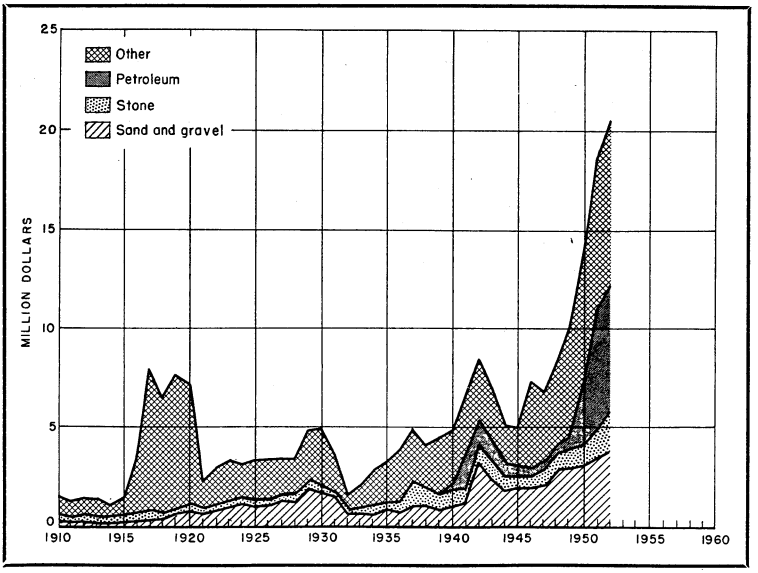

FIGURE 1.—Value of petroleum, sand and gravel, and stone, and total value of mineral production in Nebraska, 1910–52.

[1] Chief, Minerals Industry Division, Region V, Bureau of Mines, Minneapolis, Minn.

TABLE 1.—Mineral production in Nebraska, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays (except for cement)	86,186	$86,686	90,245	$90,720
Natural gas thousand cubic feet	3,895,000	499,000	5,568,000	740,000
Petroleum (crude) 42-gallon barrels	2,558,000	5,960,000	[2] 2,660,000	[2] 6,490,000
Sand and gravel	4,969,243	3,477,409	5,436,540	3,874,106
Stone (except limestone for cement)	942,967	1,437,899	1,245,106	1,946,448
Undistributed: Cement, natural-gas liquids, pumice and pumicite		7,008,419		7,455,871
Total Nebraska		18,469,000		20,597,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production.
[2] Final figure. Supersedes preliminary figure given in commodity chapter.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—Nebraska has two cement plants, the Ideal Cement Co. of Denver, Colo. (with a plant at Superior, Nuckolls County) and the Ash Grove Lime & Portland Cement Co. of Kansas City, Mo. (with a plant at Louisville, Cass County). Limestone and clays quarried locally are used in manufacturing the cement.

Clays.—Clay deposits of various types are widespread in the State. The chief use is for the manufacture of common brick and other heavy clay products. A small quantity of clay has been produced for use in manufacturing fire brick, and some material suitable for ceramic-ware has been found. Most deposits commercially operated are in the eastern or southeastern part of the State. Virtually all the clay produced is used by the producer in manufacturing finished products. Consequently, there is no established market price for crude clay. In this report the value is estimated at $1 per ton as an average cost of production. In 1952, 7 companies reported production of clays for use in brick and tile manufacture, 1 for use in manufacture of flowerpots, and 2 for use in cement manufacture.

Perlite.—Crude perlite obtained from deposits located in Western States was expanded at a plant in Omaha and used chiefly as light-weight aggregate in plaster and concrete.

Pumice and Pumicite.—Occurrences of pumicite have been reported in most counties in the State. Many of them, however, do not have commercial importance. Most of the production has come from Banner, Custer, Frontier, Furnas, Harlan, Lincoln, and Morrill Counties. Production in 1952 was from Custer County by the LaRue-Axtell Pumice Co. at Calloway. Early production was used chiefly in cleansers and soaps, and to date most of it has gone into that market. Pumicite varies in color from white or cream to bluish; although it has good cleansing qualities, it darkens when wet. Production in 1952 decreased 16 percent from 1951.

Sand and Gravel.—Sand and gravel are found in virtually all parts of Nebraska. The greater proportion of sand and gravel produced is from the Platte River and its major tributaries. The Republican

River also furnishes considerable sand and gravel for local markets. The 10 largest producers of sand and gravel in Nebraska in 1952 were: Lyman Richey Sand & Gravel Corp., Omaha; Christensen Sand & Gravel Co., Fremont; Western Sand & Gravel Co., Lincoln; Schellberg Sand & Gravel Co., Lincoln; Steele Bros., Dorchester; Gerhold Company, Columbus; H. Kirkpatrick, Lexington; Einung Sand & Gravel Co., Wayne; Melvin Thomas, Ashland; and West Point Sand & Gravel Co., West Point.

The commercial sand and gravel produced in 1952 totaled 4,892,300 short tons. Companies producing 1,536,500 tons of this total (31 percent) reported the method of transportation. These companies reported 45 percent of their product shipped by rail and 55 percent shipped by truck. Assuming that all noncommercial output was transported by truck (chiefly for State and county highway use) it can be estimated that, of the total sand and gravel produced in 1952, 40 percent was transported by rail and 60 percent by truck. No transportation by water was reported.

TABLE 2.—Sand and gravel sold or used by producers, 1951–52, by classes of operations and uses

	1951			1952		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Glass				1,507	$1,300	$0.86
Molding	360	$242	$0.67	10,796	11,485	1.06
Building	608,400	424,076	.70	763,404	575,472	.75
Paving	111,019	75,470	.68	647,758	465,131	.72
Grinding and polishing	675	450	.67			
Engine	73,594	37,742	.51	101,716	55,954	.55
Filter				(1)	(1)	
Railroad ballast	4,560	1,824	.40	(1)	(1)	
Other	20,270	6,251	.31	12,649	2,488	.20
Gravel:						
Building	1,765,074	1,373,334	.78	854,715	605,227	.71
Paving	1,795,318	1,231,964	.69	2,480,365	1,815,199	.73
Railroad ballast	31,882	18,893	.59	8	21	2.63
Other	1,176	2,104	1.79	(1)	(1)	
Undistributed				19,368	10,562	.55
Total commercial sand and gravel	4,412,328	3,172,350	.72	4,892,286	3,542,839	.72
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building	27,925	2,185	.08	892	331	.37
Paving	41,684	20,828	.50			
Gravel:						
Building	6,250	2,000	.32	9	7	.78
Paving	481,056	280,046	.58	543,353	330,929	.61
Total Government-and-contractor sand and gravel	556,915	305,059	.55	544,254	331,267	.61
Grand total	4,969,243	3,477,409	.70	5,436,540	3,874,106	.71

[1] Included with "Undistributed" to avoid disclosure of individual company operations.

Stone.—Virtually all stone produced in Nebraska is limestone. A small quantity of crushed stream boulders or river boulders is also produced. However, data are included with those for limestone.

In 1952, 1,243,662 tons of limestone valued at $1,943,560 and 1,444 tons of miscellaneous stone valued at $2,888 were produced. These figures do not include limestone used in manufacturing cement. The six largest commercial producers of limestone, except for use in cement, in Nebraska during 1952 were: Hopper Bros. quarries at Pawnee City; Heebner quarries at Nebraska City; United Minerals Products Co. and Western Limestone Products Co., both of Omaha; Nelson quarry at Auburn; and the Chicago, Burlington & Quincy Railroad Co. Most of the stone was crushed for use in building and road construction or for agricultural purposes. Dimension stone cut by companies in the eastern portion of Nebraska is chiefly from quarries in adjacent States.

MINERAL FUELS

Coal.—No commercial production of coal has been reported since 1924.

Petroleum and Natural Gas.—The first discovery of oil in Nebraska was made November 1, 1939 at a well about 3½ miles west of Falls City, Richardson County. Production has increased from 2,000 barrels in 1939 to 2,660,000 in 1952. Output of crude petroleum and/or natural gas and natural-gas liquids in 1952 was from wells in Banner, Cheyenne, Deuel, Harlan, Kimball, and Richardson Counties.

REVIEW BY COUNTIES

ADAMS

Western Brick & Supply Co. of Lincoln, with a plant at Hastings, produced clay for manufacturing heavy clay products. M. M. Lippincott, also at Hastings, produced sand and gravel, chiefly for road construction, and sand for filters. The Adams County Highway Department also produced some gravel for road construction.

BANNER

Crude petroleum and natural gas are produced in the county. The Banner County Highway Department produced gravel.

BOONE

St. Edward Sand & Gravel Co., St. Edward, produced sand and gravel for building and road purposes.

BOYD

Gravel was produced by the County Highway Department.

BROWN

Chicago & Northwestern Railroad produced sand and gravel for ballast and also for use as bedding sand in stock cars. Alvin A. Quinn, Ainsworth, produced sand and gravel for building and road purposes.

TABLE 3.—Value of mineral production in Nebraska 1951–52, by counties (except for petroleum, natural gas, and natural-gas liquids [1])

County	1951	1952	Minerals produced in order of value
Adams	$33,369	$34,168	Sand and gravel, clay.
Banner	[1] 300	[1] 450	Petroleum, natural gas, sand and gravel.
Boyd	----------	5,000	Sand and gravel (1952).
Buffalo	74,128	34,622	Sand and gravel.
Burt	----------	6	Sand and gravel (1952).
Butler	12,823	41,000	Sand and gravel.
Cass	5,249,521	5,678,308	Cement, stone, sand and gravel, clay.
Cedar	9,690	35,260	Sand and gravel.
Cheyenne	(1)	(1)	Petroleum, natural gas.
Clay	74,472	59,467	Sand and gravel.
Cuming	87,312	92,231	Do.
Deuel	(1)	(1)	Petroleum, natural gas.
Dodge	466,287	619,093	Sand and gravel.
Douglas	635,488	557,324	Sand and gravel, clay.
Fillmore	----------	19,356	Sand and gravel (1952).
Franklin	----------	331	Do.
Furnas	1,968	2,389	Sand and gravel.
Gage	110,747	110,804	Stone, clay (1951).
Garden	----------	655	Sand and gravel.
Hall	81,656	125,792	Do.
Hamilton	36,180	38,095	Do.
Harlan	(1)	[1] 12,804	Petroleum, sand and gravel.
Holt	15,085	7,881	Sand and gravel.
Kearney	7,285	----------	Sand and gravel (1951).
Keith	8,400	----------	Do.
Kimball	(1)	(1)	Petroleum.
Knox	55,088	34,944	Sand and gravel.
Lancaster	351,218	186,809	Sand and gravel, clay, stone.
Madison	11,912	26,000	Sand and gravel.
Morrill	80,428	79,622	Do.
Perkins	344	3,795	Do.
Pierce	32,920	42,800	Do.
Platte	176,085	206,282	Do.
Richardson	[1] 18,540	(1)	Petroleum, stone (1951).
Sioux	2,005	2,716	Sand and gravel.
Stanton	----------	33,750	Sand and gravel (1952).
Thayer	22,500	22,500	Sand and gravel.
Webster	50	----------	Sand and gravel (1951).
York	20,000	16,500	Sand and gravel.
Undistributed [1] [2]	10,793,612	12,466,391	
Total	18,469,413	20,597,145	

[1] Figures for petroleum, natural gas and natural gas liquids included with "Undistributed;" data by county not available.

[2] Includes production or value of minerals output which the Bureau of Mines is not at liberty to publish, for the following counties: Boone, sand and gravel; Brown, sand and gravel; Custer, pumice; Dawes, clay (1952); Dawson, sand and gravel; Dundy, sand and gravel; Hayes, sand and gravel; Howard, sand and gravel (1952); Jefferson, clay; Loup, sand and gravel (1952); Merrick, sand and gravel; Nemaha, stone; Nuckolls, cement, sand and gravel; Otoe, stone, clay; Phelps, sand and gravel (1952); Redwillow, sand and gravel; Saline, sand and gravel; Sarpy, sand and gravel, stone; Saunders, sand and gravel; Scotts Bluff, sand and gravel (1952); No production was reported for the following counties in either 1951 or 1952: Antelope, Arthur, Blaine, Box Butte, Chase, Cherry, Colfax, Dakota, Dixon, Frontier, Garfield, Gosper, Grant, Greeley, Hitchcock, Hooker, Johnson, Keya Paha, Lincoln, Logan, McPherson, Nance, Pawnee, Polk, Rook, Seward, Sheridan, Sherman, Thomas, Thurston, Valley, Washington, Wayne, Wheeler.

BUFFALO

The companies producing sand and gravel in Buffalo County include Bruner Bros., Shelton; Harry Johnson, Kearney; C. N. Luther, Kearney; Carl Whitney, Kearney; and Buffalo County Highway Department. Production was chiefly for building and road purposes.

BURT

Sand and gravel for railroad ballast were produced by the Chicago St. Paul & Omaha Railroad.

BUTLER

Gerhold Co. of Columbus produced sand and gravel for building and road purposes.

CASS

The Ash Grove Lime & Portland Cement Co. at Louisville produced portland cement. The plant has a capacity of about 2 million barrels a year. Clay flowerpots are produced by the Kahler Pottery Co., Inc., at Louisville. Limestone for use as riprap, concrete aggregate, road construction, agricultural concrete, and mineral food was produced in the county during the year. Producers include Chicago, Burlington & Quincy Railroad Co.; Heebner quarries, Nebraska City; Hopper Bros. quarries, Pawnee City; United Mineral Products Co., Weeping Water; and Western Lime Products Co., Omaha.

Sand and gravel producers were Lyman Richey Sand & Gravel Corp., Omaha, and Merritt Bros. Sand & Gravel Co. and Western Sand & Gravel Co., Lincoln. In addition to the usual building and road uses, molding and engine sand were produced by Western Sand & Gravel Co., Lincoln.

CEDAR

Einung Sand & Gravel Co., Wayne, produced sand and gravel for building and road purposes.

CHEYENNE

Petroleum and natural gas are produced from several fields in the county. In 1952 about three-fourths (1.8 million barrels) of the State petroleum production was from Cheyenne County.

CLAY

Sand and gravel for building and road purposes were produced by Deweese Sand & Gravel Co., Fairfield, and George K. Werner, Clay Center.

CUMING

Christensen Sand & Gravel Co., Fremont, and West Point Gravel Co., West Point, produced sand and gravel for building and road purposes.

CUSTER

Pumice was produced by LaRue-Axtell Pumice Co. at Callaway. Pumice is used for cleansing and scouring compounds, hand soaps, and other abrasive purposes, also as a concrete admixture and aggregate.

DAWES

Clay for use in manufacturing heavy clay products was produced by Hodkinson Bros.

DAWSON

Sand and gravel were produced by Cleo Hunt, Cozad, and N. Kirkpatrick, Lexington.

DEUEL

Some crude petroleum and natural gas were produced.

DODGE

Sand and gravel were produced by Christensen Sand & Gravel Co. Fremont; Lyman Richey Sand & Gravel Corp., Omaha; and Schnellberg Sand & Gravel Co., Lincoln. Lyman Richey Sand & Gravel Corp., Omaha, also produced glass and engine sand in addition to sand and gravel for building and road purposes.

DOUGLAS

The Omaha Brick Works at Ralston produced clay for manufacturing common and face brick. Sand and gravel were produced by the Chicago, St. Paul, Minneapolis & Omaha Railroad; the Hartford Sand & Gravel Co., Waterloo; Lyman Richey Sand & Gravel Corp., Omaha; and the J. W. McCann Co., as well as the Douglas County Highway Department, Omaha. Uses, in addition to that for building and road construction, include molding and engine sand. Expanded perlite was produced at a plant in Omaha.

DUNDY

Gravel was produced by Guy Douglass of Haigler for road construction.

FILLMORE

Fillmore County Highway Department produced gravel for road construction.

FURNAS

Laverne Manley, Norton, Kans., produced sand for building and other uses.

GAGE

Limestone for concrete and road metal use was produced by the Highway Department.

GARDEN

The Garden County Highway Department produced gravel for road use.

HALL

Sand and gravel, chiefly for building and construction use, was produced by the following companies: Brunken Bros., H & M Equipment Co., and E. H. Johnson, all of Hastings; Dean Camp, Gibbon; Lilley Sand & Gravel Co., Prosser; Lyman Richey Sand & Gravel Corp., Omaha; and Western Brick & Supply Co., Lincoln.

HAMILTON

The Hamilton County Highway Department produced gravel.

HARLAN

Cecil V. Olson, Huntley, produced sand and gravel for building and road use. A relatively small quantity of crude petroleum was produced.

HAYES

Krotter Bros., Palisade, produced sand and gravel for road use.

HOLT

Producers of sand and gravel include Atkinson Sand & Gravel Co., Atkinson, and William Krotter & Son, Stuart.

HOWARD

St. Paul Sand & Gravel Co., St. Paul, produced gravel for road purposes.

JEFFERSON

Endicott Brick & Tile Co. and Western Brick & Supply Co., Fairbury, produced clays for manufacturing common brick and other heavy clay products.

KIMBALL

Some production of crude petroleum was reported.

KNOX

The Knox County Highway Department produced gravel.

LANCASTER

Clays for use in manufacturing common brick and other heavy clay products were produced by Yankee Hill Brick Manufacturing Co. Limestone, chiefly for concrete and road metal, was produced by the Lancaster County Highway Department, and limestone and sand and gravel were produced by the Nebraska State Department of Roads.

LOUP

C. G. Gunnerson, Sargent, produced sand and gravel.

MADISON

Sand and gravel were produced by the Gerhold Co., Columbus.

MERRICK

Sand and gravel for building and road construction were produced by Lyman Richey Sand & Gravel Corp., Omaha, and Overland Sand & Gravel Co., Stromsburg.

MORRILL

Lyman Richey Sand & Gravel Corp., Omaha, produced engine sand and gravel for building and paving. A small quantity of crude petroleum was also produced.

NEMAHA

Limestone for use as riprap, concrete, road metal, and agricultural purposes is produced by Heebner quarries, Nebraska City, and the Nelson quarry, Auburn.

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NUCKOLLS

The Nebraska Cement Division, Ideal Cement Co., Denver, Colo., with a plant at Superior, produced portland cement. The plant had a rated annual capacity of 870,000 barrels in 1950. Raw materials are obtained in the vicinity and also from quarries across the State line in Kansas. Sand and gravel were produced by C. F. Bondegard, Ruskin, and the Nuckolls County Highway Department, Nelson.

OTOE

Western Brick & Supply Co. of Nebraska City produces clay chiefly for manufacturing common brick. Limestone was produced for use of the United States Army Engineers at Nebraska City.

PERKINS

Production of gravel was reported by Bertha C. Eppler, and the Perkins County Commissioners, both of Grant.

PHELPS

Conn & Johnson, Holdredge, and the Phelps County Highway Department produced sand and gravel for building or road purposes.

PIERCE

Einung Sand & Gravel Co., Wayne, produced sand and gravel for building and road purposes.

PLATTE

Lyman Richey Sand & Gravel Corp., Omaha, and the Gerhold Co., Columbus, produced sand and gravel for building and road purposes.

REDWILLOW

Sand and gravel for building and road purposes were produced by Davidson & Merritt Sand Co., Indianola, and Frank Gillen, McCook.

RICHARDSON

Oil wells in Richardson County produced about 259,000 barrels of crude petroleum in 1952.

SALINE

Sand and gravel for building and road purposes were produced by Edward Kohel, Wilder; Steele Bros., Dorchester; and Vlasak & Cawley, Crete.

SARPY

Limestone, chiefly for use as riprap, was produced by the Heebner quarries, Nebraska City. Lyman Richey Sand & Gravel Corp., Omaha, produced engine sand and sand and gravel for building and road purposes.

SAUNDERS

Sand and gravel for building and road purposes were produced by Melvin Thomas, Ashland, and Wolf Sand & Gravel Co., Morse Bluffs.

SCOTTS BLUFF

Platte Valley Cement & Tile Co., Scotts Bluff, produced sand for road purposes.

SIOUX

The Sioux County Highway Department produced gravel.

STANTON

Sand and gravel were produced by the O'Brien Sand & Gravel Co., Stanton.

THAYER

Shearer Construction Co., Hebron, produced sand and gravel.

YORK

Sand and gravel were produced by the York Gravel Co., York.

The Mineral Industry of Nevada

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Nevada Bureau of Mines.

By R. B. Maurer [1] and Robert E. Wallace [2]

NEVADA mineral production in 1952 reached an alltime high total value of $64,231,000 and represented an 11-percent rise over $57,674,000, the total value in 1951. This was the third consecutive year of advance in mineral output in the State. Metals provided $54,226,000 or 84 percent of the State's total value of minerals produced in 1952 and $47,476,000 or 82 percent in 1951. Copper led other Nevada minerals in value in 1952 and showed a moderate increase over 1951. Output of tungsten concentrates rose to second place among Nevada minerals, stimulated by a high guaranteed price plus an unwavering market provided by the Government purchase program. Mercury output, still under the impetus of the relatively high average price of 1951 and facing attractive, although slightly declining, returns for the metal in 1952, rose substantially over 1951.

Japan, in the process of industrial resurgence but with a paucity of basic mineral resources, looked to the western United States for iron ore. Nevada high-grade magnetite and hematite deposits adapted to selective mining in open pits yielded a quantity of iron ore unequaled in any prior year.

Molybdenum concentrate, a byproduct of copper concentration, reflected the increased copper production. Output of manganese ore rose appreciably in 1952, responding to the incentive offered by stable, although limited consumption within the State and in neighboring States, plus the establishment of Federal Government purchase depots for low-grade ore at reasonable distances from Nevada mines.

In contrast to the advances by certain metals, gold (fourth in value among Nevada minerals in 1952) and silver, affected by continued fixed prices, slumped in 1952. Zinc yield and lead yield (which ranked third and sixth, respectively, in value among the State minerals in 1952) and antimony output all reacted to declining metal prices and decreased noticeably.

Nonmetallic-mineral yield contributed $10,006,000 or 16 percent of the State total value in 1952 and $10,198,000 or 18 percent in 1951. The upward trend in western industry was reflected in increases in value ranging from slight to moderate for barite, clays, diatomite, fluorspar, lime, marl, perlite, salt, sulfur, stone, and talc; however, brucite, magnesite, pumice, and sand and gravel registered slight to moderate declines.

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[1] Chief, Mineral Industry Division, Region III, Bureau of Mines, San Francisco, Calif.
[2] Commodity-industry analyst.

TABLE 1.—Mineral production in Nevada, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Antimony ore and concentrate—gross weight	156	(2)	152	(2)
Barite (crude)	63,201	$387,026	68,062	$391,242
Clays (including fuller's earth)	3,220	33,420	3,958	36,278
Copper (recoverable content of ores, etc.)	56,474	27,333,416	57,537	27,847,908
Gold (recoverable content of ores, etc.)—troy ounces	121,036	4,236,260	117,203	4,102,105
Gypsum (crude)	643,637	1,811,757	608,284	1,666,938
Iron ore (usable)—long tons, gross weight	299,010	898,306	911,657	3,991,970
Lead (recoverable content of ores, etc.)	7,148	2,473,208	6,790	2,186,380
Manganese ore (35 percent or more Mn)—gross weight	328	(2)	695	(2)
Manganiferous ore (5 to 35 percent Mn)—do	1,250	(2)	7,947	(2)
Mercury—76-pound flasks	1,400	294,182	3,523	701,429
Sand and gravel	2,616,629	2,657,654	2,098,211	2,380,419
Silver (recoverable content of ores, etc.)—troy ounces	981,669	888,460	941,195	851,829
Stone (except limestone for lime)	834,807	959,815	830,712	1,158,608
Talc and ground soapstone	6,919	152,878	7,580	180,328
Tungsten concentrate—60-percent WO_3 basis	1,482	4,780,237	2,329	8,820,598
Zinc (recoverable content of ores, etc.)	17,443	6,349,252	15,357	5,098,524
Undistributed: Brucite, diatomite, fluorspar, gem stones, lime, magnesite, calcareous marl, molybdenum, perlite, pumice and pumicite, salt, sulfur ore, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)	----------	[3] 4,418,333	----------	4,816,659
Total Nevada	----------	[3] 57,674,000	----------	64,231,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels, gypsum, and magnesite are strictly production.
[2] Value included with "Undistributed."
[3] Revised figure.

TABLE 2.—Average United States prices of selected mineral commodities, 1943–47 (average) and 1948–52, produced in 1952 [1]

Commodity	1943–47 (average)	1948	1949	1950	1951	1952
Antimony—cents per pound	19.7	36.7	38.7	29.4	44.2	44.0
Antimony ore, 50–55 percent Sb dollars per short-ton unit Sb	2.54–2.63	4.55–4.76	3.74–3.93	2.92–3.05	5.57–5.82	4.08–4.34
Copper [2]—cents per pound	15.4	21.7	19.7	20.8	24.2	24.2
Fluorspar (average, all types) dollars per ton	31.25	33.84	34.92	35.22	41.41	46.35
Gold [3]—dollars per troy ounce	35.00	35.00	35.00	35.00	35.00	35.00
Iron ore (average value at mine) dollars per long ton	2.94	3.91	4.50	4.99	5.46	6.09
Lead [2]—cents per pound	9.9	17.9	15.8	13.5	17.3	16.1
Magnesite (dead burned grain) dollars per short ton	22.20	31.00	30.75	36.19	36.30	36.30
Mercury [4]—dollars per 76-pound flask	126.09	76.49	79.46	81.26	210.13	199.10
Molybdenum concentrate, 90-percent MoS_2 concentrate—cents per pound MoS_2	45.0	45.0	54.0	59.0	60.0	60.0
Silver [5]—cents per troy ounce	76.9+	80.8+	90.5+	90.5+	90.5+	90.5+
Tungsten concentrate dollars per short-ton unit WO_3	22.56	26.27	26.38	28.25	61.02	63.44
Zinc [2]—cents per pound	11.6	13.3	12.4	14.2	18.2	16.6

[1] Prices are discussed in detail in the commodity chapters of volume I, Minerals Yearbook.
[2] Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946–47 include bonus payments by Office of Metals Reserve for overquota production.
[3] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[4] Average quoted price at New York.
[5] Treasury buying price for newly mined silver, 1943 to June 30, 1946—$0.71111111; July 1, 1946 to Dec. 31, 1947—$0.905; 1948–52—$0.9050505.

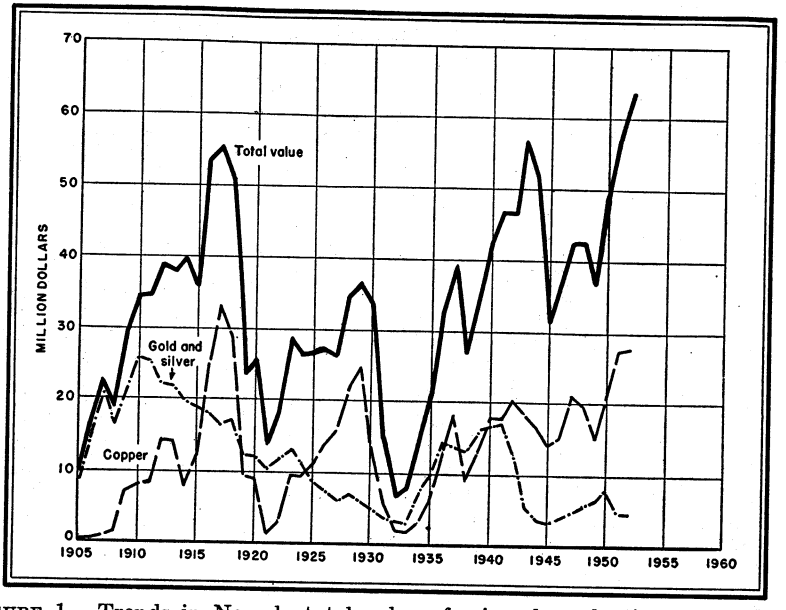

FIGURE 1.—Trends in Nevada total value of mineral production and value of gold and silver and copper production, 1905–52.

CONSUMPTION AND MARKETS

Nevada ranked 29th among the 48 States, Alaska, and the District of Columbia in mineral production. As a consumer of minerals, Nevada is in the Nation's lower category due to its small population and limited industrial activities; however, its proximity to smelting and manufacturing centers, particularly in Utah and California, places it in the position of a supplier to expanding western economy.

Marketing the State's minerals offers a wide variety of problems to mine operators. Nevada's principal copper producer (incidentally the State's largest individual industrial establishment) converts the raw mineral into blister copper, which is shipped to eastern refineries. Producers of gold sell direct to the United States Mint, and mercury mines usually market the metal to consumers and distributors. Other metal mines merely produced the ore and either sell it directly to smelters or market it at custom mills. Mills, in turn, dispose of their products; lead concentrates, for example, are marketed at smelters, whereas tungsten concentrates are sold largely to the General Services Administration. Some producers of nonmetallic minerals dispose of the raw material to grinding mills, and other producers have a product—agricultural sulfur for instance—that is sold directly to consumers after preliminary crushing. Raw materials are converted into a finished product by other operators, such as a manufacturer of wallboard who also mines and processes gypsum.

Custom Mills and Smelters.—Tungsten mining, with its attendant metallurgical problems of satisfactory concentration at small mines, revived custom milling in Nevada, largely dormant since the decline of precious-metal-ore mining. The leading operators of metallurgical plants receiving custom-tungsten material were: Getchell Mines, Inc., Red House, Humboldt County; Lindsay Mining Co., Pilot Mountain, Esmeralda County; Nevada Scheelite, Division of Kennametal, Inc., Rawhide, Mineral County; Metallurgical Development Co., Inc.,

Gardnerville, Douglas County; and Nevada Tungsten Corp., Sodaville, Mineral County.

Combined Metals Reduction Co. accepted lead-zinc ore and manganiferous ores containing lead and zinc on a custom basis at its Caselton mill in Lincoln County. Kennecott Copper Corp. treated the Consolidated Coppermines Corp. copper ore under contract at the McGill concentrator and smelted custom-fluxing ores containing gold, silver, and copper at its McGill copper smelter in White Pine County. The Lippincott Lead Co. lead smelter at Bonnie Clare, Nye County, reduced some custom lead ore and concentrates originating in California during 1952.

Mineral Brokers.—Much of the iron ore shipped to Japan from Nevada mines was consigned by brokers and traders through their California establishments. Some small lots of tungsten concentrates reached the market through brokers established in California tungsten-milling areas.

Defense Minerals Exploration Administration Program.—The Defense Minerals Exploration Administration program, designed to provide Government aid in finding new sources of strategic and critical minerals in the United States, was initiated May 16, 1951, and 27 contracts, having an approved project cost of $1,247,801, were executed with mines in Nevada from its inception through 1952. The Government agreed to advance $704,132 to the projects. Of these, 8 were tungsten properties; 3, copper; 8, lead-zinc; 3, lead-zinc-copper; 2, mercury; 1, corundum-andalusite; 1, antimony; and 1, uranium.

Other Government Assistance Activities.—Under authority of the Defense Production Act of 1950, the Defense Materials Procurement Agency used several instruments for achieving expansion of Nevada mineral facilities. In 1952 Manganese Inc., Clark County, financed development of its manganese mine and mill by a private loan obtained in 1951, 90 percent of which was guaranteed by the Government. Previously, in 1950 the company had negotiated a purchase and resale contract with the Government for a maximum of 27,500,000 long-ton units of manganese (45 percent minimum Mn) at $1.50 per unit. Titanium Metals Corp., also in Clark County, operated in 1952 on an agreement for "Advance Against Production" not to exceed $15,000,000, negotiated in 1951. That is, provisions were written into a procurement contract involving production and sale of 18,000 short tons of 99.3-percent-pure titanium metal at a floor purchase price of $5 per pound, whereby funds would be advanced to be returned, with interest, as production proceeded. Anaconda Copper Mining Co. developed its Lyon County copper property under a guarantee by DMPA to purchase copper, not otherwise disposed of by the company (up to 256,000,000 pounds at a floor price of $0.255), until December 6, 1959. Late in December 1952 Eureka Corp., Ltd., obtained Government financial assistance to dewater its Fad shaft (lead-zinc) in Eureka County. The DMPA agreed to pay 25 percent of the project cost with a maximum contribution of $750,000.[3]

To assist further the development and production of strategic minerals in Nevada in 1952, the Bureau of Public Roads under section

[3] Data from General Services Administration.

TABLE 3.—Defense Minerals Exploration Administration projects either initiated or still active in 1952

Operator	Property	County	District	Commodity	Government participation	Total contract
A. J. Lovestedt	Pioneer	Douglas	Gardnerville	Tungsten	$2,141	$2,855
Marshall Mining Co	Marshall	Elko	Contact (Salmon River)	Copper	25,211	50,421
United Minerals Corp	Rip Van Winkle	do	Merrimac	Lead-zinc	26,750	53,500
Frank Bullock	Lucky Boy-Jackson	do	Delano	do	10,350	20,700
W. F. Dunnigan	Red Rock	Esmeralda	Fish Lake Valley	Mercury	6,694	8,925
General Tungsten Co. (Irene Sykes)	Half Moon & Rock Hill	do	Columbus Marsh	Tungsten	7,950	10,600
Aubrey Minney	McAdoo	Humboldt	Bottle Creek	Mercury	13,200	17,600
F. B. Keever	Bentley	Lander	Battle Mountain	Lead-zinc	10,114	20,228
G. W. Snyder & G. W. Snyder, Jr	Lucky Strike	do	do	do	13,897	27,794
Pennsylvania Mine (E. H. Smith)	Pennsylvania	Lincoln	Viola (Pennsylvania)	Copper	12,896	25,792
Bristol Silver Mines Co	Bristol	do	Jack Rabbit (Bristol)	Lead-zinc	90,814	181,628
Comet Mines, Inc	Comet	do	Comet	do	95,000	190,000
Ely Valley Mines, Inc	Ely Valley	do	Pioche (Ely)	Zinc-lead	43,100	86,200
Raymond-Combined Mines Co	Linevada, Prince Henry, Mother Lode, Doris.	do	do	Lead-zinc	54,233	108,466
Coranda Corp	Green Talc & Bismark	Mineral	Gillis	Corundum-andalusite	32,400	36,000
Rysh & Corwin	Scheelite Extension	do	Regent	Tungsten	9,000	12,000
E. S. Perry & R. B. McPherson	King Soloman	Nye	Monitor Range	Antimony	1,980	2,640
H. P. Newman	Copper King	do	Union	Copper	1,890	3,780
Nevada Uranium Co	Stalin's Present	Pershing	Rocky Canyon	Uranium	8,231	9,145
Hamilton Consolidated Mines Corp	Rocco-Homestake	White Pine	White Pine	Lead-zinc	13,370	26,740
Grand Deposit Mining Co	Grand Deposit	do	Aurum (Silver Mountain)	Lead-zinc-copper	13,200	26,400
Walker Corp	Ward	do	Ward	Zinc-lead-copper	66,155	132,310
Baltimore Camas Mines, Inc	Schafer	do	Cherry Creek	Tungsten	15,210	20,280
Cherry Creek Tungsten Mining Co	Cherry Creek	do	do	do	56,250	75,000
Graham Development Corp	Gold King	do	Black Horse	do	12,840	17,120
Mount Wheeler Mines, Inc	Mount Wheeler	do	Mount Washington	do	56,607	75,476

6, Defense Highway Act of 1941, 55 Stat. 765, and section 12, Federal Highway Act of 1950, expended public funds to construct access roads to mines, listed in the accompanying tabulation.[4]

TABLE 4.—Bureau of Public Roads special projects in 1952

Establishment served	Commodity	County	Estimated cost
Buena Vista mines	Iron	Churchill and Pershing.	$1,983
Phelps Stokes mine	do	Nye	13,975
Nevada Scheelite mine	Tungsten	Mineral and Churchill	27,461
Nevada Massachusetts mine	do	Pershing	187,190
Lincoln mine	do	Lincoln	61,473
Black Diablo mine	Manganese	Pershing and Humboldt.	23,001
Monarch mine	do	Lincoln	13,829

NOTE.—A road to the Leviathan sulfur mine in Alpine County, Calif., involved $281,547 expended in Alpine County, Calif., and Douglas County, Nev.

General Services Administration Purchase Depots.—The General Services Administration did not maintain purchase depots for its stockpiles of strategic minerals in Nevada, but considerable tonnages of manganese ore were consigned to the Wenden, Ariz., and Deming, N. Mex., depots. Tungsten concentrates were purchased by the Government at designated milling points in lieu of established purchase depots in the tungsten-producing districts.

New Plants or Projects.—Expansion of titanium production in Nevada is not likely to open immediately a new market for local raw material, as rutile is largely used for preparing the titanium tetrachloride reduced. Expanded use of titanium metal undoubtedly will require eventual utilization of lower grade titaniferous ores as a source of needed titanium oxide. Development of manganese concentrating and nodulizing facilities at Pioche and eventual operation of the Henderson ferromanganese plant will draw on hitherto unworked ores in the State. The new antimony smelter and oxide plant in Nye County are designed to operate on Nevada ores.

New Industries and New Uses.—Initiation of acid grade fluorspar concentration in Nevada opened a new market for the State's ore and stimulated search for new deposits needed to fulfill mill requirements. Use of bentonite as a moisture retainer in soils has widened the use scope of that material, and Nevada deposits were investigated by business interests as a possible source of supply.

FLOW OF MINERALS

Domestic Shipments.—Interstate movement of minerals was predominantly exports from Nevada in 1952. Shipments of metallic ores and concentrates, blister copper, barite, gypsum, special sand, lime, magnesium compounds, perlite, and diatomite constituted a large percentage of the outgoing materials. Other than mineral fuels, cement was the main import. Railroads hauled the greater tonnage of minerals moved, although motortrucks were utilized heavily in transporting prepared nonmetallic minerals and tungsten concentrates.

[4] Data from Bureau of Public Roads.

Foreign Imports and Exports.—Iron ore was the principal Nevada mineral product entering international trade in 1952. This material also was involved in interstate flow of minerals, as the ore was transported by rail to stockpiles at California ports where it awaited suitable ocean transport. The basic material for Nevada's titanium production was largely imported rutile.

EMPLOYMENT IN MINERAL INDUSTRIES

Employment.—The trend in employment at Nevada mineral facilities reflected the expansion in copper, iron, manganese, and tungsten development. Data released by the Nevada State Inspector of Mines [5] indicated that the total persons employed for wages or contracting in the State's mines, mills, and smelters, as of June 30, 1952, was 5,054 at 169 installations, whereas 4,167 persons were employed at 146 facilities as of June 30, 1951. The heaviest gains were made in Lyon, White Pine, and Clark Counties, where the extensive preparation of mines and metallurgical plants, largely for long-term output, was only in part productive in 1952. The Bureau of Labor Statistics reported an estimated average of 4,300 persons employed exclusively at Nevada mines in 1952 compared with an estimated average of 3,500 in 1951.

Accidents.—No major disaster was reported at Nevada mineral operations in 1952. Total nonfatal accidents rose comparably to the increase in employment in 1952; but the trend in fatalities (relatively small in number) was sharply upward in this period, which involved development and construction work, normally more hazardous than straight operational activity.

Wages.—The average weekly earnings in Nevada mines in 1952 was $88.13 compared with $81.63 in 1951, an 8-percent rise.[6] Mines that operated on either unchanged or declining metal prices found it difficult to compete for skilled labor with the more fortunate segments of the industry.

REVIEW BY MINERAL COMMODITIES

METALS

Antimony.—Owing to slackened demand and lower prices, operators were hampered by a lack of buyers who would accept antimony ore and concentrates in 1952. The Last Chance Mining Co. operated a reduction plant intermittently in Wall Canyon, Nye County. The plant consisted of an electrically heated kiln, a baghouse, and an oil-fired reverberatory furnace. Some antimony oxide and antimony metal were produced during the experimental stage from Last Chance mine ore. Small lots of antimony ore were shipped from Lander and Washoe Counties, whereas ore mined in Eureka County was stockpiled. Antimonial lead ore was shipped to smelters from Pershing and Mineral Counties. During 1943–47 an annual average of 318 short tons of antimony ore and concentrate containing 29 short tons of antimony was shipped from Nevada mines compared with an annual average of 262 tons containing 58 tons of antimony in 1948–52.

[5] Nevada State Inspector of Mines, 26th Report.
[6] Data from the Bureau of Labor Statistics, U. S. Department of Labor.

The Bureau of Mines published data on concentration of antimony ore from Elko County.[7]

Cadmium.—An undetermined quantity of cadmium was recovered at smelters from zinc concentrates derived from Nevada ores mined, particularly in the Pioche district, Lincoln County, and Battle Mountain district, Lander County.

Copper.—With ample reserves of ore available for mining in the Robinson district, White Pine County, and demand for the metal unsatiated, Nevada 1952 copper output advanced over 1951 and approached the record yield of 83,663 tons attained in 1942. To bolster the State's copper-ore reserves, Kennecott Copper Corp. in the Robinson district pursued development of the Deep Ruth underground mine and projected development of the Veteran ore body by open pit; Anaconda Copper Co. prepared the Yerington mine, Yer-

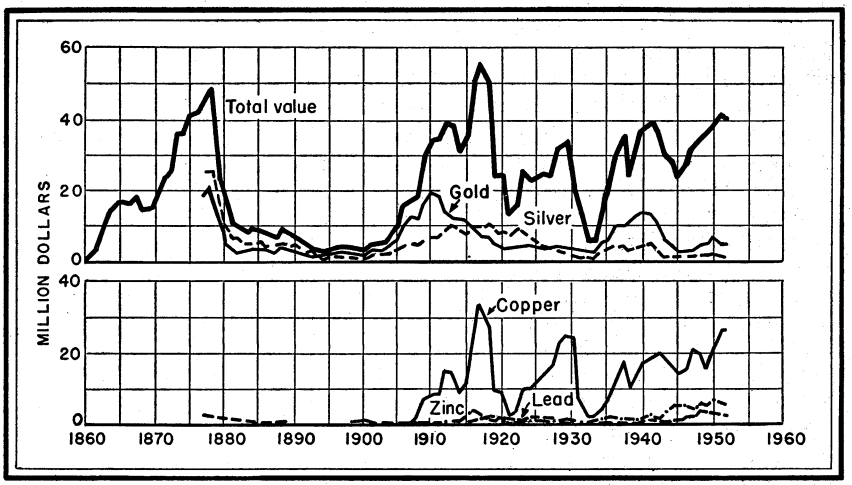

FIGURE 2.—Value of mine production of gold, silver, copper, lead, and zinc in Nevada, 1860–1952.

ington district, Lyon County, for early exploitation of its oxide ore. According to company reports, Consolidated Coppermines Corp. contemplated exploring the Dixie Valley area of northeastern Churchill County in the hope of finding a commercial deposit of copper ore. Occasional lots of direct-smelting copper ore were shipped from small mines under development in Clark, Elko, Eureka, Lincoln, and Washoe Counties, but the bulk of the copper produced outside of White Pine County was a byproduct of other Nevada ores, particularly the zinc-lead ore of Lincoln County. Leading copper-producing mines, in order of output, were: Kennecott Copper Corp., Nevada Mines Division, Ruth (Liberty) pit; Consolidated Coppermines Corp., Morris Brooks pit; the Ruth (Liberty) pit extension worked by

[7] Engel, A. L., Concentration Tests on Various Base-Metal Ores: Bureau of Mines Rept. of Investigations 4927, 1952, 14 pp.

Kennecott Copper Corp. for the account of Consolidated Coppermines Corp., and Kennecott's Kimbley pit, all in the Robinson district, White Pine County.

Gold.—High operating costs and the fixed Treasury price for gold continued to depress Nevada straight gold mining in 1952. Of the State total gold produced in 1952, 55 percent was derived from base-metal ores (51 percent from copper ore alone), 28 percent from alluvium, 16 percent from precious-metal ores, and 1 percent from miscellaneous lode material. Lode-gold mining was restricted principally to small sporadic operations; only the Goldacres mine in Lander County operated throughout the year.

The 3-percent decline in 1952 gold output from 1951 reflected largley the shutdown from September through December of the Round Mountain Gold Dredging Co. mechanical excavator-conveyor-washing plant placer operation in Nye County. The nature of the material worked presented technical difficulties that proved too costly for profit. Of the 11 placer mines that reported gold production in 1952, 1 was worked by a bucketline dredge, 5 by mechanical excavators delivering material to nonfloating washing plants, 1 by underground methods, and 4 by small-scale hand methods.

The following 6 leading producers of gold in Nevada contributed 92 percent of the State total gold in 1952: Kennecott Copper Corp., Nevada Mines Div., Ruth (Liberty) pit, Robinson district, White Pine County (copper ore); Natomas Co., Greenan Placers, Battle Mountain district, Lander County (bucketline dredge); London Extension Mining Co., Goldacres mine, Bullion district, Lander County (gold ore); Consolidated Coppermines Corp., Morris Brooks pit, Robinson district, White Pine County (copper ore); Round Mountain Gold Dredging Co., Round Mountain district, Nye County (placer); Consolidated Coppermines Corp., Ruth (Liberty) pit extension, Robinson district, White Pine County (copper ore).

Iron Ore.—The upsurge in output of Nevada iron ore in 1952 over 1951 resulted largely from the consummation of short-term contracts with the Japanese iron and steel importers whose specifications called for high-grade ore that Nevada mines were able to supply. Relatively small tonnages of exceptional grade ore were consigned to Midwestern States and Pacific Coast States steel furnaces, and a moderate tonnage of ore was utilized at Nevada dead-burned magnesite plants. Shipments of usable iron ore in 1952 averaged 59.4 percent iron.

However, toward the end of 1952 it became apparent that exports of ore to Japan would not continue beyond the short-term contracts in effect, as the Japanese were negotiating with producers in the Orient and British Columbia for ore that would be less costly owing to lower transportation charges. Supplying domestic open hearths and miscellaneous users was expected to continue.

All of Nevada's 1952 iron-ore output, reported from 12 properties, was mined by open-pit methods, and the 3 leading producers were: Minerals Material Co., Buena Vista mine, Buena Vista district, Churchill County; Standard Slag Co., Phelps Stokes (Iron Mountain) mine, Mammoth district, Nye County; and Simplot Iron Mines, Inc., Simplot (Modarelli) mine, Amarilla district, Eureka County.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc, 1943–47 (average), 1948–52, and total, 1859–1952, in terms of recoverable metals [1]

Year	Mines producing [2]		Material sold or treated [3] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1943–47 (average)	189	21	6,573,932	107,101	$3,748,535	1,310,305	$1,009,427
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	335	27	7,745,119	178,447	6,245,645	1,537,217	1,391,259
1951	199	12	7,183,733	121,036	4,236,260	981,669	888,460
1952	114	11	7,313,697	117,203	4,102,105	941,195	851,829
1859–1952 [4]			(5)	26,264,681	597,825,511	598,031,601	548,354,197

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1943–47 (average)	56,623	$17,159,163	6,401	$1,296,224	19,084	$4,447,066	$27,660,415
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
1951	56,474	27,333,416	7,148	2,473,208	17,443	6,349,252	41,280,596
1952	57,537	27,847,908	6,790	2,186,380	15,357	5,098,524	40,086,746
1859–1952 [4]	2,082,151	638,216,690	598,090	76,367,615	459,595	87,645,608	1,948,409,621

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings or slimes retreated, and ore, old tailings, slag and copper precipitates shipped to smelters during calendar year indicated.
[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[3] Does not include gravel washed.
[4] From 1904 (when first satisfactory annual canvass of mine production was made) to 1952, inclusive, the output was as follows: Gold, 14,437,805 ounces valued at $353,342,278; silver, 309,618,752 ounces, $211,195,974; copper, 2,080,225 tons, $637,570,062; lead, 360,299 tons, $53,731,053; zinc, 459,595 tons, $87,645,608; total value, $1,343,484,975.
[5] Figure not available.

Lead.—Nevada lead output in 1952 continued to be associated closely with zinc; zinc-lead ore supplied 75 percent of the total lead, whereas straight lead ores contributed only 20 percent. A relatively large number of smaller mines, mostly marginal operations worked by lessees, shipped lead ore early in 1952; however, the collapse of lead prices brought rapid cessation of mining at virtually all these properties. The State's second largest producer of lead, which milled low-grade zinc-lead ore, did not operate after October 1952. The Lippincott Lead Co. produced lead bullion for use at a California battery plant from primary and secondary lead material smelted at its Bonnie Clare, Nye County, plant.

The five principal lead-producing mines, which yielded 85 percent of the State lead, were as follows: Combined Metals Reduction Co., Pioche groups, Pioche district, Lincoln County; Copper Canyon Mining Co., Copper Canyon mine, Battle Mountain district, Lander County; New World Exploration, Research & Development Co., Aladdin mine, Railroad district, Elko County; Ely Valley Mines, Inc., Ely Valley mine, Pioche district, Lincoln County; and the New Potosi mine, G. A. Peterson, operator, Candelaria district, Mineral County.

Manganese.—Under the stimuli of expanded Government purchases of manganese ore and a market for high-silica manganiferous ore at

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in 1952, by months, in terms of recoverable metals [1]

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	5,579	53,436	3,414	445	1,137
February	7,864	69,630	4,314	530	1,244
March	9,122	82,870	4,193	569	1,644
April	10,014	93,395	5,417	683	1,666
May	10,332	73,328	5,570	536	1,676
June	11,687	83,501	5,242	571	1,718
July	11,674	73,041	5,343	431	1,223
August	12,190	78,101	5,000	556	1,191
September	11,829	82,274	5,061	578	1,186
October	10,209	92,788	5,009	665	918
November	8,248	69,097	4,340	491	726
December	8,455	89,734	4,634	735	1,028
Total	117,203	941,195	57,537	6,790	15,357

[1] Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metals (or gross metals as indicated) contained in concentrates, ores, tailings, and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

TABLE 7.—Gold and silver produced at placer mines, 1943–47 (average) and 1948–52, in fine ounces, in terms of recoverable metals

Year	Material handled (cubic yards)	Gold (fine ounces)	Silver (fine ounces)	Total value	Average gold value per cubic yard
1943–47 (average)	1,445,400	9,986	3,974	$352,551	$0.242
1948	762,500	8,178	1,463	287,554	.375
1949	1,382,140	7,942	1,676	279,487	.201
1950	5,243,450	36,378	9,800	1,282,099	.243
1951	6,165,850	30,509	14,017	1,080,501	.173
1952	5,625,620	33,079	11,011	1,167,730	.206

a Utah steel mill, Nevada manganese output exceeded the minor 1951 yield by a considerable margin; in quantity, battery ore (synthetic) was up 119 percent over 1951, metallurgical ore (35 percent Mn or more) rose 81 percent, and usable ferruginous ore (10–35 percent Mn) increased 536 percent. Synthetic battery ore shipped averaged 56 percent Mn in 1951 and 1952; metallurgical ore, 46 percent Mn in 1951 and 39 percent Mn in 1952; and ferruginous ore (exclusive of that to low-grade Government stockpiles), 28 and 24 percent Mn, respectively, in 1951 and 1952. Production in 1952 was reported from Clark (synthetic battery ore produced largely from out-of-State ore), White Pine, Lincoln, Pershing, Lander, Humboldt, and Elko Counties.

Nevada installations in process of development in 1952 pointed to a sizable increase in output of manganese ore and concentrates early in 1953. A third flotation unit and a sink-float unit were added to the Combined Metals Reduction Co. Caselton mill for treating manganiferous ores containing lead and zinc. The Pioche Manganese Co., affiliated with Combined Metals Reduction Co., was installing a rotary kiln of 300 to 500 tons daily capacity designed to agglomerate manganese flotation concentrates into nodules and at the same time fume off residual lead and zinc—objectionable constituents of manganese concentrates. The lead fume and zinc fume will be marketed. To utilize the manganese nodules, this company is assembling an

electric furnace at Henderson for producing ferromanganese. Similarly, perfection of the processes under way at the Manganese, Inc., Henderson plant to concentrate the Three Kids mine manganese ore and prepare manganese nodules will allow further expansion of the State's manganese industry.

Mercury.—Mercury output in 1952 rose 152 percent over 1951 (a year, however, in which the Nation's output was at a low level). The Cordero mine, McDermitt district, Humboldt County, was the largest mercury producer in the United States. The alltime annual peak price of the metal in 1951 ($210.13 a flask) undoubtedly influenced some expansion of operation, which actually showed results in 1952, when the average annual quotation of mercury reached $199.10 a flask. Exploration for mercury ore was pursued at some previously worked mines, but the scope of this activity was limited by the uncertain future demand for the metal; no significant discoveries were

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties, in terms of recoverable metals

County	Mines producing [1]		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Churchill	4	----	31	$1,085	3,061	$2,770
Clark	16	(2)	724	25,340	23,270	21,061
Douglas	1	----	8	280	3	3
Elko	15	(2)	132	4,620	49,469	44,772
Esmeralda	6	(2)	96	3,360	48,362	43,770
Eureka	3	(2)	6	210	447	405
Humboldt	6	(2)	60	2,100	4,388	3,971
Lander	9	[3] 4	[3] 51,271	[3] 1,794,485	[3] 144,917	[3] 131,157
Lincoln	12	----	3,751	131,285	447,786	405,269
Lyon	2	2	483	16,905	695	629
Mineral	2	1	697	24,395	20,737	18,768
Nye	11	(3)	[3] 170	[3] 5,950	[3] 11,660	[3] 10,553
Pershing	4	2	83	2,905	346	313
Storey	1	----	10	350	8	7
Washoe	4	----	85	2,975	399	361
White Pine	18	2	59,596	2,085,860	185,647	168,020
Total	114	11	117,203	4,102,105	941,195	851,829

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Churchill	----	----	4,000	$644	----	----	$4,499
Clark	66,700	$16,141	659,600	106,196	2,927,000	$485,882	654,620
Douglas	----	----	----	----	----	----	283
Elko	111,900	27,080	726,500	116,967	38,300	6,358	199,797
Esmeralda	1,500	363	106,300	17,114	----	----	64,607
Eureka	83,900	20,304	109,500	17,630	633,100	105,095	143,644
Humboldt	300	73	23,900	3,848	13,500	2,241	12,233
Lander	92,900	22,482	1,815,400	292,279	1,206,300	200,246	[3] 2,440,649
Lincoln	394,100	95,372	9,555,200	1,538,387	25,607,000	4,250,762	6,421,075
Lyon	----	----	----	----	----	----	17,534
Mineral	800	194	289,200	46,561	----	----	89,918
Nye	4,600	1,113	186,300	29,994	8,900	1,477	[3] 49,087
Pershing	----	----	2,300	370	----	----	3,588
Storey	----	----	----	----	----	----	357
Washoe	7,700	1,863	2,000	322	----	----	5,521
White Pine	114,309,600	27,662,923	99,800	16,068	279,900	46,463	29,979,334
Total	115,074,000	27,847,908	13,580,000	2,186,380	30,714,000	5,098,524	40,086,746

[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] Nye County placer combined with that of Lander County to avoid disclosure of individual output.

reported. In addition to Humboldt County production, mercury shipments were reported from Esmeralda, Mineral, and Nye Counties.

Molybdenum.—Molybdenum concentrates were recovered at the McGill, Nev., concentrator as a byproduct of Kennecott Copper Corp., Nevada Mines Division, and Consolidated Coppermines Corp. copper ore mined in the Robinson district, White Pine County. The yield of molybdenum concentrates in 1952 increased 5 percent over 1951.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1952, by classes of ore or other source materials, in terms of recoverable metals

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	19	140,967	18,337	2,249	700	1,500	----
Dry gold-silver	8	601	128	4,089	----	----	----
Dry silver	13	3,056	130	54,718	1,600	98,900	----
Total	40	144,624	18,595	61,056	2,300	100,400	----
Copper	14	6,850,328	59,295	174,357	114,099,000	13,400	11,300
Lead	33	19,477	1,272	149,383	70,300	2,652,400	196,500
Lead-copper	1	114	1	1,942	26,500	11,600	6,900
Zinc [2]	12	[2] 11,292	[2] 32	[2] 17,058	[2] 48,200	[2] 494,900	[2] 3,503,500
Zinc-copper	1	120	1	2,102	11,700	11,400	14,600
Zinc-lead	22	272,240	4,104	513,206	376,700	10,233,600	26,576,400
Zinc-lead-copper	1	489	5	8,491	47,100	60,200	60,800
Total	67	7,154,060	64,710	866,539	114,679,500	13,477,500	30,370,000
Other "lode" material:							
Old tailings [3] [4]	8	[4] 14,511	696	2,574	800	1,900	344,000
Copper precipitates	3	497	----	----	391,400	----	----
Old slag (gold)	1	5	123	15	----	200	----
Total	12	15,013	819	2,589	392,200	2,100	344,000
Total "lode" material	114	7,313,697	84,124	930,184	115,074,000	13,580,000	30,714,000
Gravel (placer operations)	11	[5]	33,079	11,011	----	----	----
Total, all sources	125	----	117,203	941,195	115,074,000	13,580,000	30,714,000

[1] Detail will not necessarily add to totals because some mines produce more than one class of material.
[2] Includes 8,346 tons of ore and contained recoverable metal from the former Metals Reserve Company stockpile at Jean, Nev.
[3] The Bureau of Mines is not at liberty to publish details of classes of "old tailings" because of the disclosure of individual output.
[4] Tungsten tailings tonnage not included.
[5] 5,625,620 cubic yards.

Silver.—With precious-metal-ore mining at low ebb in Nevada, the 1952 silver output was largely a byproduct of base-metal ores, which yielded 92 percent of the State total silver; 6 percent of the State total was derived from straight silver ore. The following 5 leaders produced 76 percent of Nevada silver in 1952: Combined Metals Reduction Co., Pioche group, Pioche district, Lincoln County; Copper Canyon Mining Co., Copper Canyon mine, Battle Mountain district, Lander County; Kennecott Copper Corp., Nevada Mines Div., Ruth (Liberty) pit, Robinson district, White Pine County; Mohawk Mine & Mill, Argentite (Mohawk) mine, Silver Peak district, Esmeralda County; and New World Exploration, Research & Development Co., Aladdin mine, Railroad district, Elko County.

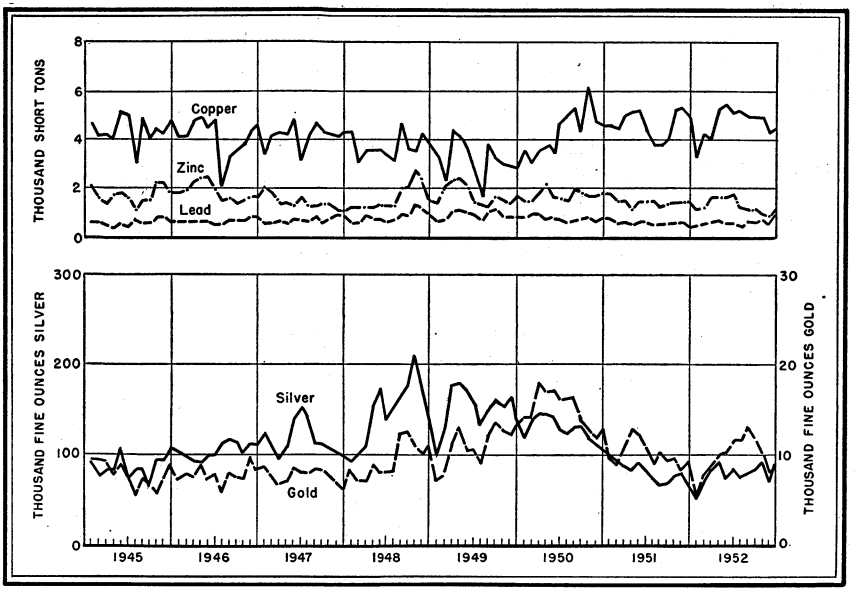

FIGURE 3.—Mine production of gold, silver, copper, lead, and zinc, 1945–52, in Nevada, by months, in terms of recoverable metals.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery and types of material processed, in terms of recoverable metals

Method of recovery and type of material processed	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation:					
Ore	370	139			
Old tailings	8	5			
Total	378	144			
Cyanidation: Ore and old tailings [1]	18,355	3,553			
Total recoverable in bullion	18,733	3,697			
Concentration, and smelting of concentrates:					
Ore	62,761	781,861	112,615,100	11,302,300	26,346,200
Old tailings	8	282	800	1,800	344,000
Total	62,769	782,143	112,615,900	11,304,100	26,690,200
Direct smelting:					
Ore	2,480	143,980	2,066,700	2,275,600	4,023,800
Old tailings	19	349		100	
Copper precipitates			391,400		
Old slag	123	15		200	
Total	2,622	144,344	2,458,100	2,275,900	4,023,800
Placer	33,079	11,011			
Grand total	117,203	941,195	115,074,000	13,580,000	30,714,000

[1] Combined to avoid disclosure of individual output.

Titanium.—Titanium sponge metal was produced at the Bureau of Mines Boulder City Electrometallurgical Plant and the Titanium Metals Corp. of America Henderson facility by reducing titanium tetrachloride with magnesium. The titanium tetrachloride is manufactured by chlorinating titanium ores, principally rutile. Although data on Nevada titanium production are not available for publication, the United States domestic commercial production of titanium sponge metal for 1952 was 1,075 short tons compared with 495 short tons in

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

A. For material treated at mills

	Material treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters [1] and recoverable metals					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES									
Churchill	201			3	3	1,851		1,000	
Clark	14,425	661	1,938	2	8	19		1,200	
Douglas	cleanup	6	1						
Elko	280			26	62	132	500	24,700	
Esmeralda	2,715	2	1	296	93	48,295	1,500	105,100	
Humboldt	278	12	6	28	43	4,237	200	14,400	13,500
Lander	198,323	17,814	1,635	2,937	783	132,163	92,700	1,809,200	1,202,300
Lincoln	223,972			34,196	3,732	425,902	272,700	9,331,400	25,465,500
Lyon	38	3	3						
Mineral	160			18	29	2,858	100	1,900	
Nye	266	79	38	32	1	734	100	15,200	8,900
Pershing	113	65	37						
Storey	14	10	8						
Washoe	157	81	30						
White Pine	6,762,158			227,474	58,015	165,952	112,248,100		
Total: 1952	7,203,100	18,733	3,697	265,012	62,769	782,143	112,615,900	11,304,100	26,690,200
1951	7,087,315	22,395	121,695	255,953	65,466	650,369	110,721,000	10,661,400	29,725,100
BY CLASSES OF MATERIAL TREATED									
Dry gold:									
Crude ore	140,322	18,064	1,754	8	62	64	500	1,100	
Old tailings	14,488	669	1,943	2	8	19		1,200	
Dry silver	2,951			299	125	52,486	1,600	95,300	
Copper	6,762,158			227,474	58,015	165,952	112,248,100		
Lead	12,598			1,925	474	59,677		1,325,200	191,500
Zinc	328			50	1	228			6,200
Zinc-lead	270,255			34,891	4,084	503,454	364,900	9,880,700	26,148,500
Tungsten tailings				363		263	800	600	344,000
Total 1952	7,203,100	18,733	3,697	265,012	62,769	782,143	112,615,900	11,304,100	26,690,200
BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS [1]									
Dry gold-silver		25	4	138				600	100
Dry silver		164	58	35,399		600		4,300	300
Copper		227,474	58,015	165,952		112,248,100			
Lead		11,758	3,446	437,949		134,000		10,456,800	1,168,000
Zinc		25,591	1,246	142,705		233,200		842,400	25,521,800
Total 1952		265,012	62,769	782,143		112,615,900		11,304,100	26,690,200

For footnotes, see end of table.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

B. For material shipped directly to smelters

	Material shipped (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Churchill	53	28	1,210		3,000	
Clark	[2] 10,853	[2] 54	[2] 21,313	[2] 66,700	[2] 658,400	[2] 2,927,000
Douglas	1	2	2			
Elko	4,161	57	49,336	111,400	701,800	38,300
Esmeralda	2		65		1,200	
Eureka	2,087	4	447	83,900	109,500	633,100
Humboldt	63		144	100	9,500	
Lander	70	133	813	200	6,200	4,000
Lincoln	1,443	19	21,884	121,400	223,800	141,500
Mineral	1,663	660	17,873	700	287,300	
Nye	882	90	10,888	4,500	171,100	
Pershing	14	1	307		2,300	
Washoe	99	4	369	7,700	2,000	
White Pine	89,206	1,570	19,693	2,061,500	99,800	279,900
Total: 1952	110,597	2,622	144,344	2,458,100	2,275,900	4,023,800
1951	96,418	2,666	195,588	2,227,000	3,634,600	5,160,900
BY CLASSES OF MATERIAL						
Dry gold:						
Crude ore	645	213	431	200	400	
Old tailings	22	18	11			
Slag	5	123	15		200	
Dry gold-silver: Crude ore	601	128	4,089			
Dry silver:						
Crude ore	105	5	2,232		3,600	
Old tailings	1	1	338		100	
Copper:						
Crude ore	88,170	1,280	8,405	1,850,900	13,400	11,300
Precipitates	497			391,400		
Lead: Crude ore	6,879	798	89,706	70,300	1,327,200	5,000
Lead-copper: Crude ore	114	1	1,942	26,500	11,600	6,900
Zinc	[2] 10,964	[2] 29	[2] 16,830	[2] 48,200	[2] 494,900	[2] 3,497,300
Zinc-copper and zinc-lead-copper [3]	609	6	10,593	58,800	71,600	75,400
Zinc-lead	1,985	20	9,752	11,800	352,900	427,900
Total 1952	110,597	2,622	144,344	2,458,100	2,275,900	4,023,800

[1] Excludes concentrates treated only by amalgamation and/or cyanidation.
[2] Includes 8,346 tons of ore and contained recoverable metal from the former Metals Reserve Company stockpile at Jean, Nev.
[3] Combined to avoid disclosure of individual output.

1951. The Bureau of Mines report [8] covering technology on titanium sponge-metal production, described various production runs, equipment, and techniques used at its Nevada plant.

Tungsten.—Nevada's 1952 tungsten production reflected the intense preparation by the industry in the previous year. Output in terms of units of WO_3 advanced 27 percent over 1951, while shipments of tungsten concentrates, in similar terms, increased 57 percent in quantity and 85 percent in value for the same period. Production was from 64 mines in 14 counties. Humboldt County led in output, followed by Pershing, Mineral, Lincoln, Nye, and White Pine Counties. Other counties with less production and in order of output were:

[8] Fuller, H. C., Baker, D. H. Jr., and Wartman, F. S., Recent Practices at the Bureau of Mines, Boulder City, Nev., Titanium Plant: Bureau of Mines Rept. of Investigations 4879, 1952, 20 pp.

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

Class of material	Material shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCENTRATES SHIPPED TO SMELTERS						
Dry gold-silver	25	4	138	75	1,052	2,077
Dry silver	164	59	35,909	706	4,770	534
Copper	227,474	59,198	179,407	113,518,154	----	----
Lead	11,758	3,447	437,984	158,159	10,641,950	1,469,711
Zinc	25,591	1,246	142,880	274,840	905,866	26,477,305
Total: 1952	265,012	63,954	796,318	113,951,934	11,553,638	27,949,627
1951	255,953	66,743	668,220	113,138,121	10,908,794	31,038,164
ORES, ETC., SHIPPED DIRECTLY TO SMELTERS						
Dry gold:						
Crude ore	645	216	463	257	403	800
Old tailings	22	18	12	7	13	----
Slag	5	123	15	----	237	----
Dry gold-silver: Crude ore	601	132	4,421	4	----	----
Dry silver:						
Crude ore	105	5	2,425	70	3,677	7,411
Old tailings	1	1	338	40	179	----
Copper:						
Crude ore	88,170	1,305	8,763	1,893,034	14,326	14,125
Precipitates	497	----	----	399,402	----	----
Lead: Crude ore	6,879	798	89,706	93,843	1,376,353	394,595
Lead-copper: Crude ore	114	1	1,942	31,169	11,837	8,603
Zinc	[1] 10,964	[1] 71	[1] 25,175	[1] 80,927	[1] 502,952	[1] 4,151,616
Zinc-copper, and zinc-lead-copper [2]	609	6	10,593	69,113	72,776	94,258
Zinc-lead	1,985	20	9,752	14,200	359,029	534,786
Total: 1952	110,597	2,696	153,605	2,582,066	2,341,782	5,206,194
1951	96,418	2,757	212,531	2,349,726	3,807,845	6,608,889

[1] Includes 8,346 tons of ore and contained metal from the former Metal Reserve Company stockpile at Jean, Nev.
[2] Combined to avoid disclosure of individual output.

Douglas, Washoe, Lyon, Churchill, Esmeralda, Elko, Lander, and Ormsby. Virtually all the concentrate produced was scheelite; some hübnerite was shipped from White Pine County.

Getchell Mine, Inc., Potosi district, Humboldt County, by virtue of ore mined and purchased led the State in units of WO_3 produced. Nevada-Massachusetts Co., Mill City district, Pershing County, milled company ore and ranked second, and Nevada Scheelite Division of Kennametal, Inc., Regent district, Mineral County, treating company and purchased ore, was in third place. Other important producers were Black Rock Mining Corp., Lincoln mine, Tem Piute district, Lincoln County; United States Vanadium Co., Riley mine, Potosi district, Humboldt County; Lindsay Mining Co., Gunmetal mine, Pilot Mountain district, Mineral County; and the Wolfram Co., Star and Nightingale mines, Nightingale district, Pershing County.

The Bureau of Mines published data on treating scheelite ore and tailings from Mineral County and Nye County scheelite ore.[9]

[9] Engel, A. L., Treatment tests of scheelite ores and tailings: Bureau of Mines Rept. of Investigations 4867, 1952, 11 pp.

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties and districts, in terms of recoverable metals [1]

County and district	Mines producing [2]		Lode material (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					
Churchill County:											
Chalk Mountain	1		9				31		3,000		$511
Eastgate	1		37	28		28	379				1,323
Holy Cross	2		208	3		3	2,651		1,000		2,665
Clark County:											
Bunkerville	3		56	3		3	29	10,800			2,745
Searchlight	3		14,463	677	1	678	2,405	5,800	2,400		27,698
Yellow Pine (Goodsprings)	9		[4] 10,746	[4] 40		[4] 40	[4] 20,795	[4] 49,900	[4] 656,800	[4] 2,927,000	[4] 623,923
Douglas County: Buckskin	1		1	8		8	3				283
Elko County:											
Centennial	1		100	54		54	57	500	1,000		2,224
Contact	2		483	10		10	1,088	54,100			14,427
Delano	1		592	4		4	8,624	1,200	131,800		29,456
Hicks	1		60	10		10	1,999	200	11,300	2,600	4,457
Island Mountain		(5)			13	13	1				456
Mountain City	2		47	3		3	524	5,600			1,934
Railroad	1		2,271	14		14	33,046	47,200	377,400	11,800	104,541
Ruby Range	2		197				139	100	33,800		5,592
Tecoma	1		359	4		4	1,607	1,100	116,900		20,682
Tuscarora	2		17	10		10	583				878
Esmeralda County:											
Lida		(5)			1	1	1				36
Tonopah	1		cleanup	2		2	1				71
Eureka County:											
Lone Mountain	2		1,378				338	100	109,500	633,100	123,055
Lynn		(5)			2	2					70
Humboldt County:											
Disaster	1		2				1				1
Golconda	1		47				17	100	7,900		1,311
Paradise Valley		(5)			5	5	1				176
Winnemucca	2		168	53		53	4,036		9,700	9,500	8,647
Lander County:											
Battle Mountain	4	2	58,694	785	(6)	[7] 785	[7] 132,534	92,900	1,814,700	1,206,300	[7] 662,320
Bullion	3		139,447	17,824		17,824	1,719		600		625,492
Lewis	1		1	1		1	338		100		357
Lincoln County:											
Ely Springs	1		1				184				167
Groom	1		211	1		1	1,044	400	64,200		11,413
Patterson	1		1				80				72
Pioche	5		221,859	3,728		3,728	425,475	270,100	9,263,400	24,985,600	6,219,937
Lyon County: Silver City	2	2	38	3	480	483	695				17,534

For footnotes, see end of table.

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties and districts, in terms of recoverable metals[1]—Continued

County and district	Mines producing[2]		Lode material (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					
Mineral County:											
Candelaria	2		1,823	689		689	20,736	800	289,200		$89,633
Rawhide		1			8	8	6				285
Nye County:											
Bullfrog (Beatty)		(5)			1	1					35
Clifford	1		11	4		4	194				315
Fluorine	1		10	3		3	1				106
Johnnie	2		3	4		4	4		300		192
Lodi	1		5	1		1	147		4,400		876
Manhattan	3	1	203	84	7	91	46				3,227
Quartz Mountain	1		900	74		74	11,169	4,600	180,100	7,000	43,970
Twin River	2		16				102		1,500	1,900	649
Pershing County:											
Rochester	1	1	62	27	7	34					1,195
Seven Troughs	2		51	38		38	32				1,359
Wild Horse	1		14	1		1	307		2,300		683
Storey County: Comstock	1		14	10		10	8				357
Washoe County:											
Galena	1		17				44		2,000		362
Pyramid	1		82	4		4	325	7,700			2,297
White Pine County:											
Duck Creek (Success)	1		20				9		1,700	3,600	879
Osceola	1	2	1		11	11	10		1,000		555
Robinson	11		6,850,764	59,521		59,521	173,974	114,295,700	13,700	275,800	29,948,237
Ward	1		407	23		23	11,179	11,900	62,600		23,886
White Cloud	1		10				20		2,800	100	486
White Pine	2		55				277	2,000	18,000	400	3,699
Undistributed[6]	19	2	7,736	376	32,543	32,919	82,174	211,200	394,900	649,300	1,449,009
Total	114	11	7,313,697	84,124	33,079	117,203	941,195	115,074,000	13,580,000	30,714,000	40,086,746

[1] Only those districts are shown separately for which Bureau of Mines is at liberty to publish figures; other producing districts are listed in footnote and their output grouped as "Undistributed."

[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.

[3] Source of silver as follows: 930,184 ounces from lode mines and 11,011 ounces from placers.

[4] Includes 8,346 tons of ore and contained recoverable metal from the former Metals Reserve Company stockpile at Jean, Nev.

[5] From property not classed as a mine.

[6] Included with "Undistributed" to avoid disclosure of individual company operations.

[7] Exclusive of placer output which is included with "Undistributed."

[8] Includes the following: Crescent in Clark County; Edgemont and Spruce Mountain in Elko County; Silver Peak and Sylvania in Esmeralda County; Maggie Creek in Eureka County; Gold Run in Humboldt County; New Pass in Lander County; Comet, Jack Rabbit and Tem Piute in Lincoln County; Round Mountain in Nye County; Rabbit Hole in Pershing County; Olinghouse (White Horse) in Washoe County; and Cleve Creek in White Pine County.

TABLE 14.—Mercury production by methods of recovery 1943–47 (average) and 1948–52

Year	Direct furnaced		Retorted		Unclassified [1]	Total		Operating mines
	Ore (short tons)	Flasks of 76 pounds	Ore (short tons)	Flasks of 76 pounds	Flasks of 76 pounds	Flasks of 76 pounds	Value [2]	
1943–47 (average)	30,427	3,866	624	98	1	3,964	$499,821	15
1948	29,891	5,330	630	46		1,206	92,247	4
1949						4,170	331,348	5
1950	3,915	680				680	55,257	1
1951	36,271	4,845	382	72	6	1,400	294,182	12
1952						3,523	701,429	9

[1] Includes mercury recovered from miscellaneous dump material.
[2] Value calculated at average price at New York.

TABLE 15.—Production and shipments of tungsten concentrates, 1951–1952

Year	Production		Shipments		
	Short tons (60 percent WO_3 basis)	Units	Short tons (60 percent WO_3 basis)	Units	Value
1951	1,922	115,307	1,482	88,916	$4,780,237
1952	2,431	145,882	2,329	139,760	8,820,598

Uranium.—There was considerable activity in prospecting for uranium in Nevada during 1952, and one showing in Pershing County was explored by the Nevada Uranium Co.

Zinc.—Mine production of recoverable zinc in 1952 declined 12 percent from the 1951 output, reflecting the price trend for the metal during the year. Nevada zinc-bearing ores are largely marginal; therefore, production of the metal declined sharply following successive price slumps. During the period of higher zinc prices in 1952, Clark County oxidized zinc ores, which contained values in gold, silver, copper, and lead and which had been accumulated on the former Metals Reserve Company stockpile at Jean, Nev., were shipped to a Utah lead smelter and fuming plant. The expansion in tungsten mining added directly to the State zinc output, contributing zinc concentrates, a byproduct of Lincoln County tungsten ore.

Combined Metals Reduction Co. Pioche group, Pioche district, Lincoln County, led in production of Nevada zinc, followed in order by Ely Valley Mines, Inc., Ely Valley mine, also in the Pioche district, and Copper Canyon Mining Co., Copper Canyon mine, Battle Mountain district, Lander County.

The Bureau of Mines published data on concentrating lead-zinc ore from the Silver Butte mine, Mud Springs district, Elko County; the Quartz Mountain district, Nye County; the East Humboldt Mining Co., Awakening district, Humboldt County; and the Jackpot mine, Yerington district, Lyon County.[10]

[10] Work cited in footnote 7.

NONMETALS

Andalusite.—No production of andalusite has been reported from Nevada since 1949; but the Coranda Corp. explored corundum-andalusite deposits in the Gillis Range, Mineral County, during 1952 under a DMEA exploration assistance contract.

Barite.—The 1952 production of barite was 94,201 tons, of which 68,062 tons was sold or used. In 1951, 63,201 tons, which comprised 40,261 tons produced and 22,940 tons from stocks, was sold or used. A large percentage of this production was from Lander and Elko Counties; a smaller tonnage of barite was quarried in Eureka County. Destination of the raw material was principally California grinding plants, with consumption largely in the paint, rotary-drilling-mud, and glass industries.

Brucite.—Brucite associated with magnesite quarried by Basic Refractories, Inc., at Gabbs, Nye County, was used for refractory magnesia.

Clays.—Activity in clay production was only moderate during 1952, although the total yield exceeded that in 1951 by 23 percent. Clay was mined in White Pine County, and fuller's earth was produced in Nye and Lyon Counties. Clay from Washoe County supplied the brick plant of the Reno Press Brick Co. at Reno. Consideration was given to Mineral County bentonite for possible use as a soil conditioner and moisture retainer, but no production was reported.

Diatomite.—Nevada diatomite deposits are of the fresh-water variety. They differ from the California coastal deposits in physical properties, being composed of smaller silica cells than the salt-water variety and normally are not extensively used for filtration.[11] Principal producers of diatomite in 1952 were Eagle Picher Co., Clark district, Storey County, and Great Lakes Carbon Corp., Miller Mountain district, Esmeralda County. Output also was reported from Churchill County, east of Fernley, and the Carlin district, Elko County. Compared with 1951 the 1952 output was 40 percent greater in quantity and 50 percent greater in value. The diatomite produced in Nevada was prepared for shipment at the mine plants. Its consumption in percentage of total tonnage shipped, by uses, was: Fillers, 58 percent; abrasives, nearly 15 percent; other uses, 27 percent. A fraction of 1 percent of the total production was used for insulation.

Dumortierite.—No production of dumortierite has been reported from Nevada since 1949.

Fluorspar.—Nevada yield of run-of-mine fluorspar normally was consigned to Pacific coast steel plants, iron foundries, and cement and enamel plants in past years. Diversion of the Mineral County, Broken Hills district, Kaiser mine (formerly the Baxter mine) fluorspar from the metallurgical-grade trade to the new Kaiser Aluminum & Chemical Corp. flotation mill in 1952, for treatment to produce an acid-grade spar, added Nevada to the list of States supplying raw material to the western aluminum industry. The acid-grade fluorspar was shipped to the General Chemical Division, Allied Chemical & Dye Corp., Nichols, Calif., for conversion into aluminum fluoride, which is used in Kaiser Aluminum & Chemical Corp. potlines. Metallurgical-grade fluorspar was mined in Nye and Churchill Counties,

[11] University of Nevada Bulletin, vol. 26, No. 7, October 1932, p. 4.

and a deposit was developed in Lander County. The State's fluorspar production during 1943–52 has been fairly constant.

Gem Stones.—Activity in gem stones in Nevada was dominated by turquoise and opal mining in 1952. Deposits of these gems have been mined sporadically for many years in the following districts: Crescent and Searchlight, Clark County; Coaldale, Crow Springs, and Klondyke, Esmeralda County; Cortez, Eureka County; Yerington, Lyon County; Candelaria, Pilot Mountain, Rand, and Silver Star, Mineral County; Battle Mountain, Lander County; and Belmont and Cactus Springs, Nye County. Agates and chalcedony have been found in the Coaldale district, Esmeralda County. Good-quality opal was mined in the Virgin Valley district, Humboldt County, in 1952.

Gypsum.—Crude gypsum was produced in Clark, Washoe, and Lyon Counties during 1952. Output was 5 percent lower in quantity and 8 percent in value compared with 1951. A large percentage of this material was calcined and some was utilized for wallboard at Nevada plants. The remainder was shipped out of State, mainly to California, where it was used principally in portland cement and in various building materials.

TABLE 16.—Crude gypsum mined, 1943–47 (average) and 1948–52

Year	Active mines	Production (short tons)	Value
1943–47 (average)	4	425, 236	$933, 898
1948	7	519, 552	1, 222, 070
1949	5	495, 229	1, 347, 666
1950	4	604, 604	1, 614, 107
1951	5	643, 637	1, 811, 757
1952	4	608, 284	1, 666, 938

Lime.—Clark County dolomite and limestone and White Pine County limestone were the sources of Nevada 1952 lime output, which exceeded the 1951 yield both in quantity and value by a moderate margin. Plants of United States Lime Products Corp. at Henderson and Sloan produced both quicklime and hydrated lime for building and chemical uses. Kennecott Copper Corp., Nevada Mines Division, prepared quicklime for its McGill copper-smelting operation.

Magnesite.—Production of magnesite in 1952 was confined to Nye County, where the raw material was mined and treated by Basic Refractories, Inc., and The Standard Slag Co. Plant products were caustic-calcined magnesia and refractory magnesia.

Marl, Calcareous.—The entire output of Nevada calcareous marl is produced near the northwest shore of Pyramid Lake in Washoe County. The material, known as chara marl and formed by the deposition of lime by algae, is mined from beds which are 150 feet higher than the present lake level.[12] The 1952 yield was slightly higher than 1951. The marl largely is ground and mixed with other ingredients in preparing poultry and livestock minerals; some is used for soil conditioning.

Perlite.—Nevada crude-perlite production increased moderately in 1952, but the relatively small output of expanded material rose substantially over 1951. Only a very small percentage of the State crude

[12] University of Nevada Bulletin, vol. 26, No. 7, October 1932, p. 6.

production was expanded locally because the cost of transporting the bulky lightweight material to distribution centers, which are largely in the more heavily populated areas outside of Nevada, would be prohibitive. Lincoln County was the principal producer of crude perlite, and small outputs were reported from Pershing, Clark, and Washoe Counties. Perlite was expanded in Clark and Washoe Counties.

Pumice and Pumicite.—Only minor tonnages of Nevada pumice and pumicite were mined in Churchill and Mineral Counties during 1952. This material, all consigned for local concrete aggregate use, was comparable to the 1951 output.

Volcanic cinder, which differs from pumice both physically and in composition, was mined near Beatty, Nye County. It was utilized for road building and building-block fabrication in Nevada.

Salt.—Although several deposits of salt exist in Nevada, only one operation in Churchill County reported production in 1952. The State output was virtually the same as 1951. The small salt output was used largely for local hide curing, stock use, and de-icing highways.

Sand and Gravel.—Sand and gravel were produced commercially in

TABLE 17.—Sand and gravel sold or used by producers 1951-52, by classes of operations and uses

	1951			1952		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Glass	(1)	(1)	(1)	(1)	(1)	(1)
Molding	63,939	$141,423	$2.21	72,444	$156,958	$2.17
Building	99,092	160,176	1.62	117,205	227,797	1.94
Paving	17,246	35,118	2.04			
Other	(1)	(1)	(1)	(1)	(1)	(1)
Gravel:						
Building	37,813	72,647	1.92	119,910	224,684	1.87
Paving	73,597	127,859	1.74	(1)	(1)	(1)
Railroad ballast	270,102	232,590	.86	2,565	281	.11
Other	7,210	6,298	.87	719	359	.50
Undistributed: Sand and gravel [1]	187,844	708,621	3.77	257,261	918,205	3.57
Total commercial sand and gravel	756,843	1,484,732	1.96	570,104	1,528,284	2.68
GOVERNMENT-AND-CONTRACTOR OPERATIONS [2]						
Sand:						
Building	6,045	19,995	3.31	1,366	4,005	2.93
Paving	39,731	20,153	.51	23,210	16,816	.72
Total Government-and-contractor sand	45,776	40,148	.88	24,576	20,821	.85
Gravel:						
Building	10,537	30,809	2.92	41	12	.29
Paving	1,803,473	1,101,965	.61	1,503,490	831,302	.55
Total Government-and-contractor gravel	1,814,010	1,132,774	.62	1,503,531	831,314	.55
Total Government-and-contractor sand and gravel	1,859,786	1,172,922	.63	1,528,107	852,135	.56
ALL OPERATIONS						
Sand	413,897	1,085,486	2.62	446,904	1,281,992	2.87
Gravel	2,202,732	1,572,168	.71	1,651,307	1,098,427	.67
Grand total	2,616,629	2,657,654	1.02	2,098,211	2,380,419	1.13

[1] Included with "Undistributed" to prevent disclosure of individual output.
[2] Includes figures for State, counties, municipalities, and other Government agencies.

Clark, Humboldt, Lincoln, and Washoe Counties and by Government agencies and their contractors for noncommercial use in Clark, Douglas, Elko, Humboldt, Nye, Ormsby, and Pershing Counties during 1952. The sand deposits of Clark County were the most important commercially, yielding material utilized largely by the glass, foundry, and structural industries. Other deposits of sand and gravel were worked at convenient locations in the State to furnish materials for building, road construction, and railroad ballast. Details of the 1951 and 1952 production are shown in table 17. In 1950, 2,617,052 short tons of sand and gravel valued at $2,253,258 was produced compared with 1,346,608 tons valued at $1,212,166 in 1949; 2,248,885 tons valued at $2,018,151 in 1948; and an annual average of 1,081,525 tons valued at $992,342 for 1943–47, inclusive.

Stone.—In 1952 Nevada stone production was slightly lower than 1951 in quantity but 21 percent greater in value. Sandstone was

TABLE 18.—Stone, commercial and noncommercial, sold or used by producers, 1951–52, by uses

Use	1951		1952	
	Quantity	Value	Quantity	Value
Dimension stone:				
Building stone:				
Sawed stone and cut blocks, cubic feet			19,577	$33,850
Approximate equivalent in short tons			1,527	
Flagging, cubic feet			6,410	12,500
Approximate equivalent in short tons			500	
Total dimension stone (quantities approximate, in short tons)			2,027	46,350
Crushed and broken stone:				
Riprap, short tons	20,988	$11,593	(1)	(1)
Concrete and road metal, do	(1)	(1)	(1)	(1)
Metallurgical, do	(1)	(1)	(1)	(1)
Chemical and refractory, do	(1)	(1)	(1)	(1)
Railroad ballast, do			(1)	(1)
Other uses, do	(1)	(1)	(1)	(1)
Undistributed, do	813,819	948,222	828,685	1,112,258
Total crushed and broken stone, do	834,807	959,815	828,685	1,112,258
Grand total (quantities approximate, in short tons)	834,807	959,815	830,712	1,158,608

[1] Figures that may not be shown separately are combined as "Undistributed."

produced in Clark and Humboldt Counties, basalt in Eureka County, limestone in Clark and White Pine Counties, and tuff in Storey County. Miscellaneous stone was crushed in Washoe County.

Sulfur.—Nevada 1952 sulfur value advanced over 1951 by virtue of the Black Rock Desert Mineral Co. expanded operation in Humboldt County. The ore mined was consigned to neighboring States, largely for soil-aid purposes.

Talc and Soapstone.—Moderate increases in quantity and value of Nevada talc and soapstone were made in 1952. The entire production, from Esmeralda County mines, was shipped to grinding plants in California.

REVIEW BY COUNTIES

CHURCHILL

The Kaiser Aluminum & Chemical Corp. new 100 ton-a-day flotation mill 1 mile west of Fallon, designed to produce acid-grade fluorspar, began operations in 1952. Fallon Concrete Products Co. utilized pumice from the Crow No. 1 and Mike No. 1 claims, 20 miles east of Fallon, at its Fallon concrete-block plant. Chick Bed Co. mined diatomaceous earth 22 miles east of Fernley by open-pit methods and operated a crushing and screening plant.

Chalk Mountain District.—Roy Durban and C. P. McCuskey shipped 9 tons of ore containing 31 ounces of silver, 3,092 pounds of lead, and 90 pounds of zinc to a smelter from the Aldona (Chalk Mountain) mine.

Eastgate District.—L. P. Burch and L. D. Lashby shipped gold-silver ore to a smelter from the Gold Ledge group.

Holy Cross District.—Clark C. Shaw worked the Camp Terrell claims and shipped 2 tons of concentrate containing 3 ounces of gold, 461 ounces of silver, 4 pounds of copper, 501 pounds of lead, and 16 pounds of zinc from 126 tons of ore milled. J. J. Martin and Nevada Rawhide Mining Corp. operated the Pyramid mine; silver ore and lead concentrates recovered from ore treated at a 15-ton flotation mill were shipped to smelters.

Mineral Basin (Buena Vista) District.—Mineral Materials Co. operated the Buena Vista mine and shipped, largely for export to Japan, 234,196 long tons of magnetite that averaged 57 percent iron.

Pike Hollow District.—Charles Cirac shipped fluorspar from the Revenue mine to a custom mill.

Sand Springs District.—The Leslie Salt Co. produced salt from the Fallon Development Co. deposits by surface mining. Harry Howard and Robert Stewart developed the Smith tungsten property. The Red Top & Red Ant Mining Co. recovered 2,442 pounds of scheelite concentrate containing 57 units of WO_3 from Red Top mine tungsten ore.

CLARK

Nu-Lite Insulated Homes, Inc., quarried crude perlite in the Castle Mountains west of Searchlight on the California border for use at its California plant.

Apex District.—United States Lime Products Corp. quarried limestone and operated a crushing plant at its Apex property.

Blue Diamond District.—Blue Diamond Corp. operated its open-pit gypsum mine, mill and board plant throughout 1952.

Bunkerville District.—Key West Nickel & Copper Corp. leached ore mined from an open cut at the Key West mine. Some copper precipitates were produced, and tailings containing platinum and nickel were stockpiled. Tri-State Metals, Inc., shipped copper ore to a smelter from the Lakeview claim.

Crescent District.—Crescent Lead Mining Co., Inc., prospected and developed the Golden Eagle mine. Trial shipments of ore containing gold, silver, copper, lead, and zinc were made to a smelter.

Dike District.—Lead King Mines, Inc., developed lead ore at the Lead King group of claims during 4 months of 1952.

Las Vegas–Boulder City District.—In the Las Vegas-Boulder City-Henderson area, the Bureau of Mines operated an experimental titanium sponge plant, and Titanium Metals Corp. of America expanded its facilities for producing the metal. Manganese, Inc., developed its plant designed to beneficiate the Three Kids mine manganese ore. Pioche Manganese Co. pursued construction of its ferromanganese plant, and Western Electro Chemical Corp. produced synthetic manganese battery ore from Nevada and Utah low-grade manganese ores. Stauffer Chemical Co. prepared chlorine from California salt at Henderson. Cindrlite, Inc., manufactured building block 9 miles southwest of Las Vegas, using Nye County volcanic cinder. United States Lime Products Corp. operated its lime hydrating and pulverizing plant at Henderson. Pabco Products, Inc., produced gypsum at its White Eagle pit and mill 8 miles north of Henderson. Sand and gravel for construction purposes were produced by Stocks Mill & Supply Co. and Las Vegas Building Materials.

Overton District.—Silica sand for molding was produced by Fred Morledge at the Red Gorge mine 4 miles west of Logandale and Moapa Placer claims 2 miles south of Overton and by Snoreen & Son at the Kaolin Wash mine 3 miles southwest of Overton. Glass sand was produced at the Nunn Co. mine 6 miles southwest of Overton and prepared at the company mill 1½ miles south of Overton. Nevada Silica Sands, Inc., produced a variety of material at its mine and mill 7 miles south and 1 mile west, respectively, of Overton, including glass sand, molding sand, building sand, and miscellaneous sands.

Searchlight District.—The Desert Milling Co. worked the Quartette and Duplex tailings in 1952; 661 ounces of gold and 1,938 ounces of silver were recovered from 14,425 tons of material cyanided. Searchlight Homestake Mining Co. shipped copper ore from the Quartette group to a smelter. Perlite Ridge mine and mill produced crude perlite 7 miles northeast of Searchlight.

Sloan District.—U. S. Lime Products Corp. quarried dolomite which was calcined at its Sloan kilns.

Yellow Pine (Goodsprings) District.—L. F. Jacobson shipped 574 tons of zinc-lead ore and 394 tons of zinc ore from the Yellow Pine mine to a smelter-fuming plant in 1952. O. F. Schwartz and M. T. Schwartz shipped 110 tons of zinc ore containing 1 ounce of gold, 271 ounces of silver, 83 pounds of copper, 3,450 pounds of lead, and 53,961 pounds of zinc to a fuming plant from the Combination group. Other mines operated principally for lead and zinc values included the Anchor, Bell, Bullion, Root and Sultan. Zinc ore (8,346 tons containing recoverable lead, copper, silver, and gold) was shipped to a smelter-fuming plant from the former Metals Reserve Company stockpile at Jean, Nev. Nevada Flagstone Quarries, Inc., produced sandstone for flagging and dressed stone.

DOUGLAS

Brunswick District.—Carson Tungsten Co. worked the Old Discovery open-pit tungsten property which lies both in Douglas and Ormsby Counties; 1,245 tons of ore treated yielded 2 tons of concentrate containing 63.45 percent WO_3.

Buckskin District.—The Standard Slag Co. worked the Minnesota mine and shipped 49,246 long tons of iron ore destined for export to Japan. Copper Butte Mining Co., Inc., sampled the Buckskin mine complex copper ore but did not continue operations after July 15, 1952.

Gardnerville (Eagle) District.—Metallurgical Development Co. operated the Alpine flotation custom mill 12 miles east of Gardnerville on tungsten ore, including Owl Lease production.

ELKO

Baroid Sales Division, National Lead Co., operated the Rossi barite mine and crushing plant 55 miles northeast of Battle Mountain. The barite was ground at Merced, Calif. Blaine Hoalst shipped manganese ore averaging 32 percent Mn to a steel plant from the Bidee-Etcheverry property 25 miles northeast of Midas. Howard Devaney quarried barite near Spruce, and shipped the material to California and Utah grinding plants.

Carlin District.—Tri-O-Lite Products Co. quarried diatomite and shipped prepared material.

Centennial District.—Atlas Gold Mining Co. developed the Edgemont group in 1952 and made ore tests at the 50-ton pilot gravity and flotation mill. Some lead concentrate containing values in copper, silver and gold was shipped to a smelter.

Contact (Salmon River) District.—Marshall Mining Co. shipped copper ore containing silver and gold to a smelter from the Marshall group. Vulcan Mines Co., Inc. (E. J. DeLuche, Lessee), worked the Vulcan mine and shipped copper ore to a smelter.

Decoy District.—Jack Travers shipped manganese ore averaging 28 percent manganese from the Black Rock prospect.

Delano District.—John Ala and Lucy Daz operated the Delno mine and shipped lead ore to smelters.

Hicks District.—C. G. Dunn et al. worked the Silver King group and shipped lead ore and zinc-lead ore to smelters. Louis Koncher, Jr., developed the Never Sweat zinc-lead property.

Island Mountain District.—Star Metal Mines (P. G. Gribble) developed the Star Metal tungsten open-pit mine and 50-ton mill and produced 500 tons of scheelite ore, most of which was stockpiled.

Mountain City (Cope) District.—Golden Ensign Mining Co. shipped 20 tons of ore grossing 3 ounces of gold, 500 ounces of silver, and 67 pounds of copper to a smelter. Bieroth & Brummell shipped copper ore from the Rio Tinto dumps. Knowles Bros. and Price Montrose explored the Garnet tungsten property.

Railroad District.—Lead & Copper Mines, Inc., and New World Exploration, Research & Development Corp. shipped 2,233 tons of lead ore containing some copper to smelters and 38 tons of zinc ore to a fuming plant from the Aladdin mine.

Rock Creek District.—C. B. Pendergast developed the April Fool group silver ore in 1952.

Ruby Range District.—Long Canyon Mining Co. shipped 18 tons of concentrates containing 0.216 ounce of gold, 68 ounces of silver, and 24,594 pounds of lead to a smelter. W. S. Peterson, lessee, operated the Summit View mine and shipped lead ore to a smelter. Noonday Mines, Ltd., developed the Noonday zinc-lead property.

Spruce Mountain District.—Nevada Lead & Zinc Co., M. H. Woodward, lessee, shipped zinc-lead and lead ore to smelters from the Killie mine.

Tecoma District.—Frank Bullock operated the Jackson mine and shipped lead ore to smelters.

Tuscarora District.—Milner Corp. shipped 11 tons of ore containing 9 ounces of gold and 440 ounces of silver to a smelter from the Dexter mine. Dale Gilliam operated the Ruby Queen mine and shipped silver ore to a smelter.

ESMERALDA

Miller Mountain District.—Great Lakes Carbon Corp. worked the Basalt Plant diatomite mine and mill in 1952.

Palmetto District.—H. N. Stewart, lessee, worked the Hideout No. 1 mine and shipped talc to a grinding plant. Frank F. Nelson shipped 165 pounds of tungsten concentrate containing 41.82 percent WO_3 from the Anything claim near Oasis.

Pilot Mountain District.—Lindsay Mining Co. operated the Gunmetal tungsten mill on custom ore and company ore from the Gunmetal mine in Mineral County; 16,911 tons of company ore and 4,612 tons of custom ore were milled, yielding 64 tons of scheelite concentrate containing 60.6 percent WO_3.

Silver Peak District.—Mohawk Mine & Mill operated the Mohawk mill at Silver Peak and treated ore from neighboring mines, including the Argentite (Mohawk), the Bruhi Enterprises' Sanger and McNamara properties, and the General Thomas mine tailings. Lead and silver concentrates were shipped to smelters.

Sylvania District.—Don Clair worked the Sylvania mine and shipped lead concentrate to a smelter. Garnet King Mining Co., lessee, developed the Garnet King tungsten mine. Sierra Talc & Clay Co. operated the Oasis mine, and Huntley Industrial Minerals, Inc., worked the Sundown mine; talc produced at both properties was ground in California. H. N. Stewart shipped soapstone from the Lone Springs (Louise) mine to a California grinding plant.

White Wolf District.—Mohawk Mining Co., Inc., developed gold ore at the Mohawk mine near Dyer.

EUREKA

Beowawe Barium Producers Association shipped barite to a California grinding plant from pits 23 miles south of Beowawe. The Southern Pacific Railroad Co. operated a stone quarry north of Palisade near the Elko County line.

Amarilla District.—Simplot Iron Mines, Inc., shipped hematite and magnetite that averaged 59.8 percent iron for export to Japan from the Modarelli mine.

Eureka District.—Eureka Corp., Ltd., explored and maintained the Richmond-Eureka zinc-lead mine and began unwatering operation in December 1952; during the year 6,865 feet of rotary drilling was completed. Consolidated Eureka Mining Co. developed the Diamond-Excelsior zinc-lead mine. Ernest Affranchino produced a small tonnage of antimony ore at the Stibnite mine.

Lone Mountain District.—M. I. A. Mines Co. developed the Mountain View group and shipped 826 tons of oxidized zinc ore containing 2 ounces of gold, 172 ounces of silver, 2,451 pounds of copper, 76,065

pounds of lead, and 310,720 pounds of zinc to a Utah fuming plant. Cardinalli & Frank shipped oxidized zinc ore from the Extension mine to a fuming plant.

Maggie Creek (Schroeder) District.—Copper King Co., lessees, operated the Copper King mine in 1952 and shipped copper ore to a smelter.

HUMBOLDT

Golconda District.—Blaine Hoalst worked the H and T mine and shipped lead ore to a smelter.

Gold Run District.—Lowman Lead Mine shipped zinc-lead ore to a concentrator-smelter and lead ore to a smelter from the Lowman property. A small shipment of lead ore was made from the Grant mine by George A. Gomes.

Jackson District.—A & B Mining Co. operated the Iron King (DeLong) mine in 1952. Iron ore produced was consigned to domestic steel furnaces.

McDermitt (Opalite) District.—Cordero Mining Co., the Nation's largest producer of quicksilver in 1952, operated an 80-ton Herreshoff furnace at the Cordero mine.

Paradise Valley (Poverty Peak) District.—Gordon I. Gould & Co. produced 23 flasks of quicksilver from 118 tons of ore treated in a 6-ton-a-day Gould rotary furnace at the Cahill mine. Western States Metals Corp. shipped manganese ore averaging 26 percent Mn from the George & Charlie mine.

Potosi District.—Getchell Mine, Inc., operated the Getchell mill on tungsten ore from the company Granite Creek, Kirby, Pacific, and Riley Extension mines and accepted tungsten ore for milling on a custom basis; 115,464 tons of company ore and 16,007 tons of custom ore milled averaged 0.39 percent WO_3. The Riley tungsten mine was developed under contract from United States Vanadium Co.; a substantial tonnage of scheelite ore was shipped to a custom mill. Valley View Mining Co., lessee, shipped 10,981 tons of tungsten ore averaging 0.54 percent WO_3 from the Valley View mine to a custom mill. TNT Lease shipped 577 tons of ore averaging 0.85 percent WO_3 from the Mountain King mine. Nevada Mining Co. operated the mine in 1952 until October and shipped 2,478 tons of scheelite ore containing 0.86 percent WO_3 to a custom mill.

Sulfur District.—Black Rock Desert Mineral Co. worked the Streeter mine and operated a grinding and screening mill at Sulphur, Nev. Sulfur material was shipped for agricultural purposes.

Virgin Valley District.—Owyhee Stone Co., Inc., formerly the Gem State Tile Co., lessee, produced building stone at the Zeb Turner property, 32 miles west of Denio. Opal was produced at the Rainbow Ridge mine. One stone, mined in 1952, is perhaps the world's largest opal. It weighed 6 pounds and was valued at $50,000.

Warm Springs District.—Nevada Sonora Mineras shipped tungsten concentrates from the Defense mine near Denio. Ore was concentrated at the Ashdown mill.

LANDER

Barium Products, Ltd., lessee, worked the Mountain Springs barite mine and plant and the Valley View barite mine 26 miles south of

Battle Mountain. E. H. Potter shipped manganese ore averaging 23 percent manganese from the Black Rock mine 19 miles south of Valmy.

Argenta District.—California Nevada Barytes Mines (division of The Glidden Co.) shipped barite from the Barium King mine to its California plant. Metals Disintegrating Co., Inc., operated its Baryte No. 1 mine; barite produced was shipped to the company California plant.

Battle Mountain District.—The Natomas Co., second largest producer of gold in Nevada in 1952, operated a Natoma-type bucketline dredge with 9½-cubic-foot buckets at Greenan Placer; the production in 1952 was appreciably greater than that in 1951. Box Canyon Placers recovered gold from gravel, using a power shovel, trommel, and sluice box. Copper Canyon Mining Co., Nevada's second largest silver and lead producer, worked the Copper Canyon mine and 350-ton flotation mill; 56,911 tons of ore containing 1,216 ounces of gold, 132,989 ounces of silver, 170,724 pounds of copper, 2,072,100 pounds of lead, 1,255,176 pounds of zinc, and an undetermined quantity of cadmium was beneficiated, and the zinc concentrates and lead concentrates produced were shipped to smelters. Zinc-lead ore from the Iron Canyon, Lucky Strike, and Trinity mines was shipped to concentrator-smelters. Ray Jepperson developed zinc-lead ore at the Bentley group. Lee F. Hand produced turquoise valued at about $12,000 in the Copper Basin area.

Bullion District.—The London Extension Mining Co., third largest producers of gold in Nevada in 1952, recovered gold and silver by cyaniding Goldacres open-pit mine ore. Lee Lakin shipped lead ore to a smelter from the Utah mine. Thomas George developed the Viola mine and shipped gold ore to a smelter. Grey Eagle Development Co. explored the Grey Eagle group; the ore contains lead, silver, gold, zinc, and copper.

Hot Springs District.—C and C Tungsten Mining Co. operated the Linka mine and shipped 100 tons of ore containing 0.49 percent WO_3. Gale G. Peer shipped 729 tons of ore containing 1.46 percent WO_3 from the Conquest mine to custom mills.

McCoy District.—Wells Cargo, Inc., leased the Hancock (Mickey) mine and shipped iron ore which eventually was exported to Japan. The New World Exploration, Research & Development Co. et al. worked the nearby McCoy mine and likewise consigned iron ore for the Oriental trade.

New Pass District.—The Thomas W. mine was operated by Richards Bros. and the Cooley Mining Co. Ore amalgamated at the mine 5-stamp mill yielded gold and silver.

Reese River District.—Sunnyside Milling Co. constructed a tungsten mill 20 miles east of Austin and developed the T-Bone tungsten property. FRH Mining Co. developed the Castle Mountain mine and planned to concentrate ore containing silver, gold, lead, zinc, and copper at the Marshall Canyon mill.

LINCOLN

Comet District.—Combined Metals Reduction Co. shipped zinc-lead ore from the Comet Coalition group (Pan-American) to the Caselton mill for beneficiation and continued exploration for new zinc-lead ore bodies at the Comet mine.

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Pioche (Ely) (Highland) District.—Combined Metals Reduction Co., largest producer of silver, lead, and zinc in Nevada, operated the Caselton mine (includes Pioche No. 1 and No. 2 mines group) and 1,000-ton-a-day mill and the Black Prince mine in 1952. The mill was enlarged to three units, and a sink-float plant was added. This provides for future production of manganese concentrate and continuing output of zinc concentrate and lead concentrate from the district's lead and zinc-lead ores, much of which contains appreciable percentages of manganese. The mill received 228,742 tons of company and custom ores in 1952 compared with 234,008 tons in 1951. The zinc concentrate and lead concentrate produced, which contained gold, silver, some copper, and cadmium, were shipped to smelters. The Pioche Manganese Co., a subsidiary of Combined Metals Reduction Co., constructed a 300- to 500-ton-feed-per-day rotary kiln designed to nodulize the manganese concentrate and fume off any residual lead and zinc in the concentrate. In addition, Combined Metals Reduction Co. worked the Hollinger perlite pit 17 miles northeast of Pioche. Crude perlite was crushed and sized at the Caselton Panacalite mill, and the product was consigned to various sections of the United States. Ely Valley Mines, Inc., second largest producer of zinc in Nevada in 1952, worked the Ely Valley mine until August 11, 1952, when exploration for new ore was begun. A total of 38,251 tons of zinc-lead ore, containing gold, silver, and copper, was shipped to a custom mill. Pioche Mines Consolidated, Inc. (Victor Cottino et al., lessees), shipped 42 tons of ore containing 2 ounces of gold, 859 ounces of silver, 236 pounds of copper, and 8,855 pounds of lead to a smelter from the Poorman mine. This company also shipped metallurgical manganese ore averaging 22 percent manganese from the Telephone mine. Lessees of Salt Lake Pioche Mining Co. shipped 84 tons of ore containing 5 ounces of gold, 1,398 ounces of silver, 275 pounds of copper, and 9,854 pounds of lead from the Apex and Financier claims to smelters. Dan Lloyd shipped ferruginous manganese ore averaging 25 percent Mn from the Independence mine.

Ely Springs (Lone Mountain) District.—The King Midas group (Hedman) silver ore was developed in 1952 by John A. Hedman.

Groom District.—Dan Sheahan, lessee, shipped 211 tons of lead ore containing silver, gold, and copper to a smelter from the Groom mine.

Jack Rabbit (Bristol) District.—Black Metal Mining Co. shipped zinc-lead ore to a custom mill from the Black Metal mine. Bristol Silver Mine Co. shipped ore containing substantial quantities of lead, zinc, copper, silver, and some gold to a smelter-fuming plant from the Bristol mine.

Patterson (Silver King) District.—J. L. Whipple made test smelter shipments of silver ore from the Highbridge mine.

Viola (Pennsylvania) District.—The Pennsylvania mine was developed for copper ore, and the Sure Shot-Jumbo-Owl claims were explored for gold and silver in 1952.

Tem Piute District.—Black Rock Mining Corp. worked the Lincoln property and stockpiled the ore mined. Old tailings were milled, and scheelite concentrate was the principal product; zinc concentrate, containing some lead, copper, and silver, was a byproduct of the operation. A new 500-ton-a-day flotation mill began operation in August 1952.

Ferguson (Delamar) District.—Delamar Perlite Co. shipped crude perlite to plants in California during 1952.

Pahranagat District.—Combined Metals Reduction Co. shipped manganese ore averaging 42 percent Mn from the South Paw mine near Mount Irish.

LYON

Churchill District.—Industrial Minerals & Chemical Co. shipped fuller's earth from a deposit near Weeks, Nev., to its California grinding plant.

Silver City District.—A. R. Dickson recovered gold and silver from Northern Belle mine tailings. The Big Three Mining Co. amalgamated Spring Valley mine ore, which yielded gold and silver. Dayton Dredging Co. washed gravel at Dayton, using a dragline and nonfloating washing plant; gold and some silver were recovered. R. M. Kolze, agent for L. B. Smith, Inc., operated a dry-land dredge at the Guy W. Walts property; gravel treated yielded gold and silver. Leo K. Johnson developed gold ore at the Buckeye Extension mine.

Wilson District.—Barney Dennison milled 1,200 tons of tungsten ore from the Cowboy mine 17 miles southeast of Wellington and recovered 3½ tons of 65-percent WO_3 concentrate. Carson Tungsten Co. shipped 1,417 pounds of concentrate containing 70.56 percent WO_3 recovered from 182 tons of Cowboy mine ore milled.

Yerington District.—Anaconda Copper Mining Co. prepared the Yerington (Empire Nevada) open-pit mine and leaching plant, 2 miles west of Yerington, for copper production. The Bureau of Mines published exploration data on the MacArthur copper deposit.[13] Regan Bros. reported a small output of gypsum from the Regan quarry 11 miles east of Yerington.

MINERAL

C. W. Cooper worked the Pumco pumice mine near Mina and shipped prepared material for concrete aggregate.

Acme (Fitting) District.—Dow Metals, Inc., operated the Kincaid mill and produced some tungsten concentrate. The company controlled the Flying Cloud (Babcock) tungsten mine in the Hawthorne district.

Broken Hills District.—Kaiser Aluminum & Chemical Corp. trucked fluorspar from the Kaiser (Baxter) mine to the company mill at Fallon.

Buena Vista District.—Don Burgner developed the Black Horse tungsten mine in 1952.

Candelaria (Columbus) District.—G. A. Peterson worked the New Potosi mine throughout 1952 and shipped 1,648 tons of antimonial lead ore containing 659 ounces of gold, 17,577 ounces of silver, 945 pounds of copper, 299,168 pounds of lead, 15,181 pounds of zinc, and 190,605 pounds of antimony to a smelter. Argentum Mining Co. of Nevada shipped silver ore and lead concentrate containing gold, silver, and copper to smelters. Candelaria Exploration Co. explored Petrel mine ore, which contains values in gold, silver, lead, and antimony. Newmont Exploration Co., Ltd., explored the silver and lead ores of the Candelaria mine.

[13] Matson, E. J., MacArthur Copper Deposit, Lyon County, Nev.: Bureau of Mines Rept. of Investigations 4906, 1952, 14 pp.

East Walker District.—Grano-Lite Gold Mining Co. explored the gold-silver ore of the Stanmore mine in 1952.

Gillis District.—W. E. Slater and Associates worked the Hayward mine, a new prospect 7 miles north of Rand, and shipped scheelite concentrate recovered from 11 tons of ore averaging 1.95 percent WO_3. Coranda Corp. explored the corundum-andalusite deposits of the Green Talc mine and Bismarck mine, 11 and 14 miles, respectively, northeast of Hawthorne.

Pilot Mountains District.—Lindsay Mining Co. shipped 16,911 tons of tungsten ore from the Gunmetal mine to the company mill in Esmeralda County. R. J. Canavan recovered 1 flask of quicksilver from 3 tons of Red Top mine ore retorted. L. C. Foster & C. J. Smith shipped 2 flasks of quicksilver recovered from 20 tons of Jackpot (Mammoth) mine ore.

Regent District.—Silvia D. Mining Co., Inc., recovered gold and silver at the Rawhide placer mine, using mechanical equipment. Corwin & Rysh Mining Co. developed the Scheelite Extension tungsten mine and shipped scheelite ore to custom mills. Nevada Scheelite Division of Kennametal, Inc., produced tungsten concentrate at its 125-ton gravity-flotation mill from 27,471 tons of Nevada Scheelite mine ore and 317 tons of custom ore; mill heads averaged 1 percent WO_3.

Santa Fe District.—Eagle tungsten mine, Jay A. Carpenter, receiver, shipped 3,463 tons of tungsten ore containing 0.6 percent WO_3 to a custom mill. R. C. Peterson shipped 560 tons of tungsten ore containing 0.3 percent WO_3 produced at the Emma mine. Mark Butler produced iron ore from the Butler (Sturdevant) and Iron Gate claims for export to Japan.

Silver Star (Gold Range) (Marietta) District.—Nevada Tungsten Corp. operated the Sodaville mill treating, on a custom basis, tungsten ore from neighboring mines, including the Silver Dyke operated by Chauncey Florey. S. G. Baker shipped 82 tons of tungsten ore containing 0.36 percent WO_3 from the Defender mine in the Marietta section.

NYE

Ash Meadows District.—The Los Angeles Chemical Co. produced fuller's earth at the Coen deposit. The operation was abandoned later in the year.

Bonnie Clare District.—Lippincott Lead Co. operated a sintering plant and furnace in 1952. Secondary lead material from various sources and lead ore and concentrates produced in the Death Valley area of California were smelted.

Clifford District.—Joe Clifford & Sons shipped 11 tons of ore containing 4.5 ounces of gold and 210 ounces of silver to a smelter from the Terry-Cougar mine.

Fairplay District.—J. H. Baxter & T. J. Hancock opened the Big Top tungsten mine, a new operation, in 1952; 367 tons of ore shipped averaged 6.66 percent WO_3. Assays ranged from 5.67 percent WO_3 to 12.58 percent WO_3.

Fluorine District.—J. Irving Crowell shipped metallurgical-grade fluorspar to Pacific coast plants from the Crowell mine. Cindrlite, Inc., mined volcanic cinder for roads and for its concrete-aggregate

plant in Clark County at the Cinder Cone mine. Silicates Corp. shipped bentonite to its California plant during 1952.

Jett District.—Last Chance Mining Co. operated the Last Chance mine and produced some antimony oxide and antimony metal at the company reduction plant. L. O. Warfield shipped quicksilver recovered from the Horse Canyon mine ore.

Johnnie District.—A. Z. Hall recovered free gold from the Globe mine ore. Martha Koofolis made a test smelter shipment of lead ore from the Naughty Boy claim.

Lodi (Mammoth) District.—Basic Refractories, Inc. produced magnesite and brucite from open-pits and from the Segerstrom mine, formerly leased by Sierra Magnesite. Two Herreshoff furnaces were operated at Gabbs to produce caustic-calcined magnesia for use in processing dead-burned magnesia. The Standard Slag Co. operated the Greenstone Addition open-pit magnesite mine and produced magnesium oxychloride in a flash furnace at Gabbs. A 195-foot oil-fired rotary kiln was installed in 1952 to prepare refractory magnesia.[14] In addition, the company operated the Phelps-Stokes (Iron Mountain) mine, and the 189,491 long tons of iron ore produced was largely for export to Japan; some ore was consigned for use in preparing dead-burned magnesite at Gabbs. El Capitan Tungsten Co. operated the El Capitan tungsten mine 6 miles northeast of Gabbs and a mill at Gabbs. Gabbs Exploration Co. worked the Victory tungsten mine 10 miles north of Gabbs and a mill at Gabbs. Alden Shields shipped high-grade lead ore from the Mohawk mine to a smelter.

Manhattan District.—Robert Selig recovered gold and silver by amalgamating 150 tons of Mill Side claim ore. Jumping Jack Mining Co. operated the Stray Dog mine and recovered gold and silver from tailings and ore by amalgamation. Lead Belt Metals Corp. developed the White Caps mine antimony-gold ore.

Quartz Mountain District.—Hill & Chiatovich et al. shipped 845 tons of lead ore from the San Rafael mine to a smelter. In addition 55 tons of zinc-lead ore was shipped to a concentrator-smelter.

Round Mountain District.—Round Mountain Gold Dredging Corp., fifth largest producer of gold in Nevada in 1952, operated its Round Mountain placer property until September 1952.

Tonopah District.—Summit King Mines, Ltd., explored an encouraging occurrence of gold-silver ore at the Tonopah King (Tonopah Development Co.) mine. Goldfield Development Co. and Red Hill Florence Mining Co. developed the Tonopah Tungsten mine 7 miles north of Tonopah.

Twin River (Millett) District.—Commodore Tungsten Mines (Smith Bros.) shipped tungsten ore from the New Year mine to a custom mill. Newmont Exploration Co., Ltd., developed the Bobby tungsten mine. Shenandoah Minerals Co. made small shipments of zinc-lead ore from the Giant and Frederick C. mines to a concentrator-smelter. August Streshley and Frank Rogers developed the Moomba claim lead ore.

Tybo (Hot Creek) District.—Lorena Peterson shipped 3 flasks of quicksilver derived from 45 tons of A and B mine ore and M. F. Peterson recovered 4 flasks of quicksilver from 60 tons of ore retorted at the M & M mine.

[14] Pit and Quarry, vol. 45, No. 9, March 1953, p. 90.

Union District.—N & M Mining Co. developed the Copper King group copper ore.

ORMSBY

Brunswick District.—H. L. Hazen and William Squires developed the Colony tungsten mine in 1952; 50 tons of ore averaging 0.73 percent WO_3 was mined and shipped to a custom mill. Carson Tungsten Co. operated the Old Discovery mine, 16 miles southeast of Carson City, and in both Ormsby and Douglas Counties.

PERSHING

Dodge Construction Co. produced crude perlite at the United States Gypsum Co. perlite quarry 12 miles northwest of Lovelock and operated the Kodak perlite screening and sizing mill 5 miles north of Lovelock. Nevada Uranium Co. explored the Stalin's Present claims 22 miles northeast of Lovelock, for uranium.

Antelope District.—First Uranium Corp. of Nevada explored the Majuba Hill mine from which ore containing copper, silver, and traces of tin had been mined previously.

Blue Lead District.—Golden Centuries Industries Corp. and C. R. Blossom shipped manganese ore averaging 20 percent manganese from the Black Eagle mine.

Hooker District.—United States Gypsum Co. operated the Empire gypsum quarry, which lies both in Pershing and Washoe Counties.

Humboldt District.—Lakeview Tungsten Corp. operated a 50-ton pilot mill in Humboldt Canyon and recovered some concentrate from the Lakeview mine tungsten ore.

Mill City District.—Nevada-Massachusetts Co., second largest producer of tungsten in Nevada in 1952, operated the Humboldt shaft (1,850 feet), the Stank shaft (1,300 feet), Sutton No. 2 shaft (800 feet), and the Sutton North Side and George Pits, in addition to the company mill at Tungsten; rehabilitation of the Sutton No. 1 underground mine, idle for 10 years, was in progress. A total of 547 tons of scheelite concentrate was produced from 146,786 tons of ore that averaged 0.30 percent WO_3. Tungsten Lead Mining Co. developed the Tungsten Lead mine 6 miles north of Tungsten.

Mineral Basin District.—Dodge Construction Co. produced 152,440 long tons of iron ore from the Segerstrom and Heizer mine for export to Japan.

Nightingale District.—Pyramid Co., Inc., shipped tungsten concentrate from the M. G. L. mine in 1952. The Wolfram Co. shipped 18,132 tons of scheelite ore from the Nightingale and Star mines to the company Toulon concentrator; 53 tons of concentrate averaging 64.75 percent WO_3 was recovered.

Polkinghorn District.—Charleston Hill National Mines, Inc., shipped manganese ore averaging 26 percent manganese from the Black Diablo mine, 21 miles south of Golconda on the Humboldt-Pershing County line.

Rabbitt Hole District.—Constant Minerals Separation Process, Inc., recovered gold and silver from the Barrel Spring mine alluvium.

Ragged Top (Copper Valley) District.—Cordero Mining Co. produced 750 tons of tungsten ore averaging 0.8 percent WO_3 from the Blue Wolf mine.

Relief (Antelope Springs) District.—Nevada Iron Ore Co. worked the Thomas pit, and the American Ore Co. operated the American Ore pit in 1952. Iron ore produced was largely for domestic open-hearth use.

Rochester District.—Tom and Bert Goodwin recovered gold and silver by amalgamating Limerick mine ore. Donald Davis and Bert Goodwin produced gold and silver from the Blue Sky placer mine.

Rose Creek District.—Leo K. Johnson shipped 61 tons of tungsten ore averaging 1.31 percent WO_3 from the Rose Creek mine to a custom mill.

Rye Patch District.—Winnemucca Mountain Mines Co. developed the Star mine and constructed a mill in 1952; 80 tons of tungsten ore was stockpiled.

Seven Troughs District.—Clinn E. Lamb worked the Annie claim and recovered gold and silver by amalgamation. L. J. Nickerson produced gold and silver from Portland Extension mine ore.

Wild Horse District.—Canfield, Sansom & Coppin shipped 14 tons of antimonial lead ore containing 1 ounce of gold, 307 ounces of silver, 2,413 pounds of lead, and 7,040 pounds of antimony from the Green mine to a smelter.

STOREY

Tuffstone Product Corp. mined tuff and operated a building-block plant 6 miles east of Sparks.

Clark District.—Eagle-Picher Co. operated the Celatom diatomite mine and the company crushing and calcining plant, 20 miles and 27 miles, respectively, east of Sparks.

Comstock District.—R. W. DeLaMare recovered gold and silver from Silver Hill mine ore by amalgamation.

Ramsey District.—J. D. Martin Estate rehabilitated the Gooseberry gold-silver mine in 1952.

WASHOE

Adaven Mining Corp. developed the White Blowout tungsten mine 9 miles northeast of Nixon, and shipped some tungsten concentrate. Reno Press Brick Co. operated its brick plant at Reno on clay mined at the Geiger mine, 10 miles south of Reno, and the Revelation Grog deposit, 12 miles east of Reno. Sno-Lite Products operated a perlite-expanding plant and light-aggregate plant 2 miles north of Reno. Isbell Construction Co. crushed miscellaneous stone and Smith-Peterson & Co. prepared building sand and gravel at Reno.

Galena District.—Constant Minerals Separation Process, Inc., shipped 17 tons of lead ore from the Galena Hill mine to a smelter, and Imperial Lead Mines, Inc., rehabilitated the Imperial zinc-lead mine and mill.

Hooker District.—United States Gypsum Co. operated the Empire calcining plant and the Empire gypsum quarry, which lies both in Washoe and Pershing Counties. The company plant for expanding perlite was put into operation June 1952.

Olinghouse (White Horse) District.—Emile Cabanne and Jimmie More worked the Babe mine and recovered gold and silver by amalgamation. The Renegade mine, G. W. DeLaMare, operator, yielded gold and silver during 1952.

Peavine District.—Citation Mining Co. developed ore containing lead and silver at the Paymaster claim.

Pyramid District.—T. O. Burrus and William Harrigan shipped 82 tons of ore containing 4 ounces of gold, 325 ounces of silver, and 7,880 pounds of copper from the Silver Bell mine to a smelter. Calcareous marl was produced by Double Check Products Co. at the Double Check mine and by Pacific Fertilizer Co., Inc.

WHITE PINE

Aurum District.—Grand Deposit Mining Co. explored and developed the Grand Deposit mine; the ore contains copper, lead, and zinc.

Black Horse District.—Graham Development Corp. developed the Gold King tungsten mine 54 miles southeast of Ely.

Cherry Creek District.—Baltimore-Camas Mine, Inc., developed the Schaefer tungsten mine and shipped scheelite concentrate. Cherry Creek Tungsten Mining Co. operated the Ticup mine and company mill. Leo F. Schmitt produced tungsten ore from the Tip-Top mine, and H. M. Cooley operated the Bluebell group of tungsten claims. Metallics Unlimited developed the Pine Nut mine and the Lucky Strike mine 6 miles northeast and 2 miles south, respectively, from Cherry Creek; 2 tons of scheelite concentrate recovered from 160 tons of 1.51-percent-WO_3 ore produced at the Pine Nut mine averaged 58.91 percent WO_3.

Cleve Creek District.—The Kolchek mine was developed for tungsten in 1952; incidentally, some gold ore containing silver was shipped to a smelter.

Duck Creek (Success) District.—Shenandoah Minerals Co. made test shipments of oxide ore from the Sundown mine to smelters (10 tons, containing a trace of gold, 7 ounces of silver, 13 pounds of copper, and 1,615 pounds of lead; and 10 tons, containing a trace of gold, 2 ounces of silver, 31 pounds of copper, 104 pounds of lead, and 4,232 pounds of zinc). Jeanette Wallace shipped 750 tons of fire clay from the McDonough pit in Mosier Canyon.

Mount Washington District.—Mount Wheeler Mines, Inc., explored the St. Lawrence, Pole Cat, Pole, and Coonan groups of claims for tungsten ore.

Newark District.—A. R. Laird, J. T. Stinnett, and M. V. Roberts shipped 2,944 tons of tungsten ore containing 0.96 percent WO_3 from the Bay State mine to custom mills.

Osceola District.—Activity was confined to a small shipment of direct smelting lead ore from the Hanna mine and some development work at the Paystreak and Mary Ann gold-placer mines.

Robinson District.—Kennecott Copper Corp., Nevada Mines Division, largest producer of copper and gold in Nevada in 1952 and third in silver output, operated the Ruth pit and Kimbley pit in 1952. Milling ore was treated at the enlarged company 21,000-ton McGill concentrator. Concentrates produced and direct smelting ore from both pits in addition to Ruth dump fluxing ore and copper precipitates from mine water, were consigned to the McGill smelter. Some fluxing ore was accepted at the smelter on a custom basis from several Nevada mines. Development of the Deep Ruth copper project from the Deep Ruth and Kellinske shafts continued. Limestone for smelter flux was

quarried at the McGill Lime pit. Consolidated Coppermines Corp., second largest producer of copper in Nevada in 1952, contracted for operation of the Morris Brooks pit and worked the Ruth (Liberty) pit extension under agreement with Kennecott Copper Corp. Mill ore produced was beneficiated at the McGill concentrator. Fluxing ore from the Morris Brooks pit and copper precipitates from mine water were direct-smelted at McGill. Lessees of Consolidated Coppermines Corp. shipped gold-silver ore and lead ore from the Beaver claim and gold ore and zinc silicate from the Willard claim to smelters. Gold-silver fluxing ore was shipped to a smelter from the Tipple mine (Fred Farnsworth), the Sunnyside mine (J. D. Hill), and the Hayes mine (Frank and Sinton Paine). Sam Robison operated the Columbia group and shipped 66 tons of ore containing 3 ounces of gold, 203 ounces of silver, 262 pounds of copper, 9,050 pounds of lead, and 19,372 pounds of zinc; and 73 tons of oxide ore containing 1 ounce of gold, 161 ounces of silver, 41 pounds of copper, 2,562 pounds of lead, and 33,627 pounds of zinc to a smelter-fuming plant. From the same property 50 tons of manganese ore averaging 36 percent Mn was shipped. Baltimore-Camas Mines, Inc., constructed a tungsten mill at Lackawana Springs.

Shoshone District.—Minerva Scheelite Mining Co. operated the Scheelite Chief mine and Minerva mill and shipped tungsten concentrate.

Taylor District.—Gardner Mines developed ore containing gold, silver, copper, lead, and zinc at the Mineral Farm group of claims.

Tungsten District.—L. Tilford shipped scheelite and hübnerite concentrates from the Hub Basin mine.

Tungstonia District.—Tungstonia Co. (D. M. Peck) shipped concentrate recovered from the Tungstonia mine tungsten ore.

Ward District.—Walker Corp. explored the Ward group in 1952; O. B. Mining Co., lessee, shipped 407 tons of ore containing 23 ounces of gold, 11,179 ounces of silver, 15,863 pounds of copper, 65,248 pounds of lead, and 15,147 pounds of zinc to a smelter from the group's Good Luck claim surface workings.

White Cloud District.—C. F. Crafts and Lowell Peterson shipped 10 tons of ore containing a trace of gold, 20 ounces of silver, 43 pounds of copper, 2,883 pounds of lead, and 171 pounds of zinc to a smelter.

White Pine (Hamilton) District.—Hal Jensen shipped lead ore from the Grand Prize mine to a smelter. Hamilton Consolidated Mines Corp. explored the Rocco-Homestake mine, and Newmont Exploration Co., Ltd., developed the Seligman mine. Lead and silver ores were shipped from these properties in prior years.

The Mineral Industry of New Hampshire

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the New Hampshire State Planning and Development Commission.

By Richard H. Mote [1]

MINERAL output in New Hampshire in 1952 had a total value of $1,941,000—the highest since 1931—and showed a 50-percent increase over the 1951 figure ($1,295,000). Substantial gains were made in the aggregate value of stone, sand and gravel, and mica production. Every county in the State, except Carroll, contributed to the expanded mineral economy. Merrimack, Cheshire, Grafton, and Rockingham Counties, in order of decreasing value of output, were the centers of greatest activity and together produced minerals valued at nearly 90 percent of the State total for 1952. The production of sand and gravel continued to be the leading mineral industry, followed by stone, as in 1951. Feldspar and mica ranked third and fourth, respectively, in value of output. Mines, pits, and quarries active during 1952 totaled 39.

TABLE 1.—Mineral production in New Hampshire, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate	50	$16,670	(2)	(2)
Clays	28,501	28,501	30,135	$30,135
Mica (sheet and scrap)	196	14,035	187	47,882
Sand and gravel	2,260,410	517,927	3,200,232	1,001,591
Stone	[3] 62,355	[3] 349,606	69,850	546,177
Undistributed: Abrasive stones, feldspar, mica, peat, stone (crushed granite, 1951), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)	----------	368,656	----------	314,732
Total New Hampshire	----------	1,295,000	----------	1,941,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production.
[2] Value included with "Undistributed."
[3] Excludes certain stone, value for which is included with "Undistributed."

Field teams of the Defense Minerals Exploration Administration, made up of Bureau of Mines engineers and geologists of the Federal Geological Survey, examined several New Hampshire mining properties for eligibility under the Federal Government program of assisting in the exploration of unknown or undeveloped sources of strategic and critical minerals and metals. As a result of this activity, 3 exploration contracts totaling $25,000 were approved for mica properties.

[1] Chief, Mineral Industry Division, Region VIII, Bureau of Mines, Pittsburgh, Pa.

REVIEW BY MINERAL COMMODITIES

METALS

Deposits of copper, lead, zinc, gold, silver, tin, and iron and other metals occur in New Hampshire, but most of them have not proved economic. Those that have yielded ore in times past, such as the Milan mine, Coos County, and Madison mine, Carroll County, have been idle for many years. There was no output of metals in the State in 1952.

NONMETALS

Abrasives (Scythestones).—Quarries at Pike, Grafton County, have produced scythestones for over 100 years. The rock is a fine-grained, dark-gray mica schist containing layers of quartz grains separated by thin laminations of mica. After quarrying, the rock is roughly trimmed, split to shape, then reduced to uniform size by grinding on rubbing beds using abrasive sand, and finally trimmed to specified length and hand finished. The sole producer in 1952 was Norton Pike Co.

Beryl.—New Hampshire ranked fourth in the United States in the production of beryl in 1952 and was exceeded only by South Dakota, New Mexico, and Colorado. Activity during the year was limited to Cheshire County, where producers of feldspar and sheet mica recovered byproduct beryl concentrates by hand-sorting methods. The principal source in 1952 was the Osborne mine in Cheshire County.

Clays.—During 1952, 4 clay pits were in operation, 1 each in Grafton and Strafford Counties and 2 in Rockingham County. Production was limited to miscellaneous clays used for the manufacture of building brick and other heavy clay products.

Feldspar.—Pegmatite rocks, the chief source of commercial feldspar, occur widely in New Hampshire. Outcrops of these rocks, which yield mica, beryl, and specimen quantities of many rare minerals, are prominent topographic features of the hilly divide between the Connecticut and Merrimack Rivers. Although the total production of crude feldspar dropped 17 percent compared with 1951, the State remained fourth-ranking producer, exceeded only by North Carolina, South Dakota, and Colorado. In 1952 feldspar was quarried in Cheshire, Grafton, and Sullivan Counties, listed in order of decreasing output. The principal producers during the year were Golding-Keene Co., Cheshire County; the Whitehall Co., Inc., Grafton County; and J. F. Morton, Inc., Sullivan County. Virtually all output in 1952 was ground and sold for use in pottery and glass manufacture. Five feldspar mines were active in the State in 1952.

Mica.—Mica has been mined in New Hampshire since 1803, when the first commercial mica produced in the United States was recovered from the Ruggles mine in Grafton County. The State has been an important source of sheet and scrap mica since that time, although the economic significance of its mica deposits diminished with development of mica resources in other States, notably North Carolina, and in foreign countries.

During 1952, 17 mines were active at one time or another; 12 of these were in Grafton County, 4 in Cheshire County, and 1 in Sullivan County. A portion of the total output was a coproduct or byproduct

of feldspar mining. Both sheet and scrap mica was recovered during the year. Over 97 percent of the 1952 State output came from mines in Grafton County.

In August 1952 General Services Administration of the Federal Government established a mica-buying depot at Franklin, Merrimack County, and began purchasing mica under provisions of its domestic mica-purchasing program announced March 14, 1952. Production from 15 individual mica mines was sold to the depot from August through December.

The total production of sheet and scrap mica in New Hampshire during 1908–52 is shown in table 2.

TABLE 2.—Production of sheet and scrap mica, 1908–52

Year	Sheet mica		Scrap mica		Total value
	Quantity (pounds)	Value	Quantity (short tons)	Value	
1908	12,000	$1,200	10	$150	$1,350
1909	55,808	12,086	412	4,094	16,180
1910	117,170	26,109	409	6,090	32,199
1911	289,473	35,103	719	9,824	44,927
1912	308,047	32,238	264	5,100	37,338
1913	731,478	65,765	692	13,906	79,671
1914	133,556	39,588	600	8,249	47,837
1915	96,685	59,414	516	7,557	66,971
1916	125,502	64,386	724	10,853	75,239
1917	472,519	159,822	680	9,229	169,051
1918	376,900	106,200	530	7,040	113,240
1919	235,724	90,915	738	13,356	104,271
1920	284,862	83,811	435	12,877	96,688
1921	491,743	63,249	537	10,613	73,862
1922	475,647	63,240	238	5,838	69,078
1923	835,751	107,674	1,078	25,871	133,545
1924	744,133	88,737	492	9,498	98,235
1925	1,120,857	198,858	1,953	47,525	246,383
1926	1,371,890	235,890	1,738	38,213	274,103
1927	720,219	78,849	1,284	22,909	101,758
1928	774,143	63,470	1,291	25,232	88,702
1929	984,778	82,657	1,657	35,977	118,634
1930	673,064	53,304	449	8,743	62,047
1931	441,164	36,368	295	5,465	41,833
1932	146,014	17,978	344	5,585	23,563
1933	167,464	22,008	532	9,563	31,571
1934	161,430	14,423	537	9,529	23,952
1935	131,586	13,727	394	5,335	19,062
1936	285,822	22,920	250	3,610	26,530
1937	235,055	20,119	306	4,397	24,516
1938	[1] 282,836	[1] 49,254	[1] 927	[1] 16,189	[1] 65,443
1939	43,670	3,738	105	1,592	5,330
1940	178,603	13,544	31	579	14,123
1941	394,907	65,104	171	3,700	68,804
1942	342,939	57,995	303	7,234	65,229
1943	700,543	583,543	1,148	28,643	612,186
1944	323,636	617,172	2,339	55,851	673,023
1945	532,944	144,947	442	11,206	156,153
1946–52 [2]	495,604	111,107	1,042	23,979	135,086
Total	16,296,166	3,606,512	26,612	531,201	4,137,713

[1] Includes production from Connecticut.
[2] Production combined for years indicated to prevent disclosure of individual company data.

Peat.—A small tonnage of peat for agricultural uses in the immediate vicinity was produced from bogs in Belknap County in 1952.

Sand and Gravel.—Sand and gravel were the most important mineral commodities in New Hampshire in 1952, accounting for 52 percent of the aggregate value of the State's mineral output during the year. Seven commercial sand and gravel plants were in operation, 1 each in Belknap, Coos, Grafton, Merrimac, and Strafford Counties and 2 in Cheshire County. Over three-quarters of the State's total output in 1952 was produced from pits worked by the New Hampshire State Highway Department.

TABLE 3.—Sand and gravel sold or used by producers, 1951–52, by classes of operations and uses

	1951			1952		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Building	45,605	$38,050	$0.83	96,241	$81,837	$0.85
Paving	79,650	41,050	.52	136,651	72,616	.53
Engine and filter	13,046	11,690	.89	13,046	11,690	.90
Total commercial sand	138,301	90,790	.66	245,938	166,143	.68
Gravel:						
Building	34,580	54,400	1.57	90,832	148,326	1.64
Paving	87,000	66,000	.76	305,991	177,052	.58
Railroad ballast	14,672	2,442	.17	4,247	1,380	.32
Total commercial gravel	136,252	122,842	.90	401,070	326,758	.82
Total commercial sand and gravel	274,553	213,632	.78	647,008	492,901	.76
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Paving	302,061	44,381	.14	410,804	95,171	.23
Total Government-and-contractor sand	302,061	44,381	.14	410,804	95,171	.23
Gravel:						
Paving	1,683,796	259,914	.15	2,142,420	413,519	.19
Total Government-and-contractor gravel	1,683,796	259,914	.15	2,142,420	413,519	.19
Total Government-and-contractor sand and gravel	1,985,857	304,295	.15	2,553,224	508,690	.20
ALL OPERATIONS						
Sand	440,362	135,171	.31	656,742	261,314	.40
Gravel	1,820,048	382,756	.21	2,543,490	740,277	.29
Grand total	2,260,410	517,927	.23	3,200,232	1,001,591	.31

Stone.—Stone ranked second to sand and gravel in value of total output in New Hampshire in 1952. Production was reported from Rockingham, Merrimack, Hillsboro, and Coos Counties, listed in order of decreasing output. Dimension stone, all granite, was quarried in Merrimack, Hillsboro, and Coos Counties and represented 75 percent of the aggregate value of stone produced in the State during the year. Although some granite was crushed for use as concrete aggregate and in road construction, most of the crushed stone produced consisted of miscellaneous stone from a quarry near Portsmouth, Rockingham County. Four commercial stone quarries were active during the year.

REVIEW BY COUNTIES

BELKNAP

Mineral production in Belknap County in 1952 was limited to sand and gravel and a small tonnage of peat. Tilton Sand & Gravel, Inc., produced sand and gravel for building and road construction at its pit and fixed plant at Tilton.

CHESHIRE

Cheshire County ranked second among New Hampshire counties in value of mineral output in 1952. Products, in order of decreasing value, included sand and gravel, feldspar, beryllium concentrates, and mica. Building and paving sand and gravel, which composed 58 percent of the total value, were produced by Keene Sand & Gravel, Inc., from its pit and plant at Swanzey, and Arthur Whitcomb, Jr., Keene. Feldspar for use in pottery manufacture and sheet mica were produced by Golding-Keene Co. at its Colony mine and mill, Alstead. This company also produced sheet mica at the Clarke mine near Gilsum. L. H. Congdon, mined feldspar and byproduct beryl, at the Osborne mine. J. F. Morton operated his feldspar mill at Cold River on ore from his mine in Sullivan County.

COOS

Rough dimension granite for use in building construction was quarried at Berlin by Henry A. St. Laurent. A small tonnage of gravel for railroad ballast was produced by the Maine Central Railroad.

GRAFTON

Feldspar, mica, sand and gravel, clay, and abrasive stone were produced in 1952 in Grafton County, which ranked third among New Hampshire counties in value of mineral output. Crude feldspar was mined by the Whitehall Co., Inc., at the Ruggles mine, 1½ miles northwest of Grafton Center. Northern Feldspar Corp. worked its mine and mill and produced crude and a small tonnage of ground feldspar for use in pottery manufacture.

Twelve mines yielded mica during the year. Sheet and scrap mica was recovered as a coproduct of feldspar mining at the Ruggles mine by the Whitehall Co., Inc. Other properties producing mica in Grafton County in 1952 included the Palermo, 1½ miles southwest of North Groton; Keyes, 4¾ miles northeast of Canaan; Valencia, 2 miles northeast of North Groton; Atwood at West Rumney; Wood in the town of Warren; Nancy near Groton; Sanders; McInnis and Draper mines.

Engine sand was produced at the West Lebanon pit of Twin States Sand & Gravel Co. Dinsmore Brick Co. mined miscellaneous clays for use in brick manufacture at its open pit near Lebanon. Norton-Pike Co. continued to quarry natural abrasive stone at its quarry at Pike.

HILLSBORO

The City of Manchester Highway Department produced sand and gravel for road construction and maintenance. Granite for monumental and building purposes was quarried during the year by New Westerly Granite Co. of New Hampshire, Inc., at its quarry 2¼ miles northwest of Milford.

MERRIMACK

Sand and gravel production credited to Merrimack County in 1952 was largely output reported by the New Hampshire State Highway Department. Paving sand and gravel were recovered during the year by Manchester Sand & Gravel Co. from its pit in southern Merrimack County.

The John Swenson Granite Co. operated its quarry at Concord throughout the year and produced rough dimension stone for wall construction and dressed stone for use in building construction, monuments, and curbing and flagging. A small tonnage of crushed and broken granite for use in concrete and road construction was also produced.

ROCKINGHAM

Clay open pits of Enos Bros. Brick Co. and W. S. Goodrich, Inc., at Exeter and Epping, respectively, yield miscellaneous clay for brick manufacture.

Crushed and broken miscellaneous stone was quarried near Portsmouth for use as road metal and concrete aggregate.

STRAFFORD

Miscellaneous clay for brick and heavy clay products was mined by New England Brick Co. from its open pit at Gonic. Kenneth L. Allen worked his gravel pit and fixed plant at Rochester during part of the year and produced building sand and gravel.

SULLIVAN

Crude feldspar was produced at the Morton mine of J. F. Morton, Inc., near Alstead, and ground in the company mill at Cold River, Cheshire County. George Eckerman recovered a small quantity of sheet mica from the Kent mine near Sunapee.

The Mineral Industry of New Jersey

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the New Jersey Department of Conservation and Development, Bureau of Geology and Topography.

By Richard H. Mote[1]

MINES, PITS, AND QUARRIES in New Jersey in 1952 yielded mineral products, the value of which totaled $57,309,000, a 3-percent drop from the 1951 figure of $59,023,000. Except for 1951 the aggregate value of the 1952 production was the largest since 1929. All counties but Hudson contributed to the State's mineral economy during the year. Sussex, Morris, Passaic, Cumberland, Somerset, Middlesex, and Cape May Counties, in order of decreasing value of output, were the major centers of activity. Each of them produced mineral commodities valued at over $1.5 million in 1952. The first 3 supplied 65 percent of the State's total value of mineral output during the year, and the aggregate value of production from all 7 counties comprised nearly 88 percent of the State total. Zinc mining continued to be the leading mineral industry, despite 6 and 11-percent declines in quantity and value of output, respectively. Stone, principally crushed basalt for use as concrete aggregate, road metal, and railroad ballast, ranked second in value of output. Sand and gravel, iron ore, and clay followed in third to fifth place, respectively. In all, 123 mines of all kinds were active in the State in 1952.

