

## Minerals yearbook: Area reports. Year 1955, Volume III 1958

**Bureau of Mines** 

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# MINERALS YEARBOOK

1 9 5 5
Volume III of Three Volumes

AREA REPORTS



Prepared by the field staff of the BUREAU OF MINES
REGIONAL DIVISIONS OF MINERAL INDUSTRIES

#### UNITED STATES DEPARTMENT OF THE INTERIOR

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### **FOREWORD**

MINERALS YEARBOOK, 1955, published in three volumes, provides a record of performance of the Nation's minerals industry during the year, with enough background information to interpret the year's developments.

Volume I includes chapters on metal and nonmetal mineral commodities, with the exception of the mineral fuels. Included also are a chapter reviewing these mineral industries, a statistical summary, and chapters on mining technology, metallurgical technology, and

employment and injuries.

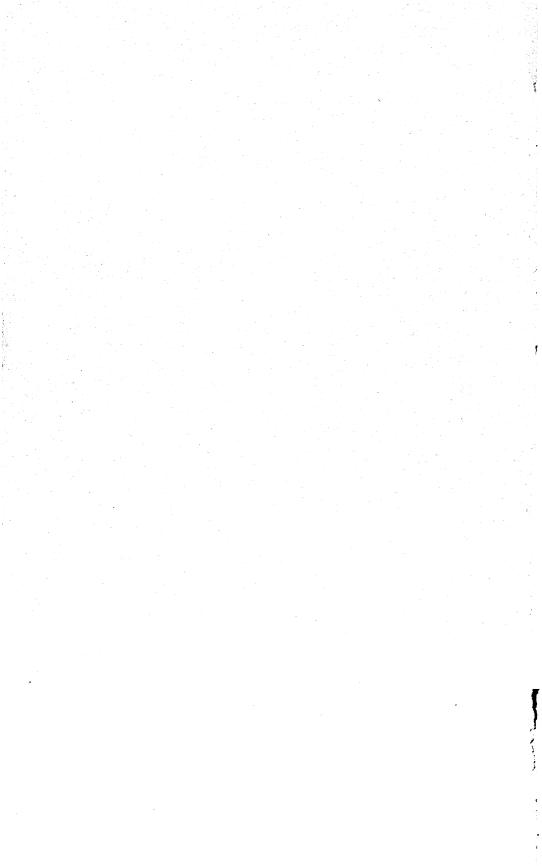
Volume II includes chapters on each mineral fuel, an employment and injuries presentation, and a mineral-fuels review chapter that summarizes developments in the fuel industries and incorporates all data previously published in the Statistical Summary chapter. Also now included in this review chapter are data on energy production and uses that have previously been included in the Bituminous Coal chapter.

Volume III is comprised of chapters covering each of the 48 States, plus chapters on the Territory of Alaska, the Territory of Hawaii and island possessions in the Pacific Ocean, and the Commonwealth of Puerto Rico and island possessions in the Caribbean Sea, including the Canal Zone. Volume III also has a Statistical Summary chapter, identical with that in Volume I, and another presenting employment

and injury data.

The data in the Minerals Yearbook are based largely upon information supplied by mineral producers, processors, and users, and acknowledgment is made of this indispensable cooperation given by industry. Information obtained from individuals by means of confidential surveys has been grouped to provide statistical aggregates. Data on individual producers are presented only if available from published or other nonconfidential sources, or when permission of the individuals concerned has been granted.

MARLING J. ANKENY, Director.



## **ACKNOWLEDGMENTS**

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

Alabama: Geological Survey of Alabama. Alaska: Alaska Department of Mines.

Arkansas: Division of Geology.

California: Division of Mines. Delaware: Delaware Geological Survey.

Florida: Florida Geological Survey. Georgia: Department of Mines, Mining, and Geology. Illinois: Illinois State Geological Survey.

Indiana: Indiana Department of Conservation.

Iowa: Iowa Geological Survey.

Kansas: State Geological Survey of Kansas.

Mansas: State Geological Survey of Mansas.
Kentucky: Kentucky Geological Survey.
Louisiana: Louisiana Geological Survey.
Maine: Department of Development of Industry and Commerce.
Maryland: Department of Geology, Mines, and Water Resources.
Michigan: Michigan Department of Conservation.
Mississippi: Geological Survey.

Mississippi: Mississippi Geological Survey.

Missouri: Division of Geological Survey and Water Yesources.

Montana: Montana Bureau of Mines and Geology. (
Nevada: Nevada Bureau of Mines.

New Hampshire: New Hampshire State Planning and De elopment Commission.

New Harsey: Russey of Geology and Tenegraphy.

New Jersey: Bureau of Geology and Topography.
New York: State Geological and Natural History Surveys.
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 and Geological Survey.
Puerto Ricc: Mineralogy and Geology Section, Economic Development Administration Property P

Puerto Rico: Mineralogy and Geology Section, Economic Developh istration, Puerto Rico.

South Carolina: Department of Geology, Mineralogy and Geography. South Dakota: State Geological Survey.

Tennessee: Tennessee Department of Conservation.

Texas: Bureau of Economic Geology, The University of Texas.

Utah: Utah Geological and Mineralogical Survey.

Virginia: Virginia Geological Survey.

Washington: Department of Conservation and Development.

West Virginia: West Virginia Geological and Economic Survey.

Wisconsin: Wisconsin Geological Survey.

Wyoming: Geological Survey of Wyoming.

Except for the two review chapters, this volume was prepared by the field staffs of the five Divisions of Mineral Industries. The following supervised preparation of the chapters: Albert J. Kauffman, Jr., chief, Division of Mineral Industries, Region I, Albany, Oreg.;

Alvin Kaufman, chief, Field Office, Region I, Juneau, Alaska; R. B. Maurer, chief, Division of Mineral Industries, Region II, San Francisco, Calif.; Alfred L. Ransome, chief, Division of Mineral Industries, Region III, Denver, Colo.; Robert S. Sanford, chief, Division of Mineral Industries, Region IV, Bartlesville, Okla.; Robert D. Thomson, acting chief, Division of Mineral Industries, Region V, Pittsburgh, Pa.; Samuel A. Gustavson, chief, Field Office, Region V, Minneapolis, Minn.; Avery H. Reed, Jr., chief, Field Office, Region V, Knowille Tenn Preparation of this volume was supervised and Knoxville, Tenn. Preparation of this volume was supervised and the chapters coordinated with those in volumes I and II by Paul Yopes, assistant to the chief, Division of Minerals.

Statisticians and researchers in the Division of Mineral Industries who gave substantial assistance to the authors of the chapters were: In Region I, May G. Downey, Ruth Robotham, and Clara M. Hutcheson; in Region II, Roy Y. Ashizawa; in Region III, Stella K. Drake and Mary Jelliffe; in Region IV, Lovenia M. Edwards and Rosalie M. Miller; in Region V, Dorothy O. Stearns, Mildred Rivers, Roy H. Davis, Eunice M. Garner, Ruth C. Melby, Richard J. Bishop, and

Wanda J. Peterson.

The manuscripts upon which this volume is based have been reviewed to insure statistical consistency between the tables, figures, and text, between this volume and volumes I and II and between this volume and those for former years, by a staff under the direct supervision of Kathleen J. D'Amico, assisted by Julia Muscal, Hope R. Anderson, Helen L. Gealy, Ruby J. Phillips, Anita C. Going, Helen E. Tice, Fairy L. McClendon, and Anne C. Rogers.

Minerals Yearbook compilations are based largely on data provided by the mineral industries. Acknowledgment is made of the willing contribution both by companies and individuals of these essential

data.

Charles W. Merrill, Chief, Division of Minerals.

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(	Oklahoma by Peter Grandone and William E. Ham.
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J	Diamond and Mort D. Turner
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# Statistical Summary of Mineral Production

By Kathleen J. D'Amico 1



CONTINUING the practice begun in 1954, this summary is identical to the summary, in volume III of this series, of mineral production in the United States, its Territories and possessions, and the Commonwealth of Puerto Rico and of principal minerals imported into and exported from the United States. For further details on production see commodity and area chapters. A summary table comparing world and United States mineral production also is included.

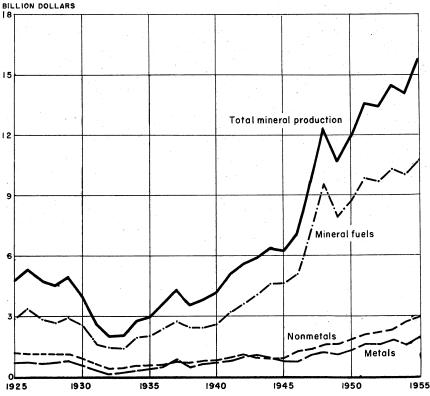


FIGURE 1.—Value of mineral production in continental United States, 1925-55.

<sup>&</sup>lt;sup>1</sup> Publications editor.

Mineral production may be measured at any of several stages of extraction and processing. The stage of measurement used in the chapter is normally what is termed "mine output." It 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.

Because of inadequacies in the statistics available, some series deviate from the foregoing definition. 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 recovered metal and valued at the average New York price for metal.

Data for clays and stone in 1954-55 include output used in making cement and lime. Mineral-production totals have been adjusted to eliminate duplication of these values.

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

TABLE 1.—Value of mineral production in continental United States, 1925-55, by mineral groups <sup>1</sup>

(Million dollars)

Year	Mineral fuels	Non- metallic minerals (except fuels)	Metals	Total	Year	Mineral fuels	Non- metallic minerals (except fuels)	Metals	Total
1925	2, 910 3, 371 2, 875 2, 666 2, 940 2, 500 1, 620 1, 413 1, 947 2, 913 2, 405 2, 798 2, 436 2, 423 2, 662	1, 187 1, 219 1, 201 1, 163 1, 166 973 671 412 432 520 564 685 711 622 754 784	715 721 622 655 802 507 287 128 205 277 365 516 756 460 631 752	4, 812 5, 311 4, 698 4, 484 4, 908 3, 980 2, 578 2, 000 2, 744 2, 942 3, 606 4, 265 3, 518 3, 808 4, 198	1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955	3, 228- 3, 568 4, 028 4, 574 4, 569 5, 090 7, 188 9, 502 7, 920 8, 689 9, 779 9, 616 10, 249 2, 9, 912 10, 774	989 1, 056 916 836 838 1, 243 1, 552 1, 559 1, 822 2, 679 2, 163 2, 342 2, 2619 3 2, 959	890 999 987 900 774 729 1, 084 1, 219 1, 101 1, 671 21, 617 21, 800 21, 507 2, 044	5, 107 5, 623 5, 931 6, 231 7, 062 9, 610 12, 273 10, 580 11, 862 2 13, 396 2 14, 038 15, 777

<sup>&</sup>lt;sup>1</sup> Data for 1925-46 are not strictly comparable with those for subsequent years; for the earlier years the value of heavy clay products has not been replaced by the value of raw clays used for such products.

<sup>2</sup> Revised figure,

<sup>3</sup> The total has been adjusted to eliminate duplicating the value of clays and stone.

TABLE 2.-Mineral production in continental United States 1952-55 1

Mineral  MINERAL FUELS Asphalt and related bitumens (native): Bituminous limestone and sandstone.	Short tons (unless otherwise stated)  1,570,698 60,740	Value 84, 887, 512 1,779, 816	Short tons (miess otherwise stated)  1, 440, 544 60, 505	Value \$4,349,327 2,184,328	Short tons (unless otherwise stated)  1, 337, 822 77, 943	1904 Value  \$3, 686, 227 2, 724, 693	Short tons (unless otherwise stated)  1,427,207	Value  ***********************************	
Carbon dioxide, natural (estimated)  Coal: Bitumhous ** Lightie Pennsylvania anthracite Natural gas iquids: Natural gasoline and cycle products Lightie Natural gasoline and cycle products LP-gases  LP-gases  LP-gases  Peat.	737, 000 463, 137, 204 3, 017, 204 40, 682, 568 145, 810, 832 8, 013, 457 4, 285, 386 2, 20, 682 2, 289, 836	2.276, 1826, 250 2.276, 182, 006 7, 211, 912 370, 714, 076 623, 640, 460 871, 468, 000 161, 692, 010 1, 788, 520, 000	670, 600 465, 677, 846 2, 851, 032 30, 949, 162 167, 652, 134 8, 386, 916 6, 327, 448 4, 692, 870 2, 204, 209 2, 367, 082	203, 450 2, 232, 68, 609 6, 793, 646 290, 138, 687 774, 686, 260 406, 242, 000 191, 688, 900 1, 617, 9	638, 900 386, 796, 876 29, 083, 477 189, 873, 071 8, 742, 546 5, 204, 304 8, 244, 168 2, 314, 988	210, 720, 220, 720, 720, 720, 720, 720, 72	50, 52, 52, 52, 53, 54, 54, 52, 54, 54, 54, 54, 54, 54, 54, 54, 54, 54	233, 640 2, 086, 633, 737 206, 662, 662 3, 880, 708 9, 880, 708 423, 775, 000 195, 221, 000 2, 222, 865 6, 870, 380, 000	
Total mineral fuels  NONMETALLIC MINERALIS (EXCEPT FUELS)  Abrastve stone: 4 Grindstones and pulpstones. Milistones and pulpstones. Pubbles (grinding). Tube-mill liners (natural). Asbestos. Bartle Bartle Coment. Coment. Coment. Coment. Figure and proposition of the following tones. Figure and proposition of the following tones. Foldspar Fluctspar Fluctspar Grand (sbrastve. Gen stones (estimated).	(5) 8.84 (2) 8.84 (3) 8.84 (4) 8.85 (4) 8.85 (5) 8.84 (5) 8.87 (6) 8.87 (7) 8.83 (8) 8.81 (9)	\$, 616, 000, 000 \$247, 434 \$, 286 9, 286 9, 286 14, 713, 625 83, 639, 240 14, 171, 630, 180, 180, 180, 180, 180, 180, 180, 18	(6) 2, 400 1, 1219 1,	\$160,000,000 \$160,001 \$160,001 \$1,100	(a) 2, 218 (b) 3, 070 (c) 2, 218 (c) 3, 070 (c) 440, 440 (c)	\$0,912,000,000 \$163,995 (9)94,891 \$6,471 \$6,471 \$6,471 \$7,873,431 \$1,871,640	(9) 2, 799 (1) 2, 139 (2) 1, 108, 103 (2) 139 (3) 138, 445 (3) 138, 445 (3) 138, 447 (4) 100 (4) 136 (4) 100 (	\$10,774,000,000 \$10,000,000 \$10,800,119 \$2,805,500 \$3,805,600 \$3,805,000 \$3,805,000 \$3,805,000 \$3,805,000 \$3,805,000 \$3,805,000 \$3,805,000 \$3,805,000 \$3,801,291 \$3,801,291 \$3,801,291 \$3,801,291 \$3,801,291	