TABLE 1.—Mineral production in New Jersey, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	683,439	$2,106,628	598,775	$1,962,599
Iron ore (usable)—long tons, gross weight	657,930	7,810,776	685,466	6,760,467
Manganiferous residuum—gross weight	267,751	(2)	215,255	(2)
Marl (greensand)	5,067	263,944	4,600	177,847
Peat	27,678	213,500	21,800	191,664
Sand and gravel	6,652,383	9,106,052	7,060,074	9,473,428
Sand and sandstone (ground)	144,098	1,053,991	138,434	1,011,844
Stone (except limestone for lime)	6,457,248	10,987,705	6,102,324	12,307,480
Zinc (recoverable content of ore, etc.) [3]	62,917	24,279,745	59,190	21,520,612
Undistributed: Lime, magnesium compounds, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)	----------	3,200,574	----------	3,902,859
Total New Jersey	----------	59,023,000	----------	57,309,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production.
[2] Value included with "Undistributed."
[3] Value reported for zinc is estimated smelting value of recoverable zinc content of ore after freight, haulage, smelting, and manufacturing charges are added.

[1] Chief, Mineral Industry Division, Region VIII, Bureau of Mines, Pittsburgh, Pa.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Peat.—Northern New Jersey peat bogs originated in the shallow lakes left by retreating ice of the last (late Pleistocene) glaciation. Remains of plants growing in the lake and transported material ultimately filled many lake basins, and this type of deposit is worked to recover peat. Production in 1952 came from the vicinity of Newton, Sussex County, and from a smaller bog near Stanhope. Output was utilized for horticultural purposes.

TABLE 2.—Production of peat, 1948–52, in short tons

Year	Short tons	Value
1948	23,102	$163,056
1949	25,500	180,750
1950	26,466	186,338
1951	27,678	213,500
1952	21,800	191,664

METALS

Iron Ore.—Iron ores occurring in New Jersey include magnetite, hematite, and limonite, but only the magnetite ore is mined commercially. Deposits occur at a number of places in the crystalline pre-Cambrian rocks of Sussex, Passaic, Morris, and Warren Counties. Mining is by underground methods, and since the ore is of variable grade, most of it requires extensive concentration before shipment. Crude-iron-ore production in the State in 1952 gained 13 percent, and shipments of usable ore rose 4 percent compared with 1951. Usable ore shipments were the greatest since 1940. Crude ore is the mined product before any treatment to eliminate waste constituents; usable ore includes direct-shipping ore (mined product requiring no treatment), washed ore, concentrates, and sinter. Five mines were active in 1952; the largest was the Scrub Oaks property of Alan Wood Steel Co. in Morris County. Other producing iron mines, in order of decreasing output in 1952, were Richard Ore Co., Richard mine, and Warren Foundry & Pipe Co., Mount Hope mine, both in Morris County; Alan Wood Steel Co. Washington mine, Warren County; and Ringwood Iron Mines, Inc., Peters mine, Passaic County.

TABLE 3.—Production and shipments of iron ore, 1943–47 (average) and 1948–52, by uses, in long tons

Year	Number of mines	Crude ore mined	Shipments of usable ore						
			Direct-shipping ore	Concentrates	Cement	Paint	Miscellaneous	Total shipments	Value
1943–47 (average)	4	995,376	136,416	322,908	3,533	89	4,556	467,502	$3,347,723
1948	4	857,444	129,729	292,794	12,146	1,377	326	436,372	3,739,985
1949	4	921,422	108,612	327,347	12,170	--------	360	448,489	4,468,575
1950	4	1,090,826	138,451	435,096	14,125	56	471	588,199	5,651,563
1951	4	1,166,495	193,143	454,555	9,967	74	191	657,930	7,810,776
1952	5	1,318,599	166,962	505,136	13,272	96	--------	685,466	6,760,467

Manganiferous Residuum.—Manganese for use in preparing spiegeleisen, an iron-manganese alloy consumed by the steel industry, continued to be recovered by The New Jersey Zinc Co. as a byproduct of zinc mining at its Franklin and Sterling Hill mines, Sussex County.

Zinc.—Zinc has been produced in New Jersey at 2 mines in the Franklin district, Sussex County, for more than 100 years. During most of this period this district has led all others in the Nation in total zinc output, and the two mining properties have produced more zinc annually than any other mine in the United States. These deposits, the Mine Hill at Franklin and the Sterling Hill, 2 or 3 miles southwest at Ogdensburg, occur in the Franklin limestone of pre-Cambrian age. The ore bodies at these localities are unlike any other known zinc deposits in the world. The principal metals are zinc, manganese, and iron; they are present in the minerals franklinite (oxide of zinc, iron, and manganese), willemite (zinc silicate), and zincite (red oxide of zinc). Portions of the ore deposits contain all three of these minerals in intimate mixture, while others consist of separate minerals uncontaminated. The ore bodies are unique in being relatively free from other heavy metals, such as lead, cadmium, and copper, which are usually found in most zinc-ore deposits.

TABLE 4.—Mine production of recoverable zinc, 1907–52

Year	Short tons	Year	Short tons	Year	Short tons
1907	62, 435	1923	75, 227	1939	88, 716
1908	66, 703	1924	84, 370	1940	91, 406
1909	79, 460	1925	89, 261	1941	93, 781
1910	65, 410	1926	80, 629	1942	94, 040
1911	63, 700	1927	95, 695	1943	92, 864
1912	76, 560	1928	99, 871	1944	80, 288
1913	79, 564	1929	103, 740	1945	81, 392
1914	83, 068	1930	97, 626	1946	64, 454
1915	118, 187	1931	94, 285	1947	76, 871
1916	111, 872	1932	81, 460	1948	76, 332
1917	121, 043	1933	75, 125	1949	50, 984
1918	102, 318	1934	76, 503	1950	55, 029
1919	92, 516	1935	85, 708	1951	62, 917
1920	78, 511	1936	89, 883	1952	59, 190
1921	56, 447	1937	101, 408		
1922	73, 657	1938	85, 839	Total	3, 816, 345

NONMETALS

Clays.—Deposits of clay suitable for use in the manufacture of brick and heavy clay products are widespread in occurrence in New Jersey. The State clay industry, however, is centered in Middlesex County, which in 1952 produced nearly two-thirds of the total output. Clays of this area include white to blue fire clay, ball clay, and dark-gray sandy clay used for common-brick manufacture. Major clay producers in the State in 1952, all in Middlesex County, were Sayre & Fisher Brick Co., Sayreville; Natco Corp. plants at Keasbey and New Brunswick; Valentine Fire Brick Co. at Perth Amboy and Woodbridge; and Crossman Co., Sayreville. Approximately 47 percent of the clay produced in 1952 in New Jersey was fire clay for use in manufacturing refractory brick. Twenty-four pits were worked during the year—13 in Middlesex County, 3 in Bergen, 2 in Burlington, and 1 each in Camden, Cumberland, Monmouth, Morris, Ocean, and Passaic Counties.

Greensand Marl.—The Cretaceous and Tertiary formations of middle and southern New Jersey include a substantial proportion of sediments containing glauconite, a hydrous silicate of potassium and iron. Owing to the green color of the mineral glauconite and the tendency for the formation to contain some clay, the deposits of this material are called greensand marl. Large quantities of this material have been used as fertilizer in years past, but recently production has been utilized almost exclusively as an exchange medium in water-softening equipment. In 1952, as in previous years, all output was from open-pit operations in Burlington and Gloucester Counties. Producing companies were Zeolite Chemical Co., Medford; Inversand Co., Sewell; and The Permutit Co., Birmingham. The price of refined greensand f. o. b. shipping point ranged from about $60 to $128 per short ton.

TABLE 5.—Greensand marl sold or used by producers, 1943–47 (average) and 1948–52

Year	Short tons	Value
1943–47 (average)	6,685	$472,715
1948	7,269	392,959
1949	6,128	276,564
1950	3,935	304,321
1951	5,067	263,944
1952	4,600	177,847

Lime.—Although limestone suitable for line manufacture is abundant in the northwestern border counties and in Somerset County, there are few active lime plants in New Jersey. The bulk of the output in 1952 was from the Sussex County plant and quarry of Limestone Products Corp. of America. A small tonnage of hydrated lime for agricultural use was manufactured in Somerset County during the year.

Magnesium Compounds.—High-purity magnesium chemicals, refractory magnesia, and precipitated magnesium carbonate were produced in New Jersey in 1952. Plants were active in Cape May, Somerset, and Warren Counties. To avoid duplication of output data only the magnesia produced from raw sea water is included in the mineral output of the State. Other raw materials utilized included dolomite and purchased magnesium carbonate.

Perlite.—Crude perlite mined in New Mexico and Colorado was expanded at three New Jersey plants in 1952 for use in building construction as a plaster and concrete aggregate. Producers active during the year included PerAleX of New Jersey, Inc., Paterson, Passaic County; Great Lakes Carbon Corp., Linden, Union County; and Coralux Perlite Corp. of New Jersey, Metuchen, Middlesex County.

Sand and Gravel.—Sand and gravel ranked third in value of output among mineral products of New Jersey in 1952. Production was reported from every county except Essex, Hudson, Hunterdon, Somerset, and Union. Principal producing counties, listed in order of decreasing output, were Cumberland, Morris, Bergen, Middlesex, Camden, and Monmouth. The aggregate output of pits in these counties accounted for 80 percent of the State total output during the year.

Sand and gravel deposits are widely distributed throughout New Jersey. Material suitable for building and paving purposes is found in surface deposits left by the retreat of the great continental ice sheet that once covered the area. Special types of industrial sands are mined from numerous beds of unconsolidated material occurring in the Cretaceous and Tertiary formations of the coastal counties. Most sand and gravel produced is consumed locally, and the magnitude of output is directly related to the tempo of construction in the area. Sixty-four commercial plants were active during 1952.

TABLE 6.—Sand and gravel sold or used by producers 1951–52, by classes of operations and uses

	1951			1952		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Glass	(1)	(1)	(1)	426,498	$774,026	$1.81
Molding	1,590,589	$3,624,613	$2.28	1,463,832	3,491,675	2.39
Building	1,854,360	1,532,618	.83	1,663,132	1,431,268	.86
Paving	1,167,790	870,996	.75	1,401,746	1,096,088	.78
Grinding and polishing and blast sand	126,254	372,507	2.95	81,803	286,229	3.50
Fire or furnace	28,821	51,997	1.80	24,164	42,081	1.74
Engine	23,075	16,957	.73	23,726	16,382	.69
Filter	40,139	120,831	3.01	45,629	140,143	3.07
Other sand	33,002	117,223	3.55	290,597	258,325	.89
Gravel:						
Building	813,578	981,872	1.21	847,674	1,094,787	1.29
Paving	406,119	364,012	.90	671,271	687,233	1.02
Railroad ballast	(1)	(1)	(1)	18,000	24,000	1.33
Other	75,716	165,247	2.15	66,842	127,293	1.90
Undistributed	469,574	884,043	1.88			
Total commercial sand and gravel	6,629,017	9,102,916	1.37	7,024,914	9,469,530	1.35
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand: Paving	346	42	.12	502	47	.09
Gravel: Paving	23,020	3,094	.13	34,658	3,851	.11
Total Government-and-contractor sand and gravel	23,366	3,136	.13	35,160	3,898	.11
Grand total	6,652,383	9,106,052	1.37	7,060,074	9,473,428	1.34

[1] Included with "Undistributed" to avoid disclosure of individual company operations.

Sand (Ground).—Producers of industrial sand in Cumberland, Middlesex, and Ocean Counties pulverized some of their output to meet specifications of consumers in the foundry, glass, and pottery industries.

Stone.—New Jersey continued in 1952 to lead the Nation in output of crushed basalt. Production of this type of rock during the year accounted for approximately 92 percent of the total stone output, the balance being crushed limestone, granite, serpentine, and rough dimension sandstone. Most of the basalt crushed was used for concrete aggregate, road building and maintenance, railroad ballast, and riprap.

Leading producers of crushed basalt in New Jersey in 1952, in order of decreasing output, were the Bound Brook quarry of North Jersey Quarry Co. and Kingston Trap Rock Co., Kingston, both in Somerset County; the Summit quarry of North Jersey Quarry Co., Union County; Hawthorne Division quarry of Samuel Braen's Sons, Passaic County; Somerset Crushed Stone Inc., Bernardsville, Somerset County; and Fanwood Stone Crushing & Quarry Co., Watchung, Somerset County. Each of these quarries yielded over 400,000 tons of crushed basalt during the year, and the aggregate output of the six represented 56 percent of the State total crushed basalt output in 1952.

TABLE 7.—Stone sold or used by producers, 1951–52, by uses

Use	1951		1952	
	Quantity	Value	Quantity	Value
Dimension stone:				
Building stone:				
Rough architectural, cubic ft.	5,625	$4,500	8,688	$8,340
Approximate equivalent in short tons	450		695	
Rubble, short tons	173	865		
Total dimension stone (quantities approximate in short tons)	623	5,365	695	8,340
Crushed and broken stone:				
Riprap, short tons	108,145	204,453	191,381	346,661
Crushed stone, do.	6,072,284	9,377,290	5,624,517	10,472,323
Fluxing, do.	(1)	(1)	6,450	14,620
Agricultural, do.	(1)	(1)	119,908	403,542
Miscellaneous, do.	(1)	(1)	159,373	1,061,994
Undistributed [1], do.	276,196	1,400,597		
Total crushed and broken stone, do.	6,456,625	10,982,340	6,101,629	12,299,140
Grand total (quantities approximate in short tons)	6,457,248	10,987,705	6,102,324	12,307,480

[1] Included with "Undistributed" to avoid disclosure of individual company operations.

REVIEW BY COUNTIES

ATLANTIC

Gravel for building and road construction and foundry sand for use in making molds for casting metal was produced during the year by Taggart Brimfield Co. at its pit and plant at Cedar Lake.

BERGEN

Sand and gravel and clay were the sole mineral products of Bergen County in 1952. Braen Sand & Gravel Co., largest producer of sand and gravel in the county in 1952, worked its pit and fixed plant at Wyckoff throughout the year and produced material used for building and highway construction. Other large producers in the county during the year, in order of decreasing output, were McKee Bros., Inc., and Samuel Braen's Sons, both with pits at Mahwah; Van Decker Bros., Inc., Warren Point; Leonard Combe, Glen Rock; and New York, Susquehanna & Western Railroad.

Hackensack Brick Co. worked its pit and plant at Little Ferry during most of the year and produced miscellaneous clay, which was used for the manufacture of brick and heavy clay products. Other producers of clay in Bergen County were Kingsland Clay Products Co., Lyndhurst, and Tri-County Brick Corp., Moonachie.

BURLINGTON

Principal producer of sand and gravel in Burlington County in 1952 was Del River Sand Dredging Co., Bordentown. Other producing properties active during the year included the South Pemberton and Birmingham plants of Fred C. Norcross, Sr.; Mount Holly plant and pit of George F. Pettinos, Inc.; the Burlington plant and pit of H. R. Sherman and Mount Holly pit of Whitehead Bros. Co. All the foregoing produced building sand and gravel in 1952 except the pits of Whitehead Bros. Co. and George F. Pettinos, Inc., at Mount Holly, which yielded molding sand.

The open-pit operations of The Permutit Co. and Zeolite Chemical Co. at Birmingham and Medford, respectively, continued to yield greensand, which was sold for use as a base-exchange medium in water softening and purifying equipment.

Miscellaneous clay for use in brick manufacture was produced during the year at the Fieldsboro pit of Church Brick Co. Graham Brick Manufacturing Co. mined miscellaneous clay for brick and heavy clay products at its pit at Maple Shade.

CAMDEN

Six sand and gravel pits were active in Camden County in 1952. Bridgeton Sand Co. produced molding sand and glass sand at its pit and fixed plant at Williamstown Junction. George F. Pettinos, Inc., continued to work its pit and fixed plant at Grenloch and produced molding sand for use in the foundry industries. Other producers of molding sand in Camden County in 1952 included Reading Sand Co., Penbyrn, and Taggart Brimfield Co., Hayville. Building and paving sand and gravel were produced during the year by Russell W. Ward, Inc., Palmyra, and Albion Sand & Gravel Co., Pine Hill Township. Fire clay was mined at the Winslow Junction pit of The Alliance Clay Product Co.

CAPE MAY

Cape May Sand & Gravel Co. recovered blast and filter sand during the year from its pit at Cape May Point. Refractory magnesia was produced from raw sea water and dolomite at the Cape May plant of Northwest Magnesite Co.

CUMBERLAND

Cumberland County ranked first among New Jersey counties in the production of sand and gravel in 1952. The 13 commercial operations active during the year supplied 29 percent of the State total output. Most of the production in 1952 was molding sand, glass sand, and sand for other industrial uses. The principal producer of molding sand in the county during the year was the New Jersey Silica Sand Co. pit and fixed plant at Millville. Sand for use in glass manufacture was the major product of the South Jersey Sand Co. Dividing Creek pit. Whitehead Bros. Co. continued to work its dredge on Dividing Creek and its fixed plant at Dorchester during 1952 and recovered molding sand for use in the foundry industries. Molding sand, glass sand, and blast sand were recovered by National Pulverizing Co. at its pit at Millville. Other producers of industrial sands in Cumberland County in 1952 were Jesse S. Morie & Son,

Inc., Mauricetown; George F. Pettinos, Inc., Manumuskin; Armstrong Cork Co., South Vineland; and Daniel Goff Co., Inc., Millville. Some of the sand produced, such as that recovered at the Pennsylvania Glass Sand Corp. pit at Newport and a portion of the output from the Millville pit of National Pulverizing Co., was ground to meet individual consumers' specifications for use in cleansing and scouring compounds, foundries, and glass and pottery manufacture. Building and paving sand and gravel were produced by Manumuskin Mining Co., Inc., with a dredge near Port Elizabeth; Menantico-Tuckahoe Sand & Gravel Co., Millville; and Brunetti Bros. and Diamond Sand & Stone Co., Vineland.

The Millville pit of Daniel Goff Co., Inc., was worked during the year and yielded fire clay.

ESSEX

Crushed basalt for use in highway construction was quarried during the year at the South Orange quarry of M. L. Kernan. Orange Quarry Co. worked its West Orange quarry during the year and produced crushed basalt for use in highway construction and as riprap.

GLOUCESTER

Mineral products of Gloucester County in 1952 included sand and gravel and greensand marl. Downer Silica Co. produced furnace sand at its pit at Downer east of Glassboro. Tri-State Sand Co. produced molding sand at its pit and fixed plant near Cedar Lake. Building and paving sand and gravel were produced at pits near Mount Royal and Bridgeport by Wenonah Sand & Gravel Co. and Penn Jersey Sand & Gravel Co., respectively.

Inversand Co. continued to work its greensand-marl open pit near Sewell during the year. As in previous years, output was utilized principally for industrial water purification.

HUNTERDON

Crushed basalt for use as road surfacing, railroad ballast, and riprap was quarried during the year at the Lambertville quarry of Lambertville Quarry Co. Preen Crushed Stone Co. worked its quarry at Oldwick during part of the year and produced crushed basalt for use in road construction. The Mulligan lime quarry at Clinton yielded crushed limestone for road-base and foundry purposes. A small tonnage of rough dimension sandstone was quarried during the year at the Stockton quarry of Vernon Kerlin.

MERCER

Stone and sand and gravel were the only mineral products of Mercer County in 1952. Stone output was limited to crushed basalt quarried by the Mercer County Work House and by Pennington Quarry Co. Material produced during the year was sold for use as road surfacing and railroad ballast. Building sand and gravel were recovered during the year at the Groveville pit of Crosswicks Sand & Gravel Co.

MIDDLESEX

The bulk of activity in the New Jersey clay industry is centered in Middlesex County. Thirteen producers were active in 1952. Although

most of the output during the year was fire clay, some miscellaneous clay was produced. Leading producers in the county included Sayre & Fisher Brick Co., Sayreville; Natco Corp., with pits and plants at Keasbey and New Brunswick; Valentine Brick Co., Perth Amboy and Woodbridge; and Crossman Co., Sayreville.

The mining and preparation of sand and gravel were carried on by six companies during the year. Crossman Co. worked its pit and fixed plant near Sayreville throughout most of the year and produced building and paving sand and a small tonnage of molding, furnace, and engine sand. Whitehead Bros Co. continued to recover molding sand and blast sand at its operations in East Brunswick Township. Producers of building and paving sand and gravel in Middlesex County in 1952 included Dallenbach Sand Co., Inc. (South Brunswick Township), Glenn Rock Concrete Products, Inc. (Jamesburg), Raritan River Sand Co (Nixon), and South River Sand Co. (Old Bridge), which also produced ground sand for filler and foundry uses.

Expanded perlite was produced at the Metuchen plant of Coralux Perlite Corp. of New Jersey.

MONMOUTH

Five commercial sand and gravel operations were active in Monmouth County in 1952. Bennett Sand & Gravel Co., Inc., recovered building and paving sand and gravel at its pit in Wall Township near Manasquan. Hause Gravel Co. purchased the pit and fixed plant of Coastal Sand & Gravel Co. at Allenwood on October 1, 1952. Output during the year consisted of paving sand and gravel. Other producers of sand and gravel in Monmouth County in 1952 included New Jersey Gravel & Sand Co., Inc., Farmingdale; Scarano Gravel Co., Wayside; and Benjamin Fary, Oakhurst.

The only active clay producer in Monmouth County in 1952 was Oschwald Brick Works, Inc., with a pit near Laurence Harbor and plant at Cliffwood. Miscellaneous clay was produced during the year.

MORRIS

Mineral products of Morris County in 1952, in order of decreasing value, were iron ore, sand and gravel, stone, and clay. The leading iron-ore producer in the county and in New Jersey during the year was the Scrub Oak mine of Alan Wood Steel Co. near Wharton. All ore from this property was concentrated by wet magnetic and gravity methods before shipment to the company steel mill at Conshohocken, Pa. Other mines in the county that yielded iron ore in 1952 were the Mount Hope property of Warren Foundry & Pipe Co. and the Richard mine of Richard Ore Co. Although some direct-shipping ore was produced from these mines, the bulk of the output was concentrated.

Acme Silica Co. produced a small tonnage of fire or furnace sand at its operation at Flanders during the early part of the year; the company then ceased operations, and the plant was shut down permanently. North Jersey Quarry Co. produced paving sand and gravel, engine sand, and railroad ballast at its pit and fixed plant at Netcong. Paving sand and engine sand were produced by Alan Wood Steel Co. in 1952 as byproducts of its iron-ore operation at Mine Hill near Wharton. Other sand and gravel producers in Morris County in 1952

included Seguine-Bogert Co., Inc., pit and plant at Kenvil; and Consolidated Stone & Sand Co., pit and plant near Riverdale.

Pompton Crushed Stone Division of Union Building & Investment Co. produced crushed granite at its Riverdale quarry during 1952. Although a small tonnage was used for railroad ballast, most of the output was sold for use in highway construction and maintenance.

OCEAN

There were two sand and gravel producers in Ocean County in 1952. New Jersey Pulverizing Co. produced glass sand, blast and filter sand, and other industrial sands at its pit and fixed plant at Pinewald near Bayville. Part of the sand mined during the year was ground for special uses as a filler medium, for foundry purposes, and in cleansing and scouring compounds. Building and paving sand and gravel were produced at the Point Pleasant plant and pit of Brown & Burdge. The Toms River operation of United Clay Mines Corp. continued to yield ball clay in 1952 but was abandoned at the end of the summer season.

PASSAIC

Crushed basalt was the principal mineral product of Passaic County in 1952, with 82 percent of the total value of mineral output during the year. Other mineral products, in order of decreasing value, were iron ore, sand and gravel, and clay. Samuel Braen's Sons worked its Hawthorne and Haledon Division quarries during the year and produced crushed basalt for use as road surfacing. Consolidated Stone & Sand Co. mined its quarry near Montclair Heights at a slightly reduced rate compared with 1951 and produced crushed basalt for road construction. Crushed basalt for highway use was quarried at Great Notch by the Great Notch Corp. Sowerbutt Quarries, Inc., worked its Prospect Park quarry throughout the year and produced crushed basalt for use as road aggregate. The company's Clifton quarry was inactive during 1952. Basalt for use as riprap and road construction was quarried at Clifton by the Union Building & Construction Corp. Expanded perlite was produced at the Paterson plant of PerAleX of New Jersey, Inc.

Ringwood Iron Mines, Inc., began production early in 1952 from its Peters and Cannon mines and concentration mill near Ringwood. Both concentrates and direct-shipping ore were produced. During the year the Defense Minerals Exploration Administration approved a $283,700 contract for Government participation in exploration at the Ringwood property.

Charles Van Orden, with a pit and fixed plant at Preakness, was the largest sand and gravel producer in the county in 1952. Output during the year was sold for use in building construction. Samuel Braen's Sons produced paving sand and gravel at a pit at Pequannock. Building sand and gravel were mined and washed at the Preakness pit and plant of H. J. Hinchman & Son. The only clay producer in Passaic County in 1952 was Patterson Brick Co., Inc., pit and plant in Wayne Township.

SALEM

A small tonnage of building sand was produced at a pit near Salem by A. W. Davis Lumber Co.

SOMERSET

Somerset County ranked first in stone production in New Jersey in 1952. Five quarries were worked during the year and together supplied over one-third of the total stone output in the State. Fanwood Stone Crushing & Quarry Co. worked its quarry at Watchung throughout the year and produced crushed basalt for use in highway construction and maintenance. Crushed basalt for use as riprap, road construction, and railroad ballast was quarried during the year at Kingston by Kingston Trap Rock Co. North Jersey Quarry Co. produced crushed basalt at its quarry west of Millington during the year. The output was used for road construction and railroad ballast. The Bound Brook quarry of North Jersey Quarry Co. yielded crushed basalt, which was used for road base, riprap, railroad ballast, and roofing granules. Crushed basalt for road purposes was produced during the year at the Bernardsville quarry of Somerset Crushed Stone, Inc.

A small tonnage of hydrated lime for agricultural use was prepared by Peapack Lime & Stone Quarry at Peapack. Johns-Manville Products Corp. produced precipitated magnesium carbonate by the Pattinson process at its Manville plant for use in 85-percent magnesia insulation.

SUSSEX

Mines, pits, and quarries in Sussex County in 1952 yielded mineral products, the aggregate value of which exceeded $25.5 million, or nearly 45 percent of the State total value of mineral output during the year. Zinc, manganese, stone, lime, peat, and sand and gravel were produced in 1952. Zinc and byproduct manganiferous residuum continued to be recovered from the Franklin and Sterling Hill mines but at a reduced rate compared with 1951.

Crushed limestone for road construction and agricultural purposes was quarried near Ogdensburg by Farber White Limestone Co. Limestone Products Corp. of America worked its quarry at Lime Crest throughout the year and produced crushed limestone for a variety of uses, including flux stone, highway stone, agricultural stone, crushed limestone for whiting or whiting substitutes, filler, and mineral food and poultry grit for animals and fowl. Some of the output was burned to produce hydrated lime for building, agricultural, and chemical purposes.

Peat, chiefly used for horticultural purposes, was recovered from bogs near Newton and Stanhope. Sand and gravel for building and road construction were produced at a pit at Lime Crest near Lafayette by Limestone Products Corp. of America.

UNION

Crushed basalt produced at the Summit quarry of North Jersey Quarry Co. was the sole mineral product of Union County in 1952. Expanded perlite was produced through the first 3 months of the year at the Linden plant of Great Lakes Carbon Corp. The plant was permanently closed in April.

WARREN

Iron ore, sand and gravel, serpentine, and clay, listed in order of decreasing value of output, were produced in Warren County in 1952. Alan Wood Steel Co. continued during the year to produce magnetite iron ore from its Washington mine near Oxford. All ore mined was concentrated before shipment to the company steel mill at Conshohocken, Pa. Two sand and gravel producers were active in 1952; the largest was Portland Sand & Gravel Co. This company produced building and paving sand and gravel at its pit and fixed plant near Carpentersville. Steckel Concrete Co. worked its pit at Harmony and produced paving sand and gravel. The Royal Green Marble Co., Inc., quarried serpentine from the pre-Cambrian Franklin formation 2 miles north of Phillipsburg. Output during the year was crushed for use in preparing terrazzo. Natco Corp. produced miscellaneous shale at its Port Murray pit during the year for use in manufacturing brick. The J. T. Baker Chemical Co. continued to produce high-purity magnesium compounds from purchased magnesium carbonate at its Phillipsburg plant.

The Mineral Industry of New Mexico

By A. J. Martin [1]

INCREASES in production of most of New Mexico's principal minerals in 1952 raised the total value of the State's mineral output to a record high of $288,500,000 compared with $256,302,000 in 1951 and the previous high of $220,080,000 in 1948. Fuels—petroleum, coal, natural gas, natural gasoline, and liquefied petroleum gases—accounted for 63 percent of the total value in 1952 and for 69 percent of the total increase over 1951. The output of all the fuels except coal showed important gains over 1951.

Metals contributed 20 percent of the total value in 1952. Copper, as usual, ranked first among the metals in both quantity and value by a wide margin; the output increased 3 percent compared with 1951. Zinc, lead, and silver production also increased, but that of gold decreased. Activity in the mining of lead and zinc continued at a high level through the first quarter of 1952 but waned with subsequent decline in prices of these metals. A number of small mines closed before midyear, and three of the larger producers shut down before the end of the year. On the other hand, the copper mines generally operated steadily throughout the year, as the price of copper held at the level of 1951, and demand for the metal remained strong.

Manganese mining, especially the working of low-grade deposits, was revived in 1951 by establishment of the Government ore-purchasing depot and the resumption of stockpiling at Deming, and shipments of concentrating-grade ore to the National Stockpile continued throughout 1952. The stockpiled ore containing less than 35 percent manganese is not included in the production figures given in table 1. Shipments of ore of 35 percent or more manganese were the largest since 1945; however, the output of ferruginous manganese ore (10 to 35 percent Mn) decreased.

Exploration and development of uranium deposits in the Grants area in Valencia and McKinley Counties, begun in December 1950, continued through 1951 and 1952.

Among the nonmetallic minerals produced, potash was by far the most important. Production was begun in 1931 and increased in every succeeding year except 1934, 1939, and 1949; the quantity sold in 1952 was 1,411,125 tons (K_2O content) valued at $46,385,000, a new record high. All the production has come from the Carlsbad region in Eddy County.

Perlite, first produced commercially in New Mexico about 1947, soon became an important mineral product. The output of perlite in 1952 was slightly higher than in 1951. Production of clay, fluorspar, pumice, sand and gravel, and stone decreased from 1951, but that of barite and salt increased.

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TABLE 1.—Mineral production in New Mexico, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate—gross weight	141	$47,008	101	$29,185
Clays	75,653	148,876	57,668	107,633
Coal	782,698	4,501,842	759,437	4,382,286
Copper (recoverable content of ores, etc.)	73,558	35,602,072	76,112	36,838,208
Fluorspar	24,402	1,163,098	16,443	823,320
Gold (recoverable content of ores, etc.)—troy ounces	3,959	138,565	2,949	103,215
Iron ore (usable)—long tons, gross weight	32,210	(2)	7,793	(2)
Lead (recoverable content of ores, etc.)	5,846	2,022,716	7,021	2,260,762
Manganese ore (35 percent or more Mn)—gross weight	226	(2)	2,360	(2)
Manganiferous ore (5 to 35 percent Mn)—do	79,844	(2)	52,934	(2)
Natural gas—thousand cubic feet	300,169,000	11,406,000	359,377,000	16,414,000
Natural-gas liquids:				
Natural gasoline—42-gallon barrels	3,307,000	10,507,000	3,903,000	11,660,000
LP-gases—do	2,281,000	3,170,000	2,724,000	3,600,000
Petroleum (crude)—do	52,719,000	129,160,000	[3] 58,681,000	[3] 144,940,000
Potassium salts—K_2O equivalent	1,217,617	37,209,740	1,411,125	46,385,452
Pumice and pumicite	245,564	884,311	217,482	755,139
Sand and gravel	1,080,256	1,087,857	496,921	499,589
Silver (recoverable content of ores, etc.)—troy ounces	443,267	401,179	479,318	433,807
Stone	1,022,901	592,179	317,894	191,642
Zinc (recoverable content of ores, etc.)	45,419	16,532,516	50,975	16,923,700
Undistributed: Barite, carbon dioxide, gem stones, molybdenum, perlite, salt, stone (crushed miscellaneous, 1952), vanadium (1952), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)	----------	1,726,948	----------	2,151,749
Total New Mexico	----------	256,302,000	----------	288,500,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production. Excludes uranium.
[2] Value included with "Undistributed."
[3] Final figure. Supersedes preliminary figure given in commodity chapter. Excludes certain stone value for which is included with "Undistributed."

TABLE 2.—Average prices of certain mineral commodities, 1951–52

Mineral	Unit	1951	1952
Beryl [1]	Short ton	$333.390	$288.960
Clays [1]	do	1.959	1.866
Coal [1]	do	5.750	5.770
Copper [2]	Recoverable content of ores, pound	.242	.242
Fluorspar [1]	Short ton	47.664	50.071
Gold [3]	Recoverable content of ores, troy ounce	35.000	35.000
Lead [2]	Recoverable content of ores, pound	.173	.161
Perlite	do (crude, unexpanded)	(4)	(4)
Petroleum [5]	42-gallon barrel	2.450	2.470
Potassium salts [1]	Short ton, K_2O equivalent	30.559	32.871
Pumice [1]	Short ton	3.601	3.472
Sand and gravel [1]	do	1.007	1.005
Silver [6]	Recoverable content of ores, troy ounce	.905+	.905+
Zinc [2]	Recoverable content of ores, pound	.182	.166

[1] Prices are based on average value f. o. b. mines or mills reported by the producers. More detail on prices by grades and markets will be found in the commodity chapter in volume I of this series.
[2] Yearly average weighted price of all grades of primary metal sold by producers.
[3] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[4] Bureau of Mines not at liberty to publish New Mexico figure separately; average value for Arizona, Colorado, and New Mexico was $4.72 a ton in 1951 and $5.70 in 1952.
[5] Value at wells.
[6] Treasury buying price for newly mined silver July 1, 1946, to date—$0.9050505 ($0.905 used in 1947 for calculating purposes).

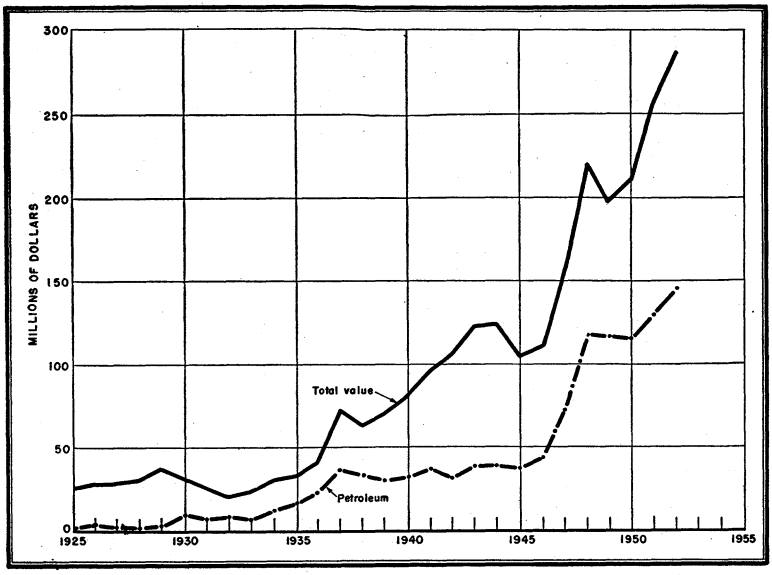

FIGURE 1.—Value of petroleum production and total value of all minerals in New Mexico, 1925–52.

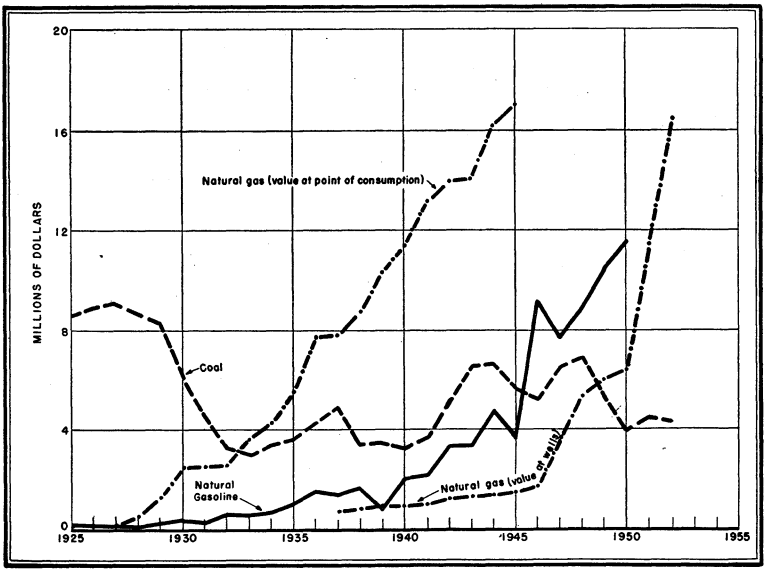

FIGURE 2.—Value of natural gas, natural gasoline in 1926–52, and coal in New Mexico, 1925–52.

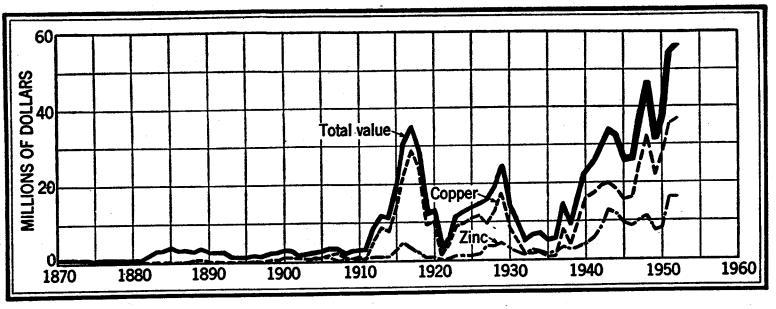

FIGURE 3.—Value of mine production of copper and zinc and total value of gold, silver, copper, lead, and zinc in New Mexico, 1870–1952. The value of gold, silver, and lead produced annually has been relatively small.

The Government's program of assistance in financing exploration in search of reserves of strategic and critical minerals, authorized by the Defense Production Act of 1950 and begun in April 1951 by the Defense Minerals Administration, was continued in 1952 under the Defense Minerals Exploration Administration (DMEA). The Government provides funds for approved projects on a modified matching basis, contributing 50, 75, or 90 percent of the cost, depending upon the minerals sought. The projects undertaken in New Mexico covered zinc, copper, lead, cobalt-uranium, and tungsten. The contracts from the beginning through December 31, 1952, involved a total of $1,012,156 in combined Government and private capital. Table 3 shows the amount of Government and private participation in each project. Repayment of the Government's contribution, without interest, through a royalty on net returns from products sold, is required if ore is discovered or delineated and the ore is mined within 10 years from the date of the contract.

TABLE 3.—Defense Minerals Exploration Administration contracts from January 1951 through Dec. 31, 1952

Name of commodity and contractor	Property	County	Date of contract	Participation	
				Government	Private
Cobalt-uranium					
Black Hawk Consolidated Mines Co.	8 mining lode claims	Grant	Apr. 11, 1952	$18,000	$2,000
Copper					
Ira L. Moseley	Atwood	Hidalgo	June 12, 1952	21,000	21,000
Lead-zinc					
Verne Byrne	Pennsylvania	Santa Fe	June 4, 1952	12,369	12,369
Clark-Mathis	Watchdog and other claims	Luna	Nov. 23, 1951	6,327	6,327
Mathis & Mathis	14 patented mining claims	Grant	Oct. 23, 1952	14,200	14,200
Peru Mining Co	Grant County mine	do	July 18, 1951	112,500	112,500
U. S. Smelting, Refining & Mining Co.	Bullfrog	do	Jan. 15, 1952	290,922	290,922
Tungsten					
Potter & Sims	Ortiz mine grant	Santa Fe	May 6, 1952	58,140	19,380
Total				533,458	478,698

REVIEW BY MINERAL COMMODITIES

METALS

Beryllium.—The Harding mine near Dixon in Taos County was a substantial producer of beryl in 1952 and in the past has also produced lepidolite, tantalum, and other mineral commodities. The mine operated continuously in 1952, employing five men. The pure Harding beryl is said to carry 12.5 percent BeO. After beryl was exempted from price control on August 10, 1952, the quoted price rose from about $32 per unit of contained beryllium oxide to $45–$48 per unit (depending on quantity) as of December 31, 1952.

Copper.—The quantity of copper ore mined in New Mexico in 1952 rose to a new record high of 8,391,537 tons from the previous high of 8,024,111 tons in 1951. The quantity of copper recovered, however, was not as large as in the peak year 1942, when the grade of ore mined was higher. Copper recovered in 1952 totaled 76,112 tons compared with 73,558 tons in 1951 and 80,100 tons in 1942. The demand for copper was strong throughout 1952. The price of domestic copper was held at the ceiling of 24.5 cents a pound established on January 26, 1951, but that of foreign copper ranged from 27.5 to 36.875 cents.

In 1952, as in the past, the Chino open-pit mine of the Kennecott Copper Corp., Chino Mines Division at Santa Rita, produced the bulk of the State copper. The Chino concentrator at Hurley, 10 miles from the mine, has a daily capacity of 22,500 tons. The company smelter adjacent to the concentrator makes fire-refined copper, treating concentrate from the Chino mill, siliceous copper ore (used as a flux) from the Chino mine, and copper precipitates from company operations at Chino and at Ray, Ariz. Most of the copper ores and concentrates produced at other New Mexico properties were shipped to the El Paso smelter of the American Smelting & Refining Co.

Copper was mined from underground workings at the Banner Mining Co.'s Bonney-Miser's Chest group (equipped with a 500-ton mill) and the Atwood mine, both near Lordsburg. In Guadalupe County low-grade, siliceous, copper fluxing ore was shipped from the Stauber open pit to the El Paso smelter. Old, siliceous, copper-bearing tailings, containing some gold and silver, were shipped from the Gillette mill site at Pinos Altos, Grant County. Statistical details of copper ore mined, metal produced, and method of recovery are given in the following section under Gold.

Gold (and Ores of Gold, Silver, Copper, Lead, and Zinc).—In 1952, as in other years since World War II, there was little activity in straight gold or gold-silver mining in New Mexico, owing to the high cost of labor and materials compared with the fixed price of gold. The quantity of straight gold and silver ores mined (804 tons) was the smallest recorded since tabulation of individual mine production was begun in 1904. The output of gold (2,949 ounces) was less than in any other year during the 84 years (1869–1952) for which figures are available. Base-metal ores and old tailings yielded 95 percent of the total gold. None of the individual mines was a large producer of gold.

The State output of metals from ores of gold, silver, copper, lead, and zinc, 1948–52, and production in 1952 by counties, class of ore, and method of recovery are shown in tables 4, 5, 6, 7, 8, and 9.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc, 1943–47 (average) and 1948–52, and total, 1848–1952, in terms of recoverable metals [1]

Year	Mines producing		Material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1943–47 (average)	59	6	7,412,810	5,048	$176,680	463,564	$356,198
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
1951	83	3	8,670,489	3,959	138,565	443,267	401,179
1952	66	1	9,120,841	2,949	103,215	479,318	433,807
1848–1952	----------	----------	[3]	2,202,966	50,438,003	70,450,259	55,384,761

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1943–47 (average)	62,572	$19,090,327	6,386	$1,249,000	46,150	$10,634,570	$31,506,774
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
1951	73,558	35,602,072	5,846	2,022,716	45,419	16,532,516	54,697,048
1952	76,112	36,838,208	7,021	2,260,762	50,975	16,923,700	56,559,692
1848–1952	1,756,449	577,972,927	310,546	40,007,987	1,085,548	196,785,366	920,589,044

[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 to smelters during the calendar year indicated.
[2] Does not include gravel washed or tonnage of precipitates shipped.
[3] Figure not available.

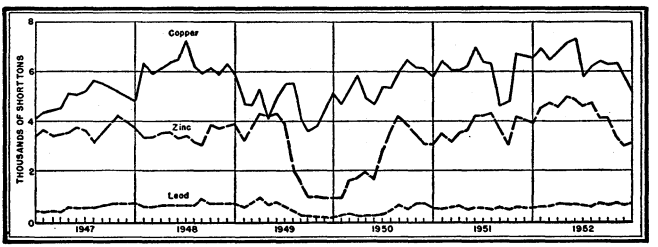

FIGURE 4.—Mine production of copper, lead, and zinc in New Mexico, by months, 1947–52, in terms of recoverable metals.

TABLE 5.—Gold and silver produced at placer mines, 1943–47 (average) and 1948–52, and in terms of recoverable metals

Year	Gold		Silver		Total value	Year	Gold		Silver		Total value
	Fine ounces	Value	Fine ounces	Value			Fine ounces	Value	Fine ounces	Value	
1943–47 (average)	30	$1,036	9	$7	$1,043	1950	6	$210	-------	-------	$210
1948	9	315	2	2	317	1951	4	140	-------	-------	140
1949	31	1,085	9	8	1,093	1952	2	70	-------	-------	70

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties, in terms of recoverable metals

County	Mines producing		Gold (lode and placer)		Silver (all lode)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Bernalillo	1		3	$105	4	$4
Colfax		1	2	70		
Dona Ana	2				179	162
Grant	19		1,756	61,460	337,916	305,831
Guadalupe	1					
Hidalgo	10		820	28,700	72,606	65,712
Luna	4		3	105	1,222	1,106
Santa Fe	4		8	280	895	810
Sierra	9		137	4,795	5,001	4,526
Socorro	16		220	7,700	61,495	55,656
Total	66	1	2,949	103,215	479,318	433,807

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Bernalillo							$109
Colfax							70
Dona Ana			4	$1,288			1,450
Grant	74,044	$35,837,296	4,838	1,557,836	48,640	$16,148,480	53,910,903
Guadalupe	531	257,004					257,004
Hidalgo	1,475	713,900	144	46,368	59	19,588	874,268
Luna	1	484	95	30,590	94	31,208	63,493
Santa Fe	3	1,452	27	8,694	36	11,952	23,188
Sierra	1	484	16	5,152	24	7,968	22,925
Socorro	57	27,588	1,897	610,834	2,122	704,504	1,406,282
Total	76,112	36,838,208	7,021	2,260,762	50,975	16,923,700	56,559,692

Iron Ore.—Most of the iron ore produced in New Mexico has come from the Central district, Grant County (which has also produced the bulk of the State copper, lead, and zinc). Iron ore shipped from mines in the State in 1952 totaled 8,000 long tons compared with 32,000 tons in 1951. The largest producer was the Hanover-Bessemer Iron & Copper Co. open pit at Fierro in the Central district, operated intermittently by Mathis & Mathis under a sublease from the United States Smelting, Refining & Mining Co. Another property at Fierro, worked by Robert Robbins, also shipped some ore. In Lincoln County ore was shipped by the Custom Mining Co. from Corona and by J. B. Close and the Southwestern Mining Co. from Carrizozo. The ore was shipped to steel and cement plants outside the State.

Lead.—Most of New Mexico's output of lead continued to come from mines producing zinc-lead or zinc ore, but substantial tonnages of lead and lead-barite ores were mined in the Hansonberg district of Socorro County and treated in gravity-concentration mills at San Antonio. Recoverable lead produced in 1952 totaled 7,021 tons, an increase of 1,175 tons over 1951 despite the decline in the price of lead from 19.00 cents a pound in the first quarter of 1952 to 14.75 cents at the end of December, with a low of 13.50 cents in October. Zinc and zinc-lead ores yielded 84 percent of the total lead in 1952, lead ore 15 percent, and other ores, mill cleanups, and old tailings 1 percent. The larger producers of lead, in order of output, were the

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1952, by classes of ore or other source materials, in terms of recoverable metals

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	4	568	130	46			
Dry gold-silver	1	17	6	382	600		
Dry silver	8	219		970	5,919	3,415	
Total	12	804	136	1,398	6,519	3,415	
Copper	9	8,391,537	1,210	76,996	[2] 111,510,896	84,920	
Lead	26	42,751	46	10,154	8,980	2,057,775	11,090
Zinc	10	635,942	940	302,845	1,600,724	8,960,480	97,004,880
Zinc-lead	19	42,312	214	78,385	105,500	2,902,105	4,856,590
Total	56	9,112,542	2,410	468,380	[2] 113,226,100	14,005,280	101,872,560
Other "lode" material:							
Old tailings, etc.[3]		7,495	401	9,540	435,145	33,305	77,440
Copper precipitates [4]	1	23,383			38,556,236		
Total	1	30,878	401	9,540	38,991,381	33,305	77,440
Total "lode" material	66	9,144,224	2,947	479,318	[2] 152,224,000	14,042,000	101,950,000
Gravel (placer operations)	1		2				
Total, all sources	67	9,144,224	2,949	479,318	[2] 152,224,000	14,042,000	101,950,000

[1] Detail will not necessarily add to totals because some mines produce more than 1 class of ore.
[2] Includes 49,000 pounds of copper contained in 36 tons of copper precipitates recovered from 30,000 tons of ore mined in 1951 and treated in 1951 and part of 1952 by heap leaching.
[3] Includes 4 tons of copper-mill cleanings, 80 tons of lead-mill cleanings, 352 tons of zinc-mill cleanings, 595 tons of copper slag, and 6,464 tons of copper tailings.
[4] Excludes 36 tons of precipitates recovered from newly mined ore treated by heap leaching, copper from which is included under copper ore.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery and types of material processed, in terms of recoverable metals

Method of recovery and type of material processed	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation [1]	116	20			
Concentration and smelting of concentrates:					
Ore	1,788	431,500	110,618,860	13,533,165	101,845,620
Mill cleanings	1	622	3,295	11,710	77,440
Total	1,789	432,122	110,622,155	13,544,875	101,923,060
Direct smelting:					
Ore	642	38,258	2,613,759	475,530	26,940
Copper precipitates			38,556,236		
Old tailings, etc.[2]	400	8,918	431,850	21,595	
Total	1,042	47,176	41,601,845	497,125	26,940
Placer	2				
Grand total	2,949	479,318	152,224,000	14,042,000	101,950,000

[1] Ore only; no old tailings, etc., processed by this method in New Mexico in 1952.
[2] Includes 4 tons of copper-mill cleanings, 595 tons of copper slag, 6,464 tons of copper tailings, and 80 tons of lead-mill cleanings.

American Smelting & Refining Co. Ground Hog group and the United States Smelting, Refining & Mining Co. Bayard group in the Central district, the Lynchburg mine in the Magdalena district, and the Portales in the Hansonberg district. These 4 mines contributed 79 percent of the State total lead.

Manganese Ore.—The Government continued to buy low-grade manganese ore for the National Stockpile at Deming at incentive prices fixed to stimulate the search for and development of domestic deposits of manganese. The price schedule f. o. b. Deming ranged from $6.10 per long dry ton for ore containing 15 percent manganese (the lowest grade acceptable) to $76.00 for ore with a 40-percent manganese content until May 29, when the schedule was revised and the prices then ranged from $8.54 to $88.00. The minimum quantity for a single delivery was 5 long tons. Shipments of manganese ore of 35 percent or more Mn content showed a large increase over 1951.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

A. *For material treated at mills*

	Material treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters and recoverable metals					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES									
Grant	8,851,842			354,434	1,351	326,722	[1]107,833,945	9,537,420	97,271,425
Hidalgo	52,556			5,442	238	43,040	2,686,110	183,560	118,000
Luna	741			331	3	1,193	1,970	187,415	188,000
Santa Fe	319			107	2	793	1,940	48,000	70,000
Sierra	715	116	20	63	3	1,435	1,325	21,000	48,000
Socorro	71,867			7,053	192	58,939	96,865	3,567,480	4,227,635
Total: 1952	8,978,040	116	20	367,430	1,789	432,122	[1]110,622,155	13,544,875	101,923,060
1951	8,557,153	341	58	343,024	2,305	361,833	106,822,653	10,906,225	90,731,193
BY CLASSES OF MATERIAL TREATED									
Dry gold	550	116	20						
Copper	8,257,971			255,055	631	46,804	[1]108,910,076		
Lead	41,041			1,203	4	3,818	3,300	1,692,010	
Lead-zinc	42,184			7,253	213	78,033	104,760	2,880,675	4,840,740
Zinc:									97,004,880
Crude ore	635,942			103,833	940	302,845	1,600,724	8,960,480	
Mill cleanings	352			86	1	622	3,295	11,710	77,440
Total zinc materials	636,294			103,919	941	303,467	1,604,019	8,972,190	97,082,320
Total: 1952	8,978,040	116	20	367,430	1,789	432,122	[1]110,622,155	13,544,875	101,923,060
BY CLASSES OF CONCENTRATES SHIPPED TO SMELTERS									
Copper				255,418	666	53,053	[1]109,068,761	11,330	14,120
Lead				10,139	707	254,297	480,442	11,992,055	679,650
Total to copper and lead plants				265,557	1,373	307,350	[1]109,549,203	12,003,385	693,770
Zinc concentrates to zinc plants				101,873	416	124,772	1,072,952	1,541,490	101,229,290
Total: 1952				367,430	1,789	432,122	[1]110,622,155	13,544,875	101,923,060
1951				343,024	2,305	361,833	106,822,653	10,906,225	90,731,193

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

B. *For material shipped directly to smelters*

	Material shipped (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Bernalillo	5	3	4			
Dona Ana	31		179		8,000	
Grant	[2] 104,831	405	11,194	[3] 40,254,055	138,580	8,575
Guadalupe	50,751			1,062,000		
Hidalgo	8,950	582	29,566	263,890	104,440	
Luna	15		29	30	2,585	
Santa Fe	27	6	102	4,060	6,000	2,000
Sierra	79	18	3,546	675	11,000	
Socorro	1,495	28	2,556	17,135	226,520	16,365
Total: 1952	[2] 166,184	1,042	47,176	[3] 41,601,845	497,125	26,940
1951	[2] 136,195	1,309	81,376	[3] 40,293,347	785,775	106,807
BY CLASSES OF MATERIAL						
Dry gold	18	14	26			
Dry gold-silver	17	6	382	600		
Dry silver	219		970	5,919	3,415	
Copper:						
Crude ore	133,566	579	30,192	2,600,820	84,920	
Mill cleanings	4	1	25	2,000		
Old tailings	6,464	393	8,049	54,000		
Precipitates [4]	23,367			38,545,104		
Tailings precipitates	16			11,132		
Slag	595	4	265	373,000		
Total copper materials	164,012	977	38,531	41,586,056	84,920	
Lead:						
Crude ore	1,710	42	6,336	5,680	365,765	11,090
Mill cleanings	80	2	579	2,850	21,595	
Total lead materials	1,790	44	6,915	8,530	387,360	11,090
Lead-zinc	128	1	352	740	21,430	15,850
Total: 1952	166,184	1,042	47,176	41,601,845	497,125	26,940

[1] Includes 49,000 pounds of copper contained in 36 tons of copper precipitates recovered from 30,000 tons of ore mined in 1951 and treated in 1951 and part of 1952 by heap-leaching.
[2] Includes copper precipitates from mine water and leached dumps as follows: 1952, 23,367 tons; 1951, 22,859 tons.
[3] Includes copper contained in precipitates recovered from mine water and leached dumps as follows: 1952, 38,545,104 pounds of copper; 1951, 37,683,606 pounds of copper.
[4] Excludes 36 tons obtained from newly mined ore treated by heap-leaching.

Production was reported from Dona Ana, Grant, Luna, Sierra, and Socorro Counties.

Manganiferous Ore.—For many years the Luck Mining Construction Co. has shipped ferruginous manganese ore from open pits at Boston Hill near Silver City in Grant County to the Colorado Fuel & Iron Corp. steel mill at Pueblo, Colo. The tonnage shipped in 1952 was not as large as in 1951.

Molybdenum.—Most of the New Mexico output of molybdenum in 1952 was recovered as a byproduct from copper ore treated in the Chino concentrator of the Kennecott Copper Corp. at Hurley, Grant County. Molybdenite ore was mined and treated at the Molybdenum Corp. of America property near Questa, Taos County.

Silver.—The increased New Mexico silver production—from 443,267 fine ounces in 1951 to 479,318 ounces in 1952—resulted from the mining of larger tonnages of base-metal ores that yielded silver as a byproduct. Zinc and zinc-lead ores, mostly from the Central district, yielded 80 percent of the total silver; copper ore, largely from the Lordsburg and Central districts, yielded 16 percent; and other ores, old tailings, and mill cleanups from various districts 4 percent. The leading producers of silver were the Ground Hog and Bayard zinc-lead mines in Grant County, the Lynchburg zinc-lead mine in Socorro County, and the Bonney-Miser's Chest and Atwood copper mines in Hidalgo County.

Tantalum Concentrate.—The Harding mine near Dixon in Taos County occasionally produces tantalum concentrate along with beryl and other minerals.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

CONCENTRATES SHIPPED TO SMELTERS

Class of material	Quantity shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Copper	255,055	5,759	116,039	[1] 114,354,980		
Lead	1,203	4	3,818	4,191	1,745,452	
Zinc:						
Crude ore	103,833	1,009	326,031	2,071,285	9,478,698	107,012,047
Mill cleanings	86	1	638	4,152	12,147	84,901
Total zinc materials	103,919	1,010	326,669	2,075,437	9,490,845	107,096,948
Zinc-lead	7,253	218	81,847	131,558	2,971,654	5,363,387
Total: 1952	367,430	6,991	528,373	[1] 116,566,166	14,207,951	112,460,335
1951	343,024	7,483	475,179	109,745,026	11,932,750	101,400,760

ORE, ETC., SHIPPED DIRECTLY TO SMELTER

Dry gold	18	14	26	177		
Dry gold-silver	17	6	382	729		
Dry silver	219		970	6,149	5,186	
Copper:						
Crude ore	133,566	642	30,837	3,245,389	141,476	
Mill cleanings	4	1	25	2,074		
Old tailings	6,464	393	8,049	54,483		
Precipitates	[2] 23,367			39,321,988		
Tailings precipitates	16			11,359		
Slag	595	8	296	385,294		
Total copper materials	[2] 164,012	1,044	39,207	43,020,587	141,476	
Lead:						
Crude ore	1,710	42	6,336	8,642	374,499	14,225
Mill cleanings	80	2	579	3,563	22,034	
Total lead materials	1,790	44	6,915	12,205	396,533	14,225
Zinc-lead	128	1	352	925	22,244	20,551
Total: 1952	166,184	1,109	47,852	43,040,772	565,439	34,776
1951	136,195	1,309	81,376	41,692,209	929,674	441,217

[1] Includes 50,475 pounds of copper contained in 36 tons of precipitates obtained from newly mined ore treated in a heap-leaching plant.
[2] Excludes 36 tons obtained from newly mined ore treated by heap-leaching.

Uranium and Vanadium.—Exploration and development of uranium deposits of the Grants area in McKinley and Valencia Counties continued in 1952. Exploration in this area was begun in December 1950 on the property of the Santa Fe Railroad, where a uranium deposit was discovered in the spring of 1950 by a Navajo. An article describing the geology of the area and progress in developing the mines and providing milling and marketing facilities was published.[2] According to this article, the first discovery of uranium mineralization was made along the north flank of the Zuni uplift, in the vicinity of Haystack Butte, and the district was extended into the Lucero uplift in August of 1951 by the discovery of uranium mineralization in Todilto limestone by a Supai living on the Laguna Reservation. The Anaconda Copper Mining Co. secured numerous leases in January and February 1951 and began an intensive exploration and development program in March 1951. The Denver Exploration Branch of the Atomic Energy Commission established a field office at Prewitt in January 1951 to study regional and detailed guides to ore and promote the development of the district. Arrangements were made for constructing a uranium mill and ore-purchasing station at Bluewater, N. Mex., by the Anaconda Copper Mining Co., under a contract agreement with the Atomic Energy Commission. The purchasing and stockpiling of both limestone and sandstone types of ore began on June 9, 1952. Another ore-purchasing depot was opened at Shiprock.

The Atomic Energy Commission and the Geological Survey each prepares publications showing results of geological studies and other work done in the search for additional uranium deposits. Volume I of Minerals Yearbook, 1952, chapter on Uranium, Radium, and Thorium, contains a review of the uranium industry in New Mexico and other States, with references to literature published.

Vanadium was recovered as a byproduct or coproduct of the mining and treatment of uranium ore.

Zinc.—Although the drop in the price of zinc caused a number of the mines to close during the year, the State output of zinc in 1952 amounted to 50,975 tons, second largest on record; the largest was 59,524 tons in 1943. The ceiling price of 19.5 cents a pound of zinc, established October 2, 1951, held until June 3, 1952, when the quoted price began to move downward and, with some fluctuation, reached the year's low of 12.5 cents on October 23, where it remained through December. Zinc and zinc-lead ores yielded nearly all (99.91 percent) of the State output of zinc in 1952. The principal producers of zinc, all in the Central district, were the American Smelting & Refining Co. Ground Hog group; United States Smelting, Refining & Mining Co. Bayard group; Kennecott Copper Corp. Oswaldo; New Mexico Consolidated Mines Co. Kearney group; New Jersey Zinc Co., Empire Zinc Division, Hanover group; and Peru Mining Co. Pewabic group. The Ground Hog, Bayard (mine and mill) and Kearney groups operated throughout the year, although the Kearney production rates were curtailed somewhat after June. The Oswaldo mine ceased production on October 4, the Hanover (Empire Zinc) mine and mill shut down on October 11, and the Pewabic closed on December 23. The closing of these mines was the principal factor in the drop in the

[2] Towle, Charles C., and Rapaport, Irving, Uranium Deposits of the Grants District, New Mexico: Min. Eng., vol. 4, No. 11, November, 1952, pp. 1037–1040.

State's monthly production of zinc to 3,096 tons in December from the peak of 5,079 tons in April.

Mills treating zinc and zinc-lead ores were the United States Smelting, Refining & Mining Co. 600-ton Bayard mill and the New Jersey Zinc Co., Empire Zinc Division, 600-ton Hanover mill in the Central district; the Peru Mining Co. 1,000-ton concentrator and American Smelting & Refining Co. 650-ton Deming milling unit at Deming, and the Minerals Operations 75-ton mill at the Hornet mine near Hachita. The zinc concentrates produced at the mills were shipped to smelters in Arkansas, Illinois, Montana, Pennsylvania, and Texas and the lead concentrates to the El Paso (Tex.) smelter.

NONMETALLIC MINERALS

Barite.—The Mex-Tex Mining Co., Inc., recovered barite from lead-barite ore mined from open pits in the Hansonberg district of Socorro County and concentrated in the company mill at San Antonio.

Clays.—The larger clay-producing counties in 1952 included Dona Ana, Bernalillo, McKinley, and Hidalgo. The value ($108,000) shown for clay represents the value at the pit before the clay was used for making brick, tile, and other products.

Fluorspar.—Shipments of fluorspar decreased 33 percent in 1952 from 1951. The largest decrease was in Valencia County; output in Luna and Grant Counties, the other leading producers, was sustained at close to the 1951 level. The mill of the General Chemical Division, Allied Chemical & Dye Corp., at Deming continued to operate on company-mined and custom crude fluorspar. The Zuni Milling Co. flotation mill at Los Lunas, Valencia County, also continued to operate. The average value per ton of the fluorspar sold in 1952 was $50.07 compared with $47.66 in 1951.

Perlite.—After the beginning of perlite mining in New Mexico in 1948, output increased rapidly, and perlite soon became one of the State's important mineral products. In 1952 the Great Lakes Carbon Corp., largest producer in the State, operated continuously its mine and crushing, sizing, and drying plant 5 miles west of Socorro in Socorro County. In Taos County the F. E. Schundler & Co. property in the No Agua Mountains was also an important producer. Most of the crude perlite prepared by those two companies was shipped to expanding plants east of the Mississippi River and in Canada. In Hidalgo County a small quantity of crude perlite was mined and used by Kirk's Perlite Industries.

Potash.—The long upward trend in potash production in New Mexico continued in 1952, and the quantity of potassium salts sold (2,439,042 short tons) increased 15 percent over 1951, the former record year. Stocks at the end of 1952 amounted to 132,509 tons compared with 40,955 tons at the end of 1951. The entire output came from the Carlsbad region in Eddy County. This region supplied 88 percent of the domestic potash marketed in the United States in 1952. There were 5 producing companies in the Carlsbad region, 1 of which had its first production in 1951 and another late in 1952.

The market for agricultural potash, which comprises the bulk of the potash sold, is widespread. Data recorded in volume 1, Minerals Yearbook, 1952 (furnished by the American Potash Institute), show deliveries of potash salts for agricultural purposes in 44 States, the

District of Columbia, and a number of foreign countries. Chemical potash was delivered in 31 States. Much the largest demand is for the 60-percent muriate of potash; other grades sold are 50-percent muriate and 22-percent manure salts. Chemical potash sold included sulfate of potash and sulfate of potash-magnesia. The average value per ton of all the New Mexico salts sold in 1952, as reported to the Bureau of Mines by the producers, was $19.02 in 1952 (or $32.87 for K_2O equivalent) and $17.50 in 1951 ($30.56 for K_2O equivalent). The grade (K_2O equivalent) of the salts averaged 57.86 percent in 1952 and 57.26 percent in 1951.

TABLE 11.—Production of potash, 1941–52, in short tons

Year	Quantity [1]	Value	Year	Quantity [1]	Value
1941	433,677	$14,084,716	1948	967,945	$29,177,328
1942	548,730	19,631,297	1949	932,497	27,950,111
1943	604,414	21,918,503	1950	1,072,772	31,944,365
1944	679,721	24,739,507	1951	1,217,617	37,209,740
1945	733,176	25,456,731	1952	1,411,125	46,385,452
1946	789,473	27,187,228			
1947	880,605	28,035,675	Total	10,271,752	333,720,653

[1] Sales of K_2O equivalent.

Pumice and Pumicite.—The output of pumice decreased 11 percent in 1952 from 1951. The producers in 1952 included the Big Chief Mining Co. and Edgar D. Otto & Son in Bernalillo County; Volcanic Cinder Co. in Dona Ana County; Dooley Bros. Pumice, Inc., in Sandoval County; General Pumice Corp. and Santa Fe Pumice Co., Inc., in Santa Fe County; and the Pumice Corp. of America in Valencia County. Much of the pumice was used locally for making building blocks and lightweight aggregate in concrete and plaster and for refined commercial pumice used in the manufacture of abrasives and other products. A substantial quantity was shipped to consumers outside the State.

Salt.—Salt recovered as a byproduct of potash refining and from mill tailings from potash plants in Eddy County comprised the bulk of the State output of salt in 1952. Solar evaporated salt was produced at Quemado, Catron County.

Sand and Gravel.—The State output of sand and gravel reported to the Bureau of Mines decreased from 1,080,000 tons in 1951 to 496,921 tons in 1952. There were heavy decreases in Bernalillo County, the principal producer, and in Santa Fe County, the second largest producer. Of the 1952 total, 347,197 tons was sold commercially, and 149,724 tons was used by Government agencies and railroads.

Stone.—The bulk of the output of stone reported in New Mexico in 1952 was crushed stone used for railroad ballast and concrete. Valencia County was the largest producer.

MINERAL FUELS

The total New Mexico production and value of the mineral fuels in 1951 and 1952 are shown in table 1 of this chapter. In 1952 crude petroleum represented 50 percent of the total value of the mineral output of the State, natural gas and natural-gas liquids 11 percent and coal 2 percent—a total of 63 percent for fuels and 37

percent for metals and nonmetallic minerals combined. Table 11 shows production in 1951 and 1952 by counties for coal, and table 12 gives production by districts and fields for petroleum. Additional statistics and a summarized review covering oil and natural-gas production and well drilling may be found in volume II of this series.

TABLE 12.—Production of coal, 1951–52, by counties [1]

County	1951			1952		
	Production (net tons)	Average value per ton	Total value	Production (net tons)	Average value per ton	Total value
Bernalillo	1,310	$5.09	$6,668	1,513	$4.58	$6,930
Colfax	637,405	5.69	3,627,486	645,770	5.80	3,744,218
McKinley	78,236	6.69	523,399	60,900	6.02	366,618
Rio Arriba	22,754	4.34	98,752	17,162	4.43	76,028
Sandoval	2,410	5.69	13,713	2,634	4.76	12,538
San Juan	3,798	5.74	21,801	3,943	4.97	19,597
Santa Fe	34,895	5.71	199,250	24,345	5.75	139,984
Socorro	1,890	5.70	10,773	1,700	5.74	9,758
Valencia				1,470	4.50	6,615
Total	782,698	5.75	4,501,842	759,437	5.77	4,382,286

[1] Excludes mines producing less than 1,000 tons.

TABLE 13.—Production of crude petroleum, 1951–52, by districts and fields, in thousands of barrels

[Oil and Gas Journal]

District and field	1951	1952	District and field	1951	1952
Southeast:			Southeast—Cont.:		
Arrowhead	988	809	Monument	(1)	(1)
Brunson	2,515	3,511	Paddock	1,178	887
Drinkard	5,037	4,007	Vacuum	4,865	4,496
Eunice	[1]10,590	[1] 9,588	Other	17,775	26,365
Grayburg-Jackson	1,545	1,353	Northwest [2]	327	359
Hobbs	4,380	3,902			
Langlie-Mattix	1,700	1,635	Total	52,729	58,725
Maljamar	1,829	1,813			

[1] Monument included with Eunice.
[2] Bureau of Mines.

REVIEW BY COUNTIES

BERNALILLO

The output of sand and gravel in Bernalillo County, reported by 5 producers, totaled 318,779 tons in 1952 compared with 882,105 tons in 1951. The tonnages represented 64 percent of the total reported for the State in 1952 and 82 percent in 1951. Clay was mined from the Kinney Brick Co. property near Albuquerque and pumice from the Edgar D. Otto & Son and Big Chief Mining Co. properties. A truckload of gold ore was shipped from the Great Combination claim in the Sandias or Soda Springs district.

CATRON

The Curtis Salt Co. at Quemado produced solar evaporated salt in 1952. The Mogollon (Cooney) gold-silver district, formerly an important metal producer, had no output during the year.

TABLE 14.—Value of mineral production in New Mexico in 1951–52, by counties and principal minerals [1] produced in 1952

County	1951	1952	Principal minerals, in order of value [1]
Bernalillo	$888,926	$355,751	Sand and gravel, pumice.
Catron	(2)	(2)	Salt.
Chaves	6,912	13,400	Clay.
Colfax	3,626,834	3,745,536	Coal.
Dona Ana	197,302	195,312	Pumice, clay, manganese.
Eddy	(2)	(2)	Potash, salt.
Grant	53,151,405	55,143,760	Copper, zinc, lead, molybdenum, silver.
Guadalupe	160,070	257,004	Copper.
Hidalgo	942,693	990,647	Copper, fluorspar, silver, lead.
Lincoln	10,087	74,538	Stone, iron ore.
Luna	396,140	305,146	Fluorspar, manganese, zinc, lead.
McKinley	(2)	(2)	Coal, clay.
Otero	(2)		
Quay	48,984	29,464	Sand and gravel.
Rio Arriba	99,133	76,028	Coal.
Sandoval	(2)	(2)	Pumice.
San Juan	21,801	19,597	Coal.
San Miguel	3,388	3,770	Stone, clay.
Santa Fe	682,451	597,941	Pumice, coal, sand and gravel.
Sierra	182,574	162,784	Manganese, fluorspar.
Socorro	2,058,724	1,705,668	Zinc, lead, perlite, barite, silver.
Taos	(2)	(2)	Molybdenum, perlite, beryl.
Valencia	1,077,760	581,199	Pumice, stone, fluorspar.
Undistributed [3]	38,503,816	47,628,455	Potash, coal, molybdenum, perlite, pumice.
Total	102,059,000	111,886,000	
Petroleum, natural gas, and natural-gas liquids.	154,243,000	176,614,000	
Total New Mexico	256,302,000	288,500,000	

[1] Excluding petroleum, natural gas, natural-gas liquids, and carbon dioxide.
[2] Value included with undistributed; Bureau of Mines not at liberty to publish.
[3] Includes value for counties indicated in appropriate column by reference footnote 2, and for gem stones, carbon dioxide, and some undistributed sand and gravel.

CHAVES

The Native Blanco Clay Co. produced 1,748 tons of clay in 1952.

COLFAX

Colfax is the State's largest coal-producing county. During some periods in the past, the county has been an important producer of gold, with accessory silver, copper, and lead; in 1952 a little placer gold was recovered on the Spanish Bar property in the Mount Baldy (Elizabethtown) district.

DONA ANA

The El Paso Brick & Tile Co. mined clay in the Las Cruces area, and the Volcanic Cinder Co. shipped pumice from its property west of Las Cruces. Small tonnages of lead-silver ore were shipped from the Bennett dump and the F. C. Peterson property at Organ. The northern part of the Organ mining district was acquired by the Defense Department (Air Force) in 1951 for extending the White Sands proving grounds, necessitating abandonment of several mines. Some manganese ore was shipped from the county to a custom mill at Deming. Blanchard Hanson shipped a few lots of fluorspar from the White Star and New Imperial claims.

EDDY

The potash deposits in the Carlsbad region are the principal source of potash in the United States. Since production was begun in 1931, output of potash salts (K_2O equivalent) has increased each year except 1934, 1939, and 1949. The increase in 1952 over 1951 in production

TABLE 15.—Mine production of gold, silver, copper, lead, and zinc in 1952,[1] by counties and districts, in terms of recoverable metals

County and district	Mines producing		Material sold or treated (short tons)	Gold (fine ounces)		
	Lode	Placer		Lode	Placer	Total
Bernalillo County: Coyote	1		5	3		3
Colfax County: Mount Baldy		1			2	2
Dona Ana County: Organ	2		31			
Grant County:						
Central	12		8,937,091	1,343		1,343
Eureka	1		6,150	16		16
Pinos Altos	5		8,409	396		396
Swartz	1		5,023	1		1
Guadalupe County: Pintado	1		50,751			
Hidalgo County:						
Lordsburg	8		60,524	820		820
San Simon	2		982			
Luna County:						
Cooks Peak	3		749	3		3
Tres Hermanas	1		7			
Santa Fe County:						
Cerrillos	3		334	3		3
San Pedro (New Placers)	1		12	5		5
Sierra County:						
Chloride	2		35	8		8
Hermosa	2		19	1		1
Kingston	2		177	3		3
Las Animas	3		563	125		125
Socorro County:						
Hansonberg	3		41,038	4		4
Magdalena	12		32,229	216		216
Silver Mountain (Water Canyon)	1		95			
Total	66	1	9,144,224	2,947	2	2,949

County and district	Silver[2] (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
Bernalillo County: Coyote	4				$109
Colfax County: Mount Baldy					70
Dona Ana County: Organ	179		8,000		1,450
Grant County:					
Central	306,236	148,016,000	8,971,000	96,086,000	53,538,643
Eureka	10,964	3,000	203,000	206,000	78,088
Pinos Altos	11,816	60,000	101,000	220,000	91,855
Swartz	8,900	9,000	401,000	768,000	202,317
Guadalupe County: Pintado		1,062,000			257,004
Hidalgo County:					
Lordsburg	70,911	2,950,000	105,000	4,000	824,347
San Simon	1,695		183,000	114,000	49,921
Luna County:					
Cooks Peak	1,201	2,000	189,500	187,000	63,228
Tres Hermanas	21		500	1,000	265
Santa Fe County:					
Cerrillos	842	2,000	54,000	72,000	21,997
San Pedro (New Placers)	53	4,000			1,191
Sierra County:					
Chloride	407	600	3,000		1,276
Hermosa	2,898		8,000		3,946
Kingston	1,666	1,400	21,000	48,000	13,301
Las Animas	30				4,402
Socorro County:					
Hansonberg	3,814	3,300	1,693,200		276,996
Magdalena	57,628	110,100	2,091,000	4,244,000	1,127,515
Silver Mountain (Water Canyon)	53	600	9,800		1,771
Total	479,318	[3] 152,224,000	14,042,000	101,950,000	56,559,692

[1] 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 records, year by year, may be found in annual issues of Mineral Resources and Minerals Yearbook.

[2] All from lode mines.

[3] Includes copper recovered from precipitates.

TABLE 16.—Mine production of gold, silver, copper, lead, and zinc by counties from earliest production [1] through 1952, in terms of recovered metals

County	Gold [2]—(lode and placer)		Silver—(lode and placer)		Copper	
	Fine ounces	Value	Fine ounces	Value	Short tons	Value
Bernalillo	34,488	$713,210	443,663	$273,583	31	$8,711
Catron	362,132	8,459,805	17,416,258	11,746,381	535	159,074
Colfax	282,717	6,114,967	296,116	224,198	214	54,730
Dona Ana	13,446	283,940	2,531,747	2,553,085	2,318	818,924
Eddy	14	289	558	347	47	15,106
Grant	485,528	11,389,435	21,898,521	18,336,000	1,637,069	540,813,633
Guadalupe	2	70	12,434	8,705	5,374	1,737,350
Hidalgo	223,849	5,109,401	6,323,016	4,510,135	77,627	23,900,525
Lincoln	163,641	3,439,276	162,921	133,388	312	97,655
Luna	4,544	110,108	281,551	200,061	44	13,538
Mora	186	3,850	15,775	15,148	12	4,284
Otero	16,466	350,282	50,693	31,678	3,334	1,286,339
Rio Arriba	1,157	25,754	14,061	8,604	76	24,649
Sandoval	7,973	171,051	213,349	117,160	131	50,905
San Miguel	178,961	4,859,515	5,477,894	2,922,427	9,357	2,124,471
Santa Fe	45,578	1,052,567	640,925	497,482	10,328	3,287,891
Sierra	183,548	4,155,453	8,586,202	8,071,215	1,401	366,788
Socorro	80,340	1,750,499	4,707,397	4,054,527	6,947	2,714,911
Taos	3,202	67,765	19,707	15,306	66	20,779
Torrance	24	704	7,789	5,130	476	201,782
Valencia			1,027	710	69	30,056
Miscellaneous	115,170	2,380,062	1,348,655	1,659,491	681	240,826
Total	2,202,966	50,438,003	70,450,259	55,384,761	1,756,449	577,972,927

County	Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	
Bernalillo	29	$2,900			$998,404
Catron	9	1,066			20,366,326
Colfax	44	2,949			6,396,844
Dona Ana	12,463	1,142,938	845	214,809	5,013,696
Eddy	3	284			16,026
Grant	135,523	19,442,340	708,295	146,612,116	736,593,524
Guadalupe	23	7,350			1,753,475
Hidalgo	6,806	1,132,076	632	150,035	34,802,172
Lincoln	872	109,069	8	2,128	3,781,516
Luna	7,576	929,596	4,550	972,038	2,225,341
Mora	33	2,566			25,848
Otero	1,033	145,285			1,813,584
Rio Arriba	53	4,530			363,537
Sandoval	7	806			39,922
San Miguel	67,000	6,151,791	210,772	21,141,983	37,200,187
Santa Fe	6,649	702,159	2,859	461,834	6,001,933
Sierra	6,005	641,014	269	55,735	13,290,205
Socorro	63,884	9,401,244	157,318	27,174,688	45,095,869
Taos	[3]	33			103,883
Torrance	[3]	28			207,644
Valencia					30,766
Miscellaneous	2,534	187,963			4,468,342
Total	310,546	40,007,987	1,085,548	196,785,366	920,589,044

[1] Beginning dates range from 1848 for Grant County to 1916 for Guadalupe County.
[2] 1932 and previous years figured at $20.6718346 per fine ounce. 1933 figured at $25.56 per fine ounce. 1934 figured at $34.95 per fine ounce. 1935–52 figured at $35 per fine ounce.
[3] Less than ½ ton.

of marketable potassium salts was 18 percent and in shipments 15 percent. Crude salts mined in 1952 totaled 7,852,732 tons compared with 6,615,891 tons in 1951. The value of the potash shipped in 1952 ($46,385,452) was greater than the value of the State output of any other single mineral except petroleum.

Before 1951 the three producing companies were the United States Potash Co., Potash Co. of America, and International Minerals &

Chemical Corp., whose mines reached the productive stage in 1931, 1934, and 1940, respectively. In 1951 the Duval Sulphur & Potash Co. went into production, and in 1952 the Southwest Potash Co., Inc. (subsidiary of the American Metal Co., Ltd.) became the fifth producer. All the companies operate mines and refineries in an area mostly about 20 miles east and northeast of Carlsbad; the refinery of the United States Potash Co. is near Loving 16 miles south of the mine. An average of about 3,300 men was employed at the mines and plants in 1952. The Freeport Sulphur Co. continued its exploratory drilling program in an area 30 or more miles east of Carlsbad, reported to extend into Lea County.

The bulk of the crude salts mined was sylvinite, produced by all 5 companies; 1 company, the International Minerals & Chemical Corp., also mined langbeinite, a double salt of potassium and magnesium sulfate, mixed with sodium chloride. The treatment process for sylvinite included flotation, leaching, and crystallization. A 50-percent K_2O granular product and a 60-percent or higher grade muriate of potash were produced. The langbeinite was treated in the mill and chemical plant of the International Minerals & Chemical Corp. to yield potassium sulfate and potassium-magnesium sulfate. Stock salt was recovered as a byproduct. Additions were being made to the plant in 1952 to expand its capacity further.

The depth of mining in the Carlsbad region ranges from 800 to 1,500 feet. The workings are reached through vertical shafts. Room-and-pillar methods of mining are employed. Underground operations—undercutting, drilling, blasting, loading, and haulage—are highly mechanized, electric power being used mostly for loading and haulage. Diesel engines are used in bulldozers and some other equipment.

Salt salvage companies recover some of the salt discarded in mill tailings from potash plants in the Carlsbad area.

GRANT

Mining is the principal industry of Grant County. The metals of chief value produced are copper, zinc, and lead; other metals include iron, gold, manganese, molybdenum (byproduct of copper production), and silver. Nonmetallic minerals produced included fluorspar, clay, and sand and gravel. There are a number of metal-mining districts in the county.

Central (Bayard, Fierro, Georgetown, Hanover, Santa Rita) District.—The Central district produced copper, zinc, lead, silver, and gold in 1952 valued altogether, in terms of recoverable metals, at $53,538,643, nearly 95 percent of the State total value of the 5 metals. The greater part of the value was in copper and the next largest in zinc.

The large Chino open-pit mine of the Kennecott Copper Corp., Chino Mines Division at Santa Rita, New Mexico's major producer of copper, operated continuously 7 days a week in 1952. The capacity for ore extraction has been increased by recent extensive stripping and expansion of mining to the east extension of the pit. About 50,000 tons of material (ore and waste) was mined daily. Data on two-way radio communication at the pit were published.[3] As the pit operations

[3] Look, Allen D., and Van Fleet, L. A., Two-Way Radio Communication at Santa Rita Open Pit, Kennecott Copper Corp., Santa Rita, N. Mex.: Bureau of Mines Inf. Circ. 7626, 1952, 8 pp.

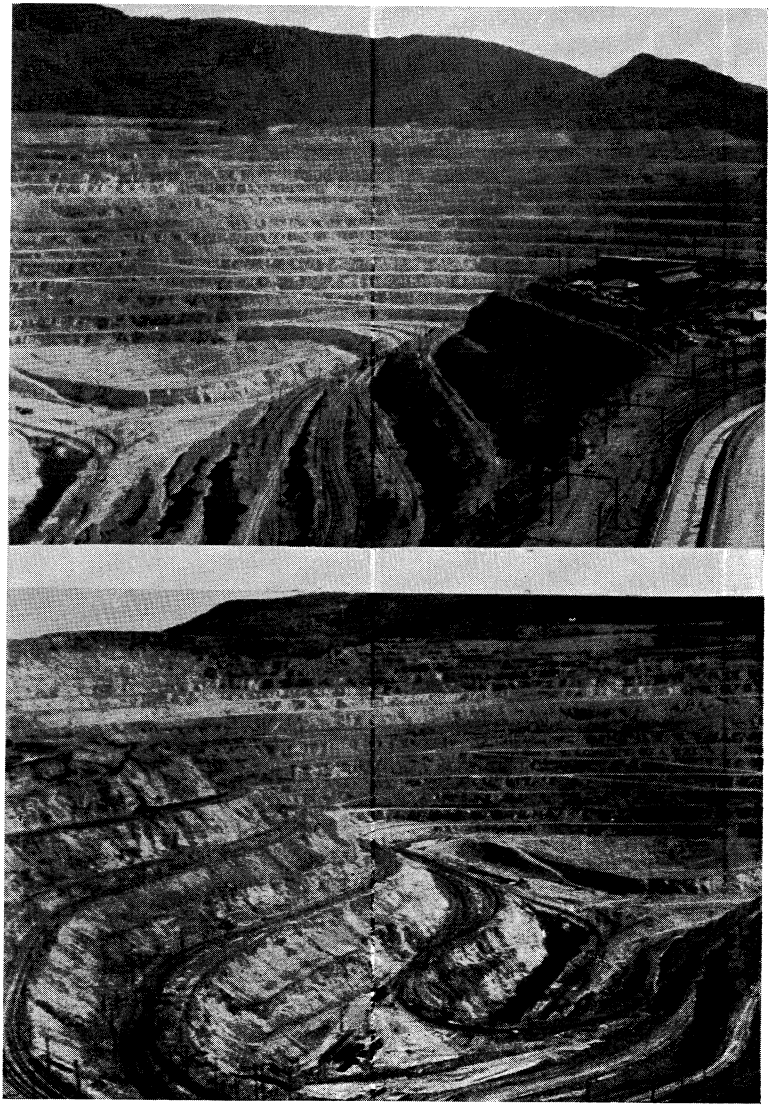

FIGURE 5.—Views of Chino mine, Kennecott Copper Corp., Chino Mines Division, Santa Rita, N. Mex., looking eastward

nearly surround the town of Santa Rita and the townsite contains copper ore, the town was being moved to a new location 1 mile away. The mine's output of copper in 1952 was a little larger than in the previous record year 1942. The ore was transported to treatment plants at Hurley, 10 miles from the mine, over a branch line of the Atchison, Topeka & Santa Fe Railway. The concentrator has a daily capacity of 22,500 tons. Molybdenite was recovered in the mill as a byproduct. The copper concentrate was smelted in the company smelter adjacent to the mill. The smelter also treated copper precipitates recovered by leaching of dumps and siliceous copper ore from the pit used as a flux. Minor quantities of gold and silver were recovered from blister copper, produced occasionally; the main product of the smelter was fire-refined copper.

The Kennecott Copper Corp. Oswaldo zinc mine was in production in 1952 until October 4, when shipments of ore ceased owing to declines in the price of zinc. The ore produced was shipped to custom mills at Hanover and Deming. Development during the year included 3,830 feet of drifts and 1,605 feet of raises; the total development in the group (Oswaldo Nos. 1 and 2) at the end of 1952 comprised 2 vertical shafts 490 and 705 feet deep, 18,626 feet of drifts and crosscuts, and 2,495 feet of raises.

The Ground Hog mine group of the American Smelting & Refining Co. operated continuously in 1952 and was again the largest producer of zinc and lead in the State. The mine has one 4-compartment vertical shaft (Star shaft) 1,926 feet deep and one 3-compartment vertical shaft (No. 5) 2,210 feet deep, connected by a 4,400-foot haulageway on the 1,950-foot level; and another shaft (North shaft) that is vertical to the 600-foot level, with a winze from there to the 1,800-foot level. Development in 1952 included 9,670 feet of drifts, raises, and crosscuts, and 36,825 feet of diamond drilling. The ore produced was shipped over the Atchison, Topeka & Santa Fe Railway branch line to the company Deming milling unit.

The Peru Mining Co. Pewabic mine was operated in 1952 from January 1 to December 23, when operations were suspended because of the unsatisfactory price of zinc. Development in the Pewabic group (opened by a 500-foot vertical shaft) during the year included 1,095 feet of drifts and 3,650 feet of diamond drilling. The company continued work on an exploration project in the Grant County mine under a DMEA contract.

The Kearney mine, operated by the New Mexico Consolidated Mining Co. (subsidiary of the Peru Mining Co.), was in production throughout 1952, although there was some curtailment after the price of zinc began to decline in June. The mine is opened by a 625-foot vertical shaft. Development in 1952 included 3,301 feet of drifts and 3,953 feet of diamond drilling. The ore produced from the Kearney mine, as well as that from the Pewabic, was shipped by rail to the Peru mill at Deming for concentration.

The Bayard group of mines of the United States Smelting, Refining & Mining Co. operated continuously in 1952. The group includes the Bull Frog, Hanover-Bessemer, and Shingle Canyon properties. The mining was done by the company and lessees and the milling by the company in its 600-ton selective flotation mill at the mine. Development during the year included 438 feet of shaft sinking, 7,439 feet of drifts and crosscuts, 2,548 feet of raises, 277 feet of winze, and

23,190 feet of diamond drilling. An exploration project under a DMEA contract was carried on during the year.

The Hanover mine and mill of the New Jersey Zinc Co., Empire Zinc Division, closed by a strike on October 17, 1950, were reopened in January 1952 and operated until October 11, when they were shut down as a result of the drop in the price of zinc. Besides ore from the Hanover mine, the mill treated other ores, mostly from the Oswaldo mine in the Central district and the Lynchburg in the Magdalena district.

Small tonnages of ore from the Betty Jo, Peerless, Pleasant View, and Three Brothers mines and cleanup material from the old Combination (Black Hawk) mill site were shipped during the year. The heap-leaching plant operated by Douglas B. White on the Zuniga (United States Smelting) property at Fierro produced some copper precipitates but was idle part of the year.

Iron ore was shipped from the Hanover-Bessemer Iron & Copper Co. property at Fierro, operated intermittently by Mathis & Mathis under a sublease from the United States Smelting, Refining & Mining Co.

Other Districts.—In the Eureka (Hachita) district, Mineral Operations, Inc., continued to operate the Hornet zinc-lead mine and mill on a small scale. At Pinos Altos the Atlas No. 2 mine (Houston Thomas group), operated by Mathis & Mathis from January through June 6, shipped 1,844 tons of zinc-lead-silver ore. White & Wright and the J. & J. Exploration Co. shipped a substantial tonnage of old tailings containing copper, silver, and gold from the old Gillette mill tailings dump. Small tonnages of ore were shipped from the Bullion, Hancock, Langston, and Pinos Altos Lode properties. In the Swartz (Carpenter, Camp Monarch) district Explorations, Inc., shipped zinc-lead-silver ore from the Royal John mine.

In the Chloride Flats district near Silver City, the Luck Mining & Construction Co. continued to ship manganiferous ore to the Colorado Fuel & Iron Corp. at Pueblo, Colo. A small tonnage of manganese ore was shipped from a claim in the Silver City area.

The principal nonmetallic mineral produced in Grant County was fluorspar. The larger producers included the Shrine mine of the General Chemical Division, Allied Chemical & Dye Corp. and the Ozark-Mahoning Co. White Eagle mine. A number of other mines and prospects contributed to the output. Some clay and sand and gravel were produced.

GUADALUPE

Drunzer and Casner shipped 50,751 tons of low-grade siliceous copper fluxing ore to the El Paso smelter from the Stauber open-pit mine 15 miles southwest of Santa Rosa.

HIDALGO

The Lordsburg district continued to be the principal mining district in Hidalgo County. The Banner Mining Co. Bonney-Miser's Chest copper mine, largest producer of ore in the county since 1936, operated continuously in 1952. The ore was treated in the company 500-ton flotation mill and yielded copper concentrate containing silver and

some gold. The ore was hoisted through the Miser's Chest shaft, deepened from 1,200 to 1,317 feet during the year. Other mine development in 1952 included 2,318 linear feet of drifts, 103 feet of raises, 765 feet of diamond drilling, and 7,263 cubic feet of station and pocket excavation. Ira L. Moseley continued to operate the Atwood mine under lease, shipping crude copper-silver-gold-lead ore to the El Paso smelter. Other small metal producers included the Ruth, Needmore, Phoenix, Francis K, Leitendorf No. 1, and Anita No. 1 properties.

The Still Bros. Mining Co. shipped fluorspar from the Doubtful mine, and the Phelps Dodge Corp. mined fire clay from a pit near Pratt.

In the San Simon district, the Silver Hill Mining Co. shipped lead-zinc-silver ore from the Silver Hill mine, and Donald McGhee & Co. shipped a little ore from the Carbon Hill property.

LINCOLN

Iron ore was shipped in 1952 by J. B. Close and the Southwestern Mining Co. at Carrizozo and the Custom Mining Co. at Corona. No gold, silver, or lead was produced in the county in 1952, and the output in 1951 was small.

LUNA

A number of mines operated in Luna County in 1952, and at Deming 2 custom mills treated base-metal ores from various counties in New Mexico and from outside the State; 1 custom mill treated fluorspar, and the Government maintained a manganese-ore-purchasing depot for the low-grade stockpile.

Mines producing nonferrous metal ores were the Mahoney group, including the Surprise (Bryan and Webster claims), operated by H. E. McCray, and the Silver Queen by John C. Rieffer, both yielding zinc-lead-silver ore, and the Copper King, worked by Little & Lyons, yielding lead-silver ore, all in the Cooks Peak district; and an unidentified claim in the Tres Hermanas district, which produced a truckload of zinc-lead-silver ore.

The Peru Mining Co. zinc-lead mill (capacity increased from 1,000 to 1,250 tons daily in 1952)[4] treated the entire output of ore from the Pewabic and Kearney mines in the Central district and also handled custom ores from the Central and other districts.

The 650-ton Deming milling unit of the American Smelting & Refining Co. treated company ore from the Ground Hog mine in the Central district and custom ores from about 35 other mines in New Mexico, Arizona, Texas, Mexico, and Cuba. An article describing the method of handling materials at the mill was published.[5]

Fluorspar mines in operation included the Greenleaf, Greenspar, Lucky, Saddler, and others. The General Chemical Division, Allied Chemical & Dye Corp., continued to operate its fluorspar mill at Deming, treating company and custom crude fluorspar from mines in New Mexico and outside the State.

Among the producers of manganese ore were the Birchfield, Florida

[4] Mining World, Flexibility in Zinc Milling: Vol. 14, No. 10, September 1952, pp. 57–60. (Peru Mining Co.'s Deming, New Mexico, flotation mill treats two types of zinc ore from company mines and custom shippers in two parallel circuits.)

[5] Weiss, Norman, and Kaanta. H. W., Deming Mill—Materials-Handling Problem Solved: Min. Eng., September 1952, pp. 857–862.

Mines, Iron Clad, and United States Manganese Corp. mines. Additional ore, comprising mostly low-grade ore amenable to beneficiation, was shipped by mines and prospects to the Government ore purchasing depots at Deming (operated by the General Services Administration) for stockpiling.

McKINLEY

Activity in uranium exploration and mining continued to expand in 1952, and several newly opened mines became productive. Nearby ore-milling facilities will be provided upon completion of the processing plant of the Anaconda Copper Mining Co. at Bluewater (Valencia County), which was under construction during 1952.

Clay was mined by the Gallup Brick & Tile Co. for the manufacture of brick and other products in the company plant at Gallup. In coal production McKinley County ranked second in the State.

OTERO

This county had no metal production in 1952 but produced a little silver and copper in 1951. Some clay was also produced in 1951.

RIO ARRIBA

Coal continued to be the principal mineral produced in Rio Arriba County, but the output in 1952 decreased 25 percent from 1951.

SANDOVAL

The San Miguel mine in the Nacimiento Mountains area, which produced some copper and silver in 1951, was idle in 1952. The Dooley Bros. Pumice, Inc., shipped pumice from its property.

SAN JUAN

The uranium-ore buying station at Shiprock was operated throughout 1952 for the Atomic Energy Commission by the American Smelting & Refining Co. The Bureau of Mines has a plant for the production of helium at Shiprock.

SAN MIGUEL

There was no output of metallic ores in San Miguel County in 1952; in the past (1927–39) the Pecos mine was a large producer of ore yielding gold, silver, copper, lead, and zinc.

SANTA FE

Ore containing lead, zinc, silver, and a little copper and gold was shipped in 1952 from the Pennsylvania mine (operated by Verne Byrne), the Tom Payne (Santa Fe Lead-Zinc Mines, Inc.), and the Grand Central claim of the Cash Entry group (G. F. Calloway), all in the Cerrillos district. In the San Pedro or New Placers district M. W. Pollock shipped some copper-gold-silver ore from the San Pedro mine.

The county output of sand and gravel decreased 20 percent from 1951. The General Pumice Corp. and the Santa Fe Pumice Co., Inc., produced pumice. Some clay was mined in the county. Coal continued to be one of the principal mineral products.

The famous turquoise mine near Cerrillos was described in an article.[6]

SIERRA

In the Kingston district Haile Mines, Inc., shipped several carlots of zinc-lead-silver ore from the Haile group (including the Miner's Dream, Lady Franklin, and other claims). Gephart & Benjamin shipped 12 tons of silver ore from the Calamity Jane dump. At the Snake group near Hillsboro some gold ore produced in a salvage operation from 1947 to 1949 was treated in a small portable gravity concentration-amalgamation mill; the gold recovered was marketed in 1952. Small lots of gold ore were shipped by Key & Wood and S. A. Wood. Manganese ore was shipped from the Black Jack, Haile, Iron King, and Spanish American properties.

In the Hermosa (Lower Palomas Creek) district Koepke & Jones worked the Pelican-Vulture group on a small scale and shipped three truckloads of high-grade silver-lead ore. A small lot of silver ore was shipped from the Palomas Chief mine. In the Chloride (Apache, Cuchillo Negro) district a small tonnage of lead ore from the Dobies mine and gold-silver ore from the St. Cloud group were shipped.

Shippers of fluorspar from mines in Sierra County included the Bailey Fluorspar Co., Blanchard Hanson, and the Sierra Development Co.

SOCORRO

In the Hansonberg district (Bingham), the Portales Mining Co. continued to operate its open-pit lead mine. The ore was trucked 33 miles to the company 450-ton mill at San Antonio for treatment. The Mex-Tex Mining Co., Inc., shipped lead-barite ore from its open-pit mine to the company 250-ton mill at San Antonio; the mill products were lead concentrate and barite. Some lead concentrate was shipped from the Major Jones mine, equipped with a gravity-concentration mill.

Near Magdalena the Lynchburg mine of the New Jersey Zinc Co., Empire Zinc Division, operated under lease by C. S. Elayer, was again the principal producer. Operations were curtailed at times during the year because of the declines in the price of zinc. The ore contained zinc, lead, and silver, with a little copper and gold; most of it was shipped to custom mills at Hanover and Deming. From the Nitt properties J. A. MacDonald and W. R. Dobson shipped zinc ore containing some lead, copper, and silver to the Peru mill at Deming and also shipped copper-silver ore to the El Paso smelter. Zinc-lead-silver ore from the Kelly group was shipped to the New Jersey Zinc Co., Empire Zinc Division, mill at Hanover, Grant County. Lessees operated the Waldo group of the American Smelting & Refining Co. on a small scale, shipping zinc-lead-silver ore. Other small producers were the El Tigre, Juanita group, La Joya Grant, Mistletoe, Mary Jane, Queen, Bert Coon prospect, "Sixty" Copper group, and Sunset Nos. 1 and 2 dump (Silver Mountains area).

[6]Foster, E. E., Famous Turquoise Mine: Mineralogist, vol. 20, No. 12, December 1952, pp. 452, 454.

Manganese ore was shipped from the Black Cat, Gallagher, Romero, and Van Pelt properties.

Perlite mining and milling has become an important industry in New Mexico in recent years. The Great Lakes Carbon Corp. open-pit mine near Socorro, equipped with a mill, was the largest producer in the State. The perlite is quarried by contract and delivered to the mill, where it is crushed, flash-dried, and sized by screens to given specifications.

TAOS

The molybdenum mine of the Molybdenum Corp. of America near Questa, a consistent producer for many years, continued to operate in 1952; the work done included considerable development. Beryl was produced from the Harding mine near Dixon, which operated continuously, employing five men. The Aztec group of mines on Copper Mountain 8 miles northeast of Dixon, which produced 21 tons of copper-silver-gold ore in 1951, had no output in 1952. The F. E. Schundler perlite mine in the No Agua Mountains in the northwestern part of the county was an important producer. It is equipped with a mill capable of handling 25 tons of perlite rock an hour.[7] The mill product is shipped to expanding plants in the Central and Eastern States.

VALENCIA

The Grants area became an active center of uranium exploration and mining after discovery of uranium deposits on the property of the Atchison, Topeka & Santa Fe Railway near Grants in 1950. During 1951 and 1952 other discoveries were made, and a number of mines began to produce ore. Under an arrangement with the Atomic Energy Commission, the Anaconda Copper Mining Co. undertook construction of an ore-treatment plant, at Bluewater 10 miles west of Grants, scheduled for completion in 1953. Ore was purchased and stockpiled at the plant for treatment later.

Fluorspar was produced from the Zuni Milling Co. and Mirabel mines, southwest and northwest, respectively of Grants. The Zuni flotation mill at Los Lunas continued to operate. The Pumice Corp. of America mined pumice on its property 9 miles north of Grants; the crude rock was processed in the company mill at Grants.

[7] Pit and Quarry, Schundler Mining Perlite from 8,900-Foot-High Bed in New Mexico Mountains: Vol. 44, No. 5, November 1951, pp. 117-119.

The Mineral Industry of New York

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the New York State Science Service, Office of Geology.

By Richard H. Mote [1]

SHARP DECLINES in the output of iron ore and zinc from New York mines in 1952, largely the result of labor strikes, combined to lower the aggregate value of the State mineral production 4 percent under the alltime high of $188,790,000 reached in 1951. The drop in value of output was accompanied by a reduction in rank as a mineral-producing State from 17 in 1951 to 18 in 1952. Nevertheless, New York in 1952 continued to hold a leading position in the output of a number of mineral products, including cement, emery, garnet, gypsum, salt, sand and gravel, slate, talc, titanium (ilmenite) concentrates, and wollastonite.

Seven mineral products—portland cement, iron ore, stone, sand and gravel, petroleum, salt, and zinc, valued in all at $160,248,000—supplied 89 percent of the State total value in 1952. Mineral production was reported from every New York county except Bronx, Hamilton, New York, Queens, and Richmond. The principal producing counties, in order of decreasing value of output, were St. Lawrence, Essex, Erie, Columbia, Greene, and Clinton. Mineral producers in these counties turned out mineral products in 1952 valued at $92,500,000, over 51 percent of the total dollar volume of mineral output during the year. Cement manufacture was the leading element in the State mineral economy in 1952. Production and shipments of this commodity were the largest ever recorded in the State. Iron ore, which ranked first in 1951, dropped to second position. Stone, sand and gravel, petroleum, salt, and zinc continued in third to sixth place, respectively.

In addition to the mineral values credited to New York in table 1, there are some that are not included, owing to lack of information.

Many lead and zinc ores contain valuable minor constituents such as bismuth and cadmium. These quantities sometimes are not known and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages, or credited to mine or origin. These minor constituents are recovered at smelting plants that frequently treat mixtures of materials from many sources, including residues from the refining of metals, such as copper, lead, and others,

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and in other ways. It is not possible in many such instances to distribute the mineral products by States of origin, and sometimes it is even difficult to obtain an accurate separation as to domestic and foreign sources. Another valuable mineral product, the output of which usually cannot be separated as to sources, is byproduct sulfuric acid.

TABLE 1.—Mineral production in New York, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement [2]—376-pound barrels	13,862,522	$34,687,090	14,624,274	$36,679,379
Clays (except for cement)	1,224,229	1,297,635	872,577	945,463
Emery	11,634	160,212	10,352	141,911
Gypsum (crude)	1,259,484	4,010,766	1,143,920	3,816,148
Iron ore (usable)—long tons, gross weight	3,649,531	39,819,368	2,896,531	34,514,879
Lead (recoverable content of ores, etc.)	1,500	519,000	1,120	360,640
Natural gas—thousand cubic feet	3,214,000	807,000	3,627,000	1,059,000
Petroleum (crude)—42-gallon barrels	4,254,000	17,990,000	[3] 4,242,000	[3] 17,940,000
Salt (common)	3,518,715	16,552,890	3,417,443	16,746,462
Sand and gravel	21,008,701	19,285,299	20,270,058	18,287,623
Silver (recoverable content of ores, etc.)—troy ounces	47,568	43,051	38,895	35,202
Slate	[4] 126,070	[4] 2,000,106	125,930	1,810,865
Stone (except limestone for cement and lime)	15,559,372	24,326,118	16,234,549	25,244,245
Talc	152,652	4,170,987	149,837	4,069,771
Zinc (recoverable content of ores, etc.)	40,051	14,578,564	32,636	10,835,152
Undistributed: Natural cement, abrasive garnet, lime, marl, peat, (1952), pyrites, titanium concentrate, wollastonite, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)	----------	8,542,154	----------	8,254,006
Total New York	----------	[4] 188,790,000	----------	180,741,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels, gypsum, and pyrites are strictly production.
[2] Excludes natural cement, value for which is included with "Undistributed."
[3] Final figure. Supersedes preliminary figure given in commodity chapter.
[4] Revised figure.

REVIEW BY MINERAL COMMODITIES

METALS

Iron Ore.—Crude-iron-ore production in New York in 1952 dropped 6 percent and usable ore (shipments) 21 percent compared with 1951, largely the result of the nationwide labor strike in the steel industry in June and July 1952. Crude ore is the mined product before any treatment to eliminate waste constituents; usable ore includes direct-shipping ore (mined product requiring no treatment), washed ore, concentrates, and sinter. Despite the decline in production, New York remained fourth among iron-ore-producing States in the Nation in 1952 and supplied nearly 6 percent of the domestic crude iron-ore output. Iron ore from New York mines is comparatively low grade, and requires beneficiation before use. Over 2 tons of crude ore is mined and milled to produce 1 ton of usable ore. Thus, in terms of usable ore, New York accounted for 3 percent of the total United States output and ranked fifth in the Nation.

As most of the mineral value of the ore mined is contained in magnetite, concentration is primarily by magnetic methods; ore is reduced to proper size by crushing and fine grinding in rod and ball mills.

Although the concentrate thus produced is high grade, it is too fine for blast-furnace smelting and therefore is sintered to produce a satisfactory furnace ore.

Waste rock at several beneficiation plants yields material of economic value. At the MacIntyre mine, Essex County, titanium concentrates (ilmenite) are recovered from the nonmagnetic mill tailings. Martite, the nonmagnetic iron oxide, is recovered from tailings at the Benson mine in St. Lawrence County. At several mines, such as the Republic Steel Corp. Chateaugay mine in Clinton County, rejected waste rock is processed and sold for highway construction and maintenance and for use in preparing concrete.

During 1952 there were 6 active iron-ore mines in New York, 1 in Clinton County, 3 in Essex County, 1 in Oneida County, and 1 in St. Lawrence County. The largest producing mine in the State was the Jones & Laughlin Ore Corp. Benson open-pit mine at Clifton, St. Lawrence County. This property ranked sixth in crude ore output among the iron-producing mines in the United States during 1952. It was exceeded in output by five open-pit mines on the Mesabi range, Minn. The second largest producing property was the National Lead Co. MacIntyre mine at Tahawus, Essex County. This property ranked 23d among the Nation's iron mines in 1952. The third largest in the State and 24th in the United States was the Republic Steel Corp. New Bed Harmony & Old Bed mine near Mineville, Essex County. Other producing properties in 1952 included the Republic Steel Corp. Chateaugay mine at Lyon Mountain, Clinton County; and Fisher Hill mine, Essex County; and the Clinton Metallic Paint Co. mine at Clinton, Oneida County. Over 60 percent of the crude iron ore produced in New York in 1952 was mined by open-pit methods. Most of the iron ore from New York mines is consumed in furnaces in the Pittsburgh, Pa., area.

The Bureau of Mines reported in 1952 on a study of haulage procedures at an iron mine in northeastern New York.[2]

TABLE 2.—Production and shipments of iron ore, 1943–47 (average) and 1948–52

Year	Number of mines	Crude ore mined (long tons)	Usable ore shipped (long tons)	Value
1943–47 (average)	7	4,301,785	1,737,795	$13,966,846
1948	7	7,856,937	2,932,442	24,384,648
1949	7	6,051,162	2,344,518	22,184,757
1950	7	6,722,422	2,917,257	27,914,818
1951	7	7,741,434	3,649,531	39,819,368
1952	6	7,267,202	2,896,531	34,514,879

Silver, Lead, and Zinc.—Mine production of lead and zinc in New York in 1952 dropped to the lowest amount since 1946. Compared with 1951 the output of silver, lead, and zinc from mines in the State was smaller by 18, 25, and 19 percent, respectively. These declines were due principally to a labor strike which closed the St. Joseph Lead Co. Balmat and Edwards mines in St. Lawrence County from July 1 through September 14, 1952. Silver, lead, and zinc are produced from the Balmat mine and zinc from the Edwards property.

[2] Sanford, Robert S., Truck Haulage at an Iron Mine in the Adirondack Mountains, N. Y.: Bureau of Mines Inf. Circ. 7629, 1952, 7 pp.

Reports of the Bureau of Mines and Geological Survey published in 1952 relating to lead and zinc ores in New York include:

NEUMANN, G. L., Lead-Zinc Depostis of Southwestern St. Lawrence County, N. Y. Bureau of Mines Rept. of Investigations 4907, 1952, 25 pp.

———. Guymard Lead-Zinc Deposit, Orange County, N. Y. Bureau of Mines Rept. of Investigations 4909, 1952, 10 pp.

SIMS, P. K., AND HOTZ, P. E. Zinc-Lead Deposit at Shawangunk Mine, Sullivan County, N. Y. Geol. Survey Bull. 978–D, 1952, pp. 101-121.

TABLE 3.—Mine production of silver, lead, and zinc, 1943–47 (average) and 1948–52, in terms of recoverable metals

Year	Mines producing	Material sold or treated (short tons)	Silver		Lead		Zinc		Total value
			Fine ounces	Value	Short tons	Value	Short tons	Value	
1943–47 (average)	3	418,553	23,142	$17,631	1,486	$285,863	34,630	$7,994,804	$8,298,298
1948	3	464,049	18,788	17,004	1,231	440,698	34,566	9,194,556	9,652,258
1949	3	504,105	18,378	16,633	1,317	416,172	37,973	9,417,304	9,850,109
1950	3	494,871	32,628	29,530	1,484	400,680	38,321	10,883,164	11,313,374
1951	2	500,490	47,568	43,051	1,500	519,000	40,051	14,578,564	15,140,615
1952	2	437,099	38,895	35,202	1,120	360,640	32,636	10,835,152	11,230,994

Titanium (Ilmenite) Concentrates.—Production of titanium concentrates decreased slightly in 1952 as compared to 1951. As in previous years all production came from the National Lead Co. MacIntyre mine at Tahawus, Essex County. This property supplied over half the total United States production of ilmenite in 1952. Ore at Tahawus is a mixture of magnetite and ilmenite; the latter constitutes about 16 percent of the crude ore. Magnetite concentrates are recovered as a coproduct of the mining operation.

The Bureau of Mines made studies on the recovery of titania from Tahawus-mine ore at College Park, Md. Ore was roasted with coke and soda ash, wet-ground, and magnetically separated to produce powdered iron and slag. Titania and byproducts were recovered from the slag by acid decomposition. Combined data from tests indicated that 85 to 90 percent of the titania content of the ore was recoverable and about 90 percent of the iron could be recovered as a metallic-iron powder.[3]

NONMETALS

Cement.—Raw materials for the manufacture of portland and natural cements occur widely in New York. Pure limestone for the production of portland cement is abundantly available throughout the State, as are local deposits of marl, clays, shale, and gypsum. Impure limestones required for the manufacture of natural cement are more restricted in availability and occur in Erie, Onondaga, Schoharie, and Ulster Counties.

New York ranked fourth among States of the Nation in 1952 in output of portland and natural cements. Production and shipments of portland cement gained 3 and 5 percent, respectively, over 1951

[3] MacMillan, R. T., Heindl, R. A., and Conley, J. E., Soda-Sinter Process for Treating Low-Grade Titaniferous Ores: Bureau of Mines Rept. of Investigations 4912, 1952, 62 pp.

and were the largest ever recorded. Producing counties in 1952, in order of decreasing output, were Columbia, Erie, Greene, Warren, Schoharie, and Onondaga. In terms of value, cement ranked first among the mineral products of the State in 1952.

Natural-cement production continued in New York in 1952, but at a reduced rate compared with 1951. Although increased use of portland cement-lime mortar and specially compounded masonry cements in recent years has produced severe competition for the natural-cement industry, the plasticity of natural cement and its ease of working in masonry construction have enabled it to retain a portion of the market it formerly held in the State cement industry. Natural cement was produced in Erie and Ulster Counties in 1952.

Construction of the Erie Canal led to the discovery of natural cement making materials at Fayetteville, Onondaga County, in 1818, and at Lockport, Niagara County, in 1824. Construction of the Delaware and Hudson Canal precipitated discovery in 1826 of limestone deposits in the Rosendale area, Ulster County. This area was a prolific source of natural cement for many years before the rise in production of portland cement.

Twelve plants were active in New York in 1952.

TABLE 4.—Production and shipments of portland cement, 1943–47 (average) and 1948–52

Year	Production (barrels)	Shipments	
		Barrels	Value
1943–47 (average)	7,428,179	7,602,503	$12,644,614
1948	12,338,481	12,299,226	26,071,417
1949	12,734,887	12,679,906	28,483,681
1950	13,054,556	13,271,469	30,895,295
1951	14,065,862	13,862,522	34,687,090
1952	14,515,086	14,624,274	36,679,379

Clays.—Although clay and shale deposits suitable for the manufacture of clay products occur in a number of localities in New York, exploitation in 1952 was limited to areas in 10 counties. In all, 21 pits were worked during the year, 5 in Ulster County, 4 each in Albany and Erie Counties, 2 in Rensselaer County, and 1 each in Orange, Onondaga, Nassau, Dutchess, Chemung, and Broome. Slip clay for use in glazing was mined in the Albany area; pits in other counties yielded miscellaneous clays.

Emery.—In 1952, as in recent years, the entire supply of domestic emery came from mines southeast of Peekskill, Westchester County. These deposits have been worked almost continuously since 1883.[4] Peak output was reached in 1917 (nearly 16,000 short tons). As in 1951, active mines were the Kingston and DeLuca. Because of the marked wear resistance of emery, a substantial portion of the output from these properties was used as a nonskid agent in concrete floors and steps. The balance was consumed for abrasive purposes, such as the preparation of emery cloth, grinding wheels, and similar products.

[4] Gillson, J. L., and Kania, J. E. A., Emery Deposits near Peekskill, N. Y.: Econ. Geol., vol. 25, (1930) pp. 506–527.

TABLE 5.—Emery sold or used by producers, 1943–47 (average) and 1948–52

Year	Quantity (short tons)	Value	
		Total	Average per ton
1943–47 (average)	6,690	$66,611	$9.96
1948	5,405	69,408	12.84
1949	4,909	60,017	12.23
1950	5,949	75,308	12.66
1951	11,634	160,212	13.77
1952	10,352	141,911	13.71

Garnet.—New York continued to be the principal domestic source of garnet in 1952. As in 1951, there were two active producers, the larger being the Gore Mountain deposit of Barton Mines Corp., 5 miles west of North Creek, Warren County. Cabot Carbon Co., Cabot Minerals Division, continued to produce byproduct garnet from its Willsboro wollastonite deposit, Essex County. At Gore Mountain, garnet (principally almandite) occurs in a surface deposit in metamorphic rock of questionable origin. Hornblende, which constitutes about 40 percent of the rock, accompanies the garnet mineralization. Mining is by quarry benching methods.

The garnet obtained as a byproduct of wollastonite mining and beneficiation, is largely the red-brown variety, andradite.

Gypsum.—New York continued in 1952 to rank third among gypsum producing States in the Nation. Gypsum deposits of New York, the most easterly in location of any such deposits in the United States, are worked in Erie, Genesee, and Monroe Counties. Commercial gypsum deposits occur interbedded with shales and dolomitic limestones in the Salina formation. The depth of the deposits is limited to about 250 feet, below which the gypsum is succeeded by beds of anhydrite, valueless for the manufacture of plaster. The workable beds of gypsum range in thickness from a few feet to 20 and vary from 90 to 96 percent hydrated calcium sulfate. All output is obtained by underground mining. Five mines yielded crude gypsum during the year—3 in Erie County and 1 each in Genesee and Monroe Counties.

The leading producer of crude gypsum in the State in 1952 was the United States Gypsum Co., with mines and plants in the vicinity of Oakfield, Genesee County. Other large producers, in order of decreasing output, were National Gypsum Co., Clarence Center, and Certain-teed Products Corp., Akron, both in Erie County; Ebsary Gypsum Co., Inc., Wheatland Station, Monroe County; and Universal Atlas Cement Co., Clarence Center, Erie County. Calcined gypsum was produced at each of the above plants except Universal Atlas Cement Co. and at the National Gypsum Co. plant in Genesee County several miles northeast of Akron.

Crude gypsum imported from New Brunswick and Nova Scotia was treated in the calcining plants of National Gypsum Co., Bronx, Bronx County, and United States Gypsum Co., New Brighton, Richmond County.

TABLE 6.—Production of crude gypsum, 1943–47 (average) and 1948–52

Year	Number of active mines	Short tons	Value	
			Total	Average per ton
1943–47 (average)	7	726,061	$1,639,171	$2.26
1948	7	1,228,358	3,294,973	2.68
1949	6	916,117	2,805,154	3.06
1950	6	1,280,100	3,876,176	3.03
1951	5	1,259,484	4,010,766	3.18
1952	5	1,143,920	3,816,148	3.34

Iron Oxide Pigments.—Natural mineral materials for use as pigments in low-priced paints were produced in New York in 1952 in Oneida and St. Lawrence Counties. Since the mineral pigments produced contained a large percentage of iron oxide, colors were limited to various shades of brown, red, and yellow. As in previous years, the largest producer in the State was the Clinton Metallic Paint Co. of Clinton, Oneida County. This company is also one of the oldest producers of mineral-paint pigments in New York State. Raw material used for the pigment production was hematite iron ore of the Clinton formation. A small tonnage of iron oxide pigments was produced by Rossie Iron Ore Co. from its stock of iron ore at Ogdensburg, St. Lawrence County.

Lime.—Lime production in New York in 1952 fell 4 percent from the 1951 level. Quicklime and hydrated lime for a variety of uses were produced by 3 operators, 1 each in Clinton, Erie, and St. Lawrence Counties. The largest producer in 1952 was The Kelley Island Lime & Transport Co. at Buffalo, Erie County.

Marl (Calcareous).—Calcareous marl for agricultural uses was produced in New York in 1952 by Louis J. Johnston from a deposit in Livingston County.

Perlite.—Crude perlite does not occur in New York State. However, in 1952 plants in Buffalo and Syracuse, using crude material from deposits in Western States, produced expanded perlite, mainly for use as a lightweight aggregate to replace heavier materials in plaster and concrete.

Pyrites.—Pyrite concentrates are recovered as a byproduct of lead and zinc mining and milling in St. Lawrence County. Production in 1952 declined 40 percent from 1951. As in previous years, output was sold to sulfuric acid manufacturers.

Salt.—New York continued in 1952 to rank second to Michigan in the production of salt in the United States. Output is recovered from deposits of rock salt in the Salina formation that are either mined as such by underground methods or used as sources of artificial brines. In the latter method, water is forced through drillholes to the salt-bearing beds, allowed to dissolve the salt, and then pumped back to the surface, where the brine is either used directly in the manufacture of other sodium salts or evaporated. Producing counties, in order of decreasing output, were Onondaga, Livingston, Tompkins, Schuyler, and Wyoming.

TABLE 7.—Salt sold or used by producers, 1943–47 (average) and 1948–52

Year	Evaporated salt		Rock salt and salt in brine		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	463, 359	$5, 154, 431	2, 426, 859	$5, 162, 374	2, 890, 218	$10, 316, 805
1948	429, 870	5, 620, 727	2, 635, 961	7, 435, 815	3, 065, 831	13, 056, 542
1949	417, 518	5, 535, 001	2, 534, 232	7, 174, 818	2, 951, 750	12, 709, 819
1950	487, 245	6, 375, 966	2, 319, 682	8, 029, 396	2, 806, 927	14, 405, 362
1951	502, 216	6, 419, 061	3, 016, 499	10, 133, 829	3, 518, 715	16, 552, 890
1952	508, 317	6, 674, 698	2, 909, 126	10, 071, 764	3, 417, 443	16, 746, 462

Sand and Gravel.—New York is one of the leading sand and gravel producing States in the Nation. Because sand and gravel deposits, virtually all of glacial origin, abound in the State, these materials are produced in nearly every county. In 1952 only 12 New York counties had no sand and gravel output. Producers near large industrial areas, such as New York and Buffalo, supplied a substantial portion of the State total production. Principal producing counties in 1952, in order of decreasing output, were Nassau, Suffolk, Erie, and Albany. Aggregate production of these four counties constituted 62 percent of the total State output during the year. Demand for sand and gravel in the New York area was supplied largely from producers in Nassau and Suffolk Counties.

TABLE 8.—Sand and gravel sold or used by producers, 1951–52, by classes of operations and uses

	1951			1952		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Molding	462, 169	$1, 200, 242	$2. 60	371, 063	$1, 054, 758	$2. 84
Building	5, 503, 950	5, 257, 088	.96	5, 599, 746	5, 165, 548	.92
Paving	5, 221, 207	4, 312, 898	.83	4, 912, 807	4, 212, 718	.86
Engine and blast	78, 162	59, 303	.76	(1)	(1)	(1)
Filter	34, 745	18, 325	.53	44, 190	37, 522	.85
Railroad ballast	33, 273	16, 636	.50	(1)	(1)	(1)
Other	183, 700	112, 382	.61	127, 693	85, 145	.67
Gravel:						
Building	3, 399, 137	3, 997, 114	1. 18	3, 180, 138	3, 854, 060	1. 21
Paving	3, 951, 563	3, 704, 561	.94	3, 438, 375	3, 053, 246	.89
Railroad ballast	39, 740	41, 194	1. 04	(1)	(1)	(1)
Other	400, 886	212, 730	.53	361, 647	211, 363	.58
Undistributed				102, 130	49, 615	.49
Total commercial sand and gravel	19, 308, 532	18, 932, 473	.98	18, 137, 789	17, 723, 975	.98
GOVERNMENT-AND-CONTRACTOR OPERATIONS [2]						
Sand:						
Building	3, 384	1, 211	.36	59, 582	10, 772	.18
Paving	177, 596	38, 684	.22	193, 053	56, 608	.29
Gravel:						
Building	53, 847	5, 238	.10	54, 711	4, 178	.08
Paving	1, 465, 342	307, 693	.21	1, 824, 923	492, 090	.27
Total Government and contractor sand and gravel	1, 700, 169	352, 826	.21	2, 132, 269	563, 648	.26
Grand total	21, 008, 701	19, 285, 299	.92	20, 270, 058	18, 287, 623	.90

[1] Included with "Undistributed."
[2] Includes figures for State, counties, municipalities, and other Government agencies.

A major portion of the total value of sand and gravel sales in 1952 was for building aggregate. Paving sand and gravel ranked second, followed by molding sand, filter sand, and other specialized sands and gravel.

Foundry or molding sands are an important product of New York sand and gravel pits. These sands, widely used throughout the country by the foundry industry, are particularly suitable for molds because of the high degree of fineness and the durability of the sand.

Slate.—Slate quarrying in New York is centered in northeastern Washington County just west of the Vermont State line. Colors of the slate are varied and include red (for which this area is the sole domestic source), green, purple, gray, black, and variegated. Except for red, the colors are similar to those of the Vermont slates. Twenty mines, 1 more than in 1951, were active during the year. Although the quantity of slate produced in 1952 remained virtually unchanged from the 1951 level, the aggregate value rose 2 percent as a result of increased unit market values. Nevertheless, output in 1952 continued to be under the 1950 record high of 151,160 short tons valued at $2,054,725. As in recent years, roofing slate was only a small portion of the total output. Nearly 99 percent of the value of New York slate sales in 1952 was from granules, flour, and flagging. All slate is mined by open-quarry methods.

TABLE 9.—Slate sold by producers, 1943–47 (average) and 1948–52, by uses

Year	Operators	Roofing		Flagging, granules, flour, and other uses		Total value
		Squares (100 square feet)	Value	Short tons	Value	
1943–47 (average)	9	224	$4,685	104,996	$994,871	$999,556
1948	13	3,730	91,988	124,120	1,440,892	1,532,880
1949	16	280	12,616	122,075	1,604,481	1,617,097
1950	21	800	38,874	150,860	2,015,851	2,054,725
1951	19	450	19,580	125,880	1,980,526	2,000,106
1952	20	600	21,456	125,694	1,789,409	1,810,865

Stone.—Stone ranked third in value of total mineral output in New York in 1952. Compared with 1951, production advanced 4 percent in quantity and 4 percent in value. A number of rock types occur within the State boundaries, but the most significant economically are limestone, basalt, sandstone, granite, and marble. Crushed stone constituted 98 percent of the total value of stone quarried in 1952. Rock types crushed to varying dimensions for use in highway and railroad construction and maintenance, concrete aggregate, and riprap included limestone, basalt, sandstone, and marble. Principal stone-producing counties, in order of decreasing value of output, were Rockland, Dutchess, Onondaga, Erie, Oneida, Niagara, and Genesee. The value of the stone output in each of these counties in 1952 exceeded 1 million dollars, and the aggregate output of the group was over 67 percent of the total value of New York stone production during the year.

TABLE 10.—Stone sold or used by producers, 1943–47 (average) and 1948–52

Year	Short tons	Value	Year	Short tons	Value
1943–47 (average)	9,030,624	$10,640,707	1950	13,121,850	$19,728,957
1948	12,687,970	17,261,486	1951	15,559,372	24,326,118
1949	13,022,070	18,160,387	1952	16,234,549	25,244,245

Talc.—New York continued to rank first in the production and sales of talc among the mineral-producing States in the Nation in 1952. Mines of the State supplied 25 percent of the 1952 total domestic output of talc, pyrophyllite, and ground soapstone. New York production comes from mines near Gouverneur, St. Lawrence County. The clear, white, fibrous talc produced in this area is ideally suited for use in the paint and ceramic industries.

All talc produced in New York is obtained by underground mining. The mines are opened by inclined shafts sunk in the talc veins. Levels are driven in each direction from the shafts along the vein at varying vertical intervals. If the vein does not exceed 15 or 20 feet in width, the levels or drifts may be cut the full width of the vein. Veins wider than 20 feet are usually cut by several drifts, with frequent cross connections. Mined ore is processed by dry-milling methods, which include crushing by jaw crushers, followed by rolls or rotary crushers. Crushed ore is then ground in pebble and tube mills, followed by gravity separation in air separators.

According to the E&MJ Metal and Mineral Markets, the market price for New York talc, double air-floated, short fiber, 325-mesh, remained constant in 1952 at $18.50 to $20.00 per short ton, f. o. b. cars at mill.

Wollastonite.—The Bristol Mountain deposit of Cabot Mineral Division, Cabot Carbon Co., near Willsboro, Essex County, continued to be the only commercial source of wollastonite in the United States. Output in 1952 was nearly double the 1951 figure. Sales were for use principally in the ceramics and paint industries.

MINERAL FUELS

Natural Gas.—Natural-gas production in New York comes principally from wells in Allegany and Steuben Counties. Marketed output [5] in the State increased 13 percent in 1952 and was at the highest level since 1949.

According to the New York State Geological Survey, an estimated 25 wells were drilled during 1952 in the Medina sandstone of western New York; 17 were dry holes and 8 producing gas wells. Eleven wells were drilled in the Oriskany sandstone; 6 were storage wells and 5 dry holes. In Van Etten Township, Chemung County, a well being drilled to the pre-Cambrian formations had reached a cable-tool record depth of approximately 11,000 feet at the end of the year.

Producing gas wells, as of December 31, 1952, totaled 1,360, a drop of 20 from the 1951 year-end figure. Approximately one-third of the State's natural-gas output came from wells in the Oriskany sandstone; wells in the Medina sandstone yielded the remainder.

[5] Comprises gas sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas in pipelines.

The American Gas Association Committee on Natural-Gas Reserves estimated proved recoverable reserves in New York to be 68,640 million cubic feet on December 31, 1952. Reserves at the end of 1951 were estimated to be 66,793 million cubic feet.

Natural-Gas Liquids.—In 1952, for the first time since commercial production was begun in 1911, no gasoline was extracted from natural gas in New York. Although the State's natural-gasoline industry had never been large, production reached a maximum of 539,000 gallons in 1926. Since 1933, however, annual output has declined sharply, and in recent years activity has been confined to one plant using the compression method to extract gasoline.

Peat.—Although peat deposits are numerous in New York State and many have been worked from time to time for over a century, exploitation has never been large. Output in 1952 came from bogs in Seneca County and, as in recent years, was sold for agricultural uses.

Petroleum.—Virtually all crude-oil production in New York in 1952 was from secondary-recovery methods. Nearly 75 percent of the output came from the Allegany field in Allegany and Steuben Counties; wells in Cattaraugus County yielded the remainder.

The average value at wells per barrel of crude petroleum produced in New York in 1952, as in 1951, was $4.23. The number of producing wells in the State decreased from 23,200 in 1951 to 22,950 in 1952. In both years the average production per well per day was 0.5 barrel.

TABLE 11.—Petroleum production, 1943–47 (average), 1948–52, and total, 1864–1952

Year	Thousands of barrels (42 gallons)	Value (thousands of dollars)	Year	Thousands of barrels (42 gallons)	Value (thousands of dollars)
1943–47 (average)	4,805	17,404	1951	4,254	17,990
1948	4,621	22,830	1952	4,242	17,940
1949	4,425	15,750			
1950	4,143	15,660	1864–1952	185,507	[1] 414,386

[1] Value shown for 1900–52 only.

REVIEW BY COUNTIES

ALBANY

Mineral products of Albany County in 1952, in order of decreasing value of output, were stone, sand and gravel, and clays. The South Bethlehem quarry of Callanan Road Improvement Co. yielded crushed limestone, which was utilized for highway and railroad maintenance, blast-furnace flux, agricultural purposes, and asphalt filler. Sandstone for use in building construction and flagging was quarried at East Berne by Julian Bocchi.

Four commercial sand and gravel operations were active during the year. Albany Gravel Co., Inc., worked its pit at Albany and produced building and paving sand and gravel. Molding sand was recovered from pits at Selkirk, Slingerlands, and Wemple by Selkirk Molding Sand Co., Inc., Whitehead Bros. Co., and Albany Sand & Supply Co., respectively.

Clays produced in 1952 were limited to slip and other miscellaneous clays used for manufacturing brick and heavy clay products. Producers active during the year included Powell & Minnock Brick Works, Sutton & Suderley Brick Co., and Roah Hook Brick Co., all at Coeymans; and Rex Clay Products Co., Inc., Albany.

ALLEGANY

Building and paving sand and gravel were produced during the year by Alfred-Atlas Gravel & Sand Corp. and The Buffalo Slag Co., Inc., from pits at Alfred Station.

Crude petroleum and natural gas continued to be recovered from wells in the southern part of the county. The total production of crude oil from Allegany County pools is by far the largest of any county in the State. All drilling of oil wells during the year was in conjunction with secondary-recovery operations by water flooding.

BROOME

Four commercial sand and gravel producers were active in Broome County in 1952. Barney & Dickenson, Inc., recovered building sand and building and paving gravel from its pit at Vestal on the Susquehanna River. Binghamton Crushed Stone & Gravel Co. worked its pit on Front Street in Binghamton throughout the year and produced material for use in building construction in the immediate area. Other producers in the county in 1952 included N. G. Masotti and Royal Winne; both worked pits at Vestal. Miscellaneous clays for brick manufacture were produced at the Binghamton pit of Binghamton Brick Co., Inc.

Corbisello Quarries, Inc., worked its quarry near Binghamton during part of the year and produced crushed stone for highway construction and riprap. Dimension sandstone for rough construction and flagging was quarried by W. R. Strong & Sons near Deposit.

CATTARAUGUS

Crude petroleum, natural gas, and sand and gravel were produced in Cattaraugus County in 1952. Wells in the southern part of the county yielded oil (approximately 1,074,000 barrels) and gas from the north end of the Bradford, Pa., field. All drilling of oil wells during the year was in conjunction with secondary-recovery operations by water flooding.

The Buffalo Slag Co., Inc., worked its pits at Allegany and Franklinville throughout the year and produced building and paving sand and gravel. Pits were mined near Allegany by E. F. Lippert & Co. and William Lippert. Other sand and gravel producers in 1952 included Ray Vogtli & Son, Gowanda, and Olean Gravel Co., Inc., Machias.

CAYUGA

The Auburn quarry of General Crushed Stone Co. yielded crushed limestone for use in highway and railroad construction and maintenance and for riprap. Building sand and gravel were produced by J. J. Harrington at his pit and fixed plant at Sennett.

CHAUTAUQUA

Mineral production in Chautauqua County in 1952 was limited to sand and gravel and natural gas. The largest commercial sand and

gravel operator was W. Lee Bull, Inc., with a pit and fixed plant near Jamestown. Sack Bros. worked its pit and plant at Bemus Point during 9 months of the year and produced building sand and gravel for use in the immediate area. Sand and gravel for local building purposes were produced at a pit near Fredonia by Seybold Bros., Inc., and a small tonnage of paving and road gravel produced in 1951 was shipped from the inactive Irving plant and pit of the Buffalo Slag Co.

Natural gas continued to be recovered from wells drilled in the Medina sandstone.

CHEMUNG

Two commercial sand and gravel producers were active in Chemung County in 1952. Dalrymple Gravel & Construction Co., Inc., worked its pit and fixed plant near Elmira during part of the year. Building and paving sand and gravel were produced at the pit and fixed plant of Elmira Transit-Mix, Inc., Horseheads. The clay open pit of Consolidated Brick Co. at Horseheads yielded miscellaneous clays for brick manufacture. Natural gas was recovered from one field during the year.

CHENANGO

Sand and gravel, the only mineral products of Chenango County in 1952, were recovered from pits worked by Bundy Concrete Co., Sherburne, and Henry M. Champion, Greene.

CLINTON

Clinton County ranked sixth among New York counties in value of mineral output in 1952, with iron ore representing nearly 95 percent of the total value. Other mineral commodities produced in the county during the year included stone, lime, and sand and gravel. Republic Steel Corp. continued to produce magnetite iron ore at its Chateaugay underground and open-pit mine at Lyon Mountain. Ore deposits at this property occur in 2 parallel zones about 15 feet thick and are known locally as the foot-wall vein and the hanging-wall vein. The underground mine is opened to a depth of over 2,400 feet. Storage-battery locomotives are used to move ore from the working areas of the mine to the hoisting shaft. All ore is concentrated and sintered in the company 4,500-ton-per-day mill before shipment. In 1952 this property ranked 4th among iron-ore mines in New York State and 26th in the United States.

Stone production in the county in 1952 was limited to limestone and miscellaneous stone. Crushed limestone was quarried by Chazy Lime & Stone Co., Inc., and Plattsburg Stone Products Corp. for use in highway maintenance and agricultural purposes. Republic Steel Corp. produced miscellaneous crushed stone for highway construction and railroad ballast at its Chateaugay mine near Lyon Mountain. This material was a byproduct of operations for recovering iron ore. Chazy Lime & Stone Co., Inc., continued to produce quicklime and hydrated lime for chemical uses at its plant at Chazy.

Sand and gravel for highway maintenance were produced at several pits in the county by the Clinton County Highway Department, Plattsburg.

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COLUMBIA

Columbia County exceeded all other New York counties in the production of cement and ranked fourth among counties of the State in aggregate value of mineral output in 1952. Universal Atlas Cement Co. operated its mill and quarry on Becraft Mountain south of Hudson throughout the year. Near-capacity production was reported at the Greenport plant of Lone Star Cement Co. south of Hudson. Additions to the plant in 1952 included improvements in bulk loading facilities.

Building and paving sand and gravel were produced from a pit at Livingston by F. H. Stickles & Son. John Gibbons, Jr., and Whitehead Bros. Co. recovered molding sand from pits at Stuyvesant. A quantity of bank-run gravel was produced by Gardner Bros., Stuyvesant.

CORTLAND

The only mineral product reported produced in Cortland County in 1952 was a small tonnage of sand and gravel recovered by the Cortland County Highway Department for use in maintenance of county roads.

DELAWARE

The North River quarry of American Bluestone Co. near Unadilla yielded rough and dressed sandstone for building construction. Other producers of dimension sandstone in Delaware County in 1952 included Johnston & Rhodes Bluestone Co., East Branch, and Earl Tompkins, Fishs Eddy. A small tonnage of sand and gravel for highway maintenance was produced by the Delaware County Highway Department at Delhi.

DUTCHESS

In terms of value, limestone was the most significant mineral product of Dutchess County in 1952. Two quarries were active during the year, the largest of which was the New York Trap Rock Corp. quarry at Clinton Point near New Hamburg. Output from this operation was used for riprap, highway and railroad maintenance, and stone sand. Dutchess Quarry & Supply Co. worked its quarry at Clinton Corners and produced crushed limestone for highway maintenance, asphalt filler, and a variety of other uses. This company also produced paving sand and gravel from a pit at Clinton Corners. A sand and gravel pit at Fishkill worked by Fishkill Builders Supply Corp. yielded material for use in building construction in the immediate area.

Newton Hook Brick Co., Inc., Dinnings Point Brick Division, mined miscellaneous clays for brick manufacture from its open pit near Beacon.

ERIE

Erie County ranked first in gypsum and lime production, second in cement output, and third in total value of mineral production among New York counties in 1952. Less important mineral products included natural gas, sand and gravel, stone, and clays.

Three gypsum producers were active during the year; the largest was National Gypsum Co., which worked its mine and plant at Clarence Center throughout the year. Other active producers were Certain-teed Products Corp. mine and plant at Akron and Universal

Atlas Cement Co. mine near Clarence Center. The United States Gypsum Co. has a mixing plant at Buffalo which treats crude gypsum from its mines in Genesee County.

Capacity production was reported from the Federal Portland Cement Co., Inc., Buffalo plant in 1952. During the year the company increased its cement-storage capacity 96,000 barrels. Lehigh Portland Cement Co. operated its plant at Buffalo at near capacity throughout the year. Limestone used was received in crushed form by boat from quarries in Michigan; the shale was mined by the company at Shaleton, 12 miles south of the plant. Natural cement continued to be produced by the Louisville Cement Co. of New York at its plant near Akron. Production was marketed for use in mortar in brick and stone work.

Stone production in the county in 1952 was limited to crushed limestone from three active quarries. Buffalo Crushed Stone Corp. worked its quarry at Bowmansville throughout the year and produced rock for use in highway and railroad maintenance. The Cheektowaga quarry of Federal Crushed Stone Corp. was operated during the summer months; production was utilized for riprap, concrete, road metal, railroad ballast, agricultural purposes, and asphalt filler. The Kelley Island Lime & Transport Co., the largest lime producer in New York in 1952, produced quicklime and hydrated lime for chemical, building, and agricultural purposes at its plant at Buffalo.

Expanded perlite was produced at the Cheektowaga plant of Buffalo Perlite Corp.

Six commercial sand and gravel pits were in operation during 1952. Although the Buffalo Slag Co., Inc., did not work its pit at Springville, some paving gravel was sold from stocks at the plant. Buffalo Sand Co., Inc., worked its fixed plant and pit near Lancaster throughout most of the year and produced building and paving sand and gravel. Gravel Products Corp. continued to work its dredge on Lake Erie near Buffalo and produced a substantial tonnage of paving sand and gravel. Other sand and gravel producers included Meyer & Meyer, who produced bank-run gravel at pits in Lancaster and Alden; Genesee Sand & Gravel Corp., Lancaster; Clarence Sand & Gravel Corp., Clarence; Pfohl Bros., Inc., Cheektowaga.

Acme Shale Brick Co., Inc., the largest clay producer in the county in 1952, manufactured brick and heavy clay products from miscellaneous clays recovered at its pit near Lake View. Other producers of clay, in order of decreasing output, included John H. Black Co., East Aurora; Buffalo Brick Corp., West Falls; and Boston Valley Pottery Co., Boston.

ESSEX

In addition to ranking first in usable iron-ore output and second in total value of mineral production among counties in New York in 1952, Essex County continued to be the sole domestic commercial source of wollastonite and the principal domestic supplier of titanium (ilmenite) concentrates.

National Lead Co. continued during the year to recover iron and titanium concentrates from titaniferous magnetite ores at its MacIntyre mine and mill at Tahawus. This property is the world's largest producer of ilmenite concentrates and ranked 23d among iron-produc-

ing mines in the United States and 2d in New York State in 1952. Open-pit mining methods with electric shovels for loading and diesel trucks for hauling are employed. Ore from the mine is crushed and ground and treated on magnetic separators to produce a magnetite concentrate assaying about 10 percent titanium dioxide and 58 percent iron. The tailings from the magnetite separation are treated for recovery of titanium (ilmenite) concentrates and an iron product, which is sintered and sold to blast-furnace operators. Titanium (ilmenite) concentrates produced during 1952 were shipped to the National Lead Co. plant at Sayreville, N. J. and E. I. du Pont de Nemours & Co., Inc., plants at Edge Moor, Del., and Baltimore, Md., for manufacture of titanium pigments. Republic Steel Corp. worked its New Bed-Harmony-Old Bed and Fisher Hill underground mines near Mineville throughout the year, except for a period of idleness caused by the nationwide steel strike in midsummer. Ore from the New Bed-Harmony-Old Bed property is crushed at the mine and shipped by rail for concentration and sintering at the company Bartlett Pond Brook mill 3 miles northwest of Port Henry. Although the bulk of the material shipped from this property is in the form of concentrates and sinter, some direct-shipping ore is produced from the Old Bed vein. All ore from the Fisher Hill mine, 2 miles north of Mineville, is concentrated in the Bartlett Pond Brook mill and sintering plant.

In 1952 Cabot Mineral Division, Cabot Carbon Co., began constructing a $1,790,000 plant near Willsboro in which wollastonite concentrates will be produced on a commercial scale. The deposit at this location previously had been mined on a small scale by Willsboro Mining Co. It was reported that the new mill will use a variation of pilot-plant operation, which includes preliminary crushing in jaw crushers and rolls, magnetic separation, air tabling, and fine grinding in conical and tube mills.[6] The capacity of the plant will be about 180 tons a day of the bagged product, which will be marketed principally to the ceramic and paint industries. Development of the wollastonite mine yielded byproduct garnet (variety andradite), which the company sold primarily to mineral collectors. A marketable crude-garnet concentrate will be a byproduct of the new mill.

Sand and gravel were produced during the year by Saranac Lake Sand & Gravel Co., Inc., from its pit and fixed plant at Saranac Lake and by the Essex County Highway Dept., Elizabethtown. A small tonnage of dimension granite was produced by the Mining & Quarrying Association near Keeseville.

FRANKLIN

Sand and gravel were the sole mineral products of Franklin County in 1952. Louis Para produced building sand and gravel from his pit and fixed plant near Malone. Bank-run gravel recovered from a pit at Paul Smith's College was used by the New York State Highway Department for the winter treatment of highways in the immediate area.

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[6] Hall, A. L., Ladoo, R. B., Secord, R. N., and Stokes, C. A., Wollastonite—a New Venture in Nonmetallic Minerals: Paper delivered at the New York meeting of AIME ,Feb. 21, 1952.

FULTON

Seven commercial sand and gravel plants were in operation in Fulton County in 1952. Art Stone Co. worked its pit and fixed plant at Gloversville during the first 3 months of the year and produced building sand and gravel. Bank-run gravel for maintenance of county roads was produced at pits operated by Edward Bradt, Gloversville; John Edwards, north of St. Johnsville; and Norman Smith, Lassellsville. Other producers during the year included A. Frederick, who purchased the John C. Moynehan pit at Gloversville October 1, 1952, and Fred Machold Estate, with a pit at Broadalbin.

GENESEE

Gypsum continued in 1952 to be the leading mineral product, in terms of value, in Genesee County. The only producer of crude material during the year was the United States Gypsum Co. mine and plant near Oakfield. National Gypsum Co. operated its mill in the western part of the county and calcined crude gypsum but did not produce crude material from its mine.

Stone produced during the year was limited to crushed limestone. General Crushed Stone Co., North Leroy No. 1 quarry, was the principal county source of this material in 1952. Production was utilized for highway and railroad maintenance. Other producers during the year included Leroy Lime & Crushed Stone Corp., with a quarry at Le Roy, and Genesee Stone Products Corp. with a quarry at Stafford. Production from these quarries was used for highway and railroad construction. Some limestone for agricultural purposes was also produced at the Stafford quarry.

Two commercial sand and gravel pits, both in Batavia, were active in 1952. Operators included Batavia Washed Sand & Gravel Co., Inc., and Philip A. Penepent.

GREENE

Greene County ranked fifth among mineral-producing counties in New York in value of mineral output in 1952, largely as a result of the concentration of portland-cement-manufacturing plants in the county. These plants, all near the Hudson River, have the advantage of easy access to tidewater and to important markets on the Atlantic Seaboard. Abundant reserves of limestone in the ledges of the Helderberg formation are available a short distance from the river. The Catskill plant of North American Cement Corp. at Alsen was operated at near capacity throughout 1952. Except for fuel and a few minor items, the raw materials consumed in manufacturing cement were quarried locally. Alpha Portland Cement Co. worked its plant at Cementon throughout the year and produced general-use, high-early-strength, and air-entrained portland cement. This plant was the first portland-cement mill constructed in Greene County; initial shipments of portland cement were made in 1900. Lehigh Portland Cement Co. operated four cement kilns at Alsen, virtually at capacity throughout the year.

Sand and gravel for use in winter maintenance of highways were recovered from a pit at Windham by Lawrence Bros. Whitehead Bros. produced molding sand from pits at Catskill and Coxsackie.

HERKIMER

General Crushed Stone Co. worked its Jordanville quarry and crusher throughout the year and produced crushed limestone for riprap, road metal, and agricultural purposes. A quarry at Newport was worked by Newport Quarries, Inc., and yielded crushed limestone for highway construction and maintenance.

Two commercial sand and gravel pits were active during the year. B. M. B. Sand & Gravel, Inc., operated its plant and pit at Gravesville during the early part of the year, after which it was sold to Eastern Rock Products Co., Inc., Utica. Building sand for use in the immediate area was produced by F. J. Steber from a pit at Poland.

JEFFERSON

Mineral products of Jefferson County in 1952 were limited to sand and gravel and limestone. The Watertown pit of Colwell Bros. was worked several months during the year and yielded building sand and gravel. Other operators in Watertown area included Anthony Marzano and Angelo Vespa. Building sand and gravel were produced by Tomlinson Bros. from April through December at its pit on Route 11 near Antwerp. A pit south of Spragueville was worked during part of the year by George Cooke.

The Watertown quarry of General Crushed Stone Co. yielded crushed limestone, which was utilized for highway and railroad maintenance and for agricultural purposes.

KINGS

F. E. Grauwiller Transportation Co., Inc., worked its dredge near Barren Island in Rockaway Inlet an average of 20 days per month during the year and recovered sand, which was used for building, engine, filter, and railroad purposes.

LEWIS

Talcose limestone was quarried by Carbola Chemical Co., Inc., at its underground mine at Natural Bridge; output was milled for use as a filler in insecticides and paints. The only sand and gravel produced in Lewis County in 1952 were recovered from pits worked by the Lewis County Highway Department, Lowville.

LIVINGSTON

Salt continued in 1952 to be the most important mineral product of Livingston County. As in previous years, the underground mine of International Salt Co., Inc., at Retsof yielded rock salt, which was milled, screened, and packaged for shipment at the company plant at the mine. The only commercial producer of sand and gravel during the year was Valley Sand & Gravel Corp., which operated a pit and fixed plant at Avon. Calcareous marl for agricultural uses was produced by Louis J. Johnston.

MADISON

Crushed limestone for road metal, agricultural purposes, and riprap was the principal mineral product of Madison County in 1952. Out-

put came from quarries at Munnsville and Perryville worked by Munnsville Limestone Corp. and Worlock Stone Co., Inc., respectively. A small tonnage of miscellaneous stone for use in rock gardens was produced by John Filose at a quarry near Chittenango.

MONROE

Mineral products of Monroe County in 1952, in order of decreasing value of output, were limestone, sand and gravel, and gypsum. Dolomite Products Co., sole producer of limestone, worked its plants at Gates and Penfield throughout most of the year, producing crushed limestone for riprap, highway and railroad construction and maintenance, and agricultural purposes.

Sand and gravel for building and road construction in the Rochester area were produced by Elam Bros. Corp., John E. Redman Sand & Gravel Corp., and Rappl & Hoenig Co. Russo Sand & Gravel Co. recovered building sand and gravel from its pit at Bushnell Basin near Pittsford during the year. Hoadley Sand & Gravel Co. worked a pit at Webster and produced building and paving sand and gravel. Active producers at Spencerport included Ingersoll Supply & Equipment Corp. and a lessee who worked a pit owned by Paul Harter. The largest producer in the county in 1952 was Valley Sand & Gravel Corp. which worked its pit and fixed plant south of Scottsville most of the year.

The sole producer of gypsum in Monroe County in 1952 was Ebsary Gypsum Co., Inc., mine and mill near Wheatland Station. Both crude gypsum and manufactured products were produced.

MONTGOMERY

St. Johnsville Supply Co., Inc., operated the only sand and gravel pit and washer plant active in Montgomery County in 1952. Output was sold to the New York State Highway Department.

Crushed limestone for highway construction and maintenance was produced at a quarry west of Pattersonville by Crushed Rock Products, Inc. Cushing Stone Co., Inc., worked its quarry at South Amsterdam during the summer months and produced crushed limestone for riprap, highway construction, and railroad ballast.

NASSAU

Nassau County ranked first in the State in the production of sand and gravel in 1952. Eleven commercial operations active during the year provided nearly 30 percent of the total State output. The largest producer was the Colonial Sand & Stone Co. plant and pit at North Hempstead. This company also worked its pit and plant at Port Washington. U. S. Dredging Corp. continued to produce paving sand and gravel at its dredge offshore at Huntington. Other large producers in 1952 included Metropolitan Sand & Gravel Corp., Port Washington; J. W. Robinson & Sons, Farmingdale; Flatland Sand Excavating Corp., Syosset; Builders Sand & Gravel Corp., East Meadows; Pine Hollow Sand & Gravel Co., Oyster Bay; and Searington Sand & Gravel Co., Inc., Hicksville.

Nassau Brick Co., Inc., sole producer of clay in the county in 1952, manufactured common brick from clay recovered at its pit at Farmingdale.

NIAGARA

Mineral products of Niagara County in 1952 included limestone and sand and gravel. Frontier Stone Products, Inc., produced crushed limestone for metallurgical purposes, road metal, and agricultural uses at its quarry at Lockport. Crushed limestone produced at the Niagara Stone Corp. Niagara Falls quarry was used in airport construction in the area. This quarry also yielded limestone, which was crushed for use as an asphalt filler. The Gasport quarry of Colorado Fuel & Iron Corp. was worked most of the year and yielded crushed limestone for metallurgical purposes, highway maintenance and construction, and agricultural uses.

Two commercial sand and gravel pits were active in the county in 1952. Building and paving sand and gravel were produced at the Lockport pit and fixed plant of Gasport Sand & Gravel Co., Inc.; George W. Bewley produced a small quantity of bank-run gravel at a pit near Lockport.

ONEIDA

Eastern Rock Products, Inc., worked its Oriskany Falls and Prospect quarries throughout the year and recovered limestone, which was crushed for use in railroad and highway construction and maintenance and for agricultural purposes.

Six commercial producers of sand and gravel were active in Oneida County in 1952. Molding sand for cores was produced by George W. Bryant Core Sands, Inc., from its pit near McConnellsville. Molding sand was also produced at Whitehead Bros. Co., which worked its pit at McConnellsville during most of the year. The pits and plants of Eastern Rock Products, Inc., at Barneveld and Booneville yielded building and paving sand. Keith Lee, leasee on a pit near Barneveld, recovered bank-run paving gravel. Clinton Metallic Paint Co. continued to produce red iron for use as a pigment in paint manufacture at its mine and mill at Clinton.

ONONDAGA

Mines, pits, quarries, and wells in Onondaga County yielded stone, salt, cement, sand and gravel, and clays in 1952. Allied Chemical & Dye Corp., Solvay Process Division, worked its Jamesville quarry throughout the year and produced crushed limestone for a number of uses, including highway and railroad construction, agricultural purposes, and preparation of chemicals. A quarry worked during the summer on Brickyard Falls farm near Manlius yielded rough dimension limestone and a small tonnage of flagging.

Artificial brines obtained from water circulated in wells at Tully, which have tapped rock-salt beds continued to be the source of evaporated salt and sodium compounds produced at the Allied Chemical & Dye Corp., Solvay Process Division, Solvay plant. Limestone quarried at the company Jamesville quarry a few miles from Solvay yields carbon dioxide essential in preparing sodium compounds. Evaporated salt is produced by the vacuum-pan process.

Alpha Portland Cement Co. operated its cement plant at Jamesville at near capacity in 1952. Limestone used at this plant is obtained at the Jamesville quarry of Allied Chemical & Dye Corp., Solvay Process Division. In November the company began revising the milling procedure from dry process to wet process.

Building and paving sand and gravel were produced at the General Crushed Stone Co. fixed plant and pit near Fayetteville. R. E. McCarthy & Sons worked a portable plant and pit at Solvay and produced building and paving gravel for the New York State Highway Department and the city of Syracuse. Bank-run gravel for road maintenance was produced at a pit in South Onondaga by Clarence Nichols. Syracuse Sand & Gravel Co., Inc., worked its pit at Nedrow throughout the year, except for a period of dry weather in the late summer which caused a shortage of water used for cleaning and washing. During the year the company produced building sand, filter sand, building gravel, and unwashed bank-run gravel. Building sand and gravel were produced from a pit at Nedrow by William F. Saunders & Sons, Inc.

The Cicero pit of Syracuse Brick Co. yielded miscellaneous clays, which were used for manufacturing brick and heavy clay products.

Expanded perlite was produced at the Syracuse plant of Minerals Processing Corp.

ONTARIO

Building and paving sand and gravel were produced in 1952 by Ontario Sand & Gravel Co., Inc., at its pit and fixed plant near Phelps. A pit near Oaks Corner, worked by Nathan Oakes & Sons, yielded sand for building construction and winter maintenance of highways. Crushed limestone for riprap and highway and railroad construction and maintenance was quarried at Geneva by General Crushed Stone Co.

ORANGE

Middle Hope Sand & Gravel Co. produced building sand and building and paving gravel at its pit near Newburgh. Other producers in the Newburgh area were Newburgh Sand, Stone & Gravel Corp. and Windsor Building Supplies Co., Inc. The Middletown pit of Dickinson Sand & Gravel Co. yielded paving and filter sand and building gravel. Seasonal activity at the pit and fixed plant of E. C. Townsend Estate yielded a small tonnage of building sand and gravel. Miscellaneous clays were produced by Jova Brick Works at its pit at Newburgh.

ORLEANS

The sole mineral product of Orleans County in 1952 was bank-run gravel for road maintenance produced by Arnold H. Picketts Sand & Gravel Co. and the Orleans County Highway Dept.

OSWEGO

General Crushed Stone Co. continued to work its pit and fixed plant at Lacona in 1952 and produced building and paving sand and gravel. Sand and gravel for the preparation of ready-mixed concrete and cement blocks were produced at a pit near Volney by Massaro Co., Inc. Whitehead Bros. Co. pit near Pulaski yielded molding sand.

OTSEGO

Sand and gravel were the only mineral products reported from Otsego County in 1952. Commercial operators active during the year included Seward Gravel Co., with a pit at Colliersville; Unadilla Concrete Products Co., Unadilla; and Homer F. Baker, Richfield Springs.

PUTNAM

Crushed limestone produced by Eastern Mineral Co., Inc., at its quarry at Patterson was the only mineral product of Putnam County in 1952. Output during the year was used for agricultural purposes and as a filler in soap, fertilizer, and flooring compounds.

RENSSELAER

Bleau Brick Works, Inc., produced a small tonnage of clay for use in manufacturing heavy clay products from its pit at Troy. Champlain Brick Co. worked its pit across the Hudson River from Mechanicville during the year and produced clay for use in the manufacture of high-grade tile and heavy clay products.

Sand and gravel were recovered from pits at Averill Park by Albert Flaxmyer and Everett Holser.

Fitzgerald Bros. Construction Co., Inc., quarried grit for highway construction at its quarry at Cropseyville.

ROCKLAND

Three quarries produced basalt in Rockland County in 1952; the largest was the Haverstraw quarry of New York Traprock Corp., Inc., where output was crushed for use in highway and railroad construction and maintenance. Other producers of crushed basalt included Suffern Stone Co., Suffern, and West Nyack Taprock Co., West Nyack.

The Tomkins Cove quarry of New York Traprock Corp., Inc., was worked throughout the year and yielded crushed limestone, which was used for riprap, highway construction and maintenance, and stone sand.

Sand and gravel were produced in Rockland County in 1952 by Graney Building Materials Corp., Sparkill, and Mount Ivy Sand & Gravel Co.

ST. LAWRENCE

St. Lawrence County ranked first among the mineral-producing counties in the State in 1952, supplying 14 percent of New York's total dollar volume of mineral production during the year. Mineral products, listed in order of decreasing value, included zinc, iron ore, talc, lead, stone, pyrite, sand and gravel, lime, and silver.

St. Joseph Lead Co. operated its Balmat and Edwards mines continuously throughout the year, except for a period of a labor strike from July 1 through September 14. Silver, lead, and zinc are produced from the Balmat mine and zinc from the Edwards property. The Balmat mine also yielded byproduct pyrite concentrates.

Jones & Laughlin Ore Corp. continued to work its Benson mine near Starlake throughout 1952. This property was the largest crude-iron-ore producer in the State during the year and ranked sixth among iron-ore producers in the United States. Mining operations include removal of earth and barren rock overburden, primary drilling and blasting of ore, and such secondary drilling and blasting for loading as are required. Five-cubic-yard electric shovels load ore into 22-ton diesel trucks for haulage to the mill.

Crude ore from the open-pit workings is crushed, ground, and concentrated by magnetic and gravity methods. Concentrates produced are sintered before shipment to the company's steel mills in the

Pittsburgh, Pa., area. Plant facilities were expanded in January 1952 to beneficiate the nonmagnetic martite ores which occur at the mine. Martite concentrates are recovered by gravity methods and sintered in the same manner as the magnetite concentrates.

The International Talc Co. mine near Gouverneur continued to be the largest producing talc property in New York State. Crude production was ground for use in the paint and ceramics industries and as an asphalt filler. Other talc mines active in the county in 1952 included the Gouverneur Talc Co. and W. H. Loomis Talc Corp. properties in Fowler Township.

Three limestone quarries were active in St. Lawrence County in 1952. The largest—the Norwood quarry of Barrett Division, Allied Chemical & Dye Corp.—yielded crushed limestone for use in highway maintenance and construction and for agricultural purposes. McConville, Inc., worked its Ogdensburg quarry and produced crushed limestone, which was used for highway construction. Balducci Crushed Stone Co. recovered crushed limestone for use in highway construction and agricultural purposes from its quarry at Gouverneur.

Vance Lucas produced unwashed bank-run sand for use in winter maintenance of highways at his pit near Massena. Molding and building sand and building and paving gravel were recovered from a pit near Massena by Kenneth J. Premo & Co. Other producers of sand and gravel in the county in 1952 included James Coffey, Pine Hill; McConville, Inc., Ogdensburg; and Putnam-Hawley Building Materials Co., Potsdam.

Lime for agricultural uses was produced during the year by Balducci Crushed Stone Co. at its plant at Gouverneur.

SARATOGA

Twelve commercial sand and gravel producers were active in Saratoga County in 1952; most of the output was molding sand. Whithead Bros. Co., the largest producer, washed material from a number of pits in the county. Other large producers of molding sand during the year, in order of decreasing output, included W. J. Dyer, who operated a pit and portable plant at Gansevoort; John B. Belott & Son, Elnora; Albany Sand & Supply, Ushers and Schuylerville; and Jewett Sand Co. and Hynes Bros., both at Ushers. Hudson Valley Sand & Stone Co. worked its pit and fixed plant near Wilton and produced building sand and gravel and paving sand. A pit near Waterford was worked by G. F. Fannucci Sons.

Dimension limestone and crushed limestone were produced in 1952 at the Saratoga Springs quarry of Pallette Stone Corp. Dimension stone quarried was untrimmed for use in foundations and retaining walls; crushed limestone was used as riprap, in highway construction, and for agricultural purposes.

SCHENECTADY

Scotia Stone & Gravel Co. recovered road and building sand and gravel from its pit at Scotia during the year. Lattanzio Sand & Gravel Co., Inc., worked its pit and fixed plant at Glenville and recovered paving sand and gravel. Bank-run gravel for highway construction was recovered from a pit near Scotia by Midway Gravel Co.

SCOHARIE

North American Cement Corp. operated its Howes Cave plant at near capacity in 1952. Limestone and clay for use in the manufacture of portland cement were quarried at company operations nearby. Crushed limestone for use in highway construction was produced at the Schoharie quarry of Schoharie Stone Corp.

SCHUYLER

Evaporated salt was recovered from artificial brines at the Watkins Glen plants of International Salt Co., Inc., and The Watkins Salt Co. Although some salt produced was recovered by direct-heat evaporation in open pans, the bulk of the output in 1952 was obtained by the vacuum-pan process, using steam evaporation.

SENECA

The Montezuma marshes in Northeastern Seneca County yielded a small tonnage of peat for local use as a soil conditioner.

STEUBEN

Three commercial sand and gravel producers were active in the county in 1952. Rhinehart & Sons Sand & Gravel Co. worked its pit near Corning during part of the year and produced building and paving sand and gravel. Sand and gravel for building construction in the immediate area were produced at the Painted Post pit of Painted Post Sand & Gravel Co. The Cohocton pit of Buffalo Slag Co. yielded building and paving sand and gravel.

Natural gas and crude petroleum continued to be recovered from wells in the Allegany field of Steuben County.

SUFFOLK

Sand and gravel were the sole mineral products of Suffolk County in 1952. Principal producers during the year were Steers Sand & Gravel Corp., with a pit and fixed plant at Northport; East Coast Lumber Terminal, Inc., with a pit near Farmingdale; and the Metropolitan Sand & Gravel Co., Northport pit and plant. Other active sand and gravel operations in 1952 included the Port Jefferson Station pit and fixed plant of W. J. McLain; Huntington Sand & Gravel Co., Inc., Huntington; Riverhead Cement Block Co., Inc., Riverhead; Setauket Sand & Gravel Co., East Setauket; Irving Lathan, East Marion; and East End Gravel Co., East Hampton Township.

SULLIVAN

Three commercial sand and gravel producers were active in the county in 1952; the largest was Sullivan Highway Production Corp., which operated a pit and fixed plant at Summitville. Other producers included Louis Pshonick, who operated a pit in Loch Sheldrake road near Liberty, and the pit and plant of Roy Crandall, Inc., near Jeffersonville.

TIOGA

Herman E. Bunce, with a pit and fixed plant at Barton, was the only sand and gravel producer active in Tioga County in 1952. Material produced included building and paving sand and gravel.

TOMPKINS

Cayuga Rock Salt Co., Inc., continued in 1952 to work its rock-salt mine and mill on the east side of Cayuga Lake at Portland Point. Evaporated salt was produced by the vacuum-pan process from artificial brines at the Myers plant of International Salt Co., Inc. West Shore Salt Co. recovered a small tonnage of evaporated salt by open-pan methods. Paul Mancini & Sons quarried sandstone for use in rough construction and flagging at its East Ithaca quarry in 1952.

ULSTER

Mineral products of Ulster County in 1952 included clays, natural cement, stone, and sand and gravel. Miscellaneous clays for manufacture of heavy clay products was produced by Star Brick Co., at its pit at Kingston. Heavy clay products were manufactured from clay recovered at the Kingston pit of the Hutton Co. Other producers of miscellaneous clays in the county in 1952 included East Kingston Brick Corp., and Brigham Brick Corp., both of East Kingston; and Alva S. Staples, Malden-on-Hudson.

Century Cement Manufacturing Co., Inc., continued in 1952 to produce natural and special mortar cements at its plant at Rosendale.

The Callanan Road Improvement Co. quarry and plant No. 3 at Kingston yielded crushed limestone, which was used for road construction and riprap. A small tonnage of rough dimension stone was produced at a quarry near Accord by Vincent Lorenz.

Molding and building sands were produced by Robert Main & Co., Saugerties, and Anthony Costanzi, Kingston, respectively.

WARREN

The Glens Falls plant of Glens Falls Portland Cement Co. operated at capacity throughout 1952 and quarried limestone for preparation of the cement locally. Jointa Lime Co., Inc., worked its quarry at Glens Falls during part of the year and produced crushed limestone for highway construction and maintenance.

The open-pit mine of Barton Mines Corp. 5 miles west of North Creek continued to yield rock containing 10 to 12 percent garnet in large crystals. Crude garnet, principally the variety almandite, is recovered in the milling process which includes crushing, screening, and heavy-medium separation methods. The crude, concentrated garnet is packed in bags weighing 100 to 150 pounds each and shipped to producers of abrasive paper and cloth.

WASHINGTON

Washington County continued in 1952 to be the sole source of slate in New York. Twenty operators were active during the year, the largest of which was Staso Milling Co., Hampton. Other producers, in order of decreasing outputs, were Tatko Bros. Slate Co., Inc., and Hilltop Slate Co., both in Middle Granville; Joseph A. Ponda Slate Co., Granville; and Sheldon Slate Products Co., Inc., Middle Granville. The aggregate production of these firms was 91 percent of the State total slate output.

Sand and gravel for highway maintenance were produced in small quantities at a number of pits in the county in 1952. The largest

producer was Julius H. Hunt, who recovered bank-run gravel from a pit near Fort Ann. Other producers included Ernest Leclaire, Dresden; Raymond Sheehan, North Granville; George Keyes, West Hebron; Hattie Dawson, Fort Ann; James Weaver, West Hebron; Ray Stout, Argyle; and Mrs. Henry Holly, who sold gravel on a contract basis to local building contractors in the area surrounding Hudson Falls.

Hudson Valley Sand & Stone Co. worked its Bruno's quarry at Middle Falls throughout the year and produced crushed limestone, most of which was used for highway construction.

WAYNE

Commercial sand and gravel operators active in Wayne County in 1952 included New York Central Railroad; Genthner Bros., East Palmyra; and Llewellyn Welch, Savannah. Production was largely bank-run gravel. Abram Cleason worked his quarry near Sodus during the first half of 1952 and produced crushed limestone for highway and agricultural use. The crushing plant and quarry were sold to General Crushed Stone Co. on June 30, 1952.

WESTCHESTER

The sole producers of emery in New York and in the United States in 1952 were Joe DeLuca, who operated the DeLuca mine, and the Kingston property of DiRubbo & Ellis, both near Peekskill.

Four commercial sand and gravel plants were active in Westchester County in 1952. The Mount Kisco pit of Empire Sand & Stone Corp. yielded paving sand and gravel. The leased pit of Warden Sand & Gravel Co., Inc., on Harris Road near Bedford Hills was worked 9 months of the year and yielded building sand and gravel. During the summer months Peekskill Masons Supply Co. worked its pit and fixed plant on Sprout Brook road near Peekskill. Building sand and a small tonnage of gravel were recovered at the Bedford Hills pit and fixed plant of Bedford Hills Concrete Products Corp.

Quarries operated near Yonkers by Q. & D. Ciuffetelli and Joseph Saso yielded granite dimension stone for building purposes.

Ground limestone, for agricultural purposes, and asphalt filler were produced during the year at the New York Traprock Corp. Verplanck mill. Limestone for milling was produced at other quarries of the corporation in adjacent counties.

WYOMING

Morton Salt Co. continued to recover evaporated salt from artificial brines at its plant at Silver Springs. It was in this county that the manufacture of salt from artificial brines in New York State originated. An exploratory well drilled for oil in 1878 at Wyoming disclosed a thick bed of salt at 1,300 feet, which yielded a saturated brine amenable to evaporation.

American Bluestone Co. worked its Amblues quarry near Portageville during 1952 and produced dressed architectural dimension stone and crushed sandstone for use as riprap.

YATES

John M. Jensen recovered gravel for highway maintenance in the immediate area at his pit and fixed plant near Benton.

The Mineral Industry of North Carolina

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of North Carolina.

By James L. Vallely [1] and Jasper L. Stuckey [2]

MINERAL PRODUCTION in North Carolina was valued at $34,726,000 in 1952, an increase of 17 percent above 1951. Most minerals gained in production over 1951, but the output of clays, olivine, quartz, titanium minerals, and vermiculite declined. Stone, sand and gravel, tungsten, feldspar, mica, clays, and talc, in the order named, were the most valuable of the State's mineral products.

Columbite-tantalite and tin concentrates were obtained for the first time as byproducts in milling spodumene (lithium ore). Ilmenite

TABLE 1.—Mineral production in North Carolina, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Abrasive stone: Millstones	(2)	$6,000	(2)	$9,285
Clays	1,462,030	2,177,515	1,357,700	2,080,172
Coal	(3)	(3)	1,600	12,684
Feldspar (crude)—long tons	166,361	1,230,404	240,364	2,416,031
Mica:				
Scrap	52,550	1,441,886	58,576	1,551,071
Sheet—pounds	464,949	127,204	595,331	664,075
Sand and gravel	7,656,370	4,435,702	8,724,748	5,665,169
Stone	[4] 8,612,967	[4] 13,292,690	[4] 9,647,513	[4] 14,694,698
Talc, pyrophyllite, and soapstone (ground)	113,950	1,982,927	115,481	1,771,518
Tin—long tons	1	1,724	4	11,601
Titanium concentrate (ilmenite)	32,400	(3)	25,328	(3)
Tungsten concentrate—60-percent WO_3 basis	1,041	(3)	1,254	(3)
Undistributed: Abrasive stones (grinding pebbles and tube-mill liners), asbestos, beryllium concentrate (1951), columbium-tantalum ore (1952), lithium minerals, olivine, quartz, stone (dimension marble, 1951–52, and crushed marble, 1952), vermiculite, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		[5] 4,951,305		5,849,314
Total North Carolina		29,647,000		34,726,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production.
[2] Weight not recorded.
[3] Value included with "Undistributed."
[4] Excludes certain stone, value for which is included with "Undistributed."
[5] Revised figure.

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[2] State geologist, North Carolina Geological Survey, Raleigh, N. C.

production was suspended in October by the only producer in North Carolina.

Under the Defense Minerals Exploration Administration program, which renders Government assistance in the exploration and development of critical and strategic minerals, 45 projects were active or completed in 1952. The following is a general summary of funds expended on DMEA projects in North Carolina during the year:

Mineral	Number of projects	Money expended	
		By Government	Total
Mica	43	$111,330	$123,726
Nickel	1	9,306	10,340
Talc	1	13,733	15,303
Total	45	134,369	149,369

More detailed tabulations are included in the County section of this chapter.

Figure 1 shows the value of mineral production in North Carolina, 1932–52, in million dollars.

REVIEW BY MINERAL COMMODITIES

METALS

Columbite-Tantalite.—Columbite-tantalite concentrate (70 percent combined pentoxides) was recovered in the treatment of lithium ore (spodumene) for the first time at the mill of Foote Mineral Co. near Kings Mountain.

Gold and Silver.—No gold or silver has been produced in North Carolina since 1949, when 13 ounces of gold was reported. The last previous year of production before 1949 was 1944, when 21 ounces of gold and 1,461 ounces of silver were produced. The total gold production since 1799 has been 1,164,601 fine ounces, and silver production for the same period was 357,223 ounces.

Nickel.—Assisted financially by DMEA, the Olivine Products Corp. explored the Consolidated Nickel Co. property in Jackson County. DMEA contributed $9,306 of the approved $10,340 expended on the project during 1952.

Tin.—Foote Mineral Co. recovered tin concentrate for the first time in its mill treating lithium ore (spodumene) near Kings Mountain, Cleveland County.

Titanium.—Ilmenite production in 1952 decreased 22 percent in tonnage and 21 percent in value below 1951. Yadkin Mica & Ilmenite Co., a subsidiary of the Glidden Co. and the only producer in the State, closed its mine at Finley, Caldwell County, in October 1952.

Tungsten.—Tungsten concentrate was produced by the Tungsten Mining Corp. from the Hamme mine in Vance County. Hübnerite is the most important of the tungsten minerals present in the ore, but significant quantities of scheelite are also recovered. During the year the Sneed shaft was sunk from the 785-foot level to 885 feet and the Central shaft deepened 117 feet to 944 feet; 10,424 feet of develop-

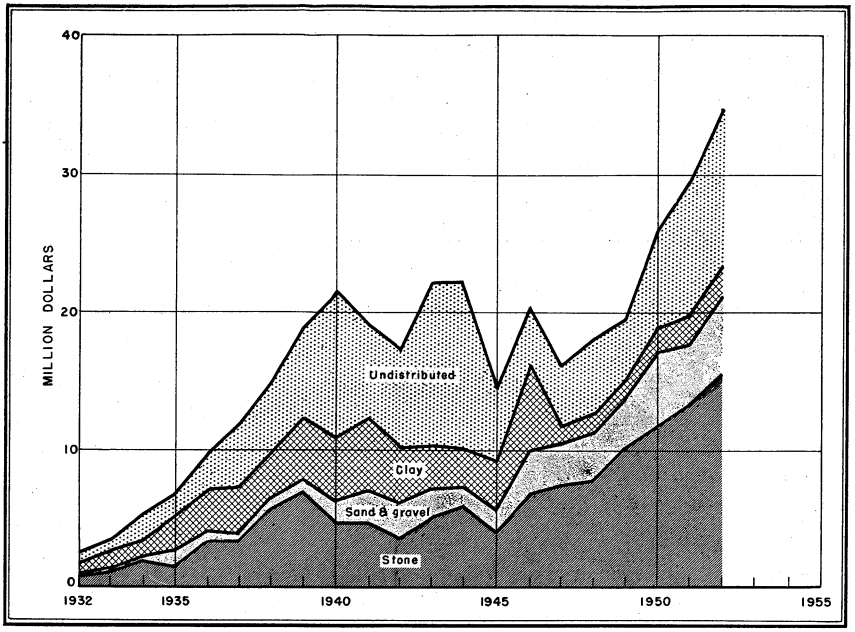

FIGURE 1.—Value of mineral production in North Carolina, 1932–52, in million dollars.

TABLE 2.—Production and shipments of ilmenite (concentrate, 51 percent TiO_2, average) in Caldwell County, 1944–47 (average) and 1948–52

Year	Production	Shipments	Year	Production	Shipments
1944–47 (average)	19,250	19,650	1950	26,543	25,853
1948	28,990	28,790	1951	32,100	32,400
1949	31,364	31,714	1952	24,928	25,328

ment work was completed, as well as 16,347 feet of diamond drilling. The milling plant was enlarged to handle 600 tons a day. Production in 1952 was 1,468 tons of concentrate containing 74,904 units of WO_3 and sales were 1,452 tons containing 75,226 units, increases of 21

TABLE 3.—Tungsten concentrate produced and shipped, 1943–47 (average) and 1948–52

Year	Produced		Shipped from mines	
	Short tons, 60 percent WO_3	Units	Short tons, 60 percent WO_3	Units
1943–47 (average)	250	14,975	241	14,437
1948	942	56,522	965	57,924
1949	942	56,484	770	46,216
1950	1,088	65,271	1,240	74,393
1951	1,035	62,078	1,041	62,463
1952	1,248	74,904	1,254	75,226

and 20 percent, in units of WO_3, respectively, over 1951. The value of shipments increased correspondingly by 21 percent over 1951.

NONMETALS

Abrasives.—Grinding pebbles, millstones, and tube-mill liners were produced in Rowan County in 1952. The total value of these products was more than double that in 1951.

Asbestos.—Small tonnages of amphibole asbestos are mined intermittently in North Carolina, but no production was reported in 1952.

Beryl.—No beryl was produced in North Carolina in 1952, although small tonnages were recovered in 1949 and 1951.

Clays.—Total clays sold or used by producers decreased from 1,462,000 tons valued at $2,177,500 in 1951 to 1,357,700 tons with a value of $2,080,200 in 1952—reductions of 7 percent in tonnage and 4 percent in value. Kaolin showed a loss of 10 percent in quantity and 11 percent in value, while miscellaneous clays production and value were, respectively, 7 and 1 percent lower than in 1951.

Two companies produced kaolin in 1952, and 32 others produced miscellaneous clays and shale for use in the manufacture of clay products.

TABLE 4.—Clays sold or used by producers, 1945–47 (average) and 1948–52

Year	Short tons	Value	Year	Short tons	Value
1945–47 (average)	836,359	$1,092,075	1950	1,437,202	$1,766,785
1948	1,204,747	1,436,417	1951	1,462,030	2,177,515
1949	1,181,047	1,335,954	1952	1,357,700	2,080,172

Feldspar.—North Carolina was the only State that showed an increase in feldspar production in 1952 compared with 1951; it was the largest producer, with 57 percent of the total United States output.

Crude feldspar sold or used totaled 240,400 long tons valued at $2,416,000 in 1952. This was an increase of 44 percent in tonnage and 96 in value over 1951 and increases of 4 and 101 percent, respectively, in quantity and value over 1946, the former peak production year for the State.

TABLE 5.—Crude feldspar sold or used by producers, 1943–47 (average) and 1948–52

Year	Long tons	Value	Year	Long tons	Value
1943–47 (average)	166,972	$916,016	1950	183,027	$1,107,061
1948	201,774	1,116,825	1951	166,361	1,230,404
1949	160,916	973,431	1952	240,364	2,416,031

Lithium Minerals.—Spodumene production in 1952 greatly expanded over that of 1951, the first year of lithium-ore production in the State since 1945. Foote Mineral Co., the only producer, owns and operates the same properties from which production was obtained before 1946.

Mica.—Mica production continued to expand in 1952. Scrap and flake mica sold or used by producers was 58,600 tons valued at

$1,551,100, increasing 11 percent in tonnage and 8 percent in value above 1951. Sheet mica sold or used rose from 465,000 pounds valued at $127,200 (including 419,500 pounds of uncut punch and circle valued at $84,100) in 1951 to 595,300 pounds with a value of $664,100 in 1952, gains of 28 and 422 percent in quantity and value, respectively. The total value of mica sold or used in 1952 was $2,215,100, a 41-percent increase over 1951 ($1,569,100).

General Services Administration opened its mica-purchasing depot at Spruce Pine, the center of the North Carolina mica industry, in July 1952 and purchased 35,900 pounds of sheet mica valued at $543,800. This represented 6 percent of the total sheet-mica production for the year; but, because of the increased prices paid by the depot, it actually represented 82 percent of the value of sheet mica produced.

Olivine.—Harbison-Walker Refractories Co. was the principal producer of olivine during 1952.

Olivine sold or used declined 20 percent below 1951, but its value increased 42 percent.

Quartz.—Quartz production decreased 10 percent in tonnage and 7 percent in value from 1951. There were only 2 producers in North Carolina in 1952, 1 each in Anson and Mitchell Counties.

Sand and Gravel.—Sand and gravel production constituted 16 percent of the value of all mineral production of the State in 1952, being second only to stone. Total tonnage and value in 1952 increased 14 and 28 percent, respectively, over 1951, with commercial production representing 52 percent of the total tonnage and 74 percent of the value.

Commercial production increased 34 percent in tonnage and 43 percent in value above 1951, while noncommercial production and value decreased 2 percent from 1951.

Stone.—Stone ranked first in the mineral output of the State in 1952, comprising 42 percent of the total value of all minerals. Production was 9,647,500 tons valued at $14,694,700, increases of 12 and 11 percent, respectively, in quantity and value above 1951. Commercial stone represented 79 percent of the tonnage and 84 percent of the value of total stone production. Commercial stone increased 12 percent in quantity and 13 percent in value over 1951. Noncommercial stone increased 11 percent in tonnage, but its value remained substantially the same as in 1951.

Talc, Pyrophyllite, and Soapstone.—All 3 minerals were produced in North Carolina in 1952, 4 companies producing pyrophyllite and 3 talc and soapstone. Pyrophyllite constituted more than 90 percent of the total production and 75 percent of the value. Total tonnage in 1952 was substantially the same as in the 2 previous years, but value decreased approximately 11 percent below 1951.

The DMEA advanced the Hitchcock Corp. $13,733 in its exploration of the Tar Heel Investment Co. property in Cherokee County. Total expenditure on the project in 1952 was $15,303.

Vermiculite.—A small tonnage of vermiculite was produced in Yancey County during 1952. The average value per ton decreased 30 percent, from $12.68 in 1951 to $8.93 in 1952.

TABLE 6.—Mica sold or used by producers, 1948–52

Kind	1948		1949		1950		1951		1952	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Sheet mica:										
Uncut punch and circle—pounds	204, 713	$22, 699	410, 630	$67, 117	457, 428	$71, 323	419, 524	$84, 056	548, 723	$102, 928
Larger uncut mica—do	53, 213	21, 979	59, 442	54, 153	26, 308	30, 856	45, 425	43, 148	10, 660	17, 362
Half trim purchased by GSA—do									677	2, 763
Full trim purchased by GSA—do									35, 271	541, 022
Total sheet mica—do	257, 926	44, 678	470, 072	121, 270	483, 736	102, 179	464, 949	127, 204	595, 331	664, 075
Scrap mica: Total scrap and flake mica—short tons	44, 428	992, 303	24, 801	640, 374	48, 193	1, 281, 584	52, 550	1, 441, 886	58, 576	1, 551, 071
Grand total (sheet and scrap)—do	44, 557	1, 036, 981	25, 036	761, 644	48, 435	1, 383, 763	52, 782	1, 569, 090	58, 874	2, 215, 146

TABLE 7.—Sand and gravel sold or used by producers, 1948–52, by uses

	1948		1949		1950		1951		1952	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Sand:										
Building	807, 894	$498, 347	740, 037	$452, 603	623, 256	$376, 403	534, 898	$360, 241	580, 500	$364, 253
Blast	244, 932	136, 831	219, 222	136, 866	363, 061	190, 895	334, 393	173, 967	1, 134, 150	627, 269
Engine	25, 702	23, 132	20, 000	18, 000	20, 000	20, 000	22, 113	22, 113	22, 113	22, 113
Other	(1)	(1)	(1)	(1)	(1)	(1)	33, 769	29, 880	(1)	(1)
Noncommercial	2, 024, 307	732, 241	2, 239, 677	624, 509	3, 793, 757	1, 341, 530	3, 695, 780	932, 137	3, 743, 907	1, 047, 727
Gravel:										
Building	413, 354	642, 416	369, 640	562, 726	343, 857	447, 512	346, 125	485, 262	(1)	(1)
Paving	822, 890	984, 685	976, 508	1, 141, 273	1, 049, 500	1, 115, 652	1, 948, 163	1, 678, 178	2, 621, 160	2, 970, 319
Railroad ballast	(1)	(1)	(1)	(1)	26, 102	18, 914	122, 702	99, 807	(1)	(1)
Other					(1)	(1)	28, 507	36, 982	(1)	(1)
Noncommercial	433, 772	439, 811	480, 546	548, 225	2, 098, 233	1, 894, 352	582, 135	584, 559	456, 117	443, 684
Undistributed [1]	64, 586	64, 940	47, 299	68, 978	34, 709	59, 809	7, 785	32, 576	166, 801	189, 804
Total commercial sand and gravel	2, 379, 358	2, 350, 351	2, 372, 706	2, 380, 446	2, 460, 485	2, 229, 185	3, 378, 455	2, 919, 006	4, 524, 724	4, 173, 758
Total noncommercial sand and gravel	2, 458, 079	1, 172, 052	2, 720, 223	1, 172, 734	5, 891, 990	3, 235, 882	4, 277, 915	1, 516, 696	4, 200, 024	1, 491, 411
Grand total sand and gravel	4, 837, 437	3, 522, 403	5, 092, 929	3, 553, 180	8, 352, 475	5, 465, 067	7, 656, 370	4, 435, 702	8, 724, 748	5, 665, 169

[1] Paving, filter, railroad ballast (1950–52) sand, and sand and gravel indicated by footnote 1 are combined with "Undistributed."

TABLE 8.—Stone sold or used by producers, 1948–52, by kinds

Kind	1948		1949		1950		1951		1952	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Commercial:										
Basalt, crushed									40,000	$50,000
Granite, crushed	2,298,370	$3,317,405	3,330,650	$5,070,529	3,908,760	$5,967,268	4,669,493	$6,780,408	4,835,132	7,272,919
Granite, dimension	95,100	922,086	20,790	1,000,184	23,880	1,163,098	23,458	1,309,981	24,190	1,317,249
Limestone, crushed	1,318,760	1,821,839	1,478,690	2,026,802	1,976,340	2,629,911	2,080,586	2,829,244	2,534,446	3,446,841
Marble	560	63,009	310	35,926	(1)	(1)	[2] 475	[2] 1,282	(2)	(2)
Stone, miscellaneous									181,119	249,992
Total commercial [3]	3,712,790	6,124,339	4,830,440	8,133,441	5,908,980	9,760,277	6,774,012	10,920,915	7,614,887	12,337,001
Noncommercial:										
Basalt, crushed	(1)	(1)	(1)	(1)	97,560	160,802	75,164	94,648	72,697	95,684
Granite, crushed	1,073,170	1,009,290	991,940	1,469,578	1,077,560	1,328,258	1,331,439	1,823,150	1,378,302	1,676,850
Limestone, crushed	33,420	40,558	68,230	76,253	115,590	125,625	101,424	117,310	119,836	137,068
Sandstone	(1)	(1)	(1)	(1)	(1)	(1)			2,500	6,000
Stone, miscellaneous [4]	417,670	539,672	334,680	398,704	511,891	519,783	330,928	336,667	459,291	442,095
Total noncommercial	1,524,260	1,589,520	1,394,850	1,944,535	1,802,601	2,134,468	1,838,955	2,371,775	2,032,626	2,357,697
Grand total [2]	5,237,050	7,713,859	6,225,290	10,077,976	7,711,581	11,894,745	8,612,967	13,292,690	9,647,513	14,694,698

[1] Bureau of Mines not at liberty to publish, included with miscellaneous, noncommercial.

[2] Excludes dimension marble, 1951, and crushed and dimension marble, 1952.

[3] Excludes dimension marble (1950–52) and crushed marble (1952).

[4] Includes stone whose value must be concealed for particular years (indicated by footnote 1 in appropriate columns).

TABLE 9.—Stone sold or used by producers, 1948—52, by kinds

Kind	1948		1949		1950		1951		1952	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Basalt, crushed	(1)	(1)	(1)	(1)	97,560	$160,802	75,164	$94,648	112,697	$145,684
Granite, dimension	18,280	$785,170	20,790	$1,000,184	23,880	1,163,098	23,458	1,309,981	24,190	1,317,249
Granite, crushed	3,448,360	4,463,611	4,322,590	6,540,107	4,986,320	7,295,526	6,000,932	8,603,558	6,213,434	8,949,769
Limestone, crushed	1,352,180	1,862,397	1,546,920	2,103,055	2,091,930	2,755,536	2,182,010	2,946,554	2,654,282	3,533,909
Marble, dimension	560	63,009	310	35,926	(1)	(1)	(2)	(2)	(2)	(2)
Marble, crushed							475	1,282	(2)	(2)
Miscellaneous, crushed	(1)	(1)	287,250	308,166	343,160	401,873	330,928	336,667	640,410	692,087
Sandstone, crushed	(1)	(1)	(1)	(1)	(1)	(1)			2,500	6,000
Undistributed	417,670	539,672	47,430	90,538	168,730	117,910				
Total	5,237,050	7,713,859	6,225,290	10,077,976	7,711,580	11,894,745	[3] 8,612,967	[3] 13,292,690	[3] 9,647,513	[3] 14,694,698

[1] Included with "Undistributed" to avoid disclosing individual company information.
[2] Bureau of Mines not at liberty to publish.
[3] Exclusive of marble (1951–52), with an incomplete total shown.

TABLE 10.—Talc, pyrophyllite, and soapstone production 1943–47 (average) and 1948–52, in short tons

Year	Short tons		Value [1]	Year	Short tons		Value [1]
	Crude mined	Products sold [1]			Crude mined	Products sold [1]	
1937–47 (average)		79,664	$812,808	1950	115,783	116,895	$1,855,163
1948	104,609	104,052	1,455,691	1951	115,480	113,950	1,982,927
1949	88,587	86,208	1,344,767	1952	116,722	115,481	1,771,518

[1] Crude, crushed, ground and sawed products.

MINERAL FUELS

Coal.—Production of coal in Chatham County in 1952 was considerably less than in the preceding year.

REVIEW BY COUNTIES

ALAMANCE

North State Pyrophyllite Co., Inc., produced pyrophyllite at its Snow Camp mine in the southern part of the county, and Hanford Brick Co. mined 28,000 tons of clay in 1952 for the manufacture of brick.

ALEXANDER

North Carolina State Highway and Public Works Commission produced 38,325 tons of sand valued at $11,498 during 1952.

ANSON

Sand and gravel sold and used in 1952 totaled 1,435,776 tons valued at $1,145,584, an increase of 45 percent in quantity but only 3 percent in value above 1951. Commercial production increased 27 percent in tonnage and only 1 percent in value. Producers were W. R. Bonsal Co., B. V. Hedricks Gravel & Sand Co., and Southern Products & Silica Co. North Carolina State Highway and Public Works Commission also produced sand and gravel for its own use.

Charlotte Chemical Laboratories was the only producer of silica (quartz) in 1952.

TABLE 11.—Sand and gravel sold or used by producers in Anson County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	1,031,329	$1,022,956	1951	992,442	$1,115,265
1949	958,623	1,016,003	1952	1,435,776	1,145,584
1950	1,058,108	1,058,997			

ASHE

Production of gravel by the North Carolina State Highway and Public Works Commission was 2,250 tons valued at $3,375 in 1952.

AVERY

Feldspar, kaolin, and sheet, scrap, and flake mica were produced in the county in 1952. Harris Clay Co. mined kaolin and flake mica from the Kalmia and Gusher Knob mines. Feldspar Producing Co. and several smaller operators mined feldspar and mica.

Sheet mica sold and used in Avery County in 1952 was 3,761 pounds valued at $36,720. Production of scrap and flake mica cannot be revealed.

The DMEA participated financially in the exploration of three mica properties during the year, as shown in table 12.

TABLE 12.—DMEA projects in Avery County in 1952

Mineral	Company	Property	Expended in 1952	
			By Government	Total
Mica	Powder Mill Mining Co.	Powder Mill	$2,702	$3,002
Do.	C. C. Burleson	Shell	1,668	1,853
Do.	Elk Mica Miners	Elk Mine	3,645	4,050
Total			8,015	8,905

BERTIE

Sand production by the North Carolina State Highway and Public Works Commission was 27,000 tons valued at $6,750.

BLADEN

Sand production by the North Carolina State Highway and Public Works Commission totaled 74,000 tons valued at $7,400.

BUNCOMBE

Sheet mica sold or used in 1952 totaled 148 pounds valued at $2,269. No mica production was reported in 1951. DMEA contributed $4,060 of a total of $4,511 spent in the exploration of the Bede Smith mica mine of Robinson & West.

Sand and gravel sold or used in 1952 totaled 852,177 tons valued at $821,921, an increase of 7 percent in tonnage and 30 percent in value. The principal producers were Bell Sand Co., McCrary Construction Co., and Reed & Abee at Asheville, Forsythe Aggregates, Inc., of Biltmore, and Grove Stone & Sand Co. at Swannanoa.

TABLE 13.—Sand and gravel sold or used by producers in Buncombe County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	466,026	$465,411	1951	798,454	$631,839
1949	523,260	527,025	1952	852,177	821,931
1950	564,860	536,555			

BRUNSWICK

North Carolina State Highway and Public Works Commission produced 24,000 tons of sand valued at $2,400.

BURKE

Sand produced by the North Carolina State Highway and Public Works Commission was the only mineral product in 1952. Production was 33,995 tons valued at $10,198.

CABARRUS

Miscellaneous crushed stone was produced by two operators in the northeast corner of the county. North Carolina State Highway and Public Works Commission reported the production of 54,675 tons of sand valued at $27,337.

CALDWELL

Yadkin Mica & Ilmenite Co., the only producer of ilmenite in the State, closed its Richland Cove mine at Finley, N. C., on October 1. Shipment of ilmenite concentrate in 1952 was 25,328 tons, a decrease of 22 percent from the previous year.

Clement Brothers, Inc., of Lenoir and the North Carolina State Highway and Public Works Commission produced sand and gravel, and Moore Bros. Brick Co. mined common clay for use in its plant at Lenoir, N. C.

CASWELL

Two commercial operators produced crushed granite and the North Carolina State Highway and Public Works Commission produced 43,200 tons of sand valued at $15,120.

CATAWBA

A granite quarry was operated near Hickory, N. C. The North Carolina State Highway and Public Works Commission produced 95,511 tons of sand valued at $28,653, and M. P. Lipe, Jr., operated the Henry River mine near Hickory, producing scrap and sheet mica. The North Carolina State Highway and Public Works Commission produced sand.

CHATHAM

Coal and shale were the only minerals produced in 1952. Coal production decreased substantially both in tonnage and value from 1951. Shale was mined by the Chatham Brick & Tile Co. at Gulf and by Pomona Terra-Cotta Co., Pomona, for use in the manufacture of clay products.

CHEROKEE

Marble, miscellaneous stone, and talc were produced in the county during the year. One operator produced both crushed and dimension marble and another crushed miscellaneous stone. The Hitchcock Corp. produced talc from the Carolina and Nancy Jordan mines and explored the Tar Heel Investment Corp. talc property under the DMEA program. DMEA's share was $13,733 of the total cost ($15,503) of the project in 1952.

Other talc producers in the area were the Minerals & Metals Corp. and Southern Talc Co. of Murphy, N. C.

The total value of mineral production in the county increased 45 percent over 1951.

CLEVELAND

Cleveland County ranked third in the State in the value of its mineral production in 1952. The total mineral production was $2,226,922, a 22-percent increase over 1951.

Foote Mineral Co. at Kings Mountain produced spodumene (lithium ore) and as secondary or byproduct minerals, recovered tin and columbite-tantalite concentrates and flake mica.

Kings Mountain Mica Co. was a large producer of scrap mica, and 5 other producers in the county reported the sales of 1,160 pounds of sheet mica valued at $17,789.

The North Carolina State Highway and Public Works Commission produced sand.

DMEA helped finance the exploration of eight mica properties during 1952. Table 14 summarizes DMEA activities in Cleveland County during the year.

TABLE 14.—DMEA mica-exploration projects, Cleveland County, in 1952

Company	Property	Expended in 1952	
		By Government	Total
Lawrence Schmitt	W. W. Martin	$3,237	$3,597
L. Rex Boone	Cliff Blanton mine	2,306	2,562
F. B. Hendricks	Hubert Cook mine No. 1	2,282	2,536
Do	Hubert Cook mine No. 2	2,118	2,353
Do	Carpenter mine	957	1,063
Do	Bumgardner mine	2,733	3,037
Do	Glen Mead mine	1,208	1,342
Do	A. P. Mead mine	49	54
Total		14,890	16,544

A single operator quarried and crushed limestone. Bennett Brick & Tile Co. produced clay for use in the company Kings Mountain plant. North Carolina State Highway and Public Works Commission produced 199,515 tons of sand valued at $59,855.

COLUMBUS

Clay was mined by the Roger Moore Brick & Tile Co. at the Acme mine near Wilmington, and the North Carolina State Highway and Public Works Commission produced sand for use in road construction.

CRAVEN

The Craven Brick Co. was the only mineral producer in the county, mining clay for use in its own plant at Kingston, N. C., for the manufacture of brick.

CUMBERLAND

Common clay was mined at the Linden mine of the Ideal Brick Co., Fayetteville. Bryan Rock & Sand Co. operated a sand and gravel dredge at Linden, and the North Carolina State Highway and Public Works Commission produced 92,000 tons of sand for highway use.

DARE

Sand produced by the North Carolina State Highway and Public Works Commission amounted to 55,600 tons, with a value of $13,900.

DAVIDSON

Cunningham Brick Co. produced 28,200 tons of shale for use in its brick plant at Thomasville, and a single operator quarried traprock.

DAVIE

North Carolina State Highway and Public Works Commission produced 58,750 tons of sand valued at $23,500.

DUPLIN

North Carolina State Highway and Public Works Commission produced 50,000 tons of sand valued at $5,000.

DURHAM

A single operator continued to operate a quarry for the production of crushed granite, and the Borden Brick & Tile Co. used clay from its Durham mine for the manufacture of clay products.

EDGECOMBE

North Carolina State Highway and Public Works Commission produced 16,200 tons of sand valued at $4,050 in the county in 1952.

FORSYTHE

A single operator produced crushed granite near Winston-Salem Sand was produced by Ira Pope & Sons and the North Carolina State Highway and Public Works Commission.

FRANKLIN

The North Carolina State Highway and Public Works Commission produced 7,000 tons of sand valued at $4,200 in 1952.

GASTON

Kendrick Brick & Tile Co. mined clay for use in its clay-products plant at Mount Holly. North Carolina State Highway and Public Works Commission produced 44,025 tons of sand valued at $13,207. Gaston Strategic Minerals Co. operated the Huskin mine and produced sheet and scrap mica. DMEA participated in two mica-exploration projects during 1952. Fletcher C. Phillips explored the Bess property, and Piedmont Minerals explored the Self mine under DMEA contracts. The Government spent $4,689 of the $5,210 total expended on the Bess property and $6,278 of a total of $6,976 spent on the Self mine.

GRANVILLE

Sand and crushed granite were produced by the North Carolina State Highway and Public Works Commission. The Major Pyrophyllite Co. is reported to have had a limited production of pyrophyllite from its mine near Stem.

GUILFORD

Guilford County ranked fifth in North Carolina in value of mineral production in 1952. Crushed granite, clay, shale, and sand were produced. Boren Clay Products Co. mined clay and shale for the manufacture of clay products at Pleasant Garden. Crushed granite was produced by four operators, and sand was produced by the North Carolina State Highway and Public Works Commission.

HARNETT

Norwood Brick Co. and Senter Brick Co. produced clay for their own use in the manufacture of brick at Lillington.

HAYWOOD

Sand and gravel were produced by Sale & Alexander. Sheet and scrap mica were reported by Putnam Bros.

Under the DMEA program of aid in the exploration for strategic minerals the Government contributed $4,845 out of a total of $5,383 expended by Fred Arrowood on the Sherwood Forest mica property (Little East Fork mine) and $802 out of $891 spent by Conway Revis exploring the Grassy Knob mica mine.

HENDERSON

Moland-Drysdale Corp. mined clay for use in the manufacture of clay products. There were two producers of crushed limestone, and J. R. Freeman and L. M. Johnson produced sheet mica.

Total value of mineral production decreased 2 percent from $247,822 in 1951 to $244,077 in 1952.

HERTFORD

Sand produced by the North Carolina State Highway and Public Works Commission was 42,000 tons valued at $10,500.

IREDELL

Statesville Brick Co. mined shale and clay for the manufacture of brick at Statesville, and the North Carolina State Highway and Public Works Commission produced 129,036 tons of sand valued at $38,711.

JACKSON

Six or more companies and individuals produced 1,228 pounds of sheet mica valued at $18,566 in 1952. The two principal producers were the Buchanan Mining Co. and the Glenda Mining Co.

DMEA assisted Dixie Minerals, Inc., in the exploration of two mica properties, the Shell Ridge mine and the Stephens property. DMEA contributed $2,304 of the $2,560 expended on the 2 properties.

Harbison-Walker Co. produced olivine for use in the manufacture of refractory products.

JOHNSTON

Riverside Brick & Tile Co. mined clay for its own use at Smithfield, and the North Carolina State Highway and Public Works Commission produced 281,500 tons of sand valued at $115,000.

JONES

Although crushed limestone was the only mineral product, Jones County ranked sixth among the counties of the State in value of mineral production in 1952.

TABLE 15.—Crushed limestone sold or used by producers in Jones County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	158,845	$217,901	1951	688,502	$943,988
1949	229,674	311,470	1952	1,105,782	1,506,998
1950	485,771	669,718			

LEE

Shale was mined for use in the manufacture of clay products by three companies: Borden Brick & Tile Co., Goldsboro; Lee Brick & Tile Co., Sanford; and Sanford Brick & Tile Co., Colon. Production in 1952 was 348,600 tons, an increase of 12 percent over 1951.

TABLE 16.—Miscellaneous clays sold or used by producers in Lee County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	224,635	$181,355	1951	310,000	$355,000
1949	236,860	194,360	1952	348,600	397,200
1950	280,250	280,250			

LENOIR

Barrus Construction Co., Inc., was the only mineral producer in the county in 1952, with 156,950 tons of sand and gravel valued at $94,830.

LINCOLN

The North Carolina State Highway and Public Works Commission produced 32,095 tons of sand valued at $9,628.

MACON

Sheet and scrap mica were the principal minerals produced in Macon County in 1952; they were valued at $108,690. Thirteen or more companies and individuals produced both scrap and sheet mica.

The Macon Mica Co. of Franklin was the principal producer of scrap mica. The three largest producers of sheet mica were the Mica Development Co., Polly Miller Mining Corp., and A. Ward, all of Franklin.

The DMEA participated in 14 projects to aid in the exploration for strategic mica. Table 17 summarizes the DMEA projects active in the county in 1952.

TABLE 17.—DMEA mica-exploration projects, Macon County, in 1952

Company	Property	Expended in 1952	
		By Government	Total
Franklin Developers, Inc	Campbell mine	$2,877	$3,197
Fred D. Cabe	Cabe No. 1 mine	1,597	1,774
Mica Development Corp	Chalk Hill mine	4,337	4,819
Harold E. Inlow	Garden Branch mine	90	100
Hoke C. Meadows	Meadows mine	2,721	3,023
Caleb J. Keller	Flynt property	2,624	2,916
Toe River Mining Co	Pine Knob mine	3,969	4,410
Fred Wilson	Big "A" mine	1,175	1,305
John Burke, Mica Miners	John Burke mine	2,610	2,900
S. L. Phillips et al	Itola-Bowers mine	810	900
W. H. Roper	Roper-Ray mine	952	1,058
A. Ward	Miller mine	1,215	1,350
Reid & Hooker	Reid mine	585	650
Bauer Mining Co	Baird Cove	190	211
Total		25,752	28,613

The Macon Construction Co. operated a sand and gravel plant in 1952.

MADISON

Feldspar Producing Co. of Irwin, Tenn., reported the production of a small tonnage of feldspar in 1952.

MARTIN

The North Carolina State Highway and Public Works Commission produced a small tonnage of sand in the county in 1952.

McDOWELL

Crushed limestone quarried by the North Carolina State Highway and Public Works Commission, sand and gravel produced by the Southern Railway System, and sheet mica comprised the mineral production of the county in 1952. Finley & Westfall was the principal mica producer.

MITCHELL

The county ranked second in the State in the value of its mineral production, with a total of $2,472,000, an increase of 107 percent above that of 1951 ($1,193,000). Minerals produced, in order of their value, were feldspar, mica (sheet, scrap and flake), kaolin, and quartz. Feldspar increased 55 percent in quantity and 150 percent in value. Scrap and flake mica decreased 30 and 20 percent, respectively, in quantity and value. Sheet mica sold or used in 1952 was 22,907 pounds valued at $321,109 compared with 110,026 pounds

valued at $23,436 in 1951. Kaolin production increased 8 percent in 1952, but its value decreased 1 percent.

Three DMEA projects to aid in the exploration and production of strategic mica were active in Mitchell County in 1952. Table 18 lists these projects and the amounts expended on them.

TABLE 18.—DMEA mica-exploration projects, Mitchell County, in 1952

Company	Property	Expended in 1952	
		By Government	Total
Sink Hole Miners	Sinkhole property	$11,655	$12,950
Buchanan & Buchanan	Stevenson mine	1,125	1,250
Robert Baker	Zinniman mine	558	620
Total		13,338	14,820

Harris Clay Co. recovered both kaolin and flake mica at the Kalmia & Spruce Pine operations. The principal producers of feldspar in 1952 were Blue Ridge Mining Co., Burnsville; and Carolina Minerals Co., Feldspar Flotation Corp., United Feldspar & Minerals, Inc., and Williams & Buchanan, all of Spruce Pine. Carolina Minerals Co. and Feldspar Flotation Corp. recovered quartz and flake mica as byproducts in the beneficiation of feldspar at their plants at Kova and Spruce Pine.

Eighty-two or more operators in Mitchell County mined or sold sheet mica to General Services Administration and mica fabricators during the year. The following were the more important producers in 1952 (includes only those that produced over 500 pounds of sheet mica):

Lewis Aldrige
Burleson & Wilson
Capitol Producing Co.
Paul Carpenter
Feldspar Producing Co.
Julius Henline
Paul Hoppe
John Phillips
Sam L. Phillips
Roy M. Pittman
Young & Wilson Mica Co.

MONTGOMERY

Mt. Gilead Brick Co. at Mount Gilead and Taylor Clay Products Co. of Salisbury mined shale for the manufacture of brick and other clay products. The North Carolina State Highway and Public Works Commission produced 48,000 tons of sand and gravel valued at $6,600.

MOORE

Moore County ranked 10th in the State in value of mineral production in 1952. Total production, consisting of pyrophyllite and sand, was $1,202,206, an increase of 19 percent above 1951. Producers of pyrophyllite were: Glendon Pyrophyllite Co. of Staley and the Standard Minerals Co., Inc., of New York, N. Y. Bryan Rock & Sand Co., Raleigh, and the Moore sand pit produced sand only.

NASH

The Nash Brick Co. mined 17,522 tons of clay in 1952 for the manufacture of brick. North Carolina State Highway and Public

Works Commission reported the production of 30,000 tons of sand valued at $15,000.

NEW HANOVER

E. L. Robbins and the North Carolina State Highway and Public Works Commission produced 64,000 tons of sand valued at $33,400 in 1952.

NORTHAMPTON

Mineral production in the county was confined to clay and sand in 1952. Grant Brick Works produced clay for use in its plant at Weldon, and Bryan Rock & Sand Co., Raleigh, and the North Carolina State Highway and Public Works Commission produced sand.

Total value of mineral production in 1952 was $393,210.

ORANGE

A single operator quarried 1,368 tons of traprock (volcanic slate) as dimension stone.

PENDER

North Carolina State Highway and Public Works Commission produced 110,000 tons of sand valued at $11,000 in 1952.

PERSON

A small tonnage of sand produced by the North Carolina State Highway and Public Works Commission was the only mineral production reported in the county in 1952.

PITT

Eastern Brick & Tile Co., Greenville, mined clay for the manufacture of clay products.

POLK

A small tonnage of dimension granite was quarried in 1952.

RANDOLPH

Carolina Pyrophyllite Co. of Staley operated its Gerheart mine during the year, and North Carolina State Highway and Public Works Commission produced a small amount of sand. No granite was quarried in the county in 1952.

RICHMOND

The only mineral production reported in 1952 was 58,050 tons of sand produced by the North Carolina State Highway and Public Works Commission.

ROCKINGHAM

Shale was the principal mineral mined in the county in 1952, with production by the Pine Hall Brick & Pipe Co. at Madison and the Roanoke-Webster Brick Co., Inc., at Draper. C. P. Robertson

mined sheet mica, and the North Carolina State Highway and Public Works Commission reported the production of a small tonnage of sand. Lambert Bros., Inc., produced crushed granite.

ROWAN

Rowan County ranked eighth in value of mineral production in North Carolina in 1952. Total production was $1,358,611, 32 percent higher than in 1951.

Abrasives, granite, clays, and sand operations were active during the year. A single operator produced crushed and dimension granite, in addition to grinding pebbles and tube-mill liners.

A single operator produced millstones and chasers. Crushed and dimension granite were produced by three operators. Isenhour Brick & Tile Co. used shale from its East Spencer mine for the manufacture of clay products, and the North Carolina State Highway and Public Works Commission produced 11,150 tons of sand.

Miscellaneous clays (common clay and shale) sold or used in Rowan County, 1948–52, are shown in table 19, and table 20 lists the production of granite, crushed and dimension, for 1948–52.

TABLE 19.—Miscellaneous clays sold or used by producers in Rowan County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	97,768	$73,330	1951	106,772	$146,772
1949	90,000	67,500	1952	99,732	135,732
1950	90,000	67,500			

TABLE 20.—Granite (crushed and dimension) sold or used by producers in Rowan County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	340,393	$659,693	1951	410,782	$877,460
1949	414,271	715,532	1952	548,351	1,216,044
1950	530,931	1,030,616			

RUTHERFORD

The Bostic Brick Co. mined clay for use in its brick plant at Lattimore, and Thomas Beaver of Ellenboro reported a small production of sheet mica. Jobe Sand Co. and the North Carolina State Highway and Public Works Commission operated sand pits in the county in 1952.

SAMPSON

Clay for the manufacture of brick and sand produced by the North Carolina State Highway and Public Works Commission were the only minerals reported from the county in 1952. Crumpler Brick Co., Inc., and Sampson Brick Co., both of Roseboro, were active during the year. Sand production was 71,000 tons.

STANLY

Shale for use in the manufacture of clay products was mined by Stanly Shale Products, Inc., Norwood, and Yadkin Brick Yards, Inc.,

of New London. The North Carolina State Highway and Public Works Commission operated a quarry for the production of crushed traprock during the year.

STOKES

Pine Hall Brick & Pipe Co. of Winston-Salem, operated two shale pits (No. 1 and No. 2 mines), and the North Carolina State Highway and Public Works Commission reported the production of 97,250 tons of sand valued at $34,500.

SURRY

The county ranked ninth in the State in value of mineral production. One operator produced crushed and dimension granite.

SWAIN

One operator quarried flagstone, while another quarried and crushed limestone.

J. L. Colville Construction Co. operated a sand and gravel plant during the year.

Total mineral production in the county was $242,148.

TRANSYLVANIA

A small quantity of sheet mica mined by Marvin Owens of Brevard was the only mineral output in 1952.

UNION

One operator produced traprock. Kendrick Brick & Tile Co. mined shale for the manufacture of clay products.

VANCE

Vance County ranked first in the State in the value of its mineral production, owing primarily to the increased production of tungsten concentrates from the Hamme mine of Tungsten Mining Corp. at Henderson. A single operator produced crushed granite.

WAKE

One operator quarried and crushed granite. The North Carolina State Highway and Public Works Commission reported the production of sand and gravel. Wake County ranked seventh among the counties in 1952 in its mineral output.

WATAUGA

The Tamarack Mining Co. explored the Mica Ridge mine under a DMEA contract to aid in the exploration for strategic mica. The Government share of the cost was $1,912 out of $2,147 expended on the project.

The North Carolina State Highway and Public Works Commission produced a small tonnage of gravel.

WAYNE

Sand and clay were the only minerals produced for sale in the county in 1952. Borden Brick & Tile Co. mined clay for use in its

plant at Goldsboro, and Bryan Rock & Sand Co., operated a sand dredge just south of Goldsboro. North Carolina State Highway and Public Works Commission produced 209,500 tons of sand valued at $78,500.

WILKES

The DMEA cooperated with Henry Lee Robinson in exploration of the Zollie Shell mica mine. A total of $1,517 was expended on the project in 1952, the Government share being $1,365.

WILSON

One operator produced crushed granite, and the North Carolina State Highway and Public Works Commission produced 56,600 tons of sand valued at $23,500. The county ranked fourth in the State in value of mineral production.

YANCEY

Mineral production in 1952 was $804,294, a 29-percent increase over 1951. Sheet and scrap mica comprised 92 percent of the value of all minerals produced; feldspar, olivine, gravel, and vermiculite made up the remaining 8 percent.

Ray Cook and the Whitehall Co., Inc., were the principal producers of crude feldspar, but several other small operators added to the total production. Feldspar Milling Co., Inc., operated a grinding plant at Burnsville.

Scrap mica sold or used in 1952 was 26,739 tons valued at $667,623, a 24-percent increase in value above 1951. Among those reporting scrap mica in 1952 were: Consolidated Mica Co., Asheville; Deneen Mica Co., Newdale; DeWeld Mica Co., Spruce Pine; Hassett Mining Co., Burnsville; Monaqua Mining Co., Asheville; and Southern Mica Co., Johnson City, Tenn.

Ben Blalock and Toe River Mica Co., Spruce Pine, and Yancey Mica Mines, Inc., of Burnsville mined most of the sheet mica produced in the county; small amounts were mined by more than a dozen other operators.

The DMEA aided in six mica-exploration projects in Yancey County during 1952. Table 21 summarizes them.

O. R. Wiseman purchased the Wray Olivine mine from the United Feldspar & Mining Co. during the year and produced a small tonnage

TABLE 21.—DMEA mica-exploration projects, Yancey County, in 1952

Company	Property	Expended in 1952	
		By Government	Total
Yancey Mica Mines	Cattail mine	$7,473	$8,330
Do.	Jesse Autry mine	8,279	9,199
Do.	Presnell mine	2,394	2,660
Chrisawn & Gibbs	Westall mine	2,160	2,400
Anglen & Elkins	Huskins mine	2,268	2,520
Grigg & West Co.	Grassy Knob mine	486	540
Total		23,060	25,649

of olivine. Vermiculite was obtained from the same mine by the American Vermiculite Co. with a plant at Altapass. Variegated Vermiculite Co. operated the Woody mine at Forbes, N. C.

The North Carolina State Highway and Public Works Commission reported the production of 21,850 tons of gravel valued at $21,880.

UNDISTRIBUTED

Mineral production, unsegregated as to county in which it was produced, included the following:

Feldspar	tons	64, 317
Mica, scrap	do	9, 427
Mica, sheet	pounds	491, 594
Sand and gravel	tons	1, 341, 740
Stone, miscellaneous	do	461, 791

VALUES

The values of mineral production shown in the tables are those reported at the mine or plant. Table 22 shows the average unit value of all commodities produced in North Carolina, 1948–52.

TABLE 22.—Average unit values of minerals produced in North Carolina, 1948–52, in dollars per unit [1]

Commodity		1948	1949	1950	1951	1952
Asbestos	short ton	100.00	100.00	100.00	100.00	
Beryl	do		250.00		300.00	
Clay, kaolin	do	18.80	19.20	20.82	21.35	20.80
Clays, miscellaneous	do	.82	.83	.90	1.18	1.16
Coal	do		7.65			7.93
Columbite-tantalite, 70 percent concentrate	pound					3.20
Feldspar	long ton	5.54	6.05	6.05	7.40	10.05
Ilmenite, concentrate (51 percent TiO_2)	pound	(2)	(2)	(2)	(2)	(2)
Mica:						
Scrap and flake	short ton	22.34	25.82	26.59	27.44	26.48
Sheet	pound	.17	.26	.21	.27	1.12
Olivine, crude	short ton	(2)	(2)	(2)	(2)	(2)
Quartz	do	3.35	3.84	4.17	4.47	4.61
Gravel	do	1.23	1.23	.99	.95	1.11
Grinding pebbles	do	18.92	14.66	17.00	17.80	18.00
Sand	do	.45	.40	.41	.34	.38
Spodumene	do				55.00	55.00
Stone:						
Granite:						
Crushed	do	1.29	1.51	1.46	1.43	1.44
Dimension	do	42.95	48.11	48.71	55.85	54.45
Limestone, crushed	do	1.38	1.36	1.32	1.35	1.35
Marble:						
Crushed	do				2.70	5.34
Dimension	do	112.50	116.00	119.00	118.00	117.50
Miscellaneous, crushed	do	1.20	1.07	1.17	1.02	1.08
Sandstone:						
Crushed	do	1.32	2.16	.59		
Dimension	do					2.40
Traprock, crushed	do	2.00	1.73	1.65	1.26	1.29
Talc	do	14.00	15.60	15.87	17.40	15.34
Tube-mill liners	do	17.50	14.58	15.20	17.90	21.75
Tungsten ore		(2)	(2)	(2)	(2)	(2)
Vermiculite	do	12.00	9.49	18.20	12.68	8.93

[1] For greater detail on prices by grades and markets, see Volume I, Minerals Yearbook, 1952.
[2] Bureau of Mines not at liberty to publish.

The Mineral Industry of North Dakota

This chapter has been prepared under a cooperative agreement for the collection of mineral data (except fuels) between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of North Dakota.

By Samuel A. Gustavson [1] and Donald H. Mullen [2]

MINERALS produced in North Dakota for many years have been clays, lignite, natural gas, sand and gravel. In April 1951 petroleum was produced from the Clarence Iverson No. 1 well in Williams County. Subsequent development of petroleum resources in the State has been rapid. The total value of all mineral production, including fuels, in North Dakota in 1952 was $12,057,000, an increase of 18 percent over 1951. Except for sand and gravel, mineral production has been largely confined to the western part of the State. Continued development of petroleum resources could extend producing areas into the central part. Figure 1 shows the total value of North Dakota mineral production from 1910 through 1952. In 1949 the method of determining the total value of mineral production was

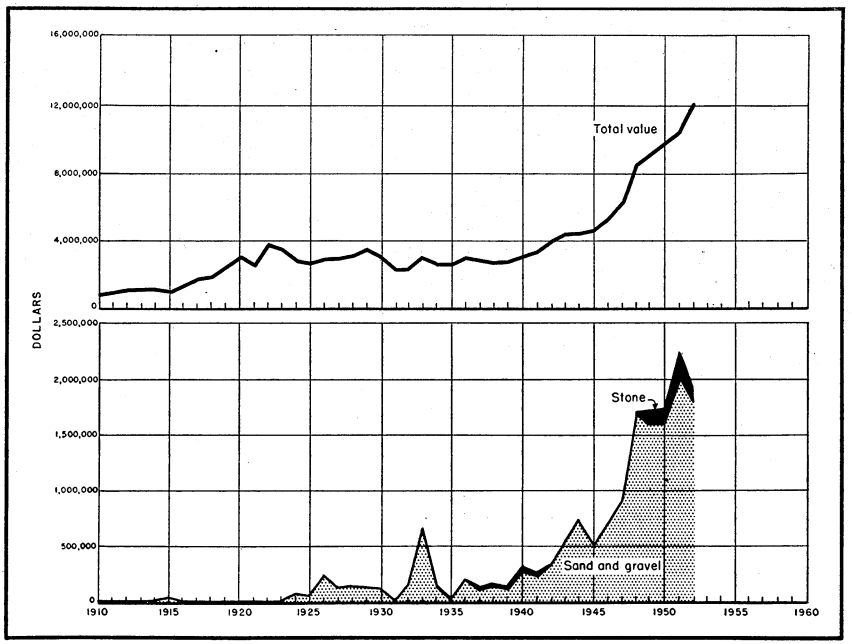

FIGURE 1.—Value of sand and gravel and stone and total value of all minerals in North Dakota, 1910–52.

[1] Chief, Mineral Industry Division, Region V, Bureau of Mines, Minneapolis, Minn.
[2] Commodity-industry analyst, Region V, Bureau of Mines, Minneapolis, Minn.

revised to exclude, as far as possible, values of finished or semi-finished products. Value under this method was also calculated for 1947 and 1948. The data from which the chart is drawn are not adjusted to any dollar index and represent dollar values for the year indicated. Table 1 summarizes the production and value of the minerals produced in the State for 1951 and 1952.

The North Dakota Research Foundation, State Capital Building, Bismarck, published Circular 1 concerning the mineral resources of the State.[3]

TABLE 1.—Mineral production in North Dakota, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	18,250	$35,250	(2)	(2)
Coal (lignite)	3,224,027	7,784,191	2,983,752	$7,068,259
Natural gas—thousand cubic feet	456,000	24,000	369,000	23,000
Petroleum (crude)—42-gallon barrels	25,000	(2)	[3] 1,549,000	(2)
Sand and gravel	4,573,341	2,140,466	6,557,069	1,841,216
Stone	281,219	213,061	67,064	4,968
Undistributed: Nonmetallic minerals, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)		50,000		3,119,900
Total North Dakota		10,247,000		12,057,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production.
[2] Value included with "Undistributed."
[3] Final figure. Supersedes preliminary figure given in commodity chapter.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Clays.—Clays for the manufacture of brick and heavy clay products were produced in Adams and Morton Counties by the Marion Clay Works at Hettinger and the Hebron Brick Co. at Hebron. Production in 1952 was greater than in 1951.

Mineral Pigments.—Vandyke brown paint pigment has been produced from lignitic humus or leonardite found in the outcrops of lignite beds and under light overburden. Production was from Slope County in 1951 and from Bowman County in 1952.

Sand and Gravel.—Sand and gravel production by commercial and noncommercial producers was reported from 23 of the State's 53 counties. Consumption was primarily for road construction and railroad ballast.

The total output was 43 percent greater than in 1951, but the value was 14 percent less. Both the increase in quantity and decrease in value were attributed to increased road building by Government agencies and decreased use of prepared sand and gravel.

Table 2 shows the sand and gravel sold and used by producers, 1951–52.

[3] Burr, Alex C., Mineral Resources of North Dakota: North Dakota Research Foundation, Circ. 1, October 1952, 22 pp.

TABLE 2.—Sand and gravel sold or used by producers, 1951–52, by classes of operation and uses

	1951			1952		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Building	148,588	$134,231	$0.90	145,048	$146,971	$1.01
Paving	55,310	49,013	.89	44,675	41,419	.93
Filter	1,709	8,544	5.00			
Other	2,421	627	.26	1,678	452	.27
Total commercial sand	208,028	192,415	.92	191,401	188,842	.99
Gravel:						
Building	418,583	622,857	1.49	630,238	731,199	1.16
Paving	360,439	418,766	1.16	385,162	199,761	.52
Railroad ballast	345,099	85,044	.25	467,316	263,769	.56
Other	69,783	29,563	.42	192,407	81,296	.42
Total commercial gravel	1,193,904	1,156,230	.97	1,675,123	1,276,025	.76
Total commercial sand and gravel	1,401,932	1,348,645	.96	1,866,524	1,464,867	.78
GOVERNMENT-AND-CONTRACTOR						
Sand:						
Building	4,483	4,695	1.05	94	57	.61
Paving	226,808	101,073	.45	41,118	14,368	.35
Total Government-and-contractor	231,291	105,768	.46	41,212	14,425	.35
Gravel:						
Building	4,778	249	.05	187	112	.60
Paving	2,935,340	685,804	.23	4,649,146	361,812	.08
Total Government-and-contractor	2,940,118	686,053	.23	4,649,333	361,924	.08
Total Government-and-contractor sand and gravel	3,171,409	791,821	.25	4,690,545	376,349	.08
ALL OPERATIONS						
Sand	439,319	298,183	.68	232,613	203,267	.87
Gravel	4,134,022	1,842,283	.45	6,324,456	1,637,949	.26
Grand total	4,573,341	2,140,466	.47	6,557,069	1,841,216	.28

Sodium Sulfate.—The existence of deposits of sodium sulfate in a number of lakes in northwestern North Dakota has been known for many years; these deposits were investigated by the Federal Emergency Relief Administration in cooperation with the North Dakota Geological Survey.[4] Futher investigations were made in 1949 by the Federal Bureau of Mines.[5] No commercial production from the deposits has been made, but several investigations by commercial concerns have been undertaken. Reserves are estimated at 15.5 million short tons of sodium sulfate, and increased industrialization of the area could provide a market for the product.

Stone.—Production of stone in North Dakota in 1952 was limited to broken granite used as riprap. The North Dakota State Highway Commission produced 67,064 tons valued at $4,968. Table 3 shows the production of stone in North Dakota by uses, 1951–52.

[4] Lavine, Irvin, Sodium Sulfate Investigation: Federal Emergency Relief Administration for North Dakota, Project S-F2-47, 38 pp. (not dated; work done in 1934).
[5] Binyon, E. O., North Dakota Sodium Sulfate Deposits: Bureau of Mines Rept. of Investigations 4880, 1952, 41 pp

TABLE 3.—Crushed and broken stone, 1951–52, by uses, in short tons

Use	1951		1952	
	Short tons	Value	Short tons	Value
Granite: Riprap	55,334	$4,099	67,064	$4,968
Miscellaneous stone:				
Railroad ballast	214,642	206,692	----------	----------
Concrete and road metal	11,243	2,270	----------	----------
Total crushed stone	281,219	213,061	67,064	4,968

MINERAL FUELS

Lignite.—Lignite production in North Dakota in 1952 was 2,983,752 tons, a decrease of 240,275 tons (7 percent) from 1951. North Dakota output represented 99 percent of the total lignite mined in the United States. Production was reported from 18 counties, with Mercer County supplying 1,054,277 tons (35 percent of the State total). Sixteen underground mines and 60 strip mines operated during the year. Days worked in 1952 averaged 202, ranging from 42 days in Mountrail County to 235 days in Ward County. The average number of days worked in 1951 was 238. The average total number of men employed in all sizes of lignite mines was 628. Only 3 mines employed 50 men or more, and 7 mines employed 20 men or more. Twenty-three mines reported 1 worker, usually the owner; 19 reported 2 employees. Other mines employed 3 to 17 men. Accidents, disabling the employee for 1 day or more during the year, totaled 47—17 in underground mines and 30 in strip mines. None of them was fatal.

Table 4 shows production, for 1951–52, by counties.

TABLE 4.—Production of coal (lignite) by counties 1951–52, in short tons
[Exclusive of mines producing less than 1,000 tons]

County	1951		1952	
	Short tons	Average value per ton [1]	Short tons	Average value per ton [1]
Adams	32,179	$3.28	22,114	$3.31
Bowman	124,511	1.68	148,836	1.64
Burke	431,062	2.49	440,907	2.33
Burleigh	22,582	3.18	20,086	3.35
Divide	318,744	2.29	292,640	2.37
Dunn	15,800	2.83	10,012	2.75
Golden Valley	2,138	2.79	1,590	2.73
Grant	29,180	3.09	26,504	3.13
Hettinger	17,333	2.90	15,093	2.87
McKenzie	3,273	3.75	1,190	4.00
McLean	328,169	2.45	289,299	2.49
Mercer	1,174,213	2.29	1,054,277	2.33
Morton	33,894	2.54	37,166	2.55
Mountrail	7,088	3.58	1,565	3.65
Oliver	6,920	2.50	6,280	2.50
Stark	119,951	2.53	75,789	2.61
Ward	540,276	2.61	522,618	2.39
Williams	16,714	3.38	17,786	3.36
Total	3,224,027	2.41	2,983,752	2.37

[1] 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 as estimated by producer at average prices that might have been received if such coal had been sold commercially.)

Natural Gas.—Production of natural gas in Bowman County continued. The quantity decreased 87 million cubic feet or 19 percent. Natural-gas statistics for the United States, by States, from 1936–50 were compiled and published.[6]

Petroleum.—Production of petroleum in 1952 increased to 1,524,000 barrels over 1951. The major portion came from Williams County, with Mountrail and McKenzie Counties entering the ranks of producers. Exploration in all western and northern counties was widespread. Table 5 shows the production of petroleum in the various fields for 1952, by months.

Petroleum was first produced in April 1951 at the Clarence Iverson No. 1 well in the Beaver Lodge field in Williams County. The Tioga field began production at the H. O. Bakken well in Williams County in April 1952. The field was extended into Mountrail County when the C. Hanson well began producing in August. The Hofflund field, the third in Williams County, began production at the North Dakota E well in October. In McKenzie County production began in the Croff field at the Risser well in May. The Charlson field, the second in McKenzie County, began production at the North Dakota D well in September.

Investigations in basic and applied research on lignite were continued at the Bureau of Mines Charles R. Robertson Lignite Research Laboratory at Grand Forks. Studies were conducted on preparation and utilization of lignite principally as a fuel and as a source of synthesis gas. Concurrent studies also were carried out on the fundamental constitution and properties of lignite. Publications concerning bituminous coal and lignite in the United States were completed.[7]

Explorations have been carried on for years in the central part of the State, particularly in Bottineau and McHenry Counties, with little success. The opening of a pool in Manitoba about 10 miles north of Westhope in Bottineau County indicates that the central part of the State is a most promising area for discovering new fields.

A survey of oil and gas leases in January 1952 showed that 28,228,666 acres was under lease. This was 63 percent of the 44,834,560 acres in the State. There were leases in each of the State's 53 counties.

Standard Oil Co. of Indiana acquired options on about 900 acres of land near Mandan in June and announced that construction of a 15,000-barrel-per-day oil refinery was under consideration. It also was announced that the Service Pipeline Co., a subsidiary of Standard Oil, planned to build a pipeline from the Williston Basin fields to the new refinery. In October plans for both the refinery and pipeline had been completed. The refinery was expected to be in operation by January 1955.

[6] Colby, D. S. and Seeley, E. M., Natural-Gas Statistics 1936–50: Bureau of Mines Inf. Circ. 7644, 1952, 11 pp.

[7] Anderson, R. L. and Young, W. H., Thickness of Bituminous Coal and Lignite Seams at all Mines and Thickness of Overburden at Strip Mines in the United States in 1950: Bureau of Mines Inf. Circ. 7642, 1952, 18 pp., Brown, R. L. and Carman, E. P., Annual Report of Research and Technological Work on Coal, Fiscal Year 1951: Bureau of Mines Inf. Circ. 7647, 81 pp.

TABLE 5.—Production of crude petroleum in 1952, by months and fields [1]

Month	Beaver Lodge field [2]		Tioga field [2]		Hofflund field [2]	
	Number of wells producing	Barrels produced	Number of wells producing	Barrels produced	Number of wells producing	Barrels produced
January	1	7,166				
February	2	10,972				
March	4	20,853				
April	7	32,625	1	3,894		
May	12	46,965	2	7,118		
June	17	76,331	4	13,189		
July	24	98,295	5	18,003		
August	33	171,307	9	41,331		
September	42	134,701	13	44,436		
October	48	132,951	17	56,550	1	365
November	50	216,618	21	98,530	1	1,774
December	60	240,385	25	106,533	1	2,110
Total: 1952		1,189,169		389,584		4,249
1951		26,196				

Month	Charlson field [2]		Croff field [2]		State total	
	Number of wells producing	Barrels produced	Number of wells producing	Barrels produced	Number of wells producing	Barrels produced
January					1	7,166
February					2	10,972
March					4	20,853
April					8	36,519
May			1	1,413	15	55,496
June			1	1,238	22	90,758
July			1	1,561	30	117,859
August			1	1,216	43	213,854
September	1	2,107	1	1,280	57	182,524
October	1	2,244	1	1,229	68	193,339
November	1	2,258	1	1,105	74	320,285
December	1	2,152	1	1,224	88	352,404
Total: 1952		8,761		10,266		1,602,029
1951						26,196

[1] Source: North Dakota Geological Survey.
[2] Beaver Lodge and Hofflund fields are in Williams County; Tioga field is in Williams and Mountrail Counties; Charlson and Croff fields are in McKenzie County.

REVIEW BY COUNTIES

ADAMS

Mineral production in Adams County consisted of lignite and clays. The principal producer of lignite was Dakota Collieries Co., Haynes. Clays and heavy clay products were produced by Marion Clay Works at Hettinger.

BILLINGS

Lignite was produced at Medora.

BOWMAN

Natural-gas production by Montana-Dakota Utilities Co. continued. Lignite was produced by the Peerless Coal Mine, Gascoyne. Paint pigments were produced by the National Aluminate Corp. from lignitic humus.

BURKE

Lignite was produced by the Truax Traer Coal Co. and at the Bonsness coal mine, Columbus. The Burke County Highway Department produced sand and gravel.

BURLEIGH

Ecklund Taplin Coal Co., Wilton, produced lignite. Dakota Sand & Gravel Co. at Bismarck produced sand and gravel for building purposes.

DIVIDE

Production in Divide County was limited to lignite by Baukol-Noonan, Inc., Noonan.

TABLE 6.—Value of mineral production in North Dakota, by counties, 1951–52

County	1951	1952	Principal minerals produced in 1952, in order of value
Adams	$106,786	$74,600	Coal, clay.
Barnes	97,209	41,100	Sand and gravel.
Benson	66,468	56,727	Do.
Bowman	233,156	267,100	Coal, natural gas.
Burke	1,310,547	1,031,312	Coal, sand and gravel.
Burleigh	764,607	434,934	Coal, sand and gravel, stone.
Cass	57,848	----------	Sand and gravel.
Dickey	----------	111,716	Do.
Divide	729,848	693,583	Coal.
Dunn	44,709	27,534	Do.
Eddy	6,278	(1)	Sand and gravel.
Foster	7,920	500	Do.
Golden Valley	5,964	4,341	Coal.
Grand Forks	69,991	(1)	Sand and gravel.
Grant	91,162	83,635	Coal, sand and gravel.
Griggs	730	----------	Sand and gravel.
Hettinger	50,261	43,319	Coal.
McIntosh	5,072	(1)	Sand and gravel.
McKenzie	15,983	38,760	Petroleum (1952), coal, sand and gravel, stone (1951).
McLean	810,172	724,018	Coal, sand and gravel.
Mercer	2,688,667	2,456,561	Coal.
Morton	192,850	113,277	Coal, clay, sand and gravel (1951).
Mountrail	25,372	462,953	Coal, sand and gravel (1952), petroleum (1952).
Nelson	27,028	22,088	Sand and gravel.
Oliver	17,298	15,701	Coal.
Pierce	1,241	----------	Sand and gravel.
Ransom	179	22,114	Do.
Renville	448,508	383,041	Do.
Richland	4,758	11,600	Do.
Rolette	13,457	1,130	Do.
Sargent	36,003	2,715	Do.
Stark	303,444	197,817	Coal.
Stutsman	40,720	(1)	Sand and gravel.
Traill	3,153	13,032	Do.
Walsh	3,656	14,840	Do.
Ward	1,584,735	1,453,077	Coal, sand and gravel.
Wells	17,622	19,922	Sand and gravel.
Williams	147,991	2,954,007	Petroleum, coal, sand and gravel.
Undistributed [2]	215,575	280,289	
Total	10,247,000	12,057,000	

[1] Bureau of Mines not at liberty to publish.
[2] Includes production output which the Bureau of Mines is not at liberty to publish, as indicated by footnote 1 above, for the following counties: McHenry, sand and gravel (1951); Sheridan, sand and gravel, (1951). Also includes stone for 1951 only (railroad ballast), which cannot be assigned to specific counties, valued at $206,692.

DUNN

Pelton coal mine, Dunn Center; Skalsky coal mine, Halliday; and the Dodge coal mine, Dodge, produced 95 percent of the lignite output. Smaller producers at Fayette, Dunn Center, and Halliday supplied the remainder.

GOLDEN VALLEY

Lignite was produced by the Mammoth coal mine, Sentinel Butte. A small tonnage of lignite was mined at Beach.

GRANT

The Davenport, Ketterling, and Coffin Butte coal mines, all of New Leipzig, and the Van Houten coal mine, Leith, furnished the major part of the lignite production. Smaller operators at Heil and New Leipzig also reported production. The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. produced sand and gravel for road ballast.

HETTINGER

New England Coal Co., New England; Regent coal mine, Regent; and the Watson coal mine, Mott, produced lignite from strip mines.

McKENZIE

In 1952 McKenzie became the second county in the State to produce petroleum in commercial quantities. The Croff field began producing in May and the Charlson field in September. Lignite was produced at the Johnson coal mine, Watford City, from a drift mine. Other mines at Watford City and Banks produced lignite from strip mines.

McLEAN

Truax Traer Coal Co. and Burns & Wretling Coal Co., both at Garrison, and the Underwood Coal Co. at Underwood produced lignite from strip mines. The Minneapolis, St. Paul & Sault Ste. Marie Railway produced sand and gravel for road ballast and other uses.

MERCER

Lignite production in Mercer County was 35 percent of the State total. Production was by the Truax Traer Coal Co. at Hazen, the principal producer, followed by the Knife River Coal Mining Co. and the Dakota Collieries Co. (both of Beulah), Midway Coal Co., Stanton; and Grishkowsky coal mine and Moxley-Erickson Coal Co., both at Beulah, in that order. Smaller producers operated at Zap and Beulah.

MORTON

Mineral production in Morton County consisted of lignite and clay. Lignite production was reported by Richter coal mine, Glen Ullin; Flemmer coal mine, Carbon coal mines 1 and 2, Kaelberer coal mine, and Olin coal mine, all at New Salem; and the Harnisch coal mine, Hebron. Smaller operators produced lignite at Almont, Judson, and Glen Ullin. The Hebron Brick Co., Hebron, produced clay for the manufacture of common brick.

MOUNTRAIL

Extension of the Tioga field into Mountrail County with production from the C. Hanson well in August made it the third county in the State to produce petroleum. At the end of the year nine wells were

producing from the Mountrail County portion of the field. Lignite was produced by the S & L coal mine, Van Hook and the Timmel coal mine, White Earth. Some production was reported at Parshall. The Great Northern Railway produced sand and gravel for road ballast and other uses.

OLIVER

The Hagle Coal Mine, Center, produced lignite.

SLOPE

Slope County produced a small tonnage of lignite.

STARK

The Dakota Briquets & Tar Products, Inc., Dickinson, produced lignite and manufactured briquets. This company is the sole producer of briquets or packaged fuel in the State. Other producers of lignite were Dickinson Coal Mining Co. and Richter coal mine. Smaller producers operated at Belfield and Richardton.

WARD

Lignite was produced by the Truax Traer Coal Co., at Velva, Quality Lignite Coal Co., Miller mine, and Vix Coal Co., all at Sawyer; and the Ankenbauer coal mine, Kenmare. The Minot Sand & Gravel Co. produced sand and gravel for building and road purposes. The Minneapolis, St. Paul & Sault Ste. Marie Railway produced sand and gravel for road ballast and other uses. The Ward County Highway Department produced sand and gravel for road construction and repairs.

WILLIAMS

During 1952 petroleum became the most important mineral product of Williams County. The first production of petroleum in North Dakota was in the Beaver Lodge field in Williams County in April 1951. Development of the field was rapid, and the number of producing wells increased from 1 in January 1952 to 60 in December. The Tioga field, the second in Williams County, began producing in April 1952. The field was extended into Mountrail County in August. The number of producing wells in the Williams County portion of the field increased to 14 by December. The Hofflund field, the third in Williams County, began producing in October 1952 from one well and continued through December. Williams County produced 93 percent of the crude petroleum in North Dakota, the remaining 7 percent being from McKenzie and Mountrail Counties.

Lignite dropped from first to second place in value of minerals produced in the county. The principal producers were H & M Coal Co., Tioga, Black Diamond coal mine, Standard coal mine and Star coal mine, all of Williston, and Sorenson coal mine, Hanks, in that order. Smaller operations were reported at Williston and Wheelock. Pioneer Sand & Gravel Co. at Williston produced sand and gravel for building purposes and road construction and repairs.

OTHER COUNTIES

Sand and gravel were produced in other counties not mentioned individually. Production was by both commercial and noncommercial producers for building purposes, railroad ballast, and road construction and repairs. The following counties are recorded as producing commercial and/or noncommercial sand and gravel:

Dickey	Sargent
Nelson	Stutsman
Ransom	Traill
Renville	Walsh
Richland	Wells
Rolette	

The North Dakota State Highway Commission produced sand and gravel in various undesignated counties for road construction and repairs.

The Mineral Industry of Ohio

By Richard H. Mote [1] and Alvin Kaufman [2]

OHIO ranked 11th among the States in the production of mineral commodities in 1952, and contributed 2.19 percent of the total national value. The value of the State mineral output decreased 3 percent as a result of declines of varying magnitude in all mineral commodities except peat, petroleum, salt, and sand and gravel. Major products in 1952 were coal, stone, cement, and lime. The State ranked first in the United States as a producer of grindstones, clays, and lime, second in stone output, third in salt and peat, and fourth in calcium-magnesium chloride and ground sandstone. The principal producing counties were Belmont, Harrison, and Jefferson.

Fuels and nonmetals represented 53 and 47 percent, respectively, of the total value of Ohio mineral output in 1952. There was no mine production of metals. The various commodities were produced in well-defined areas. Fuel production was concentrated in the eastern half of the State, limestone in the west, and sandstone and sand and gravel in the northeast. A substantial output of the latter was also obtained from river flood plains in various parts of the State.

TABLE 1.—Mineral production in Ohio, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement—376-pound barrels	11,872,278	$29,498,956	11,377,806	$28,488,500
Clays (except for cement)	5,146,531	13,223,958	5,003,870	13,153,782
Coal	37,948,692	146,677,710	36,208,450	138,090,700
Lime (open-market)	2,289,473	29,046,196	2,205,432	28,393,260
Natural gas—thousand cubic feet	38,879,000	7,854,000	30,993,000	6,725,000
Natural-gas liquids:				
Natural gasoline—42-gallon barrels	107,000	399,000	38,000	114,000
Peat	21,378	261,891	24,828	290,664
Petroleum (crude)—42-gallon barrels	3,140,000	9,580,000	[2] 3,350,000	[2] 10,020,000
Salt (common)	3,112,472	5,848,478	2,827,455	5,991,626
Sand and gravel	19,430,898	21,394,891	20,751,493	23,069,458
Stone (except limestone for cement and lime)	[3] 25,190,277	[3] 36,436,081	[3] 24,693,189	[3] 36,197,485
Undistributed: Abrasive stones, bromine, calcium-magnesium chloride, gypsum, ground sand and sandstone, and stone (crushed unclassified and dimension unclassified)		2,390,845		2,154,151
Total Ohio		302,612,000		292,689,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers) except that fuels and gypsum are strictly production.
[2] Final figure. Supersedes preliminary figure given in commodity chapter.
[3] Excludes certain stone, value for which is included with "Undistributed."

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Ohio in 1952 maintained its position as fifth largest producer of bituminous coal in the United States despite a 5-percent decline from the 1951 output. The State ranked ninth in recoverable reserves,

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with 41 billion tons estimated retrievable as of January 1, 1950, assuming 50-percent recovery. The coal-bearing rocks underlie a 12,340-square-mile area in 30 eastern counties. Of these, 26 produced coal in 1952. Monroe County entered the list of producers, balancing elimination of Scioto County. The major producing counties, in order of decreasing tonnage, were Belmont, Harrison, Jefferson, Perry, and Tuscarawas.

Approximately 53 coal beds have been identified; 17 of them are commercial under present economic conditions. Nearness of the seams to the surface results in a high percentage (61 percent) of strip-mined coal. This applies particularly to coal output in Portage, Washington, and Wayne Counties, all of which is reported as surface production.

Of the 39 percent of output produced underground, virtually all was cut and loaded by machine. The average miner produced 7.23 tons a day, while his counterpart on the surface averaged 17.88 tons. The State average of 11.37 tons per man per day compared favorably with the United States average of 7.47 tons. Coal production in 1952 totaled 36,208,450 tons, with an average value of $3.81 per ton. This output was obtained from 579 mines, of which 12 percent yielded 100,000 tons or over and 49 percent less than 10,000 tons. The industry employed an average of 15,464 men. Of these, 8,224 worked underground, 3,860 in strip pits, and 3,380 in surface jobs. The largest producers in 1952 were: Hannah Coal Co., Division of Pittsburgh Consolidation Coal Co., St. Clairsville; Powhatan Mining Co., Cleveland; Youghiogheny & Ohio Coal Co., Cleveland; and Sunnyhill Coal Co., New Lexington.

TABLE 2.—Bituminous-coal production in 1952, by counties

County	Production	Value per ton	Average tons per man per day	Strip production	Number of strip pits
Athens	811,672	$4.38	6.58	141,844	3
Belmont	7,501,666	4.04	8.71	1,045,339	15
Carroll	468,772	3.82	7.73	332,710	8
Columbiana	1,243,024	3.36	11.35	1,176,838	42
Coshocton	1,018,126	3.57	11.78	857,990	11
Gallia	727,954	3.15	9.18	499,978	5
Guernsey	486,575	3.34	10.47	415,125	6
Harrison	7,035,932	4.10	18.07	5,936,074	20
Hocking	107,499	3.70	5.77	21,167	4
Holmes	3,305	3.31	6.72	2,292	1
Jackson	583,743	3.87	13.74	541,961	12
Jefferson	4,961,106	3.95	11.00	2,503,987	26
Lawrence	242,785	3.95	8.57	191,474	6
Mahoning	807,873	3.88	15.93	807,873	17
Meigs	526,244	3.25	8.48	355,447	5
Monroe	10,000	3.47	17.61	10,000	1
Morgan	101,243	3.05	11.65	83,500	3
Muskingum	1,396,813	2.64	15.81	1,047,709	14
Noble	1,889,546	2.91	26.35	1,887,153	6
Perry	2,433,716	4.27	10.28	1,553,321	15
Portage	191,410	4.16	14.64	191,410	2
Stark	901,942	2.64	12.98	845,116	17
Tuscarawas	2,260,736	3.86	9.71	1,249,470	26
Vinton	218,365	4.22	6.10	172,333	9
Washington	184,753	3.42	25.72	184,753	2
Wayne	93,650	4.25	9.82	93,650	1
Total	36,208,450	3.81	11.37	22,148,514	277

Peat.—Ohio ranked third highest as a peat-producing State in 1952. Output was obtained from Mahoning, Seneca, Stark, and Wyandot Counties and was utilized for mulch and other soil-conditioning purposes. Production increased 16 percent compared with the previous year.

Petroleum and Natural Gas.—Ohio is the second oldest petroleum-producing State in the Nation. The first oil well was drilled near Macksburg, Washington County, in 1860, 1 year after Drake's discovery of petroleum at Titusville, Pa. Commercial use of natural gas was begun in 1884, with the discovery of this commodity in the Trenton limestone near Findlay. Today, production is obtained predominantly from the Clinton sand of southeastern Ohio.

Petroleum output is derived from two major fields—the Lima field, in the northwest in Allen, Hancock, Wood, Mercer, Seneca, Van Wert and Wyandot Counties, and the Pennsylvania Grade field, in the southeast. The total reserves were estimated by the American Petroleum Institute and the American Gas Association to be 27 million barrels of crude petroleum and 731,483 million cubic feet of natural gas. The latter figure includes 138,476 million cubic feet stored underground for future delivery.

In 1952, 23,600 wells were producing in Ohio including 17,600 oil wells and 6,000 natural-gas wells. The marketed output of petroleum and natural gas declined 7 and 20 percent, respectively. The average value of petroleum declined from $3.05 per barrel in 1951 to $2.99 in 1952. Natural gas at the wellhead increased from 20.2 cents to 21.7 cents per thousand cubic feet compared with the previous year.

The Ohio Geological Survey reported 392 oil, 218 gas, 60 combination, and 470 dry-well completions in 1952. This activity resulted in discovery of a new Clinton-sand pool in Newcastle Township, Coshocton County. In this area 60 wells were drilled, resulting in 43 producers and 17 dry holes. Exploratory activity in Jackson Township, Knox County, permitted further development of the Mount Zion pool. Of the 73 completions in this area, 56 were oil wells, 5 gas wells, and 12 dry holes. In Ashland County major Berea sand producing area, 160 wells were completed. These resulted in 85 oil, 8 gas, 4 combination, and 63 dry wells. No major gas discoveries were reported in Ohio in 1952.

In addition to the output of petroleum and natural gas, 38,000 barrels of natural gasoline valued at $114,000 was produced by 2 absorption plants. In all, 9,011 million cubic feet of natural gas was treated for an average yield of 0.18 gallon of natural gasoline per thousand cubic feet.

NONMETALS

Cement.—Shipments of Ohio portland cement in 1952 declined 4 percent compared with the record established in 1951. Stocks of finished portland cement, as of December 31, 1952, showed a 13-percent decrease from those on hand at the end of 1951. The average value increased from $2.48 per barrel in 1951 to $2.50 in 1952. Of the nine plants active in Greene, Erie, Lake, Lucas, Muskingum, Lawrence, and Stark Counties, the largest quantities were produced by Southern Portland Cement Co., Fairborn, Greene County, and Pittsburgh Plate Glass Co., East Fultonham, Muskingum County.

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TABLE 3.—Finished portland cement produced, shipped, and in stock, 1943–47 (average) and 1948–52

Year	Active plants	Production (barrels)	Shipments from mills			Stocks at mills on Dec. 31 (barrels)
			Barrels	Value		
				Total	Average per barrel	
1943–47 (average)	9	6,469,105	6,508,446	$10,403,520	$1.56	763,422
1948	9	10,035,211	10,020,198	20,496,930	2.05	600,020
1949	9	10,313,496	10,157,001	22,388,726	2.20	758,327
1950	9	10,606,739	10,512,004	24,012,983	2.28	853,982
1951	9	11,873,852	11,872,278	29,498,956	2.48	855,548
1952	9	11,270,431	11,377,806	28,488,500	2.50	748,173

Clays.—The clay industries of Ohio originated in 1841, when A. Russell first produced fire brick near East Liverpool. This was followed by the establishment of G. & M. Meyers near Toronto in 1852. That organization utilized the lower Kittanning clay beds for manufacturing various clay products. Flint clays were first utilized by Reese Thomas in Scioto County for the manufacture of fire brick. From this small start, the clay industry of Ohio has increased until today the State leads the Nation as a producer. In 1952 output was reported from 124 clay pits, including 18 underground mines, operating in 42 counties. Fire clay, which comprised 52 percent of tonnage and 80 percent of value, was the more important type of clay produced in 1952. Output of this clay declined 9 percent compared with the record 1951. Miscellaneous clay production increased 4 percent. Approximately 63 percent of the total clay output was utilized in manufacturing heavy clay products. The major producing counties were: Tuscarawas, Columbiana, and Hocking. The largest producers were McLean Fire Brick Co. and National Fireproofing Co. Miscellaneous clay-producing areas were in Cuyahoga, Stark, and Tuscarawas Counties. The fire-clay output was concentrated predominantly in Tuscarawas, Columbiana, and Stark Counties. The total clay production declined 3 percent as compared with 1951.

TABLE 4.—Clays sold or used by producers, 1951–52, by counties

County	1951		1952	
	Short tons	Value	Short tons	Value
Carroll	218,838	$316,519	205,423	$368,955
Columbiana	525,369	2,066,023	470,436	2,404,065
Cuyahoga	395,066	388,684	609,312	609,312
Hocking	213,057	1,491,547	194,530	1,208,136
Jackson	181,978	557,462	191,393	660,192
Jefferson	216,294	939,102	221,587	901,684
Lawrence	191,908	668,298	150,471	424,418
Paulding	16,346	16,346	20,960	20,960
Perry	182,689	234,371	161,338	210,894
Putnam	16,026	16,026	16,724	16,724
Stark	696,814	1,077,156	513,010	920,415
Summit	144,008	194,302	145,985	203,210
Tuscarawas	1,113,765	2,853,923	1,061,094	2,744,741
Undistributed [1]	1,574,472	2,944,298	1,531,567	2,950,036
Total	5,686,630	13,764,057	5,493,830	13,643,742

[1] Includes data for counties having less than 3 producers and clay used in cement manufacture not apportioned by counties.

TABLE 5.—Clays sold or used by producers in 1952, by kinds and uses

Use	Fire clay		Miscellaneous		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
Pottery and stoneware:						
Stoneware including chemical stoneware	4,374	$17,078	----------	----------	4,374	$17,078
Art pottery and flowerpots	14,000	70,000	----------	----------	14,000	70,000
Total	18,374	87,078	----------	----------	18,374	87,078
Tile, high-grade	77,942	188,796	40,153	$40,153	118,095	228,949
Kiln furniture: saggers, pins, stilts	319	2,622	----------	----------	319	2,622
Architectural terra cotta	145	726	----------	----------	145	726
Portland and other hydraulic cements	----------	----------	489,960	489,960	489,960	489,960
Refractories:						
Fire brick and block	770,088	4,067,110	----------	----------	770,088	4,067,110
Fire-clay mortar	74,619	367,363	----------	----------	74,619	367,363
Foundries and steelworks	346,895	1,523,295	----------	----------	346 895	1,523,295
Other	16,324	33,074	----------	----------	16,324	33,074
Total	1,207,926	5,990,842	----------	----------	1,207,926	5,990,842
Heavy clay products	1,562,751	4,669,010	1,873,350	1,951,645	3,436,101	6,620,655
Other uses	----------	----------	222,910	222,910	222,910	222,910
Grand total	2,867,457	10,939,074	2,626,373	2,704,668	5,493,830	13,643,742

Gypsum.—Ohio gypsum was first discovered in 1821 in rocks outcropping along the shore of Sandusky Bay. In 1952 the State output of this commodity was still obtained from this area. The deposits were derived from sea water evaporated in restricted basins in ancient seas that once covered the northern part of the State. U. S. Gypsum Co. and Celotex Co., Port Clinton, were the only producers of this commodity in Ohio in 1952.

Iron Oxide Pigments.—Minnesota Mining & Manufacturing Co. and C. K. Williams & Co. produced natural and manufactured iron oxide pigments in Ohio in 1952. These two organizations operated plants in Summit and Trumbull Counties, respectively. Their output consisted of pure and miscellaneous red oxides and venetian reds.

Lime.—For over 30 years Ohio has been the leading producer of burnt lime in the United States. The output of this commodity ranked, in terms of value, as the fourth largest mineral industry in the State in 1952. High-calcium lime, high-magnesium lime, and dead-burned dolomite were prepared. Lime produced was utilized for refractory (53 percent), building (26 percent), chemical and industrial (18 percent), and agricultural (3 percent) purposes. Of the 18 producers operating in 9 counties, the largest were Basic Refractories, Inc., Cleveland; U. S. Gypsum Co., Genoa; and Standard Lime & Stone Co., Woodville. Approximately 40 percent of the total lime output was obtained from Sandusky County. That area, with Seneca and Ottawa Counties, was responsible for approximately 84 percent of the total burnt-lime production. High-calcium limestones utilized for lime manufacture were the Brassfield formation in the southwest, Columbus limestone in central Ohio, and the Maxville in the southeast. The Cedarville, Springfield, and Monroe formations provided the high-magnesium rock necessary for output of dead-burned dolomite and high-magnesium lime.

TABLE 6.—Lime (quick and hydrated) sold by producers, by types, 1943–47 (average) and 1948–52

Year	Agricultural (burnt)		Building		Chemical and other industrial		Refractory		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	62,506	$472,010	302,448	$2,778,348	421,362	$3,094,639	734,152	$6,891,651	1,520,468	$13,236,648
1948	47,423	496,877	544,483	6,546,556	416,590	3,731,998	927,715	10,697,970	1,936,211	21,473,401
1949	51,724	603,555	525,357	6,713,569	327,425	3,268,128	807,742	9,736,135	1,712,248	20,321,387
1950	51,904	595,105	632,632	8,678,435	390,571	3,876,436	1,067,237	13,123,122	2,142,344	26,273,098
1951	47,092	519,367	623,236	8,290,569	437,891	4,491,313	1,181,254	15,744,947	2,289,473	29,046,196
1952	53,467	637,589	578,088	8,009,903	407,007	4,139,066	1,166,870	15,606,702	2,205,432	28,393,260

Natural Salines.—Calcium chloride and calcium-magnesium chloride were produced from well brines by the ammonia-soda process in Meigs County in 1952. The output was utilized for stabilizing rural roads, as well as for ice control on streets and sidewalks, and as a circulating brine in refrigerating plants. The sole producer was the Pomeroy Salt Corp.

Perlite, Expanded.—The output of expanded perlite manufactured from southwestern United States crude material was utilized predominantly for plaster and concrete aggregate. Production totaled 9,975 tons in 1952, with an average value per ton of $67.56. Expanded perlite was produced in Summit, Cuyahoga, Hamilton, and Sandusky Counties by five companies. The largest producer was the Cleveland Gypsum Co.

Salt.—Ohio salt output declined 9 percent in 1952, although its value increased 2 percent. This resulted from a $0.93-per-ton rise in the price of evaporated salt, which represented 70 percent of the total salt value. The brine output comprised 84 percent of the total salt tonnage and was limited to Summit and Lake Counties. Evaporated salt was produced in Summit, Wayne, and Meigs Counties. The brines are obtained by the underground solution of rock salt in hot water. The saline solution thus obtained was utilized directly by chemical plants as a raw material or evaporated for sale as salt. Of the six producing companies in Ohio in 1952, the largest were Diamond Alkali Co., Painesville, and Columbia Southern Chemical Corp., Barberton.

TABLE 7.—Salt sold or used by producers, 1943–47 (average) and 1948–52, by kinds

Year	Evaporated		Brine		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	460,347	$3,662,940	2,359,037	$911,940	2,819,384	$4,574,880
1948	441,169	4,287,147	2,311,527	1,597,196	2,752,696	5,884,343
1949	445,591	3,976,109	1,750,187	1,158,814	2,195,778	5,134,923
1950	472,966	4,274,738	2,042,239	1,216,815	2,515,205	5,491,553
1951	479,246	3,908,141	2,633,226	1,940,337	3,112,472	5,848,478
1952	461,289	4,189,883	2,366,166	1,801,743	2,827,455	5,991,626

Sand and Gravel.—The western and northern portions of Ohio continued in 1952 to be major sand- and gravel-producing areas. These

deposits result from prehistoric glacial action. Material is recovered from open pits by conventional earth-moving equipment and from bars in Lake Erie by dredges. Because of the commodity's low unit value and great bulk, which combine to limit shipping distance, the output continued to be marketed locally. As a result, 63 of the State's 88 counties reported sand and gravel production in 1952. Compared with 1951, the total State output advanced 7 percent in quantity and 8 percent in value.

Approximately 82 percent of Ohio's 1952 sand and gravel production was sold for use as building and paving aggregate. It was also utilized as a raw material for glass, as well as for polishing, grinding, filtering, railroad-ballast, traction, and refractory purposes. Glass sand was obtained from Perry, Knox, Geauga, and Scioto Counties. The major sand- and gravel-producing areas, however, were in Hamilton, Franklin, and Montgomery Counties. Out of the 202 pits active in Ohio in 1952, the largest were operated by Ohio Gravel Co., Cincinnati; American Aggregates Corp., Greenville; R. W. Sidley, Inc., Thompson; and American Materials Corp., Greenville.

TABLE 8.—Sand and gravel sold or used by producers, 1951–52, by uses

Uses	1951		1952	
	Short tons	Value	Short tons	Value
Sand:				
Molding	756,901	$2,140,996	744,356	$2,094,427
Building	3,908,440	3,850,610	4,383,974	4,368,680
Paving	3,118,593	2,765,952	3,065,943	2,757,387
Fire or furnace	66,486	209,456	66,702	187,979
Engine	60,915	106,457	63,900	110,593
Filter	11,027	34,965	17,382	33,089
Railroad ballast	5,074	2,470	(2)	(2)
Other [1]	513,563	1,306,613	415,062	1,119,685
Total	8,440,999	10,417,519	8,757,319	10,671,840
Gravel:				
Building	3,126,081	3,201,638	3,482,590	3,692,985
Paving	6,125,886	5,990,578	6,157,335	5,952,404
Railroad ballast	809,672	555,018	710,247	537,491
Other	928,260	1,230,138	1,644,002	2,214,738
Total	10,989,899	10,977,372	11,994,174	12,397,618
Total sand and gravel	19,430,898	21,394,891	20,751,493	23,069,458

[1] Includes glass, grinding, and polishing sands.
[2] Combined with other sand to avoid disclosure of individual company totals.

Sand and Sandstone (Ground).—Central Silica Co. and Millwood Sand Co., both of Zanesville, reported production of ground sand and sandstone in Perry and Knox Counties, respectively. The output was utilized in pottery, porcelain, and tile manufacture.

Stone.—The output of stone in Ohio in 1952 declined 2 percent compared with 1951. Crushed and broken material was 99 percent of the total output and 86 percent of the value. The major use of this commodity was as concrete aggregate, road metal, and railroad ballast. The most important type of stone was limestone and dolomite. This was utilized, aside from the three uses given above, for riprap, furnace flux, and agricultural stone. Limestone and dolomites were produced in 46 counties by 97 producers. The largest of these were Kelly Island Lime & Transport Co., Cleveland; National

TABLE 9.—Commercial sand and gravel sold or used by producers in 1952, by counties

County	Number of pits	Short tons	Value
Ashtabula	4	80,513	$79,901
Athens	3	58,950	72,827
Auglaize	3	251,674	223,346
Butler	9	881,081	821,168
Champaign	3	400,765	330,256
Clark	5	273,450	273,642
Coshocton	9	565,239	331,888
Cuyahoga	7	456,530	495,599
Darke	6	279,658	277,364
Fairfield	5	148,174	153,878
Franklin	4	2,305,756	2,267,668
Geauga	6	629,378	872,610
Greene	3	124,003	111,853
Hamilton	11	3,298,732	3,648,131
Huron	3	123,732	120,153
Knox	5	378,677	566,505
Licking	5	271,729	284,695
Montgomery	9	1,453,299	1,306,729
Muskingum	4	383,859	481,213
Portage	7	535,650	669,204
Preble	3	111,668	124,263
Ross	5	607,701	606,790
Shelby	4	130,946	140,695
Stark	7	963,231	890,170
Summit	7	610,623	635,106
Tuscarawas	7	460,072	608,012
Warren	6	409,464	365,343
Washington	6	242,293	234,332
Wayne	3	49,728	44,004
Williams	5	60,023	42,288
Undistributed [1]	38	4,204,895	5,989,825
Total commercial sand and gravel	202	20,751,493	23,069,458

[1] Includes those counties having less than 3 sand and gravel pits active in 1952.

Lime & Stone Co., Findlay; Marble Cliff Quarries Co., Columbus; Carbon Limestone Co., Lowellville; and Waggoner Quarries Co., Sandusky. Output was obtained predominantly from the western part of the State, where the Brassfield, Columbus, Delaware, Putnam, Hill, Van Port, and Ames formations outcrop. In addition, considerable production was obtained from the Guelph, Cedarville, and Springfield dolomites. Major producing counties were Ottawa, Franklin, Lucas, and Mahoning.

Sandstone quarrying for building purposes is the oldest stone industry in the State. This industry, which centers about Amherst, mostly used the Berea formation of northeastern Ohio, although the Buena Vista, Blackhand, Massilon, Freeport, and Marietta sandstones were also utilized. The Sharon conglomerate was quarried as ganister for refractory purposes. Sandstone output was reported by 10 companies operating in Lorain, Holmes, Scioto, Noble, Coshocton, Tuscarawas, and Harrison Counties. The leading producers were Cleveland Quarries Co., Amherst, Lorain County; Taylor Stone Co., McDermott, Scioto County; and Waller Bros. Stone Co., also of McDermott. Grindstones were produced by Nicholas Stone Co., Lorain, Lorain County; Constitution Stone Co., Constitution, Washington County; and Hill Grindstone Co., Marietta, Washington County. Ohio was the major United States source of this commodity.

TABLE 10.—Stone sold or used by producers, 1951–52, by kinds

Kind	1951		1952	
	Short tons	Value	Short tons	Value
Dimension stone:				
Limestone	3,100	$2,990	16,557	$36,376
Sandstone	162,888	5,144,775	150,071	4,853,232
Total dimension stone	165,988	5,147,765	[1] 166,628	[1] 4,889,608
Crushed and broken stone:				
Limestone	24,900,147	30,286,240	24,388,152	30,234,117
Sandstone	124,142	1,002,076	138,409	1,073,760
Total crushed and broken stone	[1] 25,024,289	[1] 31,288,316	[1] 24,526,561	[1] 31,307,877
Grand total	[1] 25,190,277	[1] 36,436,081	[1] 24,693,189	[1] 36,197,485

[1] Excludes certain stone. Bureau of Mines not at liberty to publish.

TABLE 11.—Limestone sold or used by producers, 1951–52, by counties

County	Number of pits	1951		1952	
		Short tons	Value	Short tons	Value
Allen	4	721,230	$820,739	687,809	$790,867
Delaware	4	483,623	545,670	397,543	454,705
Fayette	3	635,098	825,075	554,644	798,863
Hamilton	3	53,327	63,228	41,505	48,796
Hancock	3	449,895	518,172	446,490	525,054
Hardin	3	374,368	445,020	389,515	465,977
Highland	3	363,591	439,754	413,798	573,415
Logan	3	125,639	136,114	169,175	183,749
Lucas	4	1,443,814	1,805,375	1,469,386	1,864,225
Marion	3	656,570	759,165	789,135	919,536
Putnam	4	251,916	318,356	275,685	344,121
Sandusky	8	1,546,275	2,024,038	1,604,659	2,104,841
Seneca	3	1,001,369	1,088,332	959,072	1,076,745
Van Wert	3	377,543	345,380	306,289	280,727
Wood	4	467,119	534,520	508,629	567,914
Undistributed [1]	42	15,951,870	19,620,292	15,391,375	19,270,958
Total	97	24,903,247	30,289,230	24,404,709	30,270,493

[1] To avoid disclosure of confidential information, certain counties have been combined under "Undistributed."

REVIEW BY COUNTIES

ADAMS

Sand and gravel were produced in Adams County in 1952 by J. F. Hardman Co., Manchester, for use as building and paving materials. Plum Run Division of New York Coal Sales Co. reported a substantial output of limestone for concrete aggregate, road base and agricultural purposes.

ALLEN

National Lime & Stone Co. and Western Ohio Stone Co., both at Lima; A. J. Suever Stone Co., Delphos; and Bluffton Stone Co., Bluffton, produced limestone and dolomite in 1952. The output from these quarries was utilized for concrete aggregate, road material, agricultural stone, railroad ballast, and riprap. C. E. Duff & Son, Lakeview, was the sole commercial producer of building and paving sand and gravel in Allen County in 1952.

ASHLAND

A substantial quantity of noncommercial washed sand and gravel was produced in Ashland County in 1952.

ASHTABULA

Fire and molding sand and building and paving sand and gravel were produced in Ashtabula County in 1952 by Melvin L. Miller, Ashtabula; Northeast Materials, Inc., Kingsville; Peerless Mineral Products Co., Conneaut; and N. J. Pinney Co., Ashtabula.

ATHENS

The mines of Athens County in 1952 were substantial producers of soft coal. The average value of the county output ($4.38 per ton) was the highest in the State. Major producing companies were: Gem Coal Co., Nelsonville; New York Coal Co., Columbus; and Sebring Coal Co., Alliance. Limestone was quarried by Amesville Stone Co., Amesville, and Diamond Stone Quarries, Inc., and Dickson Bros., both of Albany. The last two organizations reported an output of crushed and broken material for use as concrete aggregate and road base. Amesville Stone Co. was one of the few companies in Ohio producing dimension limestone. This commodity was utilized as irregular stone for facing buildings, bridges, and other structures. Building and paving sand and gravel were produced by Hocking Valley Sand & Gravel Co., Nelsonville; Athens Building Material Co., Athens; and John Slater, Plains.

AUGLAIZE

Sole producer of limestone and dolomite in Auglaize County in 1952 was the National Lime & Stone Co. Rock quarried by this organization at its quarry at Buckland was crushed and sold for use as concrete aggregate, road material, and agricultural stone. Quality Sand & Gravel Co., Wapak Sand & Gravel Co., and Western Ohio Stone Co., all near Wapakoneta, reported the output of substantial quantities of building and paving sand and gravel.

BELMONT

In 1952 Belmont County was the largest coal-producing area in Ohio. Mines in the county reported an output exceeding 7½ million tons valued at $4.04 per ton. Of this total, 15 strip mines yielded over 1 million tons. The major producers were Hannah Coal Co., Division of Pittsburgh Consolidation Coal Co., St. Clairsville, operators of the Willow Grove No. 10 and Bradford No. 1 mines; Powhatan No. 1 and No. 3 mines of Powhatan Mining Co.; and Youghiogheny & Ohio Coal Co. Dorothy and Florence mines. Limestone and dolomite for agricultural purposes, concrete aggregate, and road material were quarried in Belmont County in 1952 by Somerton Crushing Co., Somerton, and George McCort. Gravel was produced by Uniontown Sand & Gravel Co., Uniontown, and miscellaneous clays by Standard Stone & Brick Co., Bellaire.

BROWN

Howard S. Watson and Brown County Highway Dept., both of Georgetown, produced limestone in Brown County in 1952.

BUTLER

Nine sand and gravel pits were in operation in Butler County in 1952. The largest of these, in order of decreasing production, were: American Materials Corp. and Hamilton Gravel Co., Hamilton; and Moorman Sand & Gravel Corp. and Middletown Sand & Gravel Co., both of Middletown. The output was utilized for building, paving, railroad ballast, and molding purposes. North Cincinnati Sand & Gravel Co. produced a small quantity of concrete aggregate and road base at its limestone quarry in Butler County.

CARROLL

Coal mines in Carroll County in 1952 yielded nearly 469,000 tons of soft coal with an average value of $3.82 per ton. Major producers were the Sterling mine of John M. Hurst & Co. and James Bros. Coal Co. James mine, Magnolia. Fire clay for use in the manufacture of structural and drain tile was produced by Whiteacre-Greer-Fireproofing Co., Magnolia; Metropolitan Brick Co., Inc., Canton; and Natco Corp. The latter organization operated a pit south of Magnolia on Route 542. Mineral City Sand Co., Canton, mined a substantial quantity of molding sand in Carroll County in 1952.

CHAMPAIGN

Building, paving, and railroad ballast sand and gravel were produced in Champaign County in 1952 by American Aggregates Corp., Urbana; Cushman Bros., Mechanicsburg; and Walter Dorsey, West Liberty.

CLARK

Crushed limestone for blast-furnace flux, concrete aggregate, road material, fertilizer filler, and agricultural stone was produced by Moore Lime Co., Springfield. This organization also reported output of a substantial quantity of quick and hydrated lime for use as mason's lime, masonry mortar, agriculatural purposes, dead-burned dolomite, chemical, and industrial uses. Eagle City Sand & Gravel Co. and George R. Malowney, Inc., both near Springfield; Enon Sand & Gravel Co., Enon; and Omer S. Porter and New Carlisle Sand & Gravel Co., both in New Carlisle, produced substantial quantities of building and paving sand and gravel.

CLERMONT

Ohio Gravel Co. operated a sand and gravel pit near Miamiville for production of building and paving sand and gravel, as well as railroad ballast. This company also produced agricultural limestone.

CLINTON

Limestone and dolomite were produced in Clinton County in 1952 by Melvin Stone Co. This organization reported output of a substantial tonnage of riprap, concrete aggregate, road metal, agricultural stone, stone sand, and flux. This company was also the sole producer of sand and gravel in the county.

COLUMBIANA

Columbiana County in 1952 was one of the leading coal-producing areas in Ohio. The mines of this county yielded over 1 million tons of bituminous coal with an average value of $3.36 per ton. The major producers were: Industrial Mining & Engineering Co., Lisbon; A. B. C. Mining Co., operators of Crawford and A. B. C. mine No. 2 near Lisbon; and the Buckeye Coal Mining Co., operator of McCoombs mine. Virtually all output was strip mined. Miscellaneous clays were produced by American Vitrified Products Co., Leslie, and Summitville Face Brick Co., Summitville. Fire-clay output was from the Wellsville and New Salisbury pits of McLean Fire Brick Co., the Negley pit of West Darlington Clay Co., National Fireproofing Corp., and L. L. Adams, Lisbon.

COSHOCTON

Coshocton County in 1952 was a large bituminous-coal-producing area. The mines of the county were responsible for the output of over 1 million tons of soft coal with an average value of $3.57 per ton. Willow Brook Coal Co., operators of the Willow Brook mine, and Freeport Gas Coal Co. Jenkins mine near Coshocton were major producers. Other mineral products included sand and gravel and sandstone. Nine sand and gravel pits were active in the county during the year; the largest was that of Edward A. Warner, Newcomerstown. Molding sand was produced by Ayers Mineral Co., Blissfield, and E. F. & James A. Myer, Layland. A substantial tonnage of sawed sandstone was mined by Pearl Sandstone Co. from a quarry near Fresno.

CRAWFORD

National Lime & Stone Co. continued to operate its limestone and dolomite quarry near Spore in 1952. The output was sold for use as concrete aggregate, road material, railroad ballast, and agricultural purposes.

CUYAHOGA

Cuyahoga County in 1952 ranked first in the State in miscellaneous clays output. Most of the production was utilized for brick and drain-tile manufacture. The major producer was Cleveland Builders Supply Co., Cleveland. Others were Berea Tile Co., Berea; Ohio Clay Co., operators of a pit 6 miles southeast of Cleveland; and Collinwood Shale Brick & Supply Co., Cleveland. Hydraulic Press Brick Co., South Park, manufactured lightweight aggregate from expanded shale. Seven sand and gravel pits yielded building and paving material during the year. Of these the largest were Canal Sand & Gravel Co., Lytle Bros., and Schmidt Bros. Sand & Supply

Co., all near Cleveland. Expanded perlite was also produced in Cuyahoga County in 1952. Cleveland Gypsum Co., sole county producer, was the largest manufacturer in Ohio. Major use was for plaster and concrete aggregate.

DARKE

Of the six sand and gravel pits operating in Darke County in 1952 the largest, by far, was the American Aggregates Corp. plant near Fort Jefferson. Other substantial producers were C. F. Poppelman, Versailles; Slagle Gravel Plant, Greenville; and Hollinger Gravel Co., New Madison. Output was utilized mainly for building and paving material. The sole producer of clays was the Darke County Tile Co., which mined miscellaneous clays from its pit at Greenville for use in manufacturing drain tile and brick.

DELAWARE

Galena Shale Tile & Brick Co., Galena, and Delaware Clay Co., Delaware, produced miscellaneous clays for use in manufacturing brick and tile in 1952. Scioto Lime & Stone Co., Delaware, produced a substantial quantity of chemical lime. This organization also reported an output of a small quantity of hydrated lime for building and agricultural purposes. Limestone for concrete aggregate, road material, and agricultural stone was quarried by the National Lime & Stone Co., Delaware; Shawnee Stone Co., Powell; Owens Stone Co., Ostrander; and Penry Stone Co., Radnor. A small tonnage of unwashed sand and gravel was produced noncommercially.

ERIE

Wagner Quarries Co. produced a substantial quantity of riprap, concrete aggregate, road material, railroad ballast, and agricultural stone from a limestone quarry near Sandusky. Molding, building, and engine sand were produced by Keener Sand & Clay Co., Huron and Kelly Island Lime & Transportation Co., Sandusky. Medusa Portland Cement Co. continued to operate its cement plant near Baybridge. Miscellaneous dimension stone for use as rough building material was quarried by Castalia Tuffa Rock Gardens, Castalia.

FAIRFIELD

Of the five sand and gravel pits in operation in Fairfield County in 1952, the largest were worked by F. H. Brewer Co., Lancaster; Crystal Rock Products Co., Bremen; and Sargent Gravel Co., Lancaster. The output was utilized mainly for building and paving material. Molding sand was produced by H. N. Rose in Rush Creek Township.

FAYETTE

Riprap, concrete aggregate, road base, railroad ballast, and agricultural stone were produced from limestone quarries near Washington Court House by Blue Rock, Inc., Fayette Limestone, Inc., and Sugar Creek Stone Co.

FRANKLIN

Franklin County was one of the principal sources of sand and gravel in Ohio in 1952. Major producers were American Aggregates Corp., Arrow Sand & Gravel Co., and Jackson Pipe Sand-Gravel Co., all operating pits near Columbus. These organizations produced building, paving, and railroad ballast sand and gravel. Marble Cliff Quarries Co. worked its limestone quarry near Marble Cliff and produced blast-furnace and open-hearth flux, concrete aggregate, road material, railroad ballast, agricultural stone, and asphalt filler. Limestone quarried was also used in the preparation of burnt lime for building, agricultural and chemical purposes.

Miscellaneous clays for use in manufacturing drain tile and glazed brick was obtained from pits of Claycraft Co., Taylor, and Columbus Clay Manufacturing Co., Blacklick.

GALLIA

Bituminous coal was the principal mineral product of Gallia County in 1952. Five strip pits were active during the year and produced over 50 percent of the total output. Coal sold in 1952 had an average value of $3.15 per ton. Epling Sand & Gravel Co., Gallipolis, and Kenner Sand & Clay Co. produced building, paving, grinding, polishing, and molding sand and gravel.

GEAUGA

Glass, building, paving, and molding sand and gravel were produced at seven pits in Geauga County in 1952. Major producers were R. W. Sidley, Inc., Thompson; Jefferson Materials Corp., Burton; and Walter C. Best, Inc., Chardon.

GREENE

Greene was the leading cement-producing county in Ohio in 1952. Southwestern Portland Cement Co. and Universal Atlas Cement Co. both operated plants near Fairborn. Substantial quantities of building and paving sand and gravel were produced by Greene Township Gravel Co., Cedarville, and Charles McNamee and Whiteacre & Roberts, both of Xenia.

GUERNSEY

Guernsey County mines in 1952 yielded approximately 500,000 tons of bituminous coal with an average value of $3.34 per ton. John Gress, Pleasant City, reported the output of a substantial quantity of limestone for concrete aggregate and road base.

HAMILTON

Hamilton County in 1952 was the largest sand- and gravel-producing area in Ohio. Output was utilized for molding, building, and paving sand and gravel, as well as for railroad ballast. Of the 11 active pits, 5 were operated by the Ohio Gravel Co.; these were near Cleves, Cincinnati, Camp Dennison, Miamitown, and Newtown.

Ohio Gravel Co. also produced agricultural limestone from quarries near Camp Dennison, Miamitown, and Newtown. Indoken Perlite Co., St. Bernard, began operations as a producer of expanded perlite under a franchise agreement with a large producer of crude perlite. The output was sold to building-supply houses.

HANCOCK

Limestone and dolomite were produced for use as concrete aggregate, road base, railroad ballast, agricultural stone, and asphalt filler in Hancock County in 1952. National Lime & Stone Co. and the Tar-Box McCall Stone Co., both of Findlay, and Pifer Stone Co., Williamstown, were major producers. Hancock Brick & Tile Co. operated a pit 3½ miles southeast of Findlay to produce miscellaneous clays for use in manufacturing drain tile.

HARDIN

Riprap, concrete aggregate, road base, railroad ballast, and agricultural stone were produced from the limestone quarries of The France Co. and Hardin Quarry Co., Dunkirk. In addition to these commodities, blast-furnace and open-hearth flux, fertilizer filler, and dust for coal mines were produced by Herzog Lime & Stone Co., Forest.

HARRISON

Harrison County ranked second among coal-producing counties of Ohio in 1952. Over 7 million tons, with an average value of $4.10 per ton, was produced during the year. Nearly 6 million tons was recovered from 20 strip pits in operation during the year. Major producers were the Hannah Coal Co. Georgetown No. 13 mine and Youghiogheny & Ohio Coal Co. Nelms mine. Hannah Coal Co. also produced limestone and dolomite. Sole producer of clay in Harrison County in 1952 was Bowerston Shale Co. A small output of sawed-sandstone blocks for building purposes was reported by Freeport Quarries, Inc., Steubenville.

HENRY

Sand and gravel for building and paving purposes were produced in Henry County in 1952 by Harpers Supply Co., Inc., and Napoleon Sand & Gravel Co., both of Napoleon. Clay was produced by August Honeck & Sons, Malinta, and Napoleon Brick & Tile Works, Napoleon.

HIGHLAND

Substantial quantities of concrete aggregate, road material, railroad ballast, agricultural stone, fertilizer filler, and rock dust for coal mines were produced from the limestone quarried in Highland County in 1952. Active operators were New York Coal Sales Co., Ohio Asphaltic Limestone Co., Inc., and Clay-Wilcox Quarry, Rainsboro. Ohio Asphaltic Limestone Co. was headquartered in New Vienna, Clinton County, but operated a quarry just across the Highland County line. Building brick and structural and drain tile were pro-

duced from local clays by The Mowrystown Brick & Tile Co., Mowrystown.

HOCKING

Hocking County in 1952 was one of the largest fire-clay-producing areas in Ohio. The county ranked third in total value of clay output. Major producers were Natco Corp., Haydenville; Logan Clay Products Co., Logan; and Hocking Valley Brick Co., Nelsonville. The Hocking County mines produced a relatively small output of bituminous coal. F. H. Brewer Co. produced building and paving sand and gravel.

HOLMES

Briarhill Stone Co., Glenmont, and Nicholl Stone Co. quarried substantial quantities of dimension sandstone in Holmes County in 1952. This commodity was utilized as sawed architectural stone, dressed or cut material, and as flagging. F. E. Kaser, Berlin, and Pioneer Sand & Gravel Co., Millersburg, mined building and paving sand and gravel. General Clay Products Co., Columbus, operated a pit near Baltic for producing fire and miscellaneous clays. The output was utilized for preparing drain tile and other types of tile. In 1952, Holmes County with an output of a little over 3,000 tons of bituminous coal, had the smallest production of any county in Ohio.

HURON

E. Biglow Co. reported a substantial output of miscellaneous clays for use in manufacturing drain tile from its pit near New London. Greenwich Sand Co., Greenwich; Huron Sand & Gravel Co., Willard; and Tessmer Sand Co., Norwalk, produced sand and gravel for building, paving, filter, and molding purposes.

JACKSON

General Refractories Co., Pyro-Refractories Co., and Oak Hill Fire Brick Co., all of Oak Hill, reported the production of plastic and flint fire clay for use in the manufacturing refractories in Jackson County in 1952. Other active clay producers were Davis Fire Brick Co., Aetna Fire Brick Co., and Ohio Fire Brick Co., also all of Oak Hill. In addition, county coal mines in 1952 yielded over 500,000 tons of bituminous coal with an average value of $3.87. The sole producer of sand was Jackson Sand Mining Co., which recovered molding, building, and furnace sand from its pit at Jackson.

JEFFERSON

Jefferson County in 1952 ranked third in Ohio as a soft-coal producer. Approximately 5 million tons with an average value of $3.95 was mined during the year. Twenty-six strip mines were in operation, with an output exceeding 2½ million tons. Hannock Coal Co., operator of Piney Fork No. 1 and No. 4 and Dun Glen No. 11 mines, was the major producer. Kaul Clay Manufacturing Co., Toronto, reported the output of plastic, fire, and miscellaneous clays. Peerless Clay Corp., Toronto; Union Clay Manufacturing Co., Empire; Lar-

son Clay Products Co., Stratton; Toronto Fire Brick Co., Toronto; and McLean Fire Brick Co. and Frederick J. Dando, both of Irondale, were other fire-clay producers active in Jefferson County. Brilliant Sand Co. recovered building sand by slackline and cableway at its pit at Brilliant.

KNOX

Sand and gravel, chiefly for building and paving purposes, was produced in Knox County in 1952 by Killbuck Sand & Gravel Co., Brinkhaven; Millwood Sand Co., Millwood; Fredericktown Sand & Gravel Co., Fredericktown; J. Harry Baughman, Mount Vernon; and T. R. Mitchart, Glenmont. J. Harry Baughman quarried stone for concrete aggregate and road material. Ground sand and sandstone for use in the manufacture of pottery, porcelain, and tile were produced by Millwood Sand Co., Zanesville, from its quarry near Howard.

LAKE

Kelly Island Lime & Transport Co. and Minot H. Allen, Willoughby, recovered a substantial tonnage of building and paving sand and gravel in Lake County in 1952. Kelly Island Co. operated a dredge near Grand River. Brine was produced by Diamond Alkali Co. near Painesville. An output of magnesium compounds was also reported from this plant. Standard Portland Cement Co. operated a portland-cement plant in Painesville Township in 1952. Miscellaneous clays for use in manufacturing paving brick was mined by Euclid Shale Brick Co. from its pit at Wickliffe.

LAWRENCE

The mines and quarries of Lawrence County yielded bituminous coal, limestone, and sand and gravel in 1952. The sales value of the total coal output averaged $3.95 per ton. Almost two-thirds of the county output was obtained from six strip mines. Alpha Portland Cement Co. and New York Coal Sales Co. Superior Cement Division operated portland-cement plants at Ironton and Superior, respectively, in 1952. Limestone for use as concrete aggregate, road base, and agricultural stone was quarried by Southern Ohio Products Co., Ironton. George B. Wilson, Chesapeake, was the sole producer of building and paving sand and gravel.

Fire clay for use in manufacturing fire brick and tile was produced at the Bear Run mine of Harbison-Walker Refractories Co. Other producers of fire clay included General Refractories Co., Carlisle Tile Co., Ironton; Cambria Clay Products Co., Blackfork; Poetker & Smith Coal & Clay Co., South Webster; Southern Ohio Products Co., Ironton; and Illinois Clay Products Co. and Eastern Clay Products Co. both of Pedro.

LICKING

Vanatta Gravel Co., Dry Creek Crushed Gravel Co., and Newark Sand & Gravel Co., all of Newark, were the largest of the five sand and gravel producers active in Licking County in 1952. Output was utilized for building and paving material.

LOGAN

Limestone and dolomite were quarried in Logan County in 1952 by National Lime & Stone Co., Northwood Stone Co., Bellefontaine, and Western Ohio Stone Co. The output of these three quarries was utilized for concrete aggregate, road material, and agricultural purposes. Neer Engineering Laboratory, Bellefontaine, was the sole producer of building and paving sand and gravel.

LORAIN

Lorain County was a major sandstone-producing area in Ohio in 1952. The output was utilized predominantly for rough, sawed, dressed, and cut architectural stone, as well as for curbing and flagging. In addition, there was a substantial production for use as riprap. Sandstone producers were Cleveland Quarries Co., Amherst, and Nicholl Stone Co., Lorain. The latter also reported an output of grindstones. Cleveland Quarries Co., and Kelly Island Lime & Transport Co. dredged sand from Lake Erie for use as fire and furnace sand, and building and paving material.

LUCAS

Lucas County in 1952 ranked as fourth largest limestone-producing area in Ohio. France Stone Co. operated quarries near Holland and Waterville. Maumee Stone Co., Maumee, and Toledo Stone & Glass Sand Co., Toledo, also produced substantial quantities of limestone. The output was utilized for riprap, concrete aggregate, road base, railroad ballast, and agricultural purposes. The Toledo House of Correction, Whitehouse, produced a small quantity of noncommercial dimension limestone. Medusa Portland Cement Co. produced portland cement at its plant at Silica. Building sand was produced in Lucas County by Vermilion Sand & Gravel Co., Vermilion, and Lake Sand & Gravel Co., Toledo.

MADISON

Building and paving sand and gravel were mined in Madison County in 1952 by West Jefferson Sand & Gravel Co., West Jefferson. The sole producer of clay was the Madison Tile Co.

MAHONING

Carbon Limestone Co., Lowellville, one of the principal producers of limestone and dolomite in Ohio in 1952, was the sole source of that commodity in Mahoning County. The output was utilized for concrete aggregate, road material, agricultural stone, asphalt filler, coalmine rock dust, mineral food, and poultry grit and for various metallurgical uses, including blast-furnace flux. American Fire Clay & Products Co., Canfield, and Pen-Hio Clay Co., Youngstown, produced substantial quantities of fire clay for sale to other companies. Over 800,000 tons of soft coal with an average value of $3.88 per ton was mined during the year. A small quantity of peat was produced for use as a soil conditioner. Sand and gravel were produced by Industrial Silica Co., Youngstown.

MARION

J. M. Hamilton & Sons Co., Marion; National Lime & Stone Co., and Tri-County Limestone Co. quarried limestone during the year for use as riprap, concrete aggregate, and road base, and for agricultural purposes. Miscellaneous clays were mined by Marion Brick & Tile Corp., Marion, and La Rue Tile Co., La Rue. Building sand was produced by Penry Sand & Gravel Co., Radnor.

MEDINA

Quillin Bros. Construction Co., Lodi, and Allied Supply Co., Medina, operated sand and gravel pits in Medina County in 1952. The output was used mainly for building and paving materials. A substantial output of miscellaneous clays for use in manufacturing brick and drain tile was reported by Wadsworth Brick & Tile Co.

MEIGS

Excelsior Salt Works, Inc., and Pomeroy Salt Corp., both of Pomeroy, produced substantial quantities of evaporated salt in Meigs County in 1952. Virtually all output was recovered by the open-pan method. Pomeroy Salt Corp. also reported the output of a small quantity of calcium chloride and calcium-magnesium chloride by the ammonia-sodium treatment of well brines at a plant near Minersville. The coal mines of Meigs County reported production exceeding 500,000 tons.

MERCER

Riprap, concrete aggregate, road material, and agricultural stone were produced in Mercer County in 1952 from limestone quarries of John W. Karch Stone Co., Celina, and Rockford Stone Co., Rockford.

MIAMI

Piqua Stone Products Div., Armco Steel Corp., continued in 1952 to work its limestone quarry near Piqua for the production of riprap, metallurgical stone (including blast-furnace flux), concrete aggregate, road material, agricultural stone, putty whiting, and rubber and asphalt fillers, coal-mine rock dust, and mineral food. Fenton Construction Co. and Steiner Washed Sand & Gravel Co. produced building and paving sand and gravel at Troy and Ludlow Falls, respectively.

MONROE

The coal mines of Monroe County reported an output of 10,000 tons of soft coal valued at $3.47 per ton. Limestone quarries were operated by Walter L. Christman and H. F. Zerger, near Woodsfield.