ontinental United States 1952-55 1-Continued

TABLE 2.—Mine	eral produc	-Mineral production in continental United States	nental Unit			Communan		
		1952	1	1953	•	1954	1955	ZQ.
Mineral	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 Gypsum.  Iron oxide-pigment materials (crude) Lithium minerals Lithium minerals Lithium minerals Lithium minerals Lithium minerals Magnesium compounds from sea water and brines (except for metals) Magnesium compounds from sea water and brines (except for metals) Mica: Calcareous (except for cement) Mica: Scrap Scrap Scrap Scrap Scrap Perlice Prince Prince Prince Prince Said (common) Sand and gravel Said (common) Sand and gravel Sodium carbonate (natural) Sodium carbonate (natural) Sodium sulfate (natural) Sodium sulfate (natural) Stone Cher mines Cher m	8, 415, 300 8, 055, 609 15, 0570 121, 526 697, 989 11, 688, 889 11, 689 11, 688, 889 11, 689 11	\$22, 896, 051 94, 795, 436 1, 052, 080 2, 871, 548 9, 382, 913 187, 148 187, 148 187, 148 198, 138 1, 082, 923 1, 048, 138 1, 048, 138 2, 667, 794 1, 048, 138 2, 667, 794 1, 048, 128 2, 667, 798 1, 048, 138 2, 667, 798 1, 048, 138 2, 667, 898 6, 484, 763	8, 292, 876  9, 659, 414  553, 147  136, 824  136, 824  17, 058, 705  1, 731, 607  1, 731, 607  1, 731, 607  1, 731, 607  1, 731, 607  1, 731, 607  1, 731, 607  1, 731, 607  1, 731, 607  1, 731, 607  1, 731, 607  20, 245, 705  20, 248, 200  20, 248, 200  20, 248, 200  21, 524, 202  315, 613  315, 613  315, 613  316, 613  316, 618  316, 618	\$23, 175, 073  111, 777, 018  \$, 223, 759  10, 459, 502  113, 347  113, 347  113, 347  113, 347  113, 347  113, 347  114, 054, 099  114, 054, 099  114, 054, 099  114, 054, 099  114, 054, 099  114, 054, 099  114, 054, 099  114, 054, 099  114, 054, 099  114, 054, 099  114, 054, 099  114, 054, 099  114, 054, 099  114, 054, 099  114, 054, 099  114, 054, 099  114, 054, 099  114, 054, 099  115, 689, 248  117, 689, 146  117, 689, 146  118, 689, 288  118, 689, 288  119, 689,	8, 905, 900 8, 612, 250 8, 612, 250 204, 015 113, 774 206, 257 206, 257 1, 503, 104 1, 503	\$27, 383, 515 1.128, 676 101, 273, 040 (*) 73, 040 1, 301, 302 1, 301, 302 1, 301, 302 1, 302, 488, 674 1, 783, 772 2, 388, 041 1, 783, 772 2, 388, 041 1, 783, 772 2, 388, 041 1, 783, 772 2, 388, 041 1, 783, 689, 681 2, 189, 486 105, 470, 444 496, 671, 727 (*) 6, 676 11, 208, 345 11, 208, 345 11, 208, 345 11, 208, 576 11, 208, 576 11, 208, 576 11, 208, 577 11, 208, 577 11, 208, 577 11, 208, 577 11, 208, 577 12, 537, 577	10, 683, 733 10, 468, 088 486, 088 155, 779 18, 779 18, 779 18, 286, 157 19, 286, 157 19, 286, 157 19, 286, 157 19, 286, 157 19, 19, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18	\$33, 937, 560 12, 712, 942 2, 712, 942 12, 713, 930 12, 73, 930 128, 340 128, 340 128, 370, 397 2, 938, 939 128, 387, 240 (9) (9) (10, 994 (10,
Total nonmetallic minerals		2, 163, 000, 000		2, 342, 000, 000		s 14 2, 619, 000, 000		14 2, 959, 000, 000

	(16) \$14, 542, 638 267, 927 6, 018, 379 (16)	22, 125 744, 932, 549 57, 079, 680	748, 602, 065 100, 731, 152 21, 650, 794 5, 128, 255	66, 919, 679 66, 919, 039	33, 635, 342 (16)	10, 267, 647 1, 122, 000 60, 841, 157	(10) 126, 608, 833 1, 425, 641	38, 882, 549	2, 044, 000, 000	15, 777, 000, 000
	1, 788, 341 500 146, 171 2, 438, 546	12, 954 998, 569 1, 630, 848	105, 236, 869 338, 024 287, 254 911, 636			673, 192 9, 182 16, 412				
	(15) \$16, 403, 388 303, 649 6, 955, 653 (15)	57, 262 492, 926, 757 55, 607, 965	\$ 525, 817, 676 89, 164, 759 15, 175, 533 3, 079, 380	4, 626, 032 64, 070, 350	33, 403, 320 (18)	8 7, 375, 344 869, 677 51, 433, 357	(10), 179, 867 102, 179, 867 820, 041	3 36, 910, 152	\$ 1, 507, 000, 000	\$ 14, 038, 000, 000
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	2, 161 1, 579, 739 751 58, 817 1, 775, 489	14,867 926,448 1,704,510	117, 197, 537 342, 635 157, 536 1, 239, 390		37, 535, 451 (16)	612, 176 6, 476 9, 587				
	\$10, 776, 254 \$233, 757 1, 776, 981 (14)	16, 723 447, 873, 756 57, 844, 640	590, 346, 970 125, 631, 842 8, 251, 774 5, 116, 985	2, 492, 533 40, 844, 575	35, 676, 497 45, 324	8, 022, 752 (16) 28, 943, 162	222, 981, 864 (15)	3 30, 363, 712	\$ 1,617,000,000	\$13, 396, 000, 000
	4, 434 1, 667, 047 21, 304 836, 372	5, 385 925, 359 1, 652, 704	97, 236, 397 390, 161 115, 379 1, 009, 018	12, 519 12, 519 42, 717, 443	39, 419, 344 17	522, 515 (18) 7, 603	. 0, 142, 799 666, 001 (16)			
METALS	Antimony ore and concentrate antimony content.  Bauxite long tons, dried equivalent.  Beryllium concentrate.  Chromite documentate documentate.  Colobal (content of concentrate).			Mercury Molybdenum (content of ore and concentrate) - pounds Molybdenum (content of ore and concentrate) - pounds	Silver (recoverable content of ores, etc.)troy onness Thi (content of ore and concentrate)long tons Thentum concentrate.	Ilmenitegross weightRutile	Zircontum concentrate Value of Items that cannot be disclosed: Magnestim	قبہ ا	Total metals	Grand total mineral production

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Excludes uranium ores and monazite.

<sup>2</sup> Includes small quantity of anthracite mined in States other than Pennsylvania.

Revised figure.

• Excludes sharpening stones, value for which is included with "Nonmetallic minerals, undistributed,"

• Weight not recorded.

• Weight not recorded.

• Figure withheld to avoid disclosing individual company confidential data; value factured withheld to avoid disclosing it items that cannot be disclosed."

• This figure. Supersedes preliminary figure given in commodity chapter.

• Beginning with 1964, quartz from pegmetites and quartzite included with stone.

Beginning with 1964, sand and sandstone (ground) included with sand and gravel

or storie, Excludes abrasive stone, bituminous limestone, bituminous sandstone, and l'ackiddes abrasive stone, all included elsewhere in table. Also excludes limestone for cement and lime, 1962-83.

Il Sold to used by producers. Quantity and value of ground material.

In Mine production of crude material.

In Data not comparable with earlier years.

In The total has been adjusted to eliminate duplicating the value of clays and stone.

In Figure withheld to avoid disclosing individual company confidential data.

TABLE 3.—Minerals produced in United States, by States, and Alaska, Hawaii, and Puerto Rico in 1955

٠.		tion of the contraction of the c
	Cop	7 7 7 7 7 7 7 7
	Colum- bium- tan- talum	7 77 7
	Co- balt	7
	Coal	T T T T T T T T T T T T T T T T T T T
ľ	Clays	
	Ohro- mite	7
Ī	Ce- ment	
.	Car- bon dt- oxide	77
	Cal- clum- magne- sium chloride	7
	Bro- mine	7
	Bo- ron	7
	Beryl- lium	7 77 7
	Bar- Bauxite	77
	Bar- ite	777 77
	Asphalt	7
	Asbes- tos	7 7
broamord s	Aplite	
STREET COTTON	Anti- mony	7
	Abra- sive stone	7 7 7
TOUT	State	Alabama Arizona Arizona Arizona Arizona Arizona Arizona Colorado Connecticut Colorado Connecticut Colorado Connecticut Colorado Connecticut Colorado Connecticut Colorado Colo

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South Dakota Tennessee Tennessee Texas Vorab Vorab Virghi Virghi Virghi Washinton West Virghii Wyoning Aski	
nth I nness and in the I nness and I nness	I

d Alaska, Hawaii, and Puerto Rico in 1955-Continued

	Man- ga- nese	777 7
3	Magne- sium com- pounds	7 7
	Magne- sium chlo- ride	
1 1	Mag- ne- site	7
21 11	Lime	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7
KICO	Lead	7 77 77 7 77 77 77
Alaska, Hawaii, and Fuerto kico in 1999	Kyan- ite	7
and	Iron oxide pig- ments	7 7
7a11,	Iron	7 77 7
, Ha	Io- dine	7
laske	Heli-	7
nd A	Gyp- sum	7777
ates, 8	Graph- ite	7
by Si	Gold	777 77 77
ates,	Gem	44 444444 44 4 F
ed St	Gar- net (abra- sive)	7 7
n Unit	Fluor- spar	77 7 7
iced i	Feld- spar	7 777 7
produ	Ep- som- ite	
Minerals produced in United States, by States, and	Emery	7
	Diato- mite	7 7 7
TABLE 3.—	State	Alabama. Arizona Arizona Arizona Arizona Colaidono Comecticut. Delaware Florida Georgia Massachusetts Massachusetts Massachusetts Massachusetts Massachusetts Massachusetts Massachusetts Massachusetts Mowassachusetts Missouri Missouri Missouri Missouri Missouri Missouri Missouri Missouri Morasachusetts Moratola Missouri Moratola Moratola Nord Georgia Nord Georgia Nord Georgia Nord Georgia Oregon Oregon South Carolina

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TABLE 3.--Minerals produced in United States, by States and Alaska, Hawaii, and Puerto Rico, in 1955--Continued

-	Sand and gravel	
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<b>5</b>	Salt	7 77 77 77 77 77
n mmno.	Rare- earth metals	77 7
	Pyrites	7
O, 111 L	Pum- ice	7 7 7 7 7 7
200	Potas- sium salts	7
ות ב מפ	Plati- num group metals	7
MII , MI	Phos- phate rock	7
B) TERM	Petro- leum	T TTT TTT TTT TTT TTT TTT TTT TTT TTT
40010	Perlite	7 77
	Peat	T   T   T   T   T   T   T   T   T   T
produced in chiral braics, by braics and brasks, hawait, and fusive hier, in 1000	Olivine Peat	
6000	Nickel	7
	Nat- ural- gas liquids	777 777 7777 7777
	Nat- ural gas	
10011	Molyb- denum	7 77
2	Mics	77 777 77 77 77 77 77 77 77 77 77 77 77
	Mer- cury	7 7 7
	State	Alabama. Arizona. Arizona. California. Colorado. Colorado. Connecticut. Dalaware. Idalam. Indiana. Ind

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South Dakota	Tennessee.	tah	mont	/irginia	/ashington	t Virg	/lsconsin	ming	ika.	Hawaii	uerto Rico	
80g		Uta	Ver	Virg	Was	West	Wisc	Wyc	Alas	Hay	Pue	

-Minerals produced in United States, by States and Alaska, Hawaii, and Puerto Rico, in 1955-Continued

TABLE 3. — Minerals produced in United States, by States and Abstra, hawan, and ruerto are of the state and Abstra, hawan, and ruerto are of the state and Abstra, hawan, and ruerto are of the state and abstra, hawan, and ruerto are of the state and abstra, hawan, and ruerto are of the state and abstract and are of the state and abstract and are of the state and		Zirco- ntum	7
S.—Minerals produced in United States, by States and Alaska, Hawani, and Turison International International States and Alaska, Hawani, and Turison International Int	100	Zino	4 5 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6
S.—Minerals produced in United States, by States and Alaska, Hawaii, and Fuero and States Solims Stone Stron. Feweread and Solim, Tripoli stan dimm elemental stone sails sails from freeversad and Solim, and the contrate sails sails from freeversad and Solim, and the contrate sails sails from freeversad and Solim, and freezers and the contrate sails sails from freezers and the contrate sails sails from freezers and the contrate sails from freezers and freeze	OOTHATT	Wol- laston- ite	7
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නි න	and Ala	Tale, pyro- phyllite, and soap- stone	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
නි න	, by States	Sulfur, sul- fur ore, and recovered elemental	77 77 77 77 77 77 77 77 77 77 77 77 77
නි න	States		7
නි න	Inited	Stone	***************************************
ම් න්	sed in l	Sodium	7
ම් න්	produ		F   F   F   F   F   F   F   F   F   F
ම් න්	nerals	Silver	7 77 77 77 77 77 77 77 77 77 77 77 77 7
HOOOONNON SEE THE THE THE PROPERTY OF THE PROP	<b>2</b>	State	Alabama Arkansas Arkansas Arkansas Colorado Colorado Colorado Connecticut Delaware Forda Georda Georda Georda Georda Georda Georda Georda Georda Georda Mansas Kentucky Louisiana Markansa Kentucky Louisiana Markansa Manseota Markansa Manseota Markansa Markana Mar

Tennessee				>	 		i			-	-			
Utah	>>		>	>>	>			A		>	7		7	
Vermont	>7	>7	:	>7		>7							7	
Washington	>>	>		>>.		*>	Ιİ			<u> </u>			.>	
West Virginia				> 7	>								>	
Wyoming	7	7	>	~	7					1				
Alaska	>			>	 		>		-	-				
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Puerto Rico				>			!			-				
			_				-							

				produce	d in 1955		produced in 1955	1
							1966	
State	1952	1953	1954	Value	Rank	Percent of U.S. total	Principal minerals in order of value	1
Alabama Arizona Arizansas Colifornia Colorado	158, 382 232, 824 117, 687 1, 215, 130 189, 852	187, 087 258, 471 127, 090 1, 393, 987 212, 690	154, 639 254, 479 131, 745 1, 429, 627 255, 852	186, 453 378, 277 132, 822 1, 457, 554 286, 121	12 24 24 24 24 24	1.18 2.40 .84 9.24 1.81	Coal, iron ore, cement, stone. Copper, sand and gravel, cement, zinc. Petroleum, bartife, stone, cement, natural gasoline. Petroleum, molybdenum, coal, cement.	
Connecticut. Delaware District of Columbia. Florida. Georgia.	7, 125 677 7 82, 878 51, 450	7, 917 659 15 92, 336 51, 395	9, 581 947 106, 510 55, 828	10, 428 1, 658 108, 957 60, 417	## ## ## ## ## ## ## ## ## ## ## ## ##	.07 .01	Stone, sand and gravel, lime, clays. Sand and gravel, stone, clays. Phosphate rock, stone, cement, clays. Clays, stone, cement, sand and gravel.	
Idaho. Illinois Indiana Lowa. Kansas.	77, 895 460, 005 162, 031 52, 481 403, 370	67, 063 462, 443 169, 781 51, 994 413, 231	69, 689 473, 077 165, 369 58, 798 449, 587	68, 513 533, 464 183, 479 63, 555 470, 830	92239	3.38 3.38 1.16 2.40 2.98	Lead, silver, phosphate rock, copper. Petroleum, coal, stone, sand and gravel. Coal, cement, sfone, petroleum. Cement, stone, sand and gravel, coal. Petroleum, natural gas, cement, salt.	
Kentucky Louisiana Maina Maryland Masyland Massachusetts	398, 446 848, 401 8, 981 26, 847 17, 812	381, 742 965, 237 10, 503 27, 085 17, 191	327, 503 998, 057 10, 716 30, 743 18, 851	391, 068 1, 156, 637 12, 991 35, 491 22, 109	I.u. 183	2, 48 7, 33 08 23	Coal, petroleum, natural gas, stone. Petroleum, natural gas, natural gasoline, salt, Cement, sand and garvel, stone, slate, Sand and gravel, cement, stone, coal. Stone, sand and gravel, lime, clays.	
Michigan Minnesota Missisppl Missouri Montana	254, 518 397, 440 101, 875 140, 977 122, 069	286, 487 542, 545 107, 868 128, 207 132, 184	279, 940 351, 474 110, 563 131, 280 126, 412	363, 787 501, 151 122, 620 151, 626 166, 993	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2.31 3.18 7.8 1.06	Iron ore, cement, copper, petroleum. Iron ore, sand and gravel, stone, cement. Petroleum, natural gas, sand and gravel, dlays. Lead, cement, stone, lime. Copper, petroleum, zinc, manganese ore.	
Nebraska Nevada. New Hampshire. New Jersey. New Mexico.	20, 597 64, 231 1, 945 57, 468 288, 474	33, 281 73, 523 1, 805 51, 945 336, 545	42, 393 89, 138 2, 112 47, 044 373, 519	54, 237 113, 231 2, 605 57, 495 435, 911	\$2.5 \$4.01	. 34 . 72 . 02 . 36 2. 76	Petroleum, cement, sand and gravel, stone. Copper, tungsten, manganese ore, sand and gravel. Sand and gravel, stone, feldspar, mica. Stone, sand and gravel, iron ore, zinc. Petroleum, potassium salts, copper, natural gas.	
New York North Carolina North Dakota Obio	180, 751 34, 726 12, 057 292, 689	186, 868 38, 451 19, 237 302, 242	192, 738 41, 651 22, 223 293, 659	216, 907 41, 210 44, 123 - 340, 457	38 36 14	1.37 . 26 2.18 2.16	Cement, fron ore, stone, sand and gravel. Stone, tungsten contentrate, sand and gravel, mica. Petroleum, coal, sand and gravel, LP-gases. Coal, stone, cement, lime.	

4.51   Petroleum, natural gas, natural gasoline, cement.	Sand and gravel, stone, cement, nickel. Coal, cement, stone, petroleum. Sand and gravel, stone, grapbite, Cement, clays, sand and gravel, verniculite. Gold, sand and gravel, stone, cement.	Coal, cement, phosphate rock, sinc. Petroleum, natural gas, natural gasoline, LP-gases. Copper, coal, iron ore, gold. Stone, state, asbestos, copper. Coal, stone, cemant, line.	Sand and gravel, coment, stone, zinc. Coal, natural gas, sand and gravel, stone. Sand and gravel, stone, iron ore, cement. Petroleum, coal, clays, sodium carbonate and sulfate.	Petroleum, coal, natural gas, cement.
4.51	6.16 6.16 113 26 26	25.31 2.10 2.10 1.09	4.79 4.79 1.89	100.00
9	34448	8 11 14 17	80 5 31 16	
711,089	31, 736 971, 064 1, 834 20, 197 40, 526	3, 993, 316 33, 929 331, 929 23, 884 172, 541	67, 334 755, 512 65, 813 297, 752	15, 777, 000
650, 205	32, 268 925, 545 1, 461 17, 744 87, 874	3, 730, 686 255, 495 20, 483 129, 603	53, 300 636, 311 54, 286 281, 306	14, 038, 000
679, 003	24, 449 1, 121, 622 1, 462 17, 771 33, 823	98, 050 3, 647, 913 298, 589 20, 302 162, 979	54, 577 790, 110 55, 212 255, 906	14, 391, 000
621, 351	26, 674 1, 145, 633 1, 260 14, 686 30, 465	3, 379, 813 265, 676 17, 891 164, 679	56, 139 825, 733 55, 710 206, 828	13, 396, 000
Oklahoma	Oregon Pennsylvania Rhode Island South Carolina South Dakote	Tennessee Toras Toras Offah Vernot Vernot	Vskhington Vest Virginis Visconin Vyoming	Total

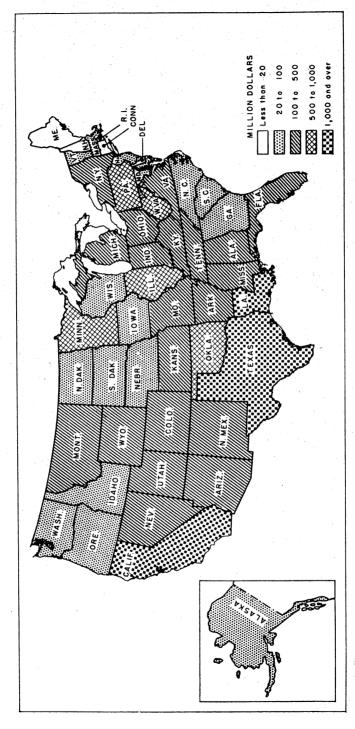


FIGURE 2.—Value of mineral production in continental United States and Alaska, 1955, by States.

TABLE 5.—Mineral production in the United States, 1952-55, by States <sup>1</sup> ALABAMA

Short tons   Cumbers   C	Short tons (unless otherwise stated)   1953   1953   10,642,409   10,642,412   10,750,816   1,243,214   37,940,412   7,943,214   37,940,412   7,946,130   1,252,061   1,244,12   1,045,816   1,246,130   1,446,130   1,446,1
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See footnotes at end of table.

TABLE 5.--Mineral production in the United States, 1952-55, by States 1--Continued

ARIZONA-Continued

	1955	Value	\$2,328,566 676,389 4 5,880,264 6,201,394 4 378,277,000		8 755,094 14,026,190 7 2,375,882 4,319,146 6 4,319,146 1,727,286 1,727,286	2, 189, 000 8, 2, 169, 000 7, 880, 000 2, 7, 802, 942 (3) 8, 025, 634 7, 615, 676	4 132, 822, 000
		Short tons (unless otherwise stated)	1, 600, 939		462,986 1,721,243 738,637 577,726 (0) 23,744	47, 483 57, 088 28, 288 9, 003, 162 (3) 6, 176, 313	
	1964	Value	\$1, 914, 315 456, 965 4, 635, 876 8, 171, 649		\$3, 488, 483 16, 998, 887 2, 566, 397 3, 589, 217 (3) (4) 1, 020, 752 1, 841, 000	3, 234, 000 2, 521, 000 79, 520, 000 6, 566, 806 8,79, 076 5, 929, 638 6, 742, 325	4 131, 745, 000
		Short tons (unless otherwise stated)	1, 205, 452 132 21, 461		370, 621 1, 949, 368 617, 450 477, 268 716 13, 728	50, 778 58, 506 29, 130 6, 611, 860 41, 845 4, 604, 067	
	1953	Value	\$618,748 468,838 6,331,900 8,010,194		7,83,945,583 12,975,992 1,734,414 6,143,757 (*) (*) 526,647	4, 123, 000 2, 562, 000 77, 170 4, 965, 383 315, 888 8, 5, 069, 750 5, 367, 669	127, 090, 000
TOTAL COMMINGS	1	Short tons (unless otherwise stated)	442, 358 134 27, 530	NSAS	380, 763 1, 529, 976 529, 126 775, 207 254 6, 123	58, 422 55, 188 29, 681 4, 903, 835 34, 516 8 3, 545, 350	
THE PARTY OF THE P	1952	Valúe	\$355,709 251,136 15,651,476 6,495,214 6 232,824,000	ARKANSAS	7 \$3, 963, 828 10, 236, 224 1, 513, 934 6, 839, 113 (9) (1, 288 (1) (2) (3) (4) (3)	4, 580, 000 2, 072, 000 72, 420, 000 4, 977, 219 8, 3, 346, 201 8, 682, 246	117, 687, 000
	Ä	Short tons (unless otherwise stated)	285, 020 71 47, 143		428, 522 1, 603, 833 552, 578 873, 088 115 2, 246 42, 325	61, 782 49, 098 29, 440 5, 011, 095 (3) 9 2, 967, 479 26	
		Mineral	Stone (except limestone for cement and lime, 1962-63).  Tungsten ore and concentrate		Barito  Bauxito  Clays  Clays  Gen stones  Hone (usable)  Laad (recoverable content of ores, etc.)  Manganiferous ore (5 to 36 percent Mn)  Natural gas  Natural gas  Natural gas	Natural gasoline and cycle productsthousand gallons LV-gases	Total Arkansas.