MONTGOMERY

Nine sand and gravel pits were in operation in Montgomery County in 1952. Of these, the pits of American Aggregates Co., Southern Hills Pit, Inc., and Keystone Gravel Co., all of Dayton, were the largest producers. Output was utilized mainly for building and paving sand

and gravel. Limestone and dolomite were quarried by Laura Gravel-Stone Co., Phillipsburg. The stone produced was crushed and sold for riprap, blast-furnace flux, concrete aggregate, road material, and agricultural stone, as well as asphalt and fertilizer filler.

MORGAN

Douglas Ervin, Stockport, and Stockport Sand & Gravel Co., Chesterhill, produced a substantial quantity of building and paving sand and gravel. Chesterhill Stone Co., Chesterhill, was the sole producer of limestone. Coal mines in the county yielded over 100,000 tons of soft coal, with an average value of $3.05 per ton in 1952.

MORROW

Carl Hunt mined building sand and paving gravel from a pit at Chesterville in 1952.

MUSKINGUM

Muskingum County was a large producer of bituminous coal in 1952. Output exceeded 1.3 million tons and was valued at $2.64 per ton. Approximately 14 strip pits were active, with a total production exceeding 1 million tons. The major coal producers were Central Ohio Coal Co., Zanesville, and George B. Herring & Son, Mansfield. Four sand and gravel pits were active during the year; the largest were worked by Muskingum River Gravel Co. and Zanesville Gravel Co., both of Zanesville. The output was utilized mainly for building and paving material. Limestone for concrete aggregate, road base, agricultural purposes, and miscellaneous uses was quarried by Sidwell Bros. south of Zanesville and Columbia Cement Division, Pittsburgh Plate Glass Co. Columbia Cement Division also operated a cement plant at East Fultonham. Clyde Nelson, Roseville, was the sole producer of fire clay.

NOBLE

Bituminous-coal production in Noble County in 1952 exceeded 1,800,000 tons. The average value per ton of the output was $2.91. Virtually all coal produced during the year came from six strip mines. The use of strip-mining methods resulted in the extremely high productivity rate of 26.35 tons per man per day. The major producers were Commercial Fuel Co. Cumberland No. 3 strip mine and Electro-Metallurgical Co., Division of Union Carbide & Carbon Corp. Dexter City mine. W. J. Zimmerling strip mine and James Merry, both of Caldwell, produced substantial quantities of limestone and dolomite. Miscellaneous clays for use in manufacturing paving and building brick were produced by Ava Brick Co., Ava.

OTTAWA

Ottawa County ranked first in 1952 among the limestone-producing counties of Ohio. The largest producer in the county was Kelly Island Lime & Transportation Co., which operated 2 quarries, 1 near Marblehead and the other near Clay Center. In addition, United States Gypsum Co. operated a quarry in the vicinity of Gypsum.

The output was utilized for blast-furnace flux, concrete aggregate, road material, and agricultural purposes and in glass manufacture, as well as a whiting agent for rubber, as an asphalt filler, and as rock dust for coal mines. These two stone producers also operated hydrated- and quick-lime plants at Clay Center and Genoa, respectively. These commodities were utilized by the building, agricultural, and chemical industries. In addition, there was a substantial output of dead-burned dolomite for refractory purposes. U. S. Gypsum and the Celotex Corp. continued gypsum operations at Gyspum and Port Clinton, respectively, in 1952.

PAULDING

Miscellaneous clays were produced in Paulding County in 1952 from the pits of the Haviland Clay Works Co., Haviland, and Baughman Tile Mill, and Dangle Drain Tile Co., both of Paulding. Auglaize Stone Co. produced a substantial tonnage of limestone and dolomite at its quarry at Oakwood.

PERRY

Perry County in 1952 ranked fourth as a bituminous-coal-producing area in Ohio. Coal mined was sold for $0.46 per ton more than the State average of $3.81. Fifteen strip pits were producing, with a total output exceeding 1½ million tons. The major producing companies were the Sunnyhill Coal Co., operators of the Sunnyhill No. 8 strip mine, and Jones Motor Sales, Inc., Zanesville, operators of the Misco mine. Claycraft Co. and Straitsville Brick Co., New Straitsville, produced fire clay for use in manufacturing glazed brick and tile. Junction City Clay Co., and Brush Creek Clay Co., both of Junction City; Belden Brick Co., Somerset; and Ludowici Celadon Co., New Lexington, mined miscellaneous clays for manufacturing roofing tile, chimney tops, building brick, acidproof brick, drain tile, flue linings, and wall coping. Central Silica Co., Zanesville, operated a quarry near Glenford and produced ground sand and sandstone. The output was utilized in manufacturing pottery, porcelain, and tile. Substantial quantities of glass and molding sand were produced by Central Silica Co., Glenford, and Industrial Minerals Co., New Lexington.

PICKAWAY

Sturm & Dillard Co. continued to recover sand and gravel from its pit at Circleville.

PIKE

Sharon Silica Co., Jackson, and Ohio Mineral Co., Zanesville, operated sand and gravel pits in Pike County in 1952. The major product was gravel for miscellaneous purposes, although there was a substantial output of molding sand. There was also production of both washed and unwashed noncommercial sand and gravel.

PORTAGE

Portage County mines yielded nearly 200,000 tons of soft coal valued at $4.16 per ton. Universal Sewer Pipe Corp. mined plastic

fire clay from its pit near Palmyra. Harbison-Walker Refractories Co. produced a substantial tonnage of sandstone for use as ganister in the manufacture of silica brick. This company completed construction of a silica-refractories plant near Windham in 1952, which featured mechanization of batch control, impact pressing, direct setting of brick from presses to tunnel-kiln cars, and close control of temperature. Seven sand and gravel pits were active in Portage County in 1952; the largest were the Industrial Silica Corp. Garrettsville and Geauga Lake plants and the Hugo Sand Co. Kent property.

PREBLE

The sole producer of limestone and dolomite in Preble County in 1952 was the Marble Cliff Quarries Co., which worked its quarries near Lewisburg during most of the year. Rock produced was crushed for use as blast-furnace flux, concrete aggregate, and agricultural stone. This company also produced hydrated and quicklime for chemical purposes. White Gravel Co., Camden; and Steiner Washed Sand & Gravel Co. and the Hawkey pit, both of West Alexander, produced building and paving sand and gravel.

PUTNAM

Four operators produced limestone and dolomite in Putnam County in 1952. National Lime & Stone Co., Rimer; Ottawa Stone Co. and Putnam Stone Co., both of Ottawa; and Schumacher Stone Co., Pandora, operated quarries. The output was utilized for concrete aggregate, road base, railroad ballast, and agricultural purposes. Miscellaneous clays were produced by Snyder Tile Co., Findlay; Etter Tile & Coal Co., Dupont; and Miller Bros. Clay Works, Ottoville.

RICHLAND

Building bricks were produced by Richland Shale Brick Co. and Ohio Lumber & Face Brick Co., both of Mansfield, from miscellaneous clays mined in Richland County in 1952. Killbuck Sand & Gravel Co., Killbuck, and Paul Farst produced commercial sand and gravel in 1952. There was also a very substantial noncommercial output during the year.

ROSS

Basic Construction Materials Division, New York Coal Sales Co., Miami Gravel Co., and Brewer & Brewer Sons, Inc., all of Chillicothe, Ohio Mineral Co. and Paint Valley Sand-Gravel Co., Bainbridge, operated pits in Ross County for producing sand and gravel in 1952. Virtually all output was utilized for building and paving material. The sole producer of limestone was the Paint Valley Sand-Gravel Co.

SANDUSKY

Sandusky County in 1952 was the leading lime producer and ranked third as a limestone producer. Eight lime plants were in operation during the year; the largest were Standard Lime & Stone Co. and Ohio Hydrate & Supply Co., both of Woodville; J. E. Baker Co., Millersville; and Dolite Co., Gibsonburg. Aside from substantial quantities of dead-burned dolomite, production consisted of building,

agricultural, and chemical lime. The output of the nine limestone quarries active in 1952 was utilized for riprap, blast-furnace flux, concrete aggregate, road base, railroad ballast, and agricultural purposes, as well as for a variety of filler and whiting uses. Major producers were France Stone Co., Woodville Lime Products Co., Kelly Island Lime & Transportation Co., and Ohio Hydrate & Supply Co. Home Sand & Coal Co., Fremont, was sole producer of building sand in Sandusky County in 1952. This company also produced a small quantity of expanded perlite, which was sold to local plastering contractors.

SCIOTO

A considerable tonnage of dimension sandstone was produced in Scioto County in 1952 from the quarries of Taylor Stone Co. and Waller Bros. Stone Co., both of McDermott. The output was utilized chiefly as rough, sawed, dressed, or cut architectural blocks, as well as for flagging. Some ganister was produced for use as furnace lining and riprap. Fire clays were mined by International Minerals & Chemical Corp., Eastern Clay Products Department, Lyra; Harbison-Walker Refractories Co., Scioto Furnace; Pyro Refractories Co., Wheelersburg; and General Refractories Co., Milford. The last organization and Portsmouth Sand & Gravel Co., Portsmouth, produced building and paving sand and gravel, as well as unwashed glass sand.

SENECA

Four quarries yielded limestone and dolomite in Seneca County in 1952. Production was utilized for various metallurgical purposes, including blast-furnace and open-hearth flux, as well as for riprap, concrete aggregate, railroad ballast, and agricultural limestone. Major producers operating in the county in 1952 were Basic Refractories, Inc., Maple Grove and Bettsville; The France Co., Bloomville; and Northern Ohio Stone Co., Flat Rock. Basic Refractories, Inc., the largest lime producer in Ohio, was the only one active in Seneca County in 1952. The output consisted entirely of dead-burned dolomite. Seneca County retained its position as the leading source of peat in Ohio. Arnold Gerhardstein mined a small tonnage of miscellaneous clays at his pit at St. Stephen.

SHELBY

Four sand and gravel pits were in operation in Shelby County in 1952; the largest were worked by Sidney Washed Sand & Gravel Co., Ernst Gravel & Stone Co., and Carl Tunks, all of Sidney. Production was utilized for building and paving materials.

STARK

Clays, portland cement, coal, peat, and sand and gravel were produced in Stark County in 1952. The county ranked second and third, respectively, in output of miscellaneous and fire clays in Ohio. Seven pits produced miscellaneous clays, and 6 pits reported production of fire clay. Major fire-clay producers were Natco Corp., East Canton and Waynesburg; Belden Brick Co., Waco; and Stark Ceramics, Inc., East Canton. Alliance Clay Products Co., Alliance, and Metropolitan

Brick Co., Inc., Canton, were major producers of miscellaneous clays. Stark County was the only peat-producing area in Ohio in 1952 in which output declined from the 1951 level. Diamond Portland Cement Co. continued to produce portland cement at its plant at Middlebranch. The coal mines of Stark County in 1952 yielded nearly 1 million tons of soft coal, which had an average sale value of $2.64 per ton. Seven sand and gravel pits were active in 1952; the largest were operated by Canton Slag Co., Youngstown, and Massillon Washed Gravel Co., Navarre. The output was utilized for building and paving material.

SUMMIT

Summit County was the major source of salt in Ohio in 1952. General Foods Corp. Diamond Crystal-Colonial Salt Division, Akron, and Columbia Southern Chemical Corp., Barberton, produced brines, part of which were used for recovering evaporated salt by the vacuum and open-pan methods. Columbia Southern Chemical Corp. also operated a limestone quarry near Barberton. The output was utilized predominantly for chemical raw material, but some rock was sold for use as concrete aggregate, road material, and agricultural stone. Summit County had seven sand and gravel producers in 1952, the largest of which were Botzum Bros., Doylestown, and J. P. Loomis Coal Supply Co. and Rubber City Sand & Gravel Co., both of Akron. The output was utilized predominantly for building and paving material. There was also a small output of molding sand. Natco Corp., Aultman, mined a substantial tonnage of fire clay. Miscellaneous clays were obtained from the pits of Camp Bros. Co. and Robinson Clay Products Co., both of Mogadore. Geotic Industries, Inc., and J. P. Loomis Coal & Supply Co. operated plants for the production of expanded perlite in Akron. This commodity was sold as an aggregate for plaster and concrete. Minnesota Mining & Manufacturing Co. produced pure red oxides.

TRUMBULL

C. K. Williams & Co. operated a plant at Warren for the production of venetian reds and miscellaneous red oxides. Sand and gravel were recovered by Kinsman Sand & Gravel Co. from its pit at Kinsman.

TUSCARAWAS

Tuscarawas County ranked first in Ohio in 1952 in the output of fire clay, third in the production of miscellaneous clays, and fifth in coal output. Coal mines of the county, of which the largest was the Midvale operation of the Columbia Southern Chemical Corp., yielded over 2,200,000 tons of bituminous coal during the year, at an average value of $3.86 per ton. Twenty pits produced fire clay, and 6 reported output of miscellaneous clays in 1952. Belden Brick Co. Sugar Creek and Port Washington mines were by far the largest producers. Seven sand and gravel pits were active in Tuscarawas County during the year. These produced building, paving, fire, engine, and filter sand and gravel, as well as a substantial output of molding sand. Major producers were Tri-County Gravel Co., Mineral City; Stocker Gravel Co., Gnadenhutten; and Industrial Silica Corp., Dundee. Sawed architectural sandstone was produced by Ten Color Stone Co., Dover.

UNION

H. E. Rockhold & Sons and Union Limestone Co. produced riprap, concrete aggregate, road base and agricultural stone at limestone quarries near West Mansfield and Marysville, respectively. Building and paving sand and gravel were produced by Clymer Materials Co., Marysville.

VAN WERT

Limestone and dolomite were produced in Van Wert County in 1952 by Union Quarries Co., Van Wert; Delphos Quarries Co.; and The France Co., operators of a quarry near Middle Point. The France Co. Convoy quarry did not operate in 1952. Rock quarried was crushed and sold for use as concrete aggregate, road material, and railroad ballast and for agricultural purposes. The sole producers of clays were Fred Minsing & Son, Delphos, and Weck tile mill, Van Wert.

VINTON

The mines of Vinton County in 1952 yielded approximately 220,000 tons of bituminous coal with an average value of $4.22 per ton. McArthur Stone & Coal Co. reported a substantial output of limestone and dolomite for use as concrete aggregate, road base, and agricultural purposes in 1952 at its quarry at McArthur. Miscellaneous clays for structural-clay-products manufacture were produced by McArthur Brick Co., McArthur.

WARREN

Of the six sand and gravel pits operating in Warren County in 1952, the largest were the Morrow operation of Van Camp Sand Gravel Co. and the Franklin plant of Franklin Sand & Gravel Co.

WASHINGTON

Of the six commercial producers of sand and gravel in Washington County in 1952, the largest were Ohio River Sand & Gravel Corp., Marietta Concrete Corp., and L. C. Riley, all of Marietta. Marietta Concrete Corp., Marietta, mined a substantial tonnage of miscellaneous clays for use in manufacturing lightweight aggregate. Other mineral products of the county during the year included grindstones produced by Constitution Stone Co., Constitution, and Hall Grindstone Co., Marietta, and coal totaling nearly 185,000 tons.

WAYNE

The mines of Wayne County in 1952 produced approximately 94,000 tons of soft coal with an average value of $4.25 per ton. W. A. Rupp Construction Co., Marshallville; T. D. Siebert, Wooster; and Charles Zollinger, Rittman, mined building and paving sand and gravel. The sole producer of salt in Wayne County was the Morton Salt Co., which operated a plant near Rittman for the production of open- and vacuum-pan evaporated salt, as well as pressed blocks. Miscellaneous clays for manufacturing building brick and tile were recovered from the pits of Metal Brick & Tile Co., Wooster, and Orrville Tile Co., Orrville.

WILLIAMS

Stryker Drain Tile Co. operated a pit for the production of miscellaneous clays near Stryker. The output was utilized in manufacturing drain tile. Flegal Gravel Co., Edgerton; Ray Shaull, Montpelier; Tri-State Gravel Co. Inc., Pioneer; and Vincent Wortkoetter, Blakeslee, produced building and paving gravel. Sand was produced by the Tri-State Gravel Co. and Easler Sand and Gravel Co.

WOOD

Limestone and dolomite for use as riprap, concrete aggregate, road base, and various miscellaneous purposes were quarried in Wood County in 1952 by The France Stone Co. from a quarry near North Baltimore; Pugh Quarry Co., Custar; E. F. Brough, West Millgrove; and National Gypsum Co. The National Gypsum Co. also operated a lime plant near Bowling Green, producing hydrated and quick lime for chemical, building, and agricultural purposes. Miscellaneous clays for use in manufacturing building brick and tile were produced by Perrysburg Tile & Brick Co., Perrysburg.

WYANDOT

National Lime & Stone Co. and J. L. Foucht were the only active producers of limestone and dolomite in Wyandot County in 1952. The output was utilized predominantly for concrete aggregate, road base, blast-furnace and open-hearth flux, railroad ballast, agricultural stone, chemical uses by glass factories, and coal-mine rock dust. National Lime & Stone Co. also produced hydrated lime for use as building material and for agricultural and chemical purposes. The only producer of clay was Claycraft Co., which operated a pit near Upper Sandusky to produce miscellaneous clays for manufacturing brick and tile. Corfman Gravel Co., Upper Sandusky, and Wilson Sand Co., also of Upper Sandusky, produced substantial quantities of building and paving sand and gravel. A small quantity of peat was also produced.

The Mineral Industry of Oklahoma

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Oklahoma.

By F. F. Netzeband [1], William E. Ham [2], and John H. Warren [2]

OKLAHOMA, the 17th largest State in the Union, with 69,919 square miles of area distributed among 77 counties, was the 6th ranking State in the production of mineral wealth in the Nation in 1952. Oklahoma was the third largest producer of natural gas and LP-gases and the fourth largest producer of natural gasoline, asphalt, crude petroleum, and zinc. The State also produced substantial tonnages of cement, coal, sand and gravel, stone, and gypsum. Metal mining (zinc-lead) centered around Ottawa County in the northeast corner of the State. Nonmetallic mining was distributed, but was concentrated principally in central, north central, and northeastern Oklahoma and the Arbuckle and Wichita Mountains. All nonmetallic materials except granite were produced from sedimentary deposits, mostly from limestones, sandstones, and shales of Paleozoic and Mesozoic age or from unconsolidated sands and clays of Tertiary and Quaternary age. Oil and gas production exceeded that of any other mineral in value and was approximately equal in value to agricultural products and to manufacturing products. Oil, with some gas, was produced from about 1,050 pools in 55 Oklahoma counties, distributed principally in northeastern, north central, central, south central, and southwestern parts of the State. The most productive counties in 1952 were Stephens, Carter, Garven, Oklahoma, and Seminole. More oil has been produced per unit of area in Oklahoma than any other State in the Nation. Gas alone was produced in seven additional counties, chiefly in east-central Oklahoma and the Panhandle. Oil and gas trunk pipeline mileage increased in 1952, as did the mileage of the gathering lines. Detailed statistics and information of the mineral fuels—crude petroleum, natural gas, natural-gas liquids, and coal—are reported in volume II of the Minerals Yearbook.

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[1] Commodity-industry analyst, Bureau of Mines, Region VI, Amarillo, Tex.
[2] Oklahoma Geological Survey.

TABLE 1.—Mineral production in Oklahoma, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays (except for cement)	345,566	$356,207	249,819	$307,189
Coal	2,223,229	13,873,424	2,193,409	12,687,855
Lead (recoverable content of ores, etc.)	16,575	5,734,950	15,137	4,874,114
Natural gas, 1,000 cubic feet	538,756,000	28,554,000	554,033,000	29,918,000
Natural-gas liquids:				
Natural gasoline, 42-gallon barrels	9,458,000	27,498,000	9,660,000	29,459,000
LP-gases, do	8,084,000	12,436,000	8,953,000	14,090,000
Petroleum (crude), do	186,869,000	480,250,000	[2] 190,435,000	[2] 487,510,000
Sand and gravel	3,183,251	2,321,653	3,769,663	2,911,845
Stone (except limestone for cement and lime)	6,966,676	6,917,548	[3] 9,636,475	[3] 8,974,334
Zinc (recoverable content of ores, etc.)	53,450	19,455,800	54,916	18,232,112
Undistributed: Native asphalt, cement, gypsum, lime, pumice and pumicite (1952), salt, ground sand and sandstone, and stone (dimension limestone, 1952)		10,088,324		12,387,022
Total Oklahoma		607,486,000		621,351,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels and gypsum are strictly production.
[2] Final figure. Supersedes preliminary figure given in commodity chapter.
[3] Excludes certain stone included with "Undistributed."

CONSUMPTION AND MARKETS

In 1952 the value of mineral production in Oklahoma was $621,351,000 compared with a value of $613,000,000 for agriculture and $583,000,000 for manufacturing.

The mineral industries in Oklahoma process much of their raw materials into finished or semifinished products, both for Oklahoma consumption and for export. Some of these industries are oil refineries processing Oklahoma oil; zinc operators, who ship their concentrates to Oklahoma smelters; glass, manufactured in Oklahoma plants from local glass sand, limestone, and dolomite; portland cement; brick, tile, and pottery made from Oklahoma clay and shale; wallboards and plasters in wide variety, produced from Oklahoma gypsum; lime; crushed stone; and building and ornamental stone.

Many of these industries utilize Oklahoma natural gas in processing their raw materials into finished products.

TRENDS AND NEW DEVELOPMENTS

Owing to rising freight costs, there was a continued trend toward decentralized production and processing of such bulk commodities as crushed stone and sand and gravel.

The newly constructed crushing and blending plant of the Dolese Bros. at Richards Spur, north of Lawton, was in its first full year of operation. Described as the Nation's outstanding new crushed-stone plant,[3] it was erected to replace an older plant that was destroyed by fire in 1949. The quarry is in the Arbuckle limestone and has a length of about 1,000 feet; the height of the face ranges from 100 to 200 feet.

The capacity of the Dewey Portland Cement Co. plant was increased 40 percent by the installation of a new 375-foot rotary kiln.[4] Also

[3] Nordberg, Bror, Nation's Outstanding New Crushed-Stone Plant: Rock Products, vol. 56, No. 1, 1953, pp. 108, 125, 180.
[4] Avery, William M., Dewey Portland's New Kiln Jumps Output 40 Percent at Dewey, Okla.: Pit and Quarry, vol. 45, No. 2, 1952, pp. 114, 116, 120.

included in the company expansion program was the modernization of its power plant and electrical distribution system.

A new granite quarry for monumental stone and exterior trim was opened near Mill Creek, in the central part of the Arbuckle Mountains, by the Century Granite Co. of Snyder, Okla.

Bentonite production from near Camargo, Dewey County, was reported in 1952 for the first time since 1946.

Interest in the possibilities of mining ilmenite for use in making pigments and titanium metal was increased by the publication of a report [5] in which alluvial sands in Comanche County were shown to contain free ilmenite that is amenable to concentration. Test drilling of 1 deposit on the north shore of Lake Lawtonka indicated a reserve of 370,000 short tons of ilmenite concentrates containing 44.12 percent TiO_2. The ilmenite constitutes 3.4 to 6.8 percent of the alluvial deposit.

A comprehensive program of drilling for zinc ore by the American Zinc, Lead & Smelting Co. in the old Davis zinc field was completed in 1952. This area, in the Arbuckle Mountains about 9 miles southwest of Davis, Murray County, had previously been worked for sphalerite and smithsonite between about 1912–14 and again during World War II. American Zinc began detailed mapping in April 1951 and by August 1952 had completed the drilling of 20,000 feet.

Deposits of kaolin and montmorillonite clays of the Wichita Mountains were briefly described.[6] Deposits in Comanche and Kiowa Counties occurring as alteration products of anorthosite were investigated by test drilling, which indicated that 7 to 25 percent kaolin can be recovered by elutriation. The elutriated product is relatively nonplastic and light firing, and contains 34 to 36 percent Al_2O_3. The drilled depth of the altered material was about 30 feet. The montmorillonite group of clays contains 13 to 25 percent Al_2O_3 and occurs as alteration products of pre-Cambrian gabbro. Drill tests indicate a large volume of these materials.

Custom Mills and Smelters.—There were 9 custom mills, operated by 6 lead-zinc mining companies, active in 1952. All these mills were in Ottawa County in the northeastern part of the State. The largest custom mill in the State and one of the largest heavy-medium mills treating lead-zinc ores in the Nation—the Eagle-Picher Central mill—processed ores from both Oklahoma and Kansas. Other mine mills were the Barbara J, Lawyers, and Rialto of the American Zinc, Lead & Smelting Co., Beck No. 1 of the Beck Mining Co., Lucky Jenny of the Harris Mining Co., Scott of the Helen H. Mining Co., and St. Louis No. 4 of the C & M Mining Co. The Bird Dog mill of the Eagle-Picher Co. treated the slimes of the Central mill, and the Sooner mill of the Sooner Milling Co. treated old tailings and slimes from both Oklahoma and Kansas.

Three horizontal-retort zinc smelters operated at near capacity throughout the year. They were the Blackwell smelter of the Blackwell Zinc Co. in Kay County, the Henryetta smelter of the Eagle-Picher Co. in Okmulgee County, and the Bartlesville smelter of the

[5] Chase, Gerald W., Ilmenite in Alluvial Sands of the Wichita Mountain System, Oklahoma: Oklahoma Geol. Survey Circ. 30, 1952, 44 pp.

[6] Chase, Gerald W., and Burwell, Albert L., Kaolin and Montmorillonite Clays of the Wichita Mountains, Okla.: Oklahoma Geol. Survey, The Hopper, vol. 12, No. 1, 1952, pp. 1–10.

National Zinc Co., Inc., in Washington County. These smelters treated ores and concentrates from the Tri-State district, from several Western States, and from foreign countries. Metal stocks at smelters increased sharply during June and July, when an extended strike of steel workers curtailed the demand for zinc.

Mineral Brokers.—Concentrates produced in the Tri-State district of Oklahoma, Kansas, and Missouri were purchased by brokers or ore buyers representing five smelting companies. Concentrate purchases from this district differ from those made in Western State mining districts in that the concentrate is purchased from the producer f. o. b. the mill, handling and freight charges being assumed by the purchaser. Concentrate prices are quoted on 60-percent zinc content and 80-percent lead content of the concentrates, subject to adjustments based on assays.

DMEA AND DMPA CONTRACTS IN OKLAHOMA

The Defense Minerals Exploration Administration (DMEA) was established to encourage exploration and development of strategic and critical materials in the United States and its Territories and possessions. The Government contributes 50 to 90 percent of the cost of exploration, depending on the mineral under contract with the operator. DMEA's contribution is repayable from a percentage of the royalties stemming from production resulting from such exploration.

In 1952 DMEA had in force a contract totaling $156,000 with the American Zinc, Lead & Smelting Co. for zinc exploration in Murray County (table 2).

TABLE 2.—DMEA contract—1952

Operator	Property	Location	Mineral	Total contract	Actual Government participation	Certification of discovery
American Zinc, Lead & Smg. Co.	John Butterfly	Davis zinc field in the Arbuckle Mountain region, Murray County.	Zinc	$156,000	$27,826.81 Final Total	None.

The Defense Materials Procurement Agency (DMPA) was created by Executive order in August 1951 to be responsible for procuring metals, minerals, and other materials in this country and overseas and to encourage production of such materials. The agency purchases metals, minerals, and other materials for Government use or resale; installs facilities or improvements in Government-owned plants and Government equipment in privately owned plants; and guarantees loans to contractors, subcontractors, and others to expedite production and delivery under Government contract.

In Oklahoma a DMPA-negotiated contract provided subsidy payment of $96,000 to the W. M. & W. Mining Co. to produce 5,750 tons of zinc.

EMPLOYMENT IN THE MINERAL INDUSTRIES

Employment.—Employment in the lead-zinc mining industry declined sharply in the latter half of the year because of falling metal prices and the lessening demands for lead and zinc. Employment in the nonmetallic industries continued at the same rate as the year before. A considerable amount of this employment was seasonal because of conformable demand and adverse weather conditions.

Accidents.—There were no reported major disasters in the metal and nonmetallic industries in Oklahoma in 1952. Metal mining continued as one of the Nation's most hazardous industries but lowered its frequency rate of injuries from that of the previous year.

Wages.—Wages and annual income of all mineral-industry workers, except lead-zinc miners, increased during the year, in line with those of other industrial workers in the State. Hourly wage rates of lead-zinc miners, which in many instances were tied to the price of concentrates, declined in response to lower concentrate prices. In other instances, loss of overtime and incentive or bonus plans accounted for the income decline.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Data and information of the mineral fuels (coal, gas, and crude petroleum) are reported in detail in Volume II of the 1952 edition of the Minerals Yearbook. This chapter includes only a brief summary of mineral fuels, but discusses in detail the metallic and nonmetallic minerals (table 3).

Coal.—Oklahoma coal production in 1952 declined for the 5th consecutive year when 2,193,400 tons, valued at $12,687,900, were produced. There were 12 counties reporting production, the largest being Okmulgee, followed by Rogers, Le Flore, Haskell, Sequoyah, McIntosh, Pittsburg, Coal, Latimer, Craig, Wagoner, and Tulsa.

Natural Gas.—Marketed production of natural gas amounted to 554,033 million cubic feet valued at $29,918,000 in Oklahoma in 1952, an increase of 15,277 million cubic feet in quantity and $1,364,000 in value over that produced in 1951.

Natural-Gas Liquids.—Oklahoma ranked fourth among the States in the combined production of natural gasoline and LP-gases in 1952, when it produced 9,660,000 barrels of natural gasoline and 8,953,000 barrels of LP-gases valued at $29,459,000 and $14,090,000, respectively.

Petroleum.—Oklahoma continued as the Nation's 4th largest producer of petroleum in 1952 with an output of 190,435,000 barrels, 2 percent more than the 186,869,000 barrels produced in 1951.

TABLE 3.—Production of mineral fuels, 1948–52

Year	Crude petroleum		Natural-gas liquids			
			Natural gasoline		LP-gases	
	Thousand barrels	Thousand dollars	Thousand barrels	Thousand dollars	Thousand barrels	Thousand dollars
1948	154,455	398,490	6,498	26,143	4,680	10,963
1949	151,660	388,250	6,855	20,360	5,630	8,408
1950	164,599	423,020	7,980	21,579	6,753	8,393
1951	186,869	480,250	9,458	27,498	8,084	12,436
1952	190,435	487,510	9,660	29,459	8,953	14,090

Year	Natural gas		Coal	
	Million cubic feet	Thousand dollars	Thousand short tons	Thousand dollars
1948	480,573	23,356	3,462	16,619
1949	435,262	20,327	3,022	15,242
1950	482,360	23,636	2,679	14,567
1951	538,756	28,554	2,223	13,873
1952	554,033	29,918	2,193	12,688

METALS

Cadmium, Germanium, Indium, and Gallium.—Minerals of these elements occur as a trace or minute quantities in many domestic zinc ores. The entire domestic production was recovered as a byproduct from the flue dusts generated in the zinc smelting process. It is impossible to determine the State origin of these commodities, because smelter practices commingle the ores from numerous sources, some of which are foreign, and because no assay is made of these constituents owing to their diminutive quantity. Cadmium occurs most commonly as the mineral greenockite (CdS), associated as a yellow powder or stain with the zinc mineral sphalerite (ZnS), and to a smaller extent with ores of lead and copper containing zinc mineralization.

Lead.—Oklahoma production of recoverable lead in 1952 dropped about 9 percent in quantity and 15 percent in value compared with 1951. It was the smallest production since 1947 and only 19 percent of 1925, the peak production year. During the year, 168 companies operated 118 mines, all in Ottawa County. Recovery, in terms of metal content, dropped from 0.47 percent in 1951 to 0.41 percent in 1952. The ore mined in the State was predominantly zinc, with a ratio of 3 parts zinc to 1 part lead. Oklahoma contributed most of the lead produced in the Tri-State district, accounting for 55 percent.

Zinc.—Concentrate recoveries from Oklahoma zinc-lead ores declined in 1952 to 2.66 percent for zinc and 0.55 percent for lead, when 3,542,213 tons of crude ore and 666,523 tons of tailings yielded 101,726 tons of zinc concentrates and 20,473 tons of lead concentrates. Production of recoverable zinc in 1952 increased 3 percent to 54,916

tons when compared with 53,450 tons in 1951, notwithstanding a 36-percent decline in metal price. The value decreased 6 percent coincident with lower metal prices. Economic forces contributing to the fluctuations in metal prices were the prolonged steel strike, which permitted zinc stocks to increase sharply; the oversupply of foreign metal stocks, which eventually sought American markets; the urgent need of some foreign Governments to convert such stocks into American dollars; and the added production from new foreign sources. This combination of events induced lower metal prices, with the net effect that many domestic marginal producers were obliged to curtail or discontinue operations. Many Oklahoma zinc properties were in this category.

Oklahoma is part of, and the major producer in, the important Tri-State mining district, which has for many years been a vital source of the Nation's zinc supply. A detailed report of this district's production is shown in tables 4 and 6.

TABLE 4.—Mine production of lead and zinc, 1948–52, and total, 1891–1952, in terms of concentrates 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
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
1951	22,613	4,714,358	99,612	12,297,096	16,575	5,734,950	53,450	19,455,800
1952	20,473	4,104,934	101,726	11,714,605	15,137	4,874,124	54,916	18,232,112
1891–1952	1,588,652	148,272,277	9,416,008	458,758,740	1,222,292	176,712,465	4,965,255	732,427,060

[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 5.—Mine production of lead and zinc in Oklahoma, part of the Tri-State district, in 1952, by months, in terms of recoverable metals

Month	Lead (short tons)	Zinc (short tons)	Month	Lead (short tons)	Zinc (short tons)
January	1,457	4,714	August	1,203	4,540
February	1,392	4,584	September	1,181	4,344
March	1,355	4,701	October	1,172	4,436
April	1,441	4,756	November	1,109	4,251
May	1,311	5,161	December	1,215	4,337
June	1,154	4,617			
July	1,147	4,475	Total	15,137	54,916

TABLE 6.—Tenor of lead and zinc ore, old tailings, and slimes milled and concentrates produced, 1951–52

	1951		1952	
	Crude ore	Old tailings and slimes	Crude ore	Old tailings and slimes
Total material milled ---------- short tons	3,542,213	666,523	3,715,329	502,350
Total concentrate produced:				
Galena ---------- do	22,568	45	20,448	25
Sphalerite ---------- do	95,233	4,379	98,856	2,870
Ratio of concentrate to material milled:				
Lead ---------- percent	0.64	0.007	0.55	0.005
Zinc ---------- do	2.69	0.66	2.66	0.57
Metal content of material milled:[1]				
Lead ---------- do	0.47	0.004	0.41	0.003
Zinc ---------- do	1.44	0.34	1.44	0.30
Average lead content of galena concentrates ---------- do	74.81	53.33	75.43	56.00
Average zinc content of sphalerite concentrates ---------- do	59.70	57.73	60.02	58.25
Average value per ton:				
Galena concentrates	$208.61	$144.91	$200.57	$148.08
Sphalerite concentrates	$123.54	$121.45	$115.24	$112.49

[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.

TABLE 7.—Weekly quoted prices for 60-percent zinc concentrates and 80-percent lead concentrates at Joplin in 1952

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. 5–May 31	$135.00	Sept. 13–20	$96.50	Jan. 5–Apr. 26	$245.95	Oct. 25–Nov. 1	$166.50
June 7	115.00	Sept. 27–Oct. 18	92.50	May 3–10–17	217.35	Nov. 8	173.70
June 14–21	107.50	Oct. 23–Nov. 1	90.00	May 24–June 14	188.55	Nov. 15–22	180.90
June 28–Aug. 2	100.00	Nov. 8–Dec. 31	84.00	June 21	195.75	Nov. 29–Dec. 20	173.70
Aug. 9–Sept. 6	92.50			June 28–Oct. 4	202.95	Dec. 27–31	184.50
				Oct. 11–18	188.10		

TRI-STATE DISTRICT

The 6,140,155 tons of crude ore and 604,350 tons of old tailings treated in the Tri-State district of Oklahoma, Kansas, and southwestern Missouri in 1952 yielded 36,333 tons of lead concentrates and 167,174 tons of zinc concentrates, containing 27,356 tons of recoverable lead and 90,512 tons of recoverable zinc (table 8).

There were 20 mine mills and 2 tailings mills operating during the year. Nine of the mine mills treated only the ores from company mines, the other 11 mine mills handling custom ores. Ten of these mills ranged in size from the large Central mill of the Eagle-Picher Co. with a daily capacity of 15,000 tons to the smaller mills having a daily capacity of around 1,400 tons. The larger part of the ores from Oklahoma and Kansas were sent to custom mills, with the Central mill receiving the greater portion of this custom ore. Zinc recovery from the retreatment of old tailings and slimes continued to decline during the year to the degree that both tailings mills discontinued operations by the end of the year.

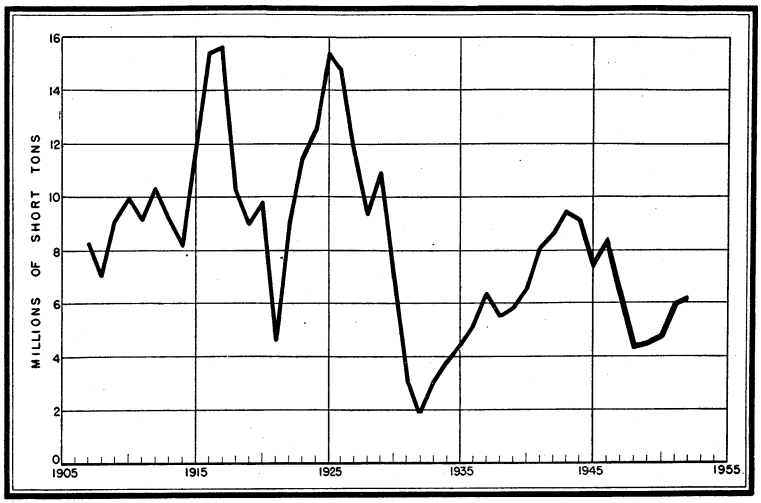

FIGURE 1.—Quantity of crude ore (rock) milled in the Tri-State district, 1907–52.

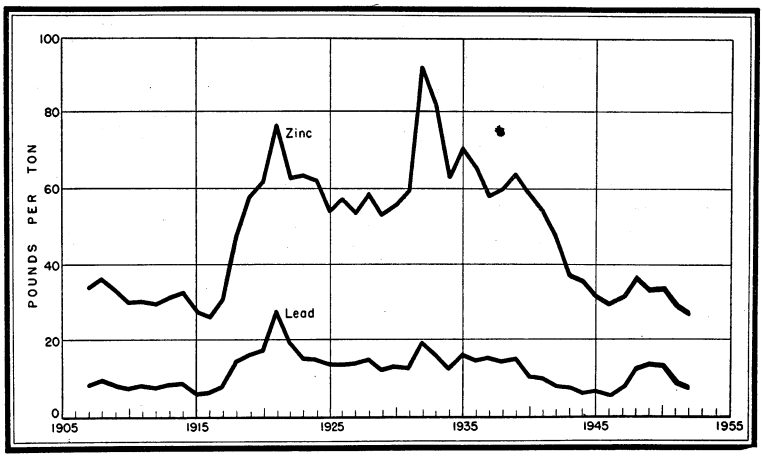

FIGURE 2.—Metal recovered per ton of crude ore (rock) milled in the Tri-State district, 1907–52.

There were 319 mines operating in the district during the year, of which 118 were in Oklahoma. Many of these mines began closing during the latter half of the year, when lead prices dropped from 19 cents to 14¾, and zinc prices from 19½ to 12½. This was a 22-percent loss for lead and a 36-percent loss for zinc and eventually resulted in the closing of 107 district mines and 5 mills.

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TABLE 8.—Mine production of lead and zinc concentrates in the Tri-State district (Kansas, Oklahoma, and Southwestern Missouri), 1948–52

Year	Lead concentrates (galena)		Zinc concentrates (sphalerite)		Recoverable metal content			
					Lead		Zinc	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1948	35,862	$8,302,564	159,609	$13,929,151	26,901	$9,630,558	84,839	$22,567,174
1949	41,471	7,824,788	147,178	11,445,018	30,883	9,759,028	78,628	19,499,744
1950	40,714	6,245,660	150,019	13,934,927	31,157	8,412,390	80,558	22,878,472
1951	36,300	7,720,550	170,263	21,023,818	26,906	9,309,476	91,553	33,325,292
1952:								
Kansas	7,747	1,582,699	47,077	5,685,236	5,916	1,904,952	25,482	8,460,024
S. W. Mo.	8,113	1,701,121	18,671	2,138,108	6,303	2,029,566	10,114	3,357,848
Okla.	20,473	4,104,934	101,726	11,714,605	15,137	4,874,114	54,916	18,232,112
Total 1952	36,333	7,388,754	167,474	19,537,949	27,356	8,808,632	90,512	30,049,984

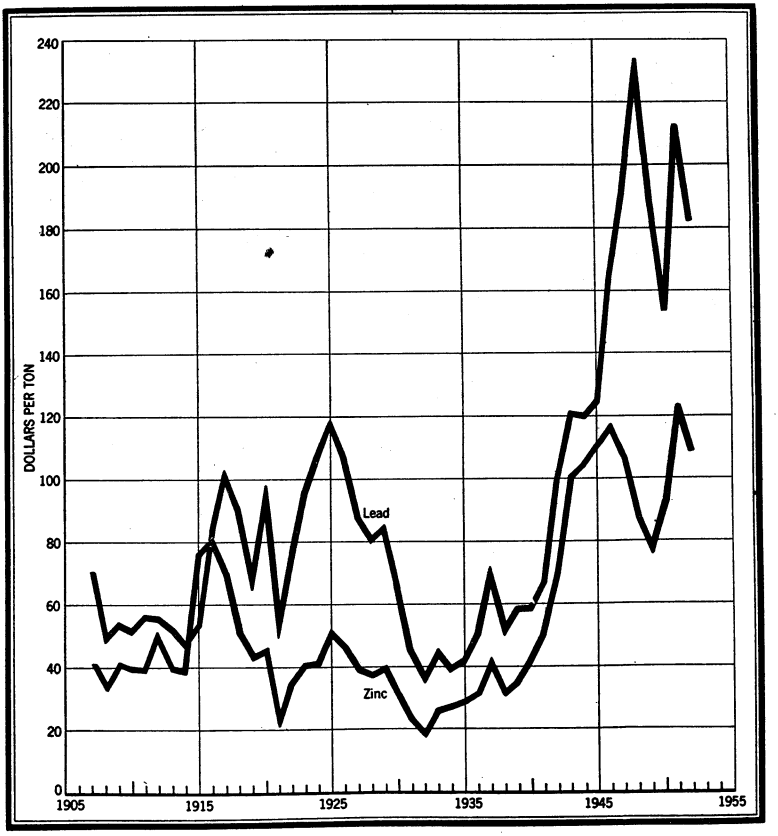

FIGURE 3.—Average prices received by sellers per ton of concentrate in the Tri-State district, 1907–52.

TABLE 9.—Tenor of ore and concentrates in Tri-State district, 1948–52

	1948	1949	1950	1951	1952
Total material milled:					
Crude ore—short tons	4,314,190	4,470,778	4,700,698	5,990,100	6,140,155
Tailings and slimes—do	2,595,903	1,602,620	967,926	746,673	604,350
Ratio of concentrates to material milled:					
Lead—percent	0.52	0.68	0.72	0.54	0.54
Zinc—do	2.31	2.42	2.65	2.53	2.48
Metal content of material milled:					
Lead—do	0.39	0.51	0.55	0.40	0.41
Zinc—do	1.23	1.29	1.42	1.36	1.34
Average lead content of galena concentrates—percent	76.53	75.98	78.08	75.62	76.79
Average zinc content of sphalerite concentrates—percent	59.04	59.36	59.66	59.74	60.04
Average value per ton:					
Galena concentrates	$231.51	$188.68	$153.40	$212.69	$203.36
Sphalerite concentrates	87.27	77.76	92.89	123.48	116.66

NONMETALS

Nonmetallic mineral commodities produced in Oklahoma in 1952 were clays (including bentonite), sand and gravel, stone, and miscellaneous products (native asphalt, cement, gypsum, lime, pumicite, salt, ground sand and sandstone, and dimension stone). Reported value of these commodities in 1952 was $24,580,000 which was greater than any previous year and a 25 percent increase over 1951. Fifty percent of the 1952 value was for miscellaneous products.

Clay.—Oklahoma has extensive and widely distributed clay resources, and nearly all the clay produced is used in the manufacture of cement or brick and tile. In 1952 clay was produced by 12 brick and tile plants in Creek, Custer, Garfield, Greer, Oklahoma, Pittsburg, Pontotoc, Seminole, and Tulsa Counties. One plant in Lincoln County was idle. Production of 246,474 tons valued at $257,014 was reported.

Bentonite production was reported in 1952 from near Camargo in Dewey County. Deposits near Camargo and Woodward, Woodward County, have been worked intermittently in the past, but the 1952 production was the first reported since 1946.

Small quantities of pottery clay are produced in Pontotoc and Tillman Counties.

TABLE 10.—Clay sold or used by producers in Oklahoma, 1948–52 [1]

Year	Short tons	Value	Year	Short tons	Value
1948	510,316	389,903	1951	551,144	561,644
1949	480,199	374,179	1952	520,050	520,130
1950	555,910	493,659			

[1] Includes clays used for cement.

Sand and Gravel.—Large deposits of sand and gravel, suitable for concrete aggregate and road surfacing, occur along and adjacent to most of the larger streams in Oklahoma. Construction sand and gravel were produced in 1952 in 32 counties. Ten plants were oper-

ated in Tulsa County, 6 in Oklahoma County, 5 in Kay County, and 4 in Pawnee County. Other plants were well distributed throughout the State.

High-purity silica sand was produced from sandstones of Ordovician age in Johnston, Murray, and Pontotoc Counties in the Arbuckle Mountains region of south central Oklahoma. Most of this sand is used in manufacturing glass, but smaller quantities are used as foundry sand and for making sodium silicate.

Sand and gravel produced in Oklahoma in 1952 are reported as 3,770,000 tons valued at $2,912,000 compared with 3,183,000 tons valued at $2,322,000 in 1951 (table 11).

TABLE 11.—Sand and gravel sold or used by commercial and Government-and-contractor producers in 1948–52

Year	Commercial			Noncommercial		Total	
	Short tons	Value	Average value per ton	Short tons	Value	Short tons	Value
1948	1,355,141	$976,069	$0.72	649,371	$111,934	2,004,512	$1,088,003
1949	1,775,623	1,259,770	.71	1,145,534	265,645	2,921,157	1,525,415
1950	1,730,067	1,500,667	.87	1,556,767	856,186	3,286,834	2,356,853
1951	2,164,382	2,103,710	.97	1,018,869	217,943	3,183,251	2,321,653
1952	2,353,559	2,209,098	.94	1,416,104	702,747	3,769,663	2,911,845

Stone.—Limestone and dolomite, chat, granite, and sandstone were produced in Oklahoma in 1952. Limestone and dolomite, used principally as crushed stone, was the leading commodity. Production and value records of stone were broken in 1952, when 9,636,000 tons valued at $8,974,000 was produced, surpassing 1951, when 6,967,000 tons valued at $6,918,000 had set the previous record. This was a 38-percent increase in quantity and a 30-percent increase in value.

Limestone and Dolomite.—Oklahoma has abundant resources of limestone and dolomite. In 1952 limestone or dolomite was produced from 15 quarries in 11 counties, the greatest production being in the Arbuckle Mountain region of south central Oklahoma, the Tulsa area of northeastern Oklahoma, and the Wichita Mountain region in southwestern Oklahoma.

Most of this stone is crushed for use in concrete aggregate, riprap, road surfacing, railroad ballast, metallurgical and chemical manufacturing, and acid neutralizers for soils.

Chemical-grade limestone is quarried for limemaking and as flux in glass manufacturing at Marble City, Sequoyah County. Chemical-grade dolomite is produced for glass manufacturing, fertilizers, and mineral feeds at Troy, Johnston County.

In 1952 Oklahoma produced 6,356,000 tons of limestone and dolomite valued at $6,943,000 compared with 4,765,000 tons valued at $5,279,000 in 1951. Limestone was quarried for building stone in the Arbuckle Mountains and near Eldorado, Jackson County, and limestone used in portland-cement manufacture was quarried in Washington and Pontotoc Counties.

Chat.—Chat is the name used in the West Central States to denote the coarse tailings obtained in milling zinc and lead ores from Ottawa County. This material is composed mostly of chert or microcrystalline silica, with small quantities of limestone, sphalerite, galena, marcasite, and pyrite.

Most of the chat sold was used for railroad ballast, concrete aggregate, and road surfacing. In 1952 operators reported sales of 3,274,008 tons valued at $1,511,742 compared with 2,050,673 tons valued at $897,112 in 1951.

Granite.—The granite industry of Oklahoma is centered in the Wichita Mountain district, in the southwestern part of the State, where production in 1952 was reported from six operators in Comanche, Greer, and Kiowa Counties. During the year a new quarry was opened near Mill Creek, Murray County, in the central part of the Arbuckle Mountains. It is the first granite quarry to be operated in the Arbuckle Mountains in about 35 years.

Production is from pre-Cambrian granites that are predominantly pink and red. The granite is used mostly for monumental stones and partly for exterior trim. Much of the stone is finished in plants of the Wichita Mountain district, but some is exported as rough stock to other States. In 1952 granite production was 5,300 tons with a value of $511,000.

Sandstone.—Sandstone produced in Oklahoma is used chiefly for building and veneer stone in the construction of residence and business buildings. The stone is worked as slabs 1½ to 6 inches thick from shallow, open-face quarries in Choctaw, Mayes, Okmulgee, and Pushmataha Counties. One mechanized trimming plant operates near Henryetta, Okmulgee County. Returns for 1952 show a production of 950 tons valued at $10,900.

TABLE 12.—Stone sold or used by producers, 1948–52, by kinds

Year	Granite		Limestone		Sandstone	
	Short tons	Value	Short tons	Value	Short tons	Value
1948	[1] 5,100	[1] $600,531	2,483,980	$2,701,765	[2]	[2]
1949	4,720	569,170	2,183,990	2,490,627	20,360	$20,370
1950	216,930	646,872	2,992,920	3,334,374	19,480	18,700
1951	4,267	527,500	4,765,419	5,279,311	146,317	213,625
1952	5,337	511,073	6,355,780	6,940,219	1,350	11,300

Year	Other stone		Total	
	Short tons	Value	Short tons	Value
1948	1,533,150	$832,053	[3][4] 4,027,630	[3][4] $4,141,379
1949	2,132,860	947,242	4,341,930	4,027,409
1950	1,792,330	848,277	5,021,660	4,848,223
1951	2,050,673	897,112	6,966,676	6,917,548
1952	3,274,008	1,511,742	9,636,475	8,974,334

[1] Excludes crushed granite, included in total.
[2] Figure withheld to avoid disclosing individual company operations.
[3] Includes crushed granite and sandstone.
[4] Incomplete figure. Excludes certain stone, Bureau of Mines not at liberty to publish.

Crushed Stone (Noncommercial).—Stone crushed by municipal, county, and State agencies included limestone, sandstone, and granite obtained from local quarries throughout the State. Production in Oklahoma in 1952 was 200,153 tons valued at $147,209.

MISCELLANEOUS MINERALS

Minerals produced in Oklahoma in 1952, for which statistics cannot be revealed because there are less than 3 producers or because 1 company produces a large percentage of the total, are native asphalt, cement, gypsum, lime, pumicite (volcanic ash), salt, ground sand and sandstone, and dimension limestone. The value of these commodities, together with bentonite produced by one operator in Dewey County, was a record high of $12,387,000. The value of miscellaneous minerals in Oklahoma, included in previous tables as "Undistributed," has been increasing from a low in 1944 of $3,606,000 to new records, beginning in 1947 and continuing each year through 1952. Values for these years are as follows: 1947, $7,149,000; 1948, $8,106,000; 1949, $8,706,000; 1950, $9,512,000; and 1951, $10,088,000. The increase in value for 1952 was 23 percent over 1951.

Cement.—Cement is produced at Dewey, Washington County, and at Ada, Pontotoc County. Both plants have expanded their capacity in recent years. Cement had the largest value of the miscellaneous minerals in Oklahoma.

Gypsum.—In 1952 three operators continued to produce gypsum in Blaine County. Quarries formerly worked in other parts of western Oklahoma were inactive during the year.

The largest producer is the United States Gypsum Co., which operates quarries and a modern calcining plant at Southard, making wallboard and many kinds of plaster. Gypsum was quarried by the Universal Atlas Cement Co., near Watonga, and by S. A. Walton near Southard principally for use as a retarder in the manufacture of portland cement.

Lime.—High-purity limestone of the St. Clair formation at Marble City continued to be burned in shaft kilns at Sallisaw, Sequoyah County, by the St. Clair Lime Co. The lime is sold chiefly for chemical use in water purification and steel metallurgy.

Perlite.—Perlite is expanded for use chiefly in concrete and plaster at 2 plants, 1 each at Oklahoma City and Tulsa. All crude perlite is imported, as there are no deposits in Oklahoma.

Pumicite.—Pumicite or volcanic ash was produced from deposits near Gate in eastern Beaver County. It is used mostly for cleansing and scouring compounds and as a concrete admixture.

Salt.—Salt was produced in two counties in 1952. The major producer was Oklahoma Salt Industries at Sayre, Beckham County, where salt continued to be produced by injecting fresh water through wells into a salt bed and recovering the brine for surface evaporation. In Woods County, salt was produced from surface encrustations on the Big Salt Plain of Cimarron River.

Silica Sand.—Silica sand is produced by the Pennsylvania Glass Sand Corp. of Oklahoma at Mill Creek, Johnston County, by grinding high-purity glass sand obtained from quarries in loosely consolidated

sandstone. It is used mostly in cleansing and scouring compounds, as a filler, and for pottery, porcelain, and tile.

Tripoli.—Tripoli continued to be mined in 1952 in eastern Ottawa County, which long has been the main source of this commodity. All tripoli mined in Oklahoma was transported to Seneca, Mo., where it was processed by the American Tripoli Corp. and sold chiefly for buffing compounds and foundry use.

REVIEW BY COUNTIES

Production of metals and nonmetals in 1952 was reported from 55 of the 77 counties in Oklahoma. These counties were well distributed throughout the State.

ATOKA

Limestone was crushed by the Southwest Stone Co. at its quarry near Stringtown. Small quantities of noncommercial stone were worked by the Atoka County Highway Department.

BEAVER

Everett Bush produced construction sand from a pit east of Beaver City. Pumicite (volcanic ash) was produced north of Gate by Dyer & Kite.

BECKHAM

The Oklahoma Salt Industries produced salt from wells southwest of Sayre.

BLAINE

Gypsum was produced by the U. S. Gypsum Co. from its quarries at Southard. The U. S. Gypsum Co. also operated large calcining, sheet rock, and plaster plants at Southard. The Universal Atlas Cement Co. operated a gypsum quarry and crushing plant northeast of Watonga. S. A. Walton operated a gypsum quarry and crusher west of Okeene.

BRYAN

Construction sand and gravel was produced from pits of the M. & K. Sand & Gravel Co. near Colbert and by H. C. Rustin Co. north of Durant.

CADDO

Construction sand and gravel was produced by the W. E. Tindel Co. near Hydro, and by James Avery near Fort Cobb. Noncommercial sand and gravel was also produced in Caddo County in 1952.

CANADIAN

The Tindel Materials Co. produced construction sand and well-packing gravel from pits northeast of Bridgeport.

CHEROKEE

Sand and gravel was produced by the Yahola Sand & Gravel Co. from the Grand River north of Fort Gibson.

CHOCTAW

O. G. Beason produced construction sand and gravel near Sawyer. The Briggle Sand and Gravel Co. produced construction sand from its plant northeast of Hugo. Building sandstone was produced by the Hanselman Stone Co. in the north part of the county.

CIMARRON

Construction sand and gravel was produced northwest of Boise City by Jack Parker.

CLEVELAND

Construction sand and gravel was produced by K. D. Zeed.

COAL

The Dolese Bros. Co. continued to crush stone at its quarry near Bromide.

COMANCHE

Ira Smith and Sons continued to produce unfinished granite dimension stone from its quarry in the western part of the county. The Dolese Bros. Co. crushed stone in its newly erected plant at the Richards Spur Quarry north of Lawton.

COTTON

Construction sand and gravel were produced northwest of Walters by Raymond Eaders; southwest of Walters by Morris Weravah; and near Temple by Robert Simpson.

CREEK

The Sapulpa Brick & Tile Co. produced clay for use in manufacturing brick and tile at its plant on the west edge of Sapulpa. Noncommercial sand and gravel and noncommercial crushed stone were produced by the County Highway Department.

CUSTER

Brick clay was produced west of Clinton by the Acme Brick Co.

DEWEY

Bentonite deposits were worked north of Camargo by L. S. Fisher for the Filtrol Corp. Construction sand and gravel were produced west of Camargo by the Amis Sand & Gravel Co.

GARFIELD

The Davies Brick & Tile Co. continued to produce clay for making brick and tile from its quarry south of Enid.

GARVIN

Construction sand and gravel were produced from deposits east of Pauls Valley by Lamar Lawson and Elmer Long. Noncommercial sand and gravel also were produced.

GRADY

The Dolese Bros. Co. continued to produce construction sand from pits near Tuttle.

GREER

The Mangum Brick & Tile Co. produced clay from its quarry south of Mangum for use in its brick plant in the west edge of Mangum. Granite was produced by the Pellow Bros. Monument Works near the town of Granite. Construction sand and gravel were produced from a pit east of Mangum by D. J. Cox.

HARPER

Construction sand and gravel were produced west of Buffalo by S. G. Shiery.

JACKSON

Building limestone was cut by power-gang saws from quarries northeast of Eldorado by L. I. Winham. Everett Gresham produced construction sand and gravel from pits east of Elmer.

JOHNSTON

The Rock Products Manufacturing Corp. produced crushed dolomite from its quarry near Troy. Unfinished granite was produced south of Mill Creek by the Century Granite Co. The Pennsylvania Glass Sand Corp. of Oklahoma continued to produce glass sand and ground silica from pits north of Mill Creek. Construction sand and gravel were produced east of Tishomingo by Claud Lamb.

KAY

Limestone was crushed near Ponca City and Uncas by the Cookson Stone Co. Construction sand and gravel were produced east of Ponca City by the Otoe Sand & Gravel Co. and by the Riverside Sand & Gravel Co. Near Blackwell, sand and gravel were produced by the Blackwell Sand & Gravel Co. and by the Midwest Concrete Supply Co. Sand is produced near Tonkawa by the Tonkawa Sand & Gravel Co.

The Blackwell zinc-retort smelter of the Blackwell Zinc Co. operated at near capacity throughout 1952, treating ores from the Tri-State mining district and from foreign countries. Natural gas produced in the area was used as fuel.

KINGFISHER

Construction sand was produced near Dover by the Dolese Bros. Co.

KIOWA

Granite was quarried near Snyder by the Century Granite Co. and by the Roosevelt Granite Co. Near Mountain Park, granite was quarried by the J. P. Gilman Granite Co. and by the Parson Bros. Granite Works. Limestone was crushed east of Roosevelt at the

quarry of the Roosevelt Materials Co. Construction sand and gravel were produced east of Hedrick by the Clingan Sand & Gravel Co. and by the Southwest Sand Co. The Lugert Sand & Gravel Co. produced sand and gravel south of Lugert.

LOGAN

Construction sand was produced east of Crescent by John McConnel.

McCURTAIN

Limestone, sold chiefly for agricultural fertilizer, was crushed west of Idabel at the quarry of the McCurtain Limestone Co.

MAJOR

Construction sand and gravel were produced near Cleo Springs by the Concho Sand & Gravel Co. and by Oren Law.

MAYES

Crushed limestone was produced southeast of Pryor by the Anco Stone Co. Building sandstone was produced near Locust Grove by L. Langston.

MURRAY

Asphaltic limestone and sandstone were produced near Dougherty by the Southern Rock Asphalt Co. Limestone was crushed near Davis and at Big Canyon at quarries of the Dolese Bros. Co. Construction gravel was produced by Makins Sand & Gravel Co. near Dougherty.

MUSKOGEE

Sand was pumped from the Arkansas River north of Muskogee by the Yahola Sand & Gravel Co. Production of noncommercial sand and gravel was reported.

NOBLE

Noncommercial sand and gravel were produced.

NOWATA

Limestone was crushed near Lenapah at the quarry of the Peerless Rock Co.

OKLAHOMA

Clay was quarried in the west part of Oklahoma City for use in making brick by the Acme Brick Co. and by the United Brick & Tile Co. Construction sand was produced north of Oklahoma City by the Dolese Bros. Co. and by the Makins Sand & Gravel Co. Sand was produced in Oklahoma City by the Myers Excavating Co. East of Oklahoma City, construction sand and gravel were produced by the Murphy Perkins Co., the Sizemore Sand Co., and the Steelman Construction Co. Noncommercial sand and gravel were produced in 1952. Perlite was expanded in the plant of the Midwestern Perlite Corp. at Oklahoma City.

OKMULGEE

Building sandstone was produced from quarries north of Henryetta by the Ada Stone Co., Joe Berry, L. E. Berry, Carl Higgins, and Bill Riley. A power trimming plant was operated near Henryetta by the Ada Stone Co. The zinc-retort smelter of the Eagle-Picher Co., at Henryetta, treated ores from the Tri-State district, from Arizona, and from foreign sources.

OSAGE

Crushed limestone was produced east of Burbank by the Burbank Rock Co. Construction sand was produced by the Means Sand Co.

OTTAWA

Chat, a byproduct of zinc and lead milling, was produced by the Eagle-Picher Co., the Baxter Chat Co., the Diplomat Gravel Co., Scott Fones, and H. D. Youngman. Tripoli was quarried in east central Ottawa County by the American Tripoli Corp. and processed in its plant at Seneca, Mo. Important quantities of lead and zinc concentrates were produced by 10 mills treating ores from 168 mines operated by 116 mining companies.

The 10 leading companies, in the order of their production and the properties they operated, were: Eagle-Picher Co. (Anna Beaver, Big Chief, Blue Goose Nos. 1 and 2, Crawfish, Goodwin, Grace Walker, Humbahwatah Nos. 1 and 2, John Beaver, Kenoyer, Netta, North Hunt, Piokee, Royal, See Sah, Slim Jim, Tongaha, Townsite, Velie, Wesah, and Joe Whitebird); American Zinc, Lead & Smelting Co. (Barbara J., Lawyers, and Rialto); John Henderson (Acme, Bingham, Buffalo, and Mahutska); Dines Mining Co. (Hunt and Van Pool); Buffalo Mining Co. (Buffalo, Clabber, Pat, Tulsa, and Wesah); Federal Mining & Smelting Co. (Gordon); W. M. & W. Mining Co. (Brewster); C. & M. Mining Co. (St. Louis No. 4); Helen H. Mining Co. (Aztec, Blue Bonnet, Blue Ribbon, and Scott); and the Tongaha Mining Co. (Tongaha).

PAWNEE

Sand was produced near Cleveland by the Osage Sand Co. and near Ralston by the Ralston Sand Co. and the Tulsa Sand Co.

PAYNE

Noncommercial sand and gravel were produced in Payne County.

PITTSBURG

Construction sand and gravel were produced by Nix & Hill from a pit south of McAlester. Shale for making brick was quarried by the Oklahoma State Penitentiary, west of McAlester.

PONTOTOC

Building limestone was quarried near Fittstown by the Ada Stone Co. The Ideal Portland Cement Co. quarried shale and limestone at Lawrence, for use in its cement plant at Ada. Glass sand was produced by the Mid-Continent Glass Sand Co. near Roff. Light-

burning clay was produced east of Ada by the Ada Brick Co. and the Frankhoma Pottery Co. Red-burning clay was produced at Ada by the Ada Brick Co.

POTTAWATOMIE

Gravel was produced from pits east of Asher by the Oklahoma Gravel Co.

PUSHMATAHA

Building sandstone was produced north of Antlers by Mike Emery.

SEMINOLE

Clay was quarried west of Wewoka for making brick and tile by the Wewoka Brick & Tile Co. The Thompson Sand & Gravel Co. produced sand and gravel from pits in northeastern Seminole County. Limestone was crushed southwest of Wewoka at the quarry of the Streeter Stone Co.

SEQUOYAH

Limestone was crushed north of Marble City at the quarry of the Marble Stone Co. Part of the limestone crushed at Marble City is burned at Sallisaw in the kilns of the St. Clair Lime Co.

TEXAS

Sand, gravel, and caliche were produced north of Guymon and sand south of Guymon by the Stewart Bros.

TILLMAN

Pottery clay was produced by the Permian Pottery Co. Construction sand and gravel were produced near Grandfield by Floyd King and near Frederick by the Ready Mix Concrete Co. Noncommercial sand and gravel were also produced.

TULSA

Brick clay was produced by the Acme Brick Co. and the United Brick & Tile Co. at Tulsa and by the United Brick & Tile Co. at Collinsville. Limestone was produced at Gray Spur, west of Tulsa, by the Acme Materials Co. East of Tulsa, near Garnett, limestone was produced by the Acme Materials Co., the Anchor Stone Co., and the Chandler Materials Co. Construction sand was produced near Jenks by the Bagby-Harris Co. and the Young Sand Co. Near Sand Springs, sand was produced by the Arkansas River Sand Co., the Mohawk Sand & Gravel Co., and the Sand Springs Sand Co. Near Tulsa, construction sand was produced by the Acme Materials Co., the Bagby-Harris Co., the Chandler Material Co., the McMichael Concrete Co., Smith Sand Co., and the Tulsa Sand Co. Perlite was expanded in the plant of the Ozark-Mahoning Co. at Tulsa.

WAGONER

Construction sand and gravel were produced north of Muskogee by R. Johnson & Sons Sand Co. and by the Muskogee Materials Co.

WASHINGTON

Cement was produced at Dewey by the Dewey Portland Cement Co. from shale and limestone quarried a short distance east of the plant. Crushed limestone was produced by the Notoka Stone Co. south of Bartlesville and by the Dewey Portland Cement Co. east of Dewey.

Ores from the Tri-State district and from several Western States were smelted at the Bartlesville zinc-retort smelter of the National Zinc Co., Inc., in 1952. This plant used natural gas to fire its furnaces.

WOODS

Salt was produced west of Freedom by Ezra Blackmon. Sand and gravel were produced near Wanoka by the Wanoka Sand & Gravel Co.

WOODWARD

Construction sand was produced north of Woodward by the Woodward Sand Co.

The Mineral Industry of Oregon

By Albert J. Kauffman, Jr.,[1] Kenneth D. Baber,[2] Frank B. Fulkerson,[2] and Paul F. Yopes[2]

VALUE of mineral production in Oregon decreased 6 percent in 1952 owing almost entirely to the smaller valuation of sand and gravel and stone output. Nonmetallic-mineral commodities accounted for more than 96 percent of the total. Although large quantities of construction materials were used at Federal dams, the value was appreciably less than in 1951. Work was in progress at the Detroit, McNary, Big Cliff, Lookout Point, Dexter, and The Dalles projects. Hydroelectric installations of Portland General Electric Co. and California Oregon Power Co. also were under construction.

Continuing and expanded production of lightweight aggregate made from shale at two plants in the Portland area further established this industry, a relatively new one in the Northwest. The plants were sole producers of lightweight aggregate in the region. Output was shipped as far east as Montana and northward into Canada.

Chromite production was at a comparatively high level. Records showed that this mining industry was experiencing its third boom period; production peaks had been attained in 1918 and 1943, with periods of little or no activity intervening.

Late in 1952 it was announced that the Government would underwrite development of the Riddle nickel deposit in Douglas County by two subsidiaries of the M. A. Hanna Co. The long-range multimillion-dollar program would involve large-scale mining operations of the nickel silicate ore and production of ferronickel.

The value of gold production was less than $200,000, the lowest annual yield reported in Oregon, except for the 3 years 1943–45.

Proposals were under consideration to bring natural gas into Oregon and Washington by pipeline from the San Juan Basin in the Southwest or from Canada. Availability of natural gas to supple-

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ment hydroelectric energy would encourage further expansion of mineral-consuming industries. The electrochemical and electrometallurgical industries, concentrated in the Portland area, continued to expand. Most of the mineral raw materials used by these operations were imported from outside the region.

The Bureau of Mines Northwest Electrodevelopment Laboratory at Albany continued smelting research on chromium, iron, manganese, and other marginal ores from Oregon and the Pacific Northwest. Problems encountered and results obtained in the work were described in an article.[3]

TABLE 1.—Mineral production in Oregon, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Chromite—gross weight	754	$62,972	6,591	$507,981
Clays (except for cement)	94,963	105,285	213,711	506,607
Coal			1,179	8,650
Copper (recoverable content of ores, etc.)	11	5,324	1	484
Gold (recoverable content of ores, etc.)—troy ounces	7,927	277,445	5,509	192,815
Lead (recoverable content of ores, etc.)	2	692	1	322
Mercury—76-pound flasks	1,177	247,323	868	172,819
Pumice and pumicite	47,026	137,136	59,578	201,809
Sand and gravel	10,504,339	9,117,343	12,219,486	8,556,218
Silver (recoverable content of ores, etc.)—troy ounces	6,218	5,628	4,037	3,654
Stone (except limestone for cement and lime)	8,721,799	10,831,483	6,250,849	8,893,368
Tungsten concentrate—60-percent WO_3 basis	1	2,795	4	15,960
Zinc (recoverable content of ores, etc.)	3	1,092	1	332
Undistributed: Asbestos (1951), carbon dioxide, cement, diatomite, gem stones, lime, perlite, and quartz		7,607,511		7,612,727
Total Oregon		28,402,000		26,674,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels and mercury are strictly production. Excludes a small quantity of manganese ore mined during the year.

During 1952 the program of the Defense Minerals Exploration Administration continued to encourage the systematic investigation of strategic and critical mineral occurrences. Financial assistance extended under the Government contracts was repayable from royalties on ore discovered and subsequently mined. The following project was active under the program during 1952:

County	Malheur.
Name of operator	Paul W. Wise.
Name of property	Coyote Antimony Group.
Mineral	Sb.
Total contract	$34,727.
Government participation—percent	75.
Contract No.	E213.

[3] Rasmussen, R. T. C., Electric Smelting at Bureau of Mines Seeks Utilization of Northwest Ores: Jour. of Met., vol. 4, No. 12, December 1952, pp. 1273–1279.

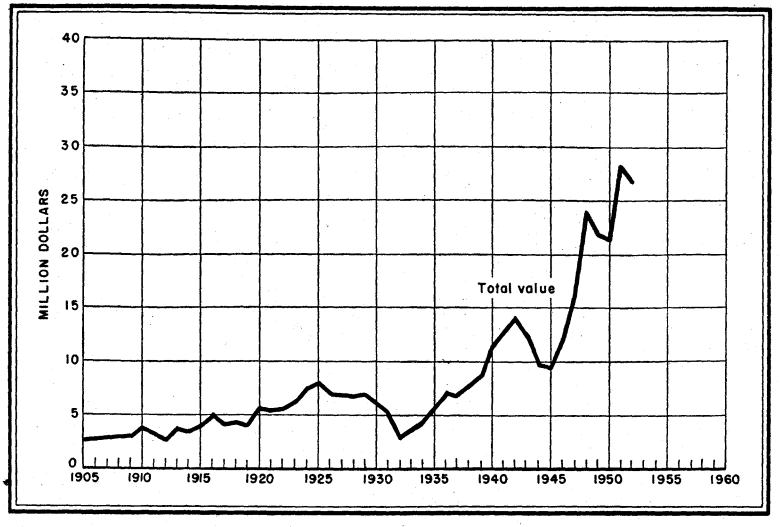

FIGURE 1.—Value of mineral production in Oregon, 1905–52.

REVIEW BY MINERAL COMMODITIES

METALS

Aluminum.—Operations at the Reynolds Metals Co. aluminum-reduction plant at Troutdale, Multnomah County, were affected late in the year by a shortage of hydroelectric power. The shortage was attributed to lack of rainfall and insufficient water stored in reservoirs to permit normal operation of generating facilities.

Prospects for the use of local clay and other aluminous materials were brightened when the Apex Smelting Co. purchased a 13-acre site at Springfield, Lane County. Plans called for construction of a plant to produce aluminum-silicon alloys, using an electric-smelting process developed with the cooperation of the Bureau of Mines.

Chromium.—Production of chromite from deposits in the State amounted to over eight times the quantity produced in 1951. Shipments to the Government Purchase Depot at Grants Pass, which was opened in August 1951, were made by 53 individuals and companies, an increase of 33 over the previous year. Full-scale operations were handicapped by heavy snow in the spring and fall, which closed many access roads. An incentive for expanded activity was provided when the tonnage limit that could be shipped to the National Stockpile annually from any 1 mine was raised from 2,000 tons to 5,000. A survey was conducted by the Oregon State Department of Geology and Mineral Industries during the year to determine the production capacity of the deposits. Of the miners contacted, 24 percent replied and estimated that they could produce 216,000 tons of chrome ore and concentrates during the authorized 3-year purchase program.

TABLE 2.—Shipments of chromite ores and concentrates, in 1952, by counties

County	Number of operations reported	Short tons, gross weight		
		Over 45 percent Cr_2O_3	Under 45 percent Cr_2O_3	Total
Curry	8	269	115	384
Douglas	2	(1)	(1)	(1)
Grant	2	415	0	415
Jackson	2	[1] 33	[1] 41	[1] 74
Josephine	39	5,580	138	5,718
Total	53	6,297	294	6,591

[1] Douglas and Jackson Counties combined to avoid disclosure of individual company operations.

TABLE 3.—Mine production of gold and silver in 1952, by months, in fine ounces of recoverable metals [1]

Month	Gold	Silver	Month	Gold	Silver
January	485	100	August	609	801
February	445	91	September	481	243
March	327	64	October	480	228
April	215	41	November	390	115
May	639	959	December	503	1,229
June	459	76			
July	476	90	Total	5,509	4,037

[1] Mine production comprises ore, gravel, or other mineral material sold or treated, and metal recovered as natural gold or as bullion from cyanidation or amalgamation, and the estimated recoverable metal (or gross metal as indicated) contained in concentrates, ore, tailings and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc, 1948–52, and total, 1852–1952, in terms of recoverable metals [1]

Year	Mines producing [2]		Material sold or treated [3] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1948	23	38	3,119	14,611	$511,385	13,596	$12,305
1949	28	29	6,215	16,226	567,910	12,195	11,037
1950	32	42	4,257	11,058	387,030	13,565	12,277
1951	14	31	1,495	7,927	277,445	6,218	5,628
1952	13	25	931	5,509	192,815	4,037	3,654
1852–1952			(4)	5,765,862	129,768,213	5,305,302	4,866,829

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
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
1951	11	5,324	2	692	3	1,092	290,181
1952	1	484	1	322	1	332	197,607
1852–1952	12,410	4,668,903	799	92,139	173	23,194	139,419,278

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, and ore shipped to smelters during calendar year indicated.
[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[3] Does not include gravel washed.
[4] Figure not available.

TABLE 5.—Gold produced at placer mines, 1943–47 (average) and 1948–52, by classes of mines and methods of recovery

Class and method	Mines producing [1]	Material treated (cubic yards)	Gold recovered	
			Fine ounces	Value
Surface placers:				
Gravel mechanically handled:				
Bucketline dredges:				
1943–47 (average)	2	2,197,500	5,944	$208,040
1948	2	[2] 3,525,300	[2] 9,842	[2] 344,470
1949	3	3,468,900	10,744	376,040
1950	2	3,051,000	7,827	273,945
1951	2	2,719,900	6,775	237,125
1952	1	2,548,736	4,571	159,985
Dragline dredges: [3]				
1943–47 (average)	4	269,000	1,380	48,300
1948	6	393,900	2,048	71,680
1949	3	594,750	3,224	112,840
1950	3	101,000	446	15,610
1951	1	6,500	47	1,645
1952	1	5,000	27	945
Nonfloating washing plants: [4]				
1943–47 (average)	1	840	27	945
1948	3	[2]	[2]	[2]
1949	4	12,700	54	1,890
1950	5	8,300	40	1,400
1951	1	[5]	5	175
1952	9	57,980	225	7,875
Gravel hydraulically handled:				
1943–47 (average)	21	84,300	412	14,420
1948	13	59,100	255	8,925
1949	21	83,300	472	16,520
1950	11	16,550	115	4,025
1951	9	27,621	147	5,145
1952	7	7,670	116	4,060
Small-scale hand methods: [6]	5	8,900	210	7,350
1943–47 (average)	5	21,600	181	6,335
1948	10	3,200	229	8,015
1949	5	9,850	207	7,245
1950	13	7,967	146	5,110
1951	1	250	6	210
1952	1	350	10	350
Underground placers (drift):	1	250	7	245
1943–47 (average)	1	400	8	280
1948	2	800	20	700
1949				
1950				
1951				
1952				
Grand total placers:				
1943–47 (average) [7]	24	2,536,240	7,729	270,515
1948	38	4,012,750	12,522	438,270
1949	29	4,157,300	14,465	506,275
1950	42	3,247,200	9,022	315,770
1951	21	2,753,600	7,164	250,740
1952	25	2,589,324	4,896	171,360

[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 bucketline 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 power excavator and washing plant, both on dry land; when washing plant is movable, outfit is termed "dry-land dredge."
[5] Data not available.
[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.
[7] Includes 31 ounces of gold from suction dredges.

TABLE 6.—Mine production of gold, silver, copper, lead and zinc in 1952, by classes of ore or other source materials, with content in terms of recoverable metals

Source	Number of mines	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Ore: Dry gold	13	931	613	2,952	2,000	2,000	2,000
Gravel (placer operations)	25		4,896	1,085			
Total, all sources	38	931	5,509	4,037	2,000	2,000	2,000

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery and types of material processed, in terms of recoverable metals

Method of recovery and type of material processed	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation	57	10			
Concentration, and smelting of concentrates	473	2,580	400	1,900	2,000
Direct smelting	83	362	1,600	100	
Total lode	613	2,952	2,000	2,000	2,000
Placer	4,896	1,085			
Grand total	5,509	4,037	2,000	2,000	2,000

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

A. For ore treated at mills

	Ore treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters and recoverable metals					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES									
Baker	420	16	2	110	45	12			
Grant	386	10	2	65	428	2,568	400	1,900	2,000
Jackson	11	12	3						
Other counties [1]	25	19	3						
Total: 1952	842	57	10	175	473	2,580	400	1,900	2,000
1951	1,143	54	10	76	471	3,498	8,300	3,800	6,000
BY CLASS OF ORE TREATED									
Dry gold	842	57	10	175	473	2,580	400	1,900	2,000
Total: 1952	842	57	10	175	473	2,580	400	1,900	2,000
BY CLASSES OF CONCENTRATES SHIPPED TO SMELTERS									
Dry gold				148	331	1,824	300	900	600
Lead				2	82	615	70	900	
Zinc				3	22	103	30	80	1,400
Dry iron [2]				22	38	38		20	
Total: 1952				175	473	2,580	400	1,900	2,000
1951				76	471	3,498	8,300	3,800	6,000

See footnotes at end of table.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

B. For ore shipped directly to smelters

	Ore shipped (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Lane	89	83	362	1,600	100	----------
Total: 1952	89	83	362	1,600	100	----------
1951	352	238	947	13,700	200	----------
BY CLASS OF ORE						
Dry gold	89	83	362	1,600	100	----------
Total: 1952	89	83	362	1,600	100	----------

[1] Includes Josephine and Wheeler Counties, for which Bureau of Mines is not at liberty to publish separate figures.
[2] From zinc-lead ore.

Copper.—Output of copper, recovered as a byproduct of gold-mining activities, declined from 11 tons in 1951 to 1 ton in 1952. The production was supplied by 3 mines—the Champion, operated by Harold E. L. Barton, Lane County; Buffalo, Boaz Mining Co., Grant County; and East Eagle, East Eagle Mining Co., Baker County. The Onion Falls mine in Josephine County, which produced copper ore in 1951, was not worked in 1952.

Gold.—Except for World War II years, Oregon's gold production was the lowest in State history. Output was 31 percent less than in 1951 and 71 percent less than in 1947, the peak year in the postwar period. About 83 percent of the gold produced in 1952 was recovered by the Powder River Dredging Co., operating a bucketline dredge near Sumpter in Baker County. Two lode mines, the Buffalo property in Grant County and Champion mine in Lane County, supplied 9 percent. The remainder came from 11 lode and 24 placer mines, which were worked intermittently. Nearly 89 percent of the gold produced came from placer mines. The decline in production compared to 1951 was due in large part to suspension of operations of a large dredge, which was operated in Grant County during part of 1951 by Porter & Co. Output from placer mines and lode mines decreased 32 and 20 percent, respectively, compared to 1951. Baker County supplied 85 percent of the total value; Grant County, 8 percent; and 7 other counties, 7 percent.

Lead and Zinc.—Gold ore from the Buffalo mine contained a small quantity of recoverable lead and zinc.

Manganese.—A small quantity of low-grade manganese ore was mined by Paul Wise from the Sheep Mountain mine near Durkee in Baker County and shipped to the Ray-O-Vac Co. plant in Salem. The Ray-O-Vac plant operated throughout the year, producing manganese dioxide for use in dry-cell batteries. Activity was reported at a manganese occurrence near Whitney, also in Baker County.

The American Metallic Chemicals Co. procured facilities near Portland and planned to produce electrolytic manganese dioxide from imported ores. Some production but no shipments were reported by the end of the year.

Mercury.—Production of quicksilver in Oregon decreased 26 percent, dropping from 1,177 flasks in 1951 to 868 in 1952. As in 1951, production was recorded from four separate operations. The Quicksilver Syndicate, which had operated at the Black Butte mine in Lane County the previous year, was inactive and was replaced as the fourth operation by the Towner Motor Co. operation at the Lost Cinnabar No. 1 in Crook County. Also producing in Crook County was the Maury Mountain mine, which is owned and operated by Eickemeyer Bros. of Post, Oreg. In Grant County Roba & Westfall mined and retorted ore at their Deer Creek property. The Bonanza mine, operated in Douglas County by the Bonanza Oil & Mine Corp., was the largest producer. Equipment available to process the ore included a 4- by 6-foot Gould rotary furnace, a 14-foot Herreshoff furnace, a 10- by 20-inch Lipman jaw crusher, and a 3- by 6-foot Secco single-deck screen. According to reports, new ore bodies were found during the year on the 500 and 600 levels south of the old workings.

TABLE 9.—Mercury ore treated and mercury produced in 1952, by counties

County	Ore treated (short tons)	Mercury produced (flasks of 76 pounds)	Value[1]
Crook	[2] 7	19	$3,783
Douglas	16,115	846	168,439
Grant	75	3	597
Total	16,197	868	172,819

[1] Value calculated at average price at New York.
[2] Partly estimated.

Nickel.—The Hanna Development Co., a subsidiary of M. A. Hanna Co., proceeded with an extensive exploratory program during 1952 at the nickel silicate deposit on Nickel Mountain near Riddle, Douglas County. A contract concluded late in the year with the Government crystallized hopes that this deposit, the largest known body of nickel ore in the United States, would become a major domestic source of the strategic metal. According to reports, mining and smelting of the ore were to be handled by two separate subsidiaries of the M. A. Hanna Co. The ore would be mined by Hanna Coal & Ore Corp., and the smelting facilities would be operated by the Hanna Nickel Smelting Co. The multimillion-dollar project was to produce ferronickel containing approximately 25 percent nickel for use in stainless and low-alloy steels.

Silver.—Minor quantities of silver were recovered as a byproduct of gold mining. Output decreased 35 percent compared to 1951. Of the total produced, about 64 percent came from Buffalo mine lode ore, 26 percent from Powder River Dredging Co. placer operations, and 9 percent from Champion mine lode ore. (See Gold for location of operations.)

Tungsten.—Production of tungsten ore and concentrates, although small, was higher than at any time in Oregon's history. Most of the ore was mined by the Ashland Mining Co. at its Mattern mine near Ashland. A smaller quantity was produced by the Bratcher Mining Corp. in the same vicinity.

Zirconium.—The Bureau of Mines Northwest Electrodevelopment Laboratory at Albany, Linn County, continued to expand its facilities for production of this strategic metal. Construction of a large-scale purification plant for separating zirconium from hafnium before reduction was completed, and initial operations were begun.

The Albany laboratory, where the magnesium-reduction method for producing the ductile metal was developed by William J. Kroll and his coworkers, continued to be the major producer in the world. Work on the process was begun at the close of World War II, and a pilot plant was put into operation in 1947. Subsequently, a larger pilot plant was built, and its success was such that a full-size plant was completed in August 1950. The entire output of metal from the plant has been consigned to the Atomic Energy Commission.

Special properties of the metal include its low rate of neutron absorption, extremely important in the construction of nuclear reactors; its high corrosion resistance, valuable in the chemical-manufacturing industry; and the fact that body tissues will grow directly to the metal without adverse effects, making it useful in surgical work.

NONMETALS

Carbon Dioxide.—Carbon dioxide for producing dry ice was recovered by the Gas-Ice Corp., Seattle, Wash., from mineral water occurring near Ashland. The water was raised through wells drilled about 300 feet deep. Dry ice is made by the same company at a similar occurrence near Klickitat, Wash.; a total of about 15 million pounds was produced from the 2 localities.

Cement.—Oregon's three cement plants in Baker, Clackamas, and Jackson Counties continued active throughout the year. Demand was reported to be strong, and some cement was imported into the State.

Clays.—A large increase in the quantity and value of clay output was reported, due to inclusion for the first time of shale production used in the manufacture of lightweight aggregate. Output of raw shale for this purpose comprised about 44 percent of the tonnage of clay sold or used in 1952. Expanded shale for building blocks and lightweight-aggregate concrete was made at a plant in Portland, Multnomah County, from Columbia County shale and at a plant in Washington County from shale mined at a nearby open pit. After crushing and screening, the shale was expanded in oil-burning rotary kilns. The product then was crushed and sized before shipment. Products were marketed under the trade names "Haydite" and "Lite-Rock." Expanded material has low shrinkage, desirable acoustical and thermal properties, and an exceptionally high strength-weight ratio.[4] Starting in 1947 with pilot-plant operations, Oregon's expanded-shale-aggregate industry grew rapidly. In 1952

[4] Kauffman, A. J., Jr., Industrial Minerals of the Pacific Northwest: Bureau of Mines Inf. Circ. 7641, 1952, p. 12.

value of output exceeded the combined value of pumice and perlite, the chief competitive commodities. The two plants in Oregon were the only ones in the Northwest, and their principal market area extended from southern Oregon into Canada.

The structural-clay-products industry continued at about the 1951 level of production, with the same 18 plants reporting output. The industry was concentrated in the Willamette Valley, where suitable raw materials were available and a market was provided by the large local population and by soil drainage needs. Use of drain tile has been encouraged by the United States Department of Agriculture program that provided for payment of 50 percent of the raw-material cost for new drainage systems. Stoneware and flowerpots were made in Portland. Fourteen of the plants in the State were in Willamette Valley counties and the remaining 4 in Klamath, Malheur, Tillamook, and Union Counties.

Diatomite.—The Great Lakes Carbon Corp. operated a diatomite quarry and preparation plant on the Deschutes River near Terrebonne, Deschutes County. The principal products were filter aids, fillers, insulation, and abrasives. Products were marketed under the trade name "Dicalite."

Lime.—Two lime-burning plants were operated in Polk County, producing quicklime used entirely for agricultural purposes.

Perlite.—Expanded perlite for acoustical tile and lightweight-plaster sand was manufactured in a plant at Frieda, Wasco County. Crude perlite was quarried at nearby Dant. The plant was leased to Kaiser Gypsum Co. in May by the owner, Dantore Division of Dant & Russell, Inc., Portland.

Pumice and Pumicite.—The sharp drop in marketed production of pumice in 1951 was reversed in 1952 as output increased 27 percent in quantity and 47 percent in value to total 59,578 tons valued at $201,809. However, production value remained 33 percent below the record high attained in the 3-year period 1948–50. Three companies in Deschutes County supplied most of the production; 1 operation reported activity in Harney County. Over 94 percent, by value, of the marketed production was used as concrete aggregate; minor quantities were consumed as abrasives, in acoustical plaster, and for road ballast. Sales for use as "thermal sand" for concrete-block manufacture were reported by one company.

Silica.—Commercial production of silica was increased considerably in 1952 by the Bristol Silica Co., sole producer in the State, at its operations in Jackson County. Output was used by the ferrosilicon and silicon carbide industries, as poultry grit, and for other special purposes. An arrangement for shipments to the Harbison-Walker Co. plant at Curtner, Calif., for the manufacture of silica brick will require further expansion of production capacity.

Sand and Gravel.—The value of Oregon sand and gravel output in 1952 was slightly less than in 1951, despite an increase in quantity of 16 percent, due to lower unit value of material used at Federal dam projects. In 1952, the output for noncommercial (Government-and-contractor) use was 6,894,400 tons valued at $3,355,600 and for commercial use 5,325,100 tons valued at $5,200,600. Production was reported from 22 counties.

Stone.—Gross production of stone declined from an alltime high of 8,721,800 tons valued at $10,831,500 in 1951 to 6,250,800 tons valued at $8,893,400. Both commercial and noncommercial (Government-and-contractor) classifications shared the drop, commercial output declining from $3,066,200 to $2,183,800 and noncommercial from $7,765,200 to $6,709,600. Reduced use of stone at Federal dam projects was a major factor contributing to the decrease. More than 92 percent of the 1952 output was used for concrete or road building. The principal stone quarried was basalt; relatively small quantities of limestone, granite, and miscellaneous stone were mined. Output was reported from 23 counties.

TABLE 10.—Value of mineral production in Oregon by counties, 1951–52

County	1951	1952	Minerals produced in 1952, in order of value
Benton	$56,785	$48,843	Sand and gravel, clay.
Clackamas	4,491,402	4,196,972	Cement, sand and gravel, stone, clay.
Clatsop	89,685	143,882	Stone, sand and gravel.
Columbia	255,994	327,792	Clay, stone, sand and gravel.
Coos	259,923	298,288	Stone, sand and gravel, coal, gold, silver.
Crook	57,271	3,783	Mercury.
Curry	3,958	32,779	Chromite, sand and gravel.
Deschutes	812,626	1,115,142	Diatomite, pumice, stone, sand and gravel.
Douglas	987,394	1,054,247	Sand and gravel, mercury, stone, chromite, gold, silver.
Gilliam	75,000	115,500	Sand and gravel.
Grant	75,145	51,317	Chromite, gold, silver, mercury, zinc, lead, copper.
Harney	60,536	6,718	Pumice.
Hood River	25,000	45,505	Stone.
Jackson	2,379,984	2,236,024	Cement, sand and gravel, stone, silica, carbon dioxide, tungsten, chromite, gold, silver.
Josephine	69,302	445,095	Chromite, gold, silver.
Klamath	414,999	212,308	Stone, sand and gravel, clay.
Lane	1,796,615	1,433,279	Sand and gravel, stone, gold, silver, copper, lead.
Lincoln	161,414	(1)	Stone.
Linn	154,756	289,694	Stone, sand and gravel, clay.
Malheur	5,282	3,750	Clay.
Marion	103,873	143,685	Sand and gravel, clay.
Morrow	132,548	38,618	Stone.
Multnomah	2,460,884	2,355,229	Sand and gravel, stone, clay.
Polk	236,291	231,827	Do.
Sherman	18,375	2,500	Stone.
Tillamook	162,920	31,070	Stone, clay.
Umatilla	523,460	385,246	Sand and gravel, stone.
Union	56,508	70,516	Stone, sand and gravel, clay, gold.
Wallowa	70,694	76,249	Stone.
Wasco	98,932	108,429	Sand and gravel, perlite, stone.
Washington	262,489	593,257	Sand and gravel, clay, stone.
Yamhill	202,876	266,973	Sand and gravel, stone, clay.
Undistributed [2]	11,839,108	10,309,229	
Total	28,402,000	26,674,000	

[1] Included with "Undistributed" to avoid disclosure of individual output.
[2] Includes value of mineral production for Baker County (cement, gold, stone, silver), Wheeler County (gold, 1952) and stone, sand and gravel, and gem-stone production that cannot be assigned to specific counties.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties, in terms of recoverable metals

County	Mines producing [1]		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Baker	2	6	4,691	$164,185	1,072	$970
Coos		2	29	1,015	3	3
Douglas		2	19	665	2	2
Grant	2	4	458	16,030	2,573	2,329
Jackson	4	6	52	1,820	7	7
Josephine	3	3	167	5,845	17	15
Lane	1		83	2,905	362	327
Other counties [2]	1	2	10	350	1	1
Total	13	25	5,509	192,815	4,037	3,654

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Baker							$165,155
Coos							1,018
Douglas							667
Grant	400	$97	1,900	$306	2,000	$332	19,094
Jackson							1,827
Josephine							5,860
Lane	1,600	387	100	16			3,635
Other counties [2]							351
Total	2,000	484	2,000	322	2,000	332	197,607

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.

[2] Includes Union and Wheeler Counties, for which Bureau of Mines is not at liberty to publish separate figures.

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties and districts, in terms of recoverable metals

County and district	Mines producing [1]		Ore (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					
Baker County:											
Baker		(3)			14	14	6				$495
Eagle	1		380	31		31	9				1,093
Lower Burnt River		3			36	36	8				1,267
Sparta	1		40	30		30	5				1,055
Sumpter		2			4,578	4,578	1,044				161,175
Upper Burnt River		1			2	2					70
Coos County:											
Beach		1			27	27	3				948
Powers		1			2	2					70
Douglas County: Riddle		2			19	19	2				667
Grant County:											
Canyon, Desolation, Greenhorn [4]	1	4	100	10	15	25	4				879
Granite	1	(3)	286	428	5	433	2,569	400	1,900	2,000	18,215
Jackson County:											
Gold Hill	1	1	1	2	15	17	2				597
Jacksonville		1			4	4					140
Sterling Creek		(3)			1	1					35
Upper Applegate	3	4	10	10	20	30	5				1,055
Josephine County:											
Galice, Grants Pass, Greenback [4]	3	1	15	15	100	115	11				4,035
Illinois River		(3)			4	4					140
Waldo		1			5	5					175
Wolf Creek		1			43	43	6				1,510
Lane County: Bohemia	1		89	83		83	362	1,600	100		3,635
Other counties [5]	1	2	10	4	6	10	1				351
Total Oregon	13	25	931	613	4,896	5,509	4,037	2,000	2,000	2,000	197,607

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] Source of silver: 2,952 ounces from lode mines, and 1,085 ounces from placers.
[3] From property not classed as a mine.
[4] District production combined; Bureau of Mines not at liberty to publish separate figures.
[5] Includes Union and Wheeler Counties.

REVIEW BY COUNTIES

BAKER

A small quantity of low-grade manganese ore was reported as mined from the Sheep Mountain mine near Durkee by Paul Wise. According to the report, the ore was shipped to the Ray-O-Vac Co. in Salem for use in making high-grade manganese dioxide for batteries.

In Sumpter district the Powder River Dredging Co., Oregon's leading gold producer, operated its Yuba electrically powered bucket dredge throughout 1952 at Sumpter Valley. The operation washed 2,548,736 cubic yards of gravel, which averaged 6 cents per yard in gold and silver values. Deer Creek Placers hydraulicked the Deer Creek mine from May to July. The two producing lode mines in the county were the East Eagle in Eagle Creek district and the Macy in Sparta district.

The Gales Creek quarry at Durkee and the limestone quarry and cement plant at Lime were operated by the Oregon Portland Cement Co., Portland. Production of cement was slightly less than in 1951. Some limestone was sold for use in sugar refining and for other purposes.

BENTON

The Monroe Brick & Tile Co., one of the largest structural clay products plants in the State, and the Corvallis Brick & Tile Co. produced common brick and drain and building tile. Wood was used as fuel by both plants. The Corvallis Sand & Gravel Co. produced washed gravel, and the county reported a small quantity of unwashed gravel used for roads.

CLACKAMAS

The Mollala Brick & Tile Co. and the Needy Brick & Tile Co. produced common brick and drain and building tile. Both wood and oil were used for fuel. The Oregon Portland Cement plant at Oswego continued as the largest cement producer in the State. Seven companies reported production of sand and gravel, and the Oregon City Sand & Gravel Co. also produced crushed rock. Crushed and broken rock and sand and gravel were produced by the county.

CLATSOP

The county highway department and the Brookfield Co. of Astoria produced washed sand and gravel. Rock Creek Crushed Rock and Astoria Crushed Rock Co. prepared crushed rock for concrete, road metal, and other uses.

COLUMBIA

The Orr Chemical & Engineering Co. produced limonite from a deposit near its new plant at Scappoose. The finely ground, activated product from the plant was used to remove sulfur from commercial gas.

Shale rock, open-pit mined near Vernonia, was shipped by rail to the Smithwick Concrete Products Co. Haydite plant in Portland, Multnomah County, for making lightweight aggregate. Two sand and gravel pits and washing plants were operated. The Goodat Crushed Rock Co. produced crushed and screened rock.

COOS

Coast Minerals Co. of Bandon operated a dragline excavator for 2 months at the Old Eagle placer on Cut Creek, 4 miles north of Bullards, in the Beach district. After a small quantity of gold was recovered, operations were suspended in August pending the addition of more equipment.

A small tonnage of bituminous coal was mined in the county. Four companies produced broken and crushed rock. Two commercial producers and the county highway department reported active sand and gravel operations.

CROOK

Mercury was produced at the Lost Cinnabar No. 1 and Maury Mountain mines by Towner Motor Co. and Eickemeyer Bros., respectively.

CURRY

The McCaleb, Ditch Creek, and Sourdough mines produced the bulk of the chromite output in the county during the year. Other mines worked or developed included the Cedar Creek, Lost Lee, and Wonder. Fred Gardner located the Fourth of July claim. An investigation of nickel occurrences in the Red Flats area, 19 miles from Gold Beach on Hunter's Creek road, was conducted by the Bureau of Mines.

A small quantity of sand and gravel was produced by Jas. G. Edington of Langlois.

DESCHUTES

The Great Lakes Carbon Corp. diatomite quarry and processing plant near Terrebonne were operated throughout the year, but had a lower production than in 1951. Pumice was mined by the Central Oregon Pumice Co., Deschutes Concrete Products Co., and Lloyd A. Williamson. Total production was greater than in 1951, and represented the bulk of the output from Oregon. Bend Sand & Gravel Co. was active, and Cinder Hill Rock Co. sold a variety of crushed rock products.

DOUGLAS

The Hanna Development Co. was engaged in extensive exploration at its property on Nickel Mountain near Riddle. Plans were made for constructing nickel-ore processing facilities at the site. Production of mercury at the Bonanza mine near Sutherlin continued throughout the year. The company installed a new condensing system and carried on development work on the ore body.

Four sand and gravel and 2 stone-crushing plants reported production having a total value of $883,426.

GILLIAM

The county highway department reported sand and gravel production.

GRANT

The Dry Camp chromite deposit near John Day yielded 415 short tons of concentrates averaging 48 percent Cr_2O_3 to 2 operators, Burt Hayes and the Tri-County Mining & Concentrating Co. Concentrates were shipped to the Government Purchase Depot at Grants Pass at a cost of $20 per ton. Reports indicated chromite discoveries at the Haggard and New properties and some activity at the Potato Patch mine.

Roba & Westfall reported production of 3 flasks of mercury at the Deer Creek mine near Canyon City.

Boaz Mining Co. of Seattle, Wash., operated the Buffalo mine and mill in Granite district during part of 1952; concentrates from 286 tons of gold ore processed in the flotation mill were shipped to smelters in Tacoma, Wash., and Tooele and Midvale, Utah.

HARNEY

The Harney Concrete Tile Co. mined pumice from its open pit near Burns. The output was used in about equal quantities as lightweight concrete aggregate and road ballast.

HOOD RIVER

Broken and crushed basalt was mined for county roadwork.

JACKSON

Ore mined from the Mattern tungsten deposit near Ashland was concentrated and shipped by the Ashland Mining Co. Ore was shipped also from the Bratcher tungsten mine by the Bratcher Mining Corp. Some test work was done on tungsten ore from a discovery on the Hall property in the same vicinity. The Onion Springs Mining Co. and the Tyrell Manganese Co. shipped chromite to the National Stockpile.

In Gold Hill district, R. E. Cook and Floyd Lance recovered 9 ounces of gold and 1 ounce of silver during March and April by hydraulicking at their placer claim on Foote Creek. The Evergreen gold-lode mine was developed in March and April by Chas. McDonald. In Upper Applegate district, King Mountain Mines, Ltd., worked the Flying Squirrel and Little Arctic mines on Boulder Creek for 3 months but terminated operations in August. R. A. Myers developed the Kate-El mine in Sailor Gulch from May to September.

The Bristol Silica Co. continued production of crushed granite for poultry grit and considerably increased its output of silica. The quarries and crushing plant of the company are located in the Rogue River area. The Ideal Cement Co., Denver, Colo., acquired ownership of the Pacific Portland Cement Co. plant at Gold Hill and the quarry in adjoining Josephine County. Cement production continued at the 1951 rate. Medford Concrete Construction Co., Inc., and M. C. Lininger & Sons, Medford, operated sand and gravel plants, most of the output being used as paving gravel or in road structures. The county also produced road gravel and crushed stone. Carbon dioxide was recovered from mineral water wells by Gas-Ice Corp., Ashland.

JOSEPHINE

Over two thirds of the chromite operations in the State, representing 90 percent of the production value, were in this county. The Goncolda mine, operated by the Chrome Milling Co., was the largest chromite producer in the county; other major producers included the Ashland Mining Co. at the Shady Cove mine; D. W. Bowers at the Sordy deposits; and Wm. S. Robertson at the Oregon Chrome mine.

The Marble Mountain quarry of the Pacific Portland Cement Co. supplied limestone for the cement plant at Gold Hill, Jackson County. Ideal Cement Co., Denver, Colo., acquired ownership of the quarry.

KLAMATH

The Klamath Falls Brick & Tile Co. produced brick and tile from local clay blended with clay shipped from California. The company mined 4,166 tons of clay from the local pit; oil was burned as fuel. O. A. McCord, Klamath Falls, produced sand and gravel for paving and road structures. The Great Northern Railway Co. produced sand and gravel and crushed rock for railroad ballast. Basalt was quarried and crushed by three companies for use as railway ballast, for roadwork, and for concrete.

LANE

The Apex Smelting Co. was carrying forward plans to construct a plant at Springfield to produce aluminum-silicon alloys.

The Champion mine in Bohemia district was operated by Harold E. L. Barton. A total of 89 tons of gold ore containing recoverable gold, silver, copper, and lead was shipped to the Tacoma, Wash., smelter. The mill, which was closed in July 1951, was not put into operation during 1952.

Lane County produced sand and gravel valued at over $1 million; 9 companies and the county reported active operations. Broken and crushed basalt, limestone, and granite exceeding $400,000 in value were produced also. Roadwork and construction in connection with the Dexter project of the Bureau of Reclamation absorbed much of the output.

LINCOLN

Crushed and broken basalt was produced by Calkins Crushing Co., Ocean Lake, and Yaquina Head Quarries, Newport. Principal use was for concrete and road building.

LINN

Crushed stone for concrete and road building, valued at $179,653 and accounting for 62 percent of Linn County's mineral output, was produced by 2 companies. Sand and gravel plants were active in Harrisburg, Lebanon, and Albany. Common brick and drain and building tile were produced by the Albany Brick & Tile Co., using slab wood for fuel.

MALHEUR

The Oregon Clay Products Co., Inc., made common and face brick at a plant in Vale, burning slack coal as fuel.

MARION

The Donald Brick & Tile Co. at Donald and Hubbard Clay Works at Hubbard made structural clay products from locally mined clay. The plant at Donald was one of the largest in Oregon. Wood and oil were used for fuel. Six companies and the county operated sand and gravel plants. The Ray-O-Vac Co. produced synthetic battery-grade manganese dioxide at Salem.

MORROW

Stone was quarried for county road building.

MULTNOMAH

The Reynolds Metals Co. produced primary aluminum from alumina shipped into the State at its Troutdale reduction plant. The American Metallic Chemicals Co. began constructing a $500,000 processing plant at Portland. Plans called for production of electrolytic battery-grade manganese dioxide, used in making dry cells. According to reports, only imported ores would be processed at the plant.

Brick of all types was produced from locally mined clay at the Sylvan Brick Co. plant at Sylvan, just west of Portland. Oil was used for fuel. The Columbia Brick Works plant at Gresham, east of Portland, produced brick and tile. The kilns were fired with coal. These plants are two of the largest in Oregon. Pacific Stoneware Co. manufactured flowerpots and other pottery items in its Portland plant. Lightweight expanded-shale aggregate was made in Portland by Smithwick Concrete Products Co. from shale mined near Vernonia, Columbia County, and shipped to the plant by rail.

Sand and gravel valued at $2 million was produced by 10 companies. The county produced sand, gravel, and crushed stone worth $253,000; output was used principally for road construction. Basalt building stone was produced by Joe Marston at the Rocky Butte quarry, Portland.

POLK

Structural clay products were made from locally mined clay at Monmouth by the Monmouth Brick & Tile Co.; oil was used for fuel. The Oregon Portland Cement Co. quarried limestone near Dallas. Dewitt's Polk County Lime Co. and Limestone Products Co. produced agricultural limestone. Two companies, the city of Dallas, and the county reported sand and gravel production.

TILLAMOOK

The Tillamook Clay Works, 7 miles southeast of Tillamook, manufactured drain tile. Wood was used for fuel. Basalt was quarried and crushed by the county.

UMATILLA

Basalt was quarried by H. E. Barnhart, Independence, and Morrison-Knudsen Co., Inc., Boise, Idaho; 75 percent of the output was used for railroad ballast. Two commercial sand and gravel plants produced building and road-construction materials, and the Union Pacific Railroad Co. mined and washed gravel for railroad ballast.

UNION

The La Grande Brick Co. produced common brick from locally mined clay. Sand, gravel, and crushed stone were mined by the county; the Hart Construction Co. operated a commercial sand and gravel plant at La Grande.

WALLOWA

Limestone was quarried at the Enterprise quarry by Greeley Lime Co., a subsidiary of Pacific Carbide & Alloys Co., and shipped by rail to Portland for use in manufacturing calcium carbide. The fines were sold for agricultural limestone. The county produced crushed basalt for road work.

WASCO

Perlite was mined near Dant and processed at Frieda. The Dalles Concrete Products Co. sand and gravel plant was operated. Other production included a small quantity of commercial basalt and sand, gravel, and stone for county roadwork.

WASHINGTON

The Empire Building Material Co. operated a crushing, screening, and rotary-kiln plant at Banks, producing expanded shale for lightweight aggregate. Shale was mined in an open-pit near the plant. About 50,000 tons of aggregate was made. The Scholl Tile Co. near Scholl and O. K. Brickyard, Sherwood, operated during the year. Four companies and the county reported sand and gravel output having a total value of $263,479, and the county also produced crushed basalt for roadwork.

YAMHILL

Structural clay products were made by the Willamina Clay Products Co., using sawdust as fuel. The McMinnville Brick & Tile Co. manufactured drain and building tile and common brick. Sand and gravel plants at Dayton, McMinnville, and Sheridan and quarries and stone-crushing plants near McMinnville and Sheridan were operated.

The Mineral Industry of Pennsylvania

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Pennsylvania Topographic and Geologic Survey.

By Richard H. Mote [1] and Alvin Kaufman [2]

THE COMMONWEALTH of Pennsylvania continued in 1952 to be one of the foremost sources of mineral commodities in the United States. It maintained its position as one of the largest producers of bituminous coal, clay, cobalt, lime, slate, stone, tripoli, and sand and gravel and continued to be the sole domestic producer of anthracite.

Pennsylvania produced a wide variety of mineral commodities, ranging from fuels to nonmetals. Of these, the most important economically were coal, cement, petroleum, stone, and natural gas.

The bituminous-coal production is centered in the southwestern and central counties, with anthracite concentrated in the northeast. Liquid fuel and natural gas come mainly from the western and north central areas. The cement and stone industries have their largest production in the northeast and southwest, respectively.

The importance of fuels to the State's mineral economy is illustrated most sharply by consideration of the 8 counties whose individual mineral production exceeded $50 million in 1952. These were, in order of size: Luzerne, Schuylkill, Washington, Cambria, Northampton, Allegheny, Lackawanna, and Greene. All except Northampton owe their predominant position to the production of coal.

In 1952 nearly 81 percent of the value of the State's mineral output was attributable to fuels, 18 percent to nonmetals, and 1 percent to metals, virtually all of which was iron ore or byproducts of that commodity. Metals declined 18 percent in value as compared with 1951, largely as a result of a prolonged strike in the iron and steel industry.

The impact of the labor strike was felt not only in the metals industry but in virtually every segment of the mineral economy. Fuel production declined 12 percent in value, partly a result of the strike as well as of the competitive forces of other fuels on the coal industry. Although fire clay for refractories and limestone for flux were particularly affected by the decreased activity in the steel industry, the nonmetals as a group declined least. The value of output dropped 5 percent.

In general, the effect of the steel strike was such that the value of Pennsylvania mineral production declined 11 percent as compared with the record high established in 1951.

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It was in a segment of the nonmetals industry that producers made an enviable safety record. Of the 10 crushed-stone plants in the United States that operated without a single lost-time injury in 1952, 3 were in Pennsylvania; 1 was operated by the Warner Co. and 2 by the General Crushed Stone Co.

TABLE 1.—Mineral production in Pennsylvania, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement---376-pound barrels	41,560,431	$107,035,506	40,037,761	$103,388,586
Clays (except for cement)	3,992,403	13,663,764	3,528,161	12,308,828
Coal:				
Anthracite	42,669,997	405,817,963	40,582,558	379,714,076
Bituminous	108,163,843	572,194,085	89,181,232	473,475,646
Cobalt (content of ore)---pounds	755,631	(2)	639,856	(2)
Gold (recoverable content of ores, etc.) troy ounces	2,179	76,265	1,500	52,500
Iron ore (usable)---long tons, gross weight	1,215,033	(2)	992,110	(2)
Lime (open-market)	1,181,100	14,260,054	1,202,981	13,842,213
Natural gas---thousand cubic feet	128,715,000	35,654,000	108,684,000	30,758,000
Natural-gas liquids:				
Natural gasoline---42-gallon barrels	192,000	656,000	171,000	548,000
LP-gases---do	18,000	71,000	19,000	75,000
Peat	8,591	46,568	7,898	43,874
Petroleum (crude)---42-gallon barrels	11,345,000	48,220,000	[3] 11,233,000	[3] 47,740,000
Sand and gravel	15,737,464	21,488,540	14,696,106	19,920,003
Silver (recoverable content of ores, etc.) troy ounces	13,575	12,286	9,247	8,369
Slate	268,830	5,688,870	214,860	4,487,648
Stone (except limestone for cement and lime)	[4] 27,399,564	[4] 46,668,590	[4] 25,609,812	[4] 44,676,456
Undistributed: Copper, mica, pyrites, ground sand and sandstone, stone (dimension unclassified, 1951 and dimension basalt, 1952), tripoli, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)	----	[5] 17,672,755	----	14,558,890
Total Pennsylvania	----	1,289,226,000	----	1,145,598,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels and pyrites are strictly production.
[2] Value included with "Undistributed."
[3] Final figure. Supersedes preliminary figure given in commodity chapter.
[4] Excludes certain stone, value for which is included with "Undistributed."
[5] Revised figure.

REVIEW BY MINERAL COMMODITIES

METALS

The Bethlehem Steel Co. Cornwall mine in Lebanon County was Pennsylvania's only metallic ore producer in 1952. This property yields a magnetic iron ore containing pyrite in association with minerals containing copper, gold, silver, and cobalt, all of which are recovered as byproducts of iron-ore beneficiation. This company also continued development work on the Grace iron mine, Morgantown, Berks County.

During the year Bethlehem Steel Co. dropped to second place as a domestic producer of commercial cobalt ore. This material was shipped as a concentrate to Wilmington, Del., for reduction.

Although no mine production of zinc was recorded in the State in 1952, activity of the New Jersey Zinc Co. at Friedensville, Lehigh County, promises to make Pennsylvania again a producer of zinc ore. The company reported that the principal service buildings and

facilities, except the concentrating mill, were completed by the end of 1952. Although the mine shaft was excavated to a depth of 1,260 feet, considerable underground development remained to be completed before the mine could begin production.

NONMETALS

Cement.—The production of cement from Pennsylvania plants decreased 6 percent in 1952 as compared with 1951, owing largely to a 33-percent drop in Pennsylvania construction activity during the year.[3]

Shipments from Pennsylvania cement plants in 1952 were 599,800 barrels over production; withdrawals from stocks were, of course, necessary, resulting in a 21-percent decline in these reserves from the level at the beginning of the year.

Pennsylvania cement production is concentrated in two major areas. The larger of these consists of Lehigh and Northampton Counties in the northeast part of the State. These 2 counties, with 16 mills, supplied 72 percent of the cement shipped in 1952. This region's leadership in cement production results from the occurrence of the Jacksonburg limestone in the area. The presence of large tonnages of this rock near the surface, with its almost ideal lime, alumina, and silica content, gives the Lehigh-Northampton area a natural advantage over most other sections of the State.

The second center of production is in the densely populated region of western Pennsylvania, comprising Allegheny, Butler, and Lawrence Counties. Five producing plants in this area utilize the Vanport limestone.

Major cement producers in 1952, in order of decreasing output, were: Universal Atlas Cement Co., Lehigh Portland Cement Co., Penn Dixie Cement Co., Keystone Portland Cement Co., Alpha Portland Cement Co., Lone Star Cement Co., Hercules Cement Corp., Whitehall Cement Mfg. Co., Dragon Cement Co., Inc., and Medusa Portland Cement Co.

TABLE 2.—Finished portland cement produced, shipped, and in stock, 1943–47 (average) and 1948–52

Year	Active plants	Production (barrels)	Shipped from mills			Stocks at mills on Dec. 31 (barrels)
			Barrels	Value		
				Total	Average per barrel	
1943–47 (average)	24	22,049,669	22,608,976	$36,626,541	$1.62	3,128,288
1948	24	38,310,627	38,255,543	81,638,484	2.13	2,056,756
1949	24	38,122,065	36,905,254	84,839,175	2.30	3,275,594
1950	24	38,646,260	39,450,611	94,604,230	2.40	2,471,243
1951	24	41,981,431	41,560,431	107,035,506	2.58	2,892,243
1952	24	39,437,971	40,037,761	103,388,586	2.58	2,292,453

[3] Engineering News Record, vol. 150, Feb. 19, 1953, p. 58.

TABLE 3.—Shipments of portland cement, 1951–52, in 376-pound barrels

County	1951		1952	
	Barrels	Value	Barrels	Value
Northampton	22, 200, 885	$57, 121, 368	21, 320, 251	$55, 077, 602
Lehigh	7, 493, 731	18, 998, 813	7, 452, 361	18, 897, 949
Allegheny, Lawrence, Butler	8, 376, 451	20, 906, 158	7, 760, 593	19, 467, 522
Berks, Montgomery, York	3, 489, 364	10, 009, 167	3, 504, 556	9, 945, 513
Total	41, 560, 431	107, 035, 506	40, 037, 761	103, 388, 586

Clays.—Although over half of Pennsylvania's 67 counties produced clays in 1952, the State's production dropped 12 percent below that in 1951. This decline was due in large part to the steel strike of mid-1952, which curtailed consumption of fire-clay refractories.

The 107 clay pits active in the Commonwealth in 1952 produced kaolin, fire clay, and various miscellaneous clays and shale. Of these, fire clay and kaolin were the most important, and represented 85 percent of the value of clay products produced in 1952. Fire clay was used for refractory and heavy clay products. This material was produced predominantly in Clearfield, Beaver, Jefferson, Somerset, and Armstrong Counties. Major producing companies continued to be Harbison-Walker Refractories Co., General Refractories Co., and North American Refractories Co.

Miscellaneous clays and shale are used in producing face brick, common brick, and other structural clay products. Production was concentrated in Allegheny, Berks, Lawrence, Northumberland, and Dauphin Counties. The largest producers of this material were Glen Gery Shale Brick Co. and Freeport Brick Co.

It should be noted that the low value attributed to miscellaneous clays has little bearing on the price of the final product, because labor and fuels involved in shaping, drying, and firing constitute such a large percentage of the manufacturing cost.

Pennsylvania kaolin was produced almost entirely in Cumberland County, with some small output in Blair County. The only producers of this white clay in 1952 were Philadelphia Clay Co. and United Clay Mines Corp. Kaolin was used almost entirely as a cement whitener.

TABLE 4.—Clays sold or used by producers, 1943–47 (average) and 1948–52

Year	Kaolin		Fire clay		Miscellaneous clays		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	25, 123	$96, 280	1, 434, 895	$4, 604, 254	954, 901	$800, 541	799, 941	$5, 500, 475
1948	50, 021	190, 998	1, 871, 687	7, 303, 153	1, 687, 319	1, 360, 997	3, 609, 027	8, 855, 148
1949	52, 478	201, 576	1, 663, 564	6, 316, 196	1, 594, 729	1, 308, 907	3, 310, 771	7, 826, 679
1950	62, 626	250, 383	1, 731, 855	7, 149, 589	1, 687, 712	1, 415, 346	3, 482, 194	8, 815, 318
1951	75, 415	306, 045	[1] 2, 205, 794	[1] 11, 653, 734	1, 949, 358	2, 127, 771	4, 230, 567	14, 087, 550
1952	(1)	(1)	[1] 1, 992, 099	[1] 10, 726, 085	1, 739, 031	1, 913, 779	3, 731, 130	12, 639, 864

[1] To avoid disclosure of individual company figures, kaolin has been combined with fire clay.

TABLE 5.—Clays sold or used by producers in 1952, by kinds and uses

	Fire clay [1]		Miscellaneous clays		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
Refractories:						
Firebrick and block	1,124,796	$7,741,760			1,124,796	$7,741,760
Fire-clay mortar	38,361	319,372	194	$1,761	38,555	321,133
Foundries and steelwork	99,346	294,791	17,620	25,120	116,966	319,911
Heavy clay products	691,673	2,166,866	1,537,249	1,673,217	2,228,922	3,840,083
Pottery and stoneware	9,059	44,905			9,059	44,905
Tile, high-grade			1,905	2,280	1,905	2,280
Paint fillers or extenders			898	12,925	898	12,925
Miscellaneous fillers			4,946	22,257	4,946	22,257
Cement	28,864	158,391	174,510	174,510	203,374	332,901
Other uses			1,709	1,709	1,709	1,709
Total	1,992,099	10,726,085	1,739,031	1,913,779	3,731,130	12,639,864

[1] Includes kaolin. [2] Includes high-alumina brick.

TABLE 6.—Clays sold or used by producers in 1952, by counties

County	Short tons	Value	County	Short tons	Value
Adams	56,500	$56,500	Huntingdon	10,540	$90,879
Allegheny	239,834	239,834	Indiana	17,610	70,440
Armstrong	240,852	852,036	Jefferson	252,961	1,151,212
Beaver	313,167	1,067,659	Lancaster	63,716	63,716
Blair	51,106	124,647	Lawrence	161,771	189,271
Butler	19,535	20,582	McKean	128,687	245,548
Centre	38,584	220,554	Montgomery	59,311	161,481
Chester	65,250	82,800	Northumberland	128,695	175,506
Clarion	82,941	353,697	Snyder	53,275	53,275
Clearfield	566,000	4,544,421	Somerset	223,378	1,046,462
Clinton	38,943	239,515	Washington	51,651	51,651
Columbia	12,599	12,599	Westmoreland	58,652	541,475
Dauphin	103,344	103,344	York	68,885	68,885
Delaware	27,350	27,350	Undistributed	554,780	714,788
Fayette	37,213	65,737			
Greene	4,000	4,000	Total	3,731,130	12,639,864

Iron Oxide Pigments.—Despite a 12-percent drop in production in 1952, Pennsylvania continued to be a major source of iron oxide pigments; the most important was the red oxide of Northampton County. Producers active in 1952 were Reichard-Coulsten, Inc.; C. K. Williams & Co., Easton; Keystone Filler & Mfg. Co., Muncy; Pen Paint & Filler Co., Antes Fort; Vitre Pigments, Inc., and Prince Mfg. Co., Bowmanstown.

TABLE 7.—Iron oxide pigments sold in 1951–52

County	1951		1952	
	Short tons	Value	Short tons	Value
Carbon and Northampton	37,541	$5,405,857	30,347	$4,436,003
Jefferson	238	11,424	392	18,322
Lycoming	15,551	239,729	16,253	264,453
Total	53,330	5,657,010	46,992	4,718,778

Lime.—Pennsylvania lime production continued to increase for the third consecutive year. Although the gain in output over 1951 was

less than 2 percent, it was notable because it indicates a growing trend toward the use of lime for chemical, industrial, and refractory purposes. The value of all types of Pennsylvania lime except refractory material declined in 1952. Industrial and chemical lime showed the greatest total dollar decrease.

There were 29 plants in operation during the year; of these, 8 plants produced 83 percent of the State output. Major producing units are owned by the Warner Co., National Gypsum Co., H. E. Millard Lime & Stone Co., and the J. E. Baker Co.

TABLE 8.—Lime sold or used by producers in 1952, by counties

County	Short tons	Value
Armstrong	608	$7,406
Centre	481,572	4,816,476
York	332,114	3,773,698
Undistributed	388,687	5,244,633
Total	1,202,981	13,842,213

Perlite.—Although crude perlite is not produced in Pennsylvania, quantities are imported from southwestern United States for heat treatment and expansion.

Expanded perlite was produced in 1952 by Panacalite Perlite Co., Pittsburgh; Pennsylvania Perlite Corp., Allentown; Perlite Mfg. Co., Carnegie; and Perlite Products, Inc. Primos, for use as a lightweight aggregate in plaster and concrete, and as a loose-fill insulation material.

Expanded perlite was first produced in Pennsylvania in 1949. Since then output has increased sharply each succeeding year. Sales in 1952 totaled a record 15,400 short tons valued at $938,700, which represented a 25-percent gain over the 1951 figure of 12,400 tons, valued at $757,100.

Sand and Gravel.—Sand and gravel output in Pennsylvania declined 7 percent in 1952 compared with the previous year. The major use of these commodities was as a building and paving aggregate. They were also utilized for glass, polishing and grinding, filtering, railroad ballast, fill, molding and refractory purposes, and traction.

Gravel output dropped 3 percent and sand 9 percent in 1952. The latter yielded the greatest revenue, exceeding the value of gravel produced by more than $3½ million.

The production of sand and gravel in Pennsylvania, as in other States, is essentially a local industry depending upon regional rather than national markets. The low unit value of the product and its great bulk limit shipping distances; as a result virtually every county in the State includes one or more sand and gravel operations.

Major producers in 1952 were Dravo Corp., Pittsburgh; Iron City Sand & Gravel Co., Pittsburgh; Pennsylvania Glass Sand Co., Lewistown; and Warner Corp. Approximately 102 sand and gravel pits were operating in Pennsylvania in 1952.

TABLE 9.—Lime sold by producers, 1943–47 (average) and 1948–52, by uses

Year	Agricultural		Building		Chemical and industrial		Refractory		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	165, 581	$1, 397, 505	48, 733	$522, 964	[1] 779, 545	[1] $6, 310, 232	(1)	(1)	993, 859	$8, 230, 701
1948	133, 931	1, 448, 207	112, 217	1, 479, 089	[1] 839, 659	[1] 8, 392, 389	(1)	(1)	1, 085, 807	11, 319, 685
1949	136, 199	1, 512, 069	111, 278	1, 566, 371	[1] 663, 588	[1] 7, 112, 239	(1)	(1)	911, 065	10, 190, 679
1950	135, 182	1, 530, 991	134, 052	1, 944, 178	650, 756	7, 110, 931	166, 461	$2, 076, 974	1, 086, 451	12, 663, 074
1951	134, 559	1, 532, 813	126, 048	1, 740, 850	741, 673	8, 551, 011	178, 820	2, 435, 380	1, 181, 100	14, 260, 054
1952	131, 007	1, 463, 596	123, 049	1, 675, 987	768, 319	8, 228, 875	180, 606	2, 473, 755	1, 202, 981	13, 842, 213

[1] To avoid disclosure of individual company operations, refractory tonnage is included with chemical and industrial.

TABLE 10.—Sand and gravel sold or used by producers in 1952, by counties

County	Short tons	Value	County	Short tons	Value
Allegheny	1,232,355	$2,184,932	Erie	420,321	$448,252
Beaver	1,060,869	1,395,564	Lancaster	263,333	543,273
Berks	23,666	38,270	Luzerne	268,257	335,994
Bucks	4,935,959	5,787,287	Mifflin	400,862	817,872
Carbon	351,697	440,256	Somerset	2,269	6,587
Crawford	86,317	90,117	Undistributed	5,131,045	7,693,772
Dauphin	519,156	137,827	Total	14,696,106	19,920,003

TABLE 11.—Sand and gravel sold or used by producers, 1951–52

	1951		1952	
	Short tons	Value	Short tons	Value
Sand:				
Molding and fire or furnace	456,912	$1,072,838	445,270	$1,103,911
Building	4,332,703	5,316,718	4,270,064	5,021,197
Paving	2,454,991	3,059,517	2,038,867	2,741,982
Grinding, polishing, and blast	334,915	675,615	204,064	414,210
Engine	297,061	647,302	226,500	450,112
Glass and filter	691,299	1,951,708	547,969	1,592,924
Other	177,425	405,837	214,488	435,330
Total sand	8,745,306	13,129,535	7,947,222	11,759,666
Gravel:				
Building	3,803,824	4,873,097	3,907,124	4,862,059
Paving	3,050,286	3,336,914	2,709,622	3,145,421
Railroad ballast	84,193	53,341	67,627	45,245
Other	53,855	95,653	64,511	107,612
Total gravel	6,992,158	8,359,005	6,748,884	8,160,337
Grand total	15,737,464	21,488,540	14,696,106	19,920,003

Slate.—Pennsylvania continued in 1952 as the Nation's foremost producer of slate despite a 21-percent drop in sales from the 1951 level. Decline in activity within the industry resulted from increased competition of other construction materials and consumer preference for New England colored slate. The effect of New England competition is best illustrated by the decrease in Pennsylvania's lead over Vermont and Maine, the second largest producing area. In 1951 Pennsylvania produced 27 percent more slate than these two States, but in 1952 this figure dropped to 6 percent.

The number of Pennsylvania slate-pit operators fell 24 percent in 1952 as a result of the smaller market. During the year production was localized in York, Northampton, and Lehigh Counties. York remained the largest tonnage producer; most of this output was crushed and ground for use in composition roofing and paints. Northampton County, however, led in dollar value because this slate was sold as dimension slate roofing and mill stock.

Major producers in 1952 were Funkhouser Co., Albion Vien Slate Co., North Bangor Slate Co., Capital Slate Co., and Stephens-Jackson Co.

TABLE 12.—Slate sold by producers, 1943–47 (average) and 1948–52 by uses

Year	Number of operators	Roofing		Mill stock		Other uses	Total value
		Squares (100 square feet)	Value	Square	Value	Value	
1943–47 (average)	19	91,686	$1,071,211	1,957,812	$617,855	$933,034	$2,622,100
1948	26	146,860	2,846,371	2,103,720	1,084,613	1,420,169	5,351,153
1949	26	112,870	2,124,573	2,339,830	1,243,798	1,210,273	4,578,644
1950	28	124,280	2,341,127	2,724,450	1,559,587	1,645,300	5,546,014
1951	25	134,180	2,681,072	2,589,090	1,416,657	1,591,141	5,688,870
1952	18	93,200	1,866,479	2,078,020	1,227,471	1,393,698	4,487,648

TABLE 13.—Slate sold by producers, 1951–52, by counties

County	1951		1952	
	Short tons	Value	Short tons	Value
Lehigh	3,740	$309,282	1,930	$188,683
Northampton and York	265,090	5,379,588	212,930	4,298,965
Total	268,830	5,688,870	214,860	4,487,648

Stone.—Stone production in Pennsylvania in 1952 declined slightly compared with the record year 1951 but was 1 percent above 1950 and 21 percent greater than 1949. The drop in 1952 was entirely in the market for crushed and broken stone.

Although virtually all the State stone output was sold as crushed or broken material, Pennsylvania continued to be one of the largest domestic producers of dimension stone for rough construction use.

Of the more than 25 million tons of rock mined or quarried in the State in 1952, 82 percent was limestone. This material was used as a fluxing agent, in concrete production, as road metal, as railroad ballast, and for agricultural purposes. A total of 10 quarries, all in the southeastern section of the State, yielded basalt and diabase. The dark color of this traprock limits its use as a building material. However, its crystalline nature imparts superior tensile strength, making it an excellent aggregate for concrete. Some of this rock is sold for monumental purposes.

Sandstone for use as dimension stone, road metal, and, when crushed, for ganister, was produced at 44 quarries in 1952. Ganister was used by several refractory plants in preparing silica brick.

Small quantities of various miscellaneous rocks, such as serpentine, soapstone, gneiss, and mica schist, were quarried for local use during the year. An estimated 14 miscellaneous stone quarries operated in the State in 1952.

TABLE 14.—Stone sold or used in 1952, by counties

County	Short tons	Value	County	Short tons	Value
Adams	1,537,067	$2,533,069	Lancaster	1,325,416	$1,944,724
Berks	1,504,618	2,215,276	Lawrence	2,632,610	4,377,355
Blair	712,010	1,536,159	Lebanon	1,280,841	1,893,807
Bucks	443,773	929,456	Lehigh	302,385	388,014
Butler	1,424,865	2,446,268	Lycoming	325,651	528,032
Carbon	23,687	53,545	Mifflin	841,479	1,337,489
Centre	987,860	1,879,197	Monroe	39,085	53,546
Chester	864,888	1,492,974	Montgomery	2,520,564	4,242,792
Clinton	106,769	164,070	Perry	77,225	140,000
Cumberland	351,743	539,957	Schuylkill	14,281	20,976
Dauphin	762,144	1,185,904	Susquehanna	4,129	56,480
Delaware	763,072	1,363,716	Westmoreland	417,805	851,991
Fayette	59,628	179,225	York	1,288,589	2,747,548
Franklin	402,151	638,369	Undistributed	[1] 3,872,387	[1] 6,379,743
Greene	25,000	50,000			
Huntingdon	600,155	2,325,919	Total	[1] 25,609,812	[1] 44,676,456
Juniata	97,935	180,855			

[1] To avoid disclosing confidential information, total is incomplete.

TABLE 15.—Stone sold or used by producers, 1951–52, by uses

Use	1951		1952	
	Quantity	Value	Quantity	Value
Dimension stone:				
Building stone—short tons	[1] 137,273	[1] $521,960	[1] 156,413	[1] $769,658
Monumental stone—cubic feet	15,529	159,291	19,449	243,148
Approximate equivalent in short tons	1,304		1,634	
Curbing and flagging—cubic feet	96,022	153,770	135,218	186,955
Approximate equivalent in short tons	7,490		11,277	
Total dimension stone—short tons	[1] 146,067	[1] 835,021	[1] 169,324	[1] 1,199,761
Crushed and broken stone:				
Riprap—short tons	150,652	260,887	[2] 188,549	[2] 322,346
Crushed stone—do	[2] 12,814,002	[2] 18,590,946	13,254,633	19,160,967
Furnace flux (limestone)—do	10,175,056	15,407,829	8,703,922	14,186,713
Refractory—do	723,102	3,457,481	676,885	3,195,579
Agricultural (limestone)—do	1,030,212	2,828,090	1,065,358	2,733,395
Other uses—do	[2] 1,572,390	[2] 3,327,127	[2] 1,485,220	[2] 3,327,413
Undistributed—do	788,083	1,961,209	65,921	550,282
Total crushed and broken stone—do	27,253,497	45,833,569	25,440,488	43,476,695
Grand total—do	[1] 27,399,564	[1] 46,668,590	[1] 25,609,812	[1] 44,676,456

[1] To avoid disclosing confidential information, certain totals are incomplete.
[2] Incomplete, the portion not included being combined as "Undistributed."

Miscellaneous Minerals.—In addition to its other mineral products, the Commonwealth's mines yielded $149,105 worth of such commodities as scrap mica, peat, tripoli, and pyrite in 1952. The latter was a byproduct of the Bethlehem Steel Co. iron-mining operation at Cornwall, Lebanon County. Scrap mica was produced in York County by General Mining Associates.

The tripoli produced in Pennsylvania is actually a rottenstone mined from open pits at Antes Fort and Muncy, Lycoming County. It is used predominantly as a filler in the manufacture of phonograph records.

The processing of iron blast-furnace slag for use as a construction material is an important adjunct of the Commonwealth's mineral

industry. In 1952 Pennsylvania supplied 20 percent of the United States total and ranked second in the country in the production of processed slag. The output increased from 5,071,800 tons valued at $7,332,500 in 1951, to 5,510,600 tons worth $7,002,700 in 1952.

Magnesium compounds were produced at plants of Keasby & Mattison and Phillip Carey Manufacturing Co., both in Montgomery County.

MINERAL FUELS

Coal.—Both anthracite and bituminous coal are mined in Pennsylvania. Bituminous or soft-coal beds underlie the western and central sections of the State and occur in detached hilltop basins, as these beds trend north and east. The trend is accompanied by decreased volatility of the coal, the high-volatile seams occurring in the area near Pittsburgh, the low-volatile toward the east.

The anthracite or hard-coal deposits in the northeastern part of the State constitute an extension of this trend. Beds of this material, the lowest volatile coal, are situated in four canoe-shaped basins of strongly folded sedimentary rocks. As anthracite is used primarily for commercial and residential heating, the advent of competitive fuels in its sales area has caused a serious marketing problem. Production in 1952 dropped 5 percent from the 1951 level and was the smallest annual output since 1886.

Bituminous-coal production in 1952 was 18 percent below that of the previous year, owing primarily to the steel strike in mid-1952 as well as to competitive factors.

To combat competition from petroleum products and natural gas, the coal industry, largely collectively but in some instances individually, continued various research programs. An important individual effort was the research laboratory of Pittsburgh Consolidation Coal Co. at Library, which investigated coal hydrogenation and gasification and pipeline distribution of pulverized coal. Bituminous Coal Research, Inc., with headquarters at Pittsburgh, is supported by a group of over 300 coal companies, railroads, and equipment manufacturers; it studied the development of mechanized mining equipment, coal-fired gas turbines, residential space heaters and automatic boilers, and expansion in the range of coals used for coking. The work of the Bureau of Mines on synthetic fuels technology at Bruceton supplemented industrial coal research and development during the year.

The major soft-coal-producing counties, in order of decreasing tonnage, were: Washington, Cambria, Allegheny, Greene, Fayette, Indiana, and Clearfield Counties.

Reserves in these counties, as well as in other coal-producing areas, are more than adequate to meet anticipated future demands. As of 1950, total reserves were estimated at 73,232,535,000 short tons. Approximately 36,616,268,000 tons was considered recoverable.[4]

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[4] Bureau of Mines, Bituminous Coal and Lignite in 1952: Mineral Market Summary 2222, 1953, 96 pp.

TABLE 16.—Production of Pennsylvania anthracite, 1951–52, by counties, in short tons

County	1951	1952	County	1951	1952
Carbon	1,670,767	1,844,775	Northumberland	5,742,283	5,550,898
Columbia	803,595	647,514	Schuylkill	13,659,220	13,287,747
Dauphin, Susquehanna, and Wayne	304,714	102,895	Sullivan	28,762	24,055
Lackawanna	5,733,782	5,323,145	Total	[1] 42,403,651	[1] 40,315,871
Luzerne	14,460,528	13,534,842			

[1] Excludes counties producing dredge coal only.

TABLE 17.—Production of bituminous coal, by counties, 1952

[Exclusive of mines producing less than 1,000 tons]

County	1952		County	1952	
	Short tons	Average value per ton		Short tons	Average value per ton
Allegheny	9,614,860	$5.30	Indiana	6,288,635	$5.24
Armstrong	3,361,174	4.35	Jefferson	1,726,513	4.20
Beaver	455,384	4.29	Lawrence	287,702	3.61
Bedford	247,058	5.99	Lycoming	31,961	4.47
Blair	209,400	4.32	McKean	43,847	3.39
Bradford	9,739	5.12	Mercer	529,542	4.14
Butler	1,897,263	4.02	Somerset	5,301,972	5.22
Cambria	12,339,260	6.09	Tioga	71,935	5.37
Cameron	66,206	3.87	Venango	511,039	3.50
Centre	1,096,230	3.95	Washington	13,369,226	5.76
Clarion	2,258,494	3.66	Westmoreland	4,588,705	5.33
Clearfield	6,025,719	4.53	Other counties: Fulton and Huntingdon	421,402	6.21
Clinton	630,972	3.26			
Elk	617,535	4.26	Total	89,181,232	5.31
Fayette	7,581,264	5.77			
Greene	9,598,195	5.69			

Natural Gas.—Production of natural gas in Pennsylvania in 1952 dropped 16 percent from the record high output of 1951. The Pennsylvania Topographic and Geologic Survey reported that the Driftwood gas field in Cameron County and the Leidy gas field in Clinton County underwent intensive development in 1952.[5] The productive area of the Driftwood field included 1,400 acres, and the Leidy pool had been expanded to 11,000 acres by the end of 1952.

Exploratory drilling in shallow sand territory (Upper Devonian or higher) led to discovery of a small gas field in southwestern Pennsylvania and two other small pools in northwestern Pennsylvania. These were in Wharton Township, Fayette County; Jenks Township, Forest County; and Liberty Township, McKean County. A total of 313 gas wells was completed during the year. In addition to the production of natural gas, 11 plants produced natural-gas liquids as a byproduct. Five of these plants produced 11,000 barrels by compression, and 6 produced 179,000 barrels by absorption.

Data on the output of natural gas and natural-gas liquids by counties in Pennsylvania in 1952 are not available.

[5] Fettke, C. R., Oil and Gas Developments in Pennsylvania in 1952: Pennsylvania Topographic and Geologic Survey, Progress Rept., 143, 1953, 30 pp.

Petroleum.—Pennsylvania is the oldest commercial oil-producing area in the United States. The first well was drilled in 1859 by Francis Drake near Titusville, Crawford County. From this foremost position, the State has declined until today it ranks 15th in the Nation in crude-oil output; however, the crude being produced is of exceptionally high quality and commands a premium price. In 1952 Pennsylvania crude was valued at $4.25 per barrel at the well. The average for the United States was $2.53.

Production in 1952 declined slightly from the previous year, despite an increase in the number of producing wells to 80,600 from 78,800 in 1951. The State produced less than 1 percent of the national petroleum output but had 16 percent of the producing wells. Pennsylvania wells in 1952 yielded the lowest average production per well per day (0.4 barrel) in the United States.

In all, 1,390 oil wells, including 1,366 in connection with secondary recovery operations, were drilled.[6] Virtually all the new wells were put on the pump or lift.

TABLE 18.—Crude-oil production, 1952, by counties [1]

County	Production (thousand barrels)	Wells connected as of Dec. 31, 1951	Wells connected during 1952	Wells disconnected during 1952	Wells connected as of Dec. 31, 1952
Allegheny	148	1,264	5	60	1,209
Armstrong	16	374			374
Beaver	15	432		15	417
Butler	217	3,539	34	128	3,445
Clarion	64	1,703	5	39	1,669
Crawford	35	910	88	82	916
Elk	32	668	5		673
Fayette	1	12			12
Forest	49	1,161	21	22	1,160
Greene	66	893	4	46	851
Jefferson	6	106			106
McKean	9,057	36,064	843	876	36,031
Mercer	7	248		2	246
Potter	223	371	42	10	403
Tioga	3	18			18
Venango	607	19,634	3,298	1,647	21,285
Warren	476	9,890	627	790	9,727
Washington	213	2,125	4	50	2,079
Total	11,235	79,412	4,976	3,767	80,621

[1] Department of Internal Affairs, Pennsylvania Topographic and Geologic Survey.

REVIEW BY COUNTIES

ADAMS

Mineral production in Adams County in 1952 was limited to clay and stone. The county ranked fifth in the State in the value of stone output, 95 percent of which was crushed and broken limestone, sold primarily for flux, road material, and agricultural purposes. The remaining stone output was basalt, crushed for use as concrete aggregate. Major stone producers during the year included Bethlehem Quarry Co, Bittinger, and the Gingell Quarries Co., Fairfield. Miscellaneous clays were produced by Alwine Brick Co., New Oxford, and Gettysburg Drain Tile Works, Gettysburg, for use in manufacturing brick and tile.

[6] Work cited in footnote 5.

ALLEGHENY

Major mineral products of Allegheny County in 1952 were bituminous coal, cement, sand and gravel, stone, and clay. The county ranked second in the State during the year in sand and gravel output, third in the production of bituminous coal and cement, and fourth in value of output of dimension stone.

Mines in the county yielded 9,614,860 short tons of bituminous coal in 1952. A large percentage of this coal, which had an average value at the mine of $5.30 per ton, was mined from the Pittsburgh and upper Freeport seams. Only 10 percent of the county production resulted from stripping, as compared with a State average of 23 percent. The county also had a small output of petroleum and natural gas. A total of 147,831 barrels of petroleum was recovered, virtually all by secondary methods, from the county's 44,722 acres of oil land. Many of the older natural-gas pools were nonproductive in 1952 and were used for summer storage of gas from other areas.

Allegheny County ranked third among Pennsylvania counties in production of cement in 1952. As native limestones are unsuitable for use in cement manufacture, most of the limestone is imported from other areas. In terms of value, cement was, next to fuels, the most important mineral product of the county. Major producers in 1952 were Pittsburgh Coke & Chemical Co., Green Bag Cement Division, Neville Island, and Universal Atlas Cement Co., Universal.

All the county's sand and gravel production in 1952 was washed material, obtained from river bottoms or old river terraces. Major producers were Dravo Corp. and Iron City Sand & Gravel Corp., both of Pittsburgh.

Most of the stone produced in the county was limestone crushed for use as road metal and railroad ballast and for agricultural purposes. Quarries in the county yielded substantial quantities of dimension sandstone used for masonry walls and flagging. In 1952 this material was produced by Elizabeth Stone Co., Elizabeth, and F. Matesia, Cuddy.

Allegheny County in 1952 was the largest source of miscellaneous clays and shale in Pennsylvania. Production was used in manufacturing building brick and tile. Major producers were Glassmere Brick & Tile Co., Glassmere; Milliken Brick Co., Inc., Wilkinsburg; Van Ormer Brick Co., Inc., Pitcairn; and McFetridge Bros. Brick Co., Creighton.

Perlite mined in the western United States was expanded at the Carnegie plant of Perlite Manufacturing Co. and at the Pittsburgh operation of Panacalite Perlite Co. Output was used as a lightweight aggregate.

ARMSTRONG

Mineral resources of Armstrong County consist of bituminous coal, natural gas, oil, stone, sand and gravel, and clay. In 1952 Armstrong County had a bituminous-coal production exceeding 3 million short tons. This coal was valued at $4.35 per ton and was produced predominantly from the Lower Kittanning and Upper and Lower Freeport beds, as the Pittsburgh seam is considered to be exhausted. Over 50 percent of the coal output during the year was strip-mined. Oil wells in the county yielded 15,752 barrels of crude oil in 1952.

All stone produced in the county was crushed or broken limestone and dolomite used for metallurgical fluxes and agricultural purposes and in the production of lime. Producers of lime included Craig Claypool, Walter Hershberger, and the C. D. McCanna lime plant, all of Kittanning. The major producer of limestone was the Michigan Limestone Division, United States Steel Co., East Brady and Worthington.

Armstrong County was the fourth largest producer of sand and gravel in Pennsylvania in 1952. All output was washed material from J. K. Davison & Bros., Pittsburgh, the county's sole producer.

The county ranked fifth among counties of the Commonwealth in output of fire clay in 1952. Leading producers included Graff-Kittanning Clay Products Co., Worthington; Continental Clay Products Co., and Kittanning Refractory Co., Inc., both in Kittanning; Kittanning Brick Co., Adrian; Freeport Brick Co., Freeport; Harbison Walker Refractories Co., Templeton; and Haws Refractories Co., Bridgeburg. The Graff-Kittanning Clay Products Co. also produced common clay, used in manufacturing brick, tile, and pottery.

BEAVER

Mines in Beaver County produced a limited number of mineral commodities in 1952. This lack of diversification was more than compensated for, however, by the county's prominent position in the clay and sand and gravel industries of Pennsylvania.