Boron minerals						The second secon			
punod-928	583, 828 7, 786, 245	\$14, 105, 000 79, 457, 745 8	715, 228 32, 002, 317	\$17, 668, 000 90, 872, 741	790, 449	\$26, 714, 440 98, 251, 245		\$33, 816, 464 103, 803, 894	
Unromite Gross weight. 2, Clays:	4,8,	7 1, 269, 000 4, 852, 266	2, 28, 29, 29,	`∞`c1	30, 661 2, 722, 850	2, 285, 250	22, 105 2, 860, 395	1,834,277 5,027,381	
Coppar (recoverable content of ores, etc.)	% % % % % % % %	387, 200	1	219, 268	(3)	(3) 213, 580		76, 500 457, 298	
Gold (recoverable content of ores, etc.)troy ounces.	258, 176	9, 036, 160	ටක් දි	8, 210, 685	237,886	(8) 8, <b>32</b> 6, 010	251, 737	(8) 8, 810, 795	_
Iron ore (usable) long tons, gross weight.	1, 463, 239	(8)	-11	(3)	1, 270, 292	2, 803, 862 (8)	1, 776, 536	3, 273, 724 (8)	
Line	238, 957	3, 752, 738	30, %	2, 269, 968 4, 653, 303	212, 381	731, 854 3, 387, 981	268, 265 268, 009	2, 462, 970 4, 372, 789	
Magnesium compounds from sea water and bitterns (partly estimated) MgO equivalent	50, 277	3, 529, 362	55	3, 483, 483	40 969	9 715 689	58 049	3 833 400	
Manganese ore (35 percent or more Mn)gross weight Manganiferous ore (5 to 35 percent Mn)	8,081	<b>E</b>	5,413	(E)	831	45,091	3, 136	270, 519	
Mari, calcareous	3 176	5	6,028	23, 102	5, 464	21, 965	(8)	(6)	
Natural gas	517, 450	86, 414, 000	531, 346	104, 675, 000	507, 289	104, 502, 000	538, 178	2, 807, 200	_
Natural gasoline and cycle productsthousand gallons	870, 996	64, 945, 000	910, 350	85.691.000	923.160	89, 293, 000		89,003,000	
LP-gases.	393, 792 10, 527	16, 700, 000	397, 572	21, 961, 000	396, 186	22, 262, 000	360, 902	19, 379, 000	
Perlite Petroleum (crude)	350 450	(8) 700	15, 282	112,790	14,811	103, 148	16,663	126, 118	
TOTAL TALBATON DATIONS	33	38,	433, 105	647, 910	<b>8</b> 69	907, 400, 000		1,099,459	-
	148	4, 880, 392	<b>8</b>	6, 263, 059	1, 185, 844	6, 126, 194		6, 751, 420	
Silver (recoverable content of ores, etc.)troy ounces. 1,	,099,658	995, 246	1, 036, 372	937, 969	309, 575	280, 181	954, 181	863, 582	
t and mie, 1952-53)	, 4,	17, 097, 080	497,	18, 472, 652	23, 303, 756	37, 541, 114 300		9 37, 164, 384	
Sulfur ore 10ng tons 10ng	33	S 8	152, 203	(3)	185,085	€		(6)	
60-percent WOs basis.	2,880	11, 360, 569	2,382	8, 939, 146	3, 512	13, 209, 371	4,383	16, 200, 924	
Zinc (recoverable content of ores, etc.)	9, 419	27,	5, 358	1, 232, 340	1,416	305, 640		1, 681, 656	
barite, bromine, calcium-magnesium chloride, carbon									
dodine, lithium minerals (1962-54), magnesite, mica (1962,	-	-							
1964-56), molybdenum, platinum-group metals (crude),									
t saits, pyrites, quark (1902-06), rate earth metal te (1953-55), ground sandstone (1952-53), slate.								-	
arbonate and sulfate, stone (dimension crushed									
concentrate (nontitanium use), wollastonite (1952), and									
values indicated by footnote 3. Excludes value of clays		98 770 001		9 70 713 000		600		001	
		90, 118, 041		24, 410, 290		40, (01, 880		00, 780, 574	
Total California		1,215, 120, 000		6 1 303 087 000		41 429 827 000		4 1 4K7 KK4 000	

See footnotes at end of table.

TABLE 5.-Mineral production in the United States, 1952-55, by States 1--Continued

COLORADO

	7	1952	<b>.</b>	1953		1954	19	1955
Mineral	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.  Clays.  Colambium-tantalum concentrate pounds, gross weight.  Colpher (recoverable content of ores, etc.).  Filotospar  Filotospar  Gen Stones.  Gold (recoverable content of ores, etc.).  Iron ore (usable).  Manganilerous ore (5 to 35 percent Mn).  Manganilerous ore (5 to 35 percent Mn).  Molybelanum (content of ores, etc.).  Molybelanum (content of ore and concentrate).  Peatrul gas.  Petroleum (crude).  Band (common).  Sand (and grave).  Sand (and grave).  Sand (and grave).  Sand (accoverable content of ores, etc.) troy ounces.  Stone (accopt language on cement and lime, 1952-53).  Tungsten ore and concentrate.  Jone on Sands.  Tungsten ore and concentrate.  Jone on Sands.  Jone of Concentrate.  Jone on Sands.  Jone	8, 623, 015 8, 623, 015 8, 806 8, 806 8, 208 104, 504 (3) 76 (4) 76 (5) 76 (6) 76 (7) 140 24, 557, 140 28, 2312 30, 381 (9) 8, 461, 039 2, 812 30, 813 (4) 76 (5) 76 (6) 76 (7) 76 (7) 76 (8) 8, 461, 039 (9) 8, 461, 039 (9	\$24,588 19,215,657 1,724,330 1,724,330 1,505,988 (9) (9) (9) (9) (9) (9) (1,505,988 (1,5	3, 547, 869 3, 547, 860 (3) 941 43, 804 110, 218 62, 936 62, 936 116, 218 63, 84 6007 84, 919 12, 438, 600 2, 200, 317 4, 530, 612 4, 530, 612 4, 530, 612	\$39, 515 1,429, 780 19,197, 732 1,688, 134 2,872, 380 4,172, 630 2,872, 380 4,172, 630 5,699, 548 1,654, 000 1,654, 000 98, 650, 000 99, 700 99, 700 98, 60, 151 1,991, 398 8, 1,750, 726 1,991, 398 8, 1,750, 726 1,991, 398 8, 1,750, 726 1,991, 398 8, 1,750, 726 1,991, 398 1,991, 700 1,991, 700 1,99	854, 711 2, 899, 711 4, 628 6, 607 6, 614 6, 614 6, 614 17, 823 18, 652, 406 8, 417, 072 18, 652, 406 9, 208 8, 417, 072 18, 682, 406 18, 682, 406 19, 927 4, 628, 472 4, 628, 472	\$27, 130 16, 078, 873 16, 078, 873 2, 668, 570 (3) 3, 197, 252 (3) 3, 865, 110 (2) 4, 883, 502 (4) (5) (9) (9) (9) (9) (127, 890, 000 (127, 890, 000 (3) (3) (4) (4) (5) (5) (6) (7) (7) (8) (8) (9) (9) (9) (9) (10, 10, 10, 10, 10, 10, 10, 10, 10, 10,	464, 231 3, 657, 930 4, 325 4, 325 4, 324 4, 114 (9) (9) (15, 806 45, 886, 694 49, 162 12, 911, 783 2, 1772, 073 2,	\$22,960 1,107,901 20,100,174 3,224,968 3,324,968 3,324,324 4,709,890 4,866,000 112,696 6,14,290 8,914,429 8,914,429 8,914,429 8,914,429 8,914,429 1,709,341
Zinc (recoverable content of ores, etc.) Value of items that cannot be disclosed: Carbon dioxide, cement, lithlum minerals (1963-54), natural-gas liquids, per- lite, pyrites, rare-earth metal concentrate (1955), stone (crushed basalt 1953), vermiculite (1964), and values indi- cated by footnote 3. Excludes value of clays used for cement (1962-53).	53, 203	17, 663, 396	37,	8, 696, 070	35, 150	7, 592, 400		8, 696, 100
Total Colorado		6 189, 852, 000		6 212, 690, 000		4 6 255, 852, 000		4 286, 121, 000

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See footnotes at end of table.

TABLE 5.—Mineral production in the United States, 1952-55, by States 1.—Continued

		GEORGIA	RGIA					
	-	1952		1953		1954	19	1955
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
	2, 562, 182 32, 100	\$23, 137, 507 160, 500	2, 651, 153 14, 100	\$23, 455, 315 70, 500	2, 711, 422 8, 090	\$24, 106, 926 40, 450	2, 953, 278	\$26, 144, 672 62, 360
You (recoverable content of ores, etc.)troy ounces. Iron ove (used). Iron oxide pigment materials (crude)	319, 959	1, 439, 251	259, 964	1, 100, 725	221, 676	871, 901	256, 700	994, 289
Mune (Sheet) Peat. Pent Sand gravel Sand and gravel Sand and sandstone (ground)	7,854 13,010 2,150 2,133,970	87, 587 18, 852 38, 000 2, 029, 367 17, 650	9, 345 14, 063 2, 305 2, 051, 068	95, 484 73, 806 (8) 1, 900, 987		(3) (3) (4) (4) (5) (5) (5) (6) (7) (7) (7) (8) (8) (8) (8) (8) (8) (8) (8) (8) (8	6, 139 (8) (8) 2, 987, 570	35, 607 (3) (3) 2, 198, 905
Stone (except limestone for cement and lime, 1962–53) Tale and soapstone	7, 132, 082	17, 166, 108 10 653, 144	7, 112, 024 11 57, 891		8, 057, 600 11 50, 536	21, 384, 227 11, 176, 876	8 7, 488, 452 11 53, 828	(13) 8 14, 249, 830 11 117, 656
spar (1964-66), manganese ore (1964-65), manganiferous ore (1965), scrap inde, slate, stone (dimension and crushed marble and crushed sandstone 1965), and minerals indicated by, footnote 3. Excludes value of clays used for								
Centent (1902-03)		6, 701, 729		6, 739, 022		6 7, 481, 432		17, 495, 020
Total Georgia		51, 450, 000		51, 395, 000		4 6 55, 828, 000		4 60, 417, 000
		IDAHO	ОП					
Antimony ore and concentrateantimony sontent.	4.173	6	=	6				

Nickel (content of ore and concentrate)	-		11	€	13	98	8	වම
Peat. Phosphate rock Pumice Pumice Sand and gravel	866, 330 88, 085 3, 925, 863	2, 950, 160 141, 253 2, 745, 201	1, 001, 969 85, 224 8, 776, 180	4, 149, 943 159, 833 2, 841, 440	1, 092, 817 (3) (4) (6, 717, 700	5, 686, 609 (3) 4, 568, 919	1, 329, 969 (3) 8, 652, 138	6, 038, 088 (8) ু 4 3, 933, 876
one (ground) ole content of nestone for ce			5, 304 14, 639, 740 1, 141, 626	43, 865 13, 249, 704 2, 260, 875	(18) (18) (19) (19) (19) (19) (19) (19) (19) (19	14, 360, 811 3, 012, 613	13, 831, 458 1, 524, 810	12, 518, 168 12, 866, 076 8 1, 866, 076
ontitanium us 60-pe res, etc.)	333 74, 317	1, 245, 499 24, 673, 244	1, 080 441 72, 153	1, 665, 983 16, 595, 190	61, 528	(8) 13, 290, 048	1, 642 63, 314	(a) 13, 115, 244
columbium-tantalum concentrate (1963, 1955), abrasive garnet, gem stones (1965), fluoraper (1954, 1955), monazite (1955), quartz (1953), stone (grushed limestone 1952, 1955), vanadium (1962-54), and values indicated by footnote 3	1	6 3, 340, 915	1	6 3, 878, 015		6 12 6, 307, 935		13 7, 001, 882
Total Idabo		6 77, 895, 000	1	0 67, 063, 000		6 69, 689, 000		68, 513, 000
		ILLINOIS	rois					
Coment S76-pound barrels.  Clays Closh Fluority Lied (recoverable content of ores, etc.) Lind Lind Lind Lind Lind Lind Lind Lind	8, 710, 621 2, 337, 623 1,88, 288 1,88, 288 10, 183 10, 183 28, 189 28, 189 28, 188 18, 887 18, 887	\$20, 600, 347 3, 871, 1051 1187, 821, 712 9, 481, 223 1, 372, 384 5, 917, 038 19, 214, 105 2, 342, 549 2, 342, 549 2, 342, 649 6, 246, 912 7, 302, 546 460, 005, 000	8, 651, 385 2, 305, 202 46, 009, 801 163, 308 1, 381 1, 50, 108 2, 232 2, 238 22, 288 22, 388, 722 14, 566	821, 961, 761 4, 573, 001 181, 567, 908 8, 567, 026 888, 442 6, 988, 442 6, 988, 442 1, 559, 000 170, 590, 540 2, 461, 767 29, 736, 966 3, 347, 880 9, 629, 924	9, 109, 076 2, 077, 186 41, 186 3, 222 53, 051 6, 78 24, 43, 056 (1, 10) 26, 407, 088 14, 427	\$23,147,871 \$,482,460 160,213,063 \$,586,219 \$86,586 7,420,840 1,345,000 199,060 1,1050 31,134,135 3,116,232 13,060,485	9, 387, 098 45, 338, 5779 46, 932, 114 166, 337 166, 337 8, 033 8, 033 26, 382, 360 28, 885, 724 21, 700	\$25, 031, 521 167, 937, 816 7, 838, 471 1, 588, 471 1, 416, 116 1, 416 1, 416
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See footnotes at end of table.

TABLE 5.--Mineral production in the United States, 1952-55, by States 1---Continued

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	19	1952	19	1953		1954	1955	5
	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 Onal Mari, calcareous (except for cement). Natural gas.	1, 331, 298 16, 350, 202 16, 414 16, 414 836	\$1,700,209 64,977,328 9,021 79,000	1, 654, 112 15, 812, 485 13, 540	\$2, 514, 227 62, 353, 519 6, 398 49, 000	1, 946, 069 13, 400, 188 28, 536	\$2, 990, 716 48, 913, 455 18, 515 44, 000	1, 729, 299 16, 149, 310 17, 080 1, 226	52, 938, 010 58, 000, 085 10, 543 152, 000
Peat.  Petroleum (crude) thousand 42-gallon barrels. Sand and gravel. Stone except limestone for cement and lime, 1952-53) Stone frame that cannot be disclosed: A brasive stones.	10, 115 12, 037 11, 546, 014 9, 126, 837	49, 775 33, 100, 000 9, 279, 908 21, 965, 454	6, 919 12, 823 11, 203, 069 9, 212, 887	37, 570, 000 9, 500, 914 22, 297, 183	11, 204 14, 405, 098 11, 181, 838	33, 160, 000 11, 879, 316 27, 460, 119	10, 988 17, 081, 982 14, 124, 406	31, 980, 000 14, 306, 348 34, 679, 589
cement, gypsum (1965), lime, pyrites (1962-53), recovered elemental sultur, and values mideated by footnote 3. Excludes value of elays used for cement (1962-53).		30, 870, 155		35, 448, 379		6 42, 448, 082		43, 887, 787
Total Indians		162, 031, 000		169, 781, 000		4 165, 369, 000		4 183, 479, 000
	7	IOWA	'A					
Cement. 376-pound barrels. Clays. Gypsum	9, 336, 727 864, 667 1, 380, 733 1, 122, 409	\$22, 849, 597 2, 681, 789 5, 297, 074 2, 797, 704	9, 111, 358 913, 413 1, 388, 006 1, 151, 692	\$23, 330, 177 974, 539 5, 262, 373 2, 939, 654	9, 858, 889 882, 849 1, 196, 698 1, 106, 626	\$27, 044, 464 920, 859 4, 502, 561 3, 085, 661 1,096	10, 429, 943 (3) 1, 258, 357 1, 337, 160	\$29, 538, 987 (3) 4, 401, 857 4, 176, 710
Lead (recoverable content of ores, etc.). Peat. Sand and gravel. Stone (except limestone for cement 1625-53). Value of items that cannot be disclosed: Nonnetals and minerals indicated by footnote 3.	14, 500 10, 796, 979 9, 899, 404	110, 334 6, 032, 898 13, 036, 726	17, 233 10, 385, 322 10, 715, 078	(3) 6, 400, 827 13, 215, 352 224, 242	(8) 12, 199, 656 13, 240, 087		(3) 11, 770, 836 15, 705, 412	(8) 8, 344, 832 18, 555, 176 1, 262, 282
Total Iowa.		16 52, 481, 000		16 51, 994, 000		4 58, 798, 000		4 63, 555, 000

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\$25, 854, 037 \$73, 016, 878 \$165, 878 \$165, 878 \$165, 878 \$16, 818, 404 \$1, 818, 404 \$1, 918, 400 \$1, 918, 400 \$1, 918, 400 \$1, 918, 400 \$1, 946, 190 \$1, 946, 190 \$1, 946, 190 \$1, 946, 190 \$1, 946, 190	4 470, 830, 000	\$4,416,131 288,665,344 808,140 17,382,000 2,492,000 6,481,000 6,288,000 15,579,312 6,445,725 6,445,725
9, 454, 270 767, 662 42, 760, 000 42, 760, 000 411, 041 118, 599 92, 596 121, 669 10, 664, 986 12, 488, 390 27, 611		875,699 69,019,010 8,899 73,214 34,991 1189,247 11,933,899
\$23,874,179 (3) 5,602,808 5,602,808 1,106,024 43,711,000 (3) (3) (3) (3) (3) (3) (3) (4) (3) (4) (5) (5) (5) (7) (7) (7) (7) (1) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7	4 449, 587, 000	\$2, 994, 926 286, 736, 940 1, 510, 344 21, 920 16, 750, 000 1, 552, 000 6, 066, 000 4, 41, 770, 700 7, 786, 786 8, 928 5, 625, 961 6, 625, 961
9, 076, 328 1, 372, 294 87, 530, 000 4, 033 112, 369 (3) (10, 317 10, 317 10, 377, 008 10, 377, 008		55, 481 56, 964, 408 96, 408 72, 713 28, 224 180, 966 113, 721 4, 729, 966 10, 129, 735
\$21,428,536 7,101,386 7,101,386 668,928 866,928 86,928 172,000 (a) (b) (a) 7,480,566 7,480,566 5,668,308 11,303,900 3,568,450	413, 231, 000	\$3,118,352 30,2871,487 30,107,487 15,638,000 2,394,000 33,520,000 3,899,327 112,470 4,811,752
8, 546, 250 670, 694 1, 7715, 004 422, 782, 800 420, 607 (e) (e) (f) (h) (h) (h) (h) (h) (h) (h) (h) (h) (h		3, 405, 100, 100, 100, 100, 100, 100, 100, 1
\$20, 966, 886 7, 902, 589 7, 902, 580 1, 904, 580 1, 904, 580 3, 241, 000 3, 116, 000 288, 910, 000 6, 800 12, 001, 740 8, 460, 024 8, 460, 024 8, 460, 024	403, 370, 000	\$5, 101, 266 31, 386, 725 31, 386, 725 11, 863, 725 16, 934, 000 2, 191, 000 3, 963, 000 3, 963, 000 2, 663, 003 2, 663, 003 1, 083, 960 4, 535, 564 4, 535, 564
8 811,762 2,025,601 36,562,602 412,644 115,206 177,406 117,406		880, 874 66, 114, 341 48, 306 73, 427 156, 198 1, 198 3, 334, 261 8, 817, 869 8, 817, 869 3, 280
Cement 19.  Clays.  Coal.  Helium.  Helium.  Natural gas.  In Pages.  Punico.  Salt (comnon)  Sa	Total Kansas	Clays  Cool  Thurspar  Lead (recoverable content of ores, etc.)  Jostural gas liquids:  Lip-gasse  Lip-gasse  Thousand 42-gallon barrels  Sand and gravel  Since (recoverable content of ores, etc.)  The coverable content of ores, etc.)  Value of Items that cannot be disclosed: Native saphalt, cement, and stone (dimension sandstone, 1662-63)  Total Kentucky

See footnotes at end of table.

TABLE 5.-Mineral production in the United States, 1952-55, by States 1--Continued

LOUISIANA

	1955	ns Val	288 18 \$659,000 932 189,844,000 932 189,844,000 1188 10,325,000 1188 10,325,000 118 10,400 119,941,860 119,941,860 119,941,860 119,941,860 119,941,860	58, 027, 15, 308,	12 1, 156, 637, 000		\$12 672 \$17 6, 875, 445 598 832, 598 282 188, 961 5,000	11 1, 922 21 (8) 721 38 2, 855, 585 31 2, 642, 228	857, 353	12 12, 991, 000
		Short tons (unless otherwise stated)	16 651, 1, 680, 1, 680, 282, 281, 281, 271, 28, 574, 28, 574, 28, 574, 28, 574,	2, 072,			2, 348, 32, 26, (6)	71 21, 121 (3) 7, 528, 903 1, 192, 361	1	
	1954	Value	16 \$940, 940 (3) 124, 531, 000 54, 330, 000 11, 620, 000 722, 370, 600 11, 686, 636 9, 686, 636	49, 222, 594 6 13, 334, 241	6 12 998, 057, 000		(8) \$5, 425, 184 26, 872 (3) (3)	(8) 36, 894 (2, 538, 143 2, 355, 386	6 865, 077	12 10, 716, 000
		Short tons (unless otherwise stated)	16 713, 940 (3) 1, 399, 222 665, 070 292, 226 246, 558 3, 088, 686 7, 910, 152 1, 872 1, 872 1, 873 1, 873 1, 873	1, 503, 503			(3) 26, 872 (5) (5)	(3) 10, 324 (3) 7, 460, 620 1, 023, 709		
	1953	Value	\$951, 612 (3) 106, 079, 000 55, 421, 000 721, 156, 000 9, 189, 526 5, 163, 248	11, 176, 929	965, 237, 000		\$5, 422, 272 27, 476 117, 090	(3) (3) 73, 564 2, 608, 386 8 1, 216, 439	1, 038, 883	10, 503, 000
CONTRACTO		Short tons (unless otherwise stated)	(524, 427 (9) 1, 293, 644 (65, 532 287, 280 256, 632 3, 061, 234 4, 538, 387	T) 000, 901		NE	2, 001, 464 29, 661 17, 637	(3) (3) 2, 428 8, 071, 937 \$ 248, 501		-
	1952	Value	\$433, 808 (a) 82, 889, 000 48, 579, 000 14, 890, 000 645, 090, 090 7, 807, 689 6, 736, 524 (a)	9, 959, 888	848, 401, 000	MAINE	(4) \$3,750,483 26,050 147,371	(3) (3) 57, 541 2, 187, 531 8 1, 795, 768	1, 015, 827	8, 981, 000
		Short tons (unless otherwise stated)	390, 136 (3), 143 (72, 042 297, 444 2, 553, 448 (905, 119 (49, 668	000 (011 (1			1, 467, 250 26, 050 18, 644	(3) (4) 1, 695 7, 078, 078 \$ 316, 874		
		Mineral	11:5-1:1:	not be disclosed: Cement red elemental sulfur, and . Excludes clays used	Total Louisiana		Beryllium concentrategross weight Clarys. Feldspar. Genes Genes Genes Genes Genes Genes	Scrap Sheet Sand and gravel Stand and gravel Stane (except limestone for cement and lime, 1932-53) Value of items that cannot be disclosed: Columbium-fanta-	durattie (1952–53), slate, stone (crushed limestone (1952–55), and values indicated by footnote 3	Total Maine.

							The second second second second	-
Clays.  Coal.  Lime Naturat gas Sand and graval.  Stone of stems that cannot be disclosed: Beryllium concentrate (1962-63).  Value of items that cannot be disclosed: Beryllium concentrate (1964, cannot, greensand marf (1964-65), mice (1964, potassium saits, quartz (1962), safe, stone (dimension filmestrone and crushed marble 1965-63, oystershells 1965), and tale and eapstone. Excludes value of clays used for cement (1962-63).	771, 922 587, 903 72, 885 2, 372 4, 956, 640 5, 391, 679	\$1,426,556 2,694,842 746,893 746,893 136,000 8,136,697 86,330,443 7,051,146	671, 164 530, 590 71, 705 7, 379, 511 8 3, 578, 250	\$1,135,700 2,441,605 208,707,736 208,000 8,219,088 6,275,124	627, 311 421, 616 67, 081 1, 394 10, 097, 800 5, 064, 526	\$1, 165, 747 1, 879, 018 685, 427 282, 000 12, 171, 613 8, 265, 521 7, 286, 888	698, 257 74, 469 74, 497 8, 694, 928 8 5, 342, 968	\$1, 264, 948 2,001, 748 2,001, 748 626, 000 12, 210, 658 8, 800, 644 8, 800, 644 11, 027, 986
Total Maryland		26, 847, 000		27, 085, 000		4 30, 743, 000		4 35, 491, 000
		MASSACHUSETTS	USETTS					
Clays.  Lone Peat. Sand and gravel Stone (except limestone for lime, 1962-53).  Value of items that cannot be disclosed: Mineral fuels and nonmetals.	140, 148 132, 135 (8) (65, 728 5, 355, 819	\$160, 371 1, 999, 546 (3) 6, 128, 744 8 9, 331, 871 191, 752	152,117 136,383 2,061 7,308,190 3,457,708	\$195,837 2,156,205 156,962 5,930,894 8,821,108	128, 998 127, 836 (3) 9, 640, 274 2, 942, 435	\$121,049 1,709,341 (3) 8,366,409 9,039,590	124, 832 134, 952 (3) 9, 580, 943 4, 128, 003	\$141, 654 1, 957, 346 (3) 8, 926, 329 11, 381, 164 6, 938
Total Massachusetts		17, 812, 000		17, 191, 000		12 18, 851, 000		12 22, 109, 000
		MICHIGAN	AAN				를 합	N
Cement 876-pound barrels 14, Olays Copper (recoverable content of ores, etc.)	, 760, 783 , 776, 917 21, 699	\$36, 819, 042 1, 810, 916 10, 502, 316	15, 863, 096 1, 645, 804 24, 097	\$41, 860, 464 1, 686, 113 13, 831, 678	16, 711, 710 1, 870, 814 23, 593	\$45, 691, 867 1, 919, 204 13, 919, 870	19, 738, 400 1, 987, 593 50, 086	\$58, 048, 400 2, 049, 077 37, 346, 236
Gypsum  Gypsum  Gypsum  Moroo ore (usable)	, 487, 642 , 779, 366	4, 200, 418 76, 088, 935	1, 446, 973 13, 312, 766	4, 091, 002 94, 691, 612	1, 693, 279 9, 709, 167	5, 035, 550 70, 004, 504	1, 762, 105 14, 143, 809	5, 660, 587 104, 258, 188
Manganiferous ore (5 to 35 percent Mn)gross weight Mart, calcareous (except for cement)gross weight Natural gas	38, 449 22, 095 164, 519 9, 052 29, 304	3, 917, 138 (3) 86, 529 1, 322, 000 419, 866	43, 190 76, 251 183, 685 7, 774 25, 439	4, 561, 922 (3) 72, 781 1, 275, 000 257, 176	37, 038 115, 361 106, 668 6, 962	4, 108, 766 (3) 37, 724 1, 239, 000 (3)	46, 536 119, 313 8, 300	5, 063, 621 67, 176 955, 000 (3)
See footnotes at end of table.					•	<b>.</b>		· · · · · · · · · · · · · · · · · · ·

TABLE 5.--Mineral production in the United States, 1952-55, by States 1--Continued