Beaver County ranked second in the output of fire clay in Pennsylvania in 1952. Major producers were McLain Fire Brick Co., Vanport; Negley Fire Clay Co., New Galilee; Malvern Fireproofing Corp., Darlington; Standard Clay Mfg. Co., New Brighton; and Eastvale Clay Products Co., Eastvale. A small tonnage of common clay was recovered from pits of W. H. Elverson Pottery Co., Inc., New Brighton.

The county ranked third among Commonwealth counties in output of sand and gravel in 1952. All production was washed material derived from the river bottoms, river terraces, and glacial deposits. Six producers operated during the year; the largest were the Dravo Corp., Shippingport Sand & Gravel Co., and Iron City Sand & Gravel Co. These 3 companies furnished 89 percent of the total county production of sand and gravel in 1952.

Mines in the county yielded a comparatively small tonnage of bituminous coal during the year. Inasmuch as most of the coal seams are less than 4 feet thick, 89 percent of the output was from strip pits. Oil wells in the county yielded 14,640 barrels of crude oil and a small quantity of natural gas during the year.

BEDFORD

The principal mineral commodity produced in Bedford County in 1952 was limestone used for flux, lime, and agricultural purposes. The major producer was New Enterprise Stone & Lime Co., New Enterprise. A considerable quantity of sandstone for refractory purposes was quarried by Leap Ganister Rock Co., Madley.

Mines in the northeast section of the county, which includes the major producing region of the Broad Top field, yielded low-volatile bituminous coal valued at $5.99 per ton.

A small quantity of building sand was produced during the year by Feight Bros. Co., Everett.

BERKS

Cement, stone, clay, and sand and gravel were produced in Berks County in 1952. Cement continued to be the principal mineral product, although Berks ranked fifth among Pennsylvania cement-producing counties. Production was from the Allentown Portland Cement Co. plant at Evansville.

Stone production in 1952 consisted of crushed diabase and limestone. The latter was produced by Berks Products Corp., South Temple; E. J. Breneman, Inc., Pottstown; and Eastern Lime Corp., Kutztown. This limestone was used as a concrete aggregate and for agricultural purposes. Crushed diabase, produced mainly by J. T. Dyer Quarry Co., Monocacy, was sold for riprap, concrete aggregate, and railroad ballast.

Glen Gery Shale Brick Corp. produced miscellaneous clays for brick manufacture from its pits at Shoemakersville and Wyomissing.

Sand and gravel, produced by J. H. Gring, Sinking Spring, and the Schildt Bros., Temple, was sold for building and paving purposes.

The Bethlehem Steel Co. continued to develop its iron-ore deposit at Morgantown in 1952.

BLAIR

Quarries in Blair County in 1952 yielded limestone for concrete aggregate and agricultural purposes and sandstone for concrete, railroad ballast, and silica brick. The largest limestone producer was the New Enterprise Stone & Lime Co., Roaring Spring. Sandstone was quarried by General Refractories Co., Claysburg; J. L. Hartman Co., Sproul; and Basalt Trap Rock Co., Woodbury Township.

Mines in the county produced a small tonnage of bituminous coal valued at $4.32 per ton. Nearly two-thirds of this material was recovered by strip mining.

Clay production in Blair County in 1952 was small but varied. Pits of United Clay Mines Corp. near Williamsburg yielded a small quantity of kaolin. Woodbury Clay Co., Houston Township, and the Blair Clay Products Co., Altoona, mined fire clay; the latter company also had a small production of common clay.

Pits of Frankstown Sand Supply Co. and George H. Trude, both at Hollidaysburg, yielded a small tonnage of building sand.

BRADFORD

Nine men were employed in mining bituminous coal in Bradford County in 1952; production totaled 9,739 short tons. Sand and gravel for building and paving purposes were produced by Karl D. Shiner, Towanda.

BUCKS

Bucks County ranked first among Pennsylvania counties in the production of sand and gravel in 1952, which amounted to approximately 34 percent of the State's total output. Most of this material was dug by floating dredges from the Delaware River flood plain between Morristown and Tullytown. Production was sold for building, paving, and molding purposes. Major producers in 1952 were Warner Co., Falls Township; Amico Sand & Gravel Co., Morrisville; A. L. Lewis, New Hope; and Durnan & Good Co., Upper Black Eddy.

Stone production included a small quantity of crushed diabase for concrete aggregate and railroad ballast; limestone for agricultural use and other purposes; and granite for monuments and architectural uses. Major producers of stone were the General Crushed Stone Co., East Rockhill Township; Rushland Quarry Co., Rushland; Edward Karpinski, Langhorne; and New Hope Crushed Stone & Lime Co., New Hope. In 1952 the Rock Hill quarry of the General Crushed Stone Co. was 1 of 10 plants in the United States to operate without a single lost-time injury.

The Quakertown Brick & Tile Co., Quakertown, produced a small quantity of clay for manufacturing bricks.

BUTLER

The major mineral commodity produced in Butler County in 1952 was bituminous coal. Approximately 7 beds were mined; 73 percent of the output was from strip pits. A total of 1,897,263 tons, having an average value of $4.02 per ton, was recovered during the year. Butler County oil wells yielded 216,871 barrels of crude petroleum and a small quantity of natural gas during the year. The county ranked fifth in the State in the production of oil; approximately 103,026 acres was considered as oil bearing.

On the basis of value, cement was second to fuels as the most important mineral product of the county in 1952; Penn-Dixie Cement Co., Winfield Township, was the sole producer. A substantial tonnage of limestone for flux, agricultural purposes, lime, and various miscellaneous uses was quarried during the year. The largest producers were Michigan Limestone Division of United States Steel Corp., Boyers; and Grove City Limestone Co., Osborne. The sole lime producer was Mercer Lime & Stone Co., Branchton.

Fire clay was produced by Pittsburgh & Erie Coal Co., Slippery Rock, and common clay by Houston-Starr Co., Mars.

The only sand and gravel producer in the county in 1952 was H. W. Cooper Co., Slippery Rock.

CAMBRIA

Bituminous coal was the major mineral commodity produced in Cambria County in 1952; the county ranked second in Pennsylvania in the production of this material. Most of the output was from the 2½- to 6-foot-thick Lower Kittanning or Miller bed. Production in 1952 had an average value at the mine of $6.09 per ton, the highest in the State.

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This County was also one of the major producers of fire clay in the State. Operators reporting in 1952 were Hiram Swank's Sons, Inc., Patton Clay Mfg. Co., and Triangle Clay Products Co.

CAMERON

Bituminous coal and natural gas were the only mineral commodities produced in Cameron County in 1952. All the bituminous coal was strip mined; as a consequence the county's coal industry had the highest production per man-day in the State.

CARBON

The major mineral product of Carbon County is a high-rank anthracite containing 3 to 5 percent volatile matter. Production in 1952 was valued at $16,393,733. Approximately 50 percent of the output was steam sizes. The average sales realization for these sizes in the Lehigh region, of which Carbon County is part, was $5.63; the domestic sizes netted $13.23.

Carbon County was the second largest source of finished iron oxide pigments in the State in 1952. Products of Prince Mfg. Co., Bowmanstown, the sole producer, included mineral black, brown and red oxides, ocher, sienna, and umber.

A small tonnage of crushed stone was reported produced from the D. D. Derstine quarry.

CENTRE

Mineral products of Centre County in 1952, in order of decreasing value of output, included lime, bituminous coal, stone, and clay. Eighty-eight percent of the coal produced was strip mined; the majority was from the Lower Kittanning bed. The average value of 1 ton of coal at the mine was $3.95 in 1952.

Ninety-eight percent of the county stone output was crushed limestone, used for flux, metallurgical purposes, and lime. Centre County led the State in lime production, primarily as a result of the widespread occurrence of the Bellefonte ledge in the Pleasant Gap-Bellefonte area. This formation is 77 feet thick and averages 98 percent $CaCO_3$. The 1952 output, used for building, agricultural, and chemical purposes, was produced by National Gypsum Co., Benner Township; Warner Co., Bellefonte; and Standard Lime & Stone Co. Limestone for uses other than in limekilns was produced by the above and by Neidigh Bros. Limestone Co., Oak Hall; Valley View Lime Co., Bellefonte; and Whiterock Quarries Co., Pleasant Gap. Crushed sandstone for silica brick was produced during the year by McFeely Brick Co.

General Refractories Co., Orviston, and J. H. France Refractories Co., Snow Shoe, produced a substantial tonnage of fire clay.

CHESTER

Lime, stone, and clay were produced in Chester County in 1952. Stone production included limestone, granite, sandstone, and miscellaneous stone. The principal producers of limestone were Warner Co., Cedar Hollow, and W. Ellis Johnson, Paoli. Output in 1952 was

used for flux, road metal, and agricultural purposes, as an asphalt filler, and for the manufacture of lime. Lime from the kilns of Warner Co. was used for building, agricultural, and chemical purposes. This company started its No. 2 rotary kiln January 29, 1952.[7] This unit is 300 feet long and has an inside diameter of 9 feet. As a result of successful operation of this kiln, all remaining shaft kilns were closed down. The largest production of granite in the State in 1952 was reported by Keystone Trappe Rock Co., Glenmoore, and French Creek Granite Co., St. Peters. Most of the output from these two operations was sold for concrete aggregate, although there was a small production of dimension granite (actually diabase for construction and architectural uses. The county ranked fifth in the State in 1952 in production of dimension stone. This material was used for curbing, flagging, and irregular blocks for buildings and bridges. A small quantity of dolomite for use in the production of magnesia was quarried during the year. Crushed and broken miscellaneous stone for use as a concrete aggregate was produced by Bradford Hills Quarry, Inc., Downingtown.

The Cedar Hollow quarry of Warner Co. was 1 of 10 in the United States operating without a single lost-time injury in 1952.

Common clay was produced by the McAvoy Vitrified Brick Co., Phoenixville, and a small quantity of fire clay was recovered by Phillip D. Cope, Lincoln University.

CLARION

Mineral commodities produced in Clarion County in 1952 were bituminous coal, natural gas, oil, and clay. The county had an output exceeding 2 million tons of soft coal, with an average value at the mine of $3.66 per ton. As a result of the limited thickness of most of the coal beds, 84 percent of the coal produced was strip mined. Oil wells in the county reported a production of 63,601 barrels of crude oil in 1952.

Clay deposits are abundant in the county, but the high iron content of many makes them unsuitable for use. Major production was fire clay from the Lower Clarion formation and flint clay from the Mercer beds. Producers of these materials were McLain Fire Brick Co., St. Charles; Frank B. Pope Co., Mayport; Climax Fire Brick Co., Climax; New Bethlehem Tile Co., New Bethlehem; and J. F. Eiswerth Estates, Lucinda. The New Bethlehem Co. was the sole county producer of common clay.

CLEARFIELD

Clearfield County ranked first among Pennsylvania counties in the production of clays in 1952. Virtually all the output was fire clay, although a small tonnage of common clay was produced by Robinson Clay Products Co., Clearfield. This company, as well as North American Refractories, Grampian and Lutherburg; Harbison-Walker Refractories Co., Mineral Springs and Wallaceton; Williamsgrove Clay Products Co., Bigler; Herman Kephart, Osceola Mills; Clearfield Clay Products Co., Clearfield; and Laclede-Christy Co., Clearfield, mined high-grade flint clay for refractory use. A high-alumina clay

[7] Rock Products, vol. 56, January 1953, p. 150.

for special high-temperature brick and cement was produced from the Mercer horizon at Curwensville and Morgan Run. Bells Landing Sand & Gravel Co., Bells Landing, produced building sand and gravel.

Bituminous coal was mined from several beds, some of them less than 2 feet thick. The high quality of the coal and low cost of strip mining made possible economic recovery of coal from the thin beds. A small quantity of natural gas was produced in the northwestern part of the county.

CLINTON

Mineral products of Clinton County in 1952 included soft coal, natural gas, clay, and crushed stone. About 95 percent of the coal output came from the county's 9 strip pits. As a result of the high percentage of coal recovered by strip mining, the county ranked fifth in the State in tonnage per man-day.

Plastic and flint clays were mined by the General Refractories Co., Beech Creek; Harbison-Walker Refractories Co., Monument; North American Refractories Co., Lock Haven; and Kelsey Mining Co., Gallagher Township. In addition, the Mill Hall Clay Products Co., Mill Hall, produced a small quantity of common clay.

In the southern end of the county, Lycoming Silica Sand Co. quarried limestone which was crushed and broken for concrete aggregate and road metal.

The output of natural gas increased substantially in 1952 relative to 1951. Daily production from the Leidy field exceeded 31 million cubic feet. Exploratory activity resulted in the discovery of the Tamarack pool early in the year; 26 wells were drilled in this area, resulting in 16 gas wells and 10 dry holes. The average daily initial open flow was 8,600,000 cubic feet.

COLUMBIA

Common clay was produced by Alliance Clay Products Co. from its pit at Mifflinville. Bloomsburg Sand & Gravel Co. operated a pit in Scott Township and recovered sand and gravel for local use. Anthracite was produced from several mines in Conyngham Township.

CRAWFORD

Crawford County's major natural resource is oil and gas. It was in this county that the huge domestic petroleum industry originated. Oil floating on the water of Oil Creek and other streams was the source of Seneca oil, so called because of its use by the Seneca Indians living in the area. The world's first producing oil well, drilled for the express purpose of finding petroleum, was successfully completed near Titusville. Since August 28, 1859, when oil first flowed from this well, the county has been an important petroleum center. In 1952 crude oil and natural gas were produced almost entirely by repressurizing old oil-bearing sands. The Pennsylvania Topographic and Geologic Survey estimated that 8,360 acres at the eastern end of the county are underlain by oil-bearing sediments. Production in 1952 was 35,295 barrels.

Pits in the county yielded substantial tonnages of sand and gravel for building and paving purposes. Major producers were the Meadville Supply Co., Meadville, and Moyers Bros. Sand & Gravel Supply Co., Conneaut Lake.

CUMBERLAND

Clay and stone were the only mineral products of Cumberland County in 1952. This county was the major source of kaolin in Pennsylvania; output during the year was sold as a cement whitener by the sole producer, Philadelphia Clay Corp., Toland. A small quantity of common clay was recovered from pits of the Penn Products Corp., Boiling Springs.

Stone production was limited to crushed limestone used for road metal and construction purposes. Major producers were Hempt Bros., Eberlys Mill; Bonny Brook quarry, Carlisle; and Valley Quarries, Inc., Chambersburg.

DAUPHIN

The principal mineral product of Dauphin County in 1952 was crushed limestone sold for flux and other metallurgical uses, concrete aggregate, railroad ballast, clay filler, and stone sand. Major producers were Bethlehem Quarry Co., Steelton; Hoffman Bros. & Wilson, Inc., Swatara Township; and H. E. Millard Lime & Stone Co., Swatara Station. The latter company also produced lime, principally for agricultural use.

A substantial tonnage of sand and gravel for building and paving was recovered from pits in the Susquehanna River terrace by Highspire Sand & Gravel Co. Ltd., Highspire, and F. H. Downey, Inc., Harrisburg. Glen Gery Shale Brick Corp., Royalton, and Bethlehem Quarry Co., Steelton, reported production of common clay.

Mines near Lykens, Wiconisco, and Williamstown yielded a small tonnage of anthracite during the year.

DELAWARE

Delaware County ranked second in the Commonwealth in production of granite dimension stone in 1952. Output was sold as irregular blocks for facing buildings and bridges, as well as for rubble. A small tonnage of the granite was crushed for stone sand. Major producers were Carl Galantino, East Lansdowne; Lima Building Stone Quarry, Inc., Lima; and Luglios Quarries and John Randazzo, both at Media. By far the most important mineral commodity produced in point of value, however, was a crushed granite-gneiss for concrete aggregate. Sole producer in 1952 was the quarry and plant of General Crushed Stone Co., Glen Mills.

The Philadelphia Brick Co. produced clay from its open pit in Darby Township. Output of expanded perlite was reported by Perlite Products, Inc., Primos.

ELK

Bituminous coal, crude oil, natural gas, and clay were produced in Elk County in 1952.

The major soft-coal-producing bed in the county is the Lower Kittanning. It was mined in Benezette, Jay, and Fox Townships; over half of the 1952 coal output was from strip mines. Oil wells yielded 31,569 barrels of crude oil and some natural gas during the year. The Benezette gas pool was discovered during the last week of December 1952. Production was recovered from the Oriskany sandstone.

Fire clay was produced at the Meyer clay mine and open pit of St. Marys Sewer Pipe Co., both in St. Marys. This material is used for manufacture of fire brick and heavy clay products.

ERIE

Erie County is a comparatively unimportant producer of mineral commodities. In 1952 the Kelly Island Lime & Transport Co. and the Nickel Plate Sand & Gravel Co., Erie, were the major producers of sand and gravel. Output was predominantly from old lake terraces. There was also an output of natural gas from the Albion sand in the Corry field.

FAYETTE

Bituminous coal continued to be the major mineral commodity produced in Fayette County, and in 1952 it ranked fifth in the State in output of this material. A high percentage of the output each year is used in manufacturing the famous Connellsville coke. Coal mined in the county ranges from 60 percent fixed carbon in the western part of the area to 72 percent in the Ligonier Basin in the east. A comparatively small quantity of natural gas was recovered from wells in anticlines in the western section of the county and from the crest of Chestnut Hill. Crude-oil production totaled 788 barrels in 1952.

The mineral commodities ranking second in value in Fayette County were sand and gravel, obtained from river beds and terraces. Principal producers were Dunbar Corp., Dunbar, and McClain Sand Co., Inc., Point Marion. The sand was sold for glass, molding, blast, fire, and engine use. The gravel was employed for building and paving.

Sandstone was quarried at several localities during the year from the Homewood-Connoquenessing strata. When crushed and broken, this material was used for silica brick, concrete, and road metal. In dimension form it was used as irregular blocks for finishing buildings and bridges. The sole producer of dimension stone was Oral Houseman, Belle Vernon. The crushed and broken material was produced by Connellsville Blue Stone Co., Connellsville, and General Refractories Co., Childs.

Flint and plastic clays for refractory use were recovered from pits worked by Big Savage Refractory Corp., Eureka Fire Brick Works, Mount Braddock, and Layton Fire Clay Co., Layton. The latter also produced common clay.

FOREST

Forest County is in the center of the Commonwealth's oil and gas belt. Wells in the county in 1952 yielded 48,825 barrels of crude oil, mostly from the Venango, Warren, Bradford, and Elk sands. Virtually all output during the year was by secondary recovery.

FRANKLIN

The major mineral commodity produced in Franklin County in 1952 was crushed and broken limestone for concrete, road metal, and agricultural purposes. Producers active during the year included Fry Coal & Stone Co., Mercersburg; Valley Quarries, Inc., Chambersburg; Binkley Bros. Inc., Dry Run; and Stewart Gaston, Shippensburg. A small tonnage of agricultural lime was produced at the plant of Frank L. Heinbough, Mercersburg. Mount Cydonia Sand Co., Inc., recovered sand for building purposes from its open pit in Greene Township.

FULTON

A small tonnage of bituminous coal was produced from mines in the northwest corner of Fulton County, an extension of the Broad Top Field of Bedford County. Limestone for concrete and road metal was quarried by H. B. Mellott Estate, Inc., McConnellsburg, and Oscar Martz Co. produced agricultural lime at its plant in Knobsville.

GREENE

The principal mineral product of Greene County in 1952 was bituminous coal. Production exceeded 9½ million tons, virtually all recovered by underground mining. The average value at the mine was $5.69 per ton. Crude oil and natural gas were produced from the Upper Nineveh, Lower Nineveh, and Gordon Stray sands. The county yielded 65,626 barrels of petroleum in 1952.

C. Wilbur Acklin Co., Jefferson, quarried a small tonnage of sandstone for concrete aggregate; and Greene County Brick & Stone Co., Waynesburg, had a small production of clay.

HUNTINGDON

Huntingdon County ranked second among Pennsylvania counties in the production of sandstone and fourth in value of output of sand and gravel. Sandstone producers included General Refractories Co., Harbison-Walker Refractories Co., and North American Refractories Co., all at Mount Union; and Stowe-Fuller Refractories Co., Alexandria. Output was utilized in the production of silica brick. White clay for refractory cement and furnace linings was recovered from pits of Alexandria Fire Clay Co., Alexandria, and Harbison-Walker Refractories Co.

Sand produced by Alexandria Fire Clay Co. and Pennsylvania Glass Sand Corp. was sold for use as glass, molding, building, fire, and engine sand.

Crushed and broken limestone for concrete and railroad ballast was quarried at McConnellstown by New Enterprise Stone-Lime Co. and in Spruce Creek Township by Warner Co.

Mines in the extension of the Broad Top field in the southern part of the county yielded soft coal.

INDIANA

Coal, clay, and limestone were produced in Indiana County in 1952. The major mineral commodity was bituminous coal. Of the more than 6 million tons produced during the year, only 865,249 was strip mined. The average value of a ton of coal at the mine was $5.24 in 1952.

Harbison-Walker Refractories Co. and Hiram Swank's Sons, Inc., Clymer, produced fire clay for refractory use.

The Hillsdale agricultural lime plant of New Castle Lime & Stone Co. was destroyed by fire early in the year. The company announced plans to build a new plant near Lowelville.

JEFFERSON

Jefferson County ranked second in the State in the production of clays in 1952. Virtually all the output was fire clay produced by Hanley Co., Summerville; Henry O'Neill & Co. (flint clay), Brookville; and Brockway Clay Co., Brockway. The sole producer of common clays was Falls Creek Clay Products Co., Falls Creek.

Fuels produced in the county during the year included crude oil and natural gas from wells in the northwest part of the county and bituminous coal, most of which was strip mined. The coal produced had an average value at the mine of $4.20 per ton.

Iron oxide pigments were produced at the plant of Vitre Pigments, Inc.

JUNIATA

In terms of value, sandstone (quarried by National Refractories Co., Van Dyke, and used in silica brick) was the most important mineral product of Juniata County in 1952.

Crushed limestone for use as concrete aggregate was quarried by W. N. Quigley in Fermanagh Township.

Jay A. Fulkroad & Son, McAlisterville, was the sole producer of lime in the county. Output was for agricultural uses.

LACKAWANNA

Anthracite was the only mineral commodity produced in Lackawanna County in 1952. The county ranked fourth in the State in output of this material.

LANCASTER

Lancaster County was one of the largest sources of limestone in Pennsylvania in 1952. This stone was crushed and broken and sold for use in concrete and as road metal. A small quantity of dimension stone for irregular blocks was quarried by J. C. Showalter Co., Blue Ball, and D. M. Stoltzfus & Son, Inc., Talmage. The latter organiza-

tion, with Ivan M. Martin, Inc., Blue Ball, and A. G. Kurtz & Sons, Ephrata, were the major producers of limestone in 1952. Lancaster County was also one of the few areas in the State in which lime was produced from dead-burned dolomite. The sole producer was J. E. Baker Co., Billmeyer.

Sand for building, paving, and fire purposes was recovered from pits operated by A. T. Harris Sand Co., Salisbury Township; Hempt Bros., Elizabethtown; and Milton Gravel Sand, Inc., East Petersburg.

Clay for brick manufacture was produced in 1952 by Glen Gery Shale Brick Co., Ephrata, and Lancaster Brick Co., Manheim Township.

LAWRENCE

Lawrence County ranked first in limestone and total stone output in Pennsylvania in 1952. The limestone quarried in the county ranges from 81 to 97 percent pure calcium carbonate and is mined from large quarries, several of which have working faces nearly a mile long. Major producers were Michigan Limestone Division, United States Steel Corp., Hillsville, and Bessemer Limestone & Cement Co., Bessemer. Output during the year was sold for flux, miscellaneous metallurgical uses, concrete, road metal, and agricultural purposes.

The cement industry of the county is based upon the abundance of exceptionally pure limestone. Plants utilizing this rock for cement production in 1952 were Bessemer Limestone & Cement Co., Bessemer, and Medusa Portland Cement Co., Wampum.

The Mahoning Valley Sand Co., West Pittsburgh, and the Superior Sand-Supply Co., New Castle, produced a substantial tonnage of sand and gravel for building and paving use in 1952.

Fire clay was produced by the Metropolitan Brick Co., Inc., Bessemer, and common clays by the Fenati Brick Co., Inc., and the Keystone Sand & Gravel Co., both of New Castle.

The county also produced a small tonnage of soft coal, virtually all by strip mining.

LEBANON

Lebanon County was the only county in Pennsylvania in 1952 in which metallic ores were produced. All of this material was from the Bethlehem Steel Co. Cornwall mine, which operated continuously during the year except for a period during midsummer when work was halted as a result of the Nation-wide labor strike in the iron and steel industry. The magnetite iron ore of the Cornwall mine yielded iron, gold, silver, copper, and cobalt in 1952.

Quarries in the county yielded large quantities of stone, principally limestone, during the year. Most of the limestone comes from the 300- to 400-foot-thick high-grade material comprising the Annville bed. Output is used for flux, as a filler, for open-hearth, miscellaneous metallurgical uses, and for agricultural purposes, as well as a concrete aggregate. The largest producers are H. E. Millard Lime & Stone Co., Annville; Calcite Quarry Corp., Lebanon; and Pennsylvania Aggregates Co., Cornwall.

In addition a small quantity of building sand was produced by Reber Sand & Coal Co., Lebanon.

LEHIGH

Lehigh County ranked second to Northampton in cement production for 1952. Major producers were Coplay Cement Mfg. Co., Whitehall Township; Giant Portland Cement Co., Egypt; Lehigh Portland Cement Co., Fogelsville and Ormond; and Whitehall Cement Mfg. Co., Cementon.

The county continued to be one of the most productive slate areas in the United States. Slate quarried in 1952 was processed into a diversity of products, including roofing, flagging, and electrical slate; blackboards; bulletin boards; and structural and sanitary products. Principal producers during the year were Francis Schleicher & Son and Penn Big Bed Slate Co., Inc.

Other mineral products of Lehigh County in 1952 included limestone and expanded perlite. Crushed limestone for concrete aggregate and road metal was quarried by Lehigh Stone Co., Ormond, and C. H. Ziegenfuss Co., Inc., Allentown. Perlite from mines in western United States was expanded at the Allentown plant of Pennsylvania Perlite Corp. for use as a lightweight aggregate.

LUZERNE

Luzerne County continued in 1952 to be the principal source of anthracite in the United States, although production followed the industry trend and decreased as compared with 1951. Shipments of steam sizes in the Wyoming region, of which Luzerne County is a part, increased from 30 percent of the total in the previous year to 32 percent in 1952. These sizes had an average value of $6.54; domestic sizes averaged $13.13 per ton.

Other mineral products produced during the year included stone, sand and gravel, and clay. Sandstone from the quarries of Coon Certified Concrete Co., Luzerne, and General Crushed Stone Co., White Haven, was used for flagging, and was crushed for railroad ballast, concrete, and road metal. The General Crushed Stone Co. White Haven quarry was awarded a safety plaque for operating without a single lost-time injury in 1952. Airport Sand & Gravel Co., Wyoming; Glendale Sand & Stone Co., Avoca; Banks Stone & Sand Co., Kingston; and Honey Hole Sand & Stone Co., Hazleton, were major producers of sand and gravel for use in building and paving, and as railroad ballast. Miscellaneous clays were mined by Hazleton Brick Co. from its open pit in Hazel Township.

LYCOMING

Lycoming County was one of the major sources of iron oxide pigments in Pennsylvania in 1952. Keystone Filler & Mfg. Co. and Pennsylvania Paint & Filler Co. produced mineral blacks and natural red oxides. These companies also mined colored shale and tripoli (rottenstone) for use as paint and phonograph-record filler, respectively.

Sand and gravel, mostly dredged from the Susquehanna River, were sold for molding, building, paving, and engine uses, as well as for railroad ballast. J. A. Eck & Sons, Inc., and the Lycoming Silica Sand Co., Fairfield Township, were principal producers of these mineral products.

Stone production in 1952 was limited to crushed limestone for road metal, agricultural, and concrete uses. Major producers were Lycoming Silica Sand Co., Muncy Township; Pine Creek Lime & Stone Co., Porter Township; and T. A. Muncy Lime Products, Muncy Township.

McKEAN

McKean County continued in 1952 to rank first among Pennsylvania counties in production of crude oil and natural gas. During the year 36,031 wells yielded 9,057,674 barrels of crude petroleum from 101,775 acres of land considered to be oil bearing. County production was 80 percent of the total of State output in 1952. Hanley Co., Lewis Run, produced common clay. Mount Jewett Fire Clay Co., Mount Jewett, produced fire clay, and Kaul Clay Products Co., Clermont, reported an output of both types. Molding sand was recovered by C. L. McGavern, Jr.

MERCER

Sand and gravel for molding, building, fire and engine purposes were produced by the Liberty Stone Products Co., West Middlesex, and the White Rock Silica Sand Co., Greenville.

Mines and wells in the county also produced small quantities of bituminous coal, oil, and natural gas in 1952.

MIFFLIN

Mineral commodities produced in Mifflin County in 1952 included stone, lime, and sand. Virtually all the stone output was limestone from quarries of Bellefonte Stone Products Corp. and Bethlehem Quarry Co., both at Naginey. Production was used for flux, concrete, railroad ballast, stone sand, and agricultural purposes. The Haws Refractories Co., Hawstone, quarried sandstone for use in silica-brick manufacture.

Sole producer of agricultural and chemical lime in 1952 was Lewistown Lime Co., Shrader.

Pits of Pennsylvania Glass Sand Corp., Wayne Township, and Miller Silica Sand Co., Burnham, yielded glass, molding, building, grinding, fire, and engine sand.

MONROE

The only mineral production reported from Monroe County in 1952 was limestone from the Thomas P. Rogers Co. quarry near Stroudsburg and building sand and gravel from the Steward & Clyde White pit close to the same town. The limestone output was crushed and sold for use in concrete and as road metal.

MONTGOMERY

In 1952 Montgomery County ranked second among Pennsylvania counties in production of dimension stone and third in the output of all types of stone. In addition, it was the only Pennsylvania county in which dimension basalt was produced in 1952.

Most of the stone output was limestone and dolomite used for flux, concrete, refractories, agriculture, magnesia production, and a filler in asphalt. Major producers were Bethlehem Quarry Co., Bridgeport; G. & W. H. Corson, Inc., Plymouth Meeting; and Stowe Trap Rock Co., Oreland. Dimension stone quarried during the year and sold as irregular blocks consisted of sandstone, granite, and basalt. Sandstone was produced by William Bambi & Sons Co., Norristown, and M. & M. Stone Co., Harleysville; granite by Marcolina Bros., Inc., Chestnut Hill; and basalt by R. K. Kibblehouse, Perkiomenville, and Montgomery Stone Co., Montgomeryville. Firestone Products Co., Inc., Edge Hill, and Irvin B. Gill Co., Collegeville, produced crushed and broken sandstone for silica brick, concrete, and road metal. Firestone Products Co., Inc., and Anthony Manero & Sons Co., Edge Hill, produced miscellaneous types of rock, which were sold for rough and dressed building stone and for refractory purposes.

Montgomery was the only county in Pennsylvania in which magnesium compounds were produced. Keasby & Mattison Co., Ambler, and Phillip Carey Mfg. Co., Plymouth Meeting, used the Pattinson process to recover precipitated magnesium carbonate, and extra light-light magnesias.

In 1952 Valley Forge Cement Co., West Conshohocken, and Wm. Bambi & Sons, Inc., were the sole producers of cement and sand and gravel, respectively.

The Norristown Brick Co., Norristown; Keller-Whilldin Pottery Co., North Wales; Robinson Clay Products Co., Pottstown; and Lansdale Brick Products Co., Lansdale, produced fire clay and common clay.

Montgomery County ranked fifth among Pennsylvania counties in output of lime in 1952. Lime suitable for use as building, agricultural, and chemical lime and dead-burned dolomite were produced by G. & W. H. Corson, Inc., and Cardol Corp., both of Plymouth Meeting.

MONTOUR

The major mineral commodity produced in Montour County in 1952 was limestone from Mausdale Quarry Co., Grovania, and Narehood Bros., Milton. Output was used as concrete aggregate and for road metal. A small quantity of agricultural lime was produced at the plant of Harry Tittle Co.

NORTHAMPTON

Northampton County ranked first in the output of cement, slate (value), and iron oxide pigments in Pennsylvania in 1952. Major producers of the latter were Reichard-Coulston Co. and C. K. William & Co. The State cement industry is concentrated to a large extent in this county. Of the 24 plants operating in Pennsylvania in 1952, 11 were in Northampton County. In addition, more than half the value of the State production came from this area. Major producers were Universal Atlas Cement Co., Northampton; Keystone Portland Cement Co., Bath; Alpha Portland Cement Co., Martins Creek; and the Lone Star Cement Corp., Nazareth.

A substantial portion of the Nation's slate production is quarried in Northampton County. Output in 1952 was sold for roofing, structural, and sanitary uses, as well as for blackboards and flagging. Of the 15 plants reporting production in 1952, the largest were North Bangor Slate Co., Bangor; Capitol Slate Co., Inc., East Bangor; Albion Vein Slate Co., Plainfield Township; Parsons Bros. Slate Co., Plainfield Township; and Stephens-Jackson Co., Pen Argyl.

Mines, pits, and quarries in the county also yielded limestone for concrete, railroad ballast, and stone sand, as well as building and paving sand and gravel. Limestone was quarried by Bethlehem Quarry Co., Bethlehem; Narehood Bros., Milton; and Trumbower Co., Inc., Nazareth. W. J. Lowe & Sons Co., Easton, and Portland Sand & Gravel Co., Portland, produced sand and gravel.

NORTHUMBERLAND

The major mineral commodity produced in Northumberland County in 1952 was anthracite, the value of which exceeded 44 million dollars. Stone production included crushed sandstone and limestone quarried by L. E. Kocher Co., and Eugene Meckley Co., Herndon, respectively. The crushed material was used as concrete aggregate, for road metal and railroad ballast.

Common clay was produced by Watsontown Brick Co., Watsontown Mineral Products Co., and Glen Gery Shale Brick Corp., all in Watsontown. W. W. Gulick Sand Co. and M. E. Wallace Co. produced molding sand from pits near Danville.

A small quantity of agricultural lime was produced by Clyde Starook at his plant in Point Township.

PERRY

Crushed and broken limestone, quarried by Binkley Bros., Inc., Newport, and used in concrete and as road metal, was the sole mineral product of Perry County in 1952.

PHILADELPHIA

United States Gypsum Co. continued to operate its gypsum products plant in Philadelphia County in 1952. Crude gypsum for processing was imported from Nova Scotia. Building sand and gravel was produced by Liberty Corp.

POTTER

Crude oil and natural gas were the only mineral products recovered in Potter County in 1952. Output was from the Oriskany and Bradford sands. The county ranked fourth among Pennsylvania oil-producing counties. Wells, principally in the northwestern part of the county, yielded 223,335 barrels of crude oil during the year.

The Tennessee Gas Transmission Co., in a joint venture with United Natural Gas Co., began developing in 1952 an underground storage reservoir in the Hebron gas field in the northwestern part of the county. After rehabilitation of old wells in the field, completion of new wells for increased injection and production capacities, and in-

stallation of other field equipment, it is planned to inject a base storage into the reservoir of approximately 23.8 billion cubic feet of natural gas and a top storage of 22.5 billion cubic feet. Maximum storage will be 46.3 billion cubic feet at approximately 2,000 p. s. i. wellhead pressure.

SCHUYLKILL

The most important mineral commodity produced in Schuylkill County in 1952 was anthracite. The county was the second largest producing area in the United States. The Schuylkill region, of which the county is part, produced the highest percentage of steam sizes in the country (54 percent). The average sales realization for this area in 1952 for domestic sizes was $12.66 per ton and for steam sizes $5.45.

A small tonnage of common clay and crushed limestone was produced by Auburn Brick Co., Auburn, and the Andreas Quarry Co., Andreas, respectively.

SNYDER

Mineral products of Snyder County in 1952 included crushed limestone for concrete and agricultural purposes, clay for brick, and lime. Lime was produced by Carton Confort Co., Mount Pleasant Mills; pits of Glen Gery Shale Brick Corp., Beavertown, and Paxton Brick Co., Paxtonville, yielded clay; and crushed limestone was quarried by National Limestone Quarry, Franklin Township.

SOMERSET

Somerset County was an important source of soft coal in Pennsylvania in 1952. Strip mines yielded 26 percent of the output during the year. The Upper Kittanning was the major bed worked.

The county ranked fourth among Pennsylvania counties in clay production. The entire output consisted of fire clay produced by Otto Brick & Tile Works, Salisbury; General Refractories Co., Fort Hill; and Hiram Swank's Sons, Inc., Conemaugh Township. There was also a minor production of agricultural lime, building sand and gravel, crushed limestone and sandstone, and natural gas. Lime was produced by Addison C. Lottig, Larimer Township, and sand and gravel by Boswell Sand Co. and E. H. Shanlis, both of Boswell. Crushed stone was recovered from quarries of Keystone Lime Co., Elk Lick Township; Somerset Limestone Co., Inc., Jefferson Township; and the Friedens Block Co., Somerset.

SULLIVAN

The only mineral commodity produced in 1952 in Sullivan County was semianthracite mined from properties at Bernice and Lopez in the northeastern part of the county.

SUSQUEHANNA

Mineral products of Susquehanna County in 1952 were limited to dimension sandstone and a small quantity of miscellaneous dimension stone. Dimension sandstone for building construction was quarried by W. H. Swingle, Jr., Harford, and Tomkins Bros. Clarence S. Chamberlain, Susquehanna, and George Wilbur Co., Hallstead, produced miscellaneous dimension stone.

TIOGA

Wells and mines in Tioga County yielded oil, natural gas, soft coal, and sand in 1952. Of the coal production 16 percent was strip mined. Continental Cement Products Co., Inc., produced paving sand. Crude-oil production during the year totaled 3,296 barrels.

UNION

The Faylor Lime & Stone Co., Winfield, was the sole mineral producer in Union County in 1952. Crushed and broken limestone produced by this company was sold for concrete aggregate and agricultural stone.

VENANGO

Venango County ranked second as a producer of oil in Pennsylvania in 1952. Wells in the county produced 607,268 barrels of crude oil, virtually all through secondary recovery. It is estimated that 155,819 acres of the county is underlain by oil-producing rocks.

Venango County also had a small output of soft coal, almost all of which was produced by strip mining. As a result, the county ranked second in ton-per-man-day production

The Industrial Silica Corp., Utica, and Oil City Sand & Gravel Co., Oil City, reported a small production of molding, building, and paving sand and gravel.

WARREN

The major mineral commodity produced in Warren County in 1952 was oil from the Warren, Glade, and Clarendon sands, which are included in the 63,777 acres of oil-producing sands estimated to underlie the county. The 476,021 barrels of crude oil recovered in 1952 placed the county in third position among oil-producing counties in the State.

Building sand and gravel were produced by General Concrete Products Corp., Starbrick, and the Anderson Brick & Supply Co., Brokenstraw Township, had a small output of clay.

WASHINGTON

Washington County ranked first in production of bituminous coal and sixth in output of oil in Pennsylvania in 1952. Virtually all bituminous coal produced was recovered by underground mining. The average value of the coal at the mine was $5.76 per short ton.

The 45,013 oil-productive acres in the county yielded 212,774 barrels of crude oil.

Other mineral commodities produced in the county in 1952 included natural gas, clay, and stone. Clay were produced by Monongahela Clay Products Co., Scott's Hollow; Donley Brick Co., Washington; and Westmoreland Clay Products Co., Vance Station. Dimension sandstone, for irregular blocks and flagging, was quarried by the Malli Mines Co.

WAYNE

In 1952 General Stone Co. quarried limestone for concrete and agricultural purposes. Chas. Caputo, Honesdale, and Wayne Con-

crete & Sand Works, Lake Ariel, produced building and paving sand and gravel. A small quantity of anthracite was also mined during the year.

WESTMORELAND

Westmoreland County is one of the larger sources of soft coal in the State. Production in 1952 had an average value at the mine of $5.33 per ton.

Quarries in the county yielded a substantial tonnage of sandstone for irregular blocks and for concrete aggregate. Producers of dimension stone were J. C. Beumont Co., Brant Hoover Co., Andrew White Co., and J. S. Robinson Co., Inc. Crushed material was produced by Adam Eidemiller, Greensburg, and Latrobe Construction Co., Ligonier Township.

Fire clay was recovered by Garfield Refractory Co. from its pit at Bolivar and from the pit of Kingston Brick Co., Latrobe. Westmoreland Clay Products Co., Greensburg, produced miscellaneous clays.

WYOMING

The Falls Sand & Gravel Co., Inc., and the Wyoming Sand & Stone Co., both in Falls Township, produced building and paving sand and gravel in 1952.

YORK

The mineral economy of York County was extensive and diversified in 1952. Mineral operations yielded large quantities of lime, cement, stone, and slate, as well as substantial tonnages of clay, sand, and gravel. The county ranked second among Pennsylvania Counties in production of lime, first in the output of slate, and seventh in the production of crushed and broken limestone.

Manufacture of lime was the principal mineral industry in the county in 1952. Three plants were operating during the year; and one, J. E. Baker Co., York, produced dead-burned dolomite. Lime for building, agriculture, and chemical purposes was produced by Amos K. Stoltzfus and H. E. Millard Lime & Stone Co.

Crushed and broken limestone was the only stone produced in the county in 1952. Output was sold for concrete aggregate, railroad ballast, agricultural purposes, filler, flux, and whiting. Major producers during the year were Thomasville Stone & Lime Co., Thomasville; York Stone & Supply Co., York; Eli Z. Zinn, Inc., York; Standard Concrete Products Co., Inc., York; and National Gypsum Co., York.

York County was also a large source of cement in 1952. This material came from the Medusa Portland Cement Co. plant in York.

The Funkhouser Co., Delta, was the sole producer of slate in the county in 1952. In terms of tonnage, the county ranked first in the State in quantity of slate produced, but the value of the product was low, since it was ground and sold as flour or granules.

Sand and gravel were produced by the Neuman Sand-Supply Co., York, for building and paving purposes. Common clay, mainly for brick use, was mined by the Spring Garden Brick & Clay Products Co., York; York Colonial Brick Co., York; and the Glen Gery Shale Brick Corp.

THE MINERAL INDUSTRY OF THE COMMONWEALTH OF PUERTO RICO, THE PANAMA CANAL ZONE, AND THE VIRGIN ISLANDS

By Avery H. Reed, Jr.[1]

PUERTO RICO

PUERTO RICO'S mineral industry includes the production of clays, iron ore, salt, sand and gravel, and stone as primary crude materials and the manufacture of portland cement and lime. The production of iron ore is intermittent, and none is currently reported.

The year 1952 was a record one for the mineral industry. Total production was 9 percent above 1951—the previous high. New production records were made for iron ore, sand and gravel, and stone.

The iron-ore industry, which started in 1951, was closed in 1952 when the only producer ceased operation because of inability to meet consumers' quality specifications.

The sand and gravel industry continued to expand and increased 23 percent over 1951, the largest output in any year.

1952 was also a record year for stone production, with tonnage 144 percent greater than in 1951. Stone for manufacture of cement and lime is not included as stone production.

Table 1 shows mineral production in 1951–52.

TABLE 1.—Mineral production in possessions of the United States, 1951–52, by individual minerals [1]

Possession and minera	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Canal Zone:				
Sand and gravel [2 3]	32,000	$26,000	56,600	$53,000
Stone (crushed) [2 3]	55,500	112,000	86,000	152,000
Total Canal Zone		138,000		205,000
Puerto Rico:				
Cement, 376-pound barrels	4,297,583	11,252,350	3,994,483	10,517,894
Iron ore (usable), long tons	39,219	225,509	138,613	797,025
Lime (open-market)	10,350	191,415	8,575	195,000
Salt (common)	10,566	119,338	12,676	122,158
Sand and gravel	99,628	99,657	122,730	164,166
Stone	283,697	613,751	[4] 689,320	[4] 1,807,388
Undistributed: Other nonmetallic minerals				6,328
Total Puerto Rico		12,502,000		13,610,000
Virgin Islands: Stone (crushed) [2 3]	11,600	47,300	12,900	51,900
Grand total		12,687,000		13,867,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers).
[2] Quantities are estimated equivalents of cubic yards reported.
[3] Data for fiscal years ended June 30.
[4] Excludes certain stone, value for which is included with "Undistributed."

[1] Assistant chief, Mineral Industry Division, Region VII, Bureau of Mines Knoxville, Tenn.

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Figure 1 shows the total value of the mineral production in Puerto Rico, 1947–52:

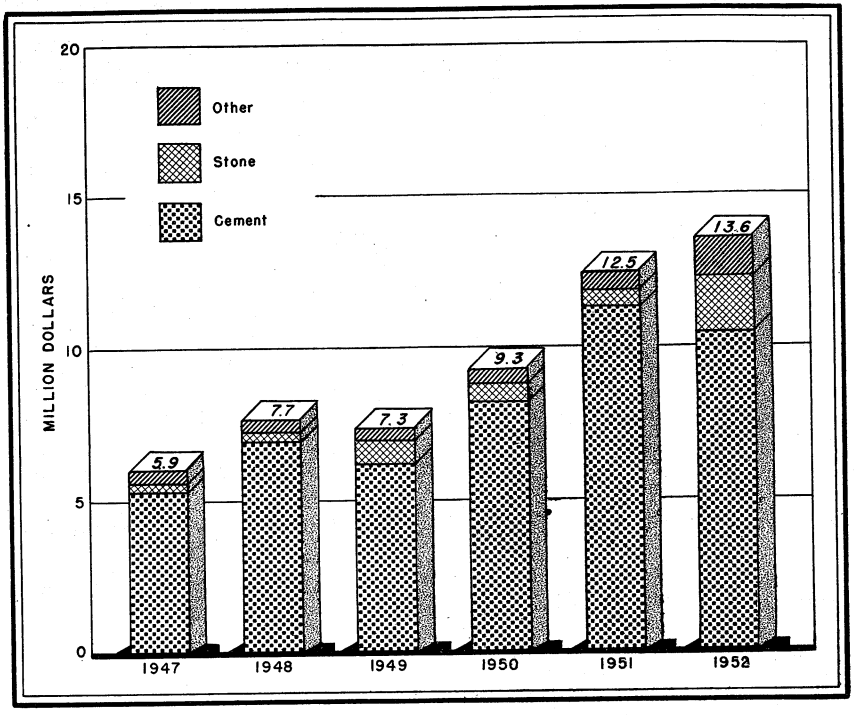

FIGURE 1.—Total value of the mineral production of Puerto Rico, 1947–52.

REVIEW BY MINERAL COMMODITIES

Basalt (Crushed).—Crushed basalt was produced in Humacao Province.

Cement (Portland).—The cement industry, which represents about 80 percent of the total value of minerals produced in Puerto Rico, continued to operate at about the same rate, although shipments declined 7 percent below 1951, the record year. Portland cement was produced in San Juan and Ponce Provinces.

TABLE 2.—Portland-cement shipments in Puerto Rico, 1940–52

Year	376-pound barrels	Value
1940–47	7,872,588	$22,130,288
1948	2,440,000	6,947,000
1949	2,171,000	6,109,000
1950	3,187,000	8,299,000
1951	4,297,583	11,252,350
1952	3,994,483	10,517,894
Total[1]	23,962,654	65,255,532

[1] Total cement shipments to date.

Clays (Miscellaneous).—Miscellaneous clays are produced in Puerto Rico, but no record of the quantity and value is available for 1952. The value of clay products produced in 1950 was reported at $451,000.

Granite (Crushed).—Crushed granite was produced in Mayaguez Province by one operator.

Iron Ore.—The West Indies Mining Corp., formed by two individuals from Minnesota, began mining operations in 1951 at the old Juncos mine in Humacao Province, and shipped 39,219 long tons of magnetite valued at $226,000 in 1951. Operations continued in 1952, but before the end of the year all mining was terminated because of inability to meet consumers' quality specifications. During 1952, 138,613 long tons of magnetite, valued at $797,000, was shipped.

Lime.—The total lime sold or used by producers was 8,575 short tons valued at $195,000 compared to 10,350 tons valued at $191,415 in 1951.

Limestone (Crushed).—Crushed limestone came from each of the seven Provinces of Puerto Rico. Total crushed stone sold or used by producers was 605,830 short tons valued at $1,659,910 compared to 244,844 tons valued at $521,048 in 1951.

Limestone (Dimension).—Some dimension limestone was quarried in San Juan and Mayaguez Provinces.

Salt.—Salt was produced in Mayaguez Province by the evaporation of sea water. Total salt sold or used by producers was 12,676 short tons valued at $122,158 compared to 10,566 tons valued at $119,338 in 1951.

Sand and Gravel.—Sand and gravel were produced in each of the seven Provinces of Puerto Rico.

TABLE 3.—Sand and gravel sold or used by producers in Puerto Rico, 1950–52

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1950	19,187	$18,594	81,826	$85,212	101,013	$103,806
1951	(1)	(1)	(1)	(1)	99,628	99,657
1952	86,515	96,143	36,215	68,023	122,730	164,166

[1] Figure withheld to avoid disclosure of individual company operations.

Stone (Miscellaneous, Crushed).—Production of crushed miscellaneous stone from San Juan Province was 31,500 short tons valued at $73,500.

Stone (Miscellaneous, Dimension).—Miscellaneous dimension stone produced in San Juan Province amounted to 13,806 short tons valued at $27,612.

REVIEW BY PROVINCES

AGUADILLA

Limestone (Crushed).—The Antilles Area Office (Panama Engineer District) and the Department of Public Works produced crushed limestone and production was continued by three other producers. Total crushed limestone sold or used was 107,678 short tons, valued at $297,311.

Sand and Gravel.—The Department of Public Works mined 162 short tons of sand valued at $198 and 7,623 short tons of gravel valued at $16,167.

ARECIBO

Limestone (Crushed).—The Department of Public Works crushed 11,883 short tons of limestone valued at $26,233.

Sand and Gravel.—The Department of Public Works excavated 270 short tons of sand valued at $400 and 437 short tons of gravel valued at $1,157.

GUAYAMA

Limestone (Crushed).—The Department of Public Works crushed 35,103 short tons of limestone valued at $87,466.

Sand and Gravel.—The Department of Public Works mined 4,624 short tons of sand valued at $5,633 and 3,782 short tons of gravel valued at $6,764.

HUMAÇAO

Basalt (Crushed).—A single operator continued to produce crushed basalt.

Lime.—The Planto de Col Hicaco, Inc., continued to produce lime; total lime sold or used was 8,575 short tons, valued at $195,000.

Limestone (Crushed).—The Department of Public Works and 1 other operator crushed limestone; total quantity sold or used was 28,756 short tons, valued at $80,658.

Iron Ore (Magnetite).—The West Indies Mining Corp. mined 138,613 long tons of magnetite valued at $797,025 before closing down its operations.

Sand and Gravel.—The Department of Public Works produced 1,305 short tons of sand valued at $2,034 and 2,453 short tons of gravel valued at $5,646.

MAYAGUEZ

Granite (Crushed).—One operator continued the production of crushed granite at about the same rate as in 1951.

Limestone (Crushed).—The Department of Public Works crushed 7,938 short tons of limestone valued at $16,093. Production was continued by two other companies. The total sold or used was 47,091 short tons valued at $86,922.

Limestone (Dimension).—Production of dimension limestone was continued by two operators.

Salt.—Production of salt by the evaporation of sea water was continued by Carlos M. Ramirez Acosta, Salinas del Papayo, Inc., and the Puerto Rico Salt Works, Inc.; total salt sold or used was 12,676 short tons valued at $122,158, a 20-percent increase in quantity and 2 percent in value over 1951.

Sand and Gravel.—The Department of Public Works mined 57,147 short tons of sand valued at $40,793 and 9,163 short tons of gravel valued at $19,356.

PONCE

Cement.—The Ponce Cement Corp. continued to manufacture portland cement at about the same rate as in previous years.

Limestone (Crushed).—The Department of Public Works and 1 other operator crushed 14,276 short tons of limestone valued at $30,893.

Sand and Gravel.—The Department of Public Works operated pits for the production of structural and paving sand and gravel.

SAN JUAN

Cement.—The Puerto Rico Cement Corp. continued to manufacture portland cement at about the same rate as in previous years.

Limestone (Crushed).—The Department of Public Works crushed 13,750 short tons of limestone valued at $39,933, and 3 other operators continued production. Total stone sold or used was 370,841 short tons valued at $1,072,449 compared to 208,916 tons valued at $451,530 in 1951.

Limestone (Dimension).—The Department of Public Works quarried 8,876 short tons of dimension limestone valued at $12,275.

Sand and Gravel.—The Department of Public Works continued to mine sand and gravel. Production of sand was reported for the first time by the Puerto Rico Glass Corp.

Stone (Miscellaneous, Crushed).—A single operator produced crushed miscellaneous stone amounting to 31,500 short tons valued at $73,500.

Stone (Miscellaneous, Dimension).—One operator quarried 13,806 short tons of miscellaneous dimension stone valued at $27,612.

PANAMA CANAL ZONE

The mineral industry of the Canal Zone is limited to the production of sand and gravel and stone.

The total value of minerals produced increased 49 percent over 1951.

REVIEW BY MINERAL COMMODITIES

Basalt (Crushed).—Table 4 shows crushed basalt sold or used by producers in the Canal Zone, 1948–52.

TABLE 4.—Crushed basalt sold or used by producers, Canal Zone, 1948–52 [1] [2]

Year	Short tons	Value
1948	178,500	[3] $267,800
1949	109,200	[3] 163,800
1950	53,000	83,000
1951	55,500	112,000
1952	86,000	152,000

[1] Data for fiscal years ended June 30.
[2] Quantities are estimated short-ton equivalents of cubic yards reported
[3] Estimated.

Sand and Gravel.—Table 5 shows sand and gravel sold or used by producers in the Canal Zone, 1948–52.

TABLE 5.—Sand and gravel sold or used by producers, Canal Zone, 1948–52 [1] [2]

Year	Short tons	Value
1948	54,500	$81,700
1949	39,000	58,500
1950	22,000	15,000
1951	32,000	26,000
1952	56,600	53,000

[1] Data for fiscal years ended June 30.
[2] Quantities are estimated short-ton equivalents of cubic yards reported.

VIRGIN ISLANDS

The mineral industry of the Virgin Islands is limited to the production of stone. The year 1952 was a record one, with production 11 percent greater than in 1951, the previous record year. Total quantity sold or used by producers was 12,900 short tons valued at $51,900 compared to 11,600 tons valued at $47,300 in 1951.

ST. CROIX ISLAND

Table 6 shows crushed miscellaneous stone sold or used by producers, 1948–52.

TABLE 6.—Crushed miscellaneous stone sold or used by producers in St. Croix Island, 1948–52 [1] [2]

Year	Short tons	Value
1948	8,600	[3] $14,000
1949	9,700	[3] 16,000
1950	2,540	4,000
1951	5,700	24,200
1952	3,800	16,150

[1] Data for fiscal years ended June 30.
[2] Quantities are estimated short-ton equivalents of cubic yards reported.
[3] Estimated.

ST. THOMAS ISLAND

Production of crushed miscellaneous stone was 9,100 short tons valued at $35,750 in 1952 compared with 5,900 tons valued at $23,100 in 1951.

VALUES

The values of mineral production shown in the tables are the values as reported at the mine or plant. Table 7 shows the average unit values of all commodities produced in the Canal Zone, Puerto Rico, and the Virgin Islands, 1948–52.

TABLE 7.—Average unit values of mineral production in the Canal Zone, Puerto Rico, and the Virgin Islands [1]

Area and commodity		1948	1949	1950	1951	1952
Canal Zone:						
Basalt, crushed	short ton	$1.50	$1.50	$1.57	$2.02	$1.77
Sand and gravel	do	1.50	1.50	.68	.81	.94
Puerto Rico:						
Basalt	do	[2]	[2]	1.24	1.47	1.55
Cement, portland	376-pound barrels	2.85	2.81	2.60	2.62	2.63
Granite, crushed	short ton	1.00	1.00	1.00	1.00	1.00
Iron ore	long ton				5.74	5.75
Lime	short ton	[2]	25.13	22.14	18.49	22.74
Limestone, crushed	do	2.00	1.62	2.42	2.13	2.74
Limestone, dimension	do	2.73	1.07	[2]	4.85	1.60
Salt	do	7.40	6.11	10.13	11.29	9.64
Sand	do	[2]	[2]	.97	.53	1.21
Gravel	do	[2]	[2]	1.04	1.30	1.81
Stone, miscellaneous, crushed	do	1.96				2.33
Stone, miscellaneous, dimension	do	[2]	[2]	[2]	[2]	2.00
Virgin Islands: Stone, miscellaneous, crushed	do	1.63	1.65	1.57	4.08	4.02

[1] For greater detail on prices by grades and markets, see vol. I, Minerals Yearbook 1952.
[2] Data not available.

The Mineral Industry of Rhode Island

By Richard H. Mote [1]

RHODE ISLAND'S mineral production in terms of value, totaled $1,250,000 in 1952, compared with $1,278,000 in 1951. Although the output of sand and gravel in 1952 advanced to the highest point since 1948, the total fell off 3 percent. Stone continued to be the most valuable mineral commodity produced within the State despite a nearly 30-percent drop in output. Natural graphite ranked third to stone and sand and gravel in value of production. During the year mineral output was recorded from 4 of the 5 counties of the State.

REVIEW BY MINERAL COMMODITIES

METALS

Deposits of metals in Rhode Island have been successfully exploited in the past but are no longer considered economic because of the availability of higher grade materials elsewhere. During the 18th century iron ore from Iron Mine Hill, Cumberland, and bog iron from Cranston were mined for use of the Colonial and Revolutionary Armies. Other metals that have been recovered include copper, manganese, and gold.[2] There was no mine output of metals in Rhode Island in 1952. During the year the Bureau of Mines reported on laboratory and semi-pilot-plant tests for recovery of titania, iron, and byproducts from low-grade iron ores of Iron Mine Hill.[3]

NONMETALS

Graphite.—In terms of value, graphite is a relatively small factor in the mineral economy of Rhode Island. It is significant, however, in that the State production represents a substantial portion of the total United States output of natural graphite. The mine at Cranston, Providence County, was 1 of only 3 active domestic sources of this commodity in 1952.

Sand and Gravel.—Sand and gravel, used chiefly for building and paving construction, was recovered from pits in Providence, Kent, and Washington Counties, listed in order of decreasing output. Nine commercial plants were active during 1952.

Stone.—In terms of value of product, the quarrying of stone

[1] Chief, Mineral Industry Division, Bureau of Mines, Region VIII, Pittsburgh, Pa.
[2] Rhode Island Development Council, Research Division, Preliminary Report on Mineral Resources in Rhode Island: June 1952, 3 pp.
[3] MacMillan, Robert T., Heindl, R. August, and Conley, John E., Soda-Sinter Process for Treating Low-Grade Titaniferous Ores: Bureau of Mines Rept. of Investigations 4912, 1952, 62 pp.

continued to be the principal mineral industry in Rhode Island in 1952. The bulk of the output during the year consisted of crushed basalt, granite, and limestone. Providence County ranked first among the 3 counties producing stone, accounting for 86 percent of the State output; Washington and Newport Counties ranked second and third, respectively.

REVIEW BY COUNTIES

KENT

Mineral production in Kent County in 1952 was limited to the output of sand and gravel. Producers included Whitehead Bros., Joseph B. Barber, and Rhode Island Sand & Gravel Co., Inc.

NEWPORT

Crushed stone for road metal was quarried by Peckham Bros. Co. from its quarry near Newport.

PROVIDENCE

Providence County ranked first among mineral-producing counties in Rhode Island in 1952 and supplied over 60 percent of the total value of the minerals produced in the State during the year. Amorphous graphite continued to be produced from meta-anthracite coal beds at Cranston by Graphite Mines, Inc. Sand and gravel for nearby highway and building construction was produced by M. A. Gammino Construction Co., Providence; Town Line Sand & Gravel Co., Slatersville; and Luigi Vallone, Inc., Warwick. Quarries in the county yielded crushed granite, limestone, and basalt in 1952. Ground limestone for agricultural purposes was produced by the Conklin Limestone Co., Inc., from its quarry near Saylesville. Crushed granite for use in highway construction was produced by Fanning & Doorley Construction Co. from a quarry near Providence. Crushed basalt, also for highway construction, was quarried by M. A. Gammino Construction Co., Providence.

WASHINGTON

Washington County ranked second to Providence County in the value of minerals produced in 1952. Dimension granite for building and monumental purposes and crushed granite for road metal and riprap constituted the bulk of the value of minerals produced. Producers in 1952 included Smith Granite Works and Sullivan Granite Co., both in Westerly. Sand and gravel plants were operated during the year by Louis B. Shaeffer, Peace Dale; Elisha Taylor, West Kingston; and Tasca Sand & Gravel Co.

The Mineral Industry of South Carolina

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, the United States Department of the Interior, and the Geological Survey of South Carolina.

By J. R. Thoenen,[1] Lawrence L. Smith,[2] and May G. Downey[3]

CONSTRUCTION materials, stone, cement, and sand and gravel represented about 60 percent of the total value of the mineral output of South Carolina in 1952, increasing the portion represented by this group of commodities in 1951 approximately 10 percent. Contributing in large measure to the increase was the expansion of facilities for cement manufacture and increased production of sand and gravel. The Carolina Giant Cement Co., Harleyville, a subsidiary of the Giant Portland Cement Co., Egypt, Pa., in 1948 converted a wartime experimental alumina plant to cement manufacture and in September 1952 completed a $4,500,000 expansion program, adding a million barrels annually to the plant capacity.[4] Additional capacity is anticipated from a proposed new plant of the American Cement Co. at Holly Hill.[5] Both operations are within 100 miles of the Savannah River atomic energy project near Aiken.

The following table presents data available for publication on the production and value of minerals from South Carolina, 1951–52.

TABLE 1.—Mineral production in South Carolina, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays (except for cement)	902,603	$4,689,609	869,819	$4,597,802
Sand and gravel	320,195	139,258	1,048,099	992,312
Stone	[2] 2,828,868	[2] 3,690,114	[2] 2,914,839	[2] 3,881,178
Undistributed: Barite, cement, kyanite, stone, (dimension granite), and vermiculite	----------	2,767,017	----------	5,159,307
Total South Carolina	----------	11,286,000	----------	14,531,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production.
[2] Excludes certain stone, value for which is included with "Undistributed."

[1] Chief, Mineral Industry Division, Region VII, Bureau of Mines, Knoxville, Tenn.
[2] State geologist, South Carolina Geological Survey, Columbia, S. C.
[3] Statistical clerk, Region VII, Bureau of Mines, Knoxville, Tenn.
[4] Pit and Quarry, vol. 45, No. 7, January 1953, p. 121.
[5] Pit and Quarry, vol. 45, No. 7, January 1953, p. 119.

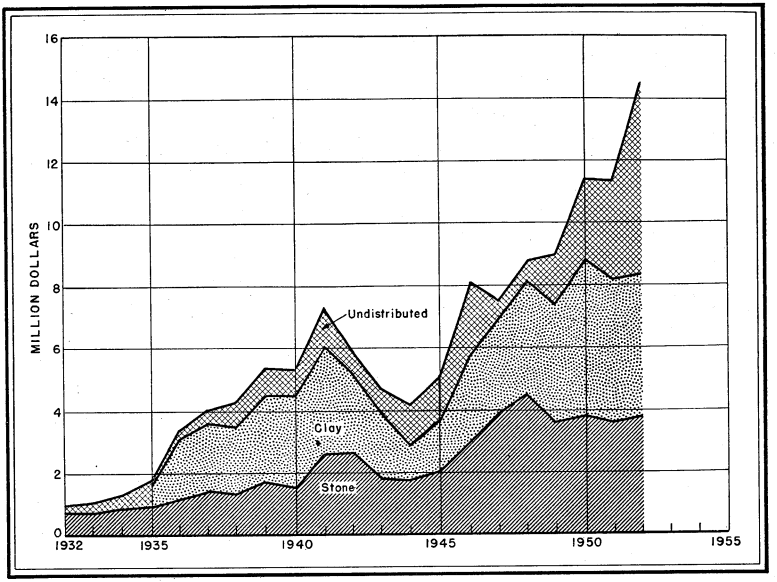

FIGURE 1.—Total value of the mineral production of South Carolina, 1932–52.

REVIEW BY MINERAL COMMODITIES

METALS

Copper.—Mine output of copper ore in South Carolina over the period 1905, when production was first reported, through 1943, the latest year of reported operation, totaled 31,856 short tons, from which 8 tons of copper, 5,358 fine ounces of gold, and 3,677 fine ounces of silver were recovered. Production was reported from four operations in Cherokee and York Counties. Activity of mines was intermittent, the years of reported production including 1905–6, 1908, 1919, 1934–35, and 1937–43. The 10-year period 1931–40, when 9,221 tons of ore was mined, (resulting in recovery of 5 tons of copper, 4,152 ounces of gold and 3,193 ounces of silver), was the most productive period in percentage of recoverable metals per ton of ore. During 1941–43 some copper was produced as a byproduct of gold ore.

Gold and Silver.—Nearly 3 million tons of gold and silver ores has been mined in South Carolina, according to records dating from 1799 to 1942. Gold and silver recovered from these ores 1829–1942, totaled 354,126 fine ounces, of which roughly 90 percent was gold and 10 percent silver. From 1900 to 1943, except for 1918, 1924–25, 1927, and 1929–30, some gold and silver ore has been produced from South Carolina mines. No operation has been reported since 1943. The 10-year period 1931–40 was the most productive decade, both in tonnage of crude ore and in recoverable metals. The Haile mine in Lancaster County holds the production record for individual mine output in the State.

Manganese.—Less than 2,000 short tons of metallurgical manganese ore was produced in McCormick County, 1943–46, and small quantities of other manganese-bearing ores were reported in 1943 and 1944

from Aiken and Greenwood Counties. No production has been reported in succeeding years.

NONMETALS

Barite.—Production of crude barite from open-pit and underground mining operations at King's Creek mine in Cherokee County has been reported in 1949–52. Since 1949 a fairly uniform output has been maintained. Ground barite is produced at a nearby mill.

Clays.—The types of clays produced in South Carolina were classified as fire clay, kaolin, and miscellaneous. Except for somewhat less than 1 percent of the output, which was sold or used as fire clay, the production was distributed roughly as one-third kaolin and two-thirds miscellaneous clays. Average values in each classification were slightly lower than in 1951.

TABLE 2.—Clays sold or used by producers, 1943–47 (average) and 1948–52, by kinds

Year	Fire clay		Kaolin		Miscellaneous clays		Total [1]	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	(2)	(2)	186,921	$1,753,163	(2)	(2)	(2)	(2)
1948	(3)	(3)	283,485	3,347,078	426,039	$364,549	709,524	$3,711,627
1949	(3)	(3)	274,458	3,488,054	423,902	318,601	698,360	3,806,655
1950	(3)	(3)	348,948	4,505,022	638,852	508,223	987,800	5,013,245
1951	(3)	(3)	322,208	4,095,912	619,272	620,022	941,480	4,715,934
1952	7,547	$18,250	322,778	4,079,112	616,953	577,899	947,278	4,675,261

[1] Excludes fire clay, 1948–52.
[2] Not available.
[3] Figure withheld to avoid disclosure of individual company operations.

Kyanite.—South Carolina is one of the few States in which kyanite is produced. In 1952 the output exceeded the 1951 tonnage, and the average value per ton also increased. Kyanite production at Henry Knob mine of Commercialores was described in a recent article.[6]

Sand and Gravel.—Sand and gravel production, reported from 5 counties in South Carolina in 1952, was the output of 6 commercial and 3 noncommercial operations and amounted to 1,048,100 short tons valued at $892,300, an increase of 227 percent in quantity and 541 percent in value compared with 1951. This was a record value and the second largest tonnage reported since 1929.

TABLE 3.—Sand and gravel sold or used by producers, 1943–47 (average) and 1948–52

Year	Short tons	Value	Year	Short tons	Value
1943–47 (av.)	433,485	$220,543	1950	348,060	$166,710
1948	403,285	198,439	1951	320,195	139,258
1949	[1] 287,108	[1] 145,142	1952	1,048,099	892,312

[1] Incomplete total, excludes noncommercial production.

Stone.—*Granite*—Over 90 percent of the stone production in South Carolina was from granite quarries producing crushed stone for road

[6] Avery, William M., Kyanite Production; South Carolina Firm Completes Tune-Up Job on Quarry and Plant Facilities: Pit and Quarry, vol. 45, No. 7, January 1953, pp. 84–85, 98.

construction, railroad ballast, riprap, and stone sand. Production increased 5 percent in quantity and 7 percent in value, and the average value increased 3 cents per ton compared with 1951. Granite classed as dimension stone, used for monuments, nearly doubled in both quantity and value. The average value remained the same as in 1951—$3.25 per cubic foot.

Limestone.—Limestone produced in South Carolina was used for agricultural purposes, in cement manufacture, and for road construction. The tonnage produced, exclusive of that used for cement, was 11 percent lower than in the previous year, and the value decreased 5 percent.

TABLE 4.—Stone sold or used by producers, 1943–47 (average) and 1948–52

Year	Dimension granite		Crushed granite		Crushed limestone		Miscellaneous stone		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	[1]	[1]	1,452,608	$1,676,947	[1]	[1]	[1]	[1]	1,675,908	$2,494,967
1948	37,561	$1,348,622	2,104,978	2,759,117	[1]	[1]	[1]	[1]	2,443,751	4,543,436
1949	11,740	330,388	2,093,279	2,776,904	335,520	$521,304	[1]	[1]	[2] 2,440,539	[2] 3,628,596
1950	14,156	477,291	2,223,923	2,881,109	319,431	477,656	[1]	[1]	[2] 2,557,510	[2] 3,836,056
1951	[1]	[1]	2,528,473	3,242,140	300,150	447,815	245	$159	[2] 2,828,868	[2] 3,690,114
1952	[1]	[1]	2,648,284	3,456,684	266,095	424,195	460	299	[2] 2,914,839	[2] 3,881,178

[1] Figure withheld to avoid disclosure of individual company operations.
[2] Incomplete figure, excludes certain stone data indicated by footnote 1.

Topaz.—Topaz has been mined in South Carolina by two companies. The Carolina Mining & Exploration Corp. operated in Chesterfield County, 1945–49, and United Feldspar & Minerals Corp. operated the Brewer mine in Kershaw County 1941–45. Both mines are now inactive, but during the periods of their productivity output totaled approximately 9,000 short tons of crude material valued at $148,000.

Vermiculite.—Vermiculite was produced by the Zonolite Co. mines in Laurens and Spartanburg Counties in 1952 and by the American Vermiculite Co. in Spartanburg County. Production of screened and cleaned material increased slightly. Production was last reported by Bee Tree Vermiculite Mines, Inc., in 1948 and by George B. Coggins in 1944 from mines in Greenville County near Travelers Rest.

REVIEW BY COUNTIES

AIKEN

Production was reported from the McKamee mine of Dixie Clay Co.; the Langley mine of South Carolina Clay Co. operated by J. M. Huber Co.; Flock, Johnson, Rodgers and Ramey mines of Southeastern Clay Co.; and the National Kaolin Products Co. mine near Aiken.

TABLE 5.—Clays sold or used by producers in Aiken County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	309,718	$3,347,681	1951	349,708	$4,100,912
1949	295,906	3,487,813	1952	349,212	4,062,248
1950	373,794	4,491,157			

The tonnage and value of production sold or used showed a downward fluctuation of about 1 percent compared with 1951. Miscellaneous clays used in brickmaking were produced by Georgia-Carolina Brick Co. at the North Augusta mine.

DMEA contract E–392–2576 for $29,184, of which $24,223 was provided by the Government, was approved in September 1952 for exploratory work by the Callahan Zinc-Lead Co. at Horse Creek Prospect. Southeastern Gravel & Sand Co. produced sand for building uses. This was the first reported production of sand from Aiken County in recent years.

CHEROKEE

Industrial Minerals, Inc., continued production of barite at King's Creek Mine. Broad River Brick Co. produced miscellaneous clays from the mine at Gaffney for brick-plant requirements. The tonnage of crushed limestone reported as sold or used for concrete and road metal and for agricultural uses was 12 percent lower than in 1951. The value decreased 9 percent.

DARLINGTON

Consumers Brick Yard produced miscellaneous clays for manufacture of heavy clay products at the Society Hill plant. The total quantity used was 37 percent less than in 1951.

DORCHESTER

Shipments of cement from the Carolina Giant Cement Co. plant at Harleyville increased 142 percent and the value 140 percent compared with 1951. Clay produced from the Summerville mine of Salisbury Brick Co., used in brickmaking, was 5 percent lower than in 1951. Also included in county production was the captive tonnage produced and used in cement manufacture by Carolina Giant Cement Co. The tonnage of limestone produced and sold or used for agricultural purposes desceased 8 percent from comparable data for 1951.

FAIRFIELD

Shale from the Richtex mine of Richland Shale Products Co. was used for manufacturing heavy clay products. The total quantity so used was 23 percent greater than in 1951. The production of crushed granite was sold or used for concrete and road metal, railroad ballast, and stone sand. The total tonnage was 15 percent greater than in 1951. The production of dimension granite for monumental purposes was estimated at approximately double the 1951 output.

GREENVILLE

Miscellaneous clays and shale were produced at the Greenville mine of Poinsett Brick & Tile Co. Total tonnage sold or used was 5 percent lower than in 1951. The city of Greenville produced sand and gravel by contract for use in paving.

The Zonolite Co. mill for processing vermiculite mined in Laurens and Spartanburg Counties is at Travelers Rest, Greenville County. Production data for all operations were reported as a unit in 1952 and were closely comparable with those of 1950 and 1951.

GREENWOOD

Angus Brick & Tile Co. and Southern Brick Co. produced shale for making brick and tile from mines near Ninety Six.

TABLE 6.—Miscellaneous clays sold or used by producers, Greenwood County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	60,000	$45,000	1951	81,500	[1] $81,500
1949	60,000	45,000	1952	69,275	52,956
1950	81,500	61,125			

[1] Estimate.

LANCASTER

Miscellaneous clays were produced at the Van Wyck mine by Ashe Brick Co. Underground and surface mining operations for sericite schist were listed in the Mineral Resources Index of the American Institute of Mining and Metallurgical Engineers, from mines in Lancaster County, but no report on operations there was obtained for 1952.

LAURENS

Vermiculite produced by the Zonolite Co. in Laurens County was combined with other company operations in South Carolina and reported as a unit in Greenville County, where the mill is situated.

LEXINGTON

A 15 percent increase in production of crushed granite used for concrete and road metal, railroad ballast, and stone sand was reported. Sand for a variety of purposes was produced from four commercial operations in Lexington County: Foster Bros., Dixiana Sand Co., Harrison Sand Corp., Southeastern Sand Co., and Southern Silica Mining & Manufacturing Co. Approximately 71 percent of this output was used for building, 19 percent for paving, and the remainder for blast, engine, filter, and unspecified uses.

TABLE 7.—Sand sold or used by producers in Lexington County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	337,007	$155,299	1951	265,852	$116,039
1949	254,086	118,934	1952	240,322	132,431
1950	229,068	112,747			

MARION

Miscellaneous clays used in the manufacture of heavy clay products were produced by J. D. Murchison and by Standard Brick Co.

MARLBORO

Clay for brick making was obtained from the Cheraw mine of Cheraw Brick Works, Inc., and from the Irby mine of Palmetto Brick Co. Total tonnage produced was 9 percent lower than in 1951.

PICKENS

The output of crushed granite in 1952 was sold or used for concrete and road metal and was 7 percent lower than in 1951.

RICHLAND

Four clay operations in Richland County produced fire clay, kaolin, and miscellaneous clays. The overall value of the tonnage reported as sold or used by producers increased 5 percent, whereas the quantity decreased 3 percent compared with 1951. Fire clay production decreased 3 percent compared with 1951 and was the output of 2 producers: Landrum Fire Brick Works, Columbia, and Columbus Pipe Co., Ridgewood. Kaolin produced by Carolina Ceramics, Inc., Pontiac, showed a notable increase over 1951 output and was used in manufacturing refractory products. Miscellaneous clays were produced by Carolina Ceramics, Inc., Columbia Pipe Co., and Guignard Brick Co., Columbia. The total quantity sold or used decreased 7 percent below 1951. Production of crushed granite amounting to 562,000 tons valued at $723,500 was sold or used for concrete and road metal, railroad ballast, riprap, and stone sand and represented an increase of approximately 1 percent in both tonnage and value compared with 1951. The South Carolina State Highway Department produced sand and gravel for paving. The total quantity sold or used increased 35 percent above 1951, and the total value increased 11 percent. A small quantity of miscellaneous stone used for paving was produced by the South Carolina State Highway Department.

TABLE 8.—Mineral production in Richland County, 1948–52, by commodities [1]

Year	Clays		Granite		Sand and gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1948	56,536	$85,144	540,000	$645,000	32,954	$20,119	629,490	$750,263
1949	67,822	68,443	559,288	786,009	(2)	(2)	[3] 627,110	[3] 854,452
1950	113,552	125,687	552,968	718,840	75,542	25,763	742,062	870,290
1951	109,188	144,990	554,000	[4] 717,000	45,799	20,780	708,987	882,770
1952	106,255	151,576	562,000	723,500	61,623	23,631	729,878	898,707

[1] Excludes a small amount of miscellaneous stone (less than 1,000 tons) in 1948–52.
[2] Figure withheld to avoid disclosure of individual company operations.
[3] Incomplete total, excludes sand and gravel 1949.
[4] Estimate.

SPARTANBURG

Sand and gravel, said to have been produced in Spartanburg County, were largely responsible for the marked increase in the tonnages of these commodities reported by commercial operations in the State. The output—approximately 98 percent sand—was sold or used for construction work. The first production of vermiculite from the Woodruff mine of American Vermiculite Co. was reported in 1952; that by Zonolite Co. in Spartanburg County was combined with other company operations in the State and reported as a unit in Greenville County.

YORK

Commercialores, Inc., Clover, continued mining kyanite at Henry Knob mine. The quantity and value of production were unsurpassed in any previous year.

UNDISTRIBUTED

The United States Bureau of Forestry produced 6,500 short tons of pit-run sand valued at $1,250 for use on roads.

VALUE

The value of mineral production shown in the tables is that reported at the mine or plant. Table 9 shows the average unit value of mineral commodities produced in South Carolina, 1948–52.

TABLE 9.—Average unit value of nonmetal mineral commodities produced in South Carolina, 1948–52 [1]

Mineral commodity	1948	1949	1950	1951	1952
Barite, crude—short tons		$8.00	$7.25	$7.28	$7.00
Cement—376-pound barrel		2.42	2.56	2.77	2.75
Clay:					
Fire clay—short ton	$3.66	5.64	1.63	2.61	2.42
Kaolin—do	11.80	12.71	12.91	12.71	12.64
Miscellaneous clays—do	.86	.77	.80	1.00	.93
Clay for cement manufacture (estimate)—do	.50	.50	.75	1.00	1.00
Kyanite—do	33.75	29.76	32.76	37.00	40.00
Gravel—do	1.58	1.33	.34	.45	.79
Sand—do	.49	.47	.51	.43	.86
Stone:					
Granite (dimension)—cubic foot	2.99	2.32	2.78	3.25	3.25
Granite (crushed)—short ton	1.31	1.33	1.30	1.28	1.31
Limestone (crushed)—do	1.44	1.55	1.50	1.49	1.59
Miscellaneous crushed stone—do		.71	.60	.65	.65
Vermiculite—do	10.00	10.00	10.00	10.00	9.87

[1] For greater detail on prices by grades and markets, see Volume I, Minerals Yearbook, 1952.

The Mineral Industry of South Dakota

By Samuel A. Gustavson[1] and D. H. Mullen[2]

DURING 1952 gold, stone, cement, clays (except for use in cement), and sand and gravel, contributed 97 percent of the total value of South Dakota's mineral production. The aggregate value of all other minerals represented 3 percent of the State total. In value, gold has supplied over 50 percent of the State mineral output for many years. Virtually all metallic minerals and most nonmetallic minerals were produced from mines in the Black Hills or adjacent areas in the western part of the State. Exceptions include granite (produced in Grant County in the northeast portion of the State), lignite in the north central portion, and sand and gravel dispersed throughout South Dakota. Figure 1 shows the total value of the mineral output of the State from 1910 through 1952. In 1949 the method of determining the value of the total mineral production was revised to exclude, so far as possible, values of finished or semifinished commodities. The value under this new method was also calculated for 1925 through 1948. Table 1 summarizes output and value of metals, and minerals produced, 1951–52.

TABLE 1.—Mineral production in South Dakota, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate—gross weight	138	$46,007	334	$166,251
Clays (except for cement)	[2] 254,116	[2] 2,917,952	227,934	2,575,783
Coal (lignite)	28,350	99,008		
Feldspar (crude)—long tons	48,559	290,520	40,163	220,954
Gold (recoverable content of ores, etc.)—troy ounces	458,101	16,033,535	482,534	16,888,690
Lead (recoverable content of ores, etc.)	2	692	2	644
Mica:				
Scrap	2,292	42,714	915	24,148
Sheet—pounds			4,308	32,034
Natural gas—thousand cubic feet	7,000	350	6,000	300
Sand and gravel	5,037,384	2,502,340	5,846,140	2,478,314
Silver (recoverable content of ores, etc.)—troy ounces	139,590	126,336	132,102	119,559
Stone (except limestone for cement and lime)	1,263,322	4,660,074	1,671,187	4,806,882
Tungsten concentrate—60-percent WO_3 basis			[3]	335
Undistributed: Cement, columbium-tantalum concentrate, lime, and lithium minerals		2,932,392		3,141,115
Total South Dakota		[2] 29,652,000		30,455,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production.
[2] Revised figure.
[3] Less than 1 ton.

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[2] Commodity-industry analyst, Region V, Bureau of Mines, Minneapolis, Minn.

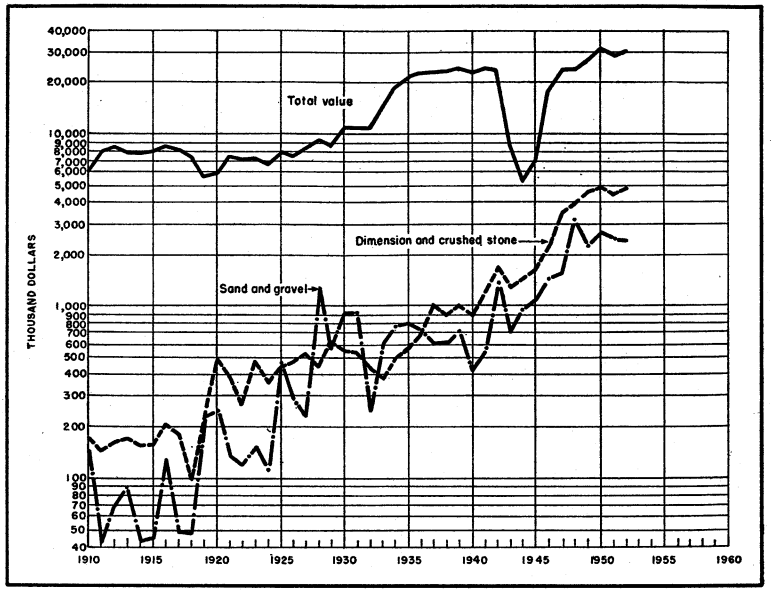

FIGURE 1.—Total value of mineral production in South Dakota, 1910–52.

DEFENSE MINERALS EXPLORATION ADMINISTRATION

In the search for new reserves of strategic and critical minerals, 12 Defense Minerals Exploration Administration (DMEA) contracts in which the Government and the operator jointly contribute to the cost of the work were in effect in South Dakota during 1952. They involved a total advance by the Government through 1952 of $55,901.00. Six contracts were started in 1951 and continued into 1952, but one of these was canceled without the expenditure of Government funds. The DMEA issued certifications of discovery or development on three of the projects during 1952. See table 2 for DMEA contracts in effect in 1952. All involved exploration in the Black Hills.

REVIEW BY MINERAL COMMODITIES

METALS

Ores of gold, silver, columbium-tantalum, beryllium, lead, and tungsten, all from Custer, Lawrence, or Pennington Counties, were produced in South Dakota in 1952. Iron ore for use in manufacturing cement was also produced in Pennington County.

Beryllium—Production of beryl in 1952 rose 142 percent in quantity compared with 1951. Increased activity in pegmatite mining resulted in this greater output. Quantities were sold on the open market and to the GSA purchasing depot at Custer. The Bureau of Mines continued to investigate pegmatite deposits to determine potential reserves, and reserves of beryl in low-grade deposits in the

TABLE 2.—DMEA contracts in effect in South Dakota in 1952

Company or operator	Place	County	Mine	Minerals	Contract date	Work begun	Work completed	Proposed total cost	Actual cost to Government	Government share, percent of total cost	DMEA certifications of discovery or development issued
Keenan Properties	Spearfish	Lawrence	Placer claims on Bear and Potato Creeks.	Tin, tungsten, columbite-tantalite.	July 16, 1951	July 16, 1951	(1)	$100,000	[2]$16,756.24	90	(1)
Black Hills Keystone Corp.	Keystone	Pennington	Sitting Bull, Bob Ingersoll.	Beryl, mica	Aug. 3, 1951	Oct. 1, 1951	Aug. 15, 1952	23,080	5,638.16	90	None.
Lewis Collingwood	Custer	Custer	Number Nine	do	Aug. 24, 1951	Sept. 1951	Dec. 31, 1951	10,000	8,313.60	90	Apr. 16, 1952.
Jack Stewart & Carl Roseberry.	do	Pennington	Gap Lode	do	Oct. 2, 1951	Oct. 15, 1951	Oct. 22, 1952	15,769	[2] 11,811.36	90	(6)
Francis Michaud & Lewis Stratton; E. Whitehead, G. R. Smith, & G. Walker.[3]	Rapid City.	Custer	Mich Lode	Beryl, mica, columbite-tantalite.	Sept. 14, 1951	Oct. 13, 1951	Apr. 10, 1952	8,010	2,499.75	90	None.
Campbell & Ventling.	Custer	do	White Top (Dakota).	Beryl, mica	Jan. 11, 1952	Feb. 5, 1952	Mar. 6, 1952	6,550	1,193.13	90	May 15, 1952.
Walter S. Clifford	do	Pennington	Jumbo	do	Aug. 13, 1951	(4)	(4)	13,499	(4)	90	(4)
Carl L. Wiehe & B. A. Gira.	do	Custer	Tanner Lode	do	Oct. 25, 1951	Apr. 11, 1952	May 2, 1952	6,686	1,008.00	90	None.
L. D. Pitts	do	do	Bruce Lode	Beryl, mica, columbite-tantalite.	Feb. 26, 1952	Apr. 21, 1952	Aug. 16, 1952	5,970	2,707.67	90	None.
Belle Eldridge Gold Mine, Inc.	Deadwood	Lawrence	Belle Eldridge	Zinc, lead	Mar. 11, 1952	June 10, 1952	[7] Dec. 4, 1952	11,600	[2] 2,772.00	50	(6)
Mineral Mills, Inc	Custer	Custer	Glenwood	Mica	June 24, 1952	July 23, 1952	Aug. 23, 1952	1,200	1,038.96	90	Oct. 17, 1952.
L. W. Collingwood et al.	do	do	Dyke No. 2	Beryl, mica, columbite-tantalite	Nov. 6, 1952	Nov. 19, 1952	(5)	5,250	[2] 850.50	90	----------
R. H. McHenry	Buffalo, Wyo.	do	Weige Group placers.	Columbite-tantalite, tin.	Feb. 5, 1952	Apr. 14, 1952	May 18, 1952	3,538	1,311.63	90	None.

[1] Completion date extended to November 1, 1954.
[2] As of December 31, 1952.
[3] Francis Michaud & Louis Stratton, Custer, sold Mich Lode mining claim to Whitehead, Smith & Walker on Jan. 5, 1952. Contract assigned to them March 6, 1952.
[4] Contract canceled March 14, 1952, without cost to the Government.
[5] Continuing.
[6] Undetermined.
[7] Work recessed December 4, 1952. Contract amended to extend completion date.

Black Hills area were estimated to be about 12,000 tons.[3] These reserves consist of 11,824 tons of indicated and inferred reserves and 234 tons of measured reserves. According to the Federal Geological Survey, 2,636 tons of beryl could be recovered by hand sorting. During the year Bureau of Mines metallurgists at Rapid City, S. Dak., and at College Park, Md., continued research to develop a commercial method of recovering beryl as well as all the other minerals of value contained in pegmatites. A progress report on pegmatite investigations from 1939 through June 1951 was published.[4]

Columbium-Tantalum.—Small quantities of columbite-tantalite were recovered from pegmatite dikes in 1952.

Gold, Silver, and Lead.—Six lode mines were active in 1952 and produced 482,534 fine ounces of gold, 132,102 fine ounces of silver, and 2 short tons of lead. The value of the metals produced in 1952 was: Gold, $16,888,690 (an increase of 5 percent over 1951); silver, $119,559 (a decrease of 5 percent from 1951); and lead, $644. Values for gold and silver were calculated at $35 and $0.9050505 per ounce, respectively, for both 1951 and 1952. The average annual price of lead

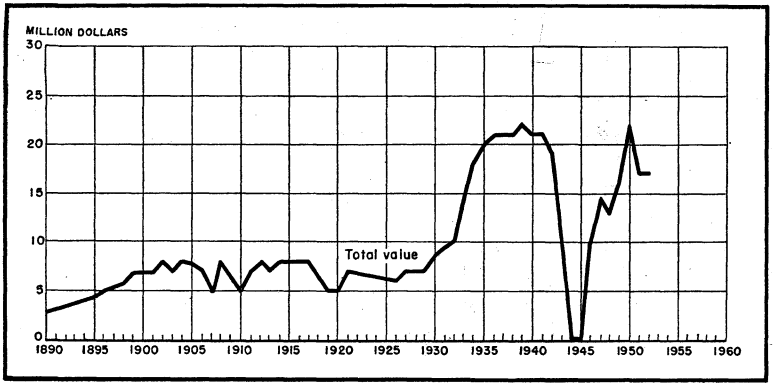

FIGURE 2.—Total value of mine production of gold and silver in South Dakota 1890–1952.

used was $0.161 per pound in 1952 and $0.173 in 1951. Table 3 shows the output of gold, silver, and lead by months, in terms of recoverable metals, and table 4 shows the mine production of gold, silver, copper, lead, and zinc for 1948 through 1952, an average for 1943–47, and the total putput from 1876 through 1952, in terms of recoverable metals.

Details of mining and milling in South Dakota are given in the Review by Counties that follows. Tables (pp. 5–6) 5 and 6 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, which explains the duplication of tonnage in tables 5 and 6.

[3] Tullis, E. L., Beryl Resources of the Black Hills, South Dakota: Bureau of Mines Rept. of Investigations 4855, 1952, 19 pp.

[4] Runke, S. M., Mullen, D. H., and Cunninghan, J. B., Progress Rept. on Pegmatite Investigations in South Dakota for Fiscal Year Ended June 30, 1951: Bureau of Mines Rept. of Investigations 4928, 1952, 46 pp.

TABLE 3.—Mine production of gold, silver, and lead in 1952, by months, in terms of recoverable metals [1]

Month	Gold (fine ounces)	Silver (fine ounces)	Lead (short tons)	Month	Gold (fine ounces)	Silver (fine ounces)	Lead (short tons)
January	37,116	10,182		August	44,174	12,122	
February	34,706	9,806		September	46,034	11,856	
March	35,644	10,744	1	October	40,294	10,506	
April	35,332	11,258		November	42,419	10,977	
May	43,267	11,666		December	38,138	10,447	
June	43,614	11,271					
July	41,796	11,267	1	Total	482,534	132,102	2

[1] Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metal (or gross metal as indicated) contained in concentrates, ores, tailings, and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc, 1943–47 (average), 1948–52, and total, 1876–1952, in terms of recoverable metals [1]

Year	Number of mines		Material sold or treated (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1943–47 (average)			466,294	178,691	$6,254,178	53,296	$43,914
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
1951	5	3	1,166,380	458,101	16,033,535	139,590	126,336
1952	6		1,324,817	482,534	16,888,690	132,102	119,559
1876–1952			[2]	23,804,626	614,759,119	10,417,526	7,560,302

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1943–47 (average)	[3]	$54	17	$2,779	24	$5,400	$6,306,385
1948			16	5,728	29	7,714	13,323,894
1949			4	1,264			16,363,011
1950							20,008,436
1951			2	692			16,160,563
1952			2	644			17,008,893
1876–1952	106	36,466	487	69,132	265	56,406	622,481,425

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings or slimes re-treated, 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.
[3] Less than 1 ton.

TABLE 5.—Gold and silver bullion produced at mills by amalgamation, 1943–47 (average) and 1948–52

Year	Material sold or treated (short tons)	Gold in bullion (fine ounces)	Silver in bullion (fine ounces)	Year	Material sold or treated (short tons)	Gold in bullion (fine ounces)	Silver in bullion (fine ounces)
1943–47 (average)	424,847	112,958	21,690	1950	1,265,118	389,473	111,080
1948	896,932	250,782	72,100	1951	1,046,305	317,593	62,685
1949	1,112,193	312,676	83,538	1952	1,209,926	328,844	64,584

TABLE 6.—Gold and silver bullion produced at mills by cyanidation, 1943–47 (average) and 1948–52

Year	Material treated (short tons)			Gold in bullion (fine ounces)	Silver in bullion (fine ounces)
	Crude ore	Sands and slimes	Total		
1943–47 (average)	39,655	409,560	449,215	63,388	29,771
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
1951	120,051	1,045,384	1,165,435	140,493	76,436
1952	114,863	1,209,884	1,324,747	153,690	67,183

Iron.—The only iron ore mined in South Dakota was for use in the State cement plant at Rapid City. The ore is mined from a deposit near Nemo in the pre-Cambrian sediments. It is a hematite ore containing about 55 percent Fe_2O_3 or 38.5 percent iron.

Tin.—Small quantities of tin are produced in the course of mining of pegmatites in the Black Hills area; however, no output of tin has been reported since 1949.

Tungsten.—A small quantity of tungsten ore was mined in Lawrence County. Concentrates amounting to 180 pounds and containing 120 pounds of tungstic oxide (WO_3) were sold in 1952.

Uranium.—The Bureau of Mines is not at liberty to publish production or value data on uranium. A brief review of activities in South Dakota may be found in Review by Counties under Fall River County (p. 12).

In cooperation with the Atomic Energy Commission, the Bureau of Mines conducted two drilling projects in South Dakota during 1952. The Edgemont carnotite drilling project in Fall River County, begun October 16 and completed November 21, 1952, involved drilling 7 holes totaling 4,477 feet at an expense to the Government of $24,491.79. The Slim Buttes uraniferous lignite drilling project in Harding County was begun on October 13 and continued into 1953.

NONMETALS

Cement.—The production of cement in South Dakota continued at the State-owned plant at Rapid City, Pennington County. This is the only plant in the State, and the distribution area extends into Iowa, North Dakota, Montana, Minnesota, Nebraska, Wyoming, and Canada.

Shipments in 1951 exceeded those of 1950 by 27,567 barrels, and shipments in 1952 exceeded those of 1951 by 88,050 barrels. The raw material is limestone and shale mined near the plant in Pennington County. Gypsum, sand, and iron ore, produced locally, are added to the mix to produce various types of cement. A small quantity of air-entrained cement also is produced. The average value per barrel for cement in 1952 was $2.58 and in 1951 $2.56.

Clays.—Clays produced and processed in South Dakota are confined to shales for cement, heavy clay products, and lightweight aggregates and bentonite.

Shale is mined near Rapid City, Pennington County, for the manufacture of cement and lightweight aggregates. Shale from the Fuson

formation is mined south of Belle Fourche by the Black Hills Clay Products Co. in Butte County for building brick and drain tile.

Bentonite has been produced near Belle Fourche in Butte County for probably 50 years. Processing plants of the American Colloid Co. and the Eastern Clay Products Department of International Minerals & Chemical Corp. are located at Belle Fourche. During 1952 nearly all mining in South Dakota was suspended, and material for processing was obtained from pits in Wyoming. It has been estimated that reserves of 30 million tons of crude bentonite are available in Wyoming in the area served by the Belle Fourche mills. The excessive overburden of the South Dakota deposits was a primary reason for the decline of mining operations within the State. The Refinite Corp. has produced nonswelling bentonite from a pit at Ardmore in Fall River County, but no production was recorded in 1952.

Feldspar.—Crude feldspar output in 1952 decreased 17 percent in quantity and 24 percent in value compared with 1951. Sixteen operators reported production from deposits in Custer and Pennington Counties, with the major portion coming from Custer County. In 1952 International Minerals & Chemical Corp. acquired Consolidated Feldspar Corp., the largest feldspar producer in the State. Other important crude producers were Hough & Patterson and Abingdon Potteries, Inc. Two grinding plants owned by Consolidated Feldspar Department of International Minerals & Chemical Corp. ground crude feldspar obtained from captive mines and purchased from local crude producers. Output of these plants was purchased mainly by the pottery, glass, and enamel industries. All crude feldspar produced by Abingdon Potteries, Inc., was shipped to its grinding plant at Abingdon, Ill., for processing.

Gem Stones.—No production of precious or semiprecious gem stones was reported in 1952. Scott's Rose Quartz Co. produced about 10 tons of feldspar from the Rose mine in Custer County in 1952. There was no production of rose quartz. The company sells rose quartz, feldspar, mica, and other minerals as specimens, chiefly to tourists. The value of these sales is included with that of the subject mineral.

Agate and chalcedonic quartz are found in the Black Hills and Bad Lands. Data on sales are not available.

Gypsum.—The production of gypsum in 1952 was limited to that used by the South Dakota State cement plant at Rapid City, Pennington County. It is mined about 2 miles north of Rapid City from a deposit in the Spearfish formation, of Triassic age. There have been no other gypsum operations in the State since 1948. The annual production is 6,000 to 10,000 tons. The value of this output is reflected in the value of the cement produced.

Lime.—Lime is produced by the Black Hills Lime Co. at Pringle, Custer County. The entire production is consumed within the State for metallurgical purposes.

Lithium.—Spodumene concentrates were produced in the Black Hills area in 1952. Lithium Corp. of America operated mines in Custer and Pennington Counties; Maywood Chemical Works and Holy Terror Gold Mining Co. in Pennington County; and Black

Hills Tin Mining Co. in Lawrence County. A report on the recovery of lithium from spodumene-amblygonite ores was published.[5]

Mica.—Production of sheet mica was resumed in 1952 as a result of Government purchasing for the National Stockpile. Six crude producers sold full-trimmed muscovite block and 19 sold hand-cobbed mica to the General Services Administration depot at Custer. Table 7 gives data on sheet-mica production from 1948–52.

Scrap-mica production decreased 60 percent in quantity in 1952 compared with 1951, as shown in table 7. Output was reported by seven operators, principally from mines in Pennington County. Scrap mica was purchased by various firms, chiefly those selling to manufacturers of roofing materials.

TABLE 7.—Mica sold or used by producers, 1948–52

	1948	1949	1950	1951	1952
Sheet mica:					
Uncut, punch and circle:					
Pounds		7,206	12,560		
Value		$846	$1,375		
Average per pound		$0.12	$0.11		
Uncut, larger than punch and circle:					
Pounds		1,161	458		[1] 490
Value		$2,542	$309		$6,580
Average per pound		$2.19	$0.67		$13.43
From hand-cobbed mica:					
Pounds					[1] 3,818
Value					$25,454
Average per pound					$6.67
Total:					
Pounds		8,367	13,018		4,308
Value		$3,388	$1,684		$32,034
Average per pound		$0.40	$0.13		$7.44
Scrap mica: Total					
Short tons	988	1,125	1,902	2,292	915
Value	$28,515	$31,285	$24,989	$42,714	$24,148
Average per ton	$28.86	$27.81	$13.14	$18.64	$26.39
Total sheet and scrap mica:					
Short tons	988	1,129	1,909	2,292	917
Value	$28,515	$34,673	$26,673	$42,714	$56,182

[1] Sold to GSA. Sheet mica from hand-cobbed mica was estimated to be 4½ percent of the total hand-cobbed mica purchased by GSA. This is the minimum GSA specification.

Sand and Gravel.—Sand and gravel deposits are widespread throughout the State. Production is from permanent plants on substantial deposits and from numerous small fixed and mobile plants that produce from deposits near points of consumption.

The major uses are building construction and roads. Major construction projects, such as the Ellsworth Air Force Base near Rapid City and other Government construction projects, require large quantities of material. Transportation is chiefly by truck, with some by rail. The availability of material near major construction projects leads to the primary use of truck transportation.

Table 8 shows the major categories of use of the sand and gravel produced in South Dakota in 1951–52.

Commercial sand and gravel companies in the State producing over 100,000 tons of material in 1952 were: Ed Birdsall Sand Co., Rapid City; Myrl Clark, Tyndall; Concrete Materials Co., Sioux Falls, Iowa; G. H. Lindekugel & Sons, Mitchell; and Dean Rounds, Rapid City.

[5] Kalenowski, L. H., and Runke, S. M., Recovery of Lithium From Spodumene-Amblygonite Mixtures: Bureau of Mines Rept. of Investigations 4863, 1952, 5 pp.

TABLE 8.—Sand and gravel sold or used by producers, 1951–52, by classes of operation and uses

	1951			1952		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Building	379,963	$321,871	$0.85	315,915	$265,679	$0.84
Paving	373,594	391,971	1.05	177,795	151,328	.85
Railroad ballast	2,842	2,558	.90	(1)	(1)	(1)
Other	3,067	3,067	1.00			
Gravel:						
Building	32,125	32,830	1.02	(1)	(1)	(1)
Paving	1,086,851	750,363	.69	1,678,657	928,403	.55
Railroad ballast	66,844	27,488	.41	76,995	39,099	.51
Other	1,515	260	.17	1,941	920	.47
Undistributed [1]				43,115	45,615	1.06
Total commercial sand and gravel	1,946,801	1,530,408	.79	2,294,418	1,431,044	.62
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building	1,084	5,990	5.53	140,150	50,147	.36
Paving	303,541	138,022	.45	182,747	128,258	.70
Gravel:						
Building	84,883	15,006	.18	78,265	4,801	.06
Paving	2,701,075	812,914	.30	3,150,560	864,064	.27
Total Government-and-contractor sand and gravel	3,090,583	971,932	.31	3,551,722	1,047,270	.29

[1] Figures that may not be shown separately are combined as "Undistributed."

Stone.—Dimension stone is quarried extensively in Grant County. A variety of brown and red granite is in demand for monuments and other decorative purposes. Rough and finished pieces are shipped throughout the United States. A list of producers of dimension stone is given under Grant County in Review by Counties (p. 13).

Crushed limestone is used extensively as road metal, for the manufacture of cement building blocks, and as a concrete aggregate in the western part of the State. Two quarries in Pennington County and one each in Custer and Lawrence Counties were operated continuously. Limestone is quarried by the State near Rapid City. Plants used to produce crushed stone for road materials are usually portable and are moved to the closest available source of material to reduce haulage costs to a minimum. The cost of hauling frequently is the deciding factor in successful bidding for the work.

Miscellaneous stone is produced at various places for local uses according to demand, the primary use being for road construction.

MINERAL FUELS

Lignite.—Lignite occurs extensively in the northwestern counties of South Dakota. Recoverable reserves in South Dakota, assuming 50-percent recovery, have been estimated by the Federal Geological Survey at 509,079,000 tons.[6]

[6] Averitt, Paul, and Berryhill, Louise R., Coal Resources of the United States, a Progress Report, November 1, 1950: Geol. Survey Circ. 94, 1950, 33 pp.

The only operation that can be considered commercial is the "strip" mine of the Dewey County Coal Co. at Firesteel in Dewey County; the company employed an average of nine men in 1952. Other deposits in Dewey, Corson, Perkins, and Harding Counties are operated intermittently by individuals for local consumption.

The thickness of bituminous-coal and lignite seams in the United States was reported.[7]

The data in the present report, as in those published for many years by the Bureau of Mines, relate only to bituminous and lignite 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.

Natural Gas.—Production of natural gas continued near Pierre in Hughes County. This gas is an accumulation of methane derived from organic material trapped in the glacial drift. Shallow wells produced about 6 million cubic feet in 1952, which was consumed locally. A review of natural-gas statistics was published,[8] showing production and consumption of natural gas for each State for 1936–50.

Petroleum.—The search for oil in South Dakota was greatly accelerated during 1952. Fourteen test wells were drilled, all in western and northwestern counties. All but one were abandoned as dry holes. One well—the Kucera-Coffing No. 1 near Dewey in western Custer County and 9 miles east of the Wyoming State line—produced about 1 barrel an hour from the Minnelusa sand, of Lower Cretaceous age. The depth of the well was 1,376 feet, and attempts to loosen the sand with dynamite caved the well and stopped the flow. It was in this area that the Beecher No. 1 well produced oil in 1929, but, because of the low price of crude at that time, it could not operate economically. The South Dakota State geologist estimated the field to be about 1 square mile in area.

Other locations extend from Pennington County east of Rapid City north and northwestward through Harding County. This area is on the southern and southwestern edge of the Williston Basin, the productive structure of North Dakota and eastern Montana.

It has been estimated that, during the past 3 years, nearly 19 million dollars has been spent in exploration.

REVIEW BY COUNTIES

BUTTE

The mineral output in Butte County was limited to bentonite, miscellaneous clays, and sand and gravel. The production of bentonite in South Dakota has declined considerably but the American Colloid Co. and Eastern Clay Products Department of International Minerals & Chemical Corp. operated processing plants at Belle Fourche. The

[7] Young, W. H., and Anderson, R. L., Thickness of Bituminous-Coal and Lignite Seams at All Mines and Thickness of Overburden at Strip Mines in the United States in 1950: Bureau of Mines Inf. Circ. 7642 1952, 18 pp.

[8] Colby, D. S., and Oppegard, B. E., Natural-Gas Statistics, 1936–50: Bureau of Mines Inf. Circ. 7644, 1952, 35 pp.

major portion of the material processed is produced in Wyoming. Only American Colloid Co. produced bentonite from South Dakota deposits in 1952. Black Hills Clay Products Co. produced heavy clay products from locally mined shale.

Butte County Highway Department produced sand and gravel for road construction.

CUSTER

Activities in Custer County in 1952 were chiefly in pegmatite mining, with feldspar, beryl, columbite-tantalite, mica, and lithium minerals were produced. Feldspar was the major product. Abingdon Potteries produced from the Abindgon mine for its own use. The Consolidated Feldspar Department of International Minerals & Chemical Corp. produced feldspar and beryl from its own and leased properties and operated a grinding mill at Custer. A substantial portion of the crude feldspar used was purchased from small operators.

TABLE 9.—Value of mineral production in South Dakota, by counties, 1951–52

County	1951	1952	Minerals produced in 1952, in order of value
Bon Homme	$125,191	$212,969	Sand and gravel.
Brown	6,409	14,255	Do.
Butte	3,034,251	2,599,468	Clay, stone, sand and gravel.
Charles Mix	----------	5,000	Sand and gravel.
Clark	5,999	54,592	Do.
Custer	493,080	254,799	Feldspar, beryl, mica, lime, lithium.
Day	67,974	62,152	Sand and gravel.
Douglas	9,514	9,709	Do.
Fall River	44,868	39,604	Do.
Grant	2,716,989	2,470,299	Stone, sand and gravel.
Gregory	61,777	28,069	Sand and gravel.
Hand	1,630	2,279	Do.
Hanson	575,321	416,768	Stone, sand and gravel.
Jerauld	21,725	14,225	Sand and gravel.
Lawrence	16,269,801	17,112,759	Gold, silver, stone, lithium, sand and gravel, tungsten.
Lincoln	15,767	40,175	Sand and gravel.
McPherson	1,635	2,600	Do.
Minnehaha	728,142	1,404,857	Stone, sand and gravel.
Pennington	3,693,673	4,091,968	Cement, stone, lithium, sand and gravel, feldspar, beryl, mica.
Union	2,375	31,391	Sand and gravel.
Undistributed [1]	1,775,879	1,587,062	
Total	29,652,000	30,455,000	

[1] Includes production or value of sand and gravel and additional minerals in parentheses, output which the Bureau of Mines is not at liberty to publish for the following counties: Aurora, Beadle, Brookings, Brule, Campbell (1951), Clay, Codington, Corson (coal only, 1951), Davison (1951), Deuel, Dewey (coal only, 1951), Faulk (1951), Hamlin, Hughes (stone, 1952, natural gas), Hutchinson, Hyde, Jackson, Kingsbury, Lake, McCook (stone, 1952), Marshall, Meade (1951), Miner, Moody (stone, 1951), Roberts, Spink, Sully, Turner, and Walworth.

No production was reported from the following counties in either 1951 or 1952: Armstrong, Bennett, Buffalo, Edmunds, Haakon, Harding, Jones, Potter, Sanborn, Shannon, Todd, Tripp, Washabaugh, Washington, Yankton and Ziebach.

The establishment by General Services Administration of a depot at Custer in June 1952 for the purchase of block and hand-cobbed mica, beryl, and columbite-tantalite was a major factor in increased production of those minerals. The depot provided a local outlet for small operators who otherwise would have difficulty in marketing. Numerous long-idle pegmatites were reopened. Many small operators confined their activities to those portions of the dikes that contained mica and beryl but little marketable feldspar. Consequently the operations did not materially increase the production of feldspar.

Lithium Corp. of America, Inc., produced a substantial quantity of spodumene from the Beecher No. 2 and Longview claims south of Custer. George Bland operated the Beecher and Black Diamond mines and produced a substantial quantity of beryl. He shipped about 92 tons averaging 8 percent BeO.

John Ross, owner of the Highland Lode near Custer, obtained long-term leases on other properties and through the assistance of an RFC loan built a mechanical sorting plant. Operations were confined to the Highland Lode and have demonstrated the feasibility of sorting pegmatite minerals from a moving belt with no hand cobbing.

The Black Hills Lime Co. at Pringle produced quicklime, all of which was consumed in the State for metallurgical purposes.

The Custer County Highway Department produced sand and gravel for road construction.

DEWEY

Mineral production in Dewey County was limited to lignite by the Dewey County Coal Co. at Firesteel and the Keller mine at Isabel. The Dewey County Coal Co. furnished the major portion of the output. Because of its low heating value, lignite has limited distribution, and the consumption area is generally confined to about a 50-mile radius from the mines.

FALL RIVER

The discovery of uranium-bearing material near Edgemont in 1951 resulted in widespread prospecting in the area. Several hundred claims were located and recorded. Several large companies, such as the United States Vanadium Corp. and the Homestake Gold Mining Co., acquired options or leases on blocks of claims and began extensive exploration. Numerous smaller companies and individuals conducted explorations. The Atomic Energy Commission established a suboffice of its Raw Materials Division in Hot Springs and began a systematic investigation of the area. Investigations consisted of surface and airborne Geiger- and scintillation-counter surveys and core and long-hole drilling at selected locations. Maps showing the location of anomalies were published monthly and placed in open file at several Government offices.

A purchase depot was established at Edgemont by the American Smelting & Refining Co. under a contract with the Atomic Energy Commission. The first shipments were received in December 1952. Previous shipments (the first of which was made by Ray Chord in January 1952), had been trucked to Salt Lake City, Utah, and Rifle, Colo. Several promising developments resulted, some of them from exploring anomalies revealed by airborne surveys. The production figures and grade of the material mined have not been released by the Atomic Energy Commission, and no value for uranium is included in this report.

Sand and gravel were produced by the Fall River Sand & Gravel Co. at Hot Springs and the Reitz & Crites Sand Co. at Oral. The Chicago & Northwestern Railroad Co. produced sand and gravel for its own use.

GRANT

Quarries in Milbank and Big Stone City produced granite for monumental and other decorative purposes. It is marketed as Dakota Mahogany, American Beauty Mahogany, Imperial Mahogany, American Rose, Melrose Russet and Royal Purple. Distribution of the stone, both rough and finished, is widespread. All granite produced for monuments or building purposes was produced in Grant County, except for a very small output in Hughes County by S. T. Jacobs from a quarry near Pierre. Producing companies in Grant County were: Cold Spring Granite Co., Cold Spring, Minn.; Consolidated Quarries, Inc., Sauk Rapids, Minn.; Dakota Granite Co., Milbank, S. Dak.; Delano Granite Works, Inc., Delano, Minn.; Robert Hunter Granite Co., Inc., Milbank, S. Dak.; Melrose Granite Co., St. Cloud, Minn.; North Star Granite Corp., St. Cloud, Minn.; and Steiner-Rausch Granite Co., Inc., Ortonville, Minn. Several of these companies also have quarries in Minnesota. Some have nationwide sales organization. Sand and gravel for road construction were produced by the county and by private operators.

HUGHES

A few tons of granite for monuments was produced by S. T. Jacobs from a quarry near Pierre.

Natural gas was produced in Hughes County from shallow wells. The gas, mostly methane, is derived from organic material trapped in the glacial drift. The gas, which has been produced for a considerable period of years, is used in Pierre for cooking and heating.

LAWRENCE

Gold and silver were the principal mineral products of Lawrence County and together furnished 56 percent of the total value of all minerals produced in the State in 1952 (excluding uranium).

November 5, 1952, marked the 75th year of operation by the Homestake Mining Co. as a corporation. The following data are extracted from the annual report of the general manager of the Homestake Mining Co. for the year ended December 31, 1952:

> On November 5, 1952, the Homestake Mining Company completed its seventy-fifth year as a corporation. From the start of operations under the truly pioneer conditions that prevailed in the Black Hills of Dakota Territory in 1877, production of gold has been almost continuous and profits have been earned annually since 1878, except during the last war period when the mine was shut down for thirty-three months by order of a Government agency. The record of the enterprise over this long span of years is one in which we can take just pride not only for its technical aspects and for the financial return to stockholders, but also for the benefits that it has been possible to provide for the employees and the community through early adoption of fair wage rates and hourly schedules, and through provision of hospital service and pensions well in advance of such policies in other less tranquil mining districts of the country.
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> At the close of 1952, around 81,000,000 tons of ore had been mined, including 6,000,000 tons from adjacent properties prior to their consolidation with the Homestake Company. The bullion records from 1878 through 1952 show a total production of 20,651,806 ounces of gold and 4,990,000 ounces of silver from the tonnage milled in this period. This quantity of gold—some 708 tons—could be stored in a cubical vault about 10.6 feet on a side, whereas the ore from which

it was won would fill a cube close to 950 feet high if in one solid block. With this output to its credit, the Homestake stands in first place among the gold mines of the continent.

* * *

The output of bullion in 1952, as you will note from the statements that accompany this report, was valued at $16,379,986.02, an increase of $893,303.92 over the previous year which is to be attributed to the larger tonnage mined in 1952. Grade of ore treated declined to a figure closer to that of the ore reserves, as was anticipated. This, together with a wage increase that became effective in the beginning of the year, resulted in somewhat lower earnings, viz., $4,248,377 before depletion in comparison with $4,450,731 in 1951.

* * *

Ore mined in 1952 was 1,209,884 tons which compares with 1,046,203 tons in 1951. Bullion with value of $16,379,986.02 was produced. This is $893,303.92 more than in 1951. Average realization was $13.54 per ton and metallurgical recovery was 96.80 per cent. This compares with $14.80 per ton and 96.79 per cent in 1951.

Ore production was 163,681 tons more than in 1951. The year began with a material shortage of men in the mine department with resultant low production in the first quarter. On January first this department had 707 men from which there was a steady increase to a total of 908 men at the end of the year. In March the work week was increased from 42 to 48 hours. This, together with the achievement of a number of improvements in equipment and methods which had been under study for some time, resulted in a material increase in production. The third quarter had the largest output of any quarter since resumption of operations after the war. During the fourth quarter tonnage was limited by the capacity of the mill which was reduced because of changes that are under way in the grinding section. Tons of ore milled in each quarter of 1951 and 1952 are as follows:

	Tons	
	1951	*1952*
1st Quarter	291, 680	244, 536
2d Quarter	284, 885	303, 739
3d Quarter	242, 657	333, 524
4th Quarter	226, 981	328, 085
Year	1, 046, 203	1, 209, 884

With increased output during the last three quarters of the year the operating costs per ton ore were held substantially equal with the preceding year. There was a slight increase in total operating cost and a decrease in the per ton cost of local and state taxes and contributions to the Pension Trust. Total expense per ton of ore, exclusive of taxes and contributions to the Pension Trust, was 1.47 per cent higher than in 1951. With inclusion of taxes (except Federal income) and the Pension Trust cost, the 1952 cost was 2.08 per cent lower than in 1951 but 72.81 per cent higher than in 1941.

Broken ore in shrinkage stopes increased from 438,600 tons on December 31, 1951 to 635,000 tons at the end of 1952. The reserve of developed ore, including broken ore, is 19,256,000 tons as compared with 20,501,000 tons at the end of 1951. The decrease in the reserve of developed ore results in part from the fact that certain areas under development yielded less ore than had been expected and in part from recalculation of tonnages in certain areas estimated some years ago with elimination of low grade portions because of higher costs.

The mine and plant were well maintained and are in excellent condition. Remodelling of the Ross crusher plant was completed in early April. All bins were emptied, cleaned and repaired. By the end of the month all ore delivered to the mill was crushed to minus one-half inch. Remodelling of the grinding section of the South Mill was begun and one unit was nearly complete at the end of the year. Completion of the three new units and the final elimination of all stamps is scheduled for the end of August.

A number of changes in equipment and methods in the mine were achieved in 1952. The major one was the complete change to lighter drilling equipment with tungsten carbide bits in all stopes. This, together with changes in method and the increase in hours worked per week, resulted in a material increase in output.

Table 10 presents salient operating data for the Homestake mine for 1948–52.

TABLE 10.—Ore milled, receipts, and dividends, Homestake mine, 1948–52 [1]

Year	Ore milled (short tons)	Receipts for bullion product		Dividends
		Total	Per ton	
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
1951	1,046,203	15,486,682.10	14.8028	4,319,952
1952	1,209,884	16,379,986.02	13.5385	3,717,168

[1] From 1876 to 1952, inclusive, this mine yielded bullion and concentrates that brought a net return of $545,243,867 and paid $178,739,434 in dividends.

The Bald Mountain Mining Co. operated its Portland, Dakota, and Clinton groups of mines (classed as one mine) and 370-ton all-sliming cyanide mill continuously during the year.

Ray Coppo shipped a small quantity of silver-lead ore from the Silver Queen dump. During 1952 a DMEA contract with Belle Eldridge Gold Mines, Inc., for lead exploration was approved. Total amount of the contract was $11,600, of which the Government advanced $5,800.

The Black Hills Tin Mining Co. resumed operations at its plant at Tinton. The mill was built in 1943 with Federal funds, following destruction of the original mill by fire in 1942, to produce columbite-tantalite and spodumene concentrates. A feldspar-grinding unit was installed in 1947. Alterations necessary to resume operations included the addition of a deslimer and a mineral jig. Material was mined from the open pit at the Tantalum Hill mine on the Giant Volney dike that had produced considerable columbite-tantalite and spodumene in previous operations.

A small quantity of tungsten concentrates was produced by Ray Coppo.

The Lawrence County Highway Department produced sand and gravel for road construction, and the Cole Construction Co. produced crushed rock for the same purpose.

PENNINGTON

The Consolidated Feldspar Department of International Minerals & Chemical Corp. operated the Hugo mine and the grinding plant at Keystone. Much of the crude material used was purchased from small producers. The company also produced scrap mica and beryl. The Black Hills Keystone Corp. produced beryl and amblygonite from the Bob Ingersoll mine. Keystone Feldspar & Chemical Co. operated the Peerless mine producing scrap mica, beryl, and some feldspar. Hough & Patterson, lessees, produced feldspar and beryl from the Big Chief, and Baldwin Sagdaline operated the White Cap, producing feldspar and beryl. Other operators worked various pegmatite dikes and produced feldspar, mica, and beryl which were sold locally.

Maywood Chemical Works operated the Etta mine at Keystone, and produced spodumene for its own use. Lithium Corp. of America, Inc., completed a flotation plant at Hill City in April 1952 and began producing spodumene concentrates from the Mateen mine at Hill City and the Beecher No. 2 south of Custer. Operation of the heavy-medium plant at the Edison mine near Keystone was discontinued. Some tailings from the heavy-medium plant were hauled to Hill City for reconcentration in the flotation plant. A well-equipped chemical laboratory is maintained for control of the product.

George Flavin, of the Holy Terror Gold Mining Co., began alterations of the Holy Terror cyanide mill at Keystone to produce spodumene concentrates by flotation. Feed to the mill was to be from the Etta dump.

Iron ore is produced from a mine near Nemo by the Nemo Ore Co., owned and operated by Pete Lien & Sons of Rapid City. The ore is hematite containing about 39 percent Fe. All output is used at Rapid City in manufacturing cement.

Lightweight Aggregates, Inc., Rapid City, built a plant to bloat shales in a rotary kiln for use as lightweight aggregate. Shale for the operation is mined from the Pierre formation east of Rapid City. The material is being used principally as an aggregate in cement building blocks.

Hills Materials Co. and Pete Lien & Sons operated limestone quarries to produce crushed limestone for use as road metal and aggregate for concrete and concrete building blocks.

Sand and gravel were produced by the Ed Birdsall Sand Co. and Northwestern Engineering Co., both of Rapid City, and Richard H. Christie at Wasta for road construction and building purposes. The Pennington County Highway Department and the National Park Service produced sand and gravel in Pennington County for road construction and repairs.

Other Counties.—Other counties in South Dakota not previously mentioned produced sand and gravel according to local needs. Production was reported by commercial and/or noncommercial operators in the following counties:

Aurora	Corson	Jerauld	Minnehaha
Beadle	Day	Kingsbury	Moody
Bon Homme	Deuel	Lake	Perkins
Brookings	Douglas	Lincoln	Roberts
Brown	Gregory	Lyman	Spink
Brule	Hand	McCook	Stanley
Charles Mix	Hanson	McPherson	Sully
Clark	Hutchinson	Marshall	Turner
Clay	Hyde	Mellette	Union
Codington	Jackson	Miner	Walworth

The South Dakota State Highway Department produced sand and gravel from numerous counties for State highway construction.

The Mineral Industry of Tennessee

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Tennessee.

By Robert W. Metcalf[1] and William D. Hardeman, Jr.[2]

PACED by record outputs of cement, phosphate rock, sand, gravel, and stone, the value of mineral production in Tennessee in 1952 topped $100 million for the first time, reaching $100,509,000, or slightly above the 1951 figure of $99,853,000 and 7 percent higher than the value recorded for 1948, the next highest year. Tennessee in recent years has ranked from 23d to 26th, in order of value of output, among the States and has consistently, over a long period, held first place in the production of pyrites and second place in phosphate rock sold or used.

TABLE 1.—Mineral production in Tennessee, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement—376-pound barrels	7,162,841	$17,203,080	7,428,604	$17,834,060
Clays (including fuller's earth) [2]	820,835	2,956,759	702,393	3,179,297
Coal	5,400,946	26,956,174	5,264,954	25,559,740
Copper (recoverable content of ores, etc.)	7,069	3,421,396	7,638	3,696,792
Fluorspar (synthetic)	140	(3)	348	(3)
Gold (recoverable content of ores, etc.)—troy ounces	108	3,780	241	8,435
Iron ore (usable)—long tons, gross weight	35,908	142,447	(3)	(3)
Lead (recoverable content of ores, etc.)	14	4,844	18	5,796
Lime (open-market)	108,970	1,097,874	100,189	1,005,235
Manganese ore (35 percent or more Mn)—gross weight			126	(3)
Natural gas—thousand cubic feet	132,000	12,000	107,000	11,000
Petroleum (crude)—42-gallon barrels	14,000	(3)	[4] 15,000	(3)
Phosphate rock—long tons	1,419,892	10,604,638	1,452,508	10,874,760
Sand and gravel	4,645,041	5,186,617	5,173,401	5,303,321
Silver (recoverable content of ores, etc.)—troy ounces	24,960	22,590	57,569	52,103
Stone (except limestone for cement and lime)	[5] 8,838,796	[5] 14,765,988	10,377,320	17,652,763
Zinc (recoverable content of ores, etc.)	38,639	14,064,596	38,020	12,622,640
Undistributed: Barite, pyrites, stone (dimension sandstone 1951), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		3,410,384		2,703,245
Total Tennessee		99,853,000		100,509,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels and pyrites are strictly production.
[2] Except clays sold or used for cement.
[3] Value included with "Undistributed."
[4] Final figure. Supersedes preliminary figure given in commodity chapter.
[5] Excludes certain stone, value for which is included with "Undistributed."

Five mineral commodities have dominated the mineral industries in Tennessee—coal, cement, stone, zinc, and phosphate rock—with coal the mineral of chief tonnage and value. These 5 commodities together in the past 5 years have constituted 83 to 85 percent of the

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[2] Director, Division of Geology, Department of Conservation, Nashville, Tenn.

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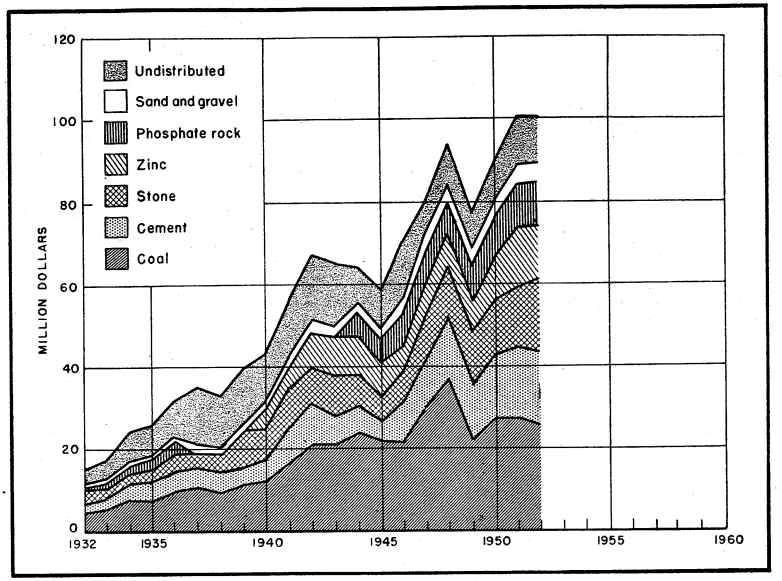

FIGURE 1.—Total value of mineral production in Tennessee, 1932–52.

TABLE 2.—Average value per unit of minerals sold in 1948–52 [1] [2]

Mineral	Unit used	1948	1949	1950	1951	1952
Barite (crude)	Short ton	$10.65	$10.24	$10.44	$12.82	$12.95
Cement	376-pound bbl.	2.02	2.15	2.20	2.40	2.40
Clays						
Ball clay	Short ton	10.95	12.55	12.09	9.18	12.98
Fire clay	do	5.79	4.93	8.88	9.51	9.57
Fuller's earth	do	14.36	13.30	14.90	14.19	13.81
Miscellaneous	do	.85	.71	.72	1.00	1.00
Coal	do	5.74	5.25	5.40	4.99	4.85
Copper (recoverable content of ores) [3]	Pound	.22	.20	.21	.24	.24
Fluorspar (synthetic)	Short ton				(4)	(4)
Gold (recoverable content of ores) [5]	Fine ounce	35.00	35.00	35.00	35.00	35.00
Iron ore (usable)	Long ton				3.97	5.91
Lead (recoverable content of ores) [3]	Pound	.18	.16	.14	.17	.16
Lime (open-market)	Short ton	8.85	9.47	9.75	10.08	10.03
Manganese ore (35 percent or more Mn), gross weight.	do	(4)	(4)	(4)	-------	(4)
Natural gas	1,000 cubic ft.	.09	.10	.10	.09	.10
Petroleum	42-gallon bbl.	(4)	(4)	(4)	(4)	(4)
Phosphate rock	Long ton	6.30	6.74	7.24	7.47	7.49
Pyrites, gross weight	do	(4)	(4)	(4)	(4)	(4)
Quartz	Short ton	12.50				
Sand and gravel	do	1.09	1.00	1.06	1.12	1.03
Silver (recoverable content of ores) [6]	Fine ounce	.905+	.905+	.905+	.905+	.905+
Stone	Short ton	1.61	1.71	1.73	1.67	1.70
Limestone	do	1.27	1.23	1.27	1.27	1.25
Marble	do	39.03	58.20	53.05	60.15	68.34
Sandstone	do	3.90	3.32	20.86	(4)	18.10
Zinc (recoverable content of ores) [3]	Pound	.13	.12	.14	.18	.17

[1] For greater detail on prices by grades and markets, see Vol. I, Minerals Yearbook, 1952.
[2] Average value f. o. b. mines or mills reported by producers except as noted.
[3] Yearly average weighted price of all grades of primary metal sold by producers.
[4] Bureau of Mines not at liberty to publish.
[5] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[6] Treasury buying price for newly mined silver July 1, 1946 to date—$0.9050505.

total value of the mineral output of Tennessee. The production of some 15 other mineral commodities comprises the balance of the State output. Although not bulking large from a national standpoint, small quantities of petroleum and natural gas, also produced in Tennessee, fill important local needs.

No Federal aid was rendered to the mineral industries of Tennessee in 1952 under the Defense Minerals Exploration Administration program to encourage the discovery and development of critical minerals.

General Services Administration mineral assistance contracts were in force on December 31, 1952, for 3 firms, 2 for the mining and processing of zinc and the other for the production of electrolytic manganese. For the American Zinc Co. of Tennessee, facilities were completed, and production was begun in the latter part of 1952. Although scheduled for operation by the middle of December, a fire damaging the control room at the Appalachian Mining & Smelting Co. plant delayed production beyond the end of the year. The construction of new facilities was well under way during 1952 at the Electro Manganese Corp.; their actual use was not expected before the end of 1953 or the first part of 1954.

TABLE 3.—Government assistance contracts in force on Dec. 31, 1952

Contractor	American Zinc Co. of Tenn.	Appalachian Mining and Smelting Co.	Electro Manganese Corp.
Contract No	GS-OOP(D)-12,114	GS-OOP(D)-656	GS-OOP(D)-12,229.
Location of property	Jefferson and Knox Counties (near Mascot).	Washington County (Embreeville).	Knox County (Knoxville).
Commodity	Zinc	Zinc	Manganese.
Annual production—tons	3,600	5,000	3,000.
Government purchase commitment:			
Tons	7,200	10,000	18,000.
Cost	$2,520,000	$3,500,000	$9,360,000.
Government financing:			
Extent		$400,000	$2,250,000.
Type		RFC loan	Advance.
Tax amortization—percent	60		85.
Production years	2	2	5.
Production to begin	Nov. 5, 1952	Dec. 19, 1953	Mar. 20, 1954.

REVIEW BY MINERAL COMMODITIES

METALS

Copper.—Output of recoverable copper in 1952 was 7,638 short tons valued at $3,696,792, or 8 percent in both quantity and value above 1951. The only producer was the Tennessee Copper Co., which mines sulfide ores from which the copper is recovered in the Copperhill-Ducktown area, Polk County. Mines active were the Burra, Calloway, Mary, Eureka, and Boyd. For production data, 1948–52, see table 4.

Ferroalloys.—Production of ferroalloys in 1952 was somewhat less than in 1951, although statistics of output for these years may not be published. In 1950 production was 93,482 tons, although in 1947 it reached 147,704 tons, the highest year of output.

TABLE 4.—Mine production of recoverable gold, silver, copper, lead, and zinc, 1943–47 (average) and 1948–52

Year	Gold		Silver		Copper		Lead		Zinc		Total value
	Fine ounces	Value	Fine ounces	Value	Short tons	Value	Short tons	Value	Short tons	Value	
1943–47 (average)	214	$7,490	46,104	$41,724	7,195	$3,122,630	76	$33,182	36,559	$8,227,543	$11,432,569
1948	156	5,460	39,692	35,923	6,693	2,904,762	----	----	29,524	7,853,384	10,799,529
1949	171	5,985	41,833	37,861	6,489	2,556,666	257	81,212	29,788	7,387,424	10,069,148
1950	160	5,600	39,958	36,164	6,851	2,850,016	113	30,510	35,326	10,032,584	12,954,874
1951	108	3,780	24,960	22,590	7,069	3,421,396	14	4,844	38,639	14,064,596	17,517,206
1952	241	8,435	57,569	52,103	7,638	3,696,792	18	5,796	38,020	12,622,640	16,385,766

In 1952, the following companies produced the indicated products:

Monsanto Chemical Co., plant at Columbia—ferrophosphorus (byproduct).
Montana Ferro-Alloys Co., plant at Memphis—ferrochromium, chrome silicide.
Tennessee Products & Chemical Corp., plant at Chattanooga—ferrosilicon, ferrosilicon briquets, ferromanganese, ferromanganese briquets.

Gold.—Gold has been recovered in recent years in Tennessee as a byproduct of copper mining. The only producer in 1952 and many prior years was the Tennessee Copper Co., which mines sulfide ores in Polk County. Output in 1952 was 241 fine ounces compared with 108 in 1951. No placer gold was reported in 1952. The total production of gold in Tennessee since the first reported output in 1831 through 1952 was 22,104 ounces valued at $521,270. For output data, 1948–52, see table 4.

Iron Ore.—Shipments of brown ore from Monroe County to the Tennessee Products & Chemical Corp. plant at Rockwood were begun by two firms in 1951 and were continued in 1952.

A small quantity of hematite was mined in Bradley County in 1952.

Iron, Pig.—Pig iron was produced in Tennessee at Rockwood, Roane County, and at Lyles-Wrigley, Hickman County, by the Tennessee Products & Chemical Corp.

Lead.—The only lead output in 1951 and 1952 was recovered during the smelting of zinc concentrates produced by Tennessee Copper Co. and American Zinc Co. of Tennessee. Total lead recovery from these sources in 1952 amounted to 18 short tons compared with 14 tons in 1951. For production data, 1948–52, see table 4.

Manganese Ore.—The output of manganese ore (all 35 percent or more Mn) in 1952 was 126 short tons. All production was made from Monroe County by one producer. Output for 1948 through 1950 was 37 tons in 1948, 175 tons in 1949, 133 tons in 1950, and none in 1951.

Silver.—The output of silver in Tennessee in 1952 more than doubled that in 1951, totaling 57,600 fine ounces compared with 25,000. All production was obtained as a byproduct after processing of copper ore by the Tennessee Copper Co. at Copperhill. For output data, 1948–52, see table 4.

Zinc.—Despite lower prices, production of zinc in Tennessee decreased only 2 percent compared with 1951. The output of recoverable metal in 1952 totaled 38,000 short tons valued at $12,622,600

compared with 38,600 tons valued at $14,064,600 in 1951. The 1952 value was the second highest value of output—10 percent below the year of peak value (1951). The principal producers operated continuously throughout the year, although on a somewhat reduced scale in the latter part of the year owing both to the steel strike (which reduced the requirements for zinc for galvanizing) and to the declining price during the latter half of the year.

Companies operating in 1952 were the Tennessee Coal & Iron Division, United States Steel Corp., with mines near Jefferson City; The American Zinc Co. of Tennessee, with mines in Jefferson and Knox Counties; and the Tennessee Copper Co., with mines in Polk County. In addition to the above companies, S. W. Forney, Jefferson City, produced and shipped a small quantity of zinc carbonate concentrate. For production data, 1948–52, see table 4.

NONMETALS

Barite.—Barite has been produced in both middle and east Tennessee, but the major deposits are in the eastern counties of Monroe, Loudon, McMinn, and Cocke. For 1950–52 output was reported only from Monroe County in the Sweetwater area. In 1948 production was reported also in Cocke, Loudon, and McMinn Counties and in 1949 in Cocke and McMinn Counties, in addition to Monroe. In 1948 and 1949 production totaled 25,800 short tons valued at $275,200 and 13,400 tons valued at $137,100, respectively. Production in 1952 was substantially higher than in 1949 and approximately 45 percent greater than in 1951.

Cement.—Production and shipments of portland cement in Tennessee in 1952 were the highest on record and totaled 7,439,900 and 7,428,600 barrels, respectively, 3 and 4 percent greater than in 1951, the former high year. The value of shipments in 1952, also a record, totaled $17,834,100 or 4 percent more than the previous high year in value (1951). The average value per barrel in each year was $2.40.

Cement is the mineral product second in point of value in Tennessee and has contributed largely to the rapid industrial growth and the varied business expansions of the State.

The history of the portland-cement industry since 1945 has been one of continuous expansion, except for a small setback in 1949. Additions, modernizations, and improvements to existing plants have resulted in this large and consistent increase in production and production facilities, for only six cement plants have been in operation in the State for many years. They are well distributed throughout Tennessee—one each at Kingsport, Knoxville, Chattanooga, Richard City, and Cowan and near Nashville. Aside from closeness to population centers, proximity to abundant coal deposits of the Cumberland Plateau and the nearness of available limestone and clay or shale were determining factors in the location of these mills.

Shipments of portland cement largely have gone to Tennessee and to States south and east, particularly Florida, Georgia, Mississippi, North Carolina, and South Carolina. Some shipments, however, have gone to Virginia, West Virginia, and Kentucky and small shipments to 1 or 2 other Northern States.

TABLE 5.—Finished portland cement produced, shipped and in stock, 1943–47 (average) and 1948–52, in 376-pound barrels

Year	Production, barrels	Shipment from mills		Stocks at mills on Dec. 31
		Barrels	Value	
1943–47 (average)	4,525,440	4,552,686	$7,699,390	511,063
1948	6,727,160	6,774,926	13,667,060	211,699
1949	6,077,549	5,992,571	12,857,600	296,677
1950	6,684,644	6,663,427	14,682,487	317,894
1951	7,221,968	7,162,841	17,203,080	377,021
1952	7,439,873	7,428,604	17,834,060	388,290

Clays.—Clays suitable for brick and tile and manufacture of other heavy clay products are abundant and widespread in Tennessee and are the basis for its important ceramic industries. Fuller's earth and fire clay were mined in Henry County, and ball clay was mined in Weakley County.

Clays sold or used by producers (except clay for cement) decreased 14 percent below 1951, but the total value increased 8 percent.

Sales of ball clay in Tennessee in 1952 totaled 163,862 short tons, valued at $2,127,274, a decline of 16 percent in sales but an increase of 19 percent in value. This clay and the wad clays produced along with the ball clay (classified in the Bureau of Mines tabulations as a refractory clay) are shipped over a wide area to the chief pottery-manufacturing plants in the country.

Fire clay sold or used by producers decreased 10 percent in quantity and value below 1951.

Fuller's earth in 1952 was mined and sold by two firms in Henry County from the Porters Creek formation and totaled 25,974 short tons valued at $358,752. It is used for oil-bleaching purposes and is suitable also for lightweight ceramic products.

Sales or use of miscellaneous clays (mostly shale) in 1952 also were smaller than in 1951. Many brick plants using this type of clay are in and near the larger cities, such as Memphis, Nashville, Knoxville, Chattanooga, Kingsport, and Johnson City.

TABLE 6.—Clays (except cement) sold or used by producers, 1943–47 (average) and 1948–52

Year	Ball clay		Fire clay		Fuller's earth		Miscellaneous clays		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	100,927	$971,649	22,390	$107,161	(1)	(1)	(2)	(2)	(2)	(2)
1948	173,797	1,902,529	30,148	174,695	(1)	(1)	506,842	$571,131	710,787	$2,648,355
1949	132,337	1,660,481	41,732	205,770	(1)	(1)	449,705	533,086	623,774	2,399,337
1950	184,434	2,230,526	20,574	182,692	(1)	(1)	582,395	680,308	787,403	3,093,526
1951	194,191	1,782,642	23,759	226,009	(1)	(1)	602,885	948,108	820,835	2,956,759
1952	163,862	2,127,274	21,290	203,845	25,974	$358,752	491,267	489,426	702,393	3,179,297

[1] Fuller's earth included with miscellaneous clays.
[2] Figure withheld to avoid disclosure of individual company operations.

Fluorspar (Synthetic).—Synthetic fluorspar was produced in Tennessee in Maury County in 1951 and 1952 as a byproduct of phosphate-rock operations. The total of marketed synthetic in 1951 and 1952, respectively, was 140 and 348 short tons. All was consumed in steel plants and foundries.

Fluorite occurs in nature in complex, usually vertical veins in limestone in the central part of the State, but no production has been reported in recent years.

Lime.—Production of lime in Tennessee in 1951 and 1952 was confined to three companies in Knox County, although in 1948 and 1949 output also came from Dickson and Franklin Counties and in 1950 from Dickson County.

Both quick and hydrated limes, including chemical lime, are produced in Tennessee. Output in 1952 totaled 100,200 short tons valued at $1,005,200, or 8 percent below 1951 in both quantity and value. Of the 1952 output, 80 percent was quicklime and 95 percent (including both quick and hydrated material) chemical lime.

Although higher than the 1950 production, output in 1952 was 60 percent under the average production of 1941–43, the years of highest output of lime in Tennessee.

TABLE 7.—Lime sold by producers, 1943–47 (average) and 1948–52

Year	Quick		Hydrated		Year	Quick		Hydrated	
	Short tons	Value	Short tons	Value		Short tons	Value	Short tons	Value
1943–47 (av.)	148,296	$977,205	47,380	$400,823	1950	69,633	$620,731	28,599	$337,594
1948	117,775	1,008,713	45,323	434,193	1951	86,776	817,419	22,194	280,455
1949	76,502	699,762	40,551	408,377	1952	80,463	791,198	19,726	214,037

Perlite (Expanded).—Crude perlite is not known to occur in Tennessee; however, in 1952 a plant in Nashville, using crude rock imported from deposits in Western States, produced expanded perlite for use mainly as a lightweight aggregate, replacing heavier materials in plaster and concrete.

Phosphate Rock.—Phosphate rock sold or used in 1952 topped previous records in both quantity and value and totaled 1,452,500 long tons valued at $10,874,800, or 2 percent greater in tonnage and 3 percent more in value than the former peak year 1951. Tennessee is second only to Florida in phosphate-rock production.

The trend of growth of the industry has been upward for many years and reflects the increased demand for the chief products of this middle Tennessee mineral, elemental phosphorus, superphosphate for fertilizer, and raw ground rock for direct application to the soil. In 1952, 64 percent of the total phosphate rock sold or used was employed in making phosphoric acid, elemental phosphorus, and ferrophosphorus; 17 percent for superphosphates; and 16 percent for direct application to the soil. Minor uses, such as filler for fertilizer and stock and poultry food, accounted for the balance.

According to grades, sale or use of phosphate rock with a bone phosphate of lime (B. P. L.) content below 60 percent has increased from 43 percent of the total rock in 1948 to 73 percent in 1952. The

higher grades, particularly the 60–66 B. P. L. material, have decreased in relative importance as far as tonnage is concerned. Grades above 70 percent minimum B. P. L. are produced in small quantities only in Tennessee.

Production in recent years has been entirely of "brown rock," although so-called "blue-rock" and "white-rock" deposits have been worked in past years. Reported production since 1948 has been from Davidson, Giles, Hickman, and Maury Counties, although reserves are known in several adjoining counties. The rock usually must be washed and beneficiated by flotation processes to prepare the material for use, either for direct application or for the furnaces.

TABLE 8.—Phosphate rock sold or used by producers, 1943–47 (average) and 1948–52

Year	Long tons	Value	Year	Long tons	Value
1943–47 (average)	[1] 1,340,538	[1] $6,530,773	1950	1,384,473	$10,028,404
1948	1,307,507	8,231,251	1951	1,419,892	10,604,638
1949	[1] 1,344,470	[1] 9,067,589	1952	1,452,508	10,874,760

[1] Includes small quantity of apatite from Virginia, 1947 and 1949.

TABLE 9.—Phosphate rock sold or used by producers, by uses, 1948–52

Use	1948		1949 [1]		1950		1951		1952	
	Long tons	Percent of total	Long tons	Percent of total	Long tons	Percent of total	Long tons	Percent of total	Long tons	Percent of total
Domestic:										
Superphosphates	231,654	18	378,760	28	301,923	22	322,607	23	249,902	17
Phosphates, phosphoric acid, phosphorus, ferrophosphorus	761,698	58	735,309	55	830,837	60	867,165	61	925,941	64
Direct application to soil	270,899	21	208,829	16	219,522	16	210,780	15	237,786	16
Fertilizer filler	11,579	1	12,546	1	14,610	1	16,454	1	15,374	1
Stock and poultry food			5,533	(2)	16,871	1	1,663	(2)	21,680	2
Undistributed [3]	31,677	2	1,275	(2)	710	(2)	1,223	(2)	1,825	(2)
Exports [4]			2,218	(2)						
Total	1,307,507	100	1,344,470	100	1,384,473	100	1,419,892	100	1,452,508	100

[1] Includes a small quantity of apatite from Virginia.
[2] Less than 1 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.