# MICHIGAN-Continued

	<b>—</b>	1952	-	1953		1954	6 <b>1</b>	1955
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Petroleum (crude)————————————————————————————————————	13, 261 4, 778, 347 29, 193, 763 17, 973, 685	\$35, 250, 000 22, 400, 872 22, 400, 879 15, 770, 816 24, 482, 809	12, 285 5, 127, 387 30, 459, 663 21, 615, 686	\$35, 870, 000 22, 171, 988 23, 170, 802 17, 639, 525 25, 276, 772	12, 028 5, 063, 638 32, 040, 639 27, 758, 443	\$35, 600, 000 29, 396, 812 25, 516, 169 21, 904, 517 6 29, 271, 636	11, 206 4, 975, 442 37, 214, 459 33, 636, 612	\$22,900,000 \$1,668,351 29,490,775 28,908,784 28,908,784 31,849,463
Total Michigan		254, 518, 000		286, 487, 000		4 6 279, 940, 000		4 363, 787, 000
		MINNESOTA	SOTA					
long tons, gross weight.		\$160, 408 375, 765, 251 (8)	91, 401 80, 533, 670 1, 091, 491	\$149, 384 517, 850, 509	(8) 48, 613, 338 504, 057	(3) \$319, 632, 491	(8) (6) (9) 419, 334 864, 628	(3) 465, 169, 412 (3)
53) ve stones, ore (1955),	19, 825, 157 8 2, 394, 178	6, 808, 763 8 5, 498, 177	19, 774, 411 2, 770, 528	7, 304, 351 6, 587, 096	23, 848, 856 8 2, 629, 456	16, 318, 520 8 7, 485, 291	25, 896, 426 8 3, 004, 521	(2) 17, 429, 334 8 7, 042, 840
peat (1954-55), stone (crushed basalt 1952, crushed sandstone 1954-55), and values indicated by footnote 3	1	9, 206, 865	1	10, 653, 888		8 8, 204, 448		11, 739, 266
Total Minnesota.		397, 440, 000		542, 545, 000		13 351, 474, 000		13 501, 151, 000

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OIMIDITORIA DE	MINDIAN FRODU	CII
\$\$, 913, 113 15, 664, 000 1, 673, 000 29, 840, 000 4, 603, 032 4, 603, 032 4, 503, 504 1122, 620, 000	\$4,003 842 \$4,012,186 \$6,012,186 \$6,012,186 \$1,234,612 \$7,372,776 \$1,372,776 \$1,000 \$9,000 \$9,000 \$1,000 \$1,101,096 \$4,883,392	4 151, 626, 000
700, 615 163, 167 22, 382 12, 242 37, 741 5, 624, 878 672, 816	363, 692 2, 255, 346 3, 262, 401 3, 262, 401 1722 261, 572 1, 464, 832 1, 464, 832 1, 464, 832 1, 69, 83, 624 268, 620 8 9 22, 368, 768 4, 476	
\$3, 103, 132 11, 657, 000 1, 94, 000 528, 000 86, 660, 000 4, 286, 871 181, 418 3, 352, 481 1110, 583, 000	83, 047, 436 31, 425, 190 6, 82, 756 10, 028, 298 1, 185, 750 34, 318, 500 11, 165, 381 10, 203, 481 24, 751 24, 751 25, 751 26, 751 26, 751 27, 751 2	4 131, 280, 000
559, 401 140, 448 27, 804 15, 288 34, 240 5, 441, 837 6 181, 418	11, 379, 257, 286, 257, 286, 257, 286, 257, 286, 287, 289, 289, 389, 386, 289, 389, 389, 389, 389, 389, 389, 389, 3	
\$3.158,386 12,340,000 2,295,000 84,060,000 2,173,871 4,700 3,083,749 107,868,000	\$3.338, 395 11,182, 208, 460 11,182, 208 1,362, 676 32,984, 490 12,084, 130 12,084, 130 13,084, 130 13	128, 207, 000
560,047 154,254 154,254 32,214 17,724 2,633,646 38,000	330, 763 9,860, 179 2, 231, 566 2, 231, 566 2, 234 2, 234 11, 212, 107 1, 212, 107 5, 792, 058 5, 792, 058 13, 947, 731 8, 13, 947, 731 9, 981	
\$2 681, 563   15, 620, 600   2, 600, 600   5, 777, 600   2, 600, 600   1, 833, 306   2, 62, 283, 312   101, 875, 000   1, 875, 000   2, 813, 12   1, 875, 000   1, 875, 00	\$2, 523, 038 12, 048; 420 12, 048; 441 12, 048; 141 1, 246, 734 4, 648, 800 11, 326, 941 (3, 000 6, 122, 195 4, 643, 362 20, 678, 362 2	140, 977, 000
2, 286, 577 90, 000	304, 080 10, 086, 850 2, 954, 400 28, 267 28, 245 1, 139, 245 1, 139, 422 15, 105, 422 15, 105, 432 15, 43	
Clays.  Natural gas Natural gas in the products in the products and gas in the products are products.  Natural gasoline and cycle products thousand gallons.  LP-gasse.  LP-gasse.  Sand and gravel.  Stone.  Sand and gravel.  Stone.  Value of items that cannot be disclosed: Certain nonmetals.  Excludes value of clays used for cement (1952-53)	Barite.  Comeaut Greenest S76-pound barrels.  Collays  Iron ore (usable)  Lead (recoverable content of ores, etc.)  Lead (recoverable content of ores, etc.)  Natural gas.  Petroleum (crude)  Sand and gavel  Sand and gavel  Sand and gavel  Silver (recoverable content of ores, etc.)  Zinc (recoverable content of ores, etc.)	Total Missouri

See footnotes at end of table.

TABLE 5.--Mineral production in the United States, 1952-55, by States 1--Continued

#### MONTANA

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	\$150,835 2,400 2,55,000 80,810,000 6,192,797 4,177,861 11,143,474 4.54,237,000	\$708, 804 \$78, 805 \$78, 805 \$78, 805 \$785, 925 \$705, 986, 512 \$705, 986, 512 \$705, 884 \$705, 884
	150, 835 (0) 12, 515 11, 2018 8, 405, 197 3, 081, 247	113.694 6, 155 72, 925 72, 925 72, 925 83, 744 94, 602 9, 291 101, 469 6, 750 846, 397 1, 611, 942 1, 611, 942 1, 616, 752 8, 670 8, 670 8, 670 8, 670 8, 670 8, 670 8, 670 8, 670 8, 670 8, 670
	\$163, 831 786,000 21, 400, 000 6, 992, 314 3, 611, 494 10, 637, 123 4 42, 393, 000	(4) \$617, 492 8,787 411, 428, 030 2, 217, 233 2, 217, 233 2, 217, 233 2, 217, 233 2, 217, 233 3, 234 40, 000 (1) (1) (2) (3) (4) (4) (5) (5) (7) (8) (8) (9) (9) (9) (9) (9) (1) (1) (1) (2) (3) (3) (4) (4) (5) (5) (5) (7) (8) (8) (9) (9) (9) (9) (9) (1) (1) (1) (2) (3) (3) (4) (4) (5) (5) (6) (7) (8) (8) (9) (9) (9) (9) (9) (1) (1) (1) (2) (3) (3) (4) (4) (5) (5) (7) (8) (8) (9) (9) (9) (9) (9) (9) (9) (1) (9) (1) (1) (2) (3) (3) (4) (4) (4) (5) (5) (7) (8) (8) (9) (9) (9) (9) (9) (9) (9) (9
	163, 831 6, 801 7, 783 8, 547, 876 2, 660, 170	88, 883 5, 478 70, 217 70, 217 70, 217 70, 217 70, 217 85, 220 12, 874 4, 974 8, 563, 281 1, 882, 781 1, 035
	\$186, 893 911,000 17, 190, 000 4, 340, 163 2, 066, 984 8, 582, 904 8, 582, 904	(a) \$614, 686 (b) 3, 501, 900 3, 501, 900 3, 501, 900 1, 145, 203 1, 139, 120 1, 396, 12
ADAA	176,856 6,748 6,344 5,969,858 1,407,158	20 60, 525 61, 526 101, 796 101, 796 101, 796 101, 796 22, 664 23, 664 11, 036, 668 11, 036, 688 11, 036, 688 11, 036, 688 11, 036, 688 11, 036, 688 12, 036 13, 036 14, 031 15, 036 16, 036 17, 036 18, 036 19, 036 1
Addridan	\$167,708 6,490,000 8,490,000 1,946,448 7,878,888 20,697,000	\$301,242 \$46,278 \$4,102,108 \$4,102,108 \$4,102,108 \$1,991,998 \$1,991,998 \$1,108,108 \$1,108
	167, 228 5, 566 5, 436, 540 1, 245, 106	8, 968 8, 968 8, 968 117, 238 117, 238 117, 238 117, 238 118, 384 11, 196 11, 196 1
	Clays  Gen stones  Gen stones  Petroleum (crude)  Estroleum (crude)  Sand and gravel  Stone (arcept limestone for cement, 1962-63)  Value of tiems that cannot be disclosed: Cement, natural- gas liquids, and pumitee. Excludes value of clays used for cement (1962-63)  Total Nebraska	Antimony ore and concentrate———————————————————————————————————

TABLE 5.--Mineral production in the United States, 1952-55, by States 1--Continued

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1955	ons Value ise	\$11,975 \$184 \$1,184 \$35,184 (3) \$5,000	(a) (b) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d		192 \$1, 561, 994 1650 13, 633, 370 (3) (4) (5) (5) (6) (4) (7) (7) (8) (7) (8) (9) (9) (10, 424, 417
	Short tons (unless otherwise stated)	35,1 (3) (6)	©©240 ۩240		644, 192 (5) (76, 550, 550, 213, 370 (1), 152, 552 (8), 367, 599 1, 404 11, 643
1954	Value	\$6, 960 35, 681 433 (³)	234,450 11,583 1,094,474 473,298 255,226 2,112,000		81, 246, 099 6, 631, 881 (3) 134, 884 (14) 14, 704, 474 (15) 12, 109, 550 7, 992, 058 19, 4, 184, 432 47, 044, 000
	Short tons (unless otherwise stated)	35, 681 255 (3)	42, 466 325 2, 240, 548 72, 486		578, 344 476, 1912 21, 101, 005, 325 6, 77, 200 (3) 87, 416
1953	Value	\$32, 640 41, 427 1, 309 286, 069	382, 680 (3) 606, 166 538, 897 15, 617 1, 805, 000		81, 326, 297  10, 114, 970  138, 404  10, 835, 948  13, 817, 866  9, 922, 990  61, 946, 000
<b>.</b>	Short tons (unless otherwise stated)	45, 198 770 28, 961	90, 716 (*) 2, 249, 001 76, 701	NEW JERSEY	532, 185 811, 506 811, 506 821, 706 7, 361, 937 6, 036, 256 6, 036, 256 45, 700
1952	Value	(3) \$30, 135 (3)	(3) (3) 1, 001, 591 546, 177 366, 597 1, 945, 000	NEV	\$1, 962, 599 6, 760, 467 (3), 177, 847 117, 847 113, 101, 834 12, 907, 408, 000
	Short tons (unless otherwise stated)	(9) 30, 135 (9)	(3) (3) (3) (3) (4) (5) (5) (6) (6) (6) (7)		588, 775 685, 466 215, 265 7, 060, 7, 138, 434 6, 10, 324 (6) 190
	Mineral	Beryllium concentrategross weight Clays Columbium-tantalum concentratepounds, gross weight Felispar Gem stones	Mica. Scrap. Sand and gravel. Stone Shale of items that cannot be disclosed: Abrasive stones, peat, and values indicated by footnote 3.  Total New Hampshire.		Clays.  Gen stones.  Iron ore (usable).  Magazilierous residuum.  Mari (grewand).  Peat.  Sand and gravel.  Sand and sandstone (ground).  Stone (except limestone for lime 1922-53).  Sulfur, recovered elemental.  Value of thems that cannot be disclosed. Lime, magnesium compounds, stone (crushed marble 1965), and values in class and values and values are cated by footnote 3.

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Beryllium concentrategross weight								
lays	101 67.668	\$29, 185 107, 633	89	\$52,014	47 839	\$43,771	4	
Coal. Columbium-tantalum concentratepounds. gross weight	759, 437		513, 781	3, 081, 366	123,099	727, 372		1, 236, 125
Copper (recoverable content of ores, etc.).	76, 112	36, 838, 208	72, 477	41,601, 798	60, 558	35, 729, 220	96,	129 49, 547, 082
Gem stones. Obdi (recoverable content of ores, etc.)troy ounces	(e), 2, 949	(8) 103, 215	(6) 2, 614	(3) 91, 490	(S) (S) (S) (S) (S) (S)	(3) 123, 865	(6)	(5) 25,000 67,095
			11, 158, 000	150, 127	41, 754, 600	2, 661 735, 183	53. 721.	946. 447
Lead (recoverable content of ores, etc.)  Manganese ore (3k percent of more Mn)	7,793	(3) 2, 260, 762	7, 525	(8) 771, 066	3,316	(3) 243, 038		(8) 982, 208
percent Mn)	52, 934	ම	(9)	(8)	20, 546	82, 184	40, 40,	<u>මෙ</u>
Scrap Sheet							84	2, 475
Natural gas million cubic feet.	359, 377	16, 414, 000	399, 086	24, 344, 000	2, 054 449, 346	13, 845 35, 049, 000	9, 431	64,930 $48,119,000$
Natural gasoline and cycle productsthousand gallons	163, 926	11,660,000					261,023	425,
		දීම		65,		885,		6, 767, 000 1, 091, 250
Potassium salts	1, 411, 125	46, 385, 452						310,
Fumice Salt (common)	(3)	755, 139 (3)	528, 649 62, 087	759,840	363, 926	1,060,096	393, 597	780, 339
Sand and gravel Silver (recoverable content of ores, etc.)	496, 921	499, 589						6,004,554
								1, 546, 665
f ores, etc.)	50, 975	16, 923, 700	13, 373	3, 075, 790	9		15.277	3, 036 3, 758, 142
ide, distonite (1963-65), molybdenum, magnesium com-								
pounds (1904), stone (crusned miscenaneous 1952), recovered elemental sulfur (1963-55), vanadium, and values								
indicated by footnote 3.		6 2, 125, 730		6 1, 651, 604		6 1, 672, 426		2, 187, 727
Total, New Mexico		6 288, 474, 000		6 336, 545, 000		6 373, 519, 000		435, 911, 000