Pyrite.—All pyrite mined in Tennessee came from the Copperhill-Ducktown area in Polk County, where flotation of sulfide ores yielded sizable quantities of copper, zinc, and iron pyrite concentrates. The copper and pyrite ores were roasted and smelted at Copperhill, where also sulfuric acid was recovered from the gases released during the manufacturing processes. The Tennessee Copper Co. was the only producer of pyrite in the State.

Sand and Gravel.—Sand and gravel sold or used in 1952 totaled 5,173,400 short tons valued at $5,303,300, a record high in both quantity and value. Tonnage was 8 percent greater than in the next highest year, 1941, and the value was 2 percent higher than in 1951, the former top year in value. Building sand and gravel composed

40 percent of the total quantity in 1952 and paving sand and gravel 48 percent; the balance of the tonnage was divided among glass, molding, grinding and polishing, engine, fire or furnace, filter sands, railroad ballast, and other gravel. In 1952, 74 percent of the total sand and gravel was commercially produced and marketed or used. The remainder (26 percent) represented production by State agencies, principally highway districts, United States Army Engineers, other United States Government departments, counties, and municipalities. The 1952 tonnage produced by Government agencies was over twice that so produced in 1951, indicating increased public building operations in 1952.

Sand and gravel deposits in Tennessee are widely distributed, and in 1952 output was reported from 25 counties in all parts of the State. Production is from alluvial deposits along the major streams, especially the comparatively friable sandstones and conglomerates of the Cumberland Plateau and many of the more geologically recent formations in west Tennessee. A considerable quantity of sand and gravel is recovered by dredging river deposits. The greater part of the production of sand and gravel is used in constructing buildings, highways, bridges, dams, sidewalks, and sewers.

TABLE 10.—Sand and gravel sold or used by producers, 1951–52, by classes of operations and uses

	1951			1952		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Molding	261,823	$728,645	$2.78	256,722	$725,584	$2.83
Building	1,205,481	1,499,963	1.24	1,083,696	1,296,831	1.20
Paving	554,537	535,422	.97	518,290	545,925	1.05
Grinding and polishing	13,070	25,386	1.94	(1)	(1)	(1)
Engine	23,242	27,363	1.18	(1)	(1)	(1)
Railroad ballast	19,197	39,287	2.05			
Other	26,809	31,939	1.19	(1)	(1)	(1)
Gravel:						
Building	673,076	904,540	1.34	888,233	1,106,351	1.25
Paving	958,618	843,904	.88	731,056	675,275	.92
Railroad ballast	255,240	209,716	.82	(1)	(1)	(1)
Other				7,250	5,438	.75
Undistributed [2]	29,500	75,886	2.57	349,066	441,957	1.27
Total commercial sand and gravel	4,020,593	4,922,051	1.22	3,834,313	4,797,361	1.25
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand: Paving	58,070	38,300	.66	534,427	336,079	.63
Gravel:						
Building	53,188	12,274	.23	91,798	44,890	.49
Paving	513,190	213,992	.42	712,863	124,991	.18
Total Government-and-contractor sand and gravel	624,448	264,566	.42	1,339,088	505,960	.38
Grand total	4,645,041	5,186,617	1.12	5,173,401	5,303,321	1.03

[1] Included with "Undistributed" to avoid disclosure of individual company operations.
[2] Includes glass, fire or furnace, and filter sands, which may not be shown separately, and other uses indicated in appropriate column by footnote reference 1.

Glass sand is produced by one firm near Sewanee, Franklin County. This company washes sand from a conglomerate on Cumberland Mountain. Foundry or molding sands are mined in Benton, Franklin, and Henderson Counties and in 1951 and 1952 totaled over 250,000 short tons, valued at more than $725,000 each year. These sands have attained high recognition, particularly the so-called stove-plate types, employed in casting small metal products.

Stone.—Production of stone in 1952 totaled 10,377,300 short tons, valued at $17,652,800, and surpassed the former record year 1951 by 17 percent in tonnage and 20 percent in value. The production of stone in Tennessee comprises the output of limestone, marble, sandstone, and miscellaneous stone. Limestone has by far the largest production and the highest total value, with marble the next most important. Sandstone and small quantities of granite and unclassified stone make up the remainder of the output.

TABLE 11.—Stone sold or used by producers, 1951–52, by kinds and uses

	Unit used	1951		1952	
		Quantity	Value	Quantity	Value
Dimension stone:					
Marble:					
Building	Cubic feet	445,019	$3,373,980	470,196	$3,659,210
Monumental	do	4,575	69,130	34,977	210,796
Total (approximate)	Short tons	38,215	3,443,110	42,940	3,870,006
Limestone (all uses)	do	1,082	835	3,226	5,926
Sandstone (all uses)	do	(1)	(1)	46,769	846,684
Total dimension stone	do	39,297	3,443,945	92,935	4,722,616
Crushed and broken stone:					
Granite:					
Crushed stone	do			10,000	12,000
Marble (all uses)	do	21,444	145,438	15,381	115,424
Limestone:					
Riprap	do	166,659	175,901	305,008	355,354
Fluxing stone	do	63,912	85,691	103,434	133,316
Crushed stone	do	7,642,392	9,262,639	8,968,944	10,789,390
Agriculture	do	595,247	792,679	532,251	729,036
Miscellaneous	do	309,845	859,695	341,086	783,206
Miscellaneous crushed stone	do			8,281	12,421
Total crushed and broken stone	do	8,799,499	11,322,043	10,284,385	12,930,147
Grand total	do	[2] 8,838,796	[2] 14,765,988	10,377,320	17,652,763

[1] Figure withheld to avoid disclosure of individual company operations.
[2] Excludes dimension sandstone, Bureau of Mines not at liberty to publish.

Although an attractively colored granite occurs along the western slopes of the Unaka Mountains in the eastern border counties, production of this commodity has been small and in 1952 consisted of crushed stone only.

Production of limestone in 1952 was about 99 percent of the total tonnage of stone quarried in Tennessee but only 73 percent of the total value, due to the higher value per ton, particularly of dimension marble. Limestone quarried in 1952 rose 17 percent in tonnage and 14 percent in value over the former record year 1951. By far the greater percentage of limestone was crushed and broken stone. The principal uses of this material were for road paving, building construction, agricultural lime, and lime and cement manufacture. Limestone was produced in 1952 in 45 counties in all parts of the State except

in west Tennessee, west of the Tennessee River. Of the total crushed limestone in 1952, about 13 percent was produced by Government agencies, such as State and county highway departments, municipalities, United States Army Engineers, and others. Crushed limestone in 1952 used for concrete or road metal by both private and Government agencies amounted to 8,414,500 tons or 82 percent of the total and agricultural limestone to 532,300 tons or 5 percent of the total. Other chief uses were for riprap and railroad ballast and as a flux in blast furnaces.

Production of marble in 1952 totaled 58,300 short tons valued at $3,985,400. Dimension stone comprised 74 percent of the tonnage and 97 percent of the value. Of the dimension stone, 93 percent was for building purposes, with 55 percent sold as rough stone in 1952. The dressed stone, of course, had considerably higher total value. Both building and monumental stones in 1952 were produced in substantially higher quantities than in 1951.

Marble quarrying in recent years has centered largely in Blount and Knox Counties, although marble deposits occur over an area about 125 miles long by 20 miles wide. Production in 1952 was by four companies, and the product mined in the Knoxville area has an excellent and extensive reputation, chiefly for interior decorative treatments. Colors range from gray through pink to deep red and chocolate, usually in variegated patterns. It has been shipped all over the country for use in many large privately financed and public buildings.

Output of sandstone in 1952 totaled 46,800 short tons valued at $846,700, a 25-percent increase in tonnage and an 8-percent rise in value over 1950 (statistics for 1951 may not be published). Quarrying during recent years has been entirely in the so-called Crab Orchard area near Crossville, Cumberland County. Output is used largely

TABLE 12.—Marble sold or used by producers, 1951–52, by uses

Use	1951		1952	
	Cubic feet	Value	Cubic feet	Value
Dimension:				
Building:				
Rough	238,525	$816,538	257,176	$664,180
Dressed:				
Sawed	59,963	349,377	49,596	399,007
Cut	146,531	2,208,065	163,424	2,596,023
Total dressed	206,494	2,557,442	213,020	2,995,030
Total building	445,019	3,373,980	470,196	3,659,210
Monumental:				
Rough			22,000	97,821
Dressed (cut)	4,575	69,130	[1] 12,977	[1] 112,975
Total monumental	4,575	69,130	34,977	210,796
Total dimension	449,594	3,443,110	505,173	3,870,006
Equivalent short tons	38,215		42,940	
Crushed:	*Short tons*		*Short tons*	
Terrazzo	10,579	128,708	6,739	106,984
Other uses	10,865	16,730	8,642	8,440
Total crushed	21,444	145,438	15,381	115,424
Total dimension and crushed	59,659	3,588,548	58,321	3,985,430

[1] Includes 8,000 cubic feet of sawed stone valued at $47,534.

for exterior walls, interior paneling, floors, flagstones, and similar purposes.

MINERAL FUELS

Coal.—Coal is the most important mineral commodity in Tennessee, and the value of its production in 1952 was more than one-quarter of the total of all mineral production in the State. Output sold or used in 1952 totaled 5,265,000 short tons, with a valuation of $25,560,000, and in recent years has averaged around 1 percent of total United States output. Production in Tennessee has centered in the 2-to 4-countywide strip in Tennessee known as the Cumberland Plateau region. The principal producing counties in 1952 were, in order of production, Campbell, Marion, Claiborne, Anderson, and Putnam compared with Campbell, Claiborne, Marion, Anderson, and Scott in 1951.

The Tennessee coals make excellent domestic coals and are suitable for industrial use and as railroad fuel. A 3-year cooperative study to determine the known reserves of coking coal in Tennessee was begun during 1952 by the Tennessee Division of Geology, the Tennessee Valley Authority, and the Federal Bureau of Mines.

TABLE 13.—Production of coal, 1943–47 (average) and 1948–52

Year	Short tons	Value	Year	Short tons	Value
1943–47 (average)	6,714,366	$23,462,354	1950	5,069,800	$27,360,273
1948	6,483,029	37,232,433	1951	5,400,946	26,956,174
1949	4,172,272	21,894,594	1952	5,264,954	25,559,740

Coke.—The Tennessee Products & Chemical Corp. at Chattanooga produced 254,319 short tons of coke in 1952, a small increase over 1951. This output was made by 44 ovens, 24 of the Semet-Solvay type and 20 of the Wilputte type, with a total annual rated capacity of 250,000 tons, thus indicating capacity production in 1952.

Natural Gas.—Small quantities of natural gas have been produced in Tennessee in recent years, largely from small pools in Morgan and Fentress Counties, although gas formerly has been produced at various locations along the Highland Rim and in the Plateau region. In 1952, gas production totaled 107 million cubic feet, of which 10 million cubic feet came from Fentress County and the balance from Morgan and Scott Counties. The present small production is in local demand for domestic and commercial purposes.

Petroleum.—Production of crude petroleum in Tennessee is a relatively minor industry but with a steady, consistent output. The yearly output totals only a few thousand barrels, and has come principally from Scott and Morgan Counties, with smaller quantities in past years from Clay and Fentress Counties. Shipments of oil generally have been to a Nashville refinery. In 1952 oil produced in Tennessee totaled 15,000 barrels, of which 3,300 barrels were produced in Jackson County. The remainder came from four counties—Morgan, Scott, Fentress, and Pickett.

REVIEW BY COUNTIES

ANDERSON

Coal production was 518,321 short tons valued at $2,555,323, which was 16 percent less in tonnage and 18 percent less in value than in the preceding year. More details of coal production will be found in

TABLE 14.—Value of mineral production in Tennessee, 1951–52, by counties [1] and principal minerals [2] produced in 1952

County	1951	1952	Principal minerals in order of value [2]
Anderson	$4,514,586	$4,391,450	Coal, limestone.
Bedford	20,104	38,400	Limestone.
Benton	561,738	564,976	Sand and gravel.
Bledsoe	33,306	129,164	Coal.
Blount	1,545,106	866,238	Marble, limestone.
Carter	235,233	333,610	Limestone, granite.
Claiborne	4,684,291	3,917,824	Coal.
Cocke	58,384	63,935	Limestone, miscellaneous stone.
Cumberland	1,488,978	1,267,302	Sandstone, limestone, coal.
Davidson	4,109,987	4,658,229	Cement, limestone, sand and gravel, miscellaneous clays, phosphate rock.
Franklin	2,900,357	2,707,956	Cement, limestone, sand and gravel.
Gibson	----------	1,668	Sand and gravel.
Giles	(3)	1,869,021	Phosphate rock, sand and gravel.
Grainger	53,668	38,330	Limestone.
Grundy	552,569	1,626,673	Coal.
Hamilton	4,175,544	5,062,158	Cement, coal, limestone, miscellaneous clays.
Hancock	31,442	24,228	Limestone.
Hawkins	80,791	41,849	Limestone, miscellaneous clays.
Haywood	70,278	11,100	Sand and gravel.
Henry	1,950,172	1,692,703	Ball clay, fuller's earth, fire clay.
Hickman	(4)	4270,565	Phosphate rock.
Humphreys	747,386	799,910	Sand and gravel, limestone.
Johnson	138,000	174,000	Limestone.
Knox	14,753,665	15,144,702	Cement, zinc, marble, limestone, lime, sand and gravel, miscellaneous clays.
Lauderdale	5,705	16,837	Sand and gravel.
Macon	85,000	----------	Limestone.
Marion	7,748,268	8,252,319	Coal, cement, sand and gravel.
Maury	8,540,557	9,019,555	Phosphate rock, limestone, sand and gravel.
Meigs	100,710	45,616	Limestone.
Morgan	1,393,815	1,717,800	Coal.
Obion	38,058	45,501	Sand and gravel.
Perry	----------	39,372	Limestone.
Pickett	72,479	44,160	Limestone, sand and gravel.
Putnam	1,443,628	1,523,197	Coal.
Roane	19,478	439,233	Limestone, coal.
Robertson	333,988	(3)	Limestone.
Scott	2,334,226	1,320,967	Coal.
Sequatchie	193,932	457,507	Do.
Sevier	300	245,125	Limestone, sand and gravel.
Stewart	39,000	40,100	Limestone.
Sullivan	2,723,613	3,113,916	Cement, limestone, miscellaneous clays.
Sumner	245,464	191,522	Limestone, sand and gravel.
Unicoi	325,942	357,877	Sand and gravel, limestone.
Union	137,266	120,000	Limestone.
Van Buren	96,686	62,367	Limestone, coal.
Washington	209,592	(3)	Miscellaneous clays.
White	472,619	533,285	Limestone, coal.
Williamson	314,188	381,036	Limestone, sand and gravel.
Undistributed [5]	30,272,901	26,845,717	
Total Tennessee.	99,853,000	100,509,000	

[1] County figures exclude barite, fluorspar (synthetic), manganese ore, petroleum, and pyrite.
[2] Other than barite, fluorspar (synthetic), manganese ore, petroleum, and pyrite.
[3] Figure withheld to avoid disclosure of individual company operations; included with undistributed.
[4] Estimate.
[5] Includes value for barite, fluorspar (synthetic), manganese ore, petroleum and pyrite, also value of production for the following counties: Bradley (limestone, iron ore), Campbell (coal, limestone, sand and gravel), Cheatham (limestone, 1951), Decatur (sand and gravel), Dickson (limestone, 1951), Fayette (sand and gravel), Fentress (coal, sand and gravel), Greene (limestone, 1952), Henderson (sand and gravel), Houston (limestone, 1951), Jefferson (lead, zinc, limestone), Loudon (limestone, miscellaneous clays), McMinn (limestone), Marshall (limestone), Monroe (limestone, iron ore), Montgomery (limestone, sand and gravel), Overton (coal, limestone), Polk (gold, silver, copper, lead, zinc, limestone), Rhea (miscellaneous clays, limestone), Rutherford (limestone), Shelby (sand and gravel, miscellaneous clay), Warren (limestone, coal), Wayne (sand and gravel), Weakley (ball clay), Wilson (limestone), Undistributed by county (sandstone, limestone).

Vol. II of the Minerals Yearbook. Three operators continued to crush limestone.

TABLE 15.—Crushed limestone sold or used by producers in Anderson County, 1948–52 [1]

Year	Short tons	Value	Year	Short tons	Value
1948	962,918	$1,554,829	1951	1,085,200	$1,379,504
1949	464,543	671,951	1952	1,523,585	1,836,127
1950	1,362,466	1,718,639			

[1] Except for use in manufacturing cement and lime.

BEDFORD

Crushed limestone sold or used for concrete and road metal by the Bedford County Highway Department was 48,000 short tons valued at $38,400 compared with 41,870 tons valued at $20,104 in 1951.

BENTON

Production of sand and gravel was continued by the Hardy Sand Co., Kimball's Mineral Supplies, Inc., the Memphis Stone & Gravel Co., and Porter-Warner Industries, Inc.

TABLE 16.—Sand and gravel sold or used by producers in Benton County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	(1)	(1)	1951	357,986	$561,738
1949	521,271	$521,271	1952	357,901	564,976
1950	372,173	490,954			

[1] Figure withheld to avoid disclosure of individual company operations.

BLEDSOE

Coal sold or used by producers was 46,130 short tons valued at $129,164 compared with 12,200 tons valued at $33,306 in 1951.

BLOUNT

Production of crushed limestone was continued by two operators. Total quantity sold or used was considerably less than in 1951. The total quantity and value of crushed marble sold or used by a single operator was 17 percent less than in 1951. The total quantity of dimension marble sold or used by a single operator was considerably less than in 1951.

BRADLEY

The Consolidated High Grade Ore Co. resumed operations at the Heiskell Mine and shipped 1 car of ore. The total quantity of crushed limestone sold or used by two producers increased 76 percent and total value increased 85 percent over 1951.

CAMPBELL

Coal sold or used by producers was 923,225 short tons valued at $5,363,520 compared with 1,305,663 tons valued at $7,833,978 in 1951. Crushed limestone sold or used by the Campbell County Highway Department for concrete and road metal increased 12 percent over

1951, and its total value increased 77 percent. The Silica Sand Co., Inc., continued to produce sand. The total quantity sold or used was 23 percent more and the total value 62 percent more than in 1951.

CARTER

Crushed granite was produced for sale or use by a single operator. The total quantity of crushed limestone sold or used was 31 percent more and the total value 37 percent more than in 1951.

CLAIBORNE

Coal sold or used by producers totaled 765,200 short tons valued at $3,917,824, compared to 895,658 tons valued at $4,684,291 in 1951.

COCKE

Crushed limestone sold or used for concrete and road metal by the Cocke County Highway Department was 32,196 short tons valued at $51,514, compared to 36,490 tons valued at $58,384 in 1951. The Cocke County Highway Department produced 8,281 short tons of crushed miscellaneous stone valued at $12,421.

CUMBERLAND

Coal sold or used by producers totaled 31,173 short tons valued at $113,781, compared to 72,032 tons valued at $253,553 in 1951. One operator continued operations. The total quantity sold or used was about the same as in 1951, but the total value was 12 percent greater. New quarries were opened by 5 operators, and 2 others continued operations. The total quantity of dimension sandstone sold or used by 7 producers decreased 18 percent below 1951 and total value decreased 13 percent.

DAVIDSON

The Marquette Cement Manufacturing Co. operated its Nashville mill throughout the year. Shipments were 14 percent more and their value 15 percent more than in 1951. W. G. Bush & Co., Inc., and L. T. Lewis & Sons continued to produce miscellaneous clays at the same rate as in 1951. The total quantity of crushed limestone sold or used by 3 operators increased 1 percent over 1951, and the total value was about the same as in 1951. The Harsh Phosphate Co. continued to produce brown phosphate rock. The total mine production decreased 4 percent and the total value decreased 5 percent below 1951. The Cumberland River Sand Co. continued to produce sand and gravel. The total quantity and value of material sold or used by producers increased 8 percent over 1951.

DECATUR

The Smiley Sand & Gravel Co. continued to produce sand at the same rate as in 1951.

FAYETTE

Banks Bros. and the Fayette County Highway Department continued to produce sand and gravel. The total quantity sold or used by producers declined 56 percent, and the total value declined 52 percent below 1951.

FENTRESS

Coal sold or used by producers totaled 177,908 short tons valued at $829,288 compared with 81,912 tons valued at $386,625 in 1951. Frogge & Williams, Inc., continued to produce gravel. The total quantity and value of material sold or used decreased 10 percent below 1951.

FRANKLIN

The Marquette Cement Manufacturing Co. operated the Cowan mill throughout the year. Shipments were about the same, but, the total value declined 4 percent below 1951. The total quantity of crushed limestone sold or used by 2 producers was 419,081 short tons valued at $495,150. The Cumberland River Sand Co. and the Estill Springs Sand-Gravel Co. continued to produce sand and gravel. The total quantity sold or used by producers declined 23 percent and the total value declined 15 percent below 1951.

GIBSON

The Gibson County Highway Department produced 23,358 short tons of gravel valued at $1,668.

GILES

The International Minerals & Chemical Corp. continued to operate the Wales mine, producing brown phosphate rock. Gravel sold or used for concrete and road metal by the Giles County Highway Department was 45,418 short tons valued at $3,364 compared with 52,556 tons valued at $5,840 in 1951.

GRAINGER

Crushed limestone sold or used for concrete and road metal by the Grainger County Highway Department was 29,945 short tons valued at $38,330 compared with 30,007 tons valued at $53,668 in 1951.

GREENE

The total quantity of crushed limestone sold or used by 2 producers increased 30 percent over 1951, and the total value increased 57 percent.

GRUNDY

Coal sold or used by producers totaled 375,675 short tons valued at $1,626,673 compared with 95,453 tons valued at $401,857 in 1951.

HAMILTON

The General Portland Cement Co. operated the Signal Mountain mill throughout the year. Shipments increased 1 percent and their value increased 2 percent over 1951. The Key-James Brick Co. and the B. Mifflin-Hood Co. continued to produce miscellaneous clays. The total quantity and value of material sold or used declined 23 percent below 1951. Coal sold or used by producers totaled 209,051 short tons valued at $744,222 compared with 102,246 tons valued at $363,996 in 1951. One new quarry was opened, and 2 others continued operations. Considerably more crushed limestone was sold or used by the three operators than in 1951. One operator continued to produce dimension limestone. The total quantity sold or used was 526 short tons valued at $526.

HANCOCK

Crushed limestone sold or used by the Hancock County Highway Department was 20,190 short tons valued at $24,228 compared with 26,201 tons valued at $31,442 in 1951.

HAWKINS

The Weaver Brick Co. continued to operate the McCloud mine. The total clay sold or used and its total value decreased 29 percent below 1951. Crushed limestone sold or used for concrete and road metal by the Hawkins County Highway Department was 25,000 short tons valued at $40,000 compared with 32,576 tons valued at $78,183 in 1951, a 23-percent decrease below 1951 in tonnage and a 49-percent drop in value.

HAYWOOD

Gravel sold or used by the Haywood County Highway Department amounted to 124,875 short tons valued at $11,100 compared with 94,875 tons valued at $70,278 in 1951.

HENDERSON

The Ayers Mineral Co. continued to produce sand. The total quantity sold or used decreased 8 percent and the total value decreased 6 percent below 1951.

HENRY

The Kentucky-Tennessee Clay Co. and the H. C. Spinks Clay Co. continued to produce ball clay. The total quantity sold or used by producers decreased 19 percent, and the total value decreased 16 percent below 1951. The Dixie Brick & Tile Co. and the Kentucky-Tennessee Clay Co. continued to produce fire clay. Production of fuller's earth was continued by the Southern Clay Co., Inc., at the Porter Creek mine and by the Tennessee Absorbent Clay Co. at the Paris mine. The total quantity sold or used by producers was 25,974 short tons valued at $358,752.

TABLE 17.—Fire clay sold or used by producers in Henry County, 1948–52

Year	Short tons	Value	Year	Short tons	Value
1948	18,677	$148,244	1951	23,759	$226,009
1949	17,732	150,770	1952	21,290	203,845
1950	20,574	182,692			

HICKMAN

The Owens Agricultural Phosphate Co. continued to mine brown phosphate rock. The total quantity and value of mine production increased 5 percent over 1951.

HUMPHREYS

The total quantity and value of crushed limestone sold or used by one operator decreased 9 percent below 1951. The Nashville, Chattanooga & St. Louis Railway and Sangravel Co., Inc., continued to

produce sand and gravel. The total quantity sold or used by producers increased 18 percent, and the total value increased 20 percent over 1951.

JEFFERSON

A very small quantity of lead was recovered during smelting of the zinc concentrates produced by the American Zinc Co. of Tennessee from Jefferson County ore. One operator continued to produce crushed limestone. The total quantity sold or used decreased 25 percent, and the total value decreased 26 percent below 1951. The American Zinc Co. of Tennessee continued to produce sphalerite at the Athletic, Grasselli, and Jarnagin mines and opened a new mine at North Friends Station. The Tennessee Coal & Iron Division of the United States Steel Corp. continued to operate the Davis-Bible mine. S. W. Forney opened a new mine and shipped 1 car of ore. The total recoverable metallic zinc was about the same as in 1951, but its value decreased 9 percent.

JOHNSON

One operator continued to produce crushed limestone. The total quantity sold or used increased 31 percent and the total value increased 26 percent over 1951.

KNOX

The Volunteer Portland Cement Co. operated the Knoxville mill throughout the year. Shipments and their value increased 5 percent over 1951. The Cherokee Shale Brick Co. and the General Shale Products Corp. continued to produce miscellaneous clays. The total quantity sold or used by producers decreased 10 percent and the total value 2 percent below 1951. The Oliver King Sand & Lime Co. operated the Cherry Street limekiln; the Standard Lime & Stone Co. operated the Asbury limekiln; and the Williams Lime Manufacturing Co. operated the Knoxville limekiln. Total lime sold or used by producers and its total value decreased 8 percent below 1951. Crushed limestone was produced by six operators. The total quantity of crushed marble sold or used by 2 operators decreased 33 percent and its total value 31 percent below 1951. The total quantity of dimension marble sold or used by 3 operators increased 24 percent and its value 17 percent over 1951. Sand and gravel production was continued by the Holston Sand & Materials Co., the Knoxville Sangravel Material Co., and the Oliver King Sand & Lime Co., Inc. The total quantity and value of material sold or used by producers increased 2 percent over 1951. Sphalerite was produced by the American Zinc Co. of Tennessee at the Mascot No. 2 mine. The total quantity of recoverable metallic zinc decreased 6 percent and its total value 14 percent below 1951.

TABLE 18.—Crushed limestone sold or used by producers in Knox County, 1948–52 [1]

Year	Short tons	Value	Year	Short tons	Value
1948	1,787,909	$2,337,460	1951	(2)	$1,830,596
1949	1,315,483	1,731,463	1952	1,725,685	2,251,609
1950	1,254,340	1,794,722			

[1] Except for cement or lime.
[2] Figure withheld to avoid disclosing individual company operations.

LAUDERDALE

Gravel sold or used by the Lauderdale County Highway Department totaled 227,305 short tons valued at $16,839 compared with 77,019 tons valued at $5,705 in 1951.

LOUDON

B. C. Wood continued to operate the Sandy mine. The total crude barite sold or used increased 3 percent and its total value 4 percent over 1951. The Old Hickory Brick Co., Inc., continued to operate the Maryville mine at the same rate as in 1951. One operator crushed limestone.

MARION

The Pennsylvania-Dixie Cement Corp. operated the Richard City mill throughout the year. Shipments increased 2 percent over 1951 and the total value 1 percent. Coal sold or used by producers totaled 869,184 short tons valued at $4,806,588 compared with 815,661 tons valued at $4,298,533 in 1951. The Dixie Sand & Gravel Corp. continued to produce sand and gravel. The total quantity sold or used decreased 5 percent and its total value 6 percent below 1951.

MARSHALL

Two operators continued to produce crushed limestone. The total quantity sold or used decreased 57 percent and its total value 62 percent below 1951.

MAURY

The Tennessee Valley Authority produced 266 short tons and shipped 348 short tons of synthetic fluorspar compared to 240 tons produced and 140 tons shipped in 1951. The fluorspar is recovered as a byproduct of the processing of phosphate rock. The total quantity of crushed limestone sold or used by one operator increased 91 percent and its total value 82 percent over 1951. The production of brown phosphate rock was continued by the Armour Fertilizer Works at the McKennon mine, the Monsanto Chemical Co., J. T. Prince, the Tennessee Valley Authority, the Victor Chemical Works at the Ewing mine, and the Virginia-Carolina Chemical Corp. at the Arrow mine. The Maury County Highway Department produced 20,925 short tons of gravel valued at $1,550 compared with 13,500 tons valued at $1,000 in 1951.

TABLE 19.—Marketable production of Tennessee brown phosphate rock in Maury County, 1948–52

Year	Long tons	Value	Year	Long tons	Value
1948	1,124,360	$7,158,601	1951	1,062,497	$8,466,052
1949	1,088,436	7,728,692	1952	1,041,527	8,561,028
1950	1,054,838	8,260,406			

McMINN

The total quantity of crushed limestone sold or used by 2 producers increased 36 percent and its value 62 percent over 1951.

MEIGS

One operator continued to produce crushed limestone. The total quantity sold or used decreased 42 percent and total value 45 percent below 1951.

MONROE

L. A. Wood continued to operate the Stephens & Ballard mine. The total quantity of crude barite sold or used increased 94 percent and its total value 96 percent over 1951. The Consolidated High Grade Ore Co. operating the Heiskell mine and the Monroe Mining Co. operating the Lindermann mine continued to produce brown iron ore. Total shipments were 7,943 long tons valued at $46,859 compared to 35,908 long tons valued at $142,447 in 1951. The Monroe County Highway Department crushed limestone for concrete and road metal. One operator produced metallurgical-grade manganese ore.

MONTGOMERY

One operator continued to produce crushed limestone. The total quantity sold or used decreased 43 percent and its total value 42 percent below 1951. The Cumberland River Sand Co. and the Montgomery County Highway Department continued to produce sand and gravel. The total quantity sold or used by producers increased 69 percent and its total value 17 percent over 1951.

MORGAN

Coal sold or used by producers totaled 327,200 short tons valued at $1,717,800 compared with 301,040 tons valued at $1,393,815 in 1951.

OBION

Gravel sold or used by the Obion County Highway Department totaled 122,851 short tons valued at $45,501 compared with 102,757 tons valued at $38,058 in 1951.

OVERTON

Coal sold or used by producers totaled 60,248 short tons valued at $215,085 compared with 53,992 tons valued at $188,432 in 1951. A new quarry was opened for the production of crushed limestone.

PERRY

One operator produced crushed limestone.

PICKETT

Crushed limestone sold or used by the Pickett County Highway Department totaled 17,664 short tons valued at $22,080 compared with 25,200 tons valued at $50,400 in 1951. The Pickett County Highway Department continued to produce gravel at the same rate as in 1951.

POLK

The Tennessee Copper Co. continued to operate the Boyd, Burra-Burra, Calloway, Mary, and Eureka mines. The sulfide ores yielded copper and zinc concentrates and pyrite. Gold, silver, copper, lead, and zinc were recovered from the concentrates. The Tennessee Copper Co. recovered 17 short tons of lead valued at $5,474 from smelting copper and zinc concentrates compared with 8 tons valued at $2,768 in 1951. The Polk County Highway Department continued to operate the Burchfield quarry at the same rate as in 1951. The Tennessee Copper Co. produced approximately 5 percent more pyrite than in 1951. The Tennessee Copper Co. recovered 9 percent more zinc than in 1951, but its total value decreased 4 percent.

PUTNAM

Coal sold or used by producers totaled 435,199 short tons valued at $1,523,197 compared with 373,942 tons valued at $1,368,628 in 1951.

RHEA

The W. S. Dickey Clay Manufacturing Co. continued to operate the Graysville clay mine. The total quantity sold or used increased 8 percent and its total value 103 percent over 1951. One operator continued to produce crushed limestone. The total quantity sold or used decreased 79 percent and total value decreased 81 percent below 1951.

ROANE

Coal sold or used by producers totaled 13,020 short tons valued at $69,527 compared with 2,906 tons valued at $15,315 in 1951. One operator opened a new quarry and produced crushed limestone.

ROBERTSON

One operator continued to produce crushed limestone at the same rate as in 1951.

RUTHERFORD

One operator produced crushed limestone.

SCOTT

Coal sold or used by producers totaled 326,972 short tons valued at $1,320,967 compared with 585,019 tons valued at $2,334,226 in 1951.

SEQUATCHIE

Coal sold or used by producers totaled 141,206 short tons valued at $457,507 compared with 62,965 tons valued at $193,932 in 1951.

SEVIER

One operator produced crushed limestone. The United States Bureau of Public Roads produced paving gravel.

SHELBY

The John A. Denie's Co. continued to produce miscellaneous clays. The total quantity and value of material sold or used decreased 9 percent below 1951. Sand and gravel production was continued by the Corps of Engineers, United States Army; the Hollywood Sand & Gravel Co., Inc.; the Marquette Cement Manufacturing Co.; and the Shelby County Highway Department. The total quantity sold or used by producers increased 60 percent and its total value 39 percent over 1951.

STEWART

One operator continued to produce crushed limestone at the same rate as in 1951.

SULLIVAN

The Pennsylvania-Dixie Cement Corp. operated the Kingsport Mill throughout the year. Shipments and value increased 3 percent over 1951. Production of miscellaneous clays was continued by the General Shale Products Corp. The total quantity sold or used decreased 32 percent and its value 63 percent below 1951. Crushed limestone was sold or used by two operators.

SUMNER

One operator continued to produce crushed limestone. The total quantity sold or used decreased 5 percent and its total value 3 percent below 1951. Gravel sold or used by the Sumner County Highway Department totaled 74,134 short tons valued at $22,810 compared with 53,188 tons valued at $12,274 in 1951.

UNICOI

One operator continued to produce crushed limestone. The total quantity sold or used decreased 16 percent below 1951, but its total value increased 19 percent. The Brooks Sand & Gravel Co. continued to produce sand and gravel. The total quantity sold or used increased 2 percent and its total value 4 percent over 1951.

UNION

Crushed limestone sold or used by the Union County Highway Department was 60,000 short tons valued at $120,000 compared with 64,694 tons valued at $137,266 in 1951.

VAN BUREN

Coal sold or used by producers totaled 9,350 short tons valued at $26,367 compared with 16,400 tons valued at $45,100 in 1951. One operator continued to produce crushed limestone. The total quantity sold or used decreased 23 percent and its total value 29 percent below 1951.

WARREN

Coal sold or used by producers totaled 6,955 short tons valued at $34,566. One operator continued to produce crushed limestone. The total quantity sold or used increased considerably over 1951.

WASHINGTON

The General Shale Products Corp. continued to produce miscellaneous clays. The total quantity sold or used decreased 37 percent and its total value 57 percent below 1951.

WAYNE

The Clifton Towing Co. operating the Baker mine, and the United States Bureau of Public Roads continued to produce sand and gravel. The total quantity sold or used decreased 35 percent and its total value 59 percent below 1951.

WEAKLEY

Ball-clay production was continued by the Bell Clay Co. at the Bell's Dresden mine, the Cooley Clay Co. at the Greenfield mine, and the United Clay Mines Corp. at the No. 6 mine. The total quantity sold or used by producers and the total value decreased 12 percent below 1951.

WHITE

Coal sold or used by producers totaled 28,937 short tons valued at $83,628 compared with 9,135 tons valued at $26,674 in 1951. Two operators continued to produce crushed limestone. The total quantity sold or used by producers increased 30 percent over 1951, but its total value decreased 3 percent.

WILLIAMSON

Two operators continued to produce crushed limestone. The total quantity and value of material sold or used by producers increased 20 percent over 1951. Gravel sold or used by the Williamson County Highway Department totaled 6,529 short tons valued at $4,836.

WILSON

Two operators continued to produce crushed limestone. The total quantity sold or used by producers increased 21 percent and its total value 22 percent over 1951.

UNDISTRIBUTED

The United States Bureau of Public Roads produced 2,700 short tons of dimension limestone valued at $5,400 and 5,700 short tons of dimension sandstone valued at $11,400. The output of crude petroleum totaled 14,800 barrels compared to 14,000 barrels in 1951.

The Mineral Industry of Texas

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the United States Bureau of Mines and the Bureau of Economic Geology of the University of Texas.

By F. F. Netzeband,[1] Howard E. Rollman,[1] and John T. Lonsdale [2]

TEXAS was the ranking State in the Nation in value of mineral production for the 18th consecutive year. About 3.4 billion dollars worth of minerals, or one fourth of the total domestic mineral output, originated in the State during 1952. Texas was the largest producer of crude petroleum, natural gas, natural-gas liquids, helium, bromine compounds, sulfur, and magnesium chloride, the third largest producer of cement and fifth in the production of gypsum. Important tonnages of stone, clays, sand and gravel, iron ore, lime, and salt were also produced (table 1).

Metal mining was centered around Cass, Cherokee, and Morris Counties in the northeastern part of the State, Mason County in the central region, and Hudspeth and Presidio Counties in the southwestern part. Nonmetallic-mineral production was widely distributed over much of the State, centering largely around the major population centers of Corpus Christi, El Paso, Austin, San Antonio, Dallas, and the Houston-Galveston-Port Arthur area. Petroleum and natural gas production was recorded in about 70 percent of the State's counties with the largest producing areas in the West Texas and Gulf Coast districts.

TRENDS AND DEVELOPMENTS

Texas participated significantly in the national aluminum-expansion program in 1952. Aluminum Co. of America expanded its Point Comfort plant on the Gulf coast from 57,000 to 92,000 tons per year, while inland at Rockdale, Milam County, partial production was begun in November 1952 at its new 85,000-ton reduction works. Full capacity was planned by the middle of 1953. Initially, power purchased from the Texas Power & Light Co. will be used in the reduction process, but later the plant will use dried lignite to generate power. Basic research by the Bureau of Mines, with the aid of the Texas Power & Light Co., contributed to this development. The process will dry lignite at low temperatures and recover the volatile tars from which valuable chemical products can be made. Determination of commercial feasibility of the process depended to a large extent on the byproduct uses of the tar.

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TABLE 1.—Mineral production in Texas, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Abrasive stone: Pebbles, grinding	350	$4,710	510	$3,100
Cement, 376-pound barrels	17,642,654	42,648,536	19,849,455	48,042,901
Clays (including fuller's earth) [2]	1,544,064	4,271,976	1,389,434	3,790,596
Copper (recoverable content of ores, etc.)	1	483	18	8,712
Feldspar (crude), long tons	(3)	(3)	2,600	31,200
Gold (recoverable content of ores, etc.), troy ounces	32	1,120	39	1,365
Gypsum (crude)	1,136,824	2,987,890	1,021,161	2,682,019
Helium (shipments), cubic feet	82,690,000	1,060,000	106,983,000	1,400,000
Iron ore (usable), long tons, gross weight	1,053,131	(3)	787,193	(3)
Lead (recoverable content of ores, etc.)	43	14,878	56	18,032
Lime (open-market)	279,957	2,532,387	281,604	2,622,975
Manganese ore (35 percent or more Mn), gross weight			56	(3)
Natural gas, thousand cubic feet	3,781,136,000	204,181,000	4,147,805,000	257,164,000
Natural-gas liquids:				
Natural gasoline and cycle products, 42-gallon barrels	59,907,000	189,973,000	61,657,000	188,500,000
LP-gases, do	48,624,000	71,943,000	58,497,000	88,635,000
Peat	1,238	10,750	1,200	12,000
Petroleum (crude), 42-gallon barrels	1,010,270,000	2,610,790,000	[4] 1,022,139,000	[4] 2,641,860,000
Salt (common)	2,401,063	4,000,100	2,640,209	4,402,032
Sand and gravel	18,488,463	15,651,531	18,661,403	17,275,255
Silver (recoverable content of ores, etc.), troy ounces	1,381	1,250	4,672	4,228
Stone (except limestone for cement and lime)	[5] 7,351,069	[5] 7,626,122	7,604,468	8,664,633
Sulfur (Frasch-process), long tons	3,835,280	81,900,000	3,691,724	78,910,000
Talc and ground soapstone	(3)	(3)	17,800	216,569
Zinc (recoverable content of ores, etc.)	24	8,736	3	996
Undistributed: Native asphalt, bromine, gem stones, graphite, magnesium chloride (for metal), mercury (1951), pumice and pumicite, sodium sulfate, stone (crushed basalt and dimension granite, 1951), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		28,947,682		34,311,770
Total Texas		3,268,555,000		3,378,557,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels, gypsum, and mercury are strictly production.
[2] Except clays sold or used for cement.
[3] Value included with "Undistributed."
[4] Final figure. Supersedes preliminary figure given in commodity chapter.
[5] Excludes certain stone, value for which is included with "Undistributed."

In May 1952, the Reynolds Metals Co. official opened its La Quinta reduction plant in San Patricio County. An annual capacity of 80,000 tons of metal was expected by early 1953. Negotiations were undertaken for a channel across Corpus Christi Bay to permit ocean carriers to bring in Jamaican bauxite direct to the plant.

The Texas Gulf Sulfur Co. began large-scale sulfur production from Spindletop dome, long important for its oil production. This company also expanded its operation at Moss Bluff dome in Liberty County. Freeport Sulfur Co. continued construction of its new Nash dome operation near Houston.

Lone Star Steel Co. continued construction of its new steel mill at Daingerfield, which, upon completion in 1953, was to add 500,000 tons of steel to Texas production.

DMEA CONTRACTS IN TEXAS

The Defense Minerals Exploration Administration (DMEA) was established to encourage exploration and development of strategic and critical materials in the United States, its Territories and possessions. The Government contributed 50 to 90 percent of the cost of exploration, depending on the mineral. DMEA's contribution was repayable in the form of a royalty accrued from production resulting from such exploration. DMEA contracts in force in Texas in 1952 are given in table 2.

TABLE 2.—Defense Minerals Exploration Administration contracts active during 1952

Operator	Property	County	Mineral	Total contract	Actual Government participation	Certification of discovery
National Lead Co.	Trone and Ollott	Fort Bend	Sulfur	$97,679	None (noncompliance).	None.
Paulsell & Cook	Rainbow mine	Presidio	Mercury	75,900	do	Do.
Maravillas Minerals Co.	Lucky Strike, Manana, and Quen Sabe claims.	Brewster	do	10,450	$2,228.18 (final total).	Do.
Carr Mining Co.	Includes Chinati, Montezuma and Presidio mines.	Presidio	Lead	10,395	$938 (final total).	Do.
Amerimex Mining Co.	Fresno mine	do	Mercury	80,000	None (inactive).	

CONSUMPTION AND MARKETS

The year 1952 witnessed continued rapid growth of all major industries in Texas. Several basic causes for this accelerated increase were: (1) Postwar defense programs, (2) the nationwide postwar boom, (3) the growing importance of the oil and gas industry in the Nation's economy, (4) decentralization policies of large companies, and (5) Government policies and programs (expansion of the aluminum industry). Production and refining of crude oil led this development, followed by processing and manufacturing. The greater part of this expansion occurred in the Gulf Coast area with other important expansion in the Dallas-Fort Worth area.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Oil, gas, and natural-gas liquids contributed 96 percent of the total mineral value of the State in 1952. Texas was the major producer of these commodities in the Nation.

Asphalt (Native).—Two companies produced asphaltic limestone in Uvalde County. The quantity produced increased during 1952.

Helium.—Texas continued to supply the largest portion (about three-fourths) of the Nation's helium output. The Government helium plant at Exell in Moore County supplied the major part of this output. The 1952 production increased 29 percent and its value 31 percent over that of 1951 (table 3). There was a tremendous increase in the national demand for this product, and both Government plants at Exell and Amarillo operated at capacity during the year.

TABLE 3.—Helium production in Texas, 1951–52, in cubic feet

County	1951		1952	
	Production (cubic feet)	Value	Production (cubic feet)	Value
Moore	57, 636, 751	$740, 571	76, 775, 640	$1, 008, 330
Potter	25, 532, 884	325, 885	30, 525, 692	396, 766

Natural Gas.—Marketed production of natural gas continued the rapid rate of increase in both volume and value that began before World War II (table 4).

Over 70 percent of the marketed gas originated from gas wells, and the remainder was recovered from oil wells (table 5).

TABLE 4.—Marketed production of natural gas, 1943–47 (average) and 1948–52 [1]

Year	Quantity (million cubic feet)	Value (thousand dollars)	Year	Quantity (million cubic feet)	Value (thousand dollars)
1943–47 (average)	1, 665, 931	119, 054	1950	3, 126, 402	146, 941
1948	2, 289, 923	103, 505	1951	3, 781, 136	204, 181
1949	2, 588, 921	118, 832	1952	4, 147, 805	257, 164

[1] Comprises gas sold or used by producers, including losses in transmission, amounts added to storage, and increases in pipelines.

TABLE 5.—Gross withdrawals and disposition of natural gas, 1951–52, in million cubic feet

Year	Gross withdrawals [1]			Disposition		
	From gas wells	From oil wells	Total	Marketed production [2]	Repressuring	Vented and wasted
1951	3, 518, 500	1, 411, 600	4, 930, 100	3, 781, 136	856, 930	292, 034
1952	3, 779, 100	1, 507, 700	5, 286, 800	4, 147, 805	784, 892	354, 103

[1] Marketed production plus quantities used in repressuring vented and wasted.
[2] Gas sold or consumed by producers, including losses in transmission, amounts added to storage and increases in gas in pipelines.

Most of the proved gas reserves of the Nation in 1952 were in Texas, according to the American Gas Association Committee on Natural Gas Reserves. Estimated proved recoverable reserves of natural gas in Texas and offshore were 105,732,763 million cubic feet, comprising 53 percent of the estimated national reserves.

Natural-Gas Liquids.—Texas produced 54 percent of the natural-gas liquids in the Nation during the year. From the 3,420,398 million cubic feet of natural gas treated, there were produced the following:

Commodity:	*Quantity (thousand barrels)*	*Value (thousand dollars)*
Natural gasoline	41, 759	119, 943
LP-gases	58, 497	88, 635
Finished gasoline and naphtha	13, 982	51, 910
Other products	5, 916	16, 647
Total	120, 154	277, 135

Production of natural gasoline in the State during the year increased 6 percent in quantity and 1 percent in value. Liquefied petroleum gases showed a 20-percent increase in quantity and 23-percent increase in value to record the highest level of production in history (table 6).

TABLE 6.—Production of natural-gas liquids, 1943–47 (average) and 1948–52

Year	Natural gasoline and cycle products		LP-gases	
	Thousand barrels	Thousand dollars	Thousand barrels	Thousand dollars
1943–47 (average)	34,604	71,775	15,997	18,706
1948	44,634	164,948	27,482	57,770
1949	47,327	138,924	29,704	45,108
1950	54,007	156,786	39,643	50,266
1951	59,907	189,973	48,624	71,943
1952	61,657	188,500	58,497	88,635

Petroleum.—Production of crude oil in 1952 was the highest in Texas history despite a strike at many refineries in May, and the State furnished nearly 45 percent of the Nation's entire crude output. Crude production has increased steadily for the past 3 years (table 7).

During the year petroleum production was recorded in 186 counties in the State, with 103 counties reporting over 1,000,000 barrels annually. The 10 counties that supplied one-third of the State's oil production [3] are listed below:

County:	*Production (thousand barrels)*
Ector	59,000
Gregg	58,000
Scurry	49,000
Andrews	40,000
Rusk	35,000
Brazoria	29,000
Harris	28,000
Wood	24,000
Upton	23,000
Refugio	22,000

TABLE 7.—Production of crude petroleum, 1943–47 (average) and 1948–52

Year	Quantity (thousand barrels)	Value (thousand dollars)	Year	Quantity (thousand barrels)	Value (thousand dollars)
1943–47 (average)	735,235	1,040,540	1950	829,874	2,147,160
1948	903,498	2,357,400	1951	1,010,270	2,610,790
1949	744,834	1,932,050	1952	1,022,139	2,641,860

At the end of 1952, 139,530 producing wells in the State were averaging 20.5 barrels a day. This represented a 4-percent increase in the number of wells compared to those in 1951. The yield per well dropped 2 percent compared with the 1951 yield.

[3] Railroad Commission of Texas, Annual Report of the Oil and Gas Division, 1952.

Texas refinery capacity at the end of 1952 was 2,227,537 barrels a day and cracked-gasoline capacity 615,595 barrels a day.[4] Both capacities represented well over one-fourth of the national capacity. There were 58 active refineries in 1952, 4 idle, and 1 under construction.

Crude-oil pipeline mileage increased 17 percent from 1949 to 1952, when 54,451 miles were in service. Products pipeline mileage increased 5 percent from 1950 to 1952 to 2,742 miles. The cubic capacity of crude pipelines increased 9 percent to 13,966,000 barrels from 1949 to 1952; product pipelines increased 5 percent to 882,000 barrels in the same period.[5]

Oil and Gas Exploration.—The intense search for new oil and gas reserves in Texas continued during 1952 to augment a similar production increase. A total of 16,812 holes was drilled, of which 9,682 were oil, 778 gas, and 6,352 dry. According to estimates of the National Oil Scouts and Landsmen Association, four dry holes were drilled for each producing well drilled in exploratory tests.

METALS

Copper.—Mine production of copper in Texas was of minor importance in 1952. A total of 18 tons was recovered from several small exploratory and development projects in the southwestern part of the State. Most of these complex base-metal ores contained small silver and gold values. All projects had terminated by the latter part of the year.

Gold-Silver.—Gold and silver were recovered from complex base-metal ores obtained from exploration and development projects in Hudspeth and Presidio Counties (table 8).

Iron Ore.—Usable iron ore totaling 787,000 long tons was shipped in Texas in 1952—a 25-percent decline from 1951. Production was at a level slightly above that of 1948.

Lead.—Mine production of recoverable lead amounted to 56 tons in 1952; it was obtained from several development projects in Hudspeth and Presidio Counties (table 8).

Magnesium.—The Government-owned electrolytic magnesium plant at Velasco continued production through 1952. The Dow Chemical Co. operated this plant as well as its own Freeport plant to supply 60 percent of the domestic primary production.

Manganese.—A small quantity of manganese ore was shipped to the National Stockpile in 1952. All exploration projects for this commodity had terminated by the latter part of the year.

Zinc.—A small quantity of zinc was recovered from complex ores produced from several exploration and development projects in the southwestern part of the State. All projects were terminated before the end of the year.

[4] Kirby, J. G., Petroleum Refineries, Including Cracking Plants, in the United States, January 1, 1953: Bureau of Mines Inf. Circ. 7667, 1953, 12 pp.

[5] Coumbe, A. T., and Avery, I. F., Crude-Oil and Refined Products Pipeline Mileage in the United States, January 1, 1953: Bureau of Mines Inf. Circ. 7671, 1953, 10 pp.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc, 1943–47 (average), 1948–52, and total, 1885–1952, in terms of recoverable metals [1]

Year	Ore (short tons)	Gold		Silver	
		Fine ounces	Value	Fine ounces	Value
1943–47 (average)	4,450	19	$410	20,470	$16,190
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
1951 [3]	750	32	1,120	1,381	1,250
1952	1,270	39	1,365	4,672	4,228
1885–1952	(4)	8,552	233,265	33,303,173	23,446,564

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1943–47 (average)	52	$14,090	46	$6,930	33	$3,210	$40,830
1948 [3]	23	9,982	170	60,860	----------	----------	75,611
1949 [3]	24	9,456	132	41,712	----------	----------	55,003
1950 [2 3]	2	832	129	34,830	----------	----------	39,598
1951 [3]	1	483	43	14,878	24	8,736	26,467
1952	18	8,712	56	18,032	3	996	33,333
1885–1952	1,383	402,028	5,443	692,471	837	132,283	24,906,611

[1] Includes recoverable metal content of ore shipped during the calendar year indicated.
[2] All of 1950 production was from 1 mine in Presidio County, which produced lead ore.
[3] 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.
[4] Data not available.

NONMETALS

Abrasive Stone.—Production of grinding pebbles in Travis County increased 160 tons for a total of 510 tons valued at $3,100 in 1952.

Bromine.—Texas was the leading State in the production of bromine. Ethyl-Dow Chemical Co. recovered bromine from sea water at Freeport, Tex. This one operation was the largest single producer and manufactured a large part of domestic production. The bulk of the product was consumed as ethylene dibromide as an additive in tetraethyl lead antiknock compounds.

Cement.—The quantity and value of cement shipments in 1952 increased 13 percent over those in 1951 (table 9). In 1948–52 the production of cement increased 46 percent and the value 58 percent. The State ranked third in production in the Nation. There were 13 cement mills in the State, operating in 8 counties—3 mills each in Harris and Dallas Counties; 2 in Bexar; and 1 each in Tarrant, Nolan, El Paso, Neuces, and McLennan. Four of the plants in the Gulf Coast area used oystershells as raw material instead of limestone. Three plants using shells were at Houston and the fourth at Corpus Christi.

Clays.—The 1952 clay production declined 7 percent below 1951 but was 23 percent above 1948 (table 10). The value followed this trend to a small degree, being 5 percent below that of 1951 but twice as much as 1948.

TABLE 9.—Finished portland cement produced and shipped, 1943–47 (average) and 1948–52, in 376-pound barrels

Year	Production (barrels)	Shipments		
		Barrels	Value	
			Total	Average per barrel
1943–47 (average)	9, 385, 650	9, 434, 640	$17, 124, 570	$1. 81
1948	13, 700, 633	13, 786, 846	30, 352, 972	2. 20
1949	14, 949, 812	14, 741, 805	33, 409, 347	2. 27
1950	17, 150, 293	17, 281, 521	39, 677, 804	2. 30
1951	18, 132, 373	17, 642, 654	42, 648, 536	2. 42
1952	19, 997, 983	19, 849, 455	48, 042, 901	2. 42

The quantity of fire clay increased 12 percent during 1952. Production was recorded in seven counties—Bastrop, Bexar, Denton, Harris, Harrison, Henderson, and Rusk. The fire clay was used mostly for heavy clay products such as building and paving brick, drain tile, sewer pipe, and kindred products. Sixty-six percent of the total went for these purposes; 32 percent went into the production of refractories; and 2 percent was used in manufacturing pottery and stoneware.

Miscellaneous clays production declined 8 percent and value 11 percent in 1952 when compared with 1951. There was production in 19 counties; the 5 principal ones, in order of production, were Ellis, Palo Pinto, Parker, Wise, and Harrison. Most of these clays went into the manufacture of heavy clay products, with about 1 percent going into rotary-drilling muds and a minute quantity into the manufacture of high-grade tile. A large quantity of clay was used in manufacturing cement. Roughly 680,000 tons of miscellaneous clays were used for this purpose.

TABLE 10.—Clays sold and used by producers, 1943–47 (average) and 1948–52, by kinds

Year	Bentonite		Fire clay		Fuller's earth		Miscellaneous clay		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	22, 770	$198, 370	153, 120	$357, 720	104, 400	$986, 760	868, 100	$844, 470	1, 148, 390	$2, 387, 320
1948	29, 926	282, 036	259, 128	590, 420	92, 310	1, 162, 336	1, 301, 190	1, 308, 548	1, 682, 554	3, 343, 340
1949	27, 598	302, 384	243, 373	537, 144	100, 745	1, 242, 558	1, 358, 460	1, 198, 063	1, 730, 176	3, 280, 149
1950	24, 574	321, 345	307, 026	674, 770	112, 466	1, 393, 773	1, 595, 211	1, 625, 503	2, 039, 277	4, 015, 391
1951	38, 425	212, 670	320, 238	764, 228	142, 273	1, 952, 304	1, 716, 117	2, 015, 763	2, 217, 053	4, 944, 965
1952	31, 386	584, 938	358, 466	1, 064, 005	105, 565	1, 030, 005	1, 573, 603	1, 791, 234	2, 069, 020	4, 470, 182

Texas was among the top 3 producers of fuller's earth in the Nation, with about 25 percent of the total. Production amounted to 105,565 short tons valued at $1,030,005, a 26-percent decrease in quantity compared with the previous year. This material was mined in Angelina, Fayette, Trinity, and Walker Counties.

Bentonite was produced in Harris, Fayette, and Jasper Counties. This production amounted to 31,386 short tons valued at $584,938, an 18-percent decrease in quantity compared with last year.

Feldspar.—Production of crude feldspar in Gillespie County increased somewhat during the year.

Gem Stones.—A small quantity of gem stones and semiprecious stones was reported from Texas in 1952. Agate was reported from the Alpine-Big Bend region, and a small quantity of topaz was recovered from deposits in Mason County.

Graphite.—The Southwestern Graphite Co. produced and refined crystalline graphite in Burnet County. Production decreased during the year.

Gypsum.—Texas was the fifth largest producing State of crude and the third largest of calcined gypsum in the Nation in 1952. There were 5 producers in the State—2 in Fisher County and 1 each in Hardeman, Hudspeth, and Nolan. Crude-gypsum production in 1952 declined 10 percent compared with 1951, but this quantity was 14 percent above the 1948 production (table 11). Production of calcined gypsum in 1952 decreased 11 percent compared with 1951, and the value dropped 8 percent.

TABLE 11.—Crude gypsum mined and calcined gypsum produced, 1943–47 (average) and 1948–52, in short tons

Year	Grude gypsum mined			Calcined gypsum produced		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
1943–47 (average)	550,140	$1,030,460	$1.87	370,480	$2,164,610	$5.85
1948	893,704	2,143,539	2.40	625,632	3,867,656	6.18
1949	843,292	2,178,569	2.58	561,778	3,930,599	7.00
1950	1,076,251	2,771,812	2.58	752,615	5,566,132	7.40
1951	1,136,824	2,987,890	2.63	793,562	6,509,550	8.20
1952	1,021,161	2,682,019	2.63	707,654	5,960,375	8.42

Lime.—Marketed production of lime in the State during 1952 was 281,604 short tons, a slight increase over the previous year. Its value was $2,622,975 or 4 percent more than in 1951 (table 12). In addition to lime sold by the producers, an approximately equal quantity was produced by companies for their own use.

Eleven lime-producing operations were active in 1952 in Brazoria, El Paso, Harris, Johnson, Nueces, Travis, and Williamson Counties. Much of the production along the Gulf coast used oystershells as a

TABLE 12.—Lime (quick and hydrated) sold by producers, 1943–47 (average) and 1948–52, in short tons

Year	Quicklime		Hydrated lime		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	77,560	$586,660	40,190	$398,620	117,750	$985,280
1948	119,627	1,031,893	49,111	551,833	168,738	1,583,726
1949	121,267	1,105,886	52,457	633,299	173,724	1,739,185
1950	163,268	1,451,929	53,171	622,438	216,439	2,074,367
1951	212,784	1,762,685	67,173	769,702	279,957	2,532,387
1952	209,904	1,802,899	71,700	820,076	281,604	2,622,975

raw material instead of limestone. The Nyotex Chemicals, Inc., the Dow Chemical Co., and the Champion Paper & Fibre Co. used shells entirely, while Columbia-Southern Chemical Corp. used both shells and limestone as raw materials. Roughly, 54 percent of the total lime output was from shells. Most of the marketed lime, however, was produced from limestone.

Pumice and Pumicite.—There were 3 mines and 2 preparation plants producing and processing pumice and pumicite in the State in Gonzales, Hidalgo, and Lubbock Counties. Production in 1952 remained at about the same level as in 1951.

Salt.—Production of salt increased 10 percent in quantity and value during 1952 over that of 1951. This continued an upward trend in production from 1948 to 1952 that increased the quantity 95 percent and the value 157 percent (table 13). Texas, in 1952, supplied 6 percent of the Nation's salt output. Most of the State's production was in the form of brine; it was recorded in seven counties—Brazoria, Fort Bend, Harris, Duval, Terry, Van Zandt, and Yoakum.

TABLE 13.—Salt sold or used by producers, 1943–47 (average) and 1948–52

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton			Total	Average per ton
1943–47 (average)	1,133,250	$2,404,200	$2.12	1950	1,852,138	$2,846,789	$1.54
1948	1,354,109	1,712,169	1.26	1951	2,401,063	4,000,100	1.67
1949	1,641,171	2,419,963	1.47	1952	2,640,209	4,402,032	1.67

Sand and Gravel.—Sand and gravel production in Texas increased slightly (1 percent) in quantity and 10 percent in value in 1952 over 1951. Noncommercial production dropped sharply during the year, resulting in 30 percent less tonnage in this category. Commercial production had a compensatory increase in tonnage of 9 percent, which more than offset the decrease in noncommercial.

Over the period 1948–52, the quantity of production has increased 23 percent, and its value has increased about 35 percent (table 14).

Texas was the eighth largest producer of sand and gravel in the Nation. Sand and gravel were produced in about 100 counties. Over 60 percent of the sand produced in the State was used for structural purposes, with 33 percent used for paving. Paving consumed nearly 54 percent of the gravel with 33 percent being used for structural purposes (table 14).

Sodium Sulfate.—Production of natural sodium sulfate in Ward County decreased during 1952.

Stone.—Texas stone production in 1952 increased 3 percent in quantity and 14 percent in value compared with 1951. In the 5-year period, 1948–52, this quantity increased to 98 percent, with an 86-percent increase in value (table 15).

Dimension stone produced from granite, sandstone, and limestone in 1952 was 47,353 short tons valued at $780,508, a 1-percent increase in tonnage and a 7-percent increase in value. Most dimension stone was cut from limestone.

TABLE 14.—Sand and gravel sold or used by producers, 1951–52, by classes of operations and uses

	1951			1952		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Molding	(1)	(1)		4,736	$7,724	$1.63
Building	3,296,388	$2,459,296	$0.75	3,784,154	2,911,363	.77
Paving	1,998,749	1,672,060	.84	2,060,517	2,062,507	1.00
Grinding and polishing	48,389	285,374	5.90	60,712	297,824	4.91
Engine	57,573	38,853	.67	47,780	30,113	.63
Filter	26,371	77,950	2.96	(1)	(1)	
Railroad ballast	2,606	1,081	.41	12,816	8,578	.67
Other	6,222	6,586	1.06	148,030	63,142	.43
Undistributed [2]	159,569	277,128	1.74	145,348	367,664	2.53
Total commercial sand	5,595,867	4,818,328	.86	6,264,093	5,748,915	.92
Gravel:						
Building	4,546,934	5,419,777	1.19	4,003,297	4,856,851	1.21
Paving	3,361,716	3,676,833	1.09	4,110,766	4,961,223	1.21
Railroad ballast	1,116,712	817,661	.73	1,556,650	957,903	.62
Other	36,212	42,502	1.17	63,508	77,701	1.22
Total commercial gravel	9,061,574	9,956,773	1.10	9,734,221	10,853,678	1.12
Total commercial sand and gravel	14,657,441	14,775,101	1.01	15,998,314	16,602,593	1.04
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building	21,962	26,360	1.20	714	1,665	2.33
Paving	98,914	55,808	.56	29,148	9,457	.32
Total Government-and-contractor sand	120,876	82,168	.68	29,862	11,122	.37
Gravel:						
Building	1,032	1,326	1.28	28,742	6,280	.22
Paving	3,709,114	792,936	.21	2,604,485	655,260	.25
Total Government-and-contractor gravel	3,710,146	794,262	.21	2,633,227	661,540	.25
Total Government-and-contractor sand and gravel	3,831,022	876,430	.23	2,663,089	672,662	.25
ALL OPERATIONS						
Sand	5,716,743	4,900,496	.86	6,293,955	5,760,037	.92
Gravel	12,771,720	10,751,035	.84	12,367,448	11,515,218	.93

[1] Included with "Undistributed."
[2] Includes glass sand and other uses indicated by footnote 1.

Crushed stone increased 1 percent in quantity and 12 percent in value in 1952 as compared to 1951. A marked increase in quantity of sandstone was produced during the year, but this gain was largely offset by a substantial decrease in the quantity of limestone produced. Limestone continued to provide the bulk of crushed-stone production, constituting 78 percent of this total. Tonnages of marble, granite, and miscellaneous stone increased during the year, while that of basalt decreased. Limestone was produced in Bexar, Brown, Comal, El Paso, Jones, Travis, Uvalde, Williamson, and Wise Counties. Marble was produced in Travis County. Basalt was quarried in Uvalde and granite in Burnet and Llano Counties.

Concrete aggregate consumed most of the crushed-stone production. Other important uses of crushed stone were railroad ballast, flux, and riprap.

TABLE 15.—Stone sold or used by producers, 1948–52, in short tons

Year	Marble		Limestone		Sandstone		Miscellaneous		Total	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1948	13,400	$160,800	3,211,820	$4,017,730	10,000	$25,000	608,480	$429,667	[1] 3,844,350	[1] $4,658,720
1949	10,000	200,000	3,574,380	4,745,885	-------	-------	450,470	202,224	[2] 4,158,430	[2] 5,289,647
1950	10,550	278,500	3,800,700	4,682,090	127,290	124,642	954,610	495,231	[3] 4,893,150	[3] 5,580,463
1951	10,675	303,500	5,928,140	6,464,008	376,957	276,847	1,035,297	581,767	[3] 7,351,069	[3] 7,626,122
1952	16,500	350,000	5,343,324	6,634,047	879,561	667,671	1,265,484	739,670	[4] 7,604,468	[4] 8,664,633

[1] Includes 650 tons of granite valued at $25,523.
[2] Includes 123,580 tons of basalt and granite valued at $141,538.
[3] Excludes certain stone, Bureau of Mines not at liberty to publish.
[4] Includes 99,599 tons of granite valued at $273,245.

Sulfur.—Production and shipments of sulfur in Texas declined slightly in 1952 (table 16). The supply situation improved during the year, easing the shortage existing in 1950. Both Frasch- and byproduct-sulfur capacity was enlarged during the year. In 1952 there were 9 producers of byproduct sulfur from the liquid purification of gas, while in 1951 there was only 1 such producer. These plants produced 48,101 gross tons of sulfur and shipped 38,402 long tons valued at $797,724. Frasch and byproduct sulfur together gave a combined total production of 3,832,696 gross tons. This was more than 60 percent of the Nation's total production of sulfur from all sources.

TABLE 16.—Sulfur produced and shipped from Frasch mines 1943–47 (average) and 1948–52, in long tons

Year	Production	Shipments		
		Long tons	Value	
			Total	Average per ton
1943–47 (average)	2,799,457	3,096,823	$50,966,776	$16.46
1948	3,867,545	3,973,201	71,500,000	18.00
1949	3,610,829	3,678,196	66,208,000	18.00
1950	3,949,164	4,248,688	80,300,000	18.90
1951	3,966,956	3,835,280	81,900,000	21.35
1952	3,784,595	3,691,724	78,910,000	21.37

Talc and Ground Soapstone.—Soapstone was produced in Gillespie County and talc in Hudspeth County in 1952. Production remained about the same as in 1951.

REVIEW BY COUNTIES

Production of metals and nonmetals in 1952 was reported in 102 of the 254 counties in Texas. These counties were distributed throughout the State.

Production of petroleum, natural gas, and natural-gas liquids is not broken down in this chapter. Some petroleum production was recorded in 186 counties and natural gas in 172 counties.

ANGELINA

Clay for rotary-drilling mud was mined by the Magnet Cove Barium Corp. at Zavalla. The Bennett-Clark Co., Inc., mined fuller's earth near Rockland.

ATASCOSA

The Espey Silica Sand Co. operated a sand pit at Espey near San Antonio, producing glass sand, molding sand, building sand, blast sand, filter sand, and sand for other uses. The West Land Security Co. produced glass sand near Poteet.

AUSTIN

Sand and gravel were produced in Austin County.

BASTROP

The Elgin Standard Brick Manufacturing Co. and the Elgin Butler Brick Co. mined plastic fire clay near Elgin for the production of brick products.

BELL

Sand and gravel were produced in Bell County.

BEXAR

Considerable mineral-production activity featured Bexar County. Sand and gravel were produced by the Acme Gravel Corp. at Culebra Road near San Antonio, Schoenfeld & Sons, Medina River Sand & Gravel Co. near Von Ormy, and the city of San Antonio for paving purposes. Miscellaneous clays for wall tile and facing tile were produced by the Southern Co. near San Antonio. The Alamo Clay Products Co. produced plastic fire clay near San Antonio. Limestone was crushed by the McDonough Bros., Inc., at the Beckman Quarry near San Antonio for use as riprap, concrete, road metal, railroad ballast, and chemical use in an alkali works. Colglazier & Hoff, Inc., produced crushed limestone for concrete, road metal, and screenings on Pinn Road near San Antonio. Two cement plants were operated in the county during 1952, by the Longhorn Portland Cement Co. at Longhorn and the other by the San Antonio Portland Cement Co. at Cementville.

BLANCO

Paving gravel was produced by Weirich Bros. at a portable plant near Johnson City.

BOSQUE

Gravel for railroad ballast was produced by the Interstate Construction Materials Co. of Valley Mills.

BOWIE

Sand for building and paving and gravel for building, paving, railroad ballast, and other uses were produced by the Gifford Hill & Co., Inc., at Farr and at Hoot near Texarkana.

BRAZORIA

Ethyl-Dow Chemical Co., the Nation's largest producer of bromine, produced ethylene dibromide at Freeport. Salt from brine was produced by the Dow Chemical Co. at Freeport for its own use. Sand

and gravel were produced in the county. The Dow Chemical Co. produced magnesium and magnesium compounds at Freeport. Frasch sulfur was produced by Freeport Sulphur Co. at Hoskins Mound and Jefferson Lake Sulphur Co. at Clemens Mound.

BRAZOS

Sand and gravel were produced for building use by Taylor Sand & Gravel Co. at San Felipe near Sealey.

BREWSTER

The National Park Service at Big Bend National Park produced sand and gravel for building and paving use.

BRISCOE

Production of sand and gravel was recorded in Briscoe County.

BROWN

The Texas Brick Co. produced clay near Brownwood for use in making common brick and face brick. High-calcium limestone was crushed by the G. C. McBride Co. at the quarry near Brownwood for use as riprap, in concrete, as road metal, for railroad ballast, and for agricultural purposes.

BURNET

Dimension and crushed granite was produced by the Texas Pink Granite Co., Inc., of Marble Falls.

CHILDRESS

Sand and gravel and noncommercial crushed stone were produced in Childress County during 1952.

COLEMAN

Glass sand, molding sand, and blast sand were produced near Santa Anna by the Santa Anna Silica Sand Co., Inc. Shale for making face brick was produced near Coleman by the Martin Brick Co.

COLORADO

A large tonnage of sand and gravel was reported in Colorado County by 4 producers in 8 operations. Horton & Horton operated fixed plants near Columbus and near eagle Lake and ran a dredge at Eagle Lake. Building sand and gravel were produced by Parker Bros. at a portable plant near Columbus. The Texas Construction Material Co. operated 2 portable plants at Eagle Lake and 1 portable plant near Columbus to produce sand and gravel for paving. Sand and gravel for building were produced at Eagle Lake and near Columbus by Thorstenberg & Tamborello.

COMAL

Lime for building and chemical uses was produced at the Dittlinger plant at New Braunfels by the United States Gypsum Co. Sand and gravel for paving were produced by Erhardt Kraft and the Comal County Highway Dept. At the New Braunfels quarry of the United States Gypsum Co. limestone was also crushed for concrete, road metal, and chemical uses. The Servtex Materials Co. crushed limestone at the Odgen Quarry near Ogden for use as riprap, metallurgical flux, in concrete, road metal, railroad ballast, and for chemical and agricultural purposes.

DALLAS

At Mesquite brick was manufactured by the Ferris Brick Co. from shale. Cement was produced by the Trinity Portland Cement Division of the General Portland Cement Co. at Eagle Ford by both the dry and wet processes. At Cement City the Lone Star Cement Corp. produced portland cement. Sand and gravel were produced at the Crews Pit of the Austin Roads Co. under contract with the State Highway Dept. Sand and gravel were produced commercially by the J. Fred Smith Co. at Knight Spur near Dallas and Trinity Mills near Carrollton, the Dallas Gravel Co. near Dallas, Gifford Hill & Co., Inc., at Bobwyn near Kleberg, John C. Corder southwest of Kleberg, Lagow Gravel Co. near Seagoville, and J. W. and Roy McGinty near Dallas. Noncommercial crushed stone was produced in the county. Expanded perlite was produced by Texas Panacalite Co. of Irv ng and the Perlite Products Corp. of Dallas.

DENTON

Plastic fire clay was produced near Denton by the Acme Brick Co. for making face brick.

DE WITT

Production of sand and gravel was recorded in De Witt County. Noncommercial crushed stone was produced, and crushed limestone was produced by the Texas & New Orleans Railroad Co.

DUVAL

Salt was pumped from the Pelanga dome in Duval County, by the Columbia-Southern Chemical Corp., 61 miles to the chemical plant at Corpus Christi.

ELLIS

Shale was mined near Palmer by the Barron Brick Co., Acme Brick Co., and the Ferris Brick Co. near Ferris.

EL PASO

Lime was produced near El Paso by the Atlas Building Products Co. and the El Paso Building Material Co. for building and chemical uses. Cement was produced by the Southwestern Portland Cement Co. at El Paso. Sand and gravel were produced at El Paso by Hugh McMillan, Bowden Sand & Gravel, and the El Paso Sand Products

Co. Noncommercial miscellaneous stone was quarried and crushed in El Paso County. The Vowell and the McMillan companies crushed limestone at plants at El Paso. Hugh McMillan quarried dimension limestone for construction purposes.

FAYETTE

Thorstenberg & Tamborella produced sand and gravel for building, paving, and railroad ballast from two pits near Fayetteville. Bentonite was produced by the Texas Co. at West Point and the National Lead Co. at its mill at Houston. At Flatonia fuller's earth was mined by the Milwhite Co., Inc., and the Flatonia Fuller's Earth Co.

FISHER

Crude and calcined gypsum was produced at Rotan by the National Gypsum Co. and by the Celotex Corp. at Longworth.

FORT BEND

The Gulf Salt Co. produced evaporated salt and brine at its plant at Missouri City.

FREESTONE

Heavy clay products were manufactured by the Teague Brick & Tile Co. at the Teague plant.

GALVESTON

The city of Galveston produced sand for paving- and road-sand uses.

GILLESPIE

Weirich Bros. produced gravel for paving use near Fredericksburg for the city of Fredericksburg, Gillespie County, and the Texas Highway Department. Dezendorf Marble Co. of Austin produced crude and ceramic feldspar. The Southwestern Talc Corp. produced crude and ground soapstone at Willow City.

GONZALES

Bentonite was mined by the National Lead Co. at Moulton. At Gonzales the Sunset Brick & Tile Co. produced miscellaneous clays. Fred Halamicek at Gonzales produced a little pumice and pumicite for use in floor sweeping. Sand and gravel were produced by the Gonzales Gravel & Sand Co. near Gonzales for building and paving.

GUADALUPE

Clay for brick was mined by the Fraser Brick Co. at McQueeney.

HARDEMAN

Crude and calcined gypsum was produced by the Certain-teed Products Corp.

HARRIS

The Ideal Cement Co., the Lone Star Cement Co., and the General Portland Cement Co. produced cement at mills near Houston. The Nyotex Chemical Co. produced commercial lime from oystershells at Houston. At Pasadena the Champion Paper & Fibre Co. produced lime from oystershells for use in cooking liquor in the manufacture of pulp. The Sheffield Steel Corp produced lime from purchased limestone for metallurgical uses. Brine was produced at Pasadena by the Diamond Alkali Co. for use at the Houston works. The Texas Brine Co. produced brine for sale at Houston. The United Salt Corp. produced rock salt and pressed blocks at the Hockley salt mine. Fire clay was produced by the Houston Brick Co. for the manufacture of heavy clay products. White clay was mined near Houston by J. M. Cordell & Sons for use in the manufacture of sewer brick, structural clay tile, and face brick. Common brick, face brick, and tile were manufactured by the Acme Brick Co. from miscellaneous clays produced near Houston. Expanded perlite was produced at Houston by the Perlite of Houston, Inc.

Sand was dredged from the San Jacinto River by Horton & Horton for use as building, paving, molding, blast, and engine sands. Parker Bros. & Co., Inc., operated a dredge on the San Jacinto River to produce sand for building uses. Frank T. Slack produced sand near Channelview for building and paving uses.

HARRISON

Clays for stoneware and red flowerpots were produced and used by the Marshall Pottery Co. near Marshall. Heavy clay products were manufactured by the Marshall Brick Co. at Marshall. At Waskom the Tri-State Brick & Tile Co. made face brick.

HASKELL

W. W. Kittley produced building gravel at a plant near Rule.

HAYS

Sand and gravel were produced by the Green Valley Gravel Co. at a plant hear San Marcos. A flood closed the plant temporarily during the year.

HENDERSON

Harbison-Walker produced plastic fire clay at its Coleman, Browning, and Keaton pits for making fire-brick refractories. Flint clay was produced by General Refractories at Troup for use in manufacturing fire-brick refractories. Common brick and facing tile were made from clay mined near Malakoff by the Texas Clay Products Co. Plastic clay mined by the Athens Tile & Pottery Co. was used for manufacturing art pottery and flowerpots.

HIDALGO

Prepared pumice was produced by the Valley Brick & Tile Co. at its plant at Rio Grande City, as well as face brick from clays near Mador. Miscellaneous crushed stone was produced by Heldenfels Bros. of Corpus Christi. Sand and gravel for building and paving purposes were produced by the Fordyce Gravel Co. of San Antonio.

HOOD

Sand and gravel were produced in Hood County by the West Texas Sand & Gravel Co.

HOUSTON

L. H. Mathis produced sand for building purposes from a bank sand pit.

HUDSPETH

A small production of gold, silver, copper, lead, and zinc, in complex ores, resulted from exploratory and development projects in the county. Gifford Hill & Co., Inc., produced crushed miscellaneous stone. Crude gypsum was quarried near Finley by the Southwestern Portland Cement Co. Crude and ground talc for ceramics and rubber was produced near Sierra Blanca at the Rossman mine of the Southwestern Talc Corp.

JASPER

Bentonite was mined at Brookeland by the Bennett-Clark Co., Inc., of Nacogdoches.

JEFFERSON

The Beaumont Brick Co., Inc., produced clay for brick products at the plant at Beaumont. C. A. McKinley Sons, Inc., operated a dredge on the Neches River near Beaumont and produced sand for building uses.

JIM WELLS

Sand and gravel for building uses were produced in the county by M. P. Wright, Jr.

JOHNSON

Larson & Clarkson of Cleburne crushed sandstone for use in concrete and road metal. Lime was produced at the kilns of the Texas Lime Co. of Cleburne for building and chemical uses.

JONES

Cut, sawed, and rough architectural and facing dimension limestone was quarried near Lueders by the West Texas Stone Co.

KENDALL

The Texas Highway Dept. in Kendall County produced gravel for paving use.

KERR

A. Schwarz produced sand and gravel for paving near Kerrville.

KIMBLE

Weirich Bros. produced gravel for paving at a portable plant near Junction.

KLEBERG

The Heldenfels Bros. of Corpus Christi produced crushed miscellaneous stone in Kleberg County.

LAMPASAS

Architectural rough blocks and flagging were cut from sandstone by the Southwest Ledge Stone Co. near Lampasas.

LEON

Noncommercial sand and gravel were produced by contractors in the county.

LIBERTY

Blast sand, engine sand, and sand and gravel for paving use were produced by dredge by the Texas Construction Material Co. near Romayor.

LIMESTONE

Shale for the manufacture of brick products was mined by the Barron Brick Co. at Broebeck.

LLANO

Dimension granite was produced by the Raesener Granite Works of Llano.

LUBBOCK

Near Lubbock the Caprock Chemical Co., Inc., produced prepared pumice and pumicite for use around filling stations for cleaning up oil and grease.

MASON

W. R. Smith shipped a small tonnage of high-grade manganese ore to the National Stockpile from the Spiller mine. At Mason, Weirich Bros. produced gravel from a portable plant.

MATAGORDA

Some small tonnage of commercial sand and gravel was produced in Matagorda County.

McLENNAN

Universal Atlas Cement Co. produced cement at Waco. Gravel was produced by the Central Texas Gravel Co. Noncommercial crushed miscellaneous stone was produced in McLennan County.

MEDINA

D'Hanis Brick & Tile produced shale for the manufacture of heavy clay products.

MIDLAND

Noncommercial crushed stone was produced in Midland County. Expanded perlite was produced at Terminal by Perlite Industries, Inc. Most of the output was used in oil-well muds and in concrete.

MILAM

Herman Zedlitz of Buckholts produced gravel for paving and other uses.

MOORE

Helium was taken from natural gas by a United States Government-operated plant at Exell.

NACOGDOCHES

At Garrison the Acme Brick Co. mined miscellaneous clays for the manufacture of brick products.

NOLAN

Cement was produced at the Maryneal plant of the Lone Star Cement Corp. Gravel was produced 4 miles southwest of Sweetwater by the Hillsdale Gravel Co. Lack of water curtailed production temporarily during the year. Crude and calcined gypsum was produced by the United States Gypsum Co. at the plant at Sweetwater.

NUECES

At Corpus Christi the Halliburton Portland Cement Co. produced portland cement. Sand and gravel for building uses were produced at Calallen by Heldenfels Bros.

OLDHAM

Sand and gravel were produced at the Jude plant of the Western Sand & Gravel Co. near Channing and by Texas Sand & Gravel Co., Ltd., of Amarillo.

PALO PINTO

Heavy clay products were made from clays produced at Mineral Wells by the Reliance Clay Products Co. and the Texas Vitrified Pipe Co. High-grade tile was produced by Texeramics Co. of Mineral Wells. Sand and gravel were produced near Mineral Wells by the Mineral Wells Sand & Gravel Co.

PARKER

Ben Roy Gholson of Millsap produced dimension sandstone for flagging. The Acme Brick Co. at Millsap and the Mineral Wells Clay Products Co. at Mineral Wells produced shale for use in making heavy clay products.

POLK

C. R. Heidelberg and F. C. Herrling produced gravel under contract for the State. Gravel for paving use was produced by the Texas Highway Department in Polk County. Blast sand was produced at Corrigan by the Texas Construction Materials Co.

POTTER

Helium was produced from natural gas at Amarillo by the United States Government (Bureau of Mines) plant outside the city. Sand and gravel for building and paving use were produced by the Panhandle Gravel Corp. 14 miles north of Amarillo. The Texas Sand & Gravel Co., Ltd., produced sand and gravel for building and paving use.

PRESIDIO

A small tonnage of lead and zinc from complex ores resulted from exploratory and development projects in the county.

RANDALL

Sand and gravel were produced in Randall County.

REEVES

Sand for building uses and gravel for building, paving, and well packing were produced by F. M. Reeves & Sons, Inc., near Pecos. Building sand and gravel were produced by Herman A. Lindley near Orla. Noncommercial crushed stone was produced in Reeves County.

ROBERTSON

Payne Bros. produced sand and gravel for a short period on the Reistino farm with a portable plant.

RUNNELS

A small tonnage of noncommercial sand and gravel was produced in Runnels County.

RUSK

Plastic fire clay was mined by the Henderson Clay Products Co. near Henderson to make heavy clay products. J. M. Cordell & Sons mined miscellaneous clays for heavy clay products.

SAN JACINTO

Sand and gravel were produced at Urbana by the Urbana Sand & Gravel Co.

SAN PATRICIO

Miscellaneous stone was produced in San Patrico County by Heldenfels Bros. The Fordyce Gravel Co. produced sand and gravel for building and paving purposes.

STARR

At Rio Grande City the Valley Brick & Tile Co. produced miscellaneous clays for heavy clay products.

STONEWALL

The Hamlin Sand & Gravel Co., Inc., produced sand and gravel for building and paving uses at the Flattop plant near Hamlin.

TARRANT

The Trinity Portland Cement Division of the General Portland Cement Co. operated a cement mill near Fort Worth. The city of Fort Worth and the Tarrant County Highway Department produced gravel for paving. Expanded perlite was produced at Fort Worth by the Texas Perlite Corp.

Commercial sand and gravel were produced by the Thomas Gravel Co., the Fort Worth Sand & Gravel Co., and Jefferies & Betts, Inc. Noncommercial crushed stone was produced in Tarrant County.

TAYLOR

Miscellaneous clays for heavy clay products were produced by the Abilene Brick Co. at Abilene.

TERRELL

The Texas Highway Department produced small tonnage of sand for paving purposes in Terrell County. Commercial limestone and dolomite were quarried and crushed in the county.

TERRY

Evaporated salt was produced at the Brownfield plant of the Frontier Chemical Co.

TOM GREEN

Sand and gravel were produced under contract with the city of San Angelo by Theo. and Cecil Montgomery Sand & Gravel Co.

TRAVIS

Lime was produced at McNeil at the plant of the Austin White Lime Co. for building, agricultural, and chemical uses. The Texas Crushed Stone Co. crushed limestone at its plant near Austin for concrete, road metal, railroad ballast, and agricultural purposes. Texas Quarries, Inc., produced sawed and cut limestone, dimension stone, at the mill near Austin. Dezendorf Marble Co. produced dimension marble and grinding pebbles near Austin.

TRINITY

At Trinity the Trinity Clay Products Co. produced fuller's earth.

UVALDE

Sand and gravel were produced by the D & D Gravel Co. near Uvalde. Near Dabney the White Uvalde mines crushed limestone and dolomite for use in concrete and as road metal. Crushed basalt was quarried by the Southwest Stone Co. at Uvalde.

VAL VERDE

Noncommercial crushed stone was produced in Val Verde County.

VAN ZANDT

Evaporated and rock salt was produced by the Morton Salt Co. at Grand Saline.

VICTORIA

Building and paving sand and gravel were produced near Victoria by the Fordyce Gravel Co. and Heldenfels Bros.

WALKER

Fuller's earth was produced at Riverside by the Texas Co. and the Milwhite Co., Inc.

WALLER

The Waller County Road and Bridge Department produced gravel for paving and road gravel.

WARD

Natural sodium sulfate was produced from well brine and dry-lake brine at Monahans by the Ozark-Mahoning Co.

WEBB

Miscellaneous clays for heavy clay products were produced by the Laredo Brick Co., Ligarde Brick & Tile Co., and Ricardo Chavana at Laredo. Sand and gravel were produced in Webb County.

WHARTON

Sand was produced by the Texas Highway Department in Wharton County. Gravel for paving was produced 9 miles from Wharton by H. W. Hinze.

WICHITA

The Foley Sand & Gravel Co. produced sand and gravel for building and paving uses near Wichita Falls. Noncommercial crushed stone was produced in Wichita County.

WILLIAMSON

Quick and hydrated lime for building and chemical uses was manufactured at the kilns of the Round Rock White Lime Co. at Round Rock. Crushed limestone for a metallurgical flux was quarried near Round Rock by the Round Rock White Lime Co. Near Austin the Texas Quarries, Inc., cut rough blocks and sawed stone for architectural uses.

WILSON

The W. S. Dickey Clay Manufacturing Co. at Saspamco produced miscellaneous clays for the manufacture of heavy clay products.

WISE

Shale for the manufacture of heavy clay products was produced at Bridgeport by the Acme Brick Co. Limestone was crushed at the No. 2 plant of the Southwest Stone Co. at Chico and the Oran Speer quarry for use as riprap, railroad ballast, and road metal, in concrete, and for agricultural purposes.

YOAKUM

Brine was produced at the Yoakum County plant of Frontier Chemical Co.

The Mineral Industry of Utah

By Paul Luff [1]

UTAH mineral industries in 1952 continued to be influenced by national defense requirements. The number of explorations for strategic and critical minerals increased and the mining of copper ore—by far the chief mineral industry in the State—expanded. On the other hand, activity in lead-zinc mining, one of the principal industries of the State, declined during the last 6 months of the year owing to shutdowns caused by strikes and to a weak domestic demand for lead and zinc. Nevertheless, the total value of Utah mineral production, exclusive of uranium, in 1952—$265,502,000—increased 3 percent over the $257,145,000 produced in 1951. Of the total value in 1952, copper contributed 52, coal 12, lead 6, gold 6, iron ore 6, zinc 4, silver 2, and various other minerals 12 percent. The value of the metals recovered from copper ore (including precipitates) was $167,177,424 in 1952, or 63 percent of the State total. Production of gold and molybdenum, mainly byproducts of copper ore, was greater in 1952 than in 1951, but production of carbon dioxide, cement, fluorspar, iron ore, gilsonite, gypsum, lead, lime, natural gas, potash, silver, stone, zinc, and various minor products was less. In contrast, the output of coal, manganese, petroleum, salt, sand and gravel, tungsten, uranium, and vanadium was greater.

In 1952 Utah continued to produce the most gilsonite in the United States and ranked second in copper, gold, silver, and molybdenum, third in lead, fifth in iron ore, and ninth in zinc; it was also a large producer of coal, cement, clay, gypsum, sand and gravel, stone, uranium, and vanadium.

Except for lead and zinc during the latter half of the year, markets and prices for metals and nonmetals were stable throughout 1952. The demand for some metals was unusually high, owing to requirements for national defense purposes. The Treasury price of gold remained at $35 a fine ounce and of silver at $0.905+; the average price of copper remained at $0.242 per pound; but the average price of lead dropped to $0.161 per pound and zinc to $0.166 per pound. The year opened with lead at 19.0 cents a pound and zinc at 19.5 cents a pound and closed with lead at 14.75 cents a pound and zinc at 12.50 cents a pound.

The labor supply, both skilled and unskilled, was ample throughout the year. An average of approximately 14,000 employees per month was maintained in the mineral industries in Utah during 1952. At major operations the workweek remained at 6 days throughout the year.

Despite the fact that some mines and plants were operated at capacity in 1952, no major accidents were reported at Utah mineral operations.

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[1] Commodity-industry analyst, Region IV, Bureau of Mines, Denver, Colo.

The Federal Government's assistance in financing exploration projects in search of reserves of strategic and critical minerals, authorized by the Defense Production Act of 1950, continued throughout 1952. From 1951 through December 31, 1952, the Government has financed projects in Utah as follows: Copper (1), copper-lead-zinc (3), fluorspar-uranium (1), lead (2), lead-zinc (13), tungsten (2), and uranium (13). The total cost of the 35 projects has amounted to $3,098,873, of which the Government provided $1,732,224 and private industry $1,366,649. Details covering the various projects are given in table 3.

GENERAL REVIEW

Mills, Smelters, Refineries, and Purchase Depots.—Six custom mills operated continuously in Utah in 1952; 3—Midvale, 1,700-ton concentrator of the United States Smelting, Refining & Mining Co., Tooele 1,500-ton concentrator of the International Smelting & Refining Co., and Bauer 700-ton concentrator of the Combined Metals Reduction Co.—treated lead-zinc ore, and the other 3—Vanadium Corp. plant at Hite, Atomic Energy Commission plant at Monticello,

TABLE 1.—Mineral production in Utah, 1951–52 [1]

	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Asphalt and related bitumens, native: Gilsonite	65,521	$1,895,374	60,740	$1,779,815
Carbon dioxide, natural (estimated) thousand cubic feet	97,436	10,000	84,500	10,000
Clays (including fuller's earth) [2]	285,128	1,269,203	180,066	1,115,642
Coal	6,135,957	32,652,543	6,140,305	32,410,303
Copper (recoverable content of ores, etc.)	271,086	131,205,624	282,894	136,920,696
Fluorspar	17,827	398,480	17,304	438,699
Gold (recoverable content of ores, etc.) troy ounces	432,216	15,127,560	435,507	15,242,745
Iron ore (usable) long tons, gross weight	4,637,239	10,141,653	3,990,505	15,025,899
Lead (recoverable content of ores, etc.)	50,451	17,456,046	50,210	16,167,620
Lime	48,791	501,266	34,450	423,441
Manganese ore (35 percent or more Mn) gross weight			95	[3]
Manganiferous ore (5 to 35 percent Mn) do	1,369	[3]	3,397	[3]
Natural gas thousand cubic feet	3,733,000	246,000	3,006,000	225,000
Perlite (crude)	3,422	16,017	[2]	[2]
Petroleum (crude) 42-gallon barrels	1,305,000	[3]	1,737,000	[3]
Phosphate rock long tons	580	2,900	[2]	[3]
Pumice and pumicite	9,422	11,478	4,048	4,048
Salt (common)	131,444	570,379	136,125	522,721
Sand and gravel	2,971,268	2,268,750	3,260,044	2,350,412
Silver (recoverable content of ores, etc.) troy ounces	7,310,665	6,616,521	7,194,109	6,511,032
Stone (except limestone for cement and lime)	1,226,710	1,291,118	[4] 852,351	[4] 1,123,108
Sulfur			[5]	[5]
Tungsten concentrate 60-percent WO_3 basis	[6]	565	3	9,449
Zinc (recoverable content of ores, etc.)	34,317	12,491,388	32,947	10,938,404
Undistributed: Native asphalt, (bituminous sandstone, 1951), cement, gypsum, molybdenum, natural gasoline, potassium salts, stone (crushed marble, 1952), vanadium, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		22,971,645		24,282,846
Total Utah		257,145,000		265,502,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels and gypsum are strictly production.
[2] Except clays sold or used for cement.
[3] Value included with "Undistributed."
[4] Excludes certain stone, value for which is included with "Undistributed."
[5] Sulfur was produced, but statistical detail is lacking.
[6] Less than 1 ton.

TABLE 2.—Average prices [1] of certain mineral commodities in Utah, 1951–52

Commodity	Unit	1951	1952
Cement	376-pound barrel	$3.103	$2.599
Clays	Short ton	4.451	6.196
Coal	do	5.320	5.280
Copper [2]	Pound	.242	.242
Fluorspar (crude)	Short ton	22.353	25.352
Gilsonite	do	28.922	29.302
Gold [3]	Troy ounce	35.000	35.000
Gypsum (crude)	Short ton	3.201	3.204
Iron ore	Long ton	2.187	3.765
Lead [2]	Pound	.173	.161
Manganiferous ore	Short ton (5 to 35 percent Mn)	14.921	14.367
Molybdenum	Mo content, pound	.942	.954
Perlite (crude)	Short ton	4.680	5.101
Petroleum [4]	42-gallon barrel	2.200	2.190
Pumice	Short ton	1.218	1.000
Salt (common)	do	4.339	3.840
Sand and gravel	do	.764	.721
Silver [5]	Troy ounce	.905+	.905+
Stone	Short ton	1.053	1.414
Tungsten	Short-ton unit, contained in 60-percent WO_3 concentrate.	62.780	57.970
Zinc [2]	Pound	.182	.166

[1] Prices of clay, coal, fluorspar, gilsonite, gypsum, iron ore, perlite, pumice, salt, and sand and gravel are based on average value f. o. b. mines or mills reported by the producers. More detail on prices by grades and markets will be found in the commodity chapter in Volume I of this series.
[2] Yearly average weighted price of all grades of primary metal sold by producers.
[3] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[4] Value at wells.
[5] Treasury buying price for newly mined silver July 1, 1946, to date—$0.9050505 ($0.905 used in 1947 for calculating purposes).

and the Vitro Chemical Co. plant at Salt Lake City—treated uranium ore. Lead-zinc ore was treated also in mills at Frisco and Park City, copper ore in flotation mills at Arthur and Magna, and sulfur ore in a flotation mill at Sulphurdale. Tungsten ore was shipped to custom mills in California and manganese ore to the Ironton pig-iron and Geneva steel plants in Utah; Western Electrochemical Co., Henderson, Nev.; and the General Services Administration purchase depot at Butte, Mont. At Bauer the Combined Metals Reduction Co. operated a plant to recover resin from coal (including a resin plant) and a plant to produce expanded perlite. The Garfield copper smelter and the copper-anode plant of the American Smelting & Refining Co., the Garfield copper refinery of the Kennecott Copper Corp., the Midvale lead smelter of the United States Smelting, Refining & Mining Co., and the Tooele lead smelter and zinc-slag fuming plant of the International Smelting & Refining Co. operated continuously in 1952. Utah has no zinc smelter; nearly all of the zinc concentrates produced in 1952 were shipped to the electrolytic zinc plants of the Anaconda Copper Mining Co. at Anaconda and Great Falls, Mont., and most of the oxide-zinc fume produced at the Tooele fuming plant was shipped to a plant at Bartlesville, Okla.

The Garfield Chemical & Manufacturing Co., a subsidiary of the American Smelting & Refining Co., and Kennecott Copper Corp. completed plans to increase production capacity of sulfuric acid from 500 to 700 tons per day. The firm supplies acid requirements for J. R. Simplot Co. of Pocatello, Idaho, which produces ordinary and triple superphosphate fertilizer, and for other acid users.

Six oil refineries operated in Utah in 1952, and the output of various types of oil and gasoline was greater than in 1951. The chief operators were the Utah Oil Refining Co. at Salt Lake City, Salt Lake Re-

TABLE 3.—Defense Minerals Exploration Administration (DMEA) contracts from the beginning in 1951 through December 31, 1952

Name of commodity and contractor	Property	County	Date of contract	Participation	
				Government	Private
Copper					
West Park Mining Co	West Park and Green Monster.	Wasatch	Apr. 11, 1952	$8,100	$8,100
Copper-lead-zinc					
East Utah Mining Co		do	Aug. 17, 1951	54,587	54,587
Kentucky-Utah Mining Co	Dixie Apex	Washington	Dec. 11, 1951	17,500	17,500
Park Heber Consolidated Mining Co.	10 claims	Wasatch	June 25, 1952	13,500	13,500
Fluorspar-uranium					
Fred Staats	5 claims	Beaver	Sept. 4, 1952	17,500	7,500
Lead					
Duke Page Auto Co	Evelyn	Juab	Oct. 30, 1952	8,854	8,854
Naildriver Mining Co	Naildriver	Wasatch	June 22, 1951	42,063	42,063
Lead-zinc					
American Fork Consolidated Mines.	Blue Rock (Pacific)	Utah	Mar. 29, 1952	8,019	8,019
Chief Consolidated Mining Co.	Chief No. 1 Mine	Juab	June 12, 1951	231,710	231,710
Combined Metals Reduction Co.	Ben Harrison and Muirbrook Mines.	Tooele	June 7, 1951	111,000	111,000
Do	Butterfield Unit	Salt Lake	Aug. 16, 1951	27,550	27,550
Harringtin-Hickory Mine (Harrington Mines Co.).		Beaver	Sept. 4, 1951	62,620	62,620
New Park Mining Co	Mayflower Mine	Wasatch	May 31, 1951	117,198	117,198
New Quincy Mining Co	New Quincy	do	Feb. 28, 1952	11,929	11,929
Park Utah Consolidated Mines Co.	Keetley Unit	do	Aug. 6, 1951	21,000	21,000
Do	Judge Unit	do	June 25, 1951	89,994	89,994
Privateer Mining Co	Eva	Juab	Aug. 2, 1951	4,031	4,031
Silver King Coalition Mines Co.	Silver King	Summit and Wasatch.	Oct. 22, 1951	160,767	160,767
United Mining Development Co.	Ida and Black Jack groups.	Tooele	June 6, 1952	8,274	8,274
United States Smelting, Refining & Mining Co.	U. S. and Lark Mines.	Salt Lake	June 27, 1952	308,678	308,678
Tungsten					
Louise W. Garrick	Duke Page	Millard	May 14, 1952	20,025	6,675
Cecil R. Woodman	Yellow Hammer and other claims.	Tooele	Nov. 29, 1951	9,284	3,095
Uranium					
Boomerang Mining Co	Carvusite	Grand	Nov. 4, 1952	21,706	2,412
Bullion Monarch Mining Co	Farmer John No. 3 claim.	Piute	June 23, 1952	24,957	2,773
Canary Mining Co	Canary	Daggett	Dec. 5, 1951	24,053	2,673
J. Walter Duncan, Jr	17 claims	San Juan	Mar. 4, 1952	38,871	4,319
Ellihill Mining Co	Jomac claims	do	Sept. 4, 1952	17,145	1,905
Excalibur Uranium Corp	18 claims	Emery	Jan. 24, 1952	53,364	5,929
Glenn Mining Co	Potts and Heatherly No. 8 claims.	Piute	Oct. 15, 1952	20,876	2,320
R. A. Glenny and Scott M. Cutler.		do	Aug. 19, 1952	22,050	2,450
Moreno Cripple Creek Corp	Snowflake and Sunflower claims.	San Juan	Oct. 29, 1952	19,260	2,140
Plateau Mining Co	Yellow Circle group	do	Oct. 23, 1951	17,050	1,894
Salina Mining & Smelting Co	Lynn claims	Kane	Sept. 10, 1952	15,255	1,695
J. R. Simplot Co., Inc	Commodity Uranium.	Garfield and Wayne.	Dec. 13, 1951	64,340	7,149
Sunnyside Uranium Co	Buddy and Freedom claims.	Piute	Sept. 9, 1952	39,114	4,346
Total				1,732,224	1,366,649

fining Co. at North Salt Lake, and Phillips Petroleum Co. at Woods Cross.

The United States Steel Corp. operated its steel plant at Geneva all year, producing steel plate, hot-rolled coils, strip, and various structural steel shapes. The plant can produce 1,879,000 tons of steel ingots a year. The pig-iron plant of the United States Steel Corp. at Ironton operated all year, producing several hundred thousand tons of pig iron and coke; byproducts produced were gas, coal tar, light oil, and ammonium sulfate. Most of the pig iron was shipped to steel plants in California. The coke used at the blast furnace comes from coal mined in Carbon County, Utah, and the iron ore from Iron County, Utah. Uranium ore-purchasing depots were established in 1952 at Marysvale and Thompson.

New Plants or Projects and New Industries.—A comparatively new industry in Utah is the production of chemically pure wax for use in making waxed paper and various types of waxed cartons and for home canning. The Sure-Seal Corp. operated its plant at Salt Lake City all year and produced one railroad car of wax per day. In 1951 and 1952 the corporation manufactured a special wax for the Explosives Division of the United States Army. The corporation is planning to build a new wax refinery at Woods Cross north of Salt Lake City. Utah's Uinta Basin provides the corporation with its raw material,which contains 47.9 percent wax.

The Kalunite plant at Salt Lake City, used during World War II for testing Marysvale alunite for production of alumina, was purchased and remodeled early in 1952 by the Vitro Chemical Co. for treating uranium ore.

The Chemical Corp. of America took over operation of the sulfur deposit at Sulphurdale in 1952, built a new 200-ton pilot flotation mill, and began shipments of sulfur concentrate in March.

Construction of the new cobalt refinery at Garfield was completed in 1952, but no cobalt was produced. Chemical Construction Co., builders of the plant for Howe Sound Co., was "tuning up" the plant at the close of the year. The plant will treat cobalt concentrate produced from the Calera Mining Co. (subsidiary of Howe Sound Co.) mill in Lemhi County, Idaho.

Western Phosphates, Inc., began in December to construct its triple superphosphate fertilizer plant at Garfield. The company was organized by Kennecott Copper Corp., American Smelting & Refining Co., and Stauffer Chemical Co. to produce triple superphosphate made by use of the "wet" or sulfuric acid process in treating phosphate rock mined by the San Francisco Chemical Co. at Leefe, Wyo.

Base-Metal Ore Output in 1952.—The quantity of copper ore mined and treated increased 5 percent (from 30,454,456 tons in 1951 to 32,037,657 in 1952), but lead-zinc ore decreased 2 percent (from 673,022 tons to 660,591). Of the 32,037,657 tons of copper ore produced in Utah in 1952, 32,037,217 came from the West Mountain (Bingham) district. Of the 660,591 tons of lead-zinc ore mined in 1952, 422,248 (64 percent) came from the West Mountain (Bingham) district; 136,888 (21 percent) from the Park City region; 46,594 (7 percent) from the Tintic district; 41,193 (6 percent) from the Ophir and Rush Valley districts; and 13,668 (2 percent) from other districts. A total of 14,195 tons of lead ore was mined in 1952; most of it came

from the West Mountain (Bingham) district. Lead, copper, and zinc slag, smelter cleanings, and old tailings treated totaled 31,681 tons. The siliceous material was largely silver ore and old tailings from the Park City region and the Tintic and West Mountain (Bingham) districts. The number of mines producing in the State declined from 82 in 1951 to 63 in 1952 (all lode mines). Details on production of metals by class of ore are given in table 7.

The 32,875,034 tons of ore, old tailings, and other metal-bearing material produced in Utah in 1952 included the following: 32,699,373 tons (99 percent) treated at mills; 168,519 tons (nearly 1 percent) shipped direct to smelters; and 7,142 tons of old slag smelted and fumed. Details on the production of metals, by methods of recovery and classes of material processed are given in tables 8, 9, and 10.

REVIEW BY MINERAL COMMODITIES

METALS

Arsenic.—About 150 tons of arsenic was produced in Utah in 1952 as a byproduct of lead smelting.

Cobalt.—No cobalt was produced in 1952 at Howe Sound's new cobalt refinery at Garfield owing to metallurgical difficulties encountered. The refinery was built to treat cobalt concentrate produced at the Calera Mining Co. (subsidiary of Howe Sound Co.) mill at Blackbird, Idaho.

Copper.—Utah's 1952 production (282,894 short tons) of recoverable copper was the largest since 1943 and 11,808 tons (4 percent) more than in 1951. Most (96 percent) of the State copper production was recovered from copper ore mined from the Utah Copper open pit at Bingham (Salt Lake County) by the Kennecott Copper Corp. The ore, averaging 0.945 percent copper, was hauled by gondolas from Bingham to the company 40,000-ton concentrators at Arthur and Magna. The resulting copper concentrates were hauled to the nearby Garfield smelter. In addition, the company operated its copper-leaching plant at the mouth of Bingham Canyon all year and produced 10,867 dry tons of copper precipitates. The United States

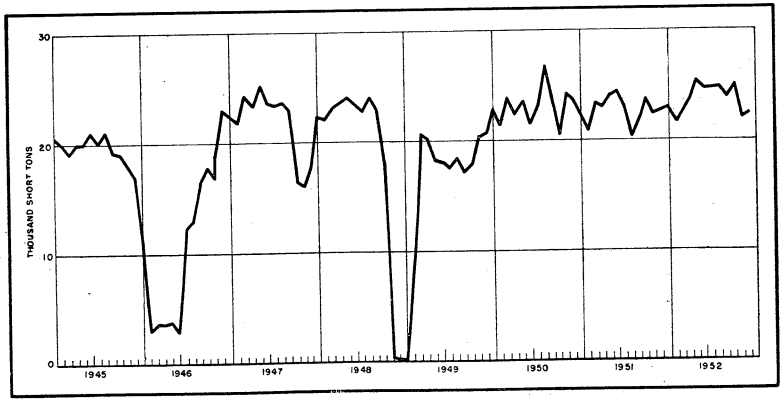

FIGURE 1.—Mine production of copper in Utah, 1945–52, by months, in terms of recoverable metals.

& Lark group, also at Bingham, was the only other Utah property to produce over 1 million pounds of recoverable copper in 1952. These 2 producers contributed 99.7 percent of the State copper. The price of domestic copper was held at about 24.50 cents a pound, established January 26, 1951. Statistical details of copper ore mined, metal produced, and method of recovery are given in the following section under gold.

Gold.—Utah's 1952 production of recoverable gold (435,507 fine ounces) was the largest, except for 1950, in State history and 3,291 ounces (1 percent) more than in 1951. Most of the gold produced in Utah is a byproduct of copper ore, and since this class of ore increased in 1952 the State production of gold increased also. In 1952 copper ore yielded 403,279 ounces (93 percent of the total) of gold—11,879 ounces (3 percent) more than in 1951. Nearly all of the gold recovered from copper ore came from the West Mountain (Bingham) district (Salt Lake County). Lead-zinc ore supplied 27,763 ounces (6 percent of the total) of gold in 1952, a decrease of 5,726 ounces (2 percent)

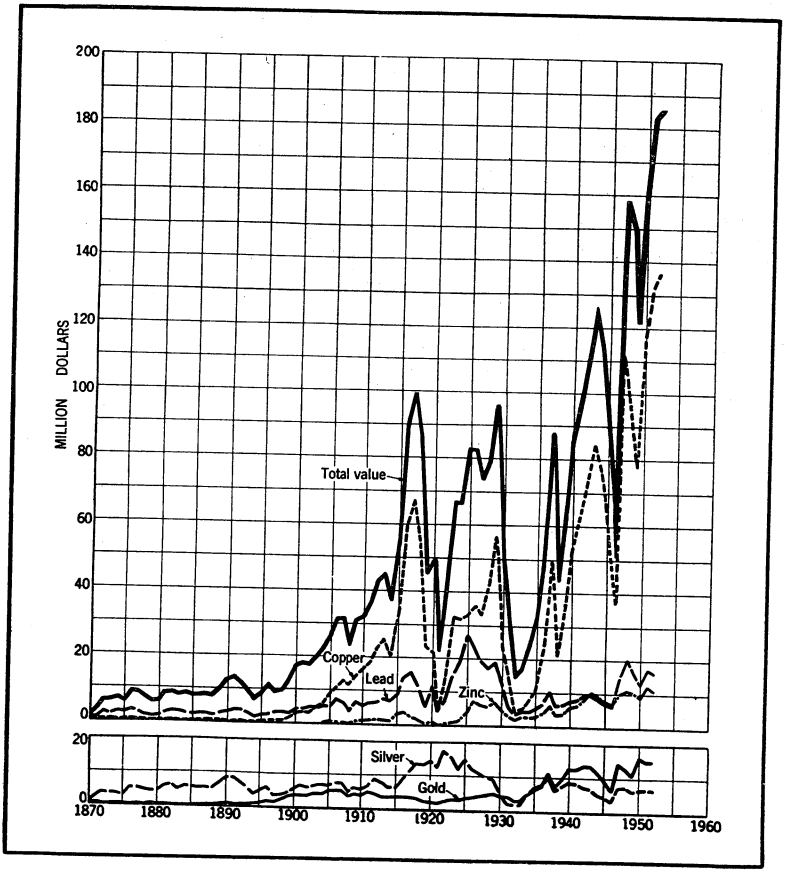

FIGURE 2—Value of mine production of gold, silver, copper, lead, and zinc in Utah, 1870–1952.

from 1951. Of the gold recovered from lead-zinc ore, 94 percent came from the Park City region (Summit and Wasatch Counties) and West Mountain (Bingham) district.

The West Mountain (Bingham) district supplied 96 percent of the State total gold in 1952, the Park City region 3, and the Tintic and Rush Valley districts 1 percent. The output of gold in the West Mountain (Bingham) district increased 3 percent over 1951, but in the Park City region it decreased 25 percent and in the Tintic district 41 percent.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc, 1943–47 (average), 1948–52, and total, 1864–1952, in terms of recoverable metals [1]

Year	Mines producing		Material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1943–47 (average)	100	1	27,335,785	322,973	$11,304,069	7,015,489	$5,370,291
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
1951	82	----------	31,356,837	432,216	15,127,560	7,310,665	6,616,521
1952	63	----------	32,875,034	435,507	15,242,745	7,194,109	6,511,032
1864–1952	----------	----------	[3] 743,808,652	13,072,394	357,758,830	763,311,342	564,033,233

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1943–47 (average)	242,751	$74,125,159	47,800	$9,244,027	38,297	$8,845,436	$108,888,982
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
1951	271,086	131,205,624	50,451	17,456,046	34,317	12,491,388	182,897,139
1952	282,894	136,920,696	50,210	16,167,620	32,947	10,938,404	185,780,497
1864–1952	6,423,836	2,044,606,317	4,723,174	586,078,426	1,207,786	202,089,651	3,754,566,457

[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] Does not include gravel washed or tonnage of precipitates shipped.
[3] Figures estimated for certain years before 1901.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in 1952, by months, in terms of recoverable metals [1]

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	37,026	585,500	22,935	3,850	2,850
February	32,581	601,520	21,660	4,920	3,450
March	36,221	621,235	22,405	4,465	3,250
April	36,581	630,610	23,635	4,670	3,200
May	39,411	661,835	25,265	5,225	3,370
June	35,346	659,360	24,500	4,970	3,210
July	38,221	535,500	24,615	2,970	1,800
August	39,106	599,500	24,784	3,840	2,264
September	34,881	587,500	23,850	3,610	2,200
October	37,696	598,540	24,900	3,705	2,400
November	34,436	523,488	21,995	3,535	2,173
December	34,001	589,521	22,350	4,450	2,780
Total	435,507	7,194,109	282,894	50,210	32,947

[1] Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metal (or gross metal as indicated) contained in concentrates, ores, tailings, and other mineral materials shipped directly to smelters or sold to ore buyers during the year.

The leading gold producers in Utah in 1952—each with an output exceeding 1,000 ounces of recoverable metal—were as follows: Utah Copper mine and United States & Lark group in the West Mountain (Bingham) district; the property of the New Park Mining Co. in the Park City region; the Chief Consolidated Chief No. 1 mine in the Tintic district; and the Park Utah Consolidated property in the Park City region. These 5 properties furnished 99 percent of the State gold.

The State output of metals from ores of gold, silver, copper, lead, and zinc, 1948–52, and production in 1952 by counties, classes of ore, and methods of recovery are shown in tables 4, 5, 6, 7, 8, 9, and 10.

Iron, Steel, and Iron Ore.—The two plants—Geneva steel and Ironton pig iron in Utah County—of the United States Steel Corp. operated all year. The Ironton plant operated the Kaiser-Frazer Parts Corp. blast furnace at Ironton leased by the United States Steel Corp. Most of the pig iron produced by this blast furnace was shipped to steel plants in California; some was shipped in a molten state to the Geneva open-hearth furnaces. The Geneva plant produced steel plate, strip, and various structural steel shapes; approximately 50 percent of the production was shipped to Pittsburg, Calif., in coil form for processing into sheet and tin-mill products. The usual blast-

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties, in terms of recoverable metals

County	Mines producing, lode [1]	Gold		Silver	
		Fine ounces	Value	Fine ounces	Value
Beaver	4	113	$3,955	37,177	$33,647
Box Elder	1			22	20
Grand	2			84	76
Juab	10	2,230	78,050	610,493	552,527
Piute	2	74	2,590	7,372	6,672
Salt Lake	9	417,661	14,618,135	5,350,244	4,842,241
San Juan	1			306	277
Sevier	1	5	175	506	458
Summit	10	2,486	87,010	568,955	514,933
Tooele	10	884	30,940	267,310	241,929
Utah	10	713	24,955	57,947	52,445
Wasatch	2	11,341	396,935	292,608	264,825
Washington	1			1,085	982
Total	63	435,507	15,242,745	7,194,109	6,511,032

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Beaver	15	$7,260	291	$93,702	182	$60,424	$198,988
Box Elder			9	2,898	7	2,324	5,242
Grand	1	484					560
Juab	73	35,332	4,112	1,324,064	2,948	978,736	2,968,709
Piute	2	968	13	4,186	3	996	15,412
Salt Lake	282,109	136,540,756	34,423	11,084,206	20,406	6,774,792	173,860,130
San Juan	10	4,840					5,117
Sevier							633
Summit	89	43,076	4,493	1,446,746	3,505	1,163,660	3,255,425
Tooele	168	81,312	3,664	1,179,808	1,650	547,800	2,081,789
Utah	60	29,040	189	60,858	5	1,660	168,958
Wasatch	367	177,628	3,001	966,322	4,241	1,408,012	3,213,722
Washington			15	4,830			5,812
Total	282,894	136,920,696	50,210	16,167,620	32,947	10,938,404	185,780,497

[1] No placer production in Utah in 1952.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1952, by classes of ore or other source materials, in terms of recoverable metals

Source [1]	Number of mines [2]	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Ore:							
Dry gold-silver	9	24,379	967	70,499	146,439	788,113	7,120
Dry silver	12	106,492	2,198	480,984	163,234	2,840,094	2,530
Total	20	130,871	3,165	551,483	309,673	3,628,207	9,650
Copper	9	32,037,657	403,279	3,284,470	544,537,898	23,850	
Lead	19	14,195	740	72,178	89,788	2,934,725	3,570
Lead-copper	1	39	2	496	1,760	7,973	
Lead-zinc	23	660,591	27,763	3,197,137	3,252,342	92,833,985	64,916,100
Total	44	32,712,482	431,784	6,554,281	547,881,788	95,800,533	64,919,670
Other "lode" material:							
Old tailings	9	[3] 21,070	408	70,144	51,699	608,860	139,480
Copper precipitates	3				17,349,440		
Old slag, mill cleanings and smelter cleanings	8	[4] 10,611	150	18,201	195,400	382,400	825,200
Total	20	31,681	558	88,345	17,596,539	991,260	964,680
Total, all sources	63	32,875,034	435,507	7,194,109	565,788,000	100,420,000	65,894,000

[1] All lode material; no placer recovery in Utah in 1952.
[2] Detail will not add to totals because some mines produce more than one class of ore.
[3] Gold-silver 95 tons, silver 17,925 tons, lead 50 tons, zinc 3,000 tons.
[4] Copper slag 1,058 tons, lead slag 1,247 tons, zinc slag 7,142 tons, gold mill cleanings 1 ton, copper mill cleanings 4 tons, silver smelter cleanings 1,042 tons, lead smelter cleanings 117 tons.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery and types of material processed, in terms of recoverable metals

Method of recovery and type of material processed [1]	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Concentration, and smelting of concentrates:					
Ore	430,788	6,473,417	547,614,759	92,765,915	64,865,085
Old tailings	4	817	420	8,380	76,400
Total	430,792	6,474,234	547,615,179	92,774,295	64,941,485
Direct smelting:					
Ore	4,161	632,347	576,702	6,662,825	64,235
Old tailings	404	69,327	51,279	600,480	63,080
Copper precipitates [2]			17,349,440		
Old slag, mill cleanings, and smelter cleanings	150	18,201	195,400	382,400	825,200
Total	4,715	719,875	18,172,821	7,645,705	952,515
Grand total	435,507	7,194,109	565,788,000	100,420,000	65,894,000

[1] All lode material; no placer recovery in Utah in 1952.
[2] All from Salt Lake County.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery and classes of material processed, in terms of recoverable metals [1]

A. For ore and old tailings treated at mills

	Material treated (short tons)	Concentrate shipped to smelters and recoverable metals					
		Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES							
Beaver	12,181	1,255	91	34,347	24,500	521,700	364,000
Juab	46,594	9,984	707	312,358	49,558	5,318,460	5,891,350
Salt Lake	32,458,373	1,036,117	416,490	5,266,006	546,624,291	65,671,378	40,792,500
San Juan	[2]	39		295	18,800		
Summit	64,770	21,124	1,432	319,199	67,997	8,342,613	6,944,960
Tooele	42,312	9,124	751	249,576	150,433	6,910,917	2,461,675
Utah	25	14	1	498	200	7,227	5,000
Wasatch	75,118	12,950	11,320	291,955	679,400	6,002,000	8,482,000
Total: 1952	32,699,373	1,090,607	430,792	6,474,234	547,615,179	92,774,295	64,941,485
1951	31,134,299	1,028,548	424,704	6,253,396	530,213,552	88,250,602	66,352,900
BY CLASSES OF ORE AND OLD TAILINGS TREATED							
Copper	32,036,100	894,909	403,035	3,278,895	544,364,650		
Zinc: Old tailings	3,000	160	4	817	420	8,380	76,400
Lead-zinc	660,273	195,538	27,753	3,194,522	3,250,109	92,765,915	64,865,085
Total 1952	32,699,373	1,090,607	430,792	6,474,234	547,615,179	92,774,295	64,941,485
BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS							
Copper		894,909	403,035	3,278,895	544,364,650		
Lead		99,145	19,837	2,461,037	2,234,514	83,768,506	1,904,289
Lead-zinc		1,868	172	75,109	26,575	995,215	1,017,060
Iron (from lead-zinc ore)		33,583	3,679	118,155	137,704	1,249,351	254,877
Total to copper and lead plants		1,029,505	426,723	5,933,196	546,763,443	86,013,072	3,176,226
Zinc concentrates to zinc plants		61,102	4,069	541,038	851,736	6,761,223	61,765,259
Total: 1952		1,090,607	430,792	6,474,234	547,615,179	92,774,295	64,941,485
1951		1,028,548	424,704	6,253,396	530,213,552	88,250,602	66,352,900

B. For ore, material shipped directly to smelters

	Material shipped (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Beaver	530	22	2,830	5,500	60,300	
Box Elder	130		22		18,000	14,000
Grand	64		84	2,000		
Juab	63,149	1,523	298,135	96,442	2,905,540	4,650
Piute	302	74	7,372	4,000	26,000	6,000
Salt Lake	28,718	1,171	84,238	[3] 17,593,709	3,174,622	19,500
San Juan	4		11	1,200		
Sevier	8	5	506			
Summit	58,504	1,054	249,756	110,003	643,387	65,040
Tooele	8,920	133	17,734	185,567	417,083	838,325
Utah	14,777	712	57,449	119,800	370,773	5,000
Wasatch	412	21	653	54,600		
Washington	143		1,085		30,000	
Total: 1952	175,661	4,715	719,875	[3] 18,172,821	7,645,705	952,515
1951	222,538	7,512	1,057,269	[3] 11,958,448	12,651,398	2,281,100

See footnotes at end of table.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery and classes of material processed, in terms of recoverable metals [1]—Continued

	Material shipped (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY CLASSES OF MATERIAL						
Dry gold: Mill cleanings	1	33	22			
Dry gold-silver:						
Crude ore	24,379	967	70,499	146,439	788,113	7,120
Old tailings	95	5	387	220	2,120	
Dry silver:						
Crude ore	106,492	2,198	480,984	163,234	2,840,094	2,530
Old tailings	17,925	392	68,740	50,459	590,460	63,080
Smelter cleanings	1,042	31	4,217	12,570	47,900	
Copper:						
Crude ore	1,557	244	5,575	173,248	23,850	
Precipitates				17,349,440		
Old slag and mill cleanings	1,062	42	6,318	130,615	61,000	
Lead:						
Crude ore	14,195	740	72,178	89,788	2,934,725	3,570
Old tailings	50	7	200	600	7,900	
Old slag and smelter cleanings	1,364	8	1,629	4,130	53,500	
Lead-copper	39	2	496	1,760	7,973	
Lead-zinc	318	10	2,615	2,233	68,070	51,015
Total to copper and lead plants	168,519	4,679	713,860	18,124,736	7,425,705	127,315
Zinc: Old slag to zinc plant	7,142	36	6,015	48,085	220,000	825,200
Total 1952	175,661	4,715	719,875	18,172,821	7,645,705	952,515

[1] No bullion produced in 1952.
[2] Uranium ore, 39 tons copper concentrate recovered as byproduct.
[3] Includes copper recovered from smelting mine-water precipitates as follows: 1952—17,349,440 pounds; 1951—10,981,202 pounds.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery and classes of material processed, in terms of gross metal content

Class or material	Quantity shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
ORES AND OLD TAILINGS TREATED AT MILLS						
Copper	32,036,100	557,384	3,698,302	605,458,503		
Zinc: Old tailings	3,000	12	1,634	1,500	30,000	180,000
Lead-zinc	660,273	40,902	3,732,601	4,920,703	106,921,962	86,473,628
Total: 1952	32,699,373	598,298	7,432,537	610,380,706	106,951,962	86,653,628
1951	31,134,299	587,785	7,145,566	587,125,046	101,215,169	86,754,458
CONCENTRATES SHIPPED TO SMELTERS						
Copper	894,909	403,035	3,278,895	555,474,124		
Lead	99,145	19,837	2,461,037	2,869,451	86,729,453	11,711,847
Lead-zinc	1,868	172	75,109	31,076	1,042,370	1,099,107
Iron (from lead-zinc ore)	33,583	3,679	118,155	144,072	1,826,915	2,494,231
Total to copper and lead plants	1,029,505	426,723	5,933,196	558,518,723	89,598,738	15,305,185
Zinc concentrate to zinc plants	61,102	4,071	541,412	992,328	7,153,794	63,816,289
Total: 1952	1,090,607	430,794	6,474,608	559,511,051	96,752,532	79,121,474
1951	1,028,548	424,711	6,254,522	541,689,704	92,144,899	79,210,489

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery and classes of material processed, in terms of gross metal content—Continued

Class or material	Quantity shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
ORES, OLD TAILINGS, ETC., SHIPPED DIRECTLY TO SMELTERS						
Dry gold: Mill cleanings	1	33	22			
Dry gold-silver:						
Crude ore	24,379	967	70,499	150,968	1,253,611	9,053
Old tailings	95	5	387	229	3,261	4,750
Dry silver:						
Crude ore	106,492	2,198	480,984	171,016	4,394,532	29,961
Old tailings	17,925	392	68,740	55,296	963,654	535,000
Smelter cleanings	1,042	31	4,217	13,020	78,350	
Copper:						
Crude ore	1,557	244	5,575	178,328	39,810	
Precipitates				17,614,621		
Old slag and mill cleanings	1,062	42	6,318	135,369	93,602	
Lead:						
Crude ore	14,195	740	72,178	119,868	3,084,703	199,002
Old tailings	50	7	200	955	8,242	
Old slag and smelter cleanings	1,364	8	1,629	5,799	56,284	
Copper-lead	39	2	496	2,347	8,293	2,000
Lead-zinc	318	10	2,615	2,937	69,832	64,606
Total to copper and lead plants	168,519	4,679	713,860	18,450,753	10,054,174	844,372
Zinc: Old slag to zinc plant	7,142	36	6,015	56,842	225,637	1,057,939
Total: 1952	175,661	4,715	719,875	18,507,595	10,279,811	1,902,311
1951	222,538	7,512	1,057,454	12,238,340	16,168,109	3,437,588

furnace charge consists of iron ore, limestone, dolomite, coke, and manganese ore. All of these minerals and most of the coal for making coke were obtained from mines in Utah. Shipments of usable iron ore in Utah in 1952 totaled 3,990,505 long tons, a 14-percent decrease from 1951; however, the value of the shipments increased from $10,141,653 to $15,025,899, owing to a rise in the average price. All of the iron ore (magnetite semialtered to hematite) produced in Utah in 1952 was mined from open pits at 6 properties in Iron County; the ore averaged 53.97 percent iron (natural). Table 11 gives the shipments of iron ore in long tons from Utah mines from 1906–52. The State reached its peak shipments of iron ore in 1951—4,637,239 tons.

TABLE 11.—Shipments of iron ore from mines, 1906–52, in long tons

Year	Quantity	Value	Year	Quantity	Value
1906–47	13,474,777	$20,134,915	1950	3,111,167	$5,746,808
1948	3,233,122	3,926,058	1951	4,637,239	10,141,653
1949	2,698,632	4,403,767	1952	3,990,505	15,025,899

Lead.—Utah's production of recoverable lead decreased to 50,210 short tons in 1952—a loss of only 241 tons from 1951. A substantial decrease in production of lead at three large producers of lead-zinc ore, resulting from shutdowns caused by strikes and from a drop in the prices of lead and zinc, more than offset a marked increase in production of lead from the United States & Lark property, the largest

producer of lead-zinc ore in the State. The price of lead was 19.00 cents a pound in New York until April 29. Thereafter the price ranged downward to 13.50 cents a pound on October 22, but strengthened to 14.75 cents a pound on December 30. In 1952 lead-zinc ore from the West Mountain (Bingham) district supplied 32,833 tons of lead (65 percent of the State total), the Park City region 7,168 tons (14 percent), and the Tintic district 2,659 tons (5 percent). The remainder came largely from lead-zinc ore from the Rush Valley (Stockton) and Ophir districts (Tooele County), silver ore and gold-silver ore from the Tintic and West Mountain (Bingham) districts, and lead ore from the West Mountain (Bingham) district. Production of lead in the West Mountain (Bingham) district was 18 percent more than in 1951, but in the Park City region it dropped 36 percent and in the Tintic district 23 percent.

The United States & Lark property remained by far the largest producer of lead in Utah, and its output in 1952 was 19 percent more than in 1951; it was followed by the Chief No. 1, New Park, Park Utah Consolidated, West Calumet, Silver King Coalition, and Butterfield properties. These 7 producers supplied 95 percent of the State lead output.

Manganese and Manganiferous Ores.—Most of the output in 1952 was manganiferous ore (5 to 35 percent Mn) from 4 properties in the Drum Mountain district, Juab and Millard Counties. Approximately 3,000 short tons of manganiferous ore was shipped to the Ironton pig-iron plant and the Geneva steel plant. In addition, about 2,000 tons was shipped to the General Services Administration low-grade stockpile at Butte, Mont., and some to the Western Electrochemical Co. at Henderson, Nev., where it was processed to synthetic battery ore.

Molybdenum.—In 1952, as in past years, the Utah Copper property of the Kennecott Copper Corp. at Bingham (Salt Lake County) was the only producer of molybdenite (MoS_2) in Utah. All production was recovered as a byproduct from the treatment of copper ore at the corporation flotation mills at Arthur and Magna. The two mills yielded 16 percent more molybdenite (MoS_2) in 1952 than in 1951, owing to an increased output of copper ore and to an improvement in the recovery of molybdenite. Most of the molybdenite concentrate was shipped to eastern points for consumption or for export. The State production of molybdenite from the time production was begun in September 1936, through 1952, has been 135,980 short tons.

Silver.—Utah's output of recoverable silver decreased to 7,194,109 fine ounces in 1952—a loss of 2 percent from 1951; it was 4 percent less than the yearly average from 1942–51. A substantial decrease in output of silver from lead ore and from old siliceous silver tailings more than offset the gain in output from copper ore and lead-zinc ore. Copper ore supplied 3,284,470 ounces—3 percent more than in 1951; lead-zinc ore 3,197,137 ounces—3 percent more; and lead ore and old siliceous silver tailings 140,918 ounces—5 percent less than in 1951. Nearly all of the silver recovered from copper ore came from the West Mountain (Bingham) district, and 91 percent of the silver recovered from lead-zinc ore came from the Park City region, Tintic district, and West Mountain (Bingham) district. Copper ore furnished 46 percent of the State silver in 1952, lead-zinc ore 44 percent,

and silver ore and gold-silver ore and old tailings 9 percent; the remainder came principally from lead ore. Production of silver increased 8 percent in the West Mountain (Bingham) district but declined 24 percent in the Park City region and 29 percent in the Tintic district.

Utah properties that produced over 170,000 ounces of recoverable silver each in 1952 were as follows: Utah Copper mine, United States & Lark group, Chief No. 1 mine, Butterfield mine, New Park property, Ontario waste dump, Park Utah Consolidated property, and West Calumet mine. These 8 producers contributed 93 percent of the State silver.

Tungsten.—Utah never has been a large producer of tungsten. In 1951 a little tungsten ore (scheelite) was produced from 3 claims in Tooele County; in 1952 ore output jumped to about 170 tons, mainly through operations of 2 mines in Millard County and 2 mines in Tooele County. All of the ore was hauled to custom milling plants at Barstow and Bishop, Calif. However, one operator indicated that this was too long a haul for profitable operations.

Uranium.—As a result of provisions of the Atomic Energy Act of 1946, as amended, and the regulations based upon it, the Bureau of Mines is not at liberty to publish statistical data. However, it can be said that expansion in 1952 in all phases of exploration, development, and metallurgy resulted in an increase in uranium production. In 1952 most of the Utah uranium production was recovered from ore mined in Grand and San Juan Counties from a mineralized region known as the Colorado Plateau, which extends from western Colorado into eastern Utah; from asphaltite ore mined in the Temple Mountain district, Emery County; and from autunite ore mined in the Marysvale area, Piute County. The ore from claims in White Canyon, San Juan County, is complex because it contains an appreciable quantity of copper.

Utah mills that treated uranium ore in 1952 were the Vanadium Corp. plant at Hite, plant of the Atomic Energy Commission at Monticello,[2] and the Vitro Chemical Co. plant at Salt Lake City. In addition, ore-buying depots were established at Marysvale and Thompson.

Expansion in the search for uranium deposits included exploration projects in Daggett, Emery, Garfield, Grand, Kane, Piute, San Juan, Wayne, and Washington Counties. Probably the most significant discovery in 1952 was made on the Steen (Utex) property in the Big Indian district, San Juan County, where a massive ore body (noncarnotite) was opened up in the Chinle formation.

Contracts executed by Defense Minerals Exploration Administration, covering 15 projects in Utah, were in force at the end of 1952 and called for expenditures totaling $443,252, of which the Federal Government provided $395,352 and private capital $47,900.

Volume I of Minerals Yearbook, 1952, chapter on Uranium, Radium, and Thorium, contains a general review of the uranium industry in Utah and other States, with references to various reports published in 1952.

[2] Butler, J. A., Utah's New Uranium Mill: Eng. & Min. Jour., March 1951, p. 56.

Vanadium.—For security reasons, because of the close connection in production between vanadium and uranium, production figures on vanadium have not been published since 1947. During World War II operations were directed mainly to the production of vanadium. Since World War II, the production of both vanadium and uranium has greatly expanded as a result of the demand for uranium; nearly all uranium ores contain some vanadium. Most of the production of vanadium-uranium ores in 1952 came from the Colorado Plateau region in eastern Utah and western Colorado. Ore output in Utah came largely from Grand and San Juan Counties; the ore was treated in milling plants at Monticello, Utah, and Durango, Grand Junction, Naturita, and Rifle, Colo.

Zinc.—Utah's production of recoverable zinc declined to 32,947 short tons in 1952, a 4-percent loss from 1951. The loss resulted from the closing (caused by strikes and a drop in the prices of lead and zinc) during the year of 2 large producers of lead-zinc ore in the Park City region (Summit County) and 1 large producer in the Tintic district (Juab County). The price of zinc remained at the ceiling of 19.5 cents a pound until June 2, 1952, when it began to drop; it reached a low of 12.5 cents October 23 and remained there the rest of the year. In 1952 lead-zinc ore from the West Mountain (Bingham) district supplied 20,395 tons of zinc (62 percent of the State total); the Park City region contributed 7,746 tons (24 percent); and the Tintic district 2,951 tons (9 percent), nearly all from lead-zinc ore. The remainder came largely from lead-zinc ore from the Ophir and Rush Valley districts (Tooele County) and from zinc slag from the Smelter (Tooele) district. Production of zinc in the West Mountain (Bingham) district was about 12 percent more than in 1951 and in the Ophir district 96 percent more. On the other hand, output dropped 24 percent in the Park City region, 38 percent in the Rush Valley district, 48 percent in the Smelter (Tooele) district, and 13 percent in the Tintic district.

The United States & Lark property remained by far the largest producer of zinc in Utah, and its output in 1952 was 12 percent more than in 1951; it was followed by the New Park, Park Utah Consolidated, Chief No. 1, and Butterfield properties. These 5 properties furnished 93 percent of the State total zinc.

NONMETALS

Cement.—Utah's production of portland cement in 1952 was 23 percent less than in 1951 resulting from a reduction in the demand for cement by the building and construction trades. Two plants—one (Portland Cement Co. of Utah) near Salt Lake City, Salt Lake County, and 1 (Ideal Cement Co.) at Devils Slide, Morgan County—operated in 1952.

Clays.—Twelve mines in Utah produced 180,066 short tons of clays in 1952 compared with 16 mines in 1951 that produced 285,128 tons. Most of the output in 1952 was common clay and fire clay, produced in Morgan, Salt Lake, Summit, Tooele, and Utah Counties, and halloysite clay produced from the Dragon mine in Juab County. The common clay and fire clay were used for making brick and tile and the halloysite clay for oil filtering. About 2,900 tons of fuller's

earth and 1,964 tons of bentonite were produced from a mine in Sevier County; 9,657 tons of clay produced in Morgan and Salt Lake Counties was used for making cement.

Fluorspar.—Utah has three prominent fluorspar districts—the Indian Peak and Wah Wah area, Beaver County, the Topaz Mountain area, Juab County, and the Wild Cat Mountains area, Tooele County. The Topaz Mountain district is currently of greatest importance. Although Utah's fluorspar production declined 3 percent to 17,304 short tons in 1952 compared with 1951, the value increased 10 percent to $438,699. All of the output was metallurgical grade, shipped to steel plants in Utah from six mines near Joy (Topaz Mountain district).

Gypsum.—There were only two producers of gypsum in Utah in 1952. The output, which declined 14 percent from that in 1951, came from open pits near Sigurd, Sevier County; it was used in the manufacture of Keene's cement, wallboard, plaster, and other building materials.

Lime.—Lime production in Utah in 1952 was 29,977 short tons of quicklime and 4,473 short tons of hydrated lime compared with 42,811 and 5,980 tons, respectively, in 1951. Most of the quicklime came from a property in Salt Lake County and nearly all of the hydrated lime from a mine in Tooele County. A large part of the quicklime was used as a reagent in milling copper ore; most of the hydrated lime was used for fluxing purposes at smelting plants.

Perlite.—Two mines in Utah produced perlite in 1952; 5 mines produced 3,422 tons in 1951. Most of the perlite produced in both years came from a property near Milford, Beaver County; the crude material was processed and used mainly as a plaster aggregate.

Phosphate Rock.—The output of phosphate rock in Utah in 1951 and 1952 was small; all of it in both years came from a property near Woodruff, Rich County, where it was used for stock and poultry feed.

Potash (Potassium Salts).—Bonneville, Ltd., continued to be Utah's only producer of potash. Production of potassium chloride from the company potassium-bearing brines of Salduro Marsh on the Bonneville Salt Flats, Tooele County, was less in 1952 than in 1951.

Pumice and Pumicite (Volcanic Ash).—All (4,048 short tons) of the pumice and pumicite output in Utah in 1952 came from 1 producer at Cedar Fork, Utah County; the output was used as an aggregate in making lightweight concrete blocks. In 1951, 3 mines—1 in Beaver County, 1 in Millard County, and 1 in Utah County—produced 9,422 tons.

Salt (Sodium Chloride).—Four operators in Utah produced 136,125 short tons of salt in 1952 valued at $522,721. The same 4 operators in 1951 produced 131,444 tons valued at $570,379. Most of the output in 1952 was derived from sea water by solar evaporation from 2 properties in Salt Lake and Tooele Counties; however, 5,471 tons was rock salt produced from mines in Sanpete and Sevier Counties. A large part of the rock salt was used by the cattle industry and for melting ice during the winter months.

Sand and Gravel.—About 30 sand and gravel pits were operated in Utah in 1952—1 in Box Elder, 4 in Cache, 2 in Davis, 1 in

Emery, 1 in Grand, 1 in Iron, 11 in Salt Lake, 1 in Sevier, 1 in Tooele, 2 in Utah, 1 in Washington, and 4 in Weber County. The total output was 3,260,044 short tons valued at $2,350,412. Of the total output, 1,644,496 tons (50 percent) valued at $1,127,921 was commercial (produced by private companies), and 1,615,548 tons valued at $1,222,491 was noncommercial (used by county highway departments); the largest consumer was the Utah State Road Commission of Salt Lake County. Table 12 gives the sand and gravel marketed in short tons from pits in Utah, 1908–52.

TABLE 12.—Production of sand and gravel, 1908–52, in short tons.

Year	Quantity	Value	Year	Quantity	Value
1908–47	49,822,774	$24,092,767	1950	3,435,277	$2,251,515
1948	2,278,184	1,368,562	1951	2,971,268	2,268,750
1949	2,331,688	1,553,408	1952	3,260,044	2,350,412

Stone.—Seven counties—Box Elder, Cache, Juab, Salt Lake, Sanpete, Tooele, and Utah—in Utah produced 852,351 short tons of crushed stone in 1952 valued at $1,123,108. Of the total output, 712,325 tons was crushed limestone, 24,278 tons crushed sandstone, 115,748 tons crushed miscellaneous stone, and a small undisclosed quantity of crushed marble. Most of the limestone was used for fluxing purposes at smelters in Utah, for making concrete, for construction of roads, for refractory material, for sugar refining, and for dust in coal mines. The sandstone was used for making fire brick and for road construction; and the miscellaneous stone was used for riprap, mainly for maintenance of railroad right-of-way.

Sulfur.—In 1952 sulfur was produced in Utah for the first time in several years. Sulfur ore from the open-pit deposit at Sulphurdale, Millard County, was treated in a new 200-ton pilot flotation mill operated by the Chemical Corp. of America.

MINERAL FUELS

The total Utah production and value of the mineral fuels in 1951 and 1952 are shown in table 1 of this chapter (p. 888).

Asphalt and Related Bitumens (Gilsonite and Wurtzilite).—As in 1951, native asphalt was produced in 1952 from a property in Uintah County; most of it was used in making asphalt roofing paper and waterproofing foundations. Gilsonite was produced from 5 properties in Duchesne and Uintah Counties; 60,740 short tons was marketed in 1952 compared with 65,521 tons in 1951. Gilsonite is a natural asphalt and so far is mined only in Utah. Since its discovery in 1875, it has been widely used in paints and varnishes, printing inks, roofing, battery cases, etc. No wurtzilite was produced in 1952. Table 13 gives the total shipments of asphalt and related bitumens in short tons from mines in Utah from 1903–47 and shipments of gilsonite only, 1948–52.

TABLE 13.—Shipments of asphalt and related bitumens (gilsonite and wurtzilite), 1903–47, and shipments of gilsonite only, 1948–52, in short tons

Year	Quantity	Value	Year	Quantity	Value
1903–47	1,708,429	$32,590,963	1950	66,186	$1,774,330
1948	52,122	1,390,713	1951	65,521	1,895,000
1949	51,462	1,303,584	1952	60,740	1,779,815

Carbon Dioxide (Natural Dry Ice).—Approximately 84,500 thousand cubic feet of carbon dioxide was produced in Utah in 1952 from 2 wells at Farnham Dome in Carbon County. The output, which was 13 percent less than in 1951, was used for refrigeration purposes.

Coal.—Coal was by far the most important of the mineral fuels as regards production, and the value in 1952 ($32,410,303) represented 12 percent of the State total mineral value. Over 72 percent of Utah's coal production in 1952 came from Carbon County; the remainder came largely from Emery, Sevier, Summit, and Iron Counties. A large part of the coal was shipped to steel plants in Utah and California and to electrical generating plants in Utah. Tables 14 and 15 give the production of coal in short tons from Utah mines, 1865–1952, and by counties in 1951 and 1952. The State reached its peak output of coal in 1947, when 7,428,699 tons was produced.

TABLE 14.—Production of coal, 1865–1952, in short tons

Year	Quantity	Value	Year	Quantity	Value
1865–1947	184,893,000	$451,114,050	1950	6,669,896	$32,050,470
1948	6,813,350	31,062,105	1951	6,135,957	32,652,543
1949	6,159,592	29,357,488	1952	6,140,305	32,410,303

TABLE 15.—Production of coal, 1951–52, by counties [1]

County	1951			1952		
	Production (short tons)	Value		Production (short tons)	Value	
		Total	Average per ton		Total	Average per ton
Carbon	4,265,471	$22,387,252	$5.25	4,452,257	$23,756,150	$5.34
Emery	1,733,217	9,720,287	5.61	1,552,246	7,999,923	5.15
Garfield				1,547	8,771	5.67
Grand	5,583	28,752	5.15	5,991	28,936	4.83
Iron	24,113	122,855	5.10	22,069	104,697	4.75
Kane	2,041	11,654	5.71	2,774	16,810	6.06
Sevier	80,404	288,250	3.59	77,533	403,682	5.21
Summit	22,728	79,093	3.48	24,888	84,984	3.42
Uintah	2,400	14,400	6.00	1,000	6,350	6.35
Total	6,135,957	32,652,543	5.32	6,140,305	32,410,303	5.28

[1] Excludes mines producing less than 1,000 tons.

Natural Gas, Natural Gasoline, and Coke.—Production of natural gas amounted to 3,006,000 thousand cubic feet valued at $225,000, a 19-percent loss in quantity from that in 1951. Nearly all of it came from wells in Clay Basin, Daggett County. Production of natural gasoline in 1952 was virtually the same as that in 1951; output in

each year was small. Production of coke was 1,210,840 short tons in 1952 compared with 1,328,208 tons in 1951; most of it was produced at the Columbia pig-iron plant of the United States Steel Corp. at Ironton, Utah County.

Petroleum.—Petroleum production ranked second in importance in mineral fuels. Most of it came from wells in the Uinta Basin area and was shipped to refining plants near Salt Lake City. Production in 1952 was 33 percent greater than in 1951, resulting from increased output in the Uinta Basin.

Additional statistics and a summarized review covering coal, petroleum, and natural-gas production may be found in Volume II of this series.

REVIEW BY COUNTIES

BEAVER

The principal output in Beaver County in 1952 was 11,860 tons of lead-zinc ore produced from the old Horn Silver mine near Milford (San Francisco district). The mine and 500-ton flotation mill were operated by Metal Producers, Inc., until June 30, when operations ceased owing to a drop in the market prices of lead and zinc. Lead-zinc ore (321 tons) and lead-silver ore (475 tons) were produced from the Harrington-Hickory group (Star and North Star district) from January 1 to May 1 by Harrington Mines Co. Other county production was 50 tons of old lead tailings from the Lincoln millsite, 5 tons of copper ore from the O. K. waste dump, and some perlite from 2 properties near Milford. All of the crude perlite produced was shipped to Salt Lake City, where it was processed and used principally as plaster aggregate. Fred Staats operated his fluorspar-uranium claim under a DMEA contract.

BOX ELDER

Output in Box Elder County in 1952 was mainly crushed stone used by the Southern Pacific Co. for riprap in maintenance of railroad right-of-way. Whitaker & Hunsaker operated a sand and gravel pit in 1952 and sold 40,500 tons to commercial consumers. All of the silver, lead, and zinc was recovered from 130 tons of ore produced from the Lake View Carbonate mine (Promotory district).

CACHE

The mineral output of Cache County in 1952 comprised 123,440 tons of sand and gravel and 62,500 tons of crushed stone used mainly in improving county highways and 30,693 tons of limestone used by sugar plants.

CARBON

Carbon County is the largest coal-producing area in Utah and the only producer of carbon dioxide in the State. In 1952 the county produced 4,452,257 tons of coal (73 percent of the State total) with an average value of $5.34 a ton; a large part of the coal was shipped to steel plants in Utah and California and to electrical generating plants in Utah. Carbon dioxide was produced from wells at Farnham dome by the Carbon Dioxide & Chemical Co. and by the Equity Oil Co.; the carbon dioxide was converted to dry ice at a plant at Wellington.

TABLE 16.—Value of mineral production in Utah, 1951–52, by counties,[1] and minerals [1] produced in 1952

County	1951	1952	Minerals produced in 1952, in order of value
Beaver	$121,848	$211,643	Lead, zinc, silver, perlite, copper, gold.
Box Elder	186,432	110,855	Stone, sand and gravel, lead, zinc, silver.
Cache	132,885	271,766	Stone, sand and gravel.
Carbon	22,397,252	23,775,169	Coal, carbon dioxide.
Daggett	246,000	225,000	Natural gas.
Davis	86,170	129,569	Sand and gravel.
Duchesne and Uintah	1,909,682	1,786,165	Gilsonite, coal.
Emery	9,725,755	7,996,194	Coal, sand and gravel.
Garfield	----------	8,771	Coal.
Grand	28,752	38,645	Coal, sand and gravel, copper, silver.
Iron	10,290,308	15,168,179	Iron ore, coal, sand and gravel.
Juab	5,119,675	4,244,450	Lead, zinc, clays, silver, fluorspar, gold, sandstone, copper, lime.
Kane	51,654	29,933	Coal, manganese and manganiferous ores.
Millard	10,395	32,470	Manganiferous ore, pumice and pumicite, tungsten.
Morgan	4,505,582	3,056,915	Cement, clays.
Piute	----------	15,412	Silver, lead, gold, zinc, copper.
Rich	2,900	(2)	Phosphate rock.
Salt Lake	182,054,141	191,700,870	Copper, gold, molybdenum, lead, zinc, silver, sand and gravel, cement, salt, lime, limestone, clays.
San Juan	12,419	5,117	Copper, silver.
Sanpete	67,256	34,186	Salt, limestone.
Sevier	1,050,920	1,110,068	Gypsum, coal, clays, salt, sand and gravel, silver, gold.
Summit	6,023,667	3,376,924	Lead, zinc, silver, gold, coal, copper, clays.
Tooele	4,988,924	3,978,254	Potash, lead, zinc, limestone, silver, lime, calcite, copper, salt, clays, gold, manganiferous ore, tungsten, sand and gravel.
Utah	947,182	799,638	Limestone, sand and gravel, clays, lead, silver, copper, gold, pumice and pumicite, zinc.
Wasatch	3,751,767	3,213,722	Zinc, lead, gold, silver, copper.
Washington	10,692	7,012	Lead, sand and gravel, silver.
Weber	89,337	80,665	Sand and gravel.
Undistributed [3]	3,333,405	4,094,408	
Total	257,145,000	265,502,000	

[1] Exclusive of uranium produced in 1951–52 and manganese ore shipped in 1952 to the Government Purchase Depot at Butte, Mont. County figures also exclude asphalt, natural gasoline and petroleum.
[2] Included with "Undistributed."
[3] Includes value of asphalt, natural gasoline, petroleum, phosphate rock (1952), vanadium, and some sand and gravel that cannot be assigned to specific counties.

DAGGETT

As in past years, natural gas from a well in Clay Basin was the only output in Daggett County. In 1952 approximately 3,000 million cubic feet valued at $225,000 was produced. The Yellow Canary uranium deposit in Red Creek Canyon was explored under a DMEA contract.

DAVIS

Oil refining was by far the most important mineral industry in Davis County in 1952, and expanded operations were reported at the three plants—Salt Lake Refining Co. and Western States Refining Co. at North Salt Lake, and Phillips Petroleum Co. at Woods Cross. The products produced from these plants were consumed largely in Utah, Idaho, Oregon, and Washington. Two sand and gravel pits at North Salt Lake were operated in 1952, 1 by Clarence Waterfall and 1 by White Hill Sand & Gravel Co. The two together sold 183,263 tons to commercial consumers.

DUCHESNE

In 1952, as in past years, gilsonite was the only mineral output in Duchesne County. Mining was done most of the year at two properties near Roosevelt.

TABLE 17.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties and districts, in terms of recoverable metals

County and district	Mines producing, lode [1]	Ore, old tailings, etc. (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
Beaver County:								
Beaver Lake	1	5		21	2,000			$503
Lincoln	1	50	7	200	600	7,900		1,843
San Francisco	1	11,860	83	28,447	22,400	495,100	315,000	166,073
Star and North Star	1	796	23	8,509	5,000	79,000	49,000	30,569
Box Elder County: Promontory	1	130		22		18,000	14,000	5,242
Grand County:								
La Sal [2]	1	7		42	600			183
Salt Valley	1	57		42	1,400			377
Juab County:								
Detroit (Drum Mountain)	1	10		21		3,200		534
Fish Springs	2	24		1,379		25,800		5,402
Tintic [3]	7	109,709	2,230	609,093	146,000	8,195,000	5,896,000	2,962,773
Piute County:								
Gold Mountain	(4)	1	33	22				1,175
Mount Baldy	1	295	41	7,224	3,600	25,900	6,000	14,010
Ohio	1	6		126	400	100		227
Salt Lake County:								
Big Cottonwood	1	206	2	1,295	2,300	39,000	19,500	11,315
Little Cottonwood	4	181	13	4,812	2,400	50,600	2,700	13,986
Smelter	(4)	2,406	39	5,846	16,700	101,400		27,022
West Mountain (Bingham)	4	32,484,298	417,607	5,338,291	564,196,600	68,655,000	40,789,800	173,807,807
San Juan County:								
La Sal [2]	(4)	4		11	1,200			300
White Canyon	1	(5)		295	18,800			4,817
Sevier County: Henry	1	8	5	506				633
Summit County: Uintah	10	123,274	2,486	568,955	178,000	8,986,000	7,010,000	3,255,425
Tooele County:								
Blue Bell	2	27	1	274		15,400		2,762
Erickson	1	1,168	5	1,043	2,000	121,600	128,200	42,462
Ophir	3	20,746	82	74,186	125,500	1,997,600	1,339,500	644,354
Rush Valley	3	21,062	679	179,401	31,000	4,909,400	1,007,100	1,151,226
Smelter	(4)	8,200	78	12,322	177,500	281,000	825,200	239,061
Willow Springs	1	29	39	84		3,000		1,924
Utah County:								
American Fork	2	69	1	695	200	16,000	5,000	4,118
Tintic [3]	8	14,733	712	57,252	119,800	362,000	5,000	164,840
Wasatch County:								
Blue Ledge	1	75,118	11,320	291,955	679,400	6,002,000	8,482,000	3,199,183
Snake Creek	1	412	21	653	54,600			14,539
Washington County: Tutsagubet	1	143		1,085		30,000		5,812
Total	63	32,875,034	435,507	7,194,109	565,788,000	100,420,000	65,894,000	185,780,497

[1] No placer production in 1952.
[2] La Sal district lies in both Grand and San Juan Counties.
[3] Tintic district lies in both Juab and Utah Counties.
[4] Production came from old mill cleanings and old smelter cleanings; not counted as mine.
[5] Uranium ore; silver and copper recovered as byproduct.

EMERY

Emery County is one of the chief coal-producing areas in Utah and in 1952 it became a large producer of uranium and vanadium. In 1952 the county produced 1,522,246 tons of coal valued at $7,989,923 ($5.15 per ton); a large part of the coal was shipped to pig-iron and steel plants in Utah County. Some carnotite-uranium ore (asphaltite) was shipped in 1952 from the Temple Mountain deposits (San Rafael mining district) to the Vitro Chemical Co. mill at Salt Lake City. The chief producer was Consolidated Uranium Mines, Inc. The remainder of the county output was 24,604 tons of sand and gravel hauled from a pit for use in improving county roads. Exploration for uranium was done in the Bow Knot district by the Excalibur Uranium Corp. under a DMEA contract.

GARFIELD

A little coal and some uranium were produced in Garfield County in 1952. The output of coal was 1,547 tons valued at $8,771 ($5.67 per ton); no coal or uranium was produced in 1951.

GRAND

Coal was the most important commodity produced in Grand County in 1952; 5,991 tons valued at $28,936 ($4.83 per ton) was hauled to various points of consumption. A sand and gravel pit was operated in 1952, and 11,549 tons was used by the Grand County Highway Department in improving roads. Seven tons of copper-silver ore was produced from the Bornite mine (La Sal district), and 57 tons of similar ore was shipped from the Hoosier claim near Brendel. Some uranium ore was produced in 1952 and hauled to the purchase depot at Thompson.

IRON

Iron ore was by far the principal commodity produced in Iron County in 1952 and was one of Utah's important mineral products, ranking fifth in value. Even though shipments of iron ore declined from 4,637,239 tons in 1951 to 3,990,505 tons in 1952, the value increased from $10,141,653 to $15,025,899, as the average price rose from $2.19 a ton to $3.77. All of the iron ore produced in the county and State in 1952 came from six mines in the Desert Mound and Iron Springs areas; the ore was mined from open pits and shipped to steel plants in Utah and California. The county also produced 22,069 tons of coal in 1952 valued at $104,697 ($4.75 per ton) and 75,000 tons of sand and gravel valued at $37,500. All sand and gravel were used for construction purposes by the Bureau of Reclamation.

JUAB

Juab County, in which the Tintic (Eureka) district is situated, is one of the most important mineral areas in Utah, especially in the production of lead, silver, zinc, clay, and fluorspar. The county was also a large producer of low-grade manganese ore in 1952 from a deposit in the Drum Mountains; all of the output was shipped to the

Government Purchase Depot at Butte, Mont., and to the Western Electrochemical Co., Henderson, Nev. Before 1952 the county was a fairly large producer of gypsum from a deposit at Nephi operated by the United States Gypsum Co., but none was produced in 1952. Another important industry at Nephi since 1948 has been the manufacture—at the Thermoid Co. plant—of rubber products (radiator hose, fan belts, and brake linings) for the automotive trade, largely for consumption in the West Coast States. All of the gold, silver, copper, lead, zinc, clays, lime, and sandstone production in 1952 came from mines and quarries at Eureka, which are reviewed under the Tintic district. Juab County produced all (17,304 tons) of Utah's fluorspar output in 1952; it came from 6 mines in the Topaz Mountain area. All ore was metallurgical grade, shipped to steel plants in California, Colorado, Missouri, Oklahoma, Oregon, Utah, and Washington and to a buyer in Iowa. The principal producers were the Bell Hill, Fluoride Queen, and Wilden properties. The average market price of fluorpsar in 1952 was $25.35 a ton, a rise of $3 a ton over 1951.

Tintic District.—The Tintic district lies in both Juab and Utah Counties. Table 18 gives metal production in each section of the district in 1952, as well as the district total for prior years.

TABLE 18.—Mine production of gold, silver, copper, lead, and zinc in Tintic district, Juab and Utah Counties, 1943–47 (average), 1948–52, and total, 1869–1952, in terms of recoverable metals

	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
1943–47 (average)	21	188,821	16,321	1,081,618	522	5,783	3,277	$3,445,527
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	18	189,870	3,277	924,722	149	6,520	5,985	4,474,031
1951	15	193,123	4,982	944,818	208	5,553	3,410	4,292,771
1952:								
Juab County	7	109,709	2,230	609,093	73	4,098	2,948	2,962,773
Utah County	8	14,733	712	57,252	60	181	3	164,840
Total 1952	15	124,442	2,942	666,345	133	4,279	2,951	3,127,613
Total 1869–1952	----	[1]15,889,825	2,631,099	265,465,950	123,177	967,093	60,575	419,365,412

[1] Figures estimated for certain years before 1901.

Despite a shutdown (caused by a strike) lasting over 2 months at the Chief No. 1 mine in the Juab part of the district, the property remained by far the most important producer of gold, silver, copper, lead, and zinc in the entire district. The Chief Consolidated Mining Co. reported that the mine produced 97,836 tons of ore in 1952 compared with 108,806 tons in 1951; the ore contained 2,153 ounces of gold, 593,426 ounces of silver, 141,700 pounds of copper, 10,313,703 pounds of lead, and 7,062,486 pounds of zinc. The mine ranked second in lead production in the State in 1952, third in silver, and fourth in zinc. Some facts regarding the new pumping plant at the Chief mine were published.[3] The Chief Consolidated Mining Co. also worked the American Star mine and shipped 4,216 tons of sili-

[3] Mining World, Chief Consolidated's New Pumping Plant: Vol. 14, No. 2, February 1952, pp. 41–42.

ceous silver ore to the copper smelter at Garfield and 151 tons of lime from its quarry at Eureka.

Lessees worked other properties in the Juab County part of the district; shipments in 1952 comprised 3,686 tons of lead-silver ore from the Centeninal-Beck-Victoria group; 2,732 tons of gold-silver ore from the Empire group; 580 tons of lead ore from the Eureka Hill mine; 445 tons of gold-silver ore from the Godiva waste dump; and 95 tons of silver ore and 37 tons of lead-zinc ore from the Showers group.

The Dragon Consolidated Mining Co. operated its underground and open-pit halloysite-clay deposit at Eureka nearly all year and shipped 65,417 tons to the Filtrol Corp. plant at Salt Lake City. The Murray Refractories Co., owner of a quartzite quarry at Eureka, shipped 11,788 tons of crushed material to its plant at Murray for use in making high-grade fire brick.

Output from the Utah County part of the district was 8,161 tons of ore and 6,572 tons of old tailings, which contained 712 ounces of gold, 57,252 ounces of silver, 124,270 pounds of copper, 581,539 pounds of lead, and 7,225 pounds of zinc. Shipments comprised 6,572 tons of old lead-silver tailings from the Harold dump; 3,240 tons of gold-silver ore from the Eureka Standard waste dump; 2,475 tons of gold-silver ore from the Eureka Lilly mine; 1,773 tons of silver ore from the Iron Blossom, Mountain View, and Tintic Standard properties; and 673 tons of gold-silver ore from the Sioux and Yankee mines.

Other Juab County production included 23 tons of lead-silver ore from the Utah mine group (Fish Springs district) and 10 tons of lead ore from the Dyke claim (Detroit district).

KANE

For the first time since 1943 manganese ore was produced in 1952 in Kane County. The King Manganese Corp. operated its claims 35 miles east of Kanab and shipped some high-grade concentrate assaying 52 percent manganese and some crude ore assaying 30 percent manganese. Other county production was 2,774 tons of coal. Crushed limestone (47,170 tons) was produced in 1951 for use in improving county roads; none was produced in 1952. Late in 1952 the Salina Mining & Smelting Co. began working its Lynn uranium claims under a DMEA contract.

MILLARD

The Cove Creek sulfur deposit at Sulphurdale was worked in 1952 after being closed for several years. The Chemical Corp. of America took over the property early in 1952, built a new 200-ton pilot flotation mill, and treated some ore. Diamond drilling has indicated approximately 2 million tons of ore reserves. Other county production was several hundred tons of low-grade manganese ore shipped from the Black Boy mine near Joy to pig-iron and steel plants in Utah and 1 ton of tungsten concentrate produced from ore mined at the New Klondike mine in Miller Canyon. Willden & Petty operated the Brown Queen mine near Delta and shipped 113 tons of tungsten ore to a custom mill at Bishop, Calif. Louise W. Garrick explored the Duke Page tungsten mine under a DMEA contract.

MORGAN

The principal mineral commodity in Morgan County in 1952 was portland cement produced at the Devils Slide plant of the Ideal Cement Co. Other county output was 14,862 tons of clays mined and used by the Interstate Brick Co.

PIUTE

The most important mineral output in Piute County in 1952 was uranium (autunite) ore produced from mines near Marysvale. Several operators received financial assistance from the Government in 1952 for exploration of uranium claims near Marysvale. Other types of ore produced included 295 tons of lead-zinc ore from the New Deer Trail group near Marysvale (Mount Baldy district) and 6 tons of copper-silver ore from the Shamrock claim (Ohio district).

RICH

Phosphate rock was the only mineral output in Rich County in 1952, and the county was the only producer of phosphate rock in the State; all of it came from the Pearl property and was used mainly by the poultry industry.

SALT LAKE

Salt Lake County, in which the West Mountain (Bingham) district is situated, is one of the most important mining, milling, and smelting areas in the United States. The total value of the county mineral output in 1952 was $191,700,870 (72 percent of the State value) and a 5-percent gain over the 1951 value. The Garfield copper smelter of the American Smelting & Refining Co. operated continuously in 1952, mainly on copper concentrates from the Arthur and Magna mills. The copper refinery of the Kennecott Copper Corp. and the copper-anode plant of the American Smelting & Refining Co., both at Garfield, operated continuously; copper bars, gold bars, and silver bars constitute the principal production of the refinery. Construction of a cobalt refinery was completed at Garfield during the year to treat cobalt concentrate produced at a mill in Idaho. The Garfield Chemical & Manufacturing Corp., a subsidiary of the American Smelting & Refining Co. and Kennecott Copper Corp., operated its sulfuric acid plant all year. Western Phosphates, Inc., began in December to construct a triple-superphosphate fertilizer plant at Garfield. The Midvale lead smelter and 1,700-ton custom lead-zinc mill of the United States Smelting, Refining & Mining Co. operated continuously. The Arthur and Magna concentrators (40,000 tons rated capacity each) of the Kennecott Copper Corp. operated continuously on copper ore produced from the Utah Copper property at Bingham. The concentrator of the Vitro Chemical Co. at Salt Lake City treated uranium ore, largely from the Marysvale and San Rafael mining districts. The Utah Oil Refining Co. at Salt Lake City operated all year, expanding its production of various types of oil and gasoline. The Sure-Seal Corp. operated its plant at Salt Lake City all year and produced one railroad car of wax a day. The chief mining activity in the county is open-pit mining of copper ore at the Utah Copper property and deep mining of lead-silver-zinc ore

at the properties of the United States Smelting, Refining & Mining Co., both at Bingham. Review of these operations is given under West Mountain (Bingham) district, which follows.

West Mountain (Bingham) District.—In 1952 the West Mountain (Bingham) district produced 96 percent of the State gold, 74 percent of the silver, over 99 percent of the copper, 68 percent of the lead, 62 percent of the zinc, and all of the molybdenum; the molybdenum was a byproduct of copper ore. The district total value of the first 5 metals was $173,807,807 (65 percent of the State total). Output comprised 32,037,217 tons of copper ore, 422,248 tons of lead-zinc ore, 14,863 tons of siliceous silver ore and gold-silver ore, 11,002 tons of copper precipitates, 15,592 tons of molybdenite concentrate, and 9,970 tons of lead ore. Production of each of the six metals in 1952 was greater than in 1951, owing to a substantial increase in output of copper ore from the Utah Copper property, by far the largest producer of copper ore in the State, and in output of lead-zinc ore from the United States & Lark mines of the United States Smelting, Refining & Mining Co., the largest producer of lead-zinc ore in the State.

TABLE 19.—Mine production of gold, silver, copper, lead, and zinc in West Mountain (Bingham) district, Salt Lake County, 1943–47 (average), 1948–52, and total 1865–1952, in terms of recoverable metals

Year	Number of mines	Ore (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)	Total value
1943–47 (average)	9	26,593,142	286,052	4,110,173	240,806	25,567	17,053	$95,480,425
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
1951	4	30,863,391	407,196	4,923,249	270,183	29,120	18,286	166,208,080
1952	4	32,484,298	417,607	5,338,291	282,098	34,328	20,395	173,807,807
Total 1865–1952	--------	[1]693,658,481	8,100,302	172,177,312	6,185,897	1,742,384	599,332	2,668,245,150

[1] Figures estimated for certain years before 1901.

In 1952 the Utah Copper Division of the Kennecott Copper Corp. operated its 2 flotation-concentrators at Arthur and Magna and its copper-precipitating plant at Bingham 7 days per week throughout the year. The 2 mills treated 32,036,100 tons of ore, averaging 0.945 percent copper and containing small quantities of gold, silver, and molybdenum, compared with 30,444,800 tons of ore, averaging 0.957 percent copper in 1951. In addition to copper concentrate (894,870 tons), the corporation shipped 14,326 tons of molybdenite concentrate and 10,867 tons of copper precipitate. The property continued to be the largest producer of copper and the second largest producer of molybdenum in the United States and the largest producer of gold and silver in Utah. According to the corporation annual report for 1952, the increased copper production of about 5 percent over 1951 at the Utah Copper property resulted mainly from an increased quantity of copper precipitate recovered from the waste dumps, and the increase of 16 percent in molybdenite production resulted from a larger quantity of copper ore mined and from an improvement in the method of recovery. New flotation cells are being installed in the two mills, which will improve the recovery of copper and molybdenite. The new 7,000-foot haulage tunnel being driven from the bottom of

the pit to the waste dumps was completed August 30. Use of the tunnel will result in further economies in ore haulage and waste disposal.

Steady operations throughout the year at the United States & Lark property resulted in a substantial gain in production of gold, silver, copper, lead, and zinc. Output from both mines in 1952 comprised 400,418 tons of lead-zinc ore, 14,746 tons of siliceous gold-silver ore, 9,970 tons of lead ore, 1,117 tons of copper ore, and 131 tons of copper precipitates; output of lead-zinc ore exceeded that in 1951 by 13 percent. The property was by far the largest producer of lead and zinc in the State in 1952 and ranked second in production of copper, gold, and silver. According to the company annual report to stockholders, development of new ore paced ore extraction, and several interesting ore showings were developed in new areas.

Lead-zinc ore was also mined throughout the year at the Butterfield group by the Combined Metals Reduction Co.; 21,389 tons of ore was shipped to the company flotation mill at Bauer. In addition, 117 tons of gold-silver ore and silver ore was shipped to the smelter at Garfield.

Other district production was 166 tons of lead-zinc ore and 4 tons of copper precipitates from the National Tunnel property and 275 tons of material (lead-zinc) cleaned up from loading stations.

Lessees worked the Cardiff mine (Big Cottonwood district) 7 months in 1952 and shipped 115 tons of silver ore and 91 tons of lead-zinc ore. Four mines in the Little Cottonwood district produced 181 tons of ore containing 13 ounces of gold, 4,852 ounces of silver, 2,904 pounds of copper, 53,684 pounds of lead, and 28,236 pounds of zinc. The principal output was 146 tons of lead-silver ore produced from the South Hecla mine. Output in the Smelter district in 1952 comprised 1,159 tons of smelter cleanings from the Murray smelter site, 1,247 tons of old slag from the Midvale smelter dump, and about 150 tons of byproduct arsenic.

Production of cement in Salt Lake County in 1952 was 12 percent less than in 1951; the only operator was the Portland Cement Co. of Utah. Clay output (33,732 short tons) was virtually the same as that in 1951; all of it was common clay mined and used for making brick by the Interstate Brick Co. All (29,285 tons) of the county lime production was quicklime produced by the Kennecott Copper Corp. for use as a reagent in milling copper ore; limestone was mined by the American Smelting & Refining Co. for use as flux material in smelting copper concentrate at the Garfield plant; and salt was produced by solar evaporation at the property of the Morton Salt Co. on the shores of Great Salt Lake near Saltair. Output of sand and gravel from 11 pits in 1952 was 2,443,347 tons; over half of it was noncommercial material used by the Utah State Road Commission in improving highways. The railroads used 137,026 tons for road ballast; the remainder was used chiefly by the building and construction trades.

In 1952 two plants—Perlite, Inc., and Utco Products Co.—at Salt Lake City produced expanded perlite.

SAN JUAN

The principal output in San Juan County in 1952 was uranium-vanadium (uraninite) ore from the La Sal (Big Indian) district and copper-uranium ore from the White Canyon district. Charles A. Steen discovered a large body of uranium-vanadium ore at his Mi Vida claim in the Big Indian district in July 1952, sank a shaft in October to develop the ore body, and made his first shipment of ore December 6. The ore-bearing deposit is in the Chinle formation and is mined by a modified room-and-pillar method. The ore was hauled by trucks from a stockpile to ore-buying stations at Monticello and Thompson, Utah, and Grand Junction, Colo. Vanadium Corp. of America continued operating its pilot concentrator at Hite, Utah, on copper-uranium ore purchased from various operators in White Canyon. There were numerous operators in the county in 1952 exploring for uranium ore; six companies received financial assistance from the Government through DMEA contracts.

SANPETE

In 1952 the Royal Crystal Salt Co. continued to ship rock salt from its mine at Axtell. The salt was used mainly by the cattle industry and for melting ice. Other output in 1952 was 3,000 short tons of limestone mined for local consumption in refining sugar. Some (33,750 tons) sand and gravel were hauled from a pit in 1951 for local consumption; none was reported hauled in 1952.

SEVIER

Production in Sevier County in 1952 comprised gold, silver, sand and gravel, salt, gypsum, clays, and coal, valued in all at $1,109,973 compared with $1,050,920 in 1951. The most important mineral produced was gypsum, followed by coal. All of the gypsum produced in Utah in 1952 came from two properties—United States Gypsum and Western Gypsum—near Sigurd, Sevier County. The gypsum produced in 1952, slightly less than in 1951, was used in the manufacture of Keene's cement, wallboard, plaster, and other building materials. Output of coal declined slightly from 80,404 tons to 77,533 tons. One operator of a sand and gravel pit in 1952 sold 9,840 tons of commercial material, and Poulson Bros. Salt Co. mined some rock salt for use by the cattle industry. Western Clay & Metals Co. operated its property at Ivie in 1952 and produced 2,930 tons of fuller's earth and 1,964 tons of bentonite. This was the only property in Utah that produced either fuller's earth or bentonite. B. W. & H. Gold & Silver Mining Co. worked its Gold King claim (Henry district) 3 months in 1952 and shipped 8 tons of gold-silver ore.

SUMMIT

The principal output in Summit County in 1952 was lead-zinc ore. Details covering operations and production are given under the Park City region. The Utah Fire Clay Co. operated its clay deposit and shipped 14,606 tons to its brick and tile plants at Salt Lake City. Operators of coal mines at Coalville shipped 24,888 tons in 1952 compared with 22,728 tons in 1951.

PARK CITY REGION

The Park City region, one of the most productive areas in the State, includes the Uintah district in Summit County and the Blue Ledge and Snake Creek districts in Wasatch County. Table 20 shows the production and total value of the five metals in 1952 compared with 1948–51 and the total from 1870 to 1952.

TABLE 20.—Mine production of gold, silver, copper, lead, and zinc in Park City region, Summit and Wasatch Counties, 1943–47 (average), 1948–52, and total, 1870–1952, in terms of recoverable metals

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
1943–47 (average)	11	342,906	16,508	1,365,441	500	11,191	9,662	$6,172,034
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
1951	12	230,607	18,476	1,131,360	470	11,719	10,209	9,668,591
1952	12	198,804	13,827	861,563	456	7,494	7,746	6,469,147
Total 1870–1952	--------	[1] 16,506,559	673,816	241,838,769	37,280	1,263,213	397,921	413,576,745

[1] Figures estimated for certain years before 1901.

A decline in the market prices of lead and zinc beginning in June and unfavorable labor conditions caused 2 of the most important producers of lead-zinc ore in the Park City region to shutdown—1 in June and the other in August. As a result of these shutdowns, the output of ore and of each metal in 1952 was much less than in 1951. The output of lead-zinc ore, the chief source of metal production, dropped from 190,178 tons in 1951 to 136,888 tons in 1952, a 28-percent loss. The New Park Mining Co. was the only steady producer in the district throughout the year. The company reported that 75,118 tons of ore, containing 17,200 ounces of gold, 350,281 ounces of silver, 946,071 pounds of copper, 7,246,508 pounds of lead, and 10,007,687 pounds of zinc, was shipped in 1952 to the custom flotation mill of the Combined Metals Reduction Co. at Bauer. The property ranked second in zinc production in the State in 1952, third in gold and lead, and fifth in silver.

The Judge and Keetley units of the Park Utah Consolidated Mines Co. closed June 26 owing to a strike. The company reported that 34,780 tons of ore was shipped in 1952 (55,185 tons in 1951), which contained 1,249 ounces of gold, 179,934 ounces of silver, 24,707 pounds of copper, 4,931,102 pounds of lead, and 6,632,237 pounds of zinc. According to the company annual report to stockholders, an agreement on wages failed and a strike was called June 26, 1952. The wage demands were for an increase of approximately 15 percent, which, coupled with the weakness of metal prices, resulted in a shutdown of the property.

The Silver King Coalition Mines Co. closed its mine and mill August 15, because of a marked decrease in the market prices of lead and zinc. The company reported that 24,470 tons of ore was milled in 1952 (44,465 tons in 1951), which contained 500 ounces of gold, 149,175 ounces of silver, 60,000 pounds of copper, 3,890,000 pounds of lead, and 1,380,000 pounds of zinc. At the close of the year plans

were under consideration to consolidate the properties of the Silver King Coalition Mines Co. with those of the Park Utah Consolidated Mines Co.

McFarland & Hullinger worked the Ontario waste dump at Park City the last 7 months of the year and shipped 46,764 tons of siliceous ore, which contained 832 ounces of gold, 201,189 ounces of silver, 77,092 pounds of copper, and 424,081 pounds of lead. A total of 11,353 tons of old tailings, containing mainly silver and lead, was shipped from the Atkinson, Big Four, Crescent, Gilmore, and Pacific Bridge properties. Reuben Garbett continued to re-treat current zinc tailings from the Silver King Coalition mill; about 3,000 tons was re-treated in 1952. Other Park City region output was mainly 412 tons of copper ore from the West Park mine on Snake Creek and 243 tons of lead-silver ore from the Silver King Western mine near Park City. The East Utah Mining Co., Naildriver Mining Co., New Quincy Mining Co., and Park Heber Consolidated Mining Co. explored their properties under DMEA contracts.

TOOELE

Tooele County is one of the chief mining, milling, and smelting areas in Utah and the only producer of potash (K_2O) in the State. The lead smelter, 1,500-ton lead-zinc custom mill, and zinc-slag fuming plant of the International Smelting & Refining Co. near Tooele operated continuously in 1952. The Combined Metals Reduction Co. operated its 700-ton lead-zinc custom mill at Bauer, a plant to recover resin from coal, a resin plant, and a perlite expanding plant. The International zinc-slag fuming plant operated in conjunction with the lead smelter treated 89,585 tons of current hot slag in 1952 from the lead blast furnace and 10,124 tons of crude zinc ore, largely from Nevada. The plant yielded 18,520 tons of zinc fume and 2,397 tons of lead fume. Most of the zinc fume was shipped to Bartlesville, Okla., and the lead fume to the Tooele smelter. The International mill yielded 7,182 tons of lead concentrate, 10,993 tons of zinc concentrate, and 15,812 tons of iron concentrate. The lead concentrate and iron concentrate were shipped to the Tooele lead smelter and the zinc concentrate to the Anaconda Copper Mining Co. zinc plants at Anaconda and Great Falls, Mont. The Bauer mill yielded 23,349 tons of lead concentrate and 32,703 tons of zinc concentrate. The potash plant near Wendover was operated by Bonneville, Ltd., on potassium-bearing brines of Salduro Marsh area of the Bonneville salt flats. Production of potash (K_2O) was less in 1952 than in 1951.

Output of clays in Tooele County dropped from 97,052 tons in 1951 to 13,673 tons in 1952; 10,717 tons was fire clay produced and used by the Utah Fire Clay Co., and 2,956 tons was common clay produced and used by the Interstate Brick Co. The Utah Lime & Stone Co. was the only operator of a lime plant and a limestone quarry in Tooele County in 1952. The company produced 4,874 tons of chemical (quicklime and hydrated lime) lime used largely by milling plants (lead-zinc) and smelting plants, 100 tons of finishing lime, 40 tons of mason's lime, and 78,785 tons of crushed limestone. In 1951, 356,500 tons of crushed limestone (noncommercial) was produced for use in constructing county highways; none was produced in 1952. Utah Calcium Products Co. operated its calcite deposit near Delle in 1952 and shipped crushed

calcite to poultry associations in Utah and to other buyers in California, Colorado, Idaho, and Washington. The only output of sand and gravel in 1952 was 3,480 tons used by the Union Pacific Co. A few thousand tons of salt was produced by solar evaporation at the property of the Stansbury Salt Co., Inc., on the shores of Great Salt Lake near Grantsville. Manganiferous ore (1,045 tons), averaging 28.61 percent Mn, was produced from 2 mines; the Black Rock mine in the Erickson district was the principal producer. Tungsten operations in 1952 were confined to two properties near Gold Hill (Clifton district)—Gold Hill Exploration Co. operated the Yellow Hammer mine and shipped 50 tons of dump ore to a custom mill at Bishop, Calif., and Star Dust Mines, Inc., operated its Star Dust mine and shipped a little high-grade ore. Most of the county gold, silver, copper, lead, and zinc production was recovered from lead-zinc ore mined in the Ophir and Rush Valley districts. In 1952, 3 mines in the Ophir district produced 20,746 tons of ore containing 115 ounces of gold, 85,361 ounces of silver, 195,168 pounds of copper, 2,262,696 pounds of lead, and 1,904,410 pounds of zinc. The chief producer was the Ophir unit of the United States Smelting, Refining & Mining Co. McFarland & Hullinger operated the Hidden Treasure mine near Ophir and shipped 2,239 tons of lead-zinc ore and 528 tons of lead ore. The Mono-Kearsarge group produced 39 tons of copper-lead ore.

Three mines in the Rush Valley district produced 21,062 tons of ore containing 1,023 ounces of gold, 214,702 ounces of silver, 43,915 pounds of copper, 5,916,768 pounds of lead, and 1,188,952 pounds of zinc. The West Calumet mine operated by the Combined Metals Reduction Co., by far the largest producer in the district, was shut down for nearly 2 months owing to a fire in the shaft. The mine produced 20,295 tons of lead-zinc ore in 1952 compared with 23,420 tons in 1951. Other district production in 1952 was 460 tons of lead-zinc ore and 48 tons of lead ore from the Honorine mine and 259 tons of lead-zinc ore from the Silver Eagle mine. The Ben Harrison and Muirbrook lead-zinc mines were explored by the Combined Metals Reduction Co. under a DMEA contract. In 1952 crude perlite from a property in Nevada was processed at the Bauer plant of the Combined Metals Reduction Co.

In the Erickson district, the Esther group (Bar X Mining Co.) was the only producer in 1952; 1,168 tons of ore was shipped, which contained 7 ounces of gold, 1,216 ounces of silver, 3,292 pounds of copper, 138,310 pounds of lead, and 177,082 pounds of zinc. The property closed in August. Other county production included 27 tons of lead-silver ore from the Blackhawk and New Eclipse claims (Blue Bell district), 29 tons of gold-lead ore from the Oro Del Rey mine (Willow Springs district), and 7,142 tons of old zinc slag and 1,058 tons of old copper slag from the International Smelting & Refining Co. dumps near Tooele.

UINTAH

The principal mineral commodities in Uintah County in 1952 were petroleum produced from wells in the Uinta Basin and gilsonite produced from three properties at Bonanza. Production of oil from the Uinta Basin has risen consistently each year since 1949, and the area is currently the largest oil-producing field in Utah. Uintah and

Duchesne Counties are the only areas in the United States that produce gilsonite; Uintah County is by far the larger producer. The American Asphalt Association, established in 1902, and the Castle Peak Gilsonite Co., established in 1907, have been the chief producers. These properties, plus the mines of the Utah Gilsonite Co., have approximately 2,000,000 tons of ore in reserve. The county also produced a little coal in 1952 for local consumption.

UTAH

Utah County, with its pig-iron plant at Ironton and steel plant at Geneva, is one of the chief smelting centers in the Western States; moreover, considerable cast-iron pipe and coke are produced at Ironton. The United States Steel Corp. operated its plants at Ironton and Geneva all year; the cast-iron-pipe plant was operated by the Pacific States Cast Iron Pipe Co. More sand and gravel were produced and used in the county in 1952 than in 1951; 2 plants—Lee Sand & Gravel and Thorns Ready Mix Concrete—produced 125,844 tons in 1952. Limestone was mined by the United States Steel Corp. for use as a flux in making pig iron and steel at its Ironton and Geneva blast furnaces. Clays (32,882 tons) were produced from 6 pits in 1952; most of it was common clay and fire clay produced and used by the Utah Fire Clay Co., Interstate Brick Co., and Harrisville Brick Co., for making brick and clay tile. Some pink pumice (4,048 tons) was produced in 1952 and used by the Wm. H. Prince & Sons Block Co. as an aggregate in making concrete blocks. The metal (gold, silver, copper, lead, and zinc) production of the county came mainly from eight properties in the Tintic district, which is reviewed under Juab County, where a large part of the Tintic district is situated. Output of the American Fork district in 1952 was 44 tons of lead ore from the Blue Rock (Pacific) mine and 25 tons of lead-zinc ore from the Silver Leaf claim.

WASATCH

The production in Wasatch County in 1952 was all metal (gold, silver, copper, lead, and zinc) from the New Park property in the Blue Ledge district and the West Park mine in the Snake Creek district (Park City region), which is reviewed under Summit County.

WASHINGTON

The metal output of Washington County in 1952 was lead and silver recovered from 143 tons of ore produced from the Dixie-Apex mine (Tutsagubet district) by the Kentucky-Utah Mining Co. The remainder of the county output was 2,700 tons of sand and gravel used by a contractor to improve county highways.

WAYNE

The only mineral activity in Wayne County in 1952 was exploration for uranium deposits. J. R. Simplot Co., Inc., received financial assistance from the Government for exploration at its property in the Temple Mountain area.

WEBER

Sand and gravel from 4 pits were the only mineral commodities produced in Weber County in 1952; 75,872 tons valued at $57,460 was produced by 3 commercial operators—Clarence Waterfall Co., Lawrence Yearsley, and D. H. Hadley. The remainder (56,250 tons) was used by the Weber County Highway Department for improving county highways. In 1951 the Ogden Pressed Brick & Tile Co. produced and used 14,160 tons of clay; none was produced in 1952.

The Mineral Industry of Vermont

By Richard H. Mote[1]

THE TOTAL VALUE of mineral production in Vermont reached a near-record $17,891,000 in 1952 despite declines in the output of major mineral products, notably slate, stone, and talc. The aggregate value of the 1952 production was 3 percent less than the 1951 total and 4 percent under the 1950 record $18,563,000. Except for Essex and Orleans Counties, every county in the State contributed to the mineral economy during the year. Rutland, Lamoille, Washington, and Orange Counties, in order of decreasing value of output, were the major centers of activity. Mines, pits, and quarries in these counties yielded mineral products, the aggregate value of which was nearly $17 million and represented 93 percent of the State's total value in 1952. Quarrying of stone continued to be the principal mineral industry; asbestos, slate, copper, and talc ranked second to fifth, respectively, in value of output. In all, 57 mines were active in the State in 1952.

TABLE 1.—Mineral production in Vermont, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Gold (recoverable content of ores, etc.) troy ounces	156	$5,460	162	$5,670
Lime (open-market)	32,179	432,483	(2)	(2)
Pyrites long tons			17,892	(2)
Sand and gravel	965,702	646,702	1,264,490	749,835
Silver (recoverable content of ores, etc.) troy ounces	41,300	37,379	45,361	41,054
Stone (except limestone for lime)	450,980	7,253,824	404,391	6,016,530
Talc	78,694	998,792	71,027	926,646
Undistributed: Asbestos, clays, copper, slate, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)		[3] 9,141,814		10,150,945
Total Vermont		[3] 18,516,000		17,891,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels and pyrites are strictly production.
[2] Value included with "Undistributed."
[3] Revised figure.

Several Vermont mining properties were assisted by the Federal Government in the exploration of unknown or undeveloped sources of strategic and critical minerals and metals. During 1952 the Defense Minerals Exploration Administration approved one contract for Government participation in exploration totaling $62,500. In addition, 3 contracts active in 1951 (2 for asbestos and 1 for copper), totaling $161,082, were continued in 1952.

[1] Chief, Mineral Industry Division, Region VIII, Bureau of Mines, Pittsburgh, Pa.

REVIEW BY MINERAL COMMODITIES

METALS

Copper.—Copper ores occur in eastern Vermont in an area roughly 20 miles long from north to south and 2 miles wide. Production in 1952 came from the Elizabeth mine, 2 miles southeast of South Strafford and 7 miles west of the Connecticut River. Other copper mines in the State include the Ely lode at Vershire and the Pike Hill deposits at Corinth, both of which have been unproductive since World War I.

Although copper ore was discovered at the Elizabeth mine in 1793, it was not until 1830 that any substantial quantity was produced. Copper output at the Ely mine began in 1821 and at the Pike Hill deposits in 1866.[2]

The ore body at the Elizabeth mine is lenticular and consists predominantly of ferrous sulfide mineral pyrrhotite containing disseminated chalcopyrite, the copper-bearing mineral. Small quantities of zinc as sphalerite, and silver and gold also occur in the ore. The deposit is approximately 8,300 feet long and has been mined to a depth of 975 feet below the level of its outcrop.

Since 1793 the Elizabeth mine has yielded nearly 36,000 short tons of copper contained in ore mined.[3] About 75 percent of this production has occurred since 1943, when the Vermont Copper Co., Inc., reopened the mine.

Gold and Silver.—The output of gold and silver in Vermont in 1952 was recovered as a byproduct of smelting copper concentrates obtained from the milling of copper ore.

NONMETALS

Asbestos.—The bulk of the United States' asbestos output is produced at the Ruberoid Co. Vermont Asbestos Mines Division mine on Belvidere Mountain, 15 miles north of Hyde Park, Lamoille County. The deposit is regarded as a southward extension of the well-known Quebec, Canada, deposits, and the asbestos veins occur in massive serpentine as they do in Canada. Chrysotile asbestos, principally of the slip-fiber type (fibers lie in same plane as the vein or on slippage planes) is mined by open-pit methods and treated in the modern company mill about one-fourth mile from the quarry. The Vermont asbestos deposits are not yet fully explored, although considerable diamond drilling has been conducted in recent years. On the basis of this drilling, a 20-year supply at the current or even an enlarged production rate seems to be assured.[4] During 1952 exploratory work, including diamond drilling, was conducted, partly financed by loans from Defense Minerals Exploration Administration.

Vermont asbestos prices per short ton, f. o. b. Hyde Park or Morrisville, Vt., remained constant until February 1952, when they were increased as follows: Group 3 (Spinning and Filtering) from $279.50–$302 to $321–$348; Group 4 (Shingle Fiber) from $135–$162 to $156–$173; Group 5 (Paper Fiber) from $81.50–$115 to $110–$132; Group 6

[2] Jacobs, Elbridge C., Report of the State Geologist on the Mineral Industries and Geology of Vermont, 1941–42: pp. 1–16.
[3] McKinstry, H. E., and Mikkola, Aimo K., The Elizabeth Copper Mine, Vermont: Econ. Geol., vol. 49, No. 1, p. 2.
[4] Bureau of Mines, Asbestos: Materials Survey, MS–2, February 1952, 147 pp.

(Waste, Stucco, or Plaster) from $71.40 to $78; and Group 7 (Refuse or Shorts) from $34–$63 to $37–$68.50. These prices remained in effect for the balance of the year.

Clay.—No clay was reported mined in Vermont in 1952. A small tonnage was produced in Chittenden County in 1951 for use in manufacturing building brick.

Lime.—The Vermont Associated Lime Industries, Inc., was the State's only producer of lime in 1952. The product was marketed as both quicklime and hydrated lime and for a wide variety of uses.

Pyrites.—Pyrrhotite concentrates, recovered as a byproduct of copper-ore milling, were sold for use in the production of sulfur dioxide gas.

Sand and Gravel.—Sand and gravel production was reported from 10 counties, the largest of which, in order of decreasing value of output, were Washington, Windham, Bennington, and Caledonia. Seventeen commercial plants were active during the year.

Slate.—The Vermont slate-producing region, which lies along the border of southwestern Vermont and eastern New York, is the second most important in the United States and is exceeded only by the production of gray slate in eastern Pennsylvania. Except for the red-slate deposits of New York, it is the only area in the United States in which colored slates are mined. Varieties include sea green, unfading green, fading green, purple, and variegated (greenish gray and purplish mixed). All slate produced in Vermont in 1952 came from 21 active quarries in Rutland County. State output fell over 4 percent compared with 1951. Most producers agreed that the demand for slate products has declined an even greater percentage during 1952; some indicated demand had dropped as much as 10 percent.

Stone.—Stone quarrying continued to be the most important mineral industry in Vermont. Output of the 13 active quarries in the State in 1952 supplied one-third of the total value of Vermont mineral production. Stone quarried during the year included crushed, broken, and dimension granite and marble and crushed and broken limestone. Output dropped 10 percent from 1951 owing in part to a labor strike among granite workers which halted operations at some quarries from May 1 to October 6. Five active marble quarries were working during the year, 1 each in Franklin, Grand Isle, and Washington Counties, and 2 in Rutland County. Three granite quarries were

TABLE 2.—Stone sold or used by producers, 1951–52, by uses

Use	1951		1952	
	Short tons	Value	Short tons	Value
Dimension stone (building and monumental)	[1] 69,171	[1] $4,100,912	[1] 48,563	[1] $3,010,130
Crushed and broken stone:				
Concrete and road metal	[1] 93,652	[1] 117,556	[1] 98,643	[1] 135,451
Riprap, railroad ballast, furnace flux, and agricultural	151,846	504,795	129,896	428,417
Other uses [2]	111,153	937,244	110,344	774,653
Undistributed	25,158	1,593,317	16,945	1,667,879
Total	450,980	7,253,824	404,391	6,016,530

[1] Incomplete, to avoid disclosure of individual company operations. The portion not included is combined with "Undistributed."

[2] Includes stone used in the manufacture of paper, glass, and sugar; for acid neutralization; as terrazzo; and for filler for paints, putty, rubber, and other products.

worked during the year, 1 in Orange County and 2 in Washington County. Five limestone quarries were active, 1 each in Addison, Bennington, and Franklin Counties and 2 in Rutland County.

Talc.—Vermont ranked fourth in output of talc in 1952 and was exceeded only by New York, California, and North Carolina. The bulk of the State's production comes from 2 deposits in north-central Vermont, 1 near Johnson in Lamoille County and the other in Washington County about 2 miles south of Waterbury. At both these localities the talc is associated with serpentine, most of which cannot be milled as a talc product. Talc at the mine near Waterbury occurs enclosing a central core of serpentine, some of which is verde antique or common green marble. Other Vermont counties in which talc was mined in 1952 included Windham and Windsor.

TABLE 3.—Talc, pyrophyllite, and ground soapstone sold by producers, 1943–47 (average) and 1948–52

Year	Quantity (short tons)	Value	
		Total	Average per ton
1943–47 (average)	66,639	$795,712	$11.94
1948	70,922	1,014,718	14.31
1949	64,508	788,341	12.22
1950	72,135	906,396	12.57
1951	78,694	998,792	12.69
1952	71,027	926,646	13.05

REVIEW BY COUNTIES

ADDISON

Mineral products of Addison County in 1952, in order of decreasing value, were lime, limestone, and sand and gravel. Lime, both hydrated and quicklime, for building construction and chemical purposes was produced by the Vermont Associated Lime Industries, Inc., at its plants at Leicester and New Haven Junctions. Stone production in the county during the year was limited to crushed and broken limestone quarried by the Vermont Associated Lime Industries, Inc. Most of the output was for agricultural purposes. Washed and unwashed building sand and gravel were produced by Peter Cusino from his pit near Bristol.

BENNINGTON

William E. Dailey, Jr., operated his sand and gravel plant near North Bennington part of the year and produced material for building and road construction. The pit and portable plant of W. H. Hinman, Inc., near Pownal yielded paving and road gravel. Crushed limestone for road construction was produced at a portable crushing plant at South Shaftsbury by William E. Dailey, Jr.

CALEDONIA

Sand and gravel for building and road construction were produced during the year by Caledonia Sand & Gravel Co. from its pit and portable plant at Waterford.

CHITTENDEN

The Champlain Valley Company Division of the Vermont Associated Lime Industries, Inc., produced quicklime for a variety of uses at its plant in Winooski. Pits of the Rutland Railway Corp. and George C. Stanley & Sons, Inc., near Burlington, yielded engine, building, paving, and road sand. A small tonnage of limestone was quarried and crushed for road maintenance by the city of Burlington.

FRANKLIN

Stone was the only mineral product of Franklin County in 1952; virtually all of it was crushed and broken limestone quarried by Swanton Lime Works, Inc., Swanton. Output was sold for a number of uses, including paving, manufacture of paper, agricultural purposes, metallurgical flux, and railroad ballast. A small tonnage of marble for interior use in buildings was quarried at St. Albans by the Vermont Marble Co.

GRAND ISLE

Mineral production in Grand Isle County in 1952 was limited to rough building and monumental marble from the Isle La Motte quarry of the Vermont Marble Co. Marble from this deposit is gray to black in color and occasionally is highly fossiliferous.

LAMOILLE

In terms of value, Lamoille County ranked second among Vermont counties in mineral output in 1952. During the year, mines, pits, and quarries of the county yielded asbestos, talc, and sand and gravel. The Vermont Asbestos Mines Division of the Ruberoid Co., the largest producer of chrysotile asbestos in the United States, continued in 1952 to work its open-pit mine and modern mill on Belvidere Mountain, 15 miles from Hyde Park. Graded fibers produced in the mill were utilized by the company in the manufacture of asbestos products.

The Eastern-Magnesia Talc Co., largest talc producer in the State, operated its underground mine near Johnson throughout the year. Virtually all production was milled, largely dry-ground but also in part further beneficiated by wet flotation. Output during the year was sold for a variety of uses, principally as an inert material in insecticides, as an asphalt and rubber filler, and for use in paper manufacture.

Paving and road gravel for construction purposes was produced during the summer months by Volney C. Farr from his pit and plant at Morrisville.

ORANGE

Copper was the major mineral product of Orange County, the fourth-ranking county in the State in 1952. Other mineral products, in order of decreasing value, were stone, silver, gold, and sand and gravel. The Vermont Copper Co., Inc., operated its Elizabeth mine throughout the year and treated 260,701 short tons of copper ore in the company 800-ton flotation mill. A total of 15,883 tons of copper concentrate and 17,892 tons of pyrrhotite concentrate was recovered in the milling operation. The company operated its mill 7 days per

week on a 3-shift-per-day basis. During the year the daily capacity of the mill was increased from 700 to 800 tons to accommodate treatment facilities for recovering pyrrhotite concentrate. Development at the property during the year included 5,000 feet of drifts and 12,000 feet of diamond drilling. Copper concentrates were shipped to the Phelps Dodge Refining Co. smelter at Laurel Hill, Long Island, N. Y. Pyrrhotite concentrates were sold to The Brown Co., pulp and paper manufacturers of Berlin, N. H., who converted the material to sulfur dioxide gas for use in pulp manufacture. The copper concentrates contain some gold and silver, which is recovered in the smelting operation.

Stone production in Orange County in 1952 was limited to output of granite dimension stone for monumental purposes. J. K. Pirie estate worked the only active quarry continuously during the year, except for the labor strike during the summer months.

A small tonnage of paving and road gravel was produced by Levi Lemieux from a pit near Barre.

RUTLAND

Mineral products of Rutland County in 1952, in order of decreasing value, were slate, stone, and sand and gravel. The county ranked first among Vermont mineral-producing counties and second among the eight counties producing stone during the year.

Slate furnished nearly two-thirds of the total value of minerals produced in 1952. A substantial portion of the output was in the form of granules for use in surfacing flexible shingles and roll roofing. Slate for other uses, including roofing, flagging, and structural and sanitary purposes, was also quarried. Principal producers, in order of decreasing output, were Staso Milling Division, with quarry and crusher at Castleton; Vermont Structural Slate Co., Inc., quarries at Fair Haven, North Poultney, and Wells; Rising & Nelson Slate Co., Inc., West Pawlet; Pedro Bros. Slate Co., Fair Haven; Covino Bros. Slate Co., Wells; and Taran Bros., North Poultney. These 6 companies furnished 95 percent of the Vermont slate production in 1952.

The Green Mountain Marble Corp. worked its underground quarry at West Rutland throughout the year and produced sawed slabs and cut or dressed marble for building and monumental purposes. A small tonnage of waste marble was produced as a byproduct of these operations.

The largest production of marble in the State in 1952 came from the West Rutland quarry of the Vermont Marble Co.

The Vermarco Lime Co., a subsidiary of Vermont Marble Co., produced crushed and broken limestone for a wide variety of uses from its quarry at West Rutland, Rutland County. The White Pigment Corp. continued to operate its Florence plant and open quarry during the year and produced crushed and broken limestone for use as pigments and fillers.

The principal producer of sand and gravel in Rutland County in 1952 was Vermont Marble Co., which operated three pits, at Brandon, Proctor, and West Rutland. Although some paving and road gravel was recovered, the principal output of the company during the year was sand used in sawing marble.

WASHINGTON

Washington County ranked first in the State in value of stone production during 1952 and third among the mineral-producing counties in total value of output.

The Roxbury open quarry of the Vermont Marble Co. in Washington County yielded sawed and cut marble for building interiors and monumental uses. Except for the period of the granite workers' strike from May 1 to October 6, 1952, the Rock of Ages Corp. worked its Graniteville quarry in Washington County continuously throughout the year. Production consisted of dimension stone for monumental use. Rough dimension granite for monumental use was also produced in Washington County by the Wells-Lamson Quarry Co. from its quarry at Websterville.

The underground talc mine of Eastern Magnesia Talc Co., Inc., south of Waterbury was worked throughout the year; all production was ground in the mill adjacent to the mine.

Most of the sand and gravel credited to Washington County in 1952 was produced by the Vermont State Highway Department.

WINDHAM

Talc and sand and gravel were the sole mineral products of Windham County in 1952. Vermont Talc Co. produced crude talc at its underground mine in Windham; material mined during the year was trucked 12 miles north to the company mill at Chester Depot, Windsor County, where it was ground for use in insecticides, as a filler in rubber, and for insulation of wire and cable. The largest commercial producer of sand and gravel in Vermont in 1952 was the Vermont Sand & Gravel Co., which operated its pit and fixed plant at Rockingham near Bellows Falls. The company produced some molding sand during the year, but the principal output was sand and gravel for building and road construction.

WINDSOR

Vermont Mineral Products Co. continued in 1952 to mine talc from its Carleton quarry at Chester. Output was trucked to the company mill at Chester Depot for grinding. Sand and gravel for road construction were produced during the year by Colonial Sand & Gravel, Inc., from its pit and fixed plant at Sharon.

The Mineral Industry of Virginia

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior and the Virginia Geological Survey.

By Richard H. Mote [1] and Alvin Kaufman [2]

FIRST recorded utilization of Virginia's mineral resources was in 1608, when bog-iron ore was sent to England. Today the Commonwealth ranks among the top 25 mineral-producing States. In 1952 Virginia was the sole domestic source of aplite and a principal source of pyrites, as well as 1 of the 2 sources of kyanite in the United States.

The value of mineral output increased 2 percent over 1951. Buchanan, Wise, Dickenson, and Tazewell Counties, primarily coal-producing areas, supplied approximately 65 percent of the total value in 1952.

TABLE 1.—Mineral production in Virginia, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays (except for cement)	544,147	$593,999	648,334	$704,189
Coal	21,399,869	115,978,072	21,579,368	114,861,137
Feldspar (crude)—long tons	30,979	232,099	(2)	(2)
Iron ore (usable)—long tons, gross weight	7,248	(2)	(2)	(2)
Lead (recoverable content of ores, etc.)	1,508	521,768	3,792	1,221,024
Lime (open-market)	452,680	4,551,656	442,845	4,448,924
Manganese ore (35 percent or more Mn) gross weight			1,011	(2)
Natural gas—thousand cubic feet	64,000	10,000	1,133,000	279,000
Petroleum (crude)—42-gallon barrels	12,000	(2)	[3] 10,000	(2)
Sand and gravel	5,772,781	5,750,409	7,136,112	5,556,953
Stone (except limestone for cement and lime)	9,277,252	16,621,116	9,670,961	16,969,952
Zinc (recoverable content of ores, etc.)	7,332	2,668,848	13,409	4,451,788
Undistributed: Aplite, cement, gypsum, kyanite, marl, mica, 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 2)		14,324,190		16,185,952
Total Virginia		161,252,000		164,679,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels, gypsum, and pyrites are strictly production.
[2] Value included with "Undistributed."
[3] Final figure. Supersedes preliminary figure given in commodity chapter.

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Chief among the State products in 1952 were coal, stone, cement, sand, and gravel. Fuels (coal, petroleum, and natural gas) were responsible for approximately 70 percent of the value of the total output. Production of these three commodities was concentrated in the southwestern part of the State in the Appalachian Plateau section. Although, in the main, the output of fuels increased, their value declined owing mainly to the decreased price of bituminous coal in 1952.

Nonmetallics ranked second in importance and comprised 26 percent of the total value in 1952, and metals contributed an additional 4 percent. The output of the latter, predominantly from the southwestern part of the Appalachian Valley region, showed substantial increases as a result of settlement of a labor strike that had plagued the lead and zinc industry in 1951.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Virginia is the oldest continuous coal-producing State in the Nation. Bituminous coal was first discovered at Manakin, Goochland County, in 1701, and these deposits were utilized locally until 1758. At that time, as a result of accessibility to deep-water transportation, Virginia coal entered interstate and international trade. As other coal fields within the Appalachian area were discovered in Pennsylvania, West Virginia, and Kentucky, the Old Dominion's coals declined in importance. Within the State there are approximately 50 minable coal seams, ranging in age from Mississippian to Triassic. It was the latter that provided the basis for the early coal industry. There was no production from the Triassic seams in 1952.

At present, Mississippian coal, semianthracitic in rank, is mined in Montgomery County. However, the most prolific producing area in the State is the southwest field, particularly that section in Buchanan, Wise, Dickenson, and Tazewell Counties. It is estimated that Virginia's original reserves consisted of 21,649 million tons of bituminous and semianthracite (500 million tons) coals. Of this quantity, retrievable coal as of January 1, 1950, assuming 50-percent recovery, was estimated at 10,276 million tons. Aside from substantial reserves, the State is particularly fortunate in that its output ranges from coking through steam, metallurgical, and domestic coals.

The Commonwealth remained the sixth largest producer of bituminous coal in the United States in 1952 and contrasted the downward trend in output of the majority of coal-producing States by yielding the largest tonnage of bituminous coal since earliest recorded date. In all, 315 mines producing over 1,000 tons each were active in 1952, including 31 which were strip pits. The low number of stripping operations is indicative of the small part that surface production plays in total coal output. The average production per mine during the year was 68,506 tons, compared with the United States average of 64,171 tons. About 94 percent of underground production was by machine cutting; 48 percent of the underground output was mechanically loaded.

Virginia's coal industry employed an average of 17,452 men in 1952. Of these, 14,205 worked underground, 487 in stripping operations, and 2,760 in various surface positions connected with underground mining.

TABLE 2.—Production and average value at bituminous-coal mines in 1952 by counties

County	Production (net tons)		Tons per man per day	Number of strip pits	Strip production
	Total	Average value per ton [1]			
Buchanan	6,364,855	$5.37	6.58	8	298,495
Dickenson	5,108,779	4.94	7.83	5	1,185,983
Lee	745,357	6.14	4.29	0	
Montgomery	103,285	5.25	3.73	0	
Russell	892,067	5.30	6.10	1	8,334
Scott	32,000	5.38	3.90	0	
Tazewell	3,190,233	6.11	4.78	1	10,744
Wise	5,142,792	5.04	6.14	16	742,487
Total	21,579,368	5.32	6.20	31	2,246,043

[1] Value received or charged for coal f. o. b. mine, including selling cost. (Includes a value for coal not sold but used by producer).

Petroleum and Natural Gas.—Virginia was a relatively minor producer of petroleum and natural gas in 1952. The output of the latter commodity increased greatly over the previous year, whereas petroleum production declined 17 percent. Natural gas was obtained from the Early Grove field in Scott County and the newly discovered Slate Creek and Keen Mountain fields in Dickenson County, the Nora field in Buchanan County, and scattered wells in Wise County. The Rose Hill field in Lee County, discovered in 1941, yielded petroleum.

METALS

Iron Ore.—Production of iron ore is the oldest mineral industry in Virginia. Bog ore was first shipped to Bristol, England, for smelting in 1609. As a result of a steady increase in this business, an ironworks had been established by 1619 at Falling Creek, Chesterfield County, 7 miles south of the present site of Richmond. During the Civil War this industry reached its greatest heights. At that time Oriskany iron ores from the Grace Furnace mine in Botetourt County were used by Tredegar iron works, Richmond, as raw material for production of the Merrimac's iron plates. In recent years, however, output has been relatively minor. The sole producer in 1952 was American Pigment Corp., which mined residual lump ore from its property near Pulaski, Pulaski County. The output was utilized for paint pigments.

Lead and Zinc.—Lead and zinc output from Virginia mines in 1952 was 151 and 83 percent greater, respectively, than in the previous year, as a result of settlement of labor difficulties at the Austinville mine of New Jersey Zinc Co. in Wythe County. Ore from this property was treated at the company 2,000 ton-per-day mill at the mine. Zinc concentrates were shipped to smelters at Palmerton, Pa., and Depue, Ill. Lead concentrates were sent to the Alton, Ill., smelter. New Jersey Zinc Co. continued its development of the Ivanhoe mine near Austinville; zinc-lead ore from this mine will be beneficiated at the Austinville mill.

Manganese.—Virginia ranked fifth among the States in 1952 in production of manganese ore containing 35 percent or more manganese. Output was obtained from residual deposits derived from manganifer-

TABLE 3.—Mine production of recoverable lead and zinc, 1943–47 (average) and 1948–52

Year	Lead		Zinc		Year	Lead		Zinc	
	Short tons	Value	Short tons	Value		Short tons	Value	Short tons	Value
1943–47 (average)	3,867	$772,568	17,608	$4,077,418	1950	3,254	$878,580	12,396	$3,520,464
1948	4,703	1,673,674	15,882	4,224,612	1951	1,508	521,768	7,332	2,668,848
1949	3,313	1,046,908	13,166	3,265,168	1952	3,792	1,221,024	13,409	4,451,788

ous sediments. Productive areas underlie remnants of dissected erosion surfaces or occur in synclinal basins, and consist of nodules in residual clay or replacement of underlying limestones. All the Commonwealth's 1952 output consisted of metallurgical-grade material sold primarily to the General Services Administration for stockpiling. Active producers in 1952 were N. T. Dixon Chemical Corp., Union Manganese Co. (both in Smyth County), and Globe Mining Co., Bland Mining & Manganese Corp., and Dixon Dale Co. (all in Bland County). Defense Minerals Exploration Administration aided promising manganese projects in 1952 by providing $39,600 in exploration loans to be repaid from profits of possible production.

TABLE 4.—Manganese and manganiferous ores shipped from mines, 1943–47 (average) and 1948–52, in short tons

Year	Metallurgical manganese ore	Ferruginous manganese ore	Total	Year	Metallurgical manganese ore	Ferruginous manganese ore	Total
1943–47 (average)	7,192	4,663	11,855	1950	56	----	56
1948	----	2,462	2,462	1951	----	----	----
1949	----	1,279	1,279	1952	1,011	----	1,011

Titanium.—Ilmenite was produced in Nelson County in 1952 by American Cyanamid Co. This organization operated a quarry in a dike of nelsonite on the Warwick farm near Piney River. Nelsonite is a combination of ilmenite, rutile, and apatite, with biotite, chlorite, and actinolite occurring as gangue minerals. The deposit has a weathered surface which permits open-pit mining without blasting and results in easy crushing of ore. Although the ore body lies predominantly in Nelson County, there is substantial tonnage in adjoining counties to the northeast and southwest, in a belt stretching from near Charlottesville to the vicinity of Lynchburg. The total reserves are indicated at 4.4 million tons of TiO_2.[3]

NONMETALS

Cement.—A substantial output of both portland and natural cement was reported in Virginia in 1952. Riverton Lime & Stone Co., Inc., produced natural cement in its six-pot-kiln plant at Riverton, Warren County. Local shale was used as raw material. Portland cement was produced at plants of the Lone Star Cement Corp.,

[3] Bateman, Alan M., Economic Mineral Deposits: John Wiley & Sons, Inc., New York, N. Y., 1947, p. 618.

South Norfolk, Norfolk County, and Cloverdale, Botetourt County; and Lehigh Portland Cement Co., Fordwick, Augusta County. The South Norfolk plant of Lone Star Cement Corp. utilized marl as raw material; the other plants used limestone.

Clays.—Virginia clay output increased 21 percent in 1952 compared with the previous year. Production consisted of miscellaneous clays for use in manufacturing brick, tile, and cement, as well as a small tonnage of kaolin. The only producer of the latter commodity was Cold Spring Mining Div., Yarra Engineering Corp., Greenville, Augusta County. Major clay-producing companies in the Commonwealth during the year were United Clay Products Co., Woodridge Station, Albemarle County; Woodbridge Clay Products Co., Woodbridge, Prince William County; Roanoke Webster Brick Co., Inc., Roanoke, Botetourt County; and Redford Brick Co., Richmond, Henrico County. Counties having the largest clay output were, in order of decreasing value, Henrico, Albemarle, and Prince William.

TABLE 5.—Clays (except for cement) sold or used by producers, 1943–47 (average) and 1948–52

Year	Short tons	Value	Year	Short tons	Value
1943–47 (average)	278,910	$224,545	1950	545,984	$519,641
1948	444,025	426,732	1951	544,147	593,999
1949	449,122	403,598	1952	648,334	704,189

Feldspar.—Feldspar production was centered in Bedford County in 1952. Major producer was Clinchfield Sand & Feldspar Corp., operators of the Coles, May, and Peaksville mines. The last mine yielded soda feldspar and the Coles and May mines potash feldspar. Several small producers were active in Pittsylvania County. Virginia feldspar was utilized by the ceramic industries. The Commonwealth was the only State in the Nation to report production of aplite. Dominion Minerals, Inc., and Carolina Mineral Co., Inc., operated mines near Piney River in Nelson and Amherst Counties, respectively, for the production of this commodity. Crude aplite was ground and sold as a low-cost source of alumina for glass manufacture.

Gypsum.—The only producer of gypsum in Virginia in 1952 was United States Gypsum Co., which operated a mine, mill, and plasterboard plant at Plasterco, Washington County. The company also operated a calcining plant at Norfolk for the preparation of domestic and imported gypsum.

Iron Oxide Pigments.—Residual limonite occurs in 2 belts in Virginia, 1 along the west slope of the Blue Ridge Mountains from Warren to Roanoke Counties and the other on the east side of the New River-Cripple Creek district in Pulaski County near the Wythe-Carroll County boundary. Output in 1952 was obtained from Franklin and Pulaski Counties. Active producers were American Pigment Corp., operators of mines at Hiwassee and Pulaski in Pulaski County; and Blue Ridge Talc Co., Inc., Franklin County. Production of these two companies consisted of mineral blacks and browns and red and yellow oxides, as well as ochers, siennas, and burnt and unburnt umbers.

Kyanite.—Virginia kyanite production is primarily from the Wissahickon formation, in which the kyanite occurs as bluish, long-bladed crystals, embedded in a biotite-feldspar-schist. Sole producer in 1952 was Kyanite Mining Corp., which operated a mine on Baker Mountain near Darlington Heights, Prince Edward County.

Lime.—Virginia continued in 1952 to be one of the leading sources of chemical lime in the United States, as nearly 93 percent of the State total output consisted of this type of lime. The Old Dominion's prominent position among lime-producing States is due largely to the great abundance of high-quality limestone deposits in the Shenandoah Valley and other valleys in the counties west of the Blue Ridge. Lime is also produced from soft limestones of the Coastal Plain, which consists mostly of shell marl. One plant in Norfolk County uses oystershells as a raw material. There were 12 plants active in 1952, operating in 8 counties. Major producers were National Gypsum Co. and Standard Lime & Stone Co., both of Kimballton, Giles County.

TABLE 6.—Lime (quick and hydrated) sold by producers, 1943–47 (average) and 1948–52, by types

Year	Agricultural		Building		Chemical and other industrial		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	26,913	$221,053	12,084	$108,956	142,960	$1,031,637	181,957	$1,361,646
1948	19,329	213,920	12,980	138,024	350,425	2,919,109	382,734	3,271,053
1949	21,430	255,561	12,404	142,313	315,298	2,816,023	349,132	3,213,897
1950	21,878	273,411	7,258	86,125	399,203	3,502,396	428,339	3,861,932
1951	22,840	285,443	6,309	81,005	423,531	4,185,208	452,680	4,551,656
1952	20,151	241,139	11,566	126,428	411,128	4,081,357	442,845	4,448,924

Marl, Calcareous.—Virginia in 1952 was one of the largest producers of calcareous marl in the country. Virtually the entire output was utilized for agricultural purposes. Production centered in Clarke, Giles, and Surry Counties. The output of the first two consisted of a travertine marl, while Surry County producers dredged their material from local areas in the Coastal Plain. Active producers were, in order of decreasing tonnage; Aimee Strother & Bro. Co., Clarke County; J. C. Digges & Sons, White Post, Clarke County (operators of the Apple Marl Plant); Narrows Contracting Co., Narrows, Giles County; and Paul Miller, Spring Grove, Surry County.

Mica.—The only producer of mica in Virginia in 1952 was Ed Martin, who reported output of a small tonnage of full-trimmed sheet material from a mine in Powhatan County.

Perlite.—Virginia Perlite Corp., Hopewell, Prince George County, produced expanded perlite from crude material imported from southwestern United States. The output was sold to local building-supply dealers as an aggregate for plaster.

Pyrites.—Virginia ranked as the third largest pyrite-producing State in the Nation in 1952. General Chemical Division, Allied Chemical & Dye Corp., the sole producer, operated its Gossan mine in Carroll County and produced lump and fine pyrites for utilization at the company sulfuric acid plant in Pulaski.

Salt.—Artificial brines from underground rocksalt beds were utilized in the manufacture of chlorine, caustic soda, liquid carbon dioxide, and "dry ice" by Mathieson Chemical Corp. at Saltville, Smyth County. This organization was the sole producer of salt in Virginia in 1952.

Sand and Gravel.—The output of sand and gravel increased 24 percent in 1952, while the value declined 3 percent, largely the result of a substantial increase in production of low-value noncommercial paving material. Although Virginia's 25 sand and gravel producers reported output of virtually every type of sand and gravel, 95 percent of the State production was utilized for building and paving material. Glass sand was produced by Virginia Glass Sand Corp. in Frederick County near Gore. Molding sand was obtained predominantly from Norfolk County, with a small production from Princess Anne and Campbell Counties.

The sand and gravel industry was concentrated on the Coastal Plain. The major producing counties, in order of decreasing output, were Chesterfield, Henrico, and Fairfax. The principal producers were Southern Materials Co., Inc., operating a pit in Chesterfield County; Commonwealth Sand & Gravel Corp., Henrico County; and Northern Virginia Construction Co., Inc., Fairfax County. Shenandoah Silica Co., Inc., Gore, Frederick County, produced a substantial tonnage of ground sand from sandstone for use in pottery, porcelain, and tile manufacture.

TABLE 7.—Sand and gravel sold or used by producers, 1951–52, by classes of operations and uses

	1951			1952		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Molding	17,716	$13,291	$0.75	17,649	$13,241	$0.75
Building	975,152	848,500	.87	1,171,018	948,620	.81
Paving	904,666	470,568	.52	915,573	462,639	.51
Other	91,425	74,493	.81	78,513	69,654	.89
Gravel:						
Building	1,215,396	1,831,915	1.51	1,292,339	1,922,983	1.49
Paving	1,625,387	2,003,599	1.23	1,432,245	1,536,154	1.07
Other	1,157	1,157	1.00			
Undistributed [1]	208,600	227,746	1.09	285,924	295,764	1.03
Total commercial sand and gravel	5,039,499	5,471,269	1.09	5,193,261	5,249,055	1.01
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building				45,299	15,210	.34
Paving	74,463	38,227	.51	29,716	26,040	.88
Gravel: Paving	658,819	240,913	.37	1,867,836	266,648	.14
Total Government-and-contractor sand and gravel	733,282	279,140	.38	1,942,851	307,898	.16
Grand total	5,772,781	5,750,409	1.00	7,136,112	5,556,953	.78

[1] Includes glass, grinding and polishing, fire or furnace, and engine sand; and railroad-ballast gravel (1952) to avoid disclosing individual company operations.

Slate.—Virginia slates are not suited for mill stock and consequently were utilized for roofing, roofing granules, flagging, and lightweight aggregate. In general, they are dark gray with faintly greenish or brownish tints. Output in 1952 declined 15 percent from 1951.

Soapstone, Ground.—Virginia soapstone deposits are in Albemarle and Franklin Counties. These deposits are an alteration of high-magnesium igneous rocks occurring as irregular or lenticular dikes 100 to 200 feet wide in mica schists and peridotite. The State continued in 1952 to be one of the major sources of ground soapstone in the United States. The output was utilized for foundry facings, insecticides, roofing, and rubber manufacture. Producers active during the year were Alberene Stone Corp. of Virginia, Schuyler, operators of a pit just across the border in Albemarle County, and Blue Ridge Talc Co., Inc., Henry, Franklin County.

Stone.—The output of stone in Virginia increased 4 percent in 1952 compared with the previous year. This resulted from a substantial gain in concrete and road-metal production, as well as railroad ballast. Concrete aggregate and road metal represented 63 percent of the State total output. Dimension-stone production declined slightly and comprised less than 1 and 13 percent, respectively, of the total 1952 tonnage and value.

Virginia quarries yield virtually every type of stone. Rock types produced, in order of decreasing tonnage, included limestone, granite, diabase, quartzite, dimension soapstone, greenstone, and marble. Limestone and dolomite, which composed 70 percent of the total tonnage in 1952 and were utilized predominantly for concrete aggregate, road metal, agricultural purposes, and fluxes, are found throughout the Appalachian Valley region. These carbonate rocks were quarried by 40 active producers in 19 counties. Granite was re-

TABLE 8.—Stone sold or used by producers, 1951–52, by kinds and uses

Kind and use	1951		1952	
	Short tons	Value	Short tons	Value
Dimension stone:				
Granite, all uses	465	$63,130		
Sandstone, all uses	(1)	(1)	3,600	$36,900
Crushed and broken stone:				
Granite:				
Riprap	120,000	210,000	45,413	95,744
Concrete and road metal	1,460,121	2,351,171	1,519,185	2,345,393
Railroad ballast	230,137	283,161	277,672	337,817
Other uses	91,133	110,017	63,064	63,939
Basalt and related rocks: Concrete and road metal	654,348	1,067,196	697,164	1,105,059
Limestone:				
Riprap	60,164	118,313	67,743	126,896
Fluxing stone	232,873	335,915	301,030	441,501
Concrete and road metal	3,577,644	4,890,398	3,765,784	4,957,557
Railroad ballast	508,812	557,483	589,916	664,616
Agriculture	878,453	1,415,578	925,392	1,552,349
Miscellaneous	1,133,173	2,467,034	1,152,855	2,453,234
Sandstone, all uses	219,351	498,070	160,126	388,746
Miscellaneous stone:				
Concrete and road metal	73,439	73,439	85,024	152,915
Other uses	15,689	31,829		
Undistributed [2]	21,450	2,148,382	16,993	2,247,286
Total	9,277,252	16,621,116	9,670,961	16,969,952

[1] Included with "Undistributed" to avoid disclosure of individual company operations.
[2] Includes miscellaneous dimension stone and crushed and broken marble.

covered by 6 producers active in 5 counties, predominantly in the Piedmont region. Diabase, which for purposes of convenience is classified by the Bureau of Mines as basalt, is found mostly in the Triassic basins of the Piedmont and was produced by five operators. Quarrying of quartzite is concentrated on the northwestern slope of the Blue Ridge Mountains. Output is utilized predominantly for ferrosilicon. Four companies operating in three counties quarried dimension soapstone and greenstone. Marble was produced near Harrisonburg, Rockingham County.

REVIEW BY COUNTIES

ALBEMARLE

Mines and quarries of Albemarle County in 1952 yielded stone, slate and clay. The one source of slate was Blue Ridge Slate Corp., Charlottesville, which produced roofing granules at its plant near Esmont. A substantial tonnage of soapstone was recovered by Alberene Stone Corp. of Virginia from its Schuyler mine. This output was used as building stone and for laboratory equipment, as well as being ground for roofing and rubber filler. Charlottesville Stone Corp., Charlottesville, and Superior Stone Co., Red Hill, operated quarries for the production of greenstone and granite, respectively. These were utilized for concrete aggregate, road metal, railroad ballast, and stone sand. United Clay Products Co., the largest clay producer in Virginia in 1952, mined clay from its open pit near Woodbridge Station.

AMHERST

Aplite for use in glass manufacture was produced by Carolina Minerals, Inc. W. K. & J. M. Smiley Co. operated a building-sand pit near Lynchburg.

APPOMATTOX

The only mineral commodity produced in Appomattox County in 1952 was limestone for concrete aggregate, road metal, and agricultural purposes. Active producers included Appomattox Stone Corp. and Virginia Highway Department.

AUGUSTA

Augusta Stone Corp. and Belmont Traprock Co., Inc., both of Staunton, produced substantial quantities of limestone, which was crushed for use as concrete aggregate, road metal, agricultural stone, and riprap in Augusta County in 1952. Miscellaneous clays and shales were mined by North Mountain Brick Co., Inc., and Staunton Shale Brick Co. A small quantity of kaolin was produced by Cold Spring Mining Division, Yarra Engineering Corp., Greenville. Lehigh Portland Cement Co. operated a portland-cement plant near Fordwick.

BEDFORD

Bedford County was the foremost feldspar-producing county in Virginia in 1952. Output was obtained from the Clinchfield Sand & Feldspar Corp. Coles and Peeksville mines near Bedford and May mine near Forest.

BLAND

Globe Mining Co., Bland Mining & Manganese Corp., and Dixon Dale Co. operated manganese mines near Stange on the Byrnes Heir tract.

BOTETOURT

Cement, lime, limestone, and clay were produced in Botetourt County in 1952. Roanoke-Webster Brick Co., Inc., one of the largest producers of miscellaneous clays in Virginia, continued to work its pit near Roanoke. The output was used in manufacturing brick and concrete blocks. Eagle Rock Lime Co., Eagle Rock, produced building and chemical lime at its kiln near Clifton Forge. This company, with Blue Ridge Stone Corp., Blue Ridge; James River Hydrate & Supply Co., Buchanan; and Liberty Limestone Corp., operators of Buchanan and Rocky Point Quarries, produced limestone for concrete aggregate, road metal, railroad ballast, riprap, whiting, and filler.

BRUNSWICK

The only mineral producer in Brunswick County in 1952 was Lawrenceville Brick & Tile Corp., Lawrenceville. This organization reported output of miscellaneous clays.

BUCHANAN

In 1952 Buchanan County was the largest coal producer in Virginia. Of the more than 6 million tons produced, approximately 300,000 was the result of activities at 8 strip pits. A substantial quantity of natural gas was recovered from the Slate Creek and Keen Mountain gas fields.

BUCKINGHAM

Slate was the only mineral commodity produced in Buckingham County in 1952. The largest producer in the county and in the State was Blue Ridge Slate Corp., Charlottesville, which operated a quarry near Dutch Gap and produced roofing granules. Other active producers in 1952 were: Arvonia Buckingham Slate Co., Inc., Arvonia; Le Seur-Richmond Slate Corp., Ore Bank; and Williams Slate Co., Arvonia. The output of these quarries was utilized for roofing and flagging.

CAMPBELL

Rough and dressed building stone, as well as flagging, was produced by Virginia Greenstone Co. from its greenstone quarry near Lynchburg in 1952. Lavino Furnace Co., Lynchburg, produced sand for building, paving, and molding purposes in 1952.

CAROLINE

Building sand and gravel produced by Gwathmey Sand Co. were the only mineral products of Caroline County in 1952.

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CARROLL

Pyrites was produced from the Gossan mine in Carroll County in 1952 by the General Chemical Division, Allied Chemical & Dye Corp. The entire output of the mine was utilized at the Pulaski sulfuric acid plant of the parent corporation. Sandstone was quarried by the town of Galax for its own use.

CHESTERFIELD

A substantial tonnage of miscellaneous clays were mined by Daniels Brick & Tile Co., Inc., and Richmond Clay Products Corp., both of Richmond. The one producer of sand and gravel, utilized predominantly for building and paving material, was Southern Materials Co., Inc., Chester.

CLARKE

Calcareous marl for agricultural purposes was mined at White Post by Aimee Strother & Bro. and J. C. Digges & Sons.

CULPEPER

Ralph E. Mills Co., Salem, was the sole commercial producer of limestone in Culpeper County. The output was utilized for concrete aggregate and road metal.

DICKENSON

Dickenson County ranked third as a coal producer in Virginia in 1952. The mines of the county reported output exceeding 5 million tons, of which over 1 million was strip-mine production. A small quantity of natural gas was obtained from the Nord gas field.

DINWIDDIE

Mineral production in Dinwiddie County in 1952 was limited to sand and gravel. A small tonnage of molding sand was produced by Perkinson & Finn, Inc., Petersburg. Sand and gravel for highway purposes were mined by Petersburg city engineer and Virginia Department of Highways.

ELIZABETH CITY

The only mineral products of Elizabeth City County in 1952 were paving sand and gravel produced by Lime Products Co., Hampton.

FAIRFAX

Fairfax County ranked third among Virginia counties in sand and gravel output in 1952. Major producers were Northern Virginia Construction Co., Inc., and Modern Sand & Gravel Corp., both of Alexandria. These two organizations produced substantial quantities of building sand and gravel. W. D. Sissler & Sons, Falls Church, Fairfax Quarries, Inc., and Amy B. Canard, Alexandria, operated stone quarries. The last organization produced various miscellaneous types of stone for rough building material and flagging. Sissler & Sons quarried sandstone for use as rubble and flagging, while Fairfax Quarries, Inc., produced basalt for use as concrete aggregate and road metal.

FAUQUIER

Concrete aggregate, road metal, rough building stone, and flagging were produced in Fauquier County in 1952 by N. R. Lambert, the Plains; Millbrook Quarries, Inc., Broad Run; and W. W. Sanders, Warrenton. The Sanders quarry was in basaltic rock. Millbrook Quarries produced limestone.

FRANKLIN

Blue Ridge Talc Co. continued in 1952 to produce soapstone at its Keene-Ramsey mine near Henry. Output was ground for use as foundry facing and insecticide filler. This company also produced a variety of mineral pigments including mineral blacks, natural brown and red oxides, and ochers.

FREDERICK

Glass sand, burnt lime, clay, ground silica, and limestone were produced in Frederick County in 1952. Stewart M. Perry, Inc., Winchester, and M. J. Grove Lime Co., Stephens City and Middletown, operated limestone quarries. Their output was utilized for concrete aggregate, road metal, glass-furnace flux, open-hearth plants, and agricultural uses. The Stephens City underground quarry and Middletown open pit of M. J. Grove Lime Co. also yielded a substantial quantity of raw material for the company burnt-lime plant at Stephens City. Lime production was sold for building, agricultural, and chemical uses. Virginia Glass Sand Corp., only producer of glass sand in the Commonwealth, continued to operate its open pit at Gore in 1952. Ground silica was produced by Shenandoah Silica Co., Inc., at a plant near Gore. Grinding sand purchased from the Virginia Glass Sand Co. was used as raw material. Shenandoah Brick & Tile Co. produced clay for the manufacture of brick at its pit at Winchester.

GILES

Giles County in 1952 ranked first among lime-producing counties in Virginia. Plants active during the year included National Gypsum Co. and Standard Lime & Stone Co., both at Kimballton, and Ripplemead Lime Co., Inc., Ripplemead. The output was utilized for building, agricultural, and chemical purposes. In addition to this commodity, the first two companies, as well as Pembroke Limestone Corp., Pembroke, and Virginia Limestone Corp., Klotz, produced crushed limestone for concrete aggregate, road metal, filler, and chemical uses by paper mills. Narrows Contracting Co., Narrows, quarried and crushed calcareous marl for agricultural purposes.

GOOCHLAND

Boscobel Granite Co. worked its granite quarry at Manakin during 1952 and produced crushed material sold for concrete aggregate and road metal.

GREENSVILLE

A substantial tonnage of concrete aggregate, road metal, and railroad ballast was produced by Trago Stone Corp., from a granite quarry at Skippers.

HENRICO

Limestone was quarried in Henrico County in 1952 by Augusta Stone Corp. Building and paving sand and gravel were recovered from pits near Richmond by Commonwealth Sand & Gravel Corp. and Carter Sand & Gravel Co., Inc., Richmond. Redford Brick Co. and Southside Brick Works operated pits for production of common clay near Richmond in 1952.

HENRY

Mineral production in Henry County in 1952 was limited to granite from the Martinsville city-owned quarry.

ISLE OF WIGHT

Battery Park Fish & Oyster Co., Smithfield, produced a substantial quantity of agricultural lime from limestone and oystershells.

KING WILLIAM

Paving sand and gravel were produced in King William County in 1952 by Fox Co., Aylett.

LANCASTER

T. W. Hudson, Weems, produced a small quantity of miscellaneous clays in Lancaster County during 1952. Operations were discontinued as of December 31, 1952.

LEE

The major mineral commodity produced in Lee County in 1952 was bituminous coal. The output came from the northwestern part of the county near Keokee, Johnsons Mill, St. Charles, and Pennington Gap. A substantial quantity of high-gravity paraffin-base petroleum was obtained from the Rose Hill field, discovered in 1941. Kentucky-Virginia Stone Co., Gibson Station, operated a limestone quarry for the production of riprap, concrete aggregate, road metal, railroad ballast, agricultural stone, and rock dust.

LOUDOUN

Arlington Stone Co. operated a basalt quarry near Leesburg for the production of concrete aggregate and road metal. This was the only mineral operation reported in the county.

MECKLENBURG

Granite for use as concrete aggregate, road metal, riprap, railroad ballast, and stone sand was produced by Lambert Bros., Inc., and Mills & Gorman Co., South Hill.

MONTGOMERY

Limestone, semianthracite, and burnt lime were produced in Montgomery County in 1952. The last commodity was produced by Montgomery Lime Co., Christiansburg, operators of an agricultural lime plant near Ellett. Although the output of coal was small,

the area was distinguished by the fact that it was the only county in the Commonwealth to produce semianthracite. This commodity competes with Pennsylvania anthracite in the local area. Coal mines of the county yielded over 100,000 tons valued at $5.25 per ton. Output per man per day averaged 3.73 tons, which was exceedingly low compared to the State average of 6.20 tons. Limestone for use as concrete aggregate and road metal was quarried by Albert Bros. Contractors, Inc., Salem; Montgomery Lime Co., Christiansburg; and Radford Limestone Co., Inc., Radford.

NANSEMOND

Roanoke-Webster Brick Co., Inc., operated a pit near Suffolk in Nansemond County. A small quantity of sand was produced by Virginian Railway Co., Nansemond.

NELSON

American Cyanamid Co. operated an ilmenite mine on the Warrick farm near Piney River in 1952. Aplite was mined by Dominion Minerals, Inc., Piney River; it was the larger of the two producers of this commodity in the State.

NORFOLK

Lone Star Cement Corp. utilized marl as raw material to produce portland cement at its South Norfolk plant.[4] Reliance Fertilizer & Lime Co., South Norfolk, produced agricultural lime from oystershells. Molding and building sand and gravel, as well as engine sand, were produced by J. C. Jones Sand Co., Inc., and Interstate Sand & Gravel Co., both with offices in Norfolk.

NOTTOWAY

Granite for use as concrete aggregate and road metal was quarried near Burkeville by Burkeville Stone Co., Inc.

ORANGE

Output of concrete aggregate and road metal was reported by Royal Stone Corp., Madison Run, from a basalt quarry at Madison Run in 1952.

PITTSYLVANIA

Clay for use in manufacturing brick was produced by Danville Brick Co., Danville. The city of Danville quarried granite for local use.

POWHATAN

Powhatan County in 1952 was the only area in Virginia in which mica was mined. Full-trim sheet mica was produced by Ed Martin from a mine northeast of Flatrock.

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[4] Although South Norfolk is an independent city, for the purposes of this paper, it will be included in Norfolk County.

PRINCE EDWARD

Kyanite was mined on Baker Mountain near Darlington Heights by Kyanite Mining Corp. Production was utilized predominantly for refractories.

PRINCE GEORGE

Virginia Perlite Corp., Hopewell, was the sole processor of expanded perlite in Virginia. Raw material for operating this plant was imported from southwestern United States. Arthur Hitch Co. and Friend Sand & Gravel Co., Inc., Petersburg, produced building and paving sand and gravel.

PRINCE WILLIAM

A substantial quantity of shale for use in manufacturing brick and heavy clay products was produced in Prince William County in 1952 by Woodbridge Clay Products Co. at its pit at Woodbridge.

PRINCESS ANNE

Little Creek Sand & Gravel Co. and J. C. Jones Sand Co., Inc., operated pits near Diamond Spring and Cape Henry, respectively, for the production of molding, building, and paving sands. Miscellaneous clays were mined from a pit near Oceana by Eureka Brick Co., Inc.

PULASKI

American Pigment Corp. produced mineral blacks, natural browns, red and yellow oxides, ochers, siennas, and umbers.

ROANOKE

Limestone for use as concrete aggregate, road metal, and agricultural stone was produced by Rockdale Quarries Corp., Roanoke, in 1952. Norfolk & Western Railways Co. produced sand. Salem Brick Co., Inc., Salem, was the only producer of clay.

ROCKBRIDGE

Mathews-Curtis Co., Inc., produced a substantial tonnage of quartzite at its quarry at Greenlee. The output was utilized in preparing ferrosilicon, as well as for concrete aggregate, road metal, and railroad ballast. Limestone for use as riprap, concrete aggregate, road metal, and railroad ballast was quarried by Charles W. Barger & Son, Lexington, Jackson Wiley, and Lone Jack Limestone Co., Inc. Miscellaneous clays were produced by Locher Brick Co., Glasgow, for use in making building brick.

ROCKINGHAM

Mineral production in Rockingham County in 1952 was limited to limestone quarried and crushed by Fred K. Betts, R. Y. Frazer, and C. S. Mundy, all of Harrisonburg. Output was utilized for concrete aggregate, road metal, and agricultural stone.

RUSSELL

The mines of Russell County in 1952 produced 892,067 tons of bituminous coal valued at $5.30 per ton. Output was centered in the Clinchfield, Dante, Wilder, and St. Paul areas.

SCOTT

The major mineral commodity produced in Scott County in 1952 was natural gas from the Early Grove field, a major source of natural gas in Virginia in 1952. Mines in the county yielded approximately 32,000 tons of bituminous coal with an average value of $5.38 per ton. Limestone for use as road metal and concrete aggregate was quarried by Glenita Stone Co., Natural Tunnel.

SHENANDOAH

Concrete aggregate, road metal, and flux were produced by Strasburg Lime Co., Inc., Strasburg; Shenandoah Valley Lime & Stone Corp., Capon Road; Toms Brook Lime & Stone Co., Toms Brook; Standard Limed Stone Co., Capon Road; and C. S. Mundy Co., Forestville. The only two producers of lime in Shenandoah County in 1952 were Strasburg Lime Co. and Dominion Limestone Corp., Strasburg.

SMYTH

N. T. Dixon Chemical Co. and Union Manganese Co. worked the Glade Mountain manganese mine in Smyth County in 1952. Ore produced assayed (natural) 35 percent or more manganese. Mathieson Chemical Corp. produced artificial brines from rock salt near Saltville. The brines were utilized for manufacturing chlorine, caustic soda, liquid carbon dioxide, and dry ice. The Mathieson Corp. also produced a large tonnage of limestone for chemical use by alkali plants, as well as for concrete aggregate and road metal. Limestone for the last two uses was also produced by E. P. Ellis, Marion. A substantial quantity of building sand was produced in Smyth County in 1952 by Clay S. Sayers and C. R. Snyder & Sons, both of Marion.

SPOTSYLVANIA

Massaponax Sand & Gravel Corp. recovered a substantial quantity of paving sand and gravel during the year from its pit near Fredericksburg.

SURRY

The one mineral commodity produced in Surry County in 1952 was calcareous marl, mined from the Paul Miller pit at Spring Grove.

TAZEWELL

Tazewell County ranked fourth among coal-producing counties in Virginia in 1952. Over 3 million tons with an average value of $6.11 per ton was mined during the year. Output per man per day (4.78 tons) was lower than the State average (6.20 tons). Production was derived mainly from Pocahontas, Boissevain, Sayresville, Jewell

Ridge, and Red Ash seams. Crushed limestone for concrete aggregate, road metal, railroad ballast, coal-mine rock dust, and flux was produced by Pounding Mill Quarry Corp., Pounding Mill. Burnt lime for agricultural and building purposes, as well as for chemical usage, was prepared by Blue Grass Lime Co., Tazewell, and Perry Lime Co., North Tazewell. General Shale Products Corp. mined a substantial tonnage of miscellaneous clays for use in manufacturing building brick at its pit near Richlands.

WARREN

Natural cement was produced by Riverton Lime & Stone Co., Inc., Riverton. The plant consisted of six pot kilns utilizing Buckwheat and Pea coal for fuel. This company also quarried a substantial tonnage of limestone for use as concrete aggregate, road metal, railroad ballast, and agricultural stone.

WASHINGTON

Washington County was the only gypsum-producing area in Virginia in 1952. Output came from the United States Gypsum Co. mine near Plasterco. The State Department of Highways produced limestone for its own use near Bristol.

WISE

The mines of Wise County yielded 5,142,792 tons of bituminous coal, placing the county second in Virginia in 1952. Output was obtained predominantly from the Wise, Harrold, Guest, Norrian, Pardee, Glamorgan, and Stonega areas. A small production of natural gas was reported from a few scattered wells in Wise County.

WYTHE

The Austinville mine and 2,000-ton mill of the Bertha Mineral Division of the New Jersey Zinc Co. resumed full production of lead and zinc in 1952, after having been closed for 6 months in the previous year owing to labor difficulties. This company also produced a substantial quantity of limestone for fertilizer filler and agricultural purposes. Building sand was produced in Wythe County in 1952 by Silica Products Co., Wytheville.

The Mineral Industry of Washington

By Albert J. Kauffman, Jr.,[1] Kenneth D. Baber,[2] Frank B. Fulkerson,[2] and Paul F. Yopes[2]

VALUE of mineral production in Washington continued to increase, although at a reduced rate, resulting in a gain of 3 percent compared to 11 percent in 1951 and 20 in 1950. The advance in 1952, due largely to greater quantities of lead recovered from mines in northeastern Washington and to increased tonnage of sand and gravel consumed at Federal construction projects, was nearly offset by decreases in the output of many commodities, especially magnesite and gold. Cement, sand and gravel, zinc, coal, and stone were the principal products; each had a value greater than $5 million and a combined value exceeding 75 percent of the State total. Commodities with output exceeding $1 million were lead, magnesite, copper, and gold. Washington was the leading domestic producer of magnesite. Output of nonmetallic commodities constituted nearly three-quarters of the total value.

Production of lead and zinc reached record totals for the State despite declines in prices of both metals. Mining was centered in Pend Oreille and Stevens Counties. Expansion of facilities at the Pend Oreille and Grandview mines included additional mechanized mining equipment. The new Van Stone zinc mine and 1,000-ton mill began operation. Full-scale mining and milling at the property were expected to be attained in early 1953. The mine was activated by American Smelting & Refining Co. under an agreement providing for purchase by the Defense Materials Procurement Agency of 18,436 tons of zinc produced from Van Stone ore during the first 3 years of operation at a floor price of 15½ cents per pound.

Plans to pipe oil and natural gas into Washington from producing areas were implemented during the year; construction of one crude-oil transmission line from Edmonton, Alta., to Vancouver, B. C., was underway, and a branch extending into Washington was planned. In addition to supplementing regional hydroelectric- and coal-energy resources, pipeline transmission of oil and gas would provide raw materials for refineries and chemical plants.

Production of primary aluminum from imported alumina continued as one of the major industries in Washington. At the close of 1952, 6 aluminum-reduction plants were producing in the Pacific Northwest, 5 of which were in Washington. According to the Bonneville

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Power Administration, the aluminum production and fabricating industry in the region in 1952 represented an investment of $180 million, an annual value of products approximating $600 million, and a payroll of 36,000 persons totaling $145 million. Approximately 29 percent of the national supply of primary aluminum metal was produced in Washington. During the year the producing companies were engaged in expansion programs designed to meet, at least in part, growing military and civilian demands for the metal.

In addition to the mineral values credited to Washington in table 1, some are omitted owing to lack of information. Many ores contain valuable minor constituents, such as arsenic, bismuth, cadmium,

TABLE 1.—Mineral production in Washington, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Abrasive stone:				
Pebbles (grinding)	28	$336	20	$240
Pulpstones	22	1,970	12	908
Antimony ore and concentrate, gross weight	110	(2)	100	(2)
Clays (except for cement)	205,187	285,631	225,277	286,719
Coal	857,026	6,031,400	844,197	5,986,129
Copper (recoverable content of ores, etc.)	4,089	1,979,076	4,357	2,108,788
Gold (recoverable content of ores, etc.), troy ounces	67,405	2,359,175	54,776	1,917,160
Gypsum (crude)	(2)	(2)	7,900	29,625
Lead (recoverable content of ores, etc.)	8,002	2,768,692	11,744	3,781,568
Manganese ore (35 percent or more Mn), gross weight			436	(2)
Manganiferous ore (5 to 35 percent Mn), do			142	(2)
Peat	45,304	98,955	42,580	111,386
Pumice and pumicite	5,105	10,832	3,604	8,089
Sand and gravel	10,546,949	7,595,837	13,322,279	9,422,117
Silver (recoverable content of ores, etc.), troy ounces	334,948	303,145	315,645	285,675
Stone (except limestone for cement and lime)	5,029,735	5,664,433	4,523,234	5,491,525
Tungsten concentrate, 60-percent WO_3 basis	9	33,417	4	14,008
Zinc (recoverable content of ores, etc.)	18,189	6,620,796	20,102	6,673,864
Undistributed: Carbon dioxide, cement, diatomite (1952), epsom salt made from epsomite (1951), gem stones, lime, magnesite, olivine, quartz, ground sand and sandstone, talc, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)		[3]20,800,634		20,010,946
Total Washington		54,554,000		56,129,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels and magnesite are strictly production. Some minerals that originated in Washington cannot be credited owing to lack of information (see introduction to chapter).
[2] Value included with "Undistributed."
[3] Revised figure.

cobalt, nickel, platinum-group metals, selenium, tellurium, gallium, and germanium. These quantities sometimes are not known and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages or credited to mine or origin. These minor constituents are recovered at plants that frequently treat mixtures of materials from many sources, including residues from the refining of metals such as copper, lead, and others. It is not possible, in many such instances, to allocate the mineral products by States of origin, and it is even difficult to obtain an accurate separation as to domestic and foreign sources. Another mineral product of value, the output of which usually cannot be separated as to source, is byproduct sulfuric acid.

During 1952 the program of the Defense Minerals Exploration Administration continued to encourage the systematic investigation of strategic and critical mineral occurrences. Financial assistance extended under the Government contracts was repayable from royalties on ore discovered and subsequently mined. The following projects were active under the program during part or all of 1952.

County	Name of operator	Name of property	Mineral	Total contract	Government participation, percent	Contract No.
Chelan	Black Warrior Mining Co.	Black Warrior	Pb-Zn-Cu	$34,147	50	E 49
	Phantom Creek Copper, Inc.	Pickwick	Cu	7,600	50	E172
Ferry	Ole Aavestrud & Charles J. Weller.	Kelly Camp	W	32,700	75	E 12
	Spokane Mining Syndicate, Inc.	Talisman	Cu-Zn	44,000	50	E137
King	Western States Copper Corp.	Rainy	Cu	22,300	50	E436
Okanogan	G. O. P. Antimony, Inc.	Antimony Queen	Sb	23,200	75	E132
	do	Bales Antimony	Sb	16,080	75	E258
Pend Oreille	American Zinc, Lead & Smelting Co.	Mineral Rights	Zn	120,000	50	E 76
	do	Bluebird	Pb-Zn	116,500	50	E301
	Jim Creek Mines	Jim Creek	Pb-Zn	47,500	50	E318
Pierce	Mount Rainier Mining Co.	Mount Rainier	Cu-Mo	3,000	50	E383
Skagit	Wm. Soren	Johnsburg	Pb	42,750	50	E242
Snohomish	Curtiss & Rogers	Mint	Cu	17,600	50	E417
Stevens	Addy Mining Co	Addy	W	21,290	75	E200
	Farmer Mine Enterprises.	Farmer	Pb-Zn	10,000	50	E208
	Goldfield Consolidated Mining Co.	Sierra Zinc	Pb-Zn	23,055	50	E 85
	Laurence Hammond	Merikay	Beryl	12,100	90	E344
	Mines Management, Inc.	Iroquois	Pb-Zn	24,000	50	E 1
	do	Advance	Pb-Zn	59,150	50	E308
	Pacific Northwest Mining Co.	Lucile	Pb-Zn	37,284	50	E228
	Pioneer Mining Co	Pioneer	Pb-Zn	23,651	50	E330
	Scandia Mining Group.	Scandia	Zn	29,260	50	E 60
	Tungsten Mining & Milling Co.	Germania	W	34,650	75	E214
Whatcom	Glacier Mining Co	Glacier	Cu	7,415	50	E362
Yakima	Ray Whiting & Milton Roumm.	Indian Creek Cinnabar.	Hg	18,425	75	E259

REVIEW BY MINERAL COMMODITIES

METALS

Aluminum.—Production of aluminum during the year declined to 272,300 short tons, 5 percent less than 1951. As in the preceding year, below normal precipitation in the Pacific Northwest forced curtailment of operations owing to lack of stored water for power generation. Delivery of interruptible power to reduction plants was halted in September; and, in addition, a 10-percent decrease in use of firm power was ordered by the Defense Electric Power Administration in November.

Increasing demand for aluminum for defense and consumer needs led to extensive expansion programs at the facilities of each of the three major primary aluminum producers. The programs included modernization and revision of ingot casting facilities at the Aluminum Co. of America plant in Vancouver, Clark County; an increase in annual capacity of 40 million pounds of aluminum ingots at the

TABLE 2.—Mine production of gold, silver, copper, lead, and zinc in 1952, by months, in terms of recoverable metals [1]

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	4,340	23,468	401	1,042	1,707
February	3,912	21,208	333	1,137	1,677
March	4,558	24,084	481	1,328	1,624
April	4,416	24,798	340	1,124	1,741
May	4,369	25,209	380	768	1,530
June	5,130	28,767	341	850	1,383
July	4,206	23,857	303	649	1,482
August	4,564	23,190	393	995	1,740
September	4,650	27,008	386	779	1,614
October	4,783	27,711	457	1,124	1,771
November	4,642	32,647	230	964	1,966
December	5,206	33,698	312	984	1,867
Total	54,776	315,645	4,357	11,744	20,102

[1] Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metal contained in concentrates, ore, tailings and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

Reynolds Metals Co. plant in Longview, Cowlitz County; and increases totaling more than 30 million pounds of aluminum yearly at the Kaiser Aluminum & Chemical Corp. facilities at Tacoma, Pierce County, and Mead, Spokane County. The first aluminum-reduction plant built in the Pacific Northwest since World War II was placed in operation by Alcoa at Wenatchee in Chelan County. This $45 million smelter, capable of producing 170 million pounds of aluminum yearly, began operating in June.

Antimony.—The G. O. P. Antimony, Inc., operation near Twisp, Okanogan County, was again the only reported producer in the State. A Defense Minerals Exploration Administration antimony exploration project was active at the company Bales mine.

TABLE 3.—Mine production of gold, silver, copper, lead, and zinc, 1948–52, and total, 1860–1952, in terms of recoverable metals [1]

Year	Mines producing		Material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1948	30	1	974,257	70,075	$2,452,625	375,831	$340,146
1949	29	3	1,012,198	71,994	2,519,790	357,853	323,875
1950	27	6	1,279,595	92,117	3,224,095	363,656	329,127
1951	29	1	1,304,495	67,405	2,359,175	334,948	303,145
1952	28	1	1,402,472	54,776	1,917,160	[3] 315,645	285,675
1860–1952	----------	----------	[4]	2,570,002	68,705,393	14,871,542	10,957,312

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
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
1951	4,089	1,979,076	8,002	2,768,692	18,189	6,620,796	14,030,884
1952	4,357	2,108,788	11,744	3,781,568	20,102	6,673,864	14,767,055
1860–1952	105,609	32,369,845	124,766	25,617,254	228,091	49,243,324	186,893,128

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, and ore shipped to smelters during calendar year indicated.
[2] Does not include gravel washed.
[3] No silver produced from placer mine.
[4] 1860–1903: Figures not available; 1904–52, 19,174,615 tons produced.

Beryllium.—Activity at several properties was noted during the year, although no production was recorded. Exploration and development were in progress at the Railway Dike pegmatite prospect, the McPherson lease northeast of Chewelah, and the Cannon property, also near Chewelah, all in Stevens County. Investigations at the first location were carried out under a Defense Minerals Exploration Administration agreement.

Copper.—Output of copper increased 7 percent from 1951 to 1952. Despite this gain, production was well under the 1950 total. The value of copper output in Washington exceeded that of gold for the first time in 4 years. This change resulted from a drop in gold production, an increase in copper output, and higher average prices for copper. As in former years, the Holden mine (zinc-copper ore) of Howe Sound Co. in Chelan County supplied nearly all of the State copper.

Gold.—Production of gold continued to decline. The output—19 percent less than in 1951—reached the lowest level since 1947. The Knob Hill mine in Ferry County and the Gold King mine in Chelan County, the only large active gold properties in the State, operated continuously throughout the year. Substantial quantities

TABLE 4.—Gold produced at placer mines, 1948–52, by methods of recovery

Class and method	Mines producing	Material treated (cubic yards)	Gold recovered	
			Fine ounces	Value
Nonfloating washing plants: [1]				
1948	1	2,900	10	$350
1949				
1950	1	8,000	31	1,085
1951	1	5,100	13	455
1952				
Small-scale hand methods:				
1948				
1949	3	400	10	350
1950	5	1,033	8	280
1951				
1952	1	60	3	105
Grand total placers:				
1948	1	2,900	10	350
1949	3	400	10	350
1950	6	9,033	39	1,365
1951	1	5,100	13	455
1952	1	60	3	105

[1] Includes all placer operations using power excavator and washing plant, both on dry land; an outfit with a movable washing plant is termed a "dry-land dredge."

of gold were recovered from zinc-copper ore at the Holden mine in Chelan County. Virtually all of the gold came from Chelan and Ferry Counties. About 65 percent was recovered from gold ore and most of the remainder from zinc-copper ore. Placer mining, which never supplied more than a small percentage of the Washington production, contributed only 3 ounces of gold in 1952.

Lead.—Metal mining in Washington during 1952 was highlighted by record production of both lead and zinc. Nearly all of the output of both metals came from mines in Pend Oreille and Stevens Counties in the northeastern corner of the State. The output of lead increased 47 percent compared to 1951 and was 14 percent higher than in 1950, the previous record year in lead production. The largest producers,

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in 1952, by classes of ore or other source materials, with content in terms of recoverable metals

Source	Number of mines	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Ore:							
Dry gold	6	93,184	35,818	163,402	2,900	400	250
Dry silver	1	93		70	1,100		
Total	7	93,277	35,818	163,472	4,000	400	250
Copper	3	126	2	37	3,900		
Lead	5	5,589		15,054	300	1,682,608	23,104
Zinc	2	31,052	6	962	2,500	127,389	1,614,174
Zinc-copper	2	553,861	18,922	81,711	8,646,200	17,800	1,975,218
Zinc-lead	9	707,981	25	44,628	56,163	20,747,894	36,540,104
Total	21	1,298,609	18,955	142,392	8,709,063	22,575,691	40,152,600
Old tailings: Lead	1	10,586		9,781	937	911,909	51,150
Total lode mines	28	1,402,472	54,773	315,645	8,714,000	23,488,000	40,204,000
Gravel (placer operations)	1		3				
Total, all sources	29	1,402,472	54,776	315,645	8,714,000	23,488,000	40,204,000

in order of output, were the Pend Oreille mine, owned by Pend Oreille Mines & Metals Co., and the Grandview property, operated by American Zinc, Lead & Smelting Co., in Pend Oreille County; and the Bonanza mine operated by Anaconda Copper Mining Co. and Deep Creek mine of Goldfield Consolidated Mines Co., in Stevens County. Increased production of zinc-lead ore was reported at the Pend Oreille, Grandview, and Deep Creek mines, but output from the Bonanza mine decreased substantially compared to 1951. In November Anaconda discontinued mining and milling operations at the Bonanza mine. Much of the production in 1952 from this property, predominantly a lead producer, came from old tailings retreated in the mill. Over 88 percent of the lead output in Washington in 1952 was supplied by zinc-lead ore; most of the remainder came from lead ore and old lead tailings.

Magnesium.—Pacific Northwest Alloys, Inc., continued production of magnesium at the Mead plant in Spokane under Government contract. Operations at the plant, which had been idle since World War II, were resumed in August 1951, and rehabilitation work was completed by Morrison-Knudsen Co., Inc., early in February 1952. A shortage of electric power in the Pacific Northwest caused a shutdown of three-fourths of the plant at the end of August, and magnesium output was held at one-fourth of capacity for the remainder of the year. Dolomite used at the plant was quarried in Stevens County by Gibson & Roberts, contractors.

Manganese.—Production of manganese ores was reported in the State for the first time since 1946. Shipments of manganiferous ore (10–35 percent Mn) were recorded from the Stevens and Skunk Creek claims, Grays Harbor County, by the Consolidated Minerals Co., and manganese ore (over 35 percent Mn) was mined by Crescent Mines Co. and Frank Murphy Enterprises from the Crescent mine and the Kreuger property, respectively, in Clallam County. Part of the ore

from the Crescent mine was shipped to the Government Purchase Depot at Deming, N. Mex., and the remainder was purchased under the General Services Administration "carload-lot" program. This was the first production from the property since it was operated by the Sunshine Mining Co. during World War II.

Silver.—Silver production declined 6 percent compared to 1951. This decrease was due to the decrease in gold ore production and consequent drop in recovery of byproduct silver and to decreased production of lead ore from the Bonanza mine, a leading producer of silver in 1951. About 52 percent of the silver output was obtained from gold ore, 26 percent from zinc-copper ore, 14 percent from zinc-lead ore, and small quantities from lead ore, old lead tailings, and zinc, copper, and silver ores. About 77 percent of the metal came from Chelan and Ferry Counties, and nearly all the rest from Pend Oreille and Stevens Counties. The Knob Hill and Holden mines were the principal producers.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery and types of material processed, in terms of recoverable metals

Method of recovery and type of material processed	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation	86	35			
Cyanidation	3,108	32,011			
Total recovered in bullion	3,194	32,046			
Concentration and smelting of concentrates	36,322	263,222	8,710,000	23,433,751	40,200,708
Direct smelting	15,257	20,377	4,000	54,249	3,292
Placer	3				
Grand total	54,776	315,645	8,714,000	23,488,000	40,204,000

Tungsten.—Tonnage and value of tungsten ore and concentrates shipped from the State during the year were less than half of the 1951 totals. The following operations were active: Germania Consolidated mine (Germania Consolidated Mines Co.), Stevens County; Kelly Camp mine (Kelly Camp Tungsten Co.), Ferry County; and Germania mine (Tungsten Mining & Milling Co.), Stevens County. Although production decreased sharply, exploration and development were reported in several areas. Federal funds provided by the Defense Minerals Exploration Administration and the Reconstruction Finance Corporation were used to rehabilitate the Germania mine, which has a record of production extending back to World War I. Efforts were made by the Border Lord Mining Corp. to reactivate the old German mine, renamed the Boundary mine, in Okanogan County just south of the Canadian border. Because of its inaccessibility, supplies were parachuted to crews at the workings; however, it was reported that the company was constructing an access road. The Amco Mining Co. and the Columbia Tungsten Corp. also were reported active at their properties in Stevens County.

Zinc.—Zinc output increased 11 percent over the previous high established for Washington in 1951. Production of zinc has increased each year since 1949, gaining 87 percent in the 4-year period. About 95 percent of the output in 1952 came from mines in zinc-lead producing districts in Pend Oreille and Stevens Counties. Zinc-lead ore supplied nearly 91 percent of the metal, 5 percent came from zinc-copper ore, and nearly all the remainder came from zinc ore. Production was accelerated at the Pend Oreille, Grandview, and Deep Creek mines, the three largest producing properties. A decrease was reported in zinc recovered from zinc-copper ore from the Holden mine in Chelan County, but this was offset by the output from the new Van Stone open-pit mine in Stevens County, which reached the production stage late in 1952.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

A. For ore treated at mills

	Ore treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters [1] 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									
Chelan and Ferry [2]	599,321	3,141	32,018	21,460	35,810	190,720	8,545,900	6,600	1,670,670
King	55			5	1	33	1,300		
Kittitas	185	53	28						
Okanogan	8,085			735	480	2,993	103,200	11,200	304,548
Pend Oreille and Stevens [2]	745,123			52,160	31	69,476	59,600	23,415,951	38,225,490
Total: 1952	1,352,769	3,194	32,046	74,360	36,322	263,222	8,710,000	23,433,751	40,200,708
1951	1,248,019	2,668	27,211	65,571	38,208	272,117	8,174,865	15,987,900	36,373,140
BY CLASSES OF MATERIAL TREATED									
Dry gold	53,730	3,194	32,046	1,037	17,368	112,002	2,900		
Copper	55			5	1	33	1,300		
Lead: Ore	5,514			1,980		14,820	2,500	1,630,259	22,152
Old tailings	10,586			2,104		9,781	937	911,909	51,150
Zinc	31,052			1,645	6	962		127,389	1,614,174
Zinc-copper	553,861			21,158	18,922	81,711	8,646,200	17,800	1,975,218
Zinc-lead	707,971			46,431	25	43,913	56,163	20,746,394	36,538,014
Total: 1952	1,362,769	3,194	32,046	74,360	36,322	263,222	8,710,000	23,433,751	40,200,708
BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS [1]									
Dry gold				1,037	17,368	112,002	2,900		
Copper				19,112	18,764	80,530	8,594,859	6,200	
Lead				17,805	3	61,704	13,132	22,614,302	613,502
Zinc				36,406	187	8,986	99,109	813,249	39,587,206
Total: 1952				74,360	36,322	263,222	8,710,000	23,433,751	40,200,708
1951				65,571	38,208	272,117	8,174,865	15,987,900	36,373,140

See footnotes at end of table.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1952, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

B. For ore shipped directly to smelters

	Ore shipped (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Chelan and Ferry [2]	39,502	[3]	[3]	1,100		
Okanogan	16	[3]	[3]	300	1,800	712
Pend Oreille and Stevens [2]	138	[3]	[3]	2,000	52,049	2,330
Snohomish	2	[3]	[3]	600		
Whatcom	45	[3]	[3]		400	250
Total: 1952	39,703	15,257	20,377	4,000	54,249	3,292
1951	56,476	26,516	35,618	3,135	16,100	4,860
BY CLASSES OF ORE						
Dry gold	39,454	15,256	19,354		400	250
Dry silver	93		70	1,100		
Copper	71	1	4	2,600		
Lead	75		234	300	52,349	952
Zinc-lead	10		715		1,500	2,090
Total: 1952	39,703	15,257	20,377	4,000	54,249	3,292

[1] Excludes concentrates treated only by amalgamation and/or cyanidation.
[2] Combined to avoid disclosure of individual output.
[3] Included in total to avoid disclosure of individual output.

NONMETALS

Abrasive Materials.—The combined value of pulpstones and grinding pebbles marketed in 1952 was $1,148, less than half of the 1951 total. As in past years, pulpstones were manufactured from sandstone quarried at the Wilkeson quarry of Walker Cut Stone Co., Inc., in Pierce County. Four pulpstones having a total weight of 12 tons were sold. This company is the sole producer of pulpstones in the United States. Grinding pebbles obtained from Stevens County were sold by Manufacturers Mineral Co., Seattle.

Other mineral materials used for abrasives were diatomite, pumice, and silica. (See these commodities for additional information.)

Silicon carbide was manufactured at Vancouver, Clark County, by Carborundum Co.

Carbon Dioxide.—Gas-Ice Corp. recovered natural carbon dioxide gas from a producing area near Klickitat in Klickitat County. The gas was obtained from wells approximately 300 feet deep drilled near carbon dioxide-producing mineral springs. The company recovers carbon dioxide from a similar occurrence near Ashland, Oreg. Dry ice from the 2 plants was marketed throughout the Northwest; the Klickitat County area supplied about 65 percent of the total.

Cement.—The total value of cement output exceeded that of any other mineral commodity produced in the State from locally mined raw materials. More than half of the cement manufactured in the four Northwestern States was produced at six plants in Washington. Four of the plants were in the industrialized western part of the

State—2 in King County and 1 each at Bellingham, Whatcom County, and Concrete, Skagit County. The other two plants are in the eastern part of the State, in Spokane and Pend Oreille Counties.

Clays.—The value of clay reported sold or used in 1952 (except that used in the manufacture of cement) was about the same as in 1951, despite an increase of almost 10 percent in quantity mined. Fire-clay output of 80,000 tons valued at $155,700 and miscellaneous clay output of 145,300 tons with a value of $131,100 were reported. Raw clay materials were mined in open pits, except at the Kummer deposit in King County where room-and-pillar coal-mine methods were employed. This clay was burned in piles on the surface to oxidize carbonaceous material, yielding a light-colored refractory clay of consistent high quality.

Heavy clay products were made in 12 plants, 7 of which were in the more heavily populated western part of the State (in Clark, King, Lewis, Pierce, and Snohomish Counties). The remaining 5 plants were east of the Cascade Mountains—3 in the Spokane area and 1 each in Chelan and Yakima Counties. In King and Spokane Counties, refractory clay products were made at 3 plants, and 2 flower-pot-manufacturing plants were active.

There are extensive clay deposits in the vicinity of the important industrial centers of Seattle and Spokane, suitable for a larger refractory clay-products industry to supply the northwestern market. Industrial clay-deposit locations were listed in a report.[3]

Diatomite.—Potentially productive diatomite beds are found over a wide area in south-central Washington. Output from a deposit in Adams County was reported about 25 years ago, and in more recent years beds have been worked in the vicinity of Roza, Kittitas County, and south of Quincy, Grant County. During 1952 the only production reported was from the Quincy area. The diatomite bed mined was 10 to 14 feet thick and favorably situated for open-pit mining. The bed underlies many square miles in the area. Crude diatomite was hauled by truck to a plant at Quincy, where it was crushed, dried, classified, and otherwise treated. Refined diatomite was sacked automatically in 50-pound bags for shipment.

Gem Stones.—No large companies were producing gem stones, but Washington was a source of material for the polished stones sold in many curio shops and by mineral dealers. Polished samples of petrified wood were sold at the Gingko Petrified Forest State Park east of Ellensburg, Kittitas County.

Gypsum.—The sole production of gypsum in the State was from the Poison Lake deposit in Okanogan County. Output of 7,900 tons was valued at $29,600. The product was used chiefly for agricultural purposes.

Lime.—Output of lime by the two producers reporting in the State was slightly less than in 1951. The active properties were at Evans, Stevens County, and Roche Harbor, San Juan County. About 75 percent of production was used as chemical lime and 25 percent for various building purposes.

Magnesite.—During 1952 Washington increased the lead it has held as the principal domestic supplier of natural magnesite, as a

[3] Sohn, I. G., Industrial Clays, Other Than Potential Sources of Alumina of the Columbia Basin: Geol. Survey Circ. 158, 1952, 18 pp.

result of production by the Northwest Magnesite Co. in Stevens County. However, gross output of crude magnesite, both nationally and in the State, was 24 percent less than in 1951. The decrease was due chiefly to lessened demand for magnesia refractories as a consequence of a strike in the steel industry that closed plants for 2 months or longer.

The magnesite deposits, massive replacements in dolomite, contain irregular bodies of limestone, quartz, and dolomite as impurities. The quarried rock was crushed, screened, and beneficiated by heavy-medium separation and flotation at plants near the quarries. Concentrates were transported about 5 miles by aerial tramway to a calcining plant at Chewelah. Here they were dead-burned and crushed in rod mills before shipment to refractory centers in the East.

Oil and Gas.—Among the most significant developments affecting the mineral industry in Washington were plans to pipe natural-gas and petroleum products into the area. According to an article: [4]

> Transmission for an excess of 200,000 barrels of Alberta crude daily is in the offing for the North Pacific Coast region of Washington. Trans Mountain Oil Pipe Line Co. has authorized Canadian Bechtel Limited to begin planning, designing, and engineering work on 30 miles of oil pipeline as an extension into Washington from the Edmonton-Vancouver line now under construction.

Initial capacity of the line will be 120,000 barrels of crude daily. To implement the assured supply of oil, General Petroleum Corp. planned to construct a 35,000-barrel-per-day refinery at Ferndale just north of Bellingham and scheduled completion for 1954. Other major oil companies were investigating possible refinery sites in the Puget Sound area.

To serve another area, the Continental Pipe Line Co. applied for Federal Power Commission consent to construct an oil-products line from Billings, Mont., to Spokane.

Olivine.—The value of olivine output dropped to less than $500. Efforts were continued to commercialize the large deposits of this material found in the northwestern part of the State.

Peat.—Washington retained the position it gained in 1951 as the leading peat-producing State. Output of 42,600 tons had a value of $111,400 compared with $99,000 in 1951. The average price of material sold increased from $2.18 per ton in 1951 to $2.62. Of 25 active operations, 12 were in King County, 7 in Snohomish, 2 in Kitsap, and 1 each in Spokane, Pierce, Mason, and Thurston.[5]

Peat was used principally for soil improvement; and smaller quantities were employed for litter in poultry yards, bedding in horticultural work, and other purposes.

Pumice.—Output of pumice (3,600 tons valued at $8,100) declined 25 percent in value compared with 1951. Except for 1950, there has been a steady decrease since 1947, when a record high of 26,500 tons valued at $74,000 was attained.

Virtually all of the production was reported by two operators in Chelan County from deposits near Entiat and Twenty-five Mile Creek. One other operation in Chelan County and one in Skagit County reported small tonnages mined.

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[4] World Oil, vol. 135, No. 7, December 1952, p. 274.
[5] Kauffman, A. J., Jr., Industrial Minerals of the Pacific Northwest: Bureau of Mines Inf. Circ. 7641, 1952, 75 pp.

Potentially commercial pumice deposits occur principally within two regions in the State. One extends throughout a large part of Chelan and Douglas Counties into Grant and Okanogan Counties; the other region lies between Mount St. Helens and Mount Rainier in the southwestern part of the State.

Prepared pumice was used almost entirely as a lightweight concrete aggregate. A small quantity (less than 2 percent) was employed for making acoustical plaster.

Sand and Gravel.—A 26-percent increase in tonnage and 24-percent rise in value over 1951 raised Washington sand and gravel output to a new high. Total production of 13,322,300 tons ($9,422,100) consisted of 6,895,300 tons ($5,100,800) marketed commercially, and 6,427,000 tons ($4,321,300) used for noncommercial purposes by Federal, State, and county agencies. Although commercial production was slightly greater than in 1951, noncommercial output increased about 60 percent, owing largely to the quantity of sand and gravel used at Chief Joseph Dam and other projects of the Corps of Engineers. Output of sand and gravel was obtained from 34 of the 39 counties in Washington, and 76 commercial operations were reported.

Based on value, 49 percent of the commercial production was used for building, 37 percent for road construction (including bridges and culverts), and 14 percent for other purposes. Specialty products included glass, molding, blast, and engine sands.

Silica.—Crushed-quartz and ground-sandstone production showed a decrease in both tonnage and value compared to 1951. Output was reported by 3 companies, 2 in Stevens County and 1 in adjoining Spokane County.

A large percentage of the crushed-quartz output was used in the manufacture of ferrosilicon. Other uses were as an abrasive and for foundry and traction sand. Ground sand and sandstone were marketed for abrasive use and as foundry and filter sand. Sand was produced in King County for use in the manufacture of glass (value included with sand and gravel).

Stone.—Value and tonnage of stone production decreased about 3 and 10 percent, respectively, from 1951. Gross value of broken, crushed, and dimension stone output (excluding stone used in making lime and cement, and grindstones) was $5,491,500. About 73 percent ($4,032,400) was marketed through commercial channels, and 27 percent ($1,459,100) was noncommercial production, that is, reported by Government agencies as being produced by themselves or by contractors for their consumption.

TABLE 8.—Stone sold or used, 1951–52, by uses

Use	1951		1952	
	Short tons	Value	Short tons	Value
Agriculture (limestone)	50,916	$186,888	78,000	$325,051
Building (dimension stone)	6,469	276,168	[1] 6,284	[1] 293,678
Concrete, road metal, and screenings	3,598,253	3,766,698	3,527,163	3,638,379
Riprap	372,179	356,253	195,143	236,183
Railroad ballast	835,870	621,256	509,006	518,385
Terrazzo chips	2,082	21,276	2,226	35,148
Other	163,966	435,894	205,412	444,701
Total	5,029,735	5,664,433	4,523,234	5,491,525

[1] Includes some monumental, curbing, and flagging stone.

The dimension-stone output reported consisted almost entirely of sandstone quarried and cut by Walker Cut Stone Co., Inc., near Wilkeson, Pierce County. This stone, used in the State Capitol buildings at Olympia, was marketed throughout the Northwest.

Terrazzo chips were produced by two companies from marble quarried in Stevens County, and an upward trend in sales was noted. A significant increase (about 53 percent) in output of agricultural limestone was made. Five companies in King, Pacific, Snohomish, and Stevens Counties reported sales for this purpose. Substantial quantities of limestone were used also at paper mills, and other important consumers included a glass factory and a metallurgical plant. Small quantities were used for making calcium carbide and mineral wool, for stucco, and as coal-mine rock dust.

Broken and crushed stone and screenings used for road building and as concrete aggregate accounted for about two-thirds of the value of stone produced. The output for these purposes was principally basalt, with smaller quantities of granite, limestone, and miscellaneous stone.

Strontium.—One of the few commercial strontium mineral deposits in the United States is on Fidalgo Island, Skagit County, near La Conner. The deposit contains celestite and strontianite in about equal proportions, associated with calcite and serpentine. In some areas the combined strontium mineral content is as high as 92 percent. Ore reserves were estimated to be about 5,000 tons. This unusual deposit was described in an article published in 1950.[6] One of the owners reported that in 1952, mining and development were done and about 80 tons of ore was shipped. Crude rock was transported by barge to Seattle, where it was crushed and ground in a plant of the operating company, Manufacturers Mineral Co. The ground product was sold for use in purifing caustic soda. The total mine output since 1937, when the present operators obtained a lease, has been approximately 400 tons.

Talc (Soapstone).—The quantity of soapstone mined increased more than 32 percent compared to 1951 and one additional operation reported production, bringing the total number of producers to 5. Skagit County supplied the entire output. Crude material was ground at a number of plants in Washington and Oregon, some operated by the primary producers. More than 97 percent of the ground product was used in the manufacture of insecticides, a small quantity as fertilizer mix, and the remainder for other purposes.

REVIEW BY COUNTIES AND DISTRICTS

ADAMS

Basalt for concrete and road work was quarried by F. R. Hewett & Co., Parkwater, and H. T. Mast, Colfax. Sand and gravel were mined for county roads.

ASOTIN

Sand and gravel were mined for county road building and also by Lewiston Pre-Mix Concrete Co., Lewiston, Idaho, for concrete aggregate.

[6] Caldwell, William E., and Waterman, George H., A Northwest Strontium Mineral Deposit: Sci. Monthly, vol. 50, No. 4, 1950, p. 268.

BENTON

Three commercial sand and gravel plants were reported in operation. Gravel for paving and road structures represented the bulk of the output; smaller quantities of building sand and gravel were prepared at plants in Pasco and Kennewick. Crushed basalt was produced for roadwork and concrete.

CHELAN

Production of aluminum from the new $45 million Aluminum Co. of America reduction plant at Wenatchee was begun in June. Annual output was scheduled to reach 170 million pounds. The Keokuk Electro-metal Co. produced ferroalloys at its plant in Wenatchee.

Two sand and gravel companies in Wenatchee reported output for general building and road construction. The Great Northern Railway Co. mined gravel used largely for ballast. Pumice used as lightweight-concrete aggregate was mined at the B & K mine near Entiat and by Arne Sorlie near Twenty-five Mile Creek. The Wenatchee Brick &

TABLE 9.—Value of mineral production in Washington by counties, 1951–52

County	1951	1952	Minerals produced in 1952, in order of value
Adams	$4,583	$171,325	Sand and gravel, stone.
Asotin	42,556	97,495	Sand and gravel.
Benton	151,746	581,747	Sand and gravel, stone.
Chelan	4,623,448	3,750,068	Copper, gold, zinc, sand and gravel, silver, pumice, clay, lead, sandstone.
Clallam	20,000	74,640	Manganese, sand and gravel.
Clark	323,260	232,665	Sand and gravel, stone, clay.
Cowlitz	349,487	571,603	Stone, sand and gravel.
Douglas	130,118	97,965	Sand and gravel, stone.
Franklin	84,583	65,793	Stone, sand and gravel.
Garfield	12,349	27,500	Stone.
Grant	212,800	619,302	Diatomite, stone, sand and gravel.
Grays Harbor	349,114	224,210	Sand and gravel, manganese.
Island	17,150	64,962	Sand and gravel, stone.
Jefferson	291,281	250,500	Stone, sand and gravel.
King	7,910,492	7,940,908	Cement, coal, sand and gravel, stone, clay, copper, silver, gold.
Kitsap	138,202	54,638	Sand and gravel.
Kittitas	3,892,521	4,229,566	Coal, sand and gravel, gold, silver.
Klickitat	119,514	123,078	Stone, sand and gravel, carbon dioxide.
Lewis	542,200	616,991	Stone, coal, sand and gravel.
Lincoln	170,205	242,064	Sand and gravel, stone.
Mason	11,000	48,597	Sand and gravel.
Okanogan	219,197	171,982	Zinc, gypsum, stone, copper, gold, sand and gravel, silver, lead, antimony.
Pacific	73,961	333,918	Stone.
Pend Oreille	(1)	11,190,689	Zinc, cement, lead, sand and gravel, silver, stone, copper, gold.
Pierce	1,703,396	1,644,830	Sand and gravel, stone, clay, coal, pulpstones.
Skagit	3,733,867	3,990,372	Cement, sand and gravel, stone, talc, strontium olivine, pumice.
Skamania	25,007	30,871	Stone, sand and gravel.
Snohomish	796,869	785,946	Sand and gravel, stone, clay, copper, gold, silver.
Spokane	3,593,342	3,655,844	Cement, sand and gravel, stone, silica, clay.
Stevens	6,748,990	5,979,763	Magnesite, zinc, lead, stone, lime, sand and gravel, silver, silica, clay, tungsten, copper, gold.
Thurston	95,343	250,594	Sand and gravel, coal.
Walla Walla	236,847	85,172	Stone, sand and gravel.
Whatcom	3,477,683	2,710,523	Cement, stone, coal, sand and gravel, gold, silver, lead, zinc.
Whitman	75,874	295,826	Stone, sand and gravel.
Yakima	245,408	291,579	Sand and gravel, stone, clay.
Undistributed	[2]14,131,936	[3]4,625,221	
Total	54,554,000	56,129,000	

[1] Included with "Undistributed" to avoid disclosure of individual output.

[2] Includes value of mineral production from the following counties: Ferry, Pend Oreille, and San Juan; also includes sand and gravel, stone, peat, and gem-stone production that cannot be assigned to specific counties.

[3] Includes value of mineral production from the following counties: Ferry (gold, silver, stone, sand and gravel, tungsten, copper) and San Juan (lime, limestone); also includes sand and gravel, stone, peat, and gem-stone production that cannot be assigned to specific counties.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties, in terms of recoverable metals

County	Mines producing		Gold (lode and placer)		Silver (lode and placer) [1]	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Chelan and Ferry [2]	5		54,135	$1,894,725	241,935	$218,964
King	2		1	35	103	93
Kittitas	1		53	1,855	28	25
Okanogan	2	1	483	16,905	3,189	2,886
Pend Oreille and Stevens [2]	16		31	1,085	70,229	63,561
Snohomish	1		1	35	4	4
Whatcom	1		72	2,520	157	142
Total	28	1	54,776	1,917,160	315,645	285,675

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Chelan and Ferry [2]	8,545,900	$2,068,108	6,600	$1,063	1,670,670	$277,331	$4,460,190
King	2,400	581					709
Kittitas							1,880
Okanogan	103,500	25,047	13,000	2,093	305,260	50,673	97,604
Pend Oreille and Stevens [2]	61,600	14,907	23,468,000	3,778,348	38,227,820	6,345,818	10,203,719
Snohomish	600	145					184
Whatcom			400	64	250	42	2,768
Total	8,714,000	2,108,788	23,488,000	3,781,568	40,204,000	6,673,864	14,767,054

[1] No silver produced from placer mine.
[2] Combined to avoid disclosure of individual output.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1952, by counties and districts, in terms of recoverable metals

County and district	Mines producing		Ore (short tons)	Gold (lode and placer) (fine ounces)	Silver [1] (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer							
Chelan and Ferry Counties [2]	5		638,730	54,135	241,935	8,545,900	6,600	1,670,670	$4,460,190
King County:									
Snoqualamie Pass	1		93		70	1,100			329
Taylor River	1		55	1	33	1,300			380
Kittitas County:									
Swauk	1		185	53	28				1,880
Okanogan County:									
Concully (Ruby)	1		16		196	300	1,800	712	658
Methow	1		8,085	480	2,993	103,200	11,200	304,548	96,841
Myers Creek and Mary Ann Creek		1		3					105
Pend Oreille and Stevens Counties [2]	16		755,261	31	70,229	61,600	23,468,000	38,227,820	10,203,719
Snohomish County:									
Sultan Basin	1		2	1	4	600			184
Whatcom County:									
Slate Creek	1		45	72	157		400	250	2,768
Total	28	1	1,402,472	54,776	315,645	8,714,000	23,488,000	40,204,000	14,767,054

[1] No silver produced from placer mine.
[2] Combined to avoid disclosure of individual output. Chelan County includes Chelan Lake, Peshastin Creek (Blewett), and Wenatchee River districts; Ferry County, Republic (Eureka) district; Pend Oreille County, Metaline district; Stevens County, Bossburg, Colville-Middleport, Loon Lake, Northport (Aladdin), and Old Dominion Districts.

Tile Co. manufactured common brick. Dimension sandstone was produced by Wilkeson-Wenatchee Stone Co. near Wenatchee.

Chelan Lake District.—Howe Sound Co., Chelan Division, operated the Holden mine in Railroad Creek Valley throughout 1952. Output consisted of 545,776 tons of zinc-copper ore containing 8,987,198 pounds of copper, 2,945,817 pounds of zinc, a substantial quantity of gold, and some silver. The 2,000-ton flotation mill produced 18,701 tons of copper concentrates and 1,722 tons of zinc concentrates. Mine development in 1952 consisted of 7,918 feet of drifts and raises, 2,183 cubic yards of volume work, and 16,630 feet of diamond drilling. Copper produced from the Holden mine from February 1 through the balance of the year was obtained by the Defense Materials Procurement Agency under a Government contract.

CLALLAM

Production of oxide manganese ore from the Crescent mine, about 30 miles west of Port Angeles, was reported. Ore was hauled by truck to that city and shipped by rail. Reports indicated that the company was receiving $120 a ton for ore loaded in cars at the railhead. Frank Murphy Enterprises was active at the Kreuger property in the same area. Washed and unwashed gravel for county road construction was produced.

Peshastin Creek (Blewett) District.—J. D. St. George operated the Olympic mine during the summer months, and the Calton Mining Co. continued development at the Polepick group; both operations produced some gold ore.

Wenatchee River District.—The Gold King mine of Lovitt Mining Co., located 3 miles south of Wenatchee, was operated continuously in 1952 and yielded a substantial quantity of siliceous gold ore.

CLARK

The Aluminum Co. of America reduetion plant at Vancouver produced primary aluminum throughout the year. Modernization of fabricating facilities was scheduled.

Silicon carbide for abrasives and refractories was manufactured by Carborundum Co. at Vancouver. A $3 million program was under consideration to double the plant capacity.

Two structural-clay-product plants—the Hidden Brick Co. in Vancouver and the Muffet Brick & Tile Co. north of Vancouver—operated in the county. Sand and gravel output for county roadwork was reported, and four companies reported production of building, paving, and general-purpose sand and gravel. Crushed stone was produced for county roadwork and at three commercial operations.

COWLITZ

Production capacity of the Reynolds Metals Co. aluminum-reduction plant at Longview was increased over 60 percent through enlargement of each of the plant's 372 reduction pots. Each pot was removed, cut in half, and expanded by adding a center section.

Sand and gravel and stone valued at $571,603 represented the total mineral production of Cowlitz County. Four commercial operations reported output, and road gravel and stone were produced for county roadwork.

DOUGLAS

Gravel was mined for county roadwork; F. R. Hewett & Co. quarried and crushed basalt; and the Great Northern Railway Co. and Bridgeport Sand & Gravel operated gravel pits and washing plants.

FERRY

Tungsten concentrates (scheelite) were produced at the Kelly Camp mine by the Kelly Camp Tungsten Co.

F. R. Hewett & Co. quarried basalt used for concrete and roadwork. Gravel was produced for county roadwork.

Republic (Eureka) District.—Metal-mining activity in Ferry County reportedly was confined to the Knob Hill gold mine of Knob Hill Mines, Inc., 1½ miles north of Republic. The mine and 400-ton flotation-cyanidation plant were operated throughout 1952.

FRANKLIN

The Northern Pacific Railway Co. quarried basalt and operated a gravel pit. Output for riprap, ballast, and other uses was reported. Gravel for county roadwork was produced also.

GARFIELD

Crushed basalt was produced for county roadwork.

GRANT

The Quincy Corp. increased output at its diatomite open-pit mine and preparation plant south of Quincy. Three commercial sand and gravel operations and one basalt quarry and crushing plant were active. Gravel and crushed stone output for county roads also was reported.

GRAYS HARBOR

Production of manganiferous ore from the Stevens and Skunk Creek properties was reported by Consolidated Minerals Co.

Building and road sand and gravel output was reported by commercial operations and for county roadwork.

ISLAND

Crushed basalt and gravel were produced for county roadwork.

JEFFERSON

The General Construction Co. quarried basalt and produced crushed rock for concrete work and road building. Gravel was mined for county roadwork.

KING

As the center of Washington's principal industrial area, King County was the site of several large metal processing and fabricating plants using scrap and imported semiprocessed metal as their raw material. Steel-ingot producing or fabricating plants in the county

included those operated by Bethlehem Pacific Coast Steel Corp., Isaacson Iron Works, Northwest Steel Rolling Mill, Pacific Car & Foundry Co., and Seidelhuber Steel Rolling Mills. The Northwest Lead Co. fabricated lead pipe, sheet lead, and other metal products from ingot produced at Kellogg, Idaho. The U. S. Assay Office at Seattle received shipments of gold bullion, principally from mining companies in Alaska.

Of mineral raw materials produced within the county, output from clay, sand, and gravel pits; basalt, limestone, and granite quarries; surface and underground coal mines; and cement quarries and plants was valued at $7.9 million in 1952 representing nearly 15 percent of the State's mineral production. Northwestern Portland Cement Co. operated quarries and a plant at Grotto, and Superior Portland Cement, Inc., operated a clay pit and cement plant in Seattle, bringing limestone in from a quarry in Skagit County. At Renton, Gladding, McBean & Co. manufactured a complete line of clay refractory shapes, vitrified clay pipe, and face brick. Raw materials were obtained principally from deposits in King County; some clay was brought from Spokane County. Three plants manufacturing structural clay products, a flower-pot plant, a sand-lime-brick plant, and a container-glass factory were active in Seattle. The Manufacturers Mineral Co. operated a crushing and grinding plant in Seattle, processing talc (soapstone), strontium minerals, granite, and marble rock (for terrazzo chips). Crushed basalt was produced at the Riverton quarry by Puget Sound Bridge & Dredging Co., and at the Veazey quarry by Northern Pacific Railway Co. Limestone was produced by J. A. Jack & Sons, Seattle, and used principally for agricultural purposes and in glass manufacture. Crushed-granite production was reported by two operators; dimension granite was sold by Patrick O'Hara, North Bend. Over 12 sand and gravel plants operated and the gross value of output exceeded $1 million. High-silica sand for glass manufacture was mined east of Auburn by Smith Bros. Silica Sand Co., Auburn, and molding sand was prepared by Cavanaugh Moulding Sand Co., Kennydale. Nine coal mines were active, the greatest output coming from 2 Palmer Coking Coal Co. properties. King County was the principal source of peat in Washington.

Snoqualmie Pass District.—A small quantity of silver ore was taken from the Sunday Creek mine.

Taylor River District.—The Rainy mine produced some copper ore.

KITSAP

The only mineral production reported was sand and gravel for county roadwork.

KITTITAS

Coal mines of the Northwest Improvement Co. and Roslyn Cascade Coal Co. produced 68 percent of Washington's coal output in 1952 and were a major factor in the economy of Kittitas County. Sand and gravel was mined for county roadwork.

Swauk District.—The Ace of Diamonds claim, which produced about 200 tons of gold ore, was the only active metal mine in Kittitas County during 1952.

KLICKITAT

Crushed stone and sand and gravel were produced for general purposes and county roadwork. The Gas-Ice Corp., Seattle, made dry ice from natural carbon dioxide gas recovered from drilled wells near Klickitat.

LEWIS

Coal output from three mines composed about one-third of the mineral production value of Lewis County. Limestone was quarried by Strong & MacDonald, Inc., Tacoma, for riprap. Pacific Sand & Gravel Co. and the Northern Pacific Railway Co. and the county produced crushed basalt. Sand and gravel output for county roadwork and general use was reported. The Chehalis Brick & Tile plant at Chehalis was one of the State's leading structural clay-product plants. Clay was obtained from nearby open pits.

LINCOLN

Gravel for county roads and crushed basalt for concrete and roadwork were produced.

MASON

Sand and gravel output for general use was reported by two companies, and road gravel was produced for the county.

OKANOGAN

The Border Lord Mining Co. continued development of the old German mine, in a remote area just south of the Canadian border. The mine had been idle since World War I. G. O. P. Antimony, Inc., was active at its Bales antimony property near Twisp.

Laucks Chemical Co. produced gypsum from deposits near Tonasket. Crushed stone and sand and gravel were mined for roadwork and general purposes.

Concully (Ruby) District.—A small quantity of crude lead ore was shipped from the Lead Rock mine by the Lead Rock Mining Co.

Methow District.—The Alder Gold-Copper Co. of Spokane worked the Alder group, producing several thousand tons of zinc-copper ore which was concentrated in the company 250-ton flotation mill.