TABLE 5.—Mineral production in the United States, 1952-55, by States 1—Continued

## NEW YORK

	51	1962	Ä	1953		1954	1955	55
Mineral	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 19.  Glays.  Binery.  Gen stones.  Gypsum.  Iron over (usable).  Lime.  Lead (recoverable content of ores, etc.).  Matural gas.  Petroleum (crude).  Sand and gravel.  Sand and gravel.  Sinte (recoverable content of ores, etc.).  Sinte (recoverable content of ores, etc.).  Sinte (recoverable content of ores, etc.).  Talc.  Cinc (recoverable content of ores, etc.).  Avalue of tiems that cannot be disclosed: Abrasive stone (1963-44), beryllum concentrate (1963), natural cement, abrasive garner, Iron oxide pigments (1963), calcareous mari (1962-64), pyrites (1963), stone (crushed unclassified 1963), recovered elemental sulfirt (1962, 1964), tutalium concentrate, wollaskonite and values indicated by footnode or concentrate, wollaskonite and values indicated by footnode	14 624, 274 1, 218, 860 10, 382 11, 143, 929 1, 1143, 929 1, 1143, 929 1, 1143, 929 1, 1143, 929 1, 1143, 929 1, 1143, 929 1, 1143, 929 1, 1143, 929 1, 1143, 937	\$36, 679, 379 1, 291, 736 1, 414, 911 34, 614, 679 36, 660 1, 660, 660 17, 940, 690 17, 940, 690 18, 287, 623 18, 287, 623	14, 965, 164, 960, 781, 960, 781, 960, 781, 166, 781, 485, 681, 485, 681, 681, 681, 681, 681, 681, 681, 681	\$39, 388, 113 1, 303, 281 143, 974 3, 507, 297 36, 346, 279 (9) 742, 000 117, 281, 111 23, 483, 837 1, 733, 332 1, 733, 332 8, 25, 266, 576 11, 861, 679	14,496,876 1,196,158 9,788 1,138,578 2,268 3,278 3,278 3,278 3,278 3,278 3,475	\$88 861, 205 1, 493, 603 1, 493, 603 132, 313 31, 706, 538 31, 706, 538 328, 238 (0), 538, 238 (1), 140, 000 11, 140, 000 11, 140, 000 11, 142, 048 31, 238 31, 238 (1), 490, 884	17, 942, 126 1, 308, 665 1, 238, 119 3, 201, 927 3, 301, 927 8, 3, 637 8, 561, 94 25, 561, 94 25, 561, 94 25, 561, 94 25, 561, 94 26, 162 27, 82, 93, 688 28, 83, 106 8, 1	\$52, 150, 099 1, 576, 216 1, 5
3. Excludes value of clays used for cement (1962-53)		7, 917, 911		8, 102, 030		4 6 192, 738, 000		\$, 772, 755 4 216, 907, 000

NORTH CAROLINA

Abrasive stones. Olayas	1, 357, 700	\$28, 992 2, 080, 172	1, 466, 232	\$16, 150 2, 534, 908	1,872,541	2, 519, 721	2, 375, 494	\$12, 104 1, 792, 081
Copper (recoverable content of ores, etc.) Feldspare Fendspare Fendspare	240, 364	i	268, 042	3, 290, 495	230, 744	2, 220, 707	£ 25	2, 184, 793
Gold (recoverable content of ores, etc.)troy ounces. Lead (recoverable content of ores, etc.)troy ounces. Mine:					214	7,490 1,049	<b>8</b> *	<b>9</b>
rap leet and gravel feotocrass blo content of cons.	58, 576 595, 331 8, 724, 748	1,551,071 664,075 5,666,169	56, 834 619, 895 6, 910, 982	1,428,793 1,308,494 4,992,991	61,049 479,221 7,441,200	1, 467, 122 1, 787, 197 5, 608, 284	60,887 668,444 7,785,741	1,277 5,745,
ate)	8 9, 647, 513 10 115, 481	8 14, 694, 698 10 1, 771, 518 11, 601	6 8 9,316,823 II 119, 341	8 14, 424, 323 11 578, 239	438 10, 133, 728 11 112, 704	396 15, 625, 331 11 388, 428	10, 903, 366 125, 206	16, 532, 571,
Tungsten concentrate (untentie) —— gross weight.  Tungsten concentrate —— 60-percent WO+ basis.  Yallue of items that cannot be disclessed: A brasive stone (millstones 1954), as bestos (1955–55), beryllum concentrate	1, 254	177, 296 (3)	2,074	(9)	2, 538	(9)	2, 609	<b>(9</b> )
(1962–65), columbium-tantaium concentrate (1962–59), Hithium minerals, manganiferous ores (1963), cilvine, quartz (1962–63), stone, (dimension, and crushed marble 1962–63), vermiculite and values indicated by footnote 3		5, 652, 311.		9,876,773		12, 122, 942		10,074,950
Total North Carolina		34, 726, 000		38, 451, 000.		41, 651, 000	10.000	41, 210,000
		NORTH DAKOTA	AKOTA					3
Clays.  Coal (lignite)  Natural gas  Petroleum (crude)  thousand, 42-gallon, barrels.  Pumice	2, 983, 752 899, 1, 549,	\$7, 068, 258 23, 006.	23, 084 2, 802, 558 5, 183	\$47,862 6,617,980 34,000 10,870,000	66)-1-08 200-6	(3) (8) (8) (8) (9) (9) (9) (9) (9) (9)	3, 102,087 1, 2, 2, 8, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,	87, 284, 120 87, 284, 120 82, 206, 000
Sand-and gravel- Stone Value of items that cannot be disclosed: Octrain nonmetals and values indicated by footnote 3.	6, 567, 069 67, 064	1, 841, 216 4, 968 3, 119, 900	6, 173, 737 35, 031	2, 164, 686 2, 595	7, 105, 466	2, 210, 747 3, 784 7, 040, 820		2, 687, 988 80, 560 1, 628, 636
Total North Dakota		12,057,000		19. 237. 000		22-223 000	2001 3000	44 123 000

See footnotes at end of table,

TABLE 5.-Mineral production in the United States, 1952-55, by States 1-Continued

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Ghort tone	Value Singer tous Singer tous Value (unless otherwise stated)	6, 327, 706         6, 61, 478         11, 136, 478         6, 297, 418         15, 617, 389           3, 31, 353         2, 549, 048         3, 384, 000         3, 384, 000         3, 61, 000         3, 61, 000           3, 34, 000         38, 384, 000         3, 38, 39, 30         3, 756         7, 595, 000	(4) 260, 474 29, 540 386, 970 22, 484 220, 540 386, 970 27, 484, 785 27, 280 27, 873, 469 39, 041, 308 32, 626, 737 47, 802, 189, 041, 308	1, 264, 540 2, 084, 098 2, 864, 455	302, 242, 000 4 240, 457, 000		\$637.082         452.050         \$1,282,848         10.724,166         10.5726,556           13,226,881         1,914,884         11,264,692         2,168,556         12,667,633           24,677,648         14,204         381,896         14,126         4,006,548           41,397,00         616,386         45,145,000         614,976         45,608,000	28, 066, 000 478, 590 24, 332, 000 504, 692 28, 770, 000
1963	Short tons (unless otherwise stated)	532, 437 \$32, 634, 596 9, 736, 773 131, 945, 800 35, 37, 542 8,	(3) 27, 696 3, 610 040, 237 032, 388 285, 782	-1	302,	[A	577, 557 \$ 10, 20, 20, 304 \$ 2, 699, 955 \$ 41,	433, 650 28,
	Value (to other st	\$28, 488, 500 12, 13, 643, 742 5, 138, 090, 700 34, 28, 393, 260 2, 6, 725, 000		1, 664, 191	292, 689, 000	OKLAHOMA	\$577, 420 12, 687, 855 4, 874, 114 29, 918, 000	29, 459, 000
1962	Short tons (unless otherwise stated)	11, 377, 806 5, 493, 830 36, 208, 450 2, 205, 432 30, 993	1, 596 24, 828 3, 350 2, 827, 455 20, 751, 493 824, 693, 189				520, 050 2, 193, 409 15, 137 554, 033	405, 720
	Mineral	Cement 376-pound barrels. Clays Coal Line Line Mullion cubic feet.		Value of nems. Value cannot be usedosed: Arisavie stones, calcium-magnesium chloride, gypsium, ground sand and sandstone (1952–53), stone (crushed unclassified 1952, dimension unclassified 1952–53), and values indicated by mension are accounted by some common of the common common calcium common calcium calciu	Total Ohio.		Clays	Natural gas liquids: Natural gasoline and evele productsthousand gallons

10, 219, 578 16, 525, 248 4 711, 089, 000		\$463, 514 275, 916	2, 984 59, 780 (8) 894	306, 610	(3) (11, 832, 344 11, 832, 344 7, 978 9, 417, 834 (8)	10, 500, 091	4 31, 736, 000		\$141, 969, 042 12, 413, 093	206, 096, 662 440, 451, 700 (3) (4)	56, 350
41, 543	_	5, 341 250, 608	1,708 1,786 8	1,056	(3) 11, 953, 878 8, 815 7, 741, 937				48, 089, 578	26, 204, 554 85, 713, 456 478, 840 (3)	1, 610
9, 324, 936		\$537, 928 (3)	2,950 228,200 1,370	129, 287	14, 149, 380 14, 149, 380 12, 974 8, 617, 795 (3)	69, 634, 139	4 32, 268, 000		\$117, 912, 299 10, 243, 485	247, 870, 023 378, 658, 531 (3)	46, 095
43,171		6, 655	6, 520 5	489	1, 995 67, 852 13, 167, 239 14, 335 5, 872, 353 (19)				43, 068, 234 3, 524, 398	29, 083, 477 72, 010, 101 517, 124 (3)	1,317
7, 684, 990 11, 538, 234 679, 003, 000		\$484, 453 296, 050	297, 080 297, 080 1, 310	(3) 125, 083	8, 629, 632 11, 095 11, 095 8 6, 301, 639	8, 123, 493	24, 449, 000		\$114, 002, 846 9, 987, 928	299, 139, 687 516, 490, 411 (3) 1, 737, 498	39,690
33, 413	NOH	6, 216 292, 445	8, 488	271 648	8, 763, 080 8, 763, 078 12, 259 8 4, 939, 080 (19)			LVANIA	42, 093, 765 3, 575, 287	30, 949, 152 93, 330, 871 564, 450 3, 027	1, 134
18, 232, 112 12, 116, 791 621, 351, 000	OREGON	\$507, 981 569, 968 8, 650	, 484 192, 815 322	172, 819	201, 809 8, 556, 218 3, 654 8, 893, 368 15, 960	332 7, 549, 366	26, 674, 000	PENNSYLVANIA	\$103, 388, 586 12, 639, 864	379, 714, 076 473, 475, 646 1, 686, 740	52, 500
54, 916		6, 591 277, 072 1, 179	5, 509	898	59, 578 12, 219, 486 4, 037 6, 250, 849	1			40, 037, 761 3, 731, 130	40, 582, 558 89, 181, 232 639, 856 3, 485	1, 500
Zine (recoverable content of ores, etc.).  Value of items that cannot be disclosed: Native sapisalt, bentonite (1955-164), coment, grysum, lime, punice (1955-164), salt, ground sand and sandstone (1955-56), stone (dimension limestone, 1952 and 1964), recovered elemental sulfur (1963-65), and tripoil (1963-65). Excludes value of clays used for cement (1962-58).		Obromitegross weight Clays Coal	Copper (recoverable content of cres. etc.).  Cod (recoverable content of ores, etc.)		Punito Sand and gravel Blyer (recoverable content of ores, etc.) Thungsten ore and concentrate.  "Thungsten ore and concentrate	Line (recoveration content of ores, etc.).  Altho of tense that cannot be disclosed: Carbon dioxide, cement, discontite, gen stones, tron oxide pigments (1954), lime (1962), perlife (1962-53), quartz (1952-53), stone (crushed granife 1963), and values indicated by footnote 3.	Total Oregon.		Oement. 376-pound barrels. Oement. Oement. Oement. Oement.	Anthracite Bluminous Cobalt (content of concentrate) Copper (recoverable content of ores, etc.)	Gold (recoverable content of ores, etc.)troy ounces See footnotes at end of table.

TABLE 5.--Mineral production in the United States, 1952-55, by States 1--Continued

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		1963	962	<b>3.</b>	1953	213 223	1964	118 B 11956	<b>3</b> 3 (5)
	Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons fundess otherwise stated)	Profession Services
Iron ore (usable). Iron oxide pigments (crude). Line (open-market). Natural gas. Natural gas liquids: Natural gas liquids: Natural gasoline. Li-gases. Peat. Sand and gravel. Sand and gravel. Sixtone (except limestone for Sixtone (except limestone for Sixtone). Sixtone (except limestone for Sixtone). Sixtone (except limestone for Sixtone). Tripoli. Value of thems that cannot line 1963), mice, pyrites, is 53, stone (dimension bas by footnote 3. Excludes (1962-63).	on ore (usable)  on oxide pigments (crude)  func (open-market)  atural gas  atural gas  atural gas landids  I.P-gases  I.P-gases  and and gravel  ind of inens that cannot be disclossed: Graphite (crystal-  into 1653, nice, pyrites, ground sand and sandstone (1962-63), stone (dimension basalt 1962-53), and values indicated by footnote 3. Excludes value of clays used for cement (1962-53).  Total Pennsylvania.	1, 202, 284 1, 202, 284 1, 108, 684 7, 182 14, 66, 106 1, 237 214, 80 1, 24, 80 1, 24, 80 ()	(e) 1,020,8 \$13,342,213 1,336,3 \$13,758,000 100,5 548,000 14,000 14,487,600 14,715,3 8,4,676,466 9,6,192,6 (e) (e) (e) (f) (e) (f) (f) (e) (f) (f) (f) (f) (f) (f) (f) (f) (f) (f	1, 020, 826 1, 335, 300 1, 336, 300 1, 008 8, 232 14, 715, 383 202, 385 8-202, 385 (3) (3)	(9) 816,010,114 80,717,000 (9) 90,000 20,692,326 4,419,226 (9) 4,419,311 (1,121,622,000 11,461,911	708, 1081, 583 1, 081, 583 146, 584 11, 218, 108 11, 218, 108 11, 218, 214 13, 24, 206 13, 206	45, 634, 000 45, 634, 000 320, 000 83, 000 20, 53, 000 20, 541, 35, 541 4, 412, 433, 514 4, 412, 433, 419 (1) (2) (3) (1) (2) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4	888 849 1, 424, 051 1, 424, 051 1, 424, 051 1, 424, 051 1, 312, 971 1, 312, 97	(*) 8.6.714 20.714 (*) 7.14 20.715 (*)
Sand and gravel. Stone Yalue of items that cannot and values indicated by f	ot be disclosed: Certain nonmetals y footnote 3	589, 451 168, 993	\$557, 396 654, 782 37, 500	898, 393 161, 632	\$775, 700 617, 096 69, 000	1, 013, 014	\$979, 470 (1) 481, 186	1, 940, 738	\$1,498,552 (9)
Total Rhode Island.	p		1, 250, 000		1, 462, 000		1, 461, 000		1, 834, 000

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TABLE 5.—Mineral production in the United States, 1952-55, by States 1—Continued

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	7	1952	-	1953		1954	1955	26
Mineral	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  Clays  Clays  Clays  Color  Copper (recoverable content of ores, etc.)  Gold (recoverable content of ores, etc.)  Line  Gold (recoverable content of ores, etc.)  Line  Manganese ore (36 percent or more Mn)  Starla gas  For clays  Sand and gravel  Sliver (recoverable content of ores, etc.)  For clays  Sand and gravel  Sliver (recoverable content of ores, etc.)  Stone (except limestone for cement and lime, 1932-53)  Zing (recoverable content of ores, etc.)  Stone (except limestone for cement and lime, 1932-53)  Stone (except limestone for cement and lime, 1932-63)  Sing (recoverable content of ores, etc.)  Stone (except limestone for cement and lime, 1932-63)  Stone (except limestone for cement and lime, 1932-63)  Total Tennessee.  Total Tennessee.	7, 428, 604 1, 642, 239 5, 264, 504 7, 626 100, 189 100, 189 100, 337 5, 773, 401 10, 377, 369 10, 377, 377, 377, 377, 377, 377, 377, 37	\$17, 884, 060 26, 559, 746 3, 688, 089 3, 688, 089 (9, 78) (1, 006, 236 (1, 006, 236 (1, 006, 236 (1, 306, 338 (1, 306,	7, 276, 904 1, 037, 460 5, 66, 569 7, 829 12, 751 2, 202 11, 474 2, 625 11, 518, 912 5, 231, 339 6, 231, 339 6, 231, 339 8, 465	\$18, 283, 386 3, 478, 622 25, 1682 4, 483, 846 (3) 255 82, 449 11, 10, 255 11, 10, 255 11, 10, 255 11, 10, 255 11, 10, 255 11, 00, 00 11, 80, 625 5, 629, 687 6, 629, 687 6, 629, 687 7, 364, 412 2, 364, 412 98, 050, 000	7, 569, 279 1, 015, 226 6, 528 9, 687 11, 823 11, 823 11, 633, 226 5, 155, 185 5, 156, 185 14, 040, 185 14, 040, 185 14, 040, 185	\$19, 734, 202 225, 470, 606 5, 361, 801 6, 361, 801 7, 630 (3) 7, 630 (3) 7, 630 (4) 10, 949 10, 949 10, 949 11, 743, 012 6, 141, 139 6, 560, 346 6, 560, 346 6, 560, 346 7, 470, 590	8, 811, 858 1, 207, 613 7, 092, 844 9, 911 103, 257 16, 895 1, 455, 902 5, 186, 543 6, 114, 451 40, 216	\$23,673,112 4,166,885 28,166,574 7,386,569 7,735 (*) 1,102,005 1,200,100 1,200,1
A brasive stone: Pebbles (grinding)	19, 849, 455 2, 069, 020 2, 600 (v) 11, 021, 161 107, 301, 332 107, 301, 333 56	\$3,100 4,407,182 2,682,010 1,405,000 1,405,000 1,405,000 1,803 1,803 1,803 1,18,03 1,803	19, 140, 198 2, 370, 975 2, 370, 976 (b) 1, 067, 854 1, 014, 937	\$5,500 4,678,974 (°) (°) (°) (°) (°)	(a) 21, 928, 170 2, 400, 924 (b) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d	\$66,674,124 7,002,024 100,000 1,873,230 1,873,230 1,873,230 (3)	(a) (b) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c	(3) \$67, 548, 627 19 5, 099, 922 (1) 15, 000 115, 000 2, 271, 642 (3)

5, 549, 309	378, 464, 000	206, 506 000 110, 414, 000	2, 989, 330, 000 12, 867, 094 28, 480, 350	114 1,099,522 33,543,782 105,128,170 3,143,606	11 213, 366		50, 069, 384	4 3, 993, 310, 000		\$3, 117, 310 (3)	40, 005, 140 173, 779, 954 151, 140	2, 000 15, 442, 210 24, 687, 485 15, 034, 696 582, 760	2, 386, 000 5, 140, 000	20, 011 1, 339, 086 3, 309, 280 5, 657, 077	2, 650, 480
584,855	4, 730, 798	2, 987, 808 3, 450, 430	1, 053, 297 3, 583, 242 31, 518, 123	27, 321, 444 3, 766, 882 114, 989	11 35, 064			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		82, 822 (3)	6, 295, 524 232, 949 7, 328	3, 847, 402 50, 452 88, 710	17, 163	2, 041 195, 726 5, 158, 265	925,
5, 421, 732	386, 855, 000	200, 559, 000 95, 913, 000	2, 768, 490, 000 9, 310, 339 24, 840, 811	8 29, 343, 684 92, 791, 821 2, 889, 100	1127,855	•	6 52, 527, 152	4 6 3, 730, 705,000		\$2,724,023	29, 761, 341 124, 982, 650 82, 353	14, 119, 035 19, 277, 434 12, 322, 328 431, 828	(3) (3) 2, 259, 000 4, 480, 000	3, 788 1, 020, 061 3, 592, 286 7, 502, 597	1, 545, 841
547, 436	4, 551, 232	2, 732, 100 2, 983, 962	2, 864, 312 26, 315, 635	(3) 8 25, 840, 338 3, 474, 477 107, 232	11 19, 362	-		1		75, 943	5, 007, 952 211, 835 4, 403	403, 401 3, 040, 646 44, 972 30, 428	25 16,024 1,905	5, 327, 969	1, 127, 461
4, 380, 831	333, 120, 000	200, 479, 000 109, 131, 000	2, 777, 900, 000 5, 010, 624 12, 845, 561	8 8, 550, 320 97, 601, 000	82		39, 189, 833	3, 647, 913, 000		\$2, 184, 328 (3)	1, 447, 515 37, 689, 144 154, 690, 704 374, 944	16, 920, 050 26, 496, 950 10, 878, 764 (3)	(3) 82,316 807,000 (3)	3, 179, 690	1, 446, 594
475, 569	4, 383, 158	2, 750, 370	1, 019, 164 2, 845, 190 15, 101, 226	(3) 8 9, 095, 109 3, 614, 838 84, 717	11 16, 210				H	(3)	188, 348 6, 544, 145 269, 496 15, 527	483,430 4,617,288 41,522 (3)	550 5, 155 7, 075 1, 807	4, 627, 808	997,
2, 622, 975	257, 164, 000	188, 500, 000 88, 635, 000	2, 641, 860, 000 4, 402, 032 17, 275, 255	8, 664, 633 78, 910, 000 872, 134	10 216, 569 996		34, 010, 619	3, 379, 813, 000	UTAH	10,	1, 125, 299 32, 410, 303 136, 920, 696 438, 699	15, 242, 745 15, 025, 899 16, 167, 620 (3)	33,00 33,00 33,00 33,00	2, 350, 412 8, 511, 032	8 1, 123, 108
281, 604	4, 147, 805	2, 589, 594 2, 456, 874	1, 022, 139 2, 640, 209 18, 661, 403	4, 6/2 (3) 7, 604, 468 3, 691, 724	10 17, 800		1				6, 140, 305 282, 894 17, 304	435, 507 3, 990, 505 50, 210	3, 397 3, 006 1, 737	3, 260, 044 7, 104, 105	827
	Mangaless ore (so percent or more Mil)gross weight. Natural gas	Natural gasoline and cycle productsthousand gallons LP-gasesdodododododododo	thouse	Salver (regoverable content of ores, etc.)	Tale and soapstone. Zinc (recoverable content of ores, etc.). Zinc (recoverable content of ores, etc.). Athen of thems that cannot be disclosed: Native aspiralt.	bromine, clay (fuller's earth 1965), coal (lignite 1964-55), graphite, magnesium chloride (for metal), magnesium compounds (except for metal), mercury (1966), guintee,	stone (crushed besult 1963, dimension sandstone 1964), and values indicated by footnote a Excludes value of clays sold or used for cement (1962-63)	Total Texas		Asphalt and related bitumens, native: Gilsonite. Carbon dioxide, natural (estimated)thousand cubic feet	Clays. Copper (recoverable content of ores, etc.) Fluorspar	Gella (recoverable content of ores, etc.)	Manganese ore (35 percent or more Mn)gross weight Manganiferous ore (5 to 35 percent Mn)		Shyer (recoverable content to des, etc.)

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TABLE 5.-Mineral production in the United States, 1952-55, by States !--Continued

UTAH-Continued

Mineral Short tons	1982		1953		1964	18	1955
(unless otherwise stated)	ons Value	Short tons (unless otherwise stated)	ns Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
ungsten ore and concentrate60-percent WOs basis. 194, 532 anadiumpoundspounds	\$ \$0,448 \$32 (3) 10,938,404 10,248,404	386, 388 404 28, 184 861	\$123,445 \$8 (3) \$4 6,712,320 	84 575, 884 34, 031	\$308, 634 (3) 7, 350, 696	65 995, 873 43, 556	\$224, 742 (3) 10, 714, 776 28, 733, 292
	6 265, 676, 000	000	6 298, 589, 000		6 12 255, 495, 000		12 331, 929, 000
	V	VERMONT					
(8)	74	(8) (3) ,826, 616 3, 947	47 (3) \$2, 265, 578	(8) 4, 352	(a) \$2, 567, 680	14, 200 4, 305	\$14, 200 3, 211, 530
Total Notices  Parities  P		1, 113,	171 6, 985 486 (3) 607 690, 073 128 39, 033	20, 713 1, 481, 549 48, 572	(3) (1) 110, 996 (43, 960	<b>ન</b>	6, 335 (3) 1, 169, 031 45, 657
disclosed: Asbestos, lime, slate,		.527, 11 80,	∞= o	 11 66,	8, 178, 389 11 198, 585 6 8 400 800	(3)	11, 061, 196 (3) 8 200 641
	17, 891, 000	000	20, 302, 000		12 20, 483, 000		12 23, 884, 000
	Δ	VIRGINIA	2				
gross weight 940, 496 21, 579, 368	496 \$996, 351 868 114, 861, 137	,351 952,266 ,137 19,119,050	66 \$927, 571 60 102, 022, 118	(19) 1 704, 843 3 16, 387, 292	\$39 723, 292 72, 901, 277	(19) 935, 941 23, 507, 509	\$389 873, 348 108, 173, 907
Ceen stones. Limo Manganese ore (35 percent or more Mn)gross weight (1, 011 Natural gas	1-4	221 024 2.788 448, 924 477, 384 (3) 8, 454 (3) (3) 3, 697	88 84 84 635,926 85,926 87 87 864,000	4, 320 3, 446, 158 32, 678 33, 174 1, 401	1, 183, 680 4, 610, 645 1, 780, 934 21, 079 380, 000	(a) 2, 997 494, 293 32, 654 (a) 968	893, 106 5, 048, 697 2, 779, 337 (3) 259, 000

(3) 8, 076, 104 8, 076, 104 820, 124 19, 899, 675 4, 888, 934 1, 888, 934	4 172, 541, 000	(4)	411, 700 4, 263, 030 2, 962, 668 9, 602, 668 3, 602, 689 3, 681, 339	113 264 (19) 2806 882 10, 570, 631 (0) 5, 265, 866 7, 285, 866	• 67, 334, 000
6, 460, 886 1, 860 31, 586 11, 965, 890 18, 329		(9)	365 331 609, 730 3, 958 74, 360 3, 500 10, 340	87, 640 81, 644, 161 486, 348 6, 563, 212 (0) 12 29, 586	
(3) 8, 667, 871 18, 1005 18, 971, 601 3, 614, 408	4 129, 603, 900	(6)	\$318, 500 4, 478, 127 2, 145, 240 (3) 2, 335, 900 (3) 2, 723, 612	153,068 (9) 208 13,569,014 9,526,534 (9) 26,812 4,817,664 16,923,833	4 53, 300, 000
7, 115, 403 1, 1773 17, 410 10, 883, 972 16, 738		(6)	261, 328 619, 209 3, 636 (6, 740 (7) 9, 938	43, 134 (6), 64, 687 313, 786 5, 366, 890 (1) 