PACIFIC

Columbia River Lime Co. produced limestone for agricultural use at the Bear Creek quarry. Basalt and miscellaneous stone valued at $248,000 were quarried and crushed for concrete aggregate and road building by three companies and county road crews.

PEND OREILLE

The Lehigh Portland Cement Co., with quarries and plant at Metaline Falls, was the largest single mineral-industry operation in the county on the basis of men employed. The only other nonmetal-commodity production was stone and sand and gravel for roadwork.

Metaline District.—Pend Oreille Mines & Metals Co. increased production of ore from the Pend Oreille mine, Washington's leading

lead and zinc producer, by 82,625 tons compared to 1951. According to the 1952 report to the stockholders, this increase occurred despite a shortage of miners which seriously affected mining and development. In August a second 800-ton flotation unit was placed in operation in the new east mill, which has a projected daily capacity of 2,400 tons. The first 800-ton unit, which was installed in 1950, was operated at capacity throughout 1952 on a 3-shift, 7-day basis. The 700-ton west mill was operated only on a small scale for experimental purposes. Mine development consisted of 4,499 feet of drifts and raises, 55,910 cubic feet of station work, and 13,379 feet of diamond drilling. A unit for trackless mining was installed underground, and the second leg of an incline conveyor system was installed. Work was continued on a residence housing program. American Zinc, Lead & Smelting Co. continuously operated the Grandview mine, owned by Grandview Mines, Inc., of Spokane. The property, 2 miles north of Metaline Falls, ranked second in both lead and zinc output in Washington. A small quantity of ore produced by American Zinc, Lead & Smelting Co. during development at the Lead Hill mine, in the Slate Creek area, was milled at the Grandview 750-ton flotation mill, which was operated at capacity during 1952. Sullivan Mining Co. of Wallace, Idaho, continued development at the Metaline Contact lead-zinc mine, 2 miles southwest of Metaline Falls. William E. Curtis shipped a small lot of lead ore from the Lucky Strike mine.

PIERCE

Annual aluminum-production capacity at the Kaiser Aluminum & Chemical Corp. plant at Tacoma was increased by 33 percent to approximately 66 million pounds of the metal. The Ohio Ferro-Alloys Co. produced ferroalloys at its plant in Tacoma. American Smelting & Refining Co. continued to process custom ores and concentrates received from virtually all parts of the world in its copper smelter at Tacoma. Smelter byproducts included gold, silver, arsenic, nickel sulfate, and sulfuric acid. Gold-silver bars produced by a Doré furnace were shipped to another plant for refining. In recent years, according to a company publication, 410,000 tons of ore and concentrates was smelted annually, and 80,000 tons of copper was refined each year in the electrolytic refinery. Average employment was 1,250 persons. The smelter consumed 400,000 barrels of fuel oil and 17,000 tons of limerock each year. The acid plant, completed in 1950, produced 125 tons of sulfuric acid per day by treating sulfur dioxide extracted from smelter gas.

The Walker Cut Stone Co., Inc., sandstone quarry and stone-cutting plant at Wilkeson was one of the principal nonmetal-mineral industries in the county. Dimension stone and pulpstones were marketed. Sand and gravel output exceeding $1 million in value was reported by five companies. The Builders Brick Co. obtained clay for its Seattle plant from the Clay City pit. Coal output of 3,469 tons was only half as great as in 1951. The old Skookum inclined shaft near Wilkeson was dewatered, and coal samples were taken preparatory to renewed mining of high-grade coking coal found in this area.

SAN JUAN

Roche Harbor Lime & Cement Co. quarried limestone at the Roche Harbor quarry and produced crushed limestone and quicklime. The McGraw-Kittinger limestone deposit on Orcas Island was worked by Everett Lime Co.

SKAGIT

The limestone and clay quarries and cement-manufacturing plant of Superior Portland Cement, Inc., are at Concrete, 30 miles east of Sedro Woolley. This plant was the leading producer of cement in Washington in 1952. The entire State production of soapstone was provided by five companies working deposits near Marblemount. Strontium minerals were mined by Manufacturers Mineral Co., Seattle, from a deposit on Fidalgo Island near La Conner. Small quantities of pumice and olivine were mined. Sand and gravel and crushed stone were produced for construction, road building, and general use.

SKAMANIA

Crushed stone and sand and gravel were produced for county roadwork.

SNOHOMISH

Sand and gravel, used principally for construction and roadwork and valued at more than $600,000, accounted for two-thirds of the county production. Two companies marketed 46,571 tons of limestone used almost entirely for agricultural purposes, with small amounts consumed in manufacturing mineral wool and calcium carbide. Manufacturers Mineral Co. quarried granite at the Index quarry. The Lowell Brick & Tile Co. at Everett manufactured common and face brick from locally mined clay. Pacific Grinding Wheel Co. manufactured grinding wheels, using abrasive grain imported from the East and Southeast. Peat was mined for local consumption.

Sultan Basin District.—Kromona Mines Corp. of Seattle made a test shipment of copper ore from its mine 19 miles northeast of the town of Sultan. A new 100-ton flotation plant, partly completed during 1952, was expected to be ready for operation in June 1953.

SPOKANE

Rehabilitation of the Mead magnesium plant, built during World War II by the Government at a cost of $16 million, was completed on February 5 by Morrison-Knudsen Co., Inc., under Government contract. Kaiser Aluminum & Chemical Corp. added the eighth potline to its plant in Mead, increasing its yearly capacity by over 40 million pounds of primary aluminum. Other features in the company expansion program included construction of a unit to recover cryolite from the waste carbon linings from reduction pots.

The Spokane Portland Cement Co. plant at Irvin operated at about the same rate as in 1951. Principal raw materials were obtained from company-operated quarries in Stevens County. Quartz was quarried, crushed, and screened by Pacific Silica Co. 15 miles north of Spokane. Gladding, McBean & Co. made refractories, face brick, and sewer pipe in a plant at Mica from locally mined clays. Washington Brick

& Lime Co. operated clay pits in Spokane and Stevens Counties and made face and common brick, sand-lime brick, refractories, and hollowware. This company took over the Troy Firebrick Co. operations at Troy, Idaho, during the year. A plant for manufacturing flower pots was operated by J. F. Mills, Chester. Dimension granite was produced at the Morris Quarry, Medical Lake. Crushed stone output of 713,000 tons and sand and gravel output of 922,000 tons reportedly were used for construction and road building.

STEVENS

Production of tungsten ore and concentrates was reported by Germania Consolidated Mines Co. and the Tungsten Mining & Milling Co. during the year. In addition, development was conducted by Addy Mining Co. and Columbia Tungsten Corp. on properties near Addy. Activity at the Electric Point and Kulzer hematite properties by Three Peaks Mining Co. was reported. Beryllium occurrences were explored on claims near Chewelah.

Northwest Magnesite Co., the leading natural magnesite producer in the United States, operated quarries and processing plants near Chewelah. The Spokane Portland Cement Co. quarried shale and limestone used in manufacturing cement at a plant in Spokane County; some limestone was sold to paper mills and other consumers. Peter Janni & Sons produced limestone used at paper mills and for smelter flux. A large limestone quarry and lime-burning plant were operated at Evans by the United States Gypsum Co. Ground sandstone products were marketed by Springdale Silica Sand, Inc., and Manufacturers Mineral Co.; the latter also produced grinding pebbles. The Washington Brick & Lime Co. made building brick at its Clayton plant and mined the Clayton clay pit. A small output of fire clay also was reported by this company and by Mrs. M. A. Fitzgerald. Crushed marble was produced by Northwest Marble Products Co., Chewelah, and Manufacturers Mineral Co., Seattle. Crushed-stone output for construction and roadwork was reported by D. A. Sullivan, Parkwater; sand and gravel for roads and construction were produced by Mineral Products Co.; and gravel for ballast and other purposes was mined by the Great Northern Railway Co.

Bossburg (Clugston Creek) District.—Anaconda Copper Mining Co. operated the Bonanza mine, which it acquired in 1951 under an option-purchase agreement. Mine production consisted of 5,514 tons of lead ore; in addition, 10,586 tons of old lead tailings was re-treated. The company reported that the Bonanza mine and 100-ton mill were closed in November and activity limited to exploration. A small lot of lead and zinc concentrates was shipped from the Silver Trail mine. Bonanza Lead Co. operated the Young America mine, producing several hundred tons of zinc-lead milling ore.

Colville-Middleport District.—The Bonanza Lead Co. made a shipment of zinc-lead ore from the Old Dominion mine.

Loon Lake District.—W. H. West leased the Key West claim in the fall of 1952 and shipped 1 carlot of copper ore.

Northport (Aladdin) District.—Goldfield Consolidated Mines Co. worked its Deep Creek mine and 300-ton mill the entire year; the property was the third largest zinc producer and fourth largest lead

producer in Washington. Admiral Consolidated Mining Co. operated the Admiral mine from January through October, processing zinc-lead ore in its 75-ton concentrating mill; the mill product was shipped to Trail, B. C., for smelting. Mines Management Co. operated the Advance zinc-lead mine part of 1952. Harris & Bumgarner, mining contractors of Northport, began operations in November at the Electric Point mine and shipped a small lot of lead ore. Gladstone Mountain Mining Co. operated the Gladstone Mountain property part of 1952. Pacific Northwest Mining Co. mined and milled several hundred tons of zinc-lead ore from the Red Top mine. American Smelting & Refining Co., Northport unit, began production from its new Van Stone open-pit zinc mine. In October the company completed construction of a 1,000-ton flotation mill, and at the end of 1952 the mill was operating at capacity, processing stockpiled as well as newly mined ore. The ore contains zinc, lead, and small quantities of cadmium, gold, and silver. The Defense Materials Procurement Agency has agreed to purchase, at a floor price of 15½ cents per pound, 36,872,000 pounds of zinc produced from the Van Stone mine during the first 3 years of operation. The property, named after one of the original owners—George Van Stone, was acquired by American Smelting & Refining Co. in 1950. During the 1930's and early 1940's, various owners and leaseholders produced small quantities of ore from the mine.

Old Dominion District.—Pioneer Mining Co. operated the Longshot mine throughout 1952 and shipped about 650 tons of zinc-lead ore to the Young America mill for concentration. Late in 1952, the company completed construction on a 60-ton flotation mill.

THURSTON

Coal production from Strain Coal Co. strip mines was 5,556 tons, about half the 1951 output. The only other mineral production was gravel for road construction and paving.

WALLA WALLA

Production reported in this county consisted entirely of gravel and crushed stone for county road building.

WHATCOM

The Olympic Portland Cement Co., Ltd., operated the Brennan clay pit, Kendall limestone quarry, and a portland-cement plant in Bellingham. These operations constitute the largest mineral-industry activity in the county. Limestone also was quarried by Mitchell Bay Lime Co., Tacoma, for consumption by paper mills. The Bellingham Coal Mines Co. mine was brought back into production in March under the management of Northwestern Improvement Co., after being closed down for several months. A continuous mining machine was put into service at the mine. Sand and gravel output used for building, roadwork, and railroad ballast was reported by three companies. Unwashed gravel for county roads also was produced. C. V. Wilder Co., Bellingham, produced broken and crushed stone for concrete, road building, and riprap.

Slate Creek District.—Walter Gourlie and E. H. Spafford worked the Golden Arrow mine, 45 miles northwest of Twisp, from May 20 to October 28, shipping 45 tons of gold ore.

WHITMAN

Sand and gravel and broken and crushed stone accounted for the entire mineral production from Whitman County. The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. mined gravel for ballast. J. Arlie Bryant produced crushed basalt for concrete and road metal, and the Union Pacific Railroad Co. quarried a small quantity of riprap. Gravel and crushed stone also were produced for county roadwork.

YAKIMA

Combined output of 160,000 short tons of sand and gravel was reported by 5 companies. Crushed stone was produced by the county and C&E Construction Co., Inc. Gray andesite-flagging was produced at the Mount Adams Sheet Rock quarry by Joe Marston, Portland, Oreg. Structural clay products were manufactured by Granger Clay Products, Granger.

The Mineral Industry of West Virginia

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of Interior, and the West Virginia Geological Survey.

By Richard H. Mote [1] and Alvin Kaufman [2]

DECLINES in the production of coal, natural gas, and crude petroleum from West Virginia mines and wells in 1952 combined to reduce the aggregate value of its mineral output 12 percent under 1951. Mine production of coal, which composed 90 percent of the total value of minerals produced in 1952, fell 13 percent from the 1951 rate. Lower production in 1952 reflected the reduced market demand and labor strikes in the coal and steel industries. Natural-gas output dropped 5 percent to the lowest yearly total since 1946. Crude-petroleum production has been declining since the peak annual output of 16,195,700 barrels recovered in 1900. The 1952 production, smallest since 1891, was 6 percent under the 1951 figure. As a result of the drop in output of fuels in 1952, the State slipped from fourth to fifth place among the Nation's mineral-producing States.

Inasmuch as total fuel production contributed 96 percent to the mineral value in 1952, the aggregate output of nonmetallics was relatively minor. Nevertheless, in 1952 West Virginia maintained its position among the top four States in the production of grindstones, calcium-magnesium chlorides, and ground sand and sandstone.

TABLE 1.—Mineral production in West Virginia, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays (except for cement)	992,599	$2,183,979	865,077	$2,304,716
Coal	163,309,822	853,893,679	141,713,059	741,421,131
Natural gas ---thousand cubic feet	191,146,000	35,553,000	180,995,000	35,475,000
Natural-gas liquids:				
Natural gasoline ---42-gallon barrels	1,107,000	3,337,000	1,031,000	3,069,000
LP-gases ---do	3,844,000	5,568,000	4,757,000	6,187,000
Petroleum (crude) ---do	2,757,000	10,370,000	[2] 2,602,000	[2] 9,780,000
Salt (common)	379,299	1,314,818	392,519	1,438,490
Sand and gravel	4,735,271	8,314,195	4,120,105	7,275,370
Stone (except limestone for cement and lime)	[3] 5,754,378	[3] 8,472,639	[3] 4,869,442	[3] 6,826,113
Undistributed: Abrasive stones, bromine, calcium-magnesium chloride, cement, lime, calcareous marl, ground sand and sandstone, stone (dimension limestone), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	----------	12,715,426	----------	11,898,325
Total West Virginia	----------	941,723,000	----------	825,675,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production.
[2] Final figure supersedes preliminary figure given in commodity chapter.
[3] Excludes certain stone, value for which is included with "Undistributed."

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REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Coal production in West Virginia in 1952 dropped 13 percent compared with 1951. Nevertheless, the State remained, for the 21st consecutive year, the leading producer of bituminous coal in the United States and ranked second only to Pennsylvania in total output from the earliest record through 1952 (over 5.4 billion tons). Coal was produced in 36 counties in the State during the year; the most important were Logan, McDowell, Raleigh, Fayette, and Marion. Strip mining was reported from 28 coal-producing counties; however, because of the rugged terrain, the percentage of coal mined by stripping methods (7 percent) was relatively minor compared with the national average for the United States (23 percent).

In all, 1,244 coal mines[3] were active in 1952, including 218 strip mines. Production from the average West Virginia coal mine was 49,746 tons above the national mean (64,171 tons), as a result of large operations (27.3 percent of the producing mines produced over 100,000 tons) and the high degree of underground mechanization. West Virginia producers in 1952 cut 97 percent of their coal by machines

TABLE 2.—Coal production in 1952, by counties, in short tons

County	Total production	Average value per ton	Average tons per man per day	Number of strip pits	Strip-mine production
Barbour	3,081,983	$4.17	10.23	14	1,131,719
Boone	5,921,694	5.03	7.54	2	116,576
Braxton	77,925	4.21	5.91	1	5,983
Brooke	1,507,237	4.35	8.34	6	477,903
Clay	784,050	5.37	5.48		
Fayette	10,647,536	5.78	5.34	17	833,678
Gilmer	145,129	3.26	9.44	2	67,348
Grant	59,520	5.21	3.25	1	9,298
Greenbrier	1,867,628	5.67	5.86	8	223,668
Hancock	130,691	3.88	12.21	4	111,718
Harrison	8,732,645	4.10	12.34	38	2,138,904
Kanawha	9,318,408	4.96	7.67	7	359,438
Lewis	295,309	3.50	16.73	6	263,083
Logan	18,897,617	4.94	7.83		
Marion	10,073,286	4.89	9.32	4	27,791
Marshall	447,817	4.61	6.75		
Mason	691,082	5.57	6.71		
McDowell	18,506,678	6.18	5.66	14	691,666
Mercer	2,286,004	6.31	5.50	15	542,518
Mineral	87,831	5.14	5.13	3	25,106
Mingo	6,376,623	5.01	7.44	2	101,279
Monongalia	9,558,055	4.46	9.61	10	219,407
Nicholas	3,889,573	5.11	6.39	2	348,876
Ohio	1,326,250	4.48	6.84		
Pocahontas	231,698	6.63	7.23	1	66,784
Preston	1,983,721	4.28	5.60	13	410,908
Putnam	46,426	4.83	5.68		
Raleigh	11,216,232	5.80	5.39	10	494,979
Randolph	1,445,652	5.37	6.31	11	373,937
Summers	12,053	5.23	5.24		
Taylor	382,009	3.67	11.80	5	194,572
Tucker	247,441	5.41	6.89	1	67,859
Upshur	964,354	3.96	9.06	10	300,560
Wayne	200,349	4.38	6.41		
Webster	1,428,167	5.83	5.60	1	51,116
Wyoming	8,844,386	6.11	6.24	10	517,607
Total	141,713,059	5.23	6.97	218	10,174,281

[3] Small mines producing less than 1,000 tons a year are not included.

and loaded 80 percent mechanically; 474 mines used some type of mechanical loading mechanism.

Leading coal-producing mines in the State in 1952 included Eastern Gas & Fuel Associates Federal No. 1, Marion County; Allied Chemical & Dye Corp. Semet-Solvay Division property, Fayette County; Bethlehem Mines Corp. No. 44 mine, Marion County; Consolidation Coal Co. No. 32 mine, Harrison County; and Guyan Eagle Coal Co. Nos. 1 and 4 mines, Logan County.

Of the 61 minable coal seams out of the 117 in the State, the more important are the Kanawha group, worked for gas coal, and the Pocahontas group, mined for smokeless steam coal. The coal measures, almost all of Pennsylvanian age, consist of westward-thinning, intercalated lenses of sandstone, conglomerate, shale, limestone, fire clay, and coal. The coals are clean and low in ash and embrace all ranks. In general, lower rank coals occur in the western part of the State and less volatile seams in the east, where folding of coal-bearing strata was more intense. The coal measures underlie 55 percent of the total 24,181-square-mile area of West Virginia and present an extensive reserve for the future.[4]

As of January 1, 1950, total State reserves, assuming 50-percent recovery, exceeded 53 billion tons. Over 10 billion tons of minable coal occurs in 28 of the 44 counties in which bituminous coal is found.

Petroleum and Natural Gas.—In terms of value, the production of natural gas and petroleum in 1952 ranked second and third, respectively, among the mineral industries of the State. 183,200 million cubic feet (gross production) of natural gas and 2,602,000 barrels of petroleum were produced in 1952. Compared with 1951, this represented a 5-percent decline for natural gas and a 6-percent drop for oil. The 1952 crude-petroleum output was the lowest since 1891 and reflected the gradual decrease in recovery that has marked every year since the peak reached in 1900. Of the total production of natural gas, 180,995 million cubic feet was marketed, 724 million cubic feet was utilized for repressuring, and 1,481 million cubic feet was vented or wasted.

The committees on reserves of the American Petroleum Institute and the American Gas Association, respectively, reported that, as of December 31, 1952, approximately 37 million barrels of petroleum and 1,660,070 million cubic feet of natural gas were in reserve in West Virginia. The latter figure included 116,239 million cubic feet in underground storage and 23,400 million cubic feet discovered in new fields or pools.

13,900 oil wells and 13,500 gas wells were producing in 1952 as compared to 14,500 and 14,000, respectively, in the previous year. A total of 443 new gas wells was completed in 1952; 2 additional were put down in Harrison County as storage wells. The price of natural gas increased from 18.6 cents per thousand cubic feet in 1951 to 19.6 cents in 1952. Crude petroleum remained at $3.76 per barrel.

Natural-gas production has been reported in 39 counties, principally from the Mississippian strata that underlie the coal-bearing rocks. In recent years, however, the Devonian of the southern and western portions of the State has become important.

There was little petroleum activity, aside from secondary recovery, in 1952. Repressuring with both air-gas or water flooding was under-

[4] Price, Paul D., and others, Geology and Natural Resources of West Virginia: West Virginia Geol Survey, vol. 10, 1938, 462 pp.

taken in Hancock, Monongalia, Marion, Wetzel, Tyler, Pleasant, Doddridge, Harrison, Lewis, Gilmer, Ritchie, Wirt, Roane, Clay, Kanawha, Boone, Logan, and Lincoln Counties.

Randolph County became a new source of natural gas during the year with completion of a well in the western part of the county on the Haram anticline. In addition, a new Oriskany-gas field was developed in northwestern Wood County. Approximately 83 percent of total initial open-flow natural-gas production in 1952 came from Kanawha, Mingo, Logan, Putnam, Lincoln, McDowell, Preston, Wyoming, and Wayne Counties.

A byproduct of natural gas production was natural-gas liquids. An average of 1.13 gallons of all natural-gas liquids was obtained per 1,000 cubic feet of natural gas treated in the State in 1952. Compared with 1951 the output of natural gasoline declined 7 percent, but output of LP-gases increased 24 percent. Recoverable reserves of natural-gas liquids in West Virginia, as of December 31, 1952, were estimated by the American Gas Association Committee on Natural Gas Reserves, at 19,528,000 barrels. Nine companies operated 43 plants in the State during the year. Of these plants, 28 utilized compression and 15 absorption. In addition to the output of natural gasoline and LP-gases, 11,000 barrels of finished gasoline and naphtha, and 41,000 barrels of miscellaneous natural-gas liquids were produced.

NONMETALS

Cement.—Cement was produced in West Virginia in 1952 by Standard Lime & Stone Co., Martinsburg, Berkeley County; and Alpha Portland Cement Co., Manheim, Preston County. In both areas local limestones and shales were utilized as raw material.

Clays.—Despite West Virginia's prominent position in the chinaware and clay-products industry, the State has a relatively minor output of raw material for these items. Production of fire clay (which composed 63 percent of the tonnage), and 86 percent of the value of clay produced in 1952 was concentrated in Marion, Hancock, and Kanawha Counties. Major producers were Hammond Brick Co., Fairmont, Marion County; and Globe Brick Co., Newell, Hancock County. Miscellaneous clays, predominantly shale, was produced mostly in Berkeley County, although substantial tonnages were also reported from Kanawha, Cabell, Lewis, Taylor, Upshur, Harrison, and Marion Counties. Major producers of this material were: Continental Clay Products Co., Martinsburg, Berkeley County; and

TABLE 3.—Clays sold or used by producers, 1943–47 (average) and 1948–52

Year	Fire clay		Miscellaneous		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1943–47 (average)	285,134	$853,004	163,808	$111,868	448,942	$964,872
1948	314,084	756,627	276,395	220,049	540,479	976,676
1949	239,373	586,237	315,151	230,594	554,524	816,831
1950	309,100	735,285	366,001	269,135	675,101	1,004,420
1951	732,492	1,923,872	371,154	371,154	1,103,646	2,295,026
1952	621,996	2,072,688	360,034	348,981	982,030	2,421,669

United Clay Products Co., North Mountain, Berkeley County. Production of all clays declined 11 percent in 1952 compared to the previous year.

Lime.—Burnt lime was produced in 1952 in West Virginia by Jones & Laughlin Steel Corp. and Standard Lime & Stone Co., in Berkeley and Jefferson Counties. These organizations operated five plants for producing quick and hydrated lime to be used for chemical, refractory (dead-burned dolomite), agricultural, and building purposes. West Virginia Lime Co. produced calcareous marl from a pit near Charles Town, Jefferson County, for use as agricultural material.

Magnesium Compounds.—Standard Lime & Stone Co. produced a small quantity of refractory magnesia from raw dolomite at its Millville plant, Jefferson County, in 1952.

Salt.—Salt and brine were produced in West Virginia in 1952 by Columbia Southern Chemical Corp., Natrium, Marshal County; Liverpool Salt Co., Hartford, Mason County; and Westvaco Chemical Div., Food Machinery & Chemical Corp., South Charleston, Kanawha County. The last organization also reported production of natural salines, such as calcium-magnesium chloride, bromine, and bromides, as byproducts of brine output. Bromine and its compounds were utilized in manufacturing antiknock gasoline, and the calcium-magnesium chlorides were utilized as a moisture absorbent for road building and in mining.

The solution of underground rock salt by water introduced into wells was the major brine-production method. Columbia Southern Chemical Corp., the largest producer in West Virginia, used rock-salt beds in Marshall County that averaged approximately 120 feet in thickness and lay at a depth of about 6,700 feet.

Sand and Gravel.—The production of sand and gravel in 1952 declined 13 percent compared to the previous year. Building and paving sand and gravel, mainly from terraces and flood plains along major rivers (particularly the Ohio), comprised 63 percent of the total output. Second to this use was sand for glass manufacture. Glass sand was obtained from the Oriskany and Pottsville formations in Morgan, Monongalia and Fayette Counties. A small quantity of molding sand was also produced in this same area. Of the 15 sand-

TABLE 4.—Sand and gravel sold or used by producers, 1951–52, by uses

	1951		1952	
	Short tons	Value	Short tons	Value
Sand:				
Glass	(1)	(1)	1,060,369	$3,102,404
Building	695,436	$1,043,383	418,239	620,943
Paving	789,857	982,354	780,314	882,584
Fire or furnace	49,774	57,212	60,201	87,670
Engine	239,413	399,487	198,637	334,349
Grinding and polishing	(1)	(1)	13,331	54,718
Other	120,664	332,057	(1)	(1)
Gravel:				
Building	816,147	1,088,374	441,292	585,536
Paving	798,461	974,311	949,083	1,117,476
Railroad ballast	92,336	86,411	(1)	(1)
Undistributed [2]	1,133,183	3,350,606	198,639	489,690
Total	4,735,271	8,314,195	4,120,105	7,275,370

[1] Figure withheld to avoid disclosure of individual company operations, included with "Undistributed."
[2] Includes molding sand and sand and gravel indicated by footnote 1.

and-gravel-producing counties, the largest were Morgan, Hancock, and Wetzel. In all, 22 commercial pits were worked during the year. Major producers were: Pennsylvania Glass Sand Corp., Morgan County; Ohio River Sand & Gravel Co., and Kanawha Sand Corp., both of Parkersburg, Wood County; and Dravo Corp., Hancock County.

Sand and Sandstone (Ground).—Pennsylvania Glass Sand Corp., produced substantial quantities of ground sandstone from the Oriskany formation near Berkeley Springs, Morgan County. Output was utilized for cleansing and scouring compounds, enamel, foundry and glass sand, as well as pottery, porcelain and tile manufacture.

Stone.—West Virginia stone output declined 15 percent in 1952 compared to the previous year. This was primarily the result of the prolonged, nationwide steel strike in midsummer, which reduced demand for blast-furnace flux. Both limestone and sandstone were quarried in 1952. Output of the former, however, composed the major share of stone production.

Limestone was crushed in 13 plants in 7 counties in West Virginia in 1952. Major use was as blast-furnace flux; concrete and road metal occupied second place. Although there was also a small output of dimension limestone from Jefferson County, which was used for rough building material, over 99 percent of the State limestone output was utilized as crushed and broken material. Major limestone-producing areas were Jefferson and Berkeley Counties. The largest companies operating in the State in 1952 were Michigan Limestone Div., United States Steel Corp., Jefferson County; Standard Lime & Stone Co., Berkeley County; and Acme Limestone Co., Fort Spring, Greenbrier County. Sandstone was produced at the quarries of Brown & Wright Co., Raleigh and Mercer Counties; Pennsylvania Glass Sand Corp., Morgan County; Paul E. Gabbert, Kingwood, Preston County; and Constitution Stone Co. Production was utilized predominantly for concrete aggregate, road metal, and manufacture of ferrosilicon. Constitution Stone Co. reported an output of a small quantity of grindstones in Jackson County.

TABLE 5.—Crushed and broken stone sold or used by producers, 1951–52, by uses

	1951		1952	
	Short tons	Value	Short tons	Value
Riprap	3,050	$9,050		
Flux (limestone)	3,476,645	4,370,091	2,968,872	$3,683,777
Concrete and road metal	[1] 1,110,466	[1] 1,832,281	[1] 1,027,709	[1] 1,655,694
Railroad ballast	495,388	496,931	509,276	517,482
Agricultural (limestone)	121,566	180,420	62,345	122,026
Other	177,762	561,401	205,645	640,280
Undistributed [2]	369,501	1,022,465	95,595	206,854
Total	[3] 5,754,378	[3] 8,472,639	[3] 4,869,442	[3] 6,826,113

[1] Sandstone data included with "Undistributed" to avoid disclosure of individual company output.
[2] Includes figures the Bureau of Mines is not at liberty to reveal.
[3] Incomplete total; dimension limestone not included.

REVIEW BY COUNTIES[5]

BARBOUR

The only mineral commodity produced in Barbour County in 1952 was over 3 million tons of bituminous coal. The leading producers

[5] Excludes petroleum, natural gas, and natural gas liquids. County data for these commodities are unavailable.

were the Galloway No. 3 underground mine of Simpson Coal & Chemical Corp., Galloway (formerly owned and operated by The Simpson Coke Collieries, Inc.); and the Coleman & Gay, Inc., strip mine.

BERKELEY

In 1952 Berkeley County was the major producing area for limestone flux stone in West Virginia and also the source of substantial tonnages of crushed limestone for use as concrete aggregate, road metal, and railroad ballast. Largest active companies in 1952 were J. E. Baker Co., Inwood; W. S. Frye, Berkeley Station; and Blair Limestone Division, Jones & Laughlin Steel Corp., and Standard Lime & Stone Co. (which also produced portland cement), both in Martinsburg. The last two organizations also reported output of burnt lime for chemical, agricultural, and building purposes. Clay was mined in Berkeley County by Continental Clay Products Co. and United Clay Products Co. from pits near Martinsburg and North Mountain, respectively. Output was utilized in manufacturing building brick and structural clay tile.

BOONE

The mines in Boone County yielded approximately 6 million tons of bituminous coal. Most of the output came from underground mines, the largest of which was the Eastern Gas & Fuel Associates Wharton No. 1 at Wharton. Two strip pits were active during part of the year.

BRAXTON

A relatively minor output of bituminous coal was reported from Braxton County in 1952. The principal producing property was the Cedar Creek No. 1 mine of Exchange Coal Co., Exchange.

BROOKE

The major mineral commodity produced in Brooke County in 1952 was bituminous coal. Approximately 1½ million tons was mined in 1952. One-third of this output was derived from the county's six strip pits. The leading producer was the Beech Bottom underground mine of Windsor Power House Coal Co. This property supplied over 50 percent of the county coal output during the year. Brilliant Sand Co. operated a pit near Follansbee and produced furnace sand.

CABELL

Ohio River Dredging Co. and Union Sand & Gravel Co. operated dredges on the Ohio River near Huntington to produce building, paving, and road sands and gravel. Ohio River Dredging Co. also worked various fixed and portable plants. Shale for use in manufacturing face brick was mined by Barboursville Clay Manufacturing Co., Barboursville, and West Virginia Paving & Pressed Brick Co., Huntington.

CLAY

Bituminous coal, entirely from underground operations, was the only mineral product of Clay County in 1952. Although six mines were active at one time or another during the year, over four-fifths

of the total output came from the Elk River Coal & Lumber Co. Rich Run mine.

FAYETTE

In 1952 Fayette County ranked as the fourth largest bituminous-coal producer in West Virginia. The mines of the county yielded over 10½ million tons of soft coal valued at $5.78 per ton. Of this quantity, the county's 17 strip pits produced over 830,000 tons. The coal industry employed 9,495 men, including 7,908 employed underground, 268 in strip pits, and 1,319 in various surface positions. Eastern Gas & Fuel Associates Powellton No. 6 mine, one of the oldest coal operations in the county, was shut down on March 27, 1952, because reserves were depleted. This property, originally opened in 1885, had been operated by the present owners and its predecessor companies since 1927 and at one time employed over 1,300 men. Sun Sand Co. produced glass, fire, and furnace sands at its pit and plant at Thayer.

GILMER

The mines of Gilmer County reported a small output of bituminous coal in 1952.

GRANT

Oscar Keplinger, Maysville, was sole producer of limestone in Grant County in 1952. Output was utilized for concrete aggregate and road metal. Several coal mines were active in the county during the year, the largest of which was Stony River Coal Co. Stony River No. 2.

GREENBRIER

The mines of Greenbrier County in 1952 reported production of approximately 2 million tons of bituminous coal. The leading producer was Leckie Smokeless Coal Co. Eight strip-pits were active in 1952; total surface production exceeded 200,000 tons. Acme Limestone Co., and H. Frazier Co., Inc., both of Fort Spring, reported substantial outputs of limestone for use as concrete aggregate, road metal, railroad ballast, agricultural purposes, and various miscellaneous uses.

HANCOCK

Clays, sand, gravel, and bituminous coal were produced in Hancock County in 1952. The county ranked as second largest producer of fire clay in West Virginia. The output was from the underground operation of Globe Brick Co., Newell, and Crescent Brick Co., Inc., New Cumberland, and the surface mine of the West Virginia Fire Clay Manufacturing Co., New Cumberland, which also yielded some coal as a result of stripping operations. The production was utilized predominantly in the manufacture of ladle and other refractory brick. Three sand and gravel companies operated in Hancock County in 1952. These were, in order of decreasing tonnage, McCrady-Rogers Co., New Cumberland; Keystone Division, Dravo Corp., Chester; and Duquesne Sand Co., Newell. McCrady-Rogers Co. sold its plant, effective December 15, 1952, to Dixie Sand & Gravel Co., Chattanooga, Tenn. All active producers operated dredges on the Ohio River. Output was utilized predominantly for building and paving sand and gravel.

HARRISON

The major mineral commodity produced in Harrison County in 1952 was bituminous coal. Over 8,700,000 tons with an average value of $4.10 per ton was mined; approximately 25 percent came from 38 strip mines. This comparatively high strip production resulted in one of the highest overall coal-productivity rates in the State—12.34 tons per man per day. The largest producing mines during the year, in order of decreasing output, were Consolidation Coal Co. No. 32 and Williams properties, and Barnes-Dawson Coal Co. Dawson mine, all underground mines; and B. H. Swaney, Inc., strip pit. Glenview Brick Co. reported an output of shale for use in manufacturing various types of brick and tile near Glen Elk.

JEFFERSON

Jefferson County ranked as one of the largest producing areas of limestone and dolomite in West Virginia in 1952. This was also the only section of the State from which dimension stone for rough building material was quarried. Sole producer was Jones & Laughlin Steel Corp., Blair Limestone Division at Millville. This organization, in addition to Michigan Limestone Division, United States Steel Corp., and Standard Lime & Stone Co. also produced substantial quantities of crushed limestone for blast-furnace flux, concrete aggregate, road metal, railroad ballast, and various miscellaneous uses. Standard Lime & Stone Co. and Jones & Laughlin both produced quicklime and hydrated lime near Bakerton and Millville, respectively. A substantial portion of the lime output was actually dead-burned dolomite for refractory purposes. Standard Lime & Stone Co. also produced, at its Millville plant, a small quantity of refractory magnesia from dolomite. West Virginia Lime Co. mined calcareous marl for agricultural purposes from a pit near Charles Town. Wet weather during the 1952 mining season curtailed production.

KANAWHA

Mineral products of Kanawha County in 1952 included bituminous coal, salt, natural salines, clays, and engine sand. Most of the coal production was recovered from underground mines, the largest of which included Carbon Fuel Co. Nos. 9 and 9X; Truax-Traer Coal Co. Shamrock No. 1, No. 5 Block, and Raccoon; and the Valley Camp Coal Co. Nos. 3A and 3B.

Sole producer of salt and natural salines in the county in 1952 was Westvaco Chemical Division, Food Machinery & Chemical Corp., which operated a plant near South Charleston for producing salt by evaporation, using the vacuum-pan process. Virtually all output was utilized for chlorine, bleaches, and chlorides. Chemical by-products of the operation included calcium chloride, calcium-magnesium chloride, elemental bromine, ethylene dibromide, and various other bromine compounds.

Charleston Clay Products Co., Barlow, and West Virginia Brick Co., Charleston, continued in 1952 to recover plastic and flint clays from underground mines.

Sand for use as engine sand was produced by the Zenith Sand Co., Inc., dredge on the Kanawha River and at the fixed plant of St. Albans Sand Co. near Calvert.

LEWIS

The six active strip pits in Lewis County in 1952 produced 263,083 tons of soft coal. This was 1 of the few coal-mining areas in West Virginia to have 100-percent surface production. As a result, the county had the highest productivity rate (17 tons per man per day) in the State. Principal producer during the year was the Bittner Fuel Co., Weston Brick & Coal Co., Weston; and Jane Lew Brick & Tile Co., Jane Lew, mined clays for use in the manufacture of various types of brick and tile.

LINCOLN

The only mineral commodity produced in Lincoln County in 1952 was engine sand from the dredges of the Guyan River Co., Midkiff; and Dean Coal & Sand Co., Hamlin.

LOGAN

Despite a 6-percent drop in coal output compared with 1951, Logan County continued to rank first among coal-producing counties in West Virginia. Nearly 19 million tons of soft coal was mined in 1952. The coal industry employed 12,630 men; 10,447 of them worked underground and 2,183 in various surface positions connected with underground mining. Each man produced an average of 7.83 tons per day compared with 7.34 in 1951. All output in 1952 was from underground mines, and the largest included Guyan Eagle Coal Co. Nos. 1 and 4; Powellton Coal Co. Jean Ann Nos. 2, 3, and 4; and Island Creek Coal Co. No. 22.

MARION

Marion County was the fifth largest bituminous-coal-producing area in West Virginia in 1952. Although there were four strip pits active during the year, virtually all the production was from underground mines. Leading producers, in order of decreasing output, were Eastern Gas & Fuel Associates Federal No. 1 mine; Bethlehem Mines Corp. Nos. 44 and 41 mines; and Rochester & Pittsburgh Coal Co. O'Donnell mine. Output from these 4 mines in 1952 made up nearly 60 percent of the county total coal production. Plastic, flint, and miscellaneous clays were mined by the Hammond Brick Co. near Fairmont for use in manufacturing fire brick.

MARSHALL

Columbia Southern Chemical Corp. produced substantial quantities of brine from its wells near Natrium, Marshall County, in 1952. Output was utilized for chlorine, bleaches, and chlorides. Three underground coal mines were active during part of the year; the largest was The Valley Camp Coal Co. Alexander mine.

MASON

Liverpool Salt Co. produced evaporated salt by the open-pan method at its Hartford plant. Output was utilized for textile processing, tanning, meat packing, and livestock feeding, as well as table salt. A small quantity of bituminous coal was mined in 1952; most of it was consumed locally; and the leading producer was Central Coal Co. Philip Sporn mine.

McDOWELL

McDowell County ranked second to Logan County in bituminous-coal output in 1952. Production exceeded 18½ million tons. Of this total, nearly 700,000 tons were obtained from 14 strip pits active during the year. Productivity for the coal industry in McDowell County averaged 5.6 tons per man per day. The industry employed 16,100 men for an average of 203 days during the year. Of the total number of men employed, 13,229 worked underground, 249 in strip pits, and 2,622 in various other surface positions. Leading producers, in order of decreasing output, were United States Steel Corp. No. 2 mine; Pocahontas Fuel Co., Inc. Pocahontas Nos. 33 and 34 mines; Pond Creek Pocahontas Co. No. 1 mine; and Pocahontas Fuel Co., Inc. Pocahontas No. 31 mine.

MERCER

Bituminous coal and clay were mined in Mercer County in 1952. The one producer of the latter commodity was Virginia Brick & Tile Co., Princeton. The mines of the county yielded over 2 million tons of bituminous coal. The largest producing mine in 1952 was the Turkey Gap Coal & Coke Co. property at Dott. Sandstone for concrete aggregate and road metal was quarried near Princeton by Brown & Wright.

MINERAL

The only mineral commodity produced in Mineral County in 1952 was 87,831 tons of bituminous coal valued at $5.14 per ton.

MINGO

A substantial quantity of bituminous coal, most of which came from underground mines, was produced in Mingo County in 1952. The No. 27 mine of Island Creek Coal Co. was worked most of the year and ranked first among producing properties. Engine sand for coal-mine locomotive use was produced from dredges by the Guyan Valley Sand Co., Gilbert.

MONONGALIA

Bituminous coal, limestone, and sand were mined in Monongalia County in 1952. The county, with output close to 10 million tons of soft coal, was one of the major sources of this commodity in the State. Leading producers in 1952 were the Pursglove No. 15, Osage No. 3, and Arkwright No. 1 mines of Christopher Coal Co. Crushed limestone for use as concrete aggregate, road metal, coal-mine rock dust and agricultural purposes was produced by Greer Limestone Co.

Glass, engine, grinding, and polishing sands were mined by Deckers Creek Sand Co., Greer.

MORGAN

Morgan County was the major sand-producing area in West Virginia in 1952. At its quarry and plant north of Berkeley Springs, Pennsylvania Glass Sand Corp. mined Oriskany sandstone, which was crushed and sized for sale as glass, molding, building, paving, and engine sands and for miscellaneous purposes. In addition, the company reported an output of substantial quantites of ground sand and sandstone, predominantly for cleansing and scouring compounds.

NICHOLAS

Soft coal and building sand were mined in Nicholas County in 1952. Over 3¾ million tons of bituminous coal with an average value of $5.11 per ton was produced during the year. The Quinwood No. 2 mine of Imperial Smokeless Coal Co. and Cornelia mine of Peters Creek Coal Co. at Summersville were the principal producers. Nettie Sand Co. recovered building sand from its pit at Nettie.

OHIO

Coal mines of Ohio County in 1952 yielded 1,326,250 tons of bituminous coal. Virtually all production was from mines of the Valley Camp Coal Co. at Elm Grove. A substantial quantity of building sand and gravel was dredged from the Ohio River near Wheeling by H. L. Sebright Co.

POCAHONTAS

Maust Coal & Coke Co. worked its Donegan Nos. 10 and 11 underground mines near Slatyfork throughout most of 1952. On December 15, 1952, the company ceased operations at the Donegan No. 10. Loss of output from this property was replaced in part by production from the Donegan No. 12, a new mine opened by the company on October 15, 1952.

PRESTON

Alpha Portland Cement Co. continued in 1952 to produce portland cement at its plant near Manheim. Raw material was quarried from the Greenbrier limestone on the Cheat River. Sandstone was quarried and crushed near Kingwood by Paul E. Gabbart for use as concrete aggregate and road metal. Coal mines in the county yielded 1,983,721 tons of bituminous coal during the year. Most of the mines were comparatively small; only 1, the Cascade mine of Preston County Coke Co., produced over 100,000 tons.

PUTNAM

The Hughes and Null mines near Poca and Thomas & Thomas Coal Co. Nos. 1 and 2 mines near Lanham were worked during part of 1952 and yielded 46,426 tons of coal; all of it was trucked to points of consumption.

RALEIGH

Raleigh County ranked third among coal-producing counties in West Virginia in 1952. Output exceeded 11 million tons, with an average value of $5.80 per ton. Approximately 500,000 tons was produced from 10 active strip pits. Employment in the coal industry totaled 10,211 men, of which 8,544 were employed underground, 170 in strip pits, and 1,497 in various surface positions. Leading producing mines were Armco Steel Co. Nos. 1, 4, and 5, Montcoal; Slab Fork Coal Co. Nos. 1 and 8; C. H. Mead Coal Co. Nos. 2, 6, and 7; and The New River Co., Cranberry. Sandstone, which was crushed for use as concrete aggregate and road metal, was quarried by Brown & Wright Co.

RANDOLPH

Soft-coal production exceeding 1,400,000 tons was reported from the coal mines of Randolph County in 1952. Bethlehem Mines Corp. property at Monterville was the largest producer during the year.

SUMMERS

Springdale Coal Co. worked its Hump Mountain mine approximately 4 months in 1952 and produced 12,053 tons of bituminous coal. Seventeen men were employed.

TAYLOR

Bituminous coal and clays were mined in Taylor County in 1952. The principal producers of coal were Wendel Coal Co. Wendel No. 2 mine and Mason Bros. strip mine at Grafton. Hammond Brick Co., Grafton, worked its clay open-pit mine near Grafton and produced miscellaneous clays for brick manufacture.

TUCKER

The leading coal producer in Tucker County in 1952 was the Thomas Engineering Co. strip mine about 2 miles northeast of Davis. This property was worked nearly 3 months during the year and furnished over 27 percent of the county total coal output.

UPSHUR

Nearly 1 million tons of bituminous coal with an average value of $3.96 per ton was produced in Upshur County in 1952. Approximately one-third of this total was supplied by the county's 10 active strip pits. Buckhannon Brick Co. reported production of miscellaneous clays for use in manufacturing building brick at its pit and plant at Buckhannon.

WAYNE

Laval Sand Co., Inc., operated a dredge at Fort Gay for producing engine sand. Seven underground coal mines in the vicinity of East Lynn and Sidney yielded a total of 200,349 tons of soft coal during 1952.

WEBSTER

Bituminous coal (over half of it from the mines of Pardee & Curtin Lumber Co. near Bergoo) was the sole mineral product of Webster County in 1952. Other leading producing mines during the year were the Williams River property of The Gauley Mountain Coal Co. and the Gauley No. 2 mine of Elk Lick Coal Co.

WETZEL

Sand and gravel were dredged near New Martinsville by Ohio River Sand & Gravel Corp. and Ohio Valley Sand Co., Inc. This output was utilized for building and paving material, as well as railroad ballast.

WOOD

Ohio River Sand & Gravel Corp. and Kanawha Sand Corp., both of Parkersburg, produced sand and gravel for railroad ballast and paving purposes. Kanawha Sand Corp. operated a dredge on the Ohio River.

WYOMING

In 1952 Wyoming County mines yielded 8,844,386 tons of coal with an average value of $6.11 per ton. The 5 leading mines, which together supplied 50 percent of the county total coal output in 1952, were Pocahontas Fuel Co., Inc. Itmann mine; Kopperston Nos. 1 and 2 mines, Eastern Gas & Fuel Associates; Raleigh-Wyoming Mining Co. No. 2 mine; and West Gulf Coal Co. Marylane mine. Ten strip pits were active during the year. Loss of coal production was suffered when the tipple of West Gulf Coal Co. Marylane mine was destroyed on March 30, 1952, by a fire started when a repairman upset an acetylene torch. Damage was estimated at $300,000.

The Mineral Industry of Wisconsin

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior and the Geological Survey of Wisconsin.

By Samuel A. Gustavson [1]

WISCONSIN mineral production in 1952 was valued at $55,710,000, an increase of 15 percent over 1951. Greater production of sand, gravel, stone, zinc, lead, and portland cement caused this increase. The output of other minerals decreased. In order of value, minerals produced in Wisconsin in 1952, were: Sand and gravel; stone, all types except limestone for cement manufacture; iron ore; zinc and lead; cement; lime; clays, except for cement manufacture; and peat.

Figure 1 shows total value of Wisconsin mineral output from 1910 through 1952.

Table 1 lists production and value of minerals produced in Wisconsin, 1951–52. Many ores contain valuable minor constituents. These quantities sometimes are not known and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages or credited to mine or origin. These minor constituents are recovered at plants that frequently treat mixtures of materials from many sources, including residues from the refining of metals, such as copper, lead, and others, and in other ways. It is impossible in many such instances to distribute the mineral products by States of origin, and in some instances it is even difficult to obtain an accurate separation as to domestic and foreign sources. In Wisconsin these nondistributable minerals probably include only byproduct sulfuric acid and very small quantities of silver, cadmium, and germanium, all contained in zinc, zinc-lead, or lead ores. Sulfuric acid has been produced from iron sulfide ores mined with zinc ores, but operation at the one plant in Wisconsin ceased in August 1948, and it was dismantled.

DEFENSE MINERALS EXPLORATION ADMINISTRATION

Of the 14 contracts in effect in Wisconsin during 1952 between the Defense Minerals Exploration Administration (DMEA) and mine operators, 13 included the search for new reserves of lead and/or zinc in the Upper Mississippi field and 1 for asbestos in Marinette County. Ten contracts were initiated in 1951 but continued into 1952. The largest contracts for lead-zinc drilling, in which the Government and the operator share 50 percent of the total cost, were with Calumet & Hecla, Inc., in Lafayette County and adjacent Jo Daviess County, Ill., with a proposed total expenditure of $310,430; the Eagle-Picher

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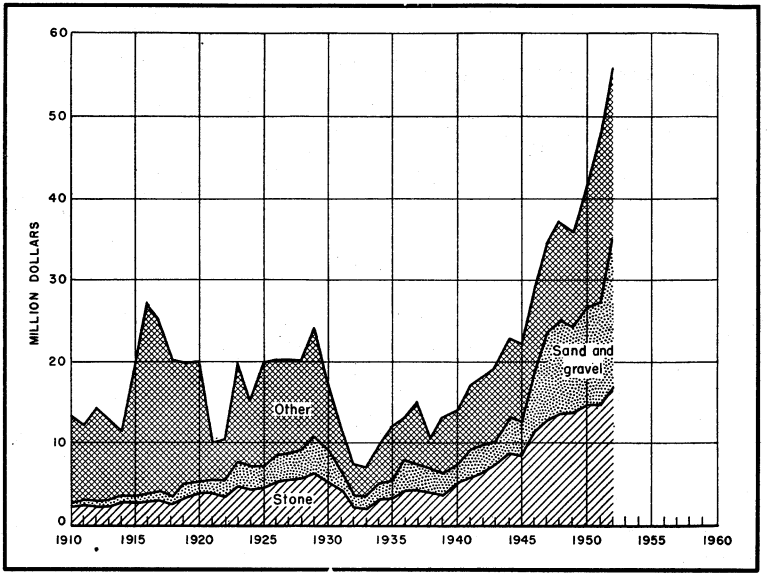

FIGURE 1.—Value of sand and gravel, stone, and total value of all minerals produced in Wisconsin, 1910–52.

TABLE 1.—Mineral production in Wisconsin, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Abrasive stone: Pebbles (grinding)	1,327	$26,540	723	$17,352
Clays (except for cement)	48,376	48,376	31,817	31,857
Iron ore (usable)long tons, gross weight	1,745,120	(2)	1,485,845	(2)
Lead (recoverable content of ores, etc.)	1,391	481,286	2,000	644,000
Lime (open-market)	124,852	1,562,200	107,813	1,368,556
Marl, calcareous (except for cement)	20,625	12,925	17,000	8,833
Sand and gravel	19,391,772	12,392,464	24,895,947	16,938,228
Stone (except limestone for cement and lime)	7,609,323	14,671,858	8,578,882	16,754,675
Zinc (recoverable content of ores, etc.)	15,754	5,734,456	20,588	6,835,216
Undistributed: Abrasive stone (tube-mill liners), cement, quartz, peat, ground sand and sandstone, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)		13,420,085		13,111,395
Total Wisconsin		48,350,000		55,710,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production. Some minerals that originate in Wisconsin cannot be credited owing to lack of information (see par. 3, p. 1).
[2] Value included with "Undistributed."

Co., Miami, Okla., in Lafayette County, with a proposed total expenditure of $191,231; and the Vinegar Hill Zinc Co., Platteville, Wis., also in Lafayette County, with a proposed total expenditure of $68,440. Work on these three projects continued into 1953. Of the 8 contracts completed during 1952, involving a total cost to the Government of $22,684, 3 resulted in certifications of discovery by the DMEA. Table 2 contains salient statistics relative to the contracts in effect in 1952.

TABLE 2.—DMEA contracts in effect during 1952

Company or operator	Mineral	County	Contract date	Work begun	Work ended	Proposed total cost	Actual cost to Government	Government share in actual cost, percent	DMEA notice of discovery reported
Dodgeville Mining Co., Madison, Wis.	Zinc	Iowa	June 14, 1951	June 20, 1951	May 17, 1952	$8,040	$3,967	50	No.
Do	do	do	June 29, 1951	July 11, 1951	Mar. 31, 1952	10,000	4,974	50	Yes.
Do	Zinc-lead	do	Oct. 2, 1951	Jan. 21, 1952	June 3, 1952	6,000	1,410	50	No.
Do	Lead-zinc	do	do	Apr. 2, 1952	Aug. 14, 1952	10,000	4,966	50	Yes.
Do	do	do	do	June 4, 1952	June 10, 1952	7,500	128	50	No.
Do	do	do	Oct. 16, 1951	June 6, 1952	June 24, 1952	7,500	307	50	No.
Vinegar Hill Zinc Co., Platteville, Wis.	do	Lafayette	June 29, 1951	Jan. 22, 1952	May 1, 1952	45,705	3,909	35	Yes.
Do	do	do	Feb. 6, 1952	Feb. 6, 1952	[1]	68,440	----------	50	
E. P. Scallon, St. Paul, Minn.	Zinc	Grant	June 20, 1951	Oct. 28, 1951	[1]	19,100	----------	50	
Calumet & Hecla, Inc., Calumet, Mich.	Zinc-lead	Lafayette and Jo Daviess (Ill.).	July 13, 1951	July 18, 1951	[1]	310,430	----------	50	
Star Mining Co., Madison, Wis.	Asbestos	Marinette	Oct. 3, 1951	----------	Aug. 29, 1952	5,000	3,023	90	No.
D. H. & S. Mining Co., Dodgeville, Wis.[2]	Lead-zinc	Iowa	Jan. 25, 1952	Mar. 24, 1952	[1]	[3] 29,154	----------	50	
The Eagle Picher Co., Miami, Okla.	do	Lafayette	June 11, 1952	June 11, 1952	[1]	191,231	----------	50	
Mayer & Thiede Mining Co., Chicago, Ill.	do	do	June 13, 1952	[4]	----------	10,000	----------	50	

[1] Contract still in effect as of Dec. 31, 1952.
[2] Contract assigned to Cuba Mining Co., Platteville, Wis., by D. H. & S. Mining Co., effective Nov. 1, 1952.
[3] As amended Nov. 1, 1952.
[4] No work done under contract during 1952.

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REVIEW BY MINERAL COMMODITIES

METALS

Iron Ore.—Iron ore is produced by Pickands Mather & Co., operating the Cary mine, and Montreal Mining Co. (Oglebay Norton & Co.), operating the Montreal mine. Both mines are underground, are in Iron County, and are the most westerly operations of the Gogebic range.

Shipments in 1952 were 1,485,845 long tons, a decrease of about 15 percent from 1951. Most of the decrease can be attributed to the 54-day steel strike that began June 3. All ore produced from Wisconsin in 1952 was direct-shipping grade. No beneficiation was necessary other than crushing to minus-4-inch size.

Most of the ore is shipped by rail to ore docks at Ashland, Wis. (some may be shipped to the Escanaba, Mich. dock), thence by boat to lower Lake ports. The iron-ore shipping season opened at Ashland April 5 and closed November 22. At Escanaba the shipping began April 2 and ended December 3.

Market prices generally quoted for Lake Superior ores are, in principal, guides for producer and purchaser in negotiating contracts, rather than being specific open market prices. Most of the ore produced in the Lake Superior District, of which Wisconsin mines are a part, is produced by the consuming company or a subsidiary of a consuming company. The value used in the various tables of this chapter, and to arrive at the total value of Wisconsin mineral production is the companies' reported value at the mine.

The Office of Price Stabilization lifted control from iron-ore transactions between affiliated corporations, effective April 28, 1952. Merchant ore remained at the Lake Erie base prices, effective December 2, 1950, and through 1951 until July 26, 1952. OPS Ceiling Price Regulation 169, September 12, 1952, established new ceiling prices for sales of ore produced in Michigan, Minnesota, or Wisconsin and delivered on or after July 26, 1952. The new prices were: Old Range Bessemer $9.45, Old Range non-Bessemer $9.30, Mesabi Bessemer $9.20, Mesabi non-Bessemer $9.05, and High-Phosphorus $9.05. 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; ores exceeding 0.18 percent phosphorus (dry) are classified as High-Phosphorus. Premiums and penalties are applied for variations in analyses and physical structure.

TABLE 3.—Iron ore (hematite) production and shipments, 1948–52

Year	Number of mines	Production (gross tons)	Shipments (gross tons)	Iron content shipments, natural (percent)
1948	2	1,492,604	1,468,953	52.84
1949	2	1,433,557	1,405,775	52.88
1950	2	1,701,638	1,701,619	52.89
1951	2	1,757,234	1,745,120	52.41
1952	2	1,495,109	1,485,845	52.56

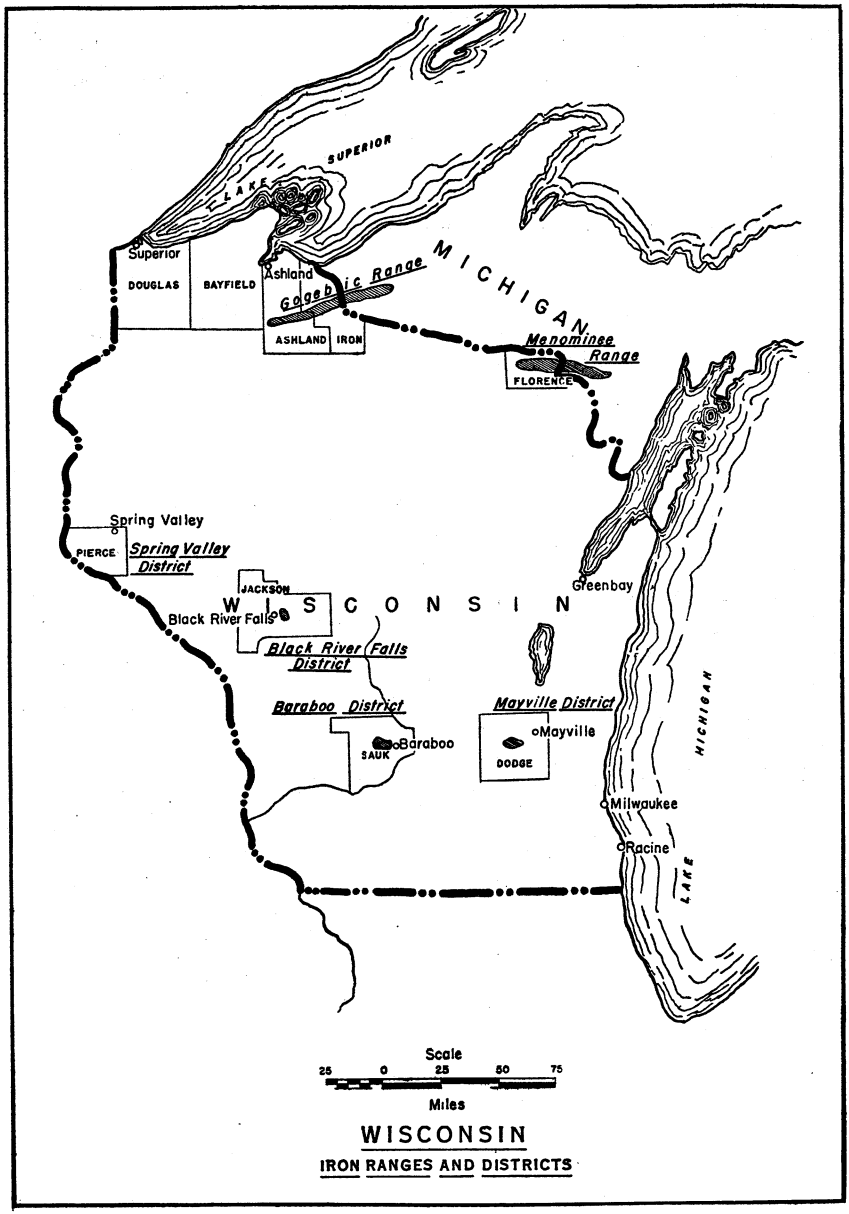

FIGURE 2.—Location of iron ranges in Wisconsin, by districts.

Lead and Zinc.—In 1952 Wisconsin mines produced 2,000 tons of lead and 20,588 tons of zinc (in terms of recoverable metals) and made the highest annual output since 1927. Production was from mines in Grant, Iowa, and Lafayette Counties in the southwestern corner of the State. This area is part of what is commonly known as the Upper

Mississippi Valley zinc-lead district. The district extends into several adjacent counties in Iowa and Jo Daviess County, Ill. No production was reported from the Iowa portion in 1952. The Illinois portion produced 14,128 tons of zinc and 1,532 tons of lead for a district total of 3,532 tons of lead and 34,716 tons of zinc.

In 1952 there were 24 lode mines and 10 tailings-reclamation operations in the State, including some very small producers but excluding individuals marketing only a few pounds of lead or zinc concentrates. The output of lead increased 44 percent and zinc 31 percent over the previous year. The increases can be attributed chiefly to output by new operators and relatively continuous operation by Vinegar Hill Zinc Co. and Calumet & Hecla, Inc. These factors more than offset cessation of operations by the Dodgeville Mining Co. in June and the curtailment or cessation of operation by several small companies when the price of zinc decreased to 12.5 cents per pound.

Average annual weighted prices used for calculating the value of lead and zinc production in Wisconsin were 16.1 cents per pound for lead and 16.6 per pound for zinc in 1952. In 1951 average prices used were 17.3 cents for lead and 18.2 for zinc. The year's opening market price for lead, New York, was 19 cents per pound. Changes during the year were chiefly downward. The first change was on April 29, to 18 cents. The market reached a low of 13.5 cents October 22 and closed the year at 14.75 cents. Price changes for zinc, East St. Louis, after opening at 19.5 cents per pound January 1 also trended chiefly downward. The first change was on June 1, to 17.5 cents per pound. Subsequently there was a general downward trend in price to 12.5 cents on October 27, at which it remained through the end of the year.

TABLE 4.—Mine production of lead and zinc, 1943–47 (average) and 1948–52, in terms of recoverable metals

Year	Mines producing		Material treated		Lead		Zinc		Total value
	Lode	Tailings	Ore (short tons)	Tailings [1] (short tons)	Short tons	Value	Short tons	Value	
1943–47 (average)	[2]	[2]	343,779	355,082	1,373	$270,373	14,399	$3,334,669	$3,605,042
1948	39	2	162,473	24,753	861	308,238	7,864	2,091,824	2,400,062
1949	45	1	165,962	8,000	857	270,812	5,295	1,313,160	1,583,972
1950	11	1	186,083	19,600	532	143,640	5,722	1,625,048	1,768,688
1951	22	3	499,971	14,750	1,391	481,286	15,754	5,734,456	6,215,742
1952	24	10	670,332	82,146	2,000	644,000	20,588	6,835,216	7,479,216

[1] Partly estimated.
[2] Data not available.

TABLE 5.—Mine production of lead and zinc in 1952, by months, in terms of recoverable metals, in short tons

Month	Lead	Zinc	Month	Lead	Zinc
January	111	1,534	August	161	1,687
February	117	1,598	September	153	1,777
March	123	1,659	October	195	2,076
April	199	1,961	November	189	1,813
May	187	1,623	December	203	1,828
June	210	1,662			
July	152	1,370	Total	2,000	20,588

Calumet & Hecla, Inc. (formerly Calumet & Hecla Consolidated Copper Co.) and Vinegar Hill Zinc Co. were the largest producers of both zinc and lead. Calumet & Hecla, Inc., operated its mine and mill continuously, except during a 2-week labor strike (June 28–July 12). Vinegar Hill Zinc Co. operated its custom mill and the Blackstone, Hancock, and Mulcahy mines. The Blackstone mine was operated the full year. Production was begun in April at the Hancock mine and in July at the Mulcahy mine. Both companies' mines and mills are in Lafayette County. In addition to these, companies producing over 1,000 tons of zinc during the year include Cuba Mining Co., from the Andrews mine, which was operated from January 1 to November 14; Murray & Richards Mining Co., from the James mine; Mifflin Mining Co., from the Coker No. 1 and Bickford mines; and the Eagle-Picher Co., Mining & Smelting Division, from the Birkett and Andrews (a different mine than that operated by the Cuba Mining Co.) mines. First production from the Birkett and Andrews mines was made in August. The above companies supplied about 86 percent of the State output of zinc and 90 percent of the lead.

Other producers in 1952 (with the date of operating during the year shown in parentheses, if available) include George M. Baker Milling Co. (April 1 to December 1); Dodgeville Mining Co. (January 1 to June 18); A. V. Austerman; E. P. Scallon; Homer Glendenning (July 1 to December 31); Whitechurch & Farr; Meekers Grove Mining Co. (January 1 to July 12); Mickey Mining Co. (January 1 to December 24); and Mineral Point Mining Co. (April 1 to August 12).

The Homestead Mining Co. was granted a Reconstruction Finance Corporation loan of $240,000 in 1952 and was obliged to begin operations, even though the price of zinc was 12.5 cents. First output from the company Acme mine was reported November 20 and from the Rasque mine December 8. However, ore was stockpiled, and no recoverable metal production from these mines is credited in 1952. See the section Defense Minerals Exploration Administration in this chapter for other data relative to Government exploration contracts with mining companies of the State.

NONMETALS

Cement.—Portland cement is produced in Manitowoc by the Manitowoc Portland Cement Co., a subsidiary of Medusa Portland Cement Co.—home office in Cleveland, Ohio. Hydraulic lime cement is produced by The Western Lime & Cement Co. of Milwaukee in its plant at High Cliff, Calumet County. Cement at the mill averaged $2.63 per barrel in 1952 and $2.48 in 1951.

Clays.—The clay produced in Wisconsin are used chiefly for manufacturing common brick, other heavy clay products, and cement. Production was principally from pits in Brown, Dunn, Fond du Lac, La Crosse, Marathon, Racine, and Waupaca Counties. Producers are listed in the appropriate county in the section, Review by Counties. Table 1 shows the production and value of clay, exclusive of that used in producing cement. Clay is not usually sold but is consumed by the producing company, and an arbitrary price of $1 per ton has been used in calculating the value. The slight variation from this $1 per ton value in table 1 reflects an actual value for a small tonnage sold.

Lime.—Total production of quicklime and hydrated lime in Wisconsin in 1952 was 107,813 short tons valued at $1,368,556, a decrease of 14 percent in output from 1951. Average prices in 1952 were $12.31 per ton for hydrated lime and $12.80 per ton for quicklime.

Plants were in Brown, Calumet, Douglas, Fond du Lac, and Dodge Counties. Western Lime & Cement Co. of Milwaukee was the largest producer. This company has plants at Green Bay, High Cliff, Knowles, and Eden. All of them use bituminous coal for fuel. The Green Bay plant produces a high-calcium lime, the others a high-magnesium lime. Other producers include the Valdez Lime & Stone Co., Valdez—a high magnesium lime; Rockwell Lime Co., Chicago, Ill., plant at Manitowoc—a high-magnesium lime; and Cutler-LaLiberte-McDougall Corp., at Superior—a high-calcium lime.

Perlite.—Crude perlite is not known to occur in Wisconsin. However, in 1952 plants in Milwaukee and Appleton, using crude rock from deposits in Western States, produced expanded perlite for use chiefly as a lightweight aggregate, replacing heavier materials, in plaster and concrete.

Sand and Gravel.—A total of 119 operators reported production of sand and/or gravel in Wisconsin in 1952. Table 6 shows use, output, and value of sand and gravel produced in the State. The 10 largest producers of sand and gravel were: Portage Manley Sand Co., Rockton, Ill.; Jaeger Sand & Gravel Co., A. J. Reiske Sons Co., and Ed Lutz Sand & Gravel Co., Inc., Milwaukee; Janesville Sand & Gravel Co., Janesville; Consumers Co. of Illinois, Chicago, Ill.; Koepke Sand & Gravel Co. and Schultz Sand & Gravel, Inc., Appleton; Friedrich & Loots, Oshkosh; and Valley Sand & Gravel Co., Waukesha. Production was reported for 57 counties in Wisconsin.

Stone.—Dimension stone produced in Wisconsin includes limestone, granite, and sandstone. Table 7 shows production and value of dimension stone and table 8 production and value of crushed stone.

Basalt is produced in Wisconsin chiefly for use as roofing granules, road metal, railroad ballast, and riprap. Output was from quarries in Marinette and Polk Counties, with one producer in each county.

Granite was cut and polished for architectural use and monuments by eight companies in Wisconsin in 1952. Quarries were operated in Ashland, Marathon, Marinette, Marquette, and Waushara Counties. Colors produced at these quarries include various shades—black, gray, and red. Names of producing companies may be found listed in the appropriate county in the section, Review by Counties. Some granite is also crushed for use as concrete aggregate or road construction. Production of rough and dressed dimension stone increased 18 percent in 1952 over 1951.

Limestone was produced in many Wisconsin counties; however, the greatest output is from the eastern and southeastern portions of the State. Much of the limestone is high in magnesium content and is dominantly dolomitic in character rather than being pure limestone ($CaCO_3$). Physical characteristics may vary greatly in adjacent quarries or even within the same quarry, few being suitable for cutting of dimension stone. The greatest tonnage use of limestone is for road surfacing, as an aggregate in concrete, or as agricultural limestone

TABLE 6.—Sand and gravel sold or used by producers, 1951–52, by classes of operations and uses

	1951			1952		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Building	2,458,999	$1,807,546	$0.74	2,276,143	$1,759,848	$0.77
Paving	709,924	493,193	.69	756,671	558,186	.74
Fire or furnace				7,350	52,000	7.07
Railroad ballast	18,881	9,684	.51	(1)	(1)	(1)
Other	168,641	87,550	.52	376,617	157,830	.42
Undistributed [2]	645,897	1,094,109	1.69	638,533	1,133,912	1.78
Total commercial sand	4,002,342	3,492,082	.87	4,055,314	3,661,776	.90
Gravel:						
Building	1,811,616	1,375,320	.76	1,992,987	1,695,615	.85
Paving	3,523,599	2,283,607	.65	5,017,094	3,485,166	.69
Railroad ballast	1,018,815	451,943	.44	990,919	375,774	.38
Other	601,059	201,987	.34	194,457	56,658	.29
Total commercial gravel	6,955,089	4,312,857	.62	8,195,457	5,613,213	.68
Total commercial sand and gravel	10,957,431	7,804,939	.71	12,250,771	9,274,989	.76
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building	72,605	45,868	.63	78,518	48,409	.62
Paving	1,063,827	398,513	.37	1,723,080	741,045	.43
Total Government-and-contractor sand	1,136,432	444,381	.39	1,801,598	789,454	.44
Gravel:						
Building	365,764	406,423	1.11	412,300	432,933	1.05
Paving	6,932,145	3,736,721	.54	10,431,278	6,440,852	.62
Total Government-and-contractor gravel	7,297,909	4,143,144	.57	10,843,578	6,873,785	.63
Total Government-and-contractor sand and gravel	8,434,341	4,587,525	.54	12,645,176	7,663,239	.61
ALL OPERATIONS						
Sand	5,138,774	3,936,463	.77	5,856,912	4,451,230	.76
Gravel	14,252,998	8,456,001	.59	19,039,035	12,486,998	.66
Grand total	19,391,772	12,392,464	.64	24,895,947	16,938,228	.68

[1] Included with "Undistributed" to avoid disclosure of individual company operations.
[2] Includes molding, blast (1951 only), engine and filter (1951 only), grinding and polishing (1952 only), sand.

(agstone). Operators producing limestone principally for use in road construction employ chiefly portable crushing and screening plants. It is common practice to crush material to a size suitable for road surfacing, screen out the fines, and then grind these fines further to suitable mesh size to meet specifications for agstone. These operators may produce from many quarries during a year, moving from quarry to quarry to reduce haulage distances. Some own their own trucking equipment, and some contract all hauling or market their product at the quarries. Crushing and hauling prices for agstone are frequently quoted on a basis of so much a ton delivered and spread, with a uni-

TABLE 7.—Dimension stone, sold or used by producers, 1951–52, by kinds and uses

Kind and use	1951			1952		
	Quantity	Value	Average value	Quantity	Value	Average value
Granite:						
Architectural:						
Rough—cubic feet				10,368	$41,256	$3.98
Dressed—do	2,600	$57,000	$21.92			
Monumental:						
Rough—do	26,004	82,963	3.19	20,332	62,301	3.06
Dressed—do	72,944	1,150,907	15.78	85,560	1,364,329	15.95
Total granite—equivalent short tons [1]	8,378	1,290,870	154.08	9,596	1,467,886	152.97
Limestone:						
Building stone:						
Rough construction:						
Commercial—short tons	4,215	18,192	4.32	2,005	9,597	4.79
Noncommercial—do				175	88	.50
Rubble:						
Commercial—do	9,642	20,819	2.16	13,545	39,522	2.92
Noncommercial—do				450	225	.50
Rough architectural—cubic feet	123,151	221,583	1.80	100,125	199,093	1.99
Dressed:						
Sawed—do	23,100	78,214	3.39	43,900	117,788	2.68
Cut—do	168,476	419,009	2.49	213,028	554,996	2.61
Curbing and flagging—do	69,414	47,643	.69	71,664	65,447	.91
Total limestone—equivalent short tons [1]	44,588	805,460	18.06	50,474	986,756	19.55
Sandstone: All uses—short tons	210	7,590	36.14	2,729	62,869	23.04
Total dimension stone—equivalent short tons [1]	53,176	2,103,920	39.57	62,799	2,517,511	40.09

[1] Following average weights per cubic foot used in converting to short tons: Granite, 165 pounds; limestone, 160 pounds; sandstone, 160 pounds.

form price applying within a certain radius distance from the quarry. In 1952, 69 producers in Wisconsin reported production of dimension or crushed and ground limestone, not including those producing lime or cement. Major producing companies included: H. Turner & Sons of Boscobel; Consumers Co., Chicago, Ill.; Waukesha Limestone Co., Inc., Waukesha; Franklin Stone Products, Inc., Milwaukee; Halquist Lannon Stone Co. and Quality Limestone Products, Inc., Sussex; Ed Kraemer & Sons, Plain; Fond du Lac Stone Co., Inc., Fond du Lac; Courtney & Plumber, Inc., Neenah; and Wisconsin Lannon Stone Co., Lannon.

Dimension limestone is produced chiefly from quarries in the eastern portion of the State near Milwaukee. Most of the output is used as a veneer for houses, making an attractive stone front. Stone in this instance is sold by the square foot. It is usually cut on five sides, and the sixth side is left rough for appearance. Dimensions are the thickness of a brick or a thickness that will equal two or more courses of brick. The width is usually that of a standard brick, 4 inches, and the length is "random."

Companies manufacturing and selling dimension limestone frequently act as agents or handle other types of dimension stone, such as cut sandstone, marble, and granite. Some of these producing companies also furnish stonemasons to lay or set the stone for customers.

In Wisconsin, law establishes specifications for grade A agricultural lime (agstone) as a product at least 90 percent of which passes a standard 8-mesh sieve and at least 50 percent passes a standard 60-mesh sieve or at least 30 percent passes a standard 100-mesh sieve. The minimum neutralizing value required is 85 percent on an oven-dry basis. A standard-grade agricultural lime designates a product of which at least 80 percent passes a standard 8-mesh sieve and at least 35 percent passes a standard 60-mesh sieve or at least 20 percent passes a standard 100-mesh sieve. The minimum neutralizing value required is 80 percent on an oven-dry basis. Moisture content should be less than 8 percent for either grade. Normally agricultural limestone is not sold on a scale weight basis, but is sold on the assumption that agstone occupies 20 cubic feet per ton. It may be interesting to note that some Wisconsin limestones contain an appreciable amount of phosphorus (0.3 percent P_2O_5); some claims have been made that this phosphorus adds to the merit of the stone as a fertilizer. Other minor elements may also benefit the soil.

Quartzite is produced for use as grinding pebbles, tube-mill liners, and a refractory. Most of the output is from quarries in Sauk County. The Baraboo Quartzite Co. produces grinding pebbles and tube-mill liners. Material is produced by General Refractories Co. of Phila-

TABLE 8.—Crushed and broken stone sold or used by producers, 1951–52, by kinds and uses

Kind and use	1951			1952		
	Short tons	Value	Average value	Short tons	Value	Average value
Basalt and granite: All uses, commercial and noncommercial	356,360	$1,141,838	$3.20	328,360	$970,089	$2.96
Limestone (exclusive of limestone used in cement and lime): Riprap:						
Commercial	238,273	293,868	1.23	116,073	173,769	1.50
Noncommercial	13,000	3,120	.24	4,750	1,900	.40
Flux	174,035	189,435	1.09	105,357	108,258	1.03
Concrete and road:						
Commercial	3,311,142	3,738,427	1.13	4,164,682	4,820,305	1.16
Noncommercial	1,376,774	1,261,074	.92	1,419,121	1,336,018	.94
Railroad ballast	221,444	231,031	1.04	195,637	231,165	1.18
Agricultural:						
Commercial	1,018,671	1,422,932	1.40	1,072,511	1,552,292	1.45
Noncommercial	195,505	307,885	1.57	219,700	349,108	1.59
Other: Commercial	73,453	130,191	1.77	85,680	179,941	2.10
Total commercial	5,037,018	6,005,884	1.19	5,739,940	7,065,730	1.23
Total noncommercial	1,585,279	1,572,079	.99	1,643,571	1,687,026	1.03
Total limestone	6,622,297	7,577,963	1.14	7,383,511	8,752,756	1.19
Sandstone: All uses, commercial and noncommercial	570,422	3,835,167	6.72	697,823	4,436,835	6.36
Miscellaneous stone: All uses, commercial and noncommercial	7,068	12,970	1.84	106,389	77,484	.73
Total commercial	5,792,271	10,848,729	1.87	6,552,409	12,310,918	1.88
Total noncommercial	1,763,876	1,719,209	.97	1,963,674	1,926,246	.98
Grand total	7,556,147	12,567,938	1.66	8,516,083	14,237,164	1.67

delphia, Pa. chiefly for use in refractories. Minnesota Mining & Mfg. Co. produces ground quartzite, chiefly for use in manufacturing abrasives (sandpaper, etc.).

Production of marl, all for agricultural use, was reported from Portage, Washburn, Washington, Waupaca, and Waushara Counties.

Wisconsin produces both dimension and ground sandstone. The dimension stone for architectural purposes is used principally for veneer on domestic dwellings. The ground sandstone produced is used principally as foundry sand. Production was from Clark, Dunn, Portage, Sauk, and Wood Counties.

MINERAL FUELS

No mineral fuels are produced in Wisconsin. Several companies, however, make coal or coke briquets. The production of packaged fuel in Wisconsin in 1952 was 18,654 short tons valued at $327,312; in 1951 production was 26,889 tons valued at $458,383. Companies making fuel briquets in the State in 1952 include Berwind Fuel Co., Coal Processing Corp., Haas Coal & Dock Co., Arthur Kuesel Coal Co., C. Reiss Coal Co., Stott Briquet Co., Ubbink Fuel & Dock Co., and United Coal & Dock Co. Companies making packaged fuel in Wisconsin in 1952 were Cleveland Cliffs Iron Co., Sawyer Fuel & Supply Co., Sheboygan Coal Co., and Superior Packaged Fuel Co.

A considerable tonnage of peat has been produced in the State, but its principal use is as a soil conditioner.

REVIEW BY COUNTIES

Table 9 gives the total value of mineral products in Wisconsin in 1951 and 1952, by counties, and indicates the minerals produced. 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.

ASHLAND

Cold Spring Granite Co., Cold Spring, Minn., produced a "veined ebony black" granite that is cut for use as monument and building stone.

BARRON

The Barron County Agricultural Department, Barron, produced limestone for agricultural purposes. Sand and gravel were produced by Clyde Lilly of Poskin and the Barron County Highway Department.

BAYFIELD

Otto Wiesner, Inc., Superior, produced sand and gravel for building and road construction.

TABLE 9.—Value of mineral production in Wisconsin, 1951–52, by counties

County	1951	1952	Minerals produced, in order of value
Barron	$248,184	$261,926	Stone, sand and gravel.
Brown	612,404	974,674	Sand and gravel, stone, lime, clay.
Buffalo	420,028	340,233	Stone.
Burnett	67,639	52,451	Stone (1952), sand and gravel.
Calumet	143,652	129,025	Lime, stone, sand and gravel, cement.
Clark	110,802	104,536	Sand and gravel, stone (1952).
Columbia	285,556	410,439	Stone, sand and gravel.
Crawford		21,741	Do.
Dane	2,142,888	6,691,448	Sand and gravel, stone.
Dodge	671,968	651,550	Sand and gravel, lime, stone.
Door	170,734	187,092	Stone, sand and gravel.
Douglas	809,779	783,777	Lime, sand and gravel, stone (1951).
Dunn	20,888	75,118	Stone, sand and gravel, clay (1952).
Fond du Lac	711,661	1,007,498	Sand and gravel, stone, lime, clay.
Forest	74,792	76,199	Sand and gravel.
Grant	875,800	660,554	Stone, zinc, sand and gravel, lead (1952).
Green	249,840	368,616	Stone, sand and gravel, ground sand and sandstone.
Green Lake	145,406	185,108	Sand and gravel.
Iowa	1,034,303	998,355	Zinc, stone, lead.
Jefferson	149,078	129,483	Sand and gravel, stone.
Kenosha	104,628	192,355	Sand and gravel.
La Crosse	76,481	105,034	Sand and gravel, stone, clay.
Lafayette	5,418,070	6,774,611	Zinc, lead, stone (1952).
Manitowoc	3,508,447	3,889,809	Cement, sand and gravel, lime, stone.
Marathon	4,218,169	4,746,211	Stone, sand and gravel, quartz, clay.
Marinette	1,008,388	853,245	Stone, sand and gravel.
Milwaukee	1,124,561	1,304,697	Do.
Oconto	132,948	196,224	Sand and gravel, stone.
Ozaukee	122,437	95,514	Sand and gravel.
Pierce	314,270	296,304	Sand and gravel, stone.
Polk	315,819	266,746	Stone, sand and gravel.
Portage	322,370	346,234	Sand and gravel, stone, marl.
Price		22,897	Sand and gravel.
Racine	851,981	851,138	Stone, sand and gravel, clay.
Richland	71,480	84,465	Stone.
Rock	1,412,456	1,280,329	Sand and gravel, stone.
St. Croix	1,143,226	650,336	Do.
Sauk	1,602,798	1,728,143	Stone, sand and gravel, abrasives.
Sawyer	39,978	42,030	Sand and gravel.
Shawano	235,003	208,066	Sand and gravel, stone.
Sheboygan	401,146	334,588	Do.
Taylor	153,498	13,048	Sand and gravel.
Vernon	8,430	135,271	Stone, sand and gravel.
Walworth	200,085	293,754	Sand and gravel, stone.
Washington	346,590	385,580	Sand and gravel, stone, marl.
Waukesha	2,994,712	3,354,218	Sand and gravel, stone, peat.
Waupaca	7,305	58,269	Sand and gravel, stone, clay, marl (1951).
Waushara	10,722	29,943	Stone, marl.
Winnebago	872,286	1,427,012	Sand and gravel, stone.
Undistributed [1]	12,386,504	11,634,218	
Total	48,350,000	55,710,000	

[1] Includes production or value of mineral output which the Bureau of Mines is not at liberty to publish for the following counties: Ashland, stone; Bayfield, sand and gravel (1952); Chippewa, sand and gravel; Eau Claire, sand and gravel (1951); Iron, iron ore, sand and gravel; Juneau, sand and gravel; Kewaunee, sand and gravel, stone (1951); Langlade, sand and gravel; Lincoln, sand and gravel; Marquette, stone, sand and gravel; Monroe, stone; Oneida, sand and gravel, stone; Outagamie, sand and gravel, stone; Pepin, stone (1951); Rusk, sand and gravel; Trempealeau, stone; Vilas, sand and gravel; Washburn, marl (1952); Wood, stone. No production was reported for the following counties: Adams, Florence, and Jackson.

BROWN

Mineral products of Brown County include clay, limestone, sand and gravel, and some crushed granite. Producers of clay chiefly for the manufacture of common brick and vitreous clay tile were the Duck Creek Brick Co. and Hockers Bros. Brick & Tile Co., both of Green Bay. Crushed limestone for building and road construction, agstone, and cut stone for flagging, rubble, etc., were produced by Daanen & Janssen, Raymond De Cleene, Victor De Cleene, and Nels Scray, all of De Pere. Some crushed granite for building or road construction was produced for the highway department of the town of Howard.

Lime was produced by the Western Lime & Cement Co., Milwaukee. The chief market for this lime is in the chemical industry. Sand and gravel, chiefly for building and road construction, were produced by Daanen & Janssen, De Pere; Quality Sand & Gravel Co., Wrightstown; Schuster Construction Co., Denmark; W. B. Sheedy Construction Co., Pulaski; and Frank Van Nelson, Green Bay.

BUFFALO

Limestone was the only mineral product reported for the county. Uses included: Riprap, agstone, and building and road purposes. Producers were H. E. Kochenderfer, Cochrane; Neuheisel Lime Works, Eau Claire; Otto Sanders, Inc., Mount Horeb; and H. O. Tiffany, Jr., Nelson.

BURNETT

Engine sand was produced by the Minneapolis, St. Paul & Sault Ste. Marie Railroad Co. The Burnett County Highway Department produced stone for building and road purposes.

CALUMET

The Western Lime & Cement Co. operated a lime plant at High Cliff and produced lime and hydraulic lime cement. The hydraulic lime cement is marketed under the trade name "Mortarite." Limestone was also produced by the Western Lime & Cement Co. Sand and gravel were produced by the Calumet County Highway Commission.

CHIPPEWA

The Chippewa Gravel Co., Chippewa Falls, produced sand and gravel for building and road purposes.

CLARK

Dimension sandstone for architectural use and flagging was produced by the Ellis Stone Construction Co., Stevens Point. Sand and gravel, chiefly for road construction, were produced by Chas. Maret, Merrillan; Plautz Bros. Sand & Gravel Co., Willard; and the Clark County Highway Commission, Neillsville.

COLUMBIA

Agstone was produced by Dann & Wendt, Rio, and Kuhnau & Hosig Bros., Spring Green. Molding sand was produced by Francis James and John F. Kirley, both of Doylestown. Marvin H. Ladwig, Columbus, and the county highway department produced sand and gravel for building and road construction.

CRAWFORD

Limestone for use as riprap, agricultural purposes, and road construction was produced by Loren J. Slaght, Prairie du Chien, and Velda Ward & Velmer Monroe, Eastman. Sand and gravel were produced by Frank Mezera, Eastman.

DANE

Mineral products of Dane County included limestone, sand and gravel; the principal use of these products was in building and road construction. Companies producing limestone include Alva Brumm, Carl F. Raemisch, and Stewart Watson, all of Madison; Engelbert Boehnen, Cross Plains; Einar Evenson, Cambridge; Elden Quam and Rein & Dahl, Stoughton; Lawrence Schneider, Oregon; the Dane County Highway Department; and the Wisconsin State Highway Commission. Companies producing sand and gravel include Capital Sand & Gravel Co., Madison Sand & Gravel Co., and Speedway Sand & Gravel Co., all of Madison; Engelbert Boehnen, Cross Plains; Sundby Sand & Gravel Co., Stoughton; Charles Langer & Son, Waterloo; Maier & Ketelbodter and Frank Raemisch, both of Waunakee; Hartland Verona Gravel Corp., Verona; the Dane County Highway Department; and the Wisconsin State Highway Commission.

DODGE

Limestone and lime were produced at Knowles by the Western Lime & Cement Co., Milwaukee, and by the Mayville White Lime Works, Mayville. Sand and gravel were produced by Edward Brunt & Eugene Frings, Watertown; C. C. Linck, Beaver Dam; Melvin Voight, Ashippun; and Dodge County Highway Department.

DOOR

Adamski & Emil Fisher, Sturgeon Bay, produced dimension limestone. Elmer L. Albert, also of Sturgeon Bay, produced limestone for riprap and other purposes. Crushed limestone, sand and gravel were produced by the county highway department.

DOUGLAS

Lime and limestone were produced by Cutler-LaLiberte-McDougall Corp., Superior. Sand and gravel were produced by Chicago, St. Paul, Minneapolis & Omaha Railroad Co.; Dean B. Ekstrom, Superior; the Douglas County Highway Department; and the city of Superior.

DUNN

The Menomonie Brick Co. at Menomonie produced common brick and other heavy clay products. Dimension sandstone for use as facing stone and architectural rough block was produced by the Downsville Cut Stone Co., Downsville. Limestone was produced by Otto Sanders, Inc., Mount Horeb, and the Dunn County Highway Commission, Menomonie. Sand and gravel were produced by the Minneapolis, St. Paul & Sault Ste. Marie Railroad Co.

FOND du LAC

The Oakfield Shale Brick & Tile Co., Oakfield, produced clays for use in manufacturing common brick and vitreous clay tile. Lime and limestone were produced at Eden by the Western Lime & Cement Co., Milwaukee. Dimension and crushed limestones were produced by the Fond du Lac Stone Co., Inc., and the Nellis Limestone Quarry,

both of Fond du Lac. Sand and gravel were produced by Braun Construction Co., and Lake View Sand & Gravel Co., Fond du Lac; Friedrich & Loots, Oshkosh; and the Fond du Lac County Highway Department.

FOREST

The Forest County Highway Department produced sand and gravel for road construction.

GRANT

E. P. Scallon, St. Paul, Minn., operated a zinc mine on the property of Frank Brunton. Scallon also did considerable development work on the Frank Brunton property under a DMEA contract. A small production of lead and zinc was reported by several other individuals. Limestone for building and road construction and agricultural purposes was produced by Becker & Tuckwood, Lancaster; Chicago, Burlington & Quincy Railroad Co.; Dell Needham, Fennimore; E. C. Schroeder Co., Inc., McGregor, Iowa; Loren T. Slaght, Prairie du Chien; Zenz & Sturmer, Bloomington; the Grant County Highway Commission; and H. Turner & Son, Boscobel. The county highway department produced sand and gravel.

GREEN

Ground sand and sandstone were produced by the Browntown Silica Co., Browntown. Crushed limestone was produced by P. W. Ryan Sons, Janesville, and Waelti Lime & Gravel Co., Juda. Sand and gravel were produced by Henry Altman, Monroe; Green County Sand & Gravel Co., Inc.; and the Green County Highway Commission.

GREEN LAKE

Molding and/or furnace sand was produced by Leonard & Theodore Chier, and F. B. Dubberstein & Sons, Ltd., both of Berlin. Kopplin & Kinas Co., Inc., Green Lake, produced sand and gravel for building purposes.

IOWA

Lead and zinc were produced by the Dodgeville Mining Co., Dodgeville, and the Mineral Point Mining Co., Mineral Point. The Dodgeville Mining Co. operated from January through June, when all operations ceased. Production in 1952 was from the Dodgeville No. 3 shaft. The Mineral Point Mining Co. operated the Richards mine from April 1 through August 12. Ore was shipped to the Vinegar Hill Zinc Co. and the Dodgeville Mining Co. mills for concentration. The Mifflin Mining Co. operated the Coker No. 1 and Bickford mines and the company mill throughout the year. Zinc was the only mineral product. Limestone was produced by Wonn & Bailey, Cobb, and the Iowa County Highway Commission.

IRON

All iron-ore output from Wisconsin was produced in this county. Oglebay, Norton & Co., Cleveland, Ohio, operated the Montreal mine, and Pickands, Mather & Co., also of Cleveland, operated the Cary mine. Both are underground operations, and work is continued

through the winter, and the ore is stockpiled then. Production in 1952 was 1,495,109 tons; shipments, 1,485,845 tons. No manganiferous iron ore is produced in Wisconsin. The mines are on an extension of the Gogebic range. Sand and gravel were produced by the county highway department.

JEFFERSON

Limestone, chiefly for agricultural use, was produced by Donald Diekow, Jefferson. Sand and gravel were produced by Hausz Bros., Fort Atkinson, and the Jefferson County Highway Commission.

JUNEAU

Sand and gravel were produced by Art Overgaard, Elroy, and the Juneau County Highway Department.

KENOSHA

Sand and gravel were produced by the director of parks, Kenosha, and the Kenosha County Highway Department.

KEWAUNEE

Sand and gravel were produced by Casco Sand & Gravel Corp., Casco, and Gersek Bros., Green Bay.

LA CROSSE

Dimension stone, riprap, and agricultural limestone were produced by Herbert Hass, La Crosse. Meir Brick Co., La Crosse, produced clays for manufacturing common brick and vitreous tile. Sand and gravel were produced by Carl N. Hauge, Medary Sand & Gravel Co., and Josephine Waldenberger, all of Onalaska; and La Crosse Sand & Gravel Co. and Kammel-Smith Sand-Gravel Co., both of La Crosse.

LAFAYETTE

Lafayette County mines produced most of the zinc and lead output in Wisconsin. During 1952 there were about 25 operators in the county. The chief producers were Calumet & Hecla, Inc. (formerly Calumet & Hecla Consolidated Copper Co.,) the Vinegar Hill Zinc Co., and Eagle-Picher Co. Calumet & Hecla, Inc., operated its Central shaft and 1,200-ton-daily-capacity flotation mill throughout the year, except for a 17-day shutdown due to a strike that began June 28 and ended July 12. The company was the largest producer of both lead and zinc in the State. Concentrates were shipped to American Zinc Lead & Smelting Co. and Matthiessen & Hegler Zinc Co. Development during the year included 1,476 feet of drift and 129,000 feet of churn drilling. Extracts from the Calumet & Hecla, Inc., annual report follow:

> At a special meeting of Shareholders on October 21, 1952, our corporate life was extended for thirty years and the Company name was changed to Calumet & Hecla, Inc.
>
> During the first half of the year, operations at the Company's zinc mines at Shullsburg, Wisconsin, were successful. However, the price of zinc dropped from 19½ to 12½ cents per pound in mid-year. The outlook for zinc in 1953 is uncertain.

Following the sharp drop in the price of zinc at the middle of the year, the Company found it necessary to reduce wages 20 cents per hour. Our employees went on a strike, but after twelve days accepted the cut and returned to work. An incentive plan has been instituted which has resulted in improved productivity and increased employee earnings.

Explorations for copper and zinc-lead ores continued throughout the year. The Government is assuming half the cost of most of this work, and will be repaid on a royalty basis if production results.

In the Wisconsin-Illinois zinc district explorations were successful in ore discovery and development. Drilling operations disclosed more ore in 1952 than was mined during the same period.

The most important of the amendments was the change of our name to Calumet & Hecla, Inc. The reasons for the change, as you know, were to make the name less cumbersome, to remove an implied limitation on the Company's activities, and to make the name comply with the laws of the State of New York, in which the Company is qualified to do business. We are sure that, in the years to come, this simplification of our name will prove helpful in many ways.

Vinegar Hill Zinc Co., the second largest producer in the State, operated the company 900-ton-per-day gravity and flotation mill and the Blackstone, Hancock, and Mulcahy mines throughout the year. Custom ores are accepted at the mill. The company did development work under a DMEA contract. Eagle-Picher Co., Mining & Smelting Division, operated the Birkett mine. Initial production from this mine was on August 15. The mine is operated through an inclined adit approximately 1,900 feet long. The ore is hauled to the company mill near Galena, Ill., for concentration. This mill also accepts some custom ores from Wisconsin.

Some limestone for road metal was produced.

LANGLADE

Sand and gravel for building and road purposes were produced by Duffeck Sand & Gravel Co. and the Langlade County Highway Department, both at Antigo.

LINCOLN

Sand and gravel for building and road purposes were produced by Merrill Gravel & Construction Co. and the Lincoln County Highway Commission at Merrill.

MANITOWOC

Portland cement was produced by the Manitowoc Portland Cement Co. at Manitowoc. In 1950 this plant had an annual capacity of 1,299,000 barrels; it was increased by addition of a new 340-foot kiln in 1952. The crude material used in manufacturing cement is not included in the limestone and clay statistics but is represented by the production and value of finished cement.

The Rockwell Lime Co., Manitowoc, and Valders Limestone Co., Valders, produced lime and crushed limestone. Dimension limestone and riprap, as well as crushed stone, were produced by the latter company. The city of Manitowoc produced crushed limestone for building and road purposes.

Sand and gravel were produced by Fred Radant Sons, Manitowoc; Walter L. Zander, Two Rivers; and the city of Manitowoc.

MARATHON

Clays for manufacturing common brick and vitreous clay tile was produced and used by the Marshfield Brick & Tile Co., Marshfield. Crushed quartz sand was produced near Wausau by the Minnesota Mining & Manufacturing Co., chiefly for use in manufacturing abrasives. In another quarry the company mined a hard argillite for roofing granules.

Four companies produced dimension granite for monuments and building use—Anderson Bros. & Johnson Co., DeVoe Granite Co., Lake Wausau Granite Co., and Rib Mountain Granite Co., all of Wausau. Granites produced are red or gray.

Sand and gravel for building and road purposes were produced by Lotz Sand & Gravel Co. and Riverside Gravel Co., Wausau, and Mike Wisnewski, Edgar.

MARINETTE

Crushed basalt for use as roofing granules was produced by the Staso Milling Co., Chicago, Ill. Dimension granite for monuments and building purposes was produced by E. A. Mundt Granite Co., Marinette, and Murphy Granite Co., Green Bay.

Sand and gravel were produced by Minneapolis, St. Paul & Sault Ste. Marie Railroad Co.; Henry F. Thomson, Coleman; and Walsh Sand & Gravel Co., Menominee, Mich.

MARQUETTE

The Montello Granite Co., Montello, produced a red dimension granite for monumental and other purposes. The trade name is "Montello Granite."

Sand and gravel were produced by the county highway department.

MILWAUKEE

Sand and gravel and crushed limestone were produced chiefly for building and road construction. Limestone was produced by the Franklin Stone Products Co., Manegold Stone Co., and Milwaukee Limestone Products Co., all of Milwaukee. Sand and gravel were produced by Fink Bros., South Milwaukee, and A. J. Reiske Sons Co., Milwaukee. Expanded perlite was produced at the Milwaukee plant of Badger Perlite Products Co.

MONROE

Limestone for agricultural use or in road construction was produced by Ray Frings, Tomah; Otto Meyer, Sparta; and Schendel Bros., Norwalk.

OCONTO

Agricultural limestone was produced by the Oconto county agent, and sand and gravel were produced by the Belongia Construction Co. and the Oconto County Highway Department, Oconto, and John Jaworski, Sobieski.

ONEIDA

Sand and gravel were produced by Musson Bros. and the Oneida County Highway Department, Rhinelander. Musson Bros. also produced crushed stone for road construction.

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OUTAGAMIE

Earl Meating-Francis LeBeau, New London, produced limestone for flagging, building, and road purposes and for agricultural use. Sand and gravel were produced by Landwehr & Hackle, Seymour. Expanded perlite was produced at the Appleton plant of Midwest Perlite Co.

OZAUKEE

Sand and gravel, chiefly for building and road construction were produced by O & W Gravel Co. and Ozaukee County Highway Department, both of Port Washington; and Otto Ladwig & Sons, Inc., and Ozaukee Sand & Gravel Co., Milwaukee.

PIERCE

Pierce County Agricultural Conservation Association produced some crushed limestone. Blast sand was produced by Maiden Rock Silica Sand Co., Maiden Rock, and molding and blast sands were produced by Bay City Sand Co., Bay City. Sand and gravel for building and road construction were produced by Funk Bros., Bay City; River Falls Sand & Gravel, Inc., River Falls; Rush River Sand & Gravel Co., Ellsworth; and the Pierce County Highway Department.

POLK

Mineral production in Polk County was chiefly for building or road construction. Basalt was produced by Dresser Trap Rock Co., Dresser, for riprap, railroad ballast, and other uses. Limestone was produced by the Polk County agricultural agent, and sand and gravel were produced by Minneapolis, St. Paul & Sault Ste. Marie Railroad Co. and the Polk County Highway Department.

PORTAGE

Dimension sandstone was produced by the Ellis Stone Construction Co., Stevens Point. Other sandstone for riprap, etc., was produced by Green Bay & Western Railroad and the city of Stevens Point. Marl for agricultural use was produced by Bert Somers, Stevens Point, and Clifford Caldwell, Waupaca. Sand and gravel were produced by Clifford Wimme and Portage County Highway Department, Stevens Point, and F. F. Mengel Co., Wisconsin Rapids.

PRICE

Minneapolis, St. Paul & Sault Ste. Marie Railroad Co. produced sand and gravel for railroad ballast.

RACINE

Clays for use in heavy clay products was dug by the Union Grove Drain Tile Co., Union Grove. Limestone was produced by the Consumers Company of Illinois, Chicago, Ill. Its market includes that for flux, railroad ballast, refractory, agricultural stone, and building and road construction. Sand and gravel were produced by J. W. Peters & Sons, Inc., Burlington, and the Racine County Highway Department.

RICHLAND

Crushed limestone was produced by the county highway department.

ROCK

Limestone for building and road construction or agstone was produced by Frank Bros., Milton Junction; Peter J. Roth and P. W. Ryan Sons, both of Janesville; and the Rock County Highway Department. Engine and other sands were produced by the Consumers Company of Illinois, Chicago, Ill. Sand and gravel were produced by Atlas Sand & Gravel Co., Janesville; Chicago, Milwaukee, St. Paul & Pacific Railway Co.; Consumers Company of Illinois, Chicago, Ill.; Edgerton Sand & Gravel Co., Edgerton; Janesville Sand & Gravel Co., Janesville; Luety Bros., Beloit; and the Rock County Highway Department.

RUSK

Sand and gravel were produced by Koepke Sand & Gravel Co., Appleton, and the Rusk County Highway Department.

ST. CROIX

Limestone was produced by Ed. J. Leary estate, River Falls; Wilson Rock & Limestone Co., Wilson; and the St. Croix County Highway Department.

SAUK

Grinding pebbles and tube-mill liners were produced by the Baraboo Quartzite Co., Baraboo. This company also produced sandstone for refractory uses. Other companies in the county that produced sandstone were General Refractories Co., Philadelphia, Pa.; John D. Geoghegan, Baraboo; and Harbison-Walker Refractories Co., Pittsburgh, Pa. Sand and gravel for construction and road use were produced by Deppe Lumber Co., Deane Dubois, and Sauk County Highway Department, all of Baraboo.

SAWYER

The county highway department produced sand and gravel.

SHAWANO

Limestone for use in concrete aggregate as road metal and agstone was produced by Braun Construction Co., Fond du Lac, and the Shawano County Agricultural Committee. Sand and gravel were produced by Herman Dey, Tigerton; Ed. J. Murphy Sand & Gravel Co., Bonduel; and M. J. Zimmerman and the Shawano County Highway Department, both of Shawano.

SHEBOYGAN

The Sheboygan County agricultural agent produced limestone, chiefly for agricultural use. Sand and gravel were produced by Crystal Lake Crushed Stone Co., Sheboygan; Elkhart Moraine Sand & Gravel Co., Elkhart Lake; the city of Sheboygan; and the Sheboygan County Commission.

TAYLOR

The county highway department produced sand and gravel.

TREMPEALEAU

Agricultural limestone was produced by the Neuheisel Lime Works of Eau Claire.

VERNON

Crushed limestone was produced by Ellefson Bros., Viroqua, and the Vernon County Highway Department. The county also produced sand and gravel.

VILAS

Sand and gravel were produced by the Chicago & North Western Railway Co.; Wissota Sand & Gravel Co.; Eau Claire, and the Vilas County Highway Department.

WALWORTH

Agstone was produced by H. E. Wheeler of Elkhorn. Sand and gravel, chiefly for building and road construction, were produced by Bernard R. Amon and Mann Bros., both of Elkhorn; Lake Geneva Sand & Gravel Co., Fontana; R. W. Miller, Lake Geneva; and Delavan Sand & Gravel Co., George Booth, and J. F. Thorpe, all of Delavan.

WASHBURN

Martin Spexet, Spooner, produced marl for agricultural use.

WASHINGTON

Sand and gravel were produced by John B. Jacklin, Richfield; Laubenstein & Portz, Inc., Hartford; Northern Sand & Gravel Co. and Fred C. Schultz & Son, both of West Bend; Palmer Crushing Co., Slinger; and the Washington County Highway Commission. Limestone was also produced by the county highway commission, and the Northern Sand & Gravel Co. produced marl for agricultural purposes.

WAUKESHA

Peat, used chiefly as a soil conditioner, was produced by the Tardif Domestic Peat Sales Co., Delafield. Dimension stone for construction and architectural use was produced by Cawley Quarry, Fonda Lannon Stone Co., White Rock Lannon Co., and Wisconsin Lannon Co., all of Lannon; Quality Limestone Products, Inc., and Halquist Lannon Stone Co., Sussex; Loyal Lannon Stone Co., Pewaukee; and W. G. Perren and Waukesha Limestone Co., Inc., both of Waukesha. Several of these companies also have lime plants, and most of them market the discard from preparation of dimension stone as material for concrete aggregate or for road metal. Sand and gravel, chiefly for building or road construction, were produced by Wm. Buege, Jaeger Sand & Gravel Co., Ed. Lutz Sand & Gravel Co., Inc., and State Washed Sand & Gravel Co., all of Milwaukee; Hartland Washed Sand & Gravel Co. and Valley Sand & Gravel Co., both of Waukesha; Northwest Sand & Gravel Co., Brookfield; A. W. Nowatske, Mukwonago; Vogt, Inc., Okauchee; and the Waukesha County Highway Department.

WAUPACA

Hockers Brick Co., New London, produced clays for use in manufacturing heavy clay products. Limestone for concrete, road metal, or agstone was produced by the Clinton Limestone Co., Clinton. Sand and gravel were produced by C. H. Peters, Fremont, and Ed. Weichoff, Seymour. Ed. Weichoff also produced blast sand.

WAUSHARA

Marl was produced and marketed by Thomas Lundberg, Coloma; Theodore Anderson, Wild Rose; William Edwards, Wautoma; and Leon Hendricksen, Redgranite. Granite for building stone and riprap was produced by the Lohrville Stone Co., Lohrville.

WINNEBAGO

Limestone was produced by Badger Highways Co., Inc., Menasha; Courtney & Plummer, Inc., Neenah; and Lutz Co. and Oshkosh Stone Co., both of Oshkosh. Sand and gravel were produced by Courtney & Plummer, Inc., Neenah; Schultz Sand & Gravel, Inc., Appleton; and Cook & Brown Lime Co., Friedrich & Loots, and Winnebago County Highway Department, all of Oshkosh.

WOOD

Sandstone for building and architectural purposes was produced by Felix Klesmith and Ellis Stone Construction Co., both of Stevens Point. The Wood County Highway Department produced crushed sandstone and crushed granite for use as concrete aggregate and road metal.

OTHER

No mineral output was reported in 1952 for Adams, Eau Claire, Florence, Jackson, and Pepin Counties.

The Mineral Industry of Wyoming

By A. J. Martin [1]

FUELS supplied 91 percent of the total value of the mineral output of Wyoming in 1952. Until 1919 coal was the mineral of chief value produced; it was then surpassed by petroleum, which has since maintained the lead, except in 1931 and 1933, and usually by a wide margin. Petroleum output has expanded greatly in recent years. The 68,074,000 barrels produced in 1952, although a little less than the record output of 1951, more than doubled that in 1944, and the value was over 4 times as high as in 1944. The oilfields extend into 19 of the State's 23 counties. Natural-gas production has also increased at a rapid rate and reached a record high in 1952. Coal output, which has trended moderately downward in quantity since 1945, decreased 5 percent in 1952 from 1951. Coal has been mined in nearly all Wyoming counties at some time in the past, and 10 counties had individual mines that produced 1,000 tons and over in 1952.

Bentonite production, in which Wyoming again ranked first among the States, increased to a new record high of 692,900 tons in 1952. The three principal-producing counties—Crook, Weston, and Big Horn—shared the increase.

Trona mining and conversion of the trona to soda ash at the Westvaco property in Sweetwater County continued on an expanding scale in 1952 and has become an important new industry in the State. About 5 years was spent in underground development, with some production, and in building surface-treatment plants and other facilities.

Since 1950 Wyoming has been one of the larger producers of sulfur recovered as a byproduct from sour natural gas. The extraction plants are at Worland and Elk Basin. The quantity of sulfur produced in 1952 was about the same as in 1951, but the quantity sold was not as large.

Other nonmetallic minerals mined in substantial quantity were phosphate rock, common clay or shale, sand and gravel, granite, limestone used in sugar-beet factories, and limestone, shale, and gypsum used for cement manufacture.

The output of iron ore (chief metallic ore mined in Wyoming) decreased 21 percent in 1952 from 1951. Although considerable gold and copper have been produced in Wyoming during some periods of the State's history, the output of gold in 1952 was only 1 ounce, and there was no production of copper. Activity in uranium prospecting and exploration was sustained throughout the year.

[1] Assistant chief for mineral statistics, Region IV, Bureau of Mines, Denver, Colo.

TABLE 1.—Mineral production in Wyoming, 1951–52 [1]

Mineral	1951		1952	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays (except for cement)	483,050	[2] $5,999,451	706,748	$9,176,507
Coal	6,429,633	26,937,896	6,088,421	26,451,530
Gold (recoverable content of ores, etc.) troy ounces	9	315	1	35
Iron ore (usable) long tons, gross weight	616,949	[3]	484,945	[3]
Natural gas thousand cubic feet	71,508,000	5,363,000	75,313,000	5,874,000
Natural-gas liquids:				
Natural gasoline 42-gallon barrels	1,176,000	3,511,000	1,226,000	4,016,000
LP-gases do	784,000	1,634,000	928,000	1,881,000
Petroleum (crude) do	68,929,000	148,200,000	[4] 68,074,000	[4] 148,400,000
Phosphate rock long tons	178,948	1,186,523	137,675	919,987
Pumice	1,867	9,141	2,851	10,918
Sand and gravel	2,347,078	1,730,900	2,426,999	1,738,548
Silver (recoverable content of ores, etc.) troy ounces	2	2		
Stone (except limestone for cement)	1,645,475	1,857,267	1,466,567	1,688,890
Undistributed: Cement, gem stones, gypsum, sodium carbonate and sulfate, sulfur ore for direct agricultural use, vermiculite, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		5,408,858		4,337,869
Total Wyoming		[2] 201,838,000		204,495,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels and gypsum are strictly production.
[2] Revised figure.
[3] Value included with "Undistributed."
[4] Final figure. Supersedes preliminary figure given in commodity chapter.

TABLE 2.—Average prices of certain mineral commodities, 1951–52 [1]

Mineral	Unit	1951	1952
Bentonite	Short ton	$12.86	$13.23
Common clay or shale	do	1.02	.56
Coal	do	4.19	4.34
Natural gas	Thousand cubic feet	.075	.078
Petroleum (crude)	42-gallon barrels	2.15	2.18
Phosphate rock	Long ton	6.63	6.68
Pumice	Short ton	4.82	3.86
Sand and gravel	do	.74	.72
Stone	do	1.13	1.15

[1] Prices are based on average value f. o. b. mines or wells reported by the producers. More detail on prices by grades and markets will be found in the commodity chapter on volume I of this series.

The Government's program of assistance in financing exploration in search of reserves of strategic and critical minerals, authorized by the Defense Production Act of 1950 and begun in April 1951 by the Defense Minerals Administration, was continued in 1952 under the Defense Minerals Exploration Administration. The Government pays 50, 75, or 90 percent of the cost, depending upon the minerals sought, for approved projects on a modified matching basis. Two projects, both covering sulfur, were undertaken in Wyoming. Table 3 shows the amount of Government and private participation in each project. Repayment of the Government contribution, without interest, through a royalty on net returns from products sold is required if ore is discovered or delineated and the ore is mined within 10 years of the date of the contract.

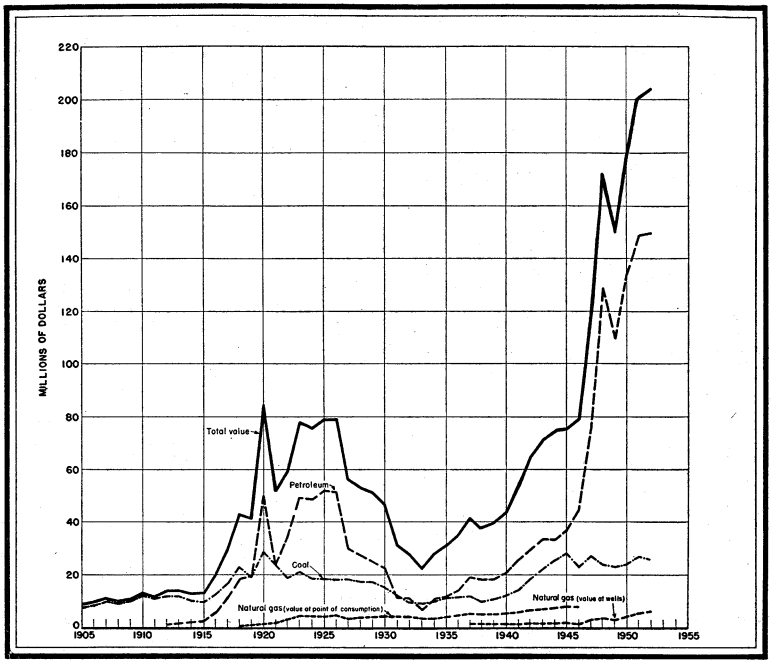

FIGURE 1.—Value of coal, petroleum, and natural gas and total value of all minerals produced in Wyoming, 1905–52.

TABLE 3.—Defense Minerals Exploration Administration contracts from the beginning in 1951 through December 31, 1952

Name of commodity and contractor	Property	County	Date of contract	Participation	
				Government	Private
Sulfur					
Continental Sulphur & Phosphate Corp.	Sunlight Basin Sulphur Deposits.	Park	June 27, 1951	$39,705	$39,705
Kenneth L. Porter	Hope Placer, Brimstone No. 1.	Hot Springs	Aug. 23, 1951	49,575	49,575
Total				89,280	89,280

REVIEW BY MINERAL COMMODITIES

METALS

Alumina (Experimental Plant).—The experimental alumina plant at Laramie, built by the Defense Plant Corporation during World War II, was reactivated in 1952 by the Bureau of Mines under a permit issued by the General Services Administration for 2 years with an option for 1 year's extension. The project was authorized in the fiscal year ended June 30, 1951, when funds were appropriated for completing and rehabilitating the plant. The purpose of the project is to demonstrate the feasibility of producing alumina suitable for the production of aluminum metal from anorthosite and other aluminum silicate rocks. Extensive deposits of anorthosite occur in the

Laramie Range in Wyoming and extend into Colorado. The Bureau's work at the plant was begun in June 1952, and several months were spent on construction, rehabilitation, installation of equipment, and setting up a pilot plant to be operated in conjunction with the main alumina plant. In December operations were begun in the main plant, using stockpiled anorthosite and limestone. The results of a previous investigation of a process for the recovery of alumina from Wyoming anorthosite have been published.[2]

Copper.—No copper has been recovered from Wyoming ores since 1946. Some exploration for copper was done in 1952 by core drilling at the Copper King property in the Silver Crown or Hecla district in Laramie County 22 miles west of Cheyenne. The 157-foot shaft was cleaned out and the 600-foot tunnel reopened in 1951. In the past copper has been 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. The most active periods were 1883 and from 1899 to 1909.

Gold and Silver.—The only output of gold and silver reported from Wyoming in 1952 was 1 ounce recovered from the Las Vegas placer in the Atlantic City district, Fremont County. Gold mining in Wyoming during the 10-year period ended in 1952 consisted of small-scale intermittent operations, except in 1947, when the Carissa mine in the Atlantic City district, equipped with a 70-ton amalgamation-cyanidation mill, produced 1,455 ounces of gold and 84 ounces of silver, valued altogether at $51,000.

TABLE 4.—Mine production of gold, silver, copper, and lead, 1943–47 (average), 1948–52, and total, 1867–1952, in terms of recoverable metals [1]

Year	Material [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)		Copper		Lead		Total value
		Fine ounces	Value	Fine ounces	Value	Short tons	Value	Short tons	Value	
1943–47 (average)	1,236	323	$11,291	31	$26	[3]	$65	1	$103	$11,485
1948	867	115	4,025	11	10	-------	----------	-------	-------	4,035
1949	[4] 1,800	389	13,615	21	19	-------	----------	-------	-------	13,634
1950	-------	-------	----------	-------	-------	-------	----------	-------	-------	----------
1951	10	9	315	2	2	-------	----------	-------	-------	317
1952	-------	1	35	-------	-------	-------	----------	-------	-------	35
1867–1952	[5]	80,041	1,909,763	74,821	51,914	16,326	5,684,372	14	1,486	7,647,535

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, and ore shipped directly to smelters during the calendar year indicated.
[2] Does not include gravel washed.
[3] Only production less than ½ ton of recoverable copper produced in 1945 from the Bartlett (Copper King) mine in Laramie County.
[4] 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.
[5] Figure not available.

Iron Ore.—Shipments of iron ore from Wyoming in 1952 totaled 484,900 long tons, a decrease of 132,000 tons from 1951. The Sunrise mine of the Colorado Fuel & Iron Corp. in the Hartville district north of Guernsey in Platte County has been one of the prominent

[2] Brown, R. A., Cservenyak, F. J., Anderberg, R. C., Kandiner, H. J., and Frattali, F. J., Recovery of Alumina From Wyoming Anorthosite by the Lime-Soda-Sinter Process: Bureau of Mines Rept. of Investigations 4132, 1947, 127 pp.

iron-ore producers of the United States every year since 1900, except 1932. The ore is shipped to the company steel works at Pueblo, Colo. The Good Fortune mine, also in the Hartville district, was under development in 1952. The total recorded output of iron ore in Wyoming, nearly all from the Sunrise mine, from 1900 through 1952 was 25,156,550 long tons.

TABLE 5.—Production of iron ore, 1900–52, in long tons

Year	Quantity	Year	Quantity	Year	Quantity	Year	Quantity
1900	73,663	1914	366,962	1928	491,280	1942	957,027
1901	134,161	1915	434,513	1929	639,477	1943	814,203
1902	209,272	1916	545,774	1930	320,023	1944	713,759
1903	214,880	1917	543,846	1931	180,771	1945	606,005
1904	135,167	1918	447,884	1932		1946	619,317
1905	474,545	1919	398,613	1933	288,640	1947	651,471
1906	590,201	1920	406,501	1934	116,562	1948	689,591
1907	558,849	1921	234,701	1935	339,134	1949	539,554
1908	354,012	1922	332,800	1936	507,278	1950	491,906
1909	542,744	1923	378,747	1937	707,907	1951	616,949
1910	656,629	1924	363,096	1938	275,995	1952	484,945
1911	479,922	1925	489,622	1939	587,892		
1912	562,219	1926	630,387	1940	831,314	Total	25,156,550
1913	537,111	1927	602,877	1941	985,852		

Lead.—No lead ore was mined in Wyoming in 1952 or 1951. Output in other years comprised small tonnages in 1932, 1934, 1935, 1942, and 1945. The ore came from the Spring Creek district in Carbon County, the Hurricane district in Crook County, and the Douglas Creek district in Albany County.

Titanium.—The Union Pacific Railroad did magnetic surveying and core drilling on titaniferous magnetite deposits in the Iron Mountain area in 1952. The results of the Bureau of Mines investigations on the recovery of titania, iron, and byproducts from low-grade titaniferous ores found in the Iron Mountain area were published during the year.[3] In 1948 the Bureau did exploratory drilling on the Shanton magnetite-ilmenite deposits in Albany County.

Uranium.—Prospecting for uranium in Wyoming continued in 1952, spurred by the Government minimum guaranteed price, with the additional incentive of development and haulage allowances, special premiums for high-grade ore, and a bonus for initial production under certain conditions. Discoveries of uranium-bearing rock were reported in a number of localities, including the Pumpkin Buttes area of Powder River Basin, the Black Hills area of Wyoming, in Southern Fremont County, and in the Miller Hill area of Carbon County. Reports on the deposits in the Miller Hill and Pumpkin Buttes areas were published.[4] The Homestake Mining Co. conducted a uranium exploration program in the Black Hills area of Wyoming.

The Atomic Energy Commission and the Geological Survey each prepared publications showing results of geological studies and other work done in the search for uranium deposits. Volume I of Minerals Yearbook, 1952 (chapter on Uranium, Radium, and Tho-

[3] Back, A. E., Chindgren, C. J., and Peterson, R. G., Treatment of Titaniferous Magnetite Ore From Iron Mountain, Wyo.: Bureau of Mines Rept. of Investigations 4902, 1952, 15 pp.

[4] Love, J. D., Preliminary Report on Uranium Deposits in the Miller Hill Area, Carbon County, Wyo.: Geol. Survey Circ. 278, 1953, 10 pp.

Love, J. D., Preliminary Report on Uranium Deposits in the Pumpkin Buttes Area, Powder River Basin, Wyo.: Geol. Survey Circ. 176, 1952, 37 pp.

rium) contains a general review of the uranium industry, with references to literature published.

NONMETALS

Bentonite.—Output of bentonite in Wyoming has increased each year since 1939 except 1942 and 1949; the quantity produced in 1952 was nearly 12 times that in 1938. The value of the output rose from $530,800 in 1938 to $9,168,700 in 1952. As the largest use of Wyoming bentonite is for conditioning rotary muds in drilling oil wells, the stepped-up drilling activity in the Rocky Mountain region was among the factors contributing to the increased bentonite production. Another important use of bentonite is for preparing molding sands in foundries.

TABLE 6.—Production of bentonite, 1934–52, in short tons

Year	Quantity	Value	Year	Quantity	Value
1934	27,161	$246,548	1945	199,293	$1,686,912
1935	34,415	350,846	1946	212,530	1,988,918
1936	55,090	520,852	1947	259,084	2,583,255
1937	67,958	659,111	1948	383,815	3,682,734
1938	58,911	530,834	1949	350,644	3,556,480
1939	76,133	777,722	1950	394,939	4,091,571
1940	91,714	976,844	1951	465,254	5,981,655
1941	145,574	1,369,057	1952	692,853	9,168,708
1942	139,410	1,259,863			
1943	159,252	1,389,644	Total	4,010,168	42,532,747
1944	196,138	1,711,193			

As usual, Wyoming produced the largest quantity of bentonite and South Dakota ranked second. The South Dakota output and the largest part of the Wyoming production are mined in the Black Hills region, which extends from South Dakota into Crook and Weston Counties, Wyoming. Other Wyoming counties that produced bentonite in 1952 were Big Horn, Natrona, Johnson, and Albany. The producing companies were the National Lead Co., Baroid Sales Division, operating in Crook and Weston Counties; Wyodak Chemical Division of the Federal Foundry Supply Co., Weston County; Eastern Clay Products Department, International Minerals & Chemical Corp., Crook County; American Colloid Co., Weston County; Black Hills Bentonite, Inc., Crook County; Wyo-Ben Products Co. and the Magnet Cove Barium Corp., Big Horn County; Benton Clay Co. plant, Casper, Natrona County (mines in Johnson and Natrona Counties); and the United Products Co., Rock River, Albany County (closed during part of the year). All the companies employ opencut mining methods. Preparation for marketing consists essentially of crushing, drying, grinding, and packing.

The price of bentonite depends upon quality and other considerations and therefore is not uniform for all producers. The average value per ton as reported by the Wyoming producers to the Bureau of Mines in 1952 increased to $13.23 from $12.86 in 1951 and $10.36 in 1950.

Cement.—The Wyoming output of cement comes from the plant of the Monolith Portland Midwest Co. at Laramie. The plant operated continuously in 1952, but its output of cement decreased moderately from 1951. The limestone and shale used in the plant were mined in the vicinity of Laramie; the gypsum was mined 45 miles north and the coal 80 miles north of Laramie.

Clays (Except Bentonite).—Miscellaneous clays were produced by the Lovell Clay Products Co. in Big Horn County and the Sheridan Press Brick & Tile Co. in Sheridan County.

Gem Stones.—No substantial activity in the mining of gem stones was reported in Wyoming in 1952 or 1951. Operations in other recent years included one by the American Jade Co. in 1949, when the company did considerable development work and mining on its jade claims in the Granite Hills area along the Sweetwater River in Fremont County.

Gypsum.—A moderate quantity of gypsum was mined by the Wyoming Construction Co. in Albany County in 1952.

Phosphate Rock.—The output of phosphate rock in 1952 came from the Leefe open-pit mine 2½ miles northwest of Sage in Lincoln County. The mine was operated by the San Francisco Chemical Co., which shipped the rock to plants outside the State.

Pumice.—Pumice for lightweight building aggregate was produced by the Superior Pumice Co., Inc., from a deposit near Superior, Sweetwater County.

Sand and Gravel.—The total output of reported sand and gravel increased slightly in 1952 over 1951. Washed, screened, or otherwise prepared material comprised 87 percent of the total production in 1952. Of the 2,427,000 tons produced, 866,000 tons came from commercial enterprises and 1,561,000 tons from Government-and-contractor operations. The leading counties in commercial production, in order of importance, were Fremont, Albany, Park, and Natrona.

Sodium Carbonate and Sulfate.—The mining and treatment of trona, begun in 1948 by the Intermountain Chemical Corp. (a Food Machinery & Chemical Corp. subsidiary) at its Westvaco property 15 miles west of Green River, Sweetwater County, was continued on an expanding scale in 1952. Previously, several years were spent in exploring and developing the deposit. According to published data,[5] expenditures on mine development and pilot plant amounted to $2,000,000, and the investment in surface equipment and processing plant to convert trona to soda ash totaled $18,000,000.

The deposit is a bed of nearly pure trona 10 to 20 feet thick at an average depth of 1,500 feet. It was originally discovered in 1938 in drilling a wildcat oil well. The first working shaft (circular and 12 feet in diameter) was sunk in 1947. Over 7 miles of development drifts and other openings was driven into the trona bed. A second circular shaft (14 feet in diameter and 1,600 feet deep) 1,200 feet from the first was nearing completion at the end of 1952. Mining is similar in many respects to coal mining; it consists of undercutting, drilling, blasting, loading onto shuttles, and dumping onto conveyors. The main conveyor dumps the ore into an underground crusher, from which the crushed ore drops into a storage hopper and is raised from there to the surface in 7-ton skip hoists.

The processing plant can handle 600,000 tons of crude trona yielding 300,000 tons of soda ash a year. A new 10-mile pipeline brings 600,000 gallons of water daily from Green River. A 20-mile pipeline delivers natural gas to the power plant that provides steam and electric power.

[5] Chemical Engineering, Trona—Soda Ash: Vol. 60, No. 5, May, 1953, pp. 118, 120.

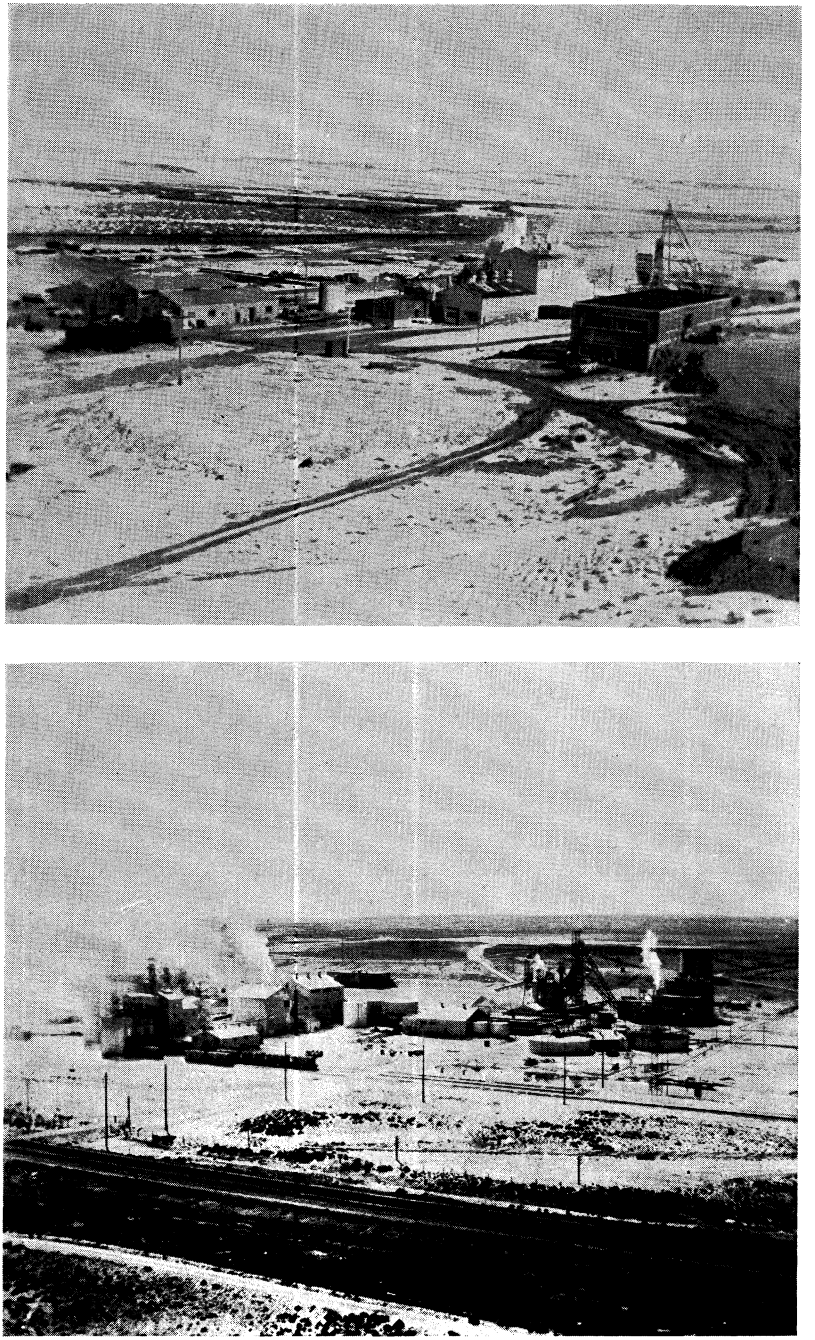

FIGURE 2.—Westvaco mine shaft and soda-ash plant, Intermountain Chemical Corp., Sweetwater County, Wyo., Feb. 1952.

(Courtesy, International Chemical Corp.

The crude trona is crushed, screened, and fed to dissolvers where the trona is dissolved in a mixture of water and a liquor from a settling tank at the crystallizer discharge. The temperature of the dissolver solution is kept at the boiling point. From the dissolvers the solution goes to clarifiers and from there to a thickener. Waste from the clarifiers contains the shale that is in the trona. Overflow from the thickener is filtered and then goes to crystallizers. The product from the crystallizers, which is 20 to 30 percent solids, passes through a settler and centrifuge to a 90-foot calciner, within which a chemical change takes place and refined soda ash is produced.

Most of the ash from the calcining kiln is cooled and conveyed to storage for bulk shipments or bag filling. Part of it is hydrated to dense ash. The soda ash is marketed through the Westvaco Division of the Food Machinery & Chemical Corp. Soda ash is used in manufacturing glass, producing alumina, and treating water; it has many other metallurgical and chemical uses.

From 1928 to 1947 the Iowa Soda Products Co. was a steady producer of sodium sulfate from Bull Lake, one of the several saline lakes a few miles north of Rawlins, Carbon County. The processing plant was destroyed by fire in 1947; since that time operations have consisted of an evaporating process, using the sun and wind as drying agents.[6] Sodium sulfate was also produced by William E. Pratt from deposits around Casper in Natrona County.

Stone.—The quantity of stone produced in Wyoming (including that crushed for railroad ballast but excluding that used for cement) in 1952 was 1,466,600 tons, an 11-percent decrease from 1951. Important producers included the Union Pacific Railroad Co. granite quarry (operated by Morrison-Knudsen Co.) in Granite Canyon west of Cheyenne and the Horse Creek limestone mine of the Great Western Sugar Co. in Laramie County; the Guernsey Stone Co. and Chicago, Burlington & Quincy Railroad Co. quarries near Guernsey in Platte County; and the Monolith Portland Midwest Co. quarry in Albany County (producing limestone used in cement manufacture).

Sulfur.—In recent years Wyoming has become an important producer of sulfur through extraction of elemental sulfur from sour natural gas produced in the Big Horn Basin in Park and Washakie Counties. The principal producers were the Texas Gulf Sulphur Co. extraction plant at Worland, which receives gas from the Pure Oil Co. wells in the oil fields north of Worland, and the Stanolind Oil & Gas Co. plant at Elk Basin, which handles hydrogen sulfide-bearing gas from company wells. Some sulfur-bearing ore was shipped from Cody by the Wyoming Gulf Sulphur Corp.

Vermiculite.—A small tonnage of vermiculite was shipped from the Mikolite Corp. property near Encampment, Carbon County, in 1952.

MINERAL FUELS

The total Wyoming production and value of the mineral fuels in 1951 and 1952 are shown in table 1 of this chapter. In 1952 petroleum represented 72 percent of the total value of the mineral output of the

[6] Young, W. A., Investigation of Sodium Sulfate Deposits in Bull Lake, Carbon County, Wyo.: Bureau of Mines Rept. of Investigations 4816, 1951, 9 pp.

State, coal 13 percent, and natural gas and natural-gas liquids 6 percent—a total of 91 percent for fuels compared with 9 percent for metals and nonmetallic minerals combined. Table 7 shows production in 1951 and 1952 by counties for coal, and table 8 gives production by fields for petroleum. Additional statistics and a summarized review covering oil and natural gas production and well drilling may be found in volume II of this series.

TABLE 7.—Production of coal, 1951–52, by counties [1]

County	1951			1952		
	Production (net tons)	Average value per ton	Total value	Production (net tons)	Average value per ton	Total value
Campbell	307,074	$1.44	$442,187	320,945	$1.38	$442,900
Carbon	1,234,948	4.57	5,643,712	1,022,928	5.23	5,346,000
Converse	4,668	3.69	17,225	8,707	3.62	31,500
Fremont	5,271	5.63	29,676	4,043	5.60	22,600
Hot Springs	24,465	6.26	153,151	17,104	7.43	127,100
Johnson	2,797	4.00	11,188	1,659	5.39	8,900
Lincoln	668,513	3.01	2,012,224	819,677	2.63	2,152,500
Sheridan	680,413	3.18	2,163,713	611,074	4.42	2,700,000
Sublette	1,128	4.48	5,053	1,016	4.90	5,000
Sweetwater	3,500,356	4.70	16,459,767	3,281,268	4.76	15,615,030
Total	6,429,633	4.19	26,937,896	6,088,421	4.34	26,451,530

[1] Figures are based on final complete returns from all operators known to have produced 1,000 tons and over per year.

TABLE 8.—Production of crude petroleum, 1951–52, by fields

[Thousands of barrels]

Field	1951	1952	Field	1951	1952
Big Muddy	878	1,197	Little Buffalo	1,001	951
Big Sand Draw	2,185	2,387	Lost Soldier-Wertz, etc.	5,225	5,299
Bonanza	(1)	1,620	Mush Creek	747	773
Byron-Garland	5,186	4,343	Oregon Basin	3,717	2,688
Cole Creek	1,317	1,820	Salt Creek	4,063	4,159
Elk Basin	7,292	8,041	Steamboat Butte	3,018	2,056
Fiddler Creek	2,126	1,321	Sussex-Meadow Creek	3,043	2,960
Frannie	3,703	3,709	Winkleman	817	811
Grass Creek	1,816	2,395	Worland	1,643	1,421
Greenrock	1,597	2,414	Other fields [1]	13,300	12,739
Hamilton Dome	3,870	3,075			
Lance Creek	2,385	1,895	Total	68,929	68,074

[1] Includes crude oil consumed on leases and net change in stocks held on leases for entire State.

REVIEW BY COUNTIES

The following review is confined to counties that produced substantial quantities of minerals other than fuels and noncommercial sand and gravel and crushed stone used by States, counties, and municipalities.

ALBANY

The Monolith Portland Midwest Co. continued to operate its quarry just east of Laramie and produced limestone for manufacturing cement in the company plant at Laramie. Shale and gypsum, also used in making cement, were mined in Albany County. During

part of 1952 the United Products Co. mined bentonite east of Rock River and processed it in the company mill at Rock River. Reports indicated that the mill was later sold for dismantling. The output of commercial sand and gravel increased considerably over that in 1951. The metal mines in the Douglas Creek district, which in the past have produced copper, gold, silver, and a little lead, have been idle in recent years.

TABLE 9.—Value of mineral production in Wyoming, 1951–52, by counties,[1] and principal minerals[1] produced in 1952

County	1951	1952	Principal minerals in order of value[1]
Bighorn	(2)	$1,274,776	Bentonite, common clay or shale.
Campbell	$468,482	442,904	Coal.
Converse	17,225	31,519	Do.
Crook	3,270,551	3,834,453	Bentonite.
Fremont	29,993	205,077	Sand and gravel, coal.
Hot Springs	171,332	139,137	Coal, sand and gravel.
Johnson	[3] 11,188	[3] 8,942	Coal, bentonite.
Laramie[4]	2,042,484	1,930,423	Stone, sand and gravel.
Lincoln	3,195,157	3,067,528	Coal, phosphate rock.
Natrona	[3] 88,713	[3] 300,184	Bentonite, sand and gravel, sodium sulfate.
Sheridan	2,258,967	2,787,046	Coal, stone, sand and gravel, clay.
Sublette	5,053	4,978	Coal.
Sweetwater	17,595,042	16,599,247	Coal, sodium carbonate and sulfate, pumice, sand and gravel.
Teton	220,626	222,622	Sand and gravel.
Uinta	13,896	500	Do.
Weston	2,711,104	3,785,859	Bentonite.
	32,099,813	34,635,695	
Petroleum, natural gas, and LP-gases.	158,708,000	160,171,000	
Undistributed	[5] 11,030,187	[6] 9,688,305	
Total	201,838,000	204,495,000	

[1] Excluding petroleum, natural gas, and natural-gas liquids.
[2] Value included with "Undistributed" to avoid disclosing value of individual company production.
[3] Value of bentonite in Johnson County included in value for Natrona County.
[4] Includes some noncommercial sand and gravel from other counties.
[5] Includes value of mineral production for the following counties; Albany, Carbon, Goshen, Park, Platte, Washakie.
[6] Includes value of mineral production and principal minerals produced in the following counties: Albany (cement, bentonite, sand and gravel); Carbon (coal, sodium sulfate); Goshen (sand and gravel); Park (sulfur, sand and gravel); Platte (iron ore, stone); Washakie (sulfur)

BIG HORN

The Magnet Cove Barium Corp., which in 1951 had been developing its bentonite properties northeast of Greybull and building a processing plant, operated continuously in 1952. The crude bentonite is mined from open pits and trucked several miles to the Big Horn River; it is transported across by tramway to the plant. The Wyo-Ben Products Co. continued to operate its bentonite mine and mill north of Greybull. The Lovell Clay Products Co. mined shale from an open pit near Lovell for use in making brick and other clay products in its plant at Lovell.

CARBON

Although Carbon County's mineral output is chiefly coal, the county has produced important quantities of other minerals, including sodium sulfate, obtained from Bull Lake north of Rawlins. The Iowa Soda Products Co. has been producing from this deposit for

many years. Vermiculite has been produced intermittently; in 1952 a small tonnage was shipped by the Mikolite Corp. from a deposit in the Encampment area. The metal mines in the Encampment and Spring Creek districts have produced copper, gold, silver, and a little lead in the past but have not been worked in recent years.

CROOK

Crook County is one of the large bentonite-producing counties of the Black Hills region. Part of the bentonite produced is processed in mills across the State line in South Dakota. The producers of bentonite in Crook County were the Eastern Clay Products Department, International Minerals & Chemical Corp.; National Lead Co., Baroid Sales Division, with mines in both Crook and Weston Counties; and the Black Hills Bentonite Co. at Moorcroft. The county production of bentonite increased 31 percent in 1952 over 1951.

FREMONT

The mineral output from Fremont County in 1952, other than petroleum and coal, was mostly in sand and gravel. In the past the Atlantic City district has produced considerable gold, but the output in 1952 was only 1 ounce valued at $35, produced from the Las Vegas placer. Since the end of World War II the only substantial gold production was 1,486 ounces valued at $52,010 in 1947, nearly all of which came from the Carissa mine. Copper has been mined in the Copper Mountain district, but the mines have been idle for many years.

JOHNSON

The Benton Clay Co. of Casper reported some bentonite production from Johnson County in 1952.

LARAMIE

The Horse Creek limestone mine of the Great Western Sugar Co. northwest of Cheyenne continued to be a large producer in 1952. The limestone is used mainly for the Great Western sugar-beet factories in Wyoming, Colorado, and Nebraska. The Granite Canyon quarry west of Cheyenne, a source of track ballast for the Union Pacific Railroad, was operated by the Morrison-Knudsen Co. Laramie County was one of the leading producers of commercial sand and gravel.

LINCOLN

The San Francisco Chemical Co. continued to produce phosphate rock from its Leefe open-pit mine near Sage west of Kemmerer in 1952; the output was not as large as in 1951. The rock was shipped to plants outside the State. A treatment plant for upgrading the phosphate shales to commercial-grade rock phosphate was under construction.

NATRONA

The Benton Clay Co. operated its bentonite mill at Casper on bentonite from mines in Natrona and Johnson Counties. Sodium

sulfate was produced by William E. Pratt from deposits in the Casper region. Natrona County was among the larger producers of sand and gravel.

PARK

Park County's output of minerals (besides petroleum and natural gas) consisted mainly of sulfur and sand and gravel. Elemental sulfur is extracted from hydrogen sulfide-bearing gas in the plant of the Stanolind Oil & Gas Co. at Elk Basin; the gas comes from wells in the Elk Basin area. The Wyoming Gulf Sulphur Corp. shipped some sulfur ore from its properties near Cody. Gypsum associated with sulfur is produced from open-pit deposits in the area.

PLATTE

In the Hartville district the Sunrise iron mine of the Colorado Fuel & Iron Corp., a large producer since 1900, was producing throughout 1952 from underground operations. The ore is hematite and is shipped to the company steelworks at Pueblo, Colo. The Good Fortune iron mine was under development by the E. C. Schroeder Co., Inc. The Hartville district also has copper-bearing deposits, but they have not been worked for many years.

The Guernsey Stone Co. operated a rock quarry near Guernsey for producing railroad ballast and riprap used by the Chicago, Burlington & Quincy Railroad Co.

SHERIDAN

The Sheridan Press Brick & Tile Co. mined clay and shale at Sheridan in 1952. Some sand and gravel and miscellaneous stone were produced in the county.

SWEETWATER

The mining and treatment of trona to make soda ash became an important industry in Wyoming with completion of exploration and development work and building of an $18,000,000 treatment plant on the property of the Intermountain Chemical Corp. (a Food Machinery & Chemical Corp. subsidiary) 15 miles west of Green River. The mine can produce 600,000 tons annually of crude trona, which, when treated, will yield about 300,000 tons of soda ash. The trona is mined from a bed 10 to 20 feet thick at a depth averaging about 1,500 feet. The mine is opened by 2 shafts about 1,600 feet deep and by 7 miles of underground workings. According to the annual report of the State inspector of coal mines, 79,245 tons of trona was mined in 1952. Some mill operations were still mostly in the testing stage, and work on the steel head frame of No. 2 shaft was not quite finished during the year.

Pumice for lightweight building aggregate and decorative stone was produced by the Superior Pumice Co., Inc., from deposits near Superior. Data on the physical properties of Superior pumice have been published.[7] Sweetwater is the largest coal-producing county in the State and an important producer of petroleum.

[7] Osterwald, Frank W. and Doris B., Wyoming Mineral Resources: Geol. Survey Wyoming Bull. 45, 1952, p. 173.

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TETON

Teton County was one of the larger producers of sand and gravel in the State in 1952.

WASHAKIE

The Texas Gulf Sulphur Co. plant 8 miles north of Worland is a large producer of elemental sulfur recovered as a byproduct from hydrogen sulfide gas. The plant receives gas from Pure Oil Co. wells in the Worland oil field, removes the hydrogen sulfide from the sour gas, and returns the sweetened gas to the Pure Oil Co. for recovery of natural gasoline and liquified petroleum gases. The residue gas is delivered to the Montana Dakota Utilities Co. for distribution.

WESTON

Bentonite production in Weston County increased 14 percent in quantity in 1952 over 1951. The producing companies were the American Colloid Co., with a mill at Upton (also operates in South Dakota); the Wyodak Chemical Division of the Federal Foundry Supply Co., with a mill at Upton; and the National Lead Co., Baroid Sales Division, with mines near Osage and a mill each at Clay Spur, Weston County, and Colony, Crook County.

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By Mabel E. Winslow

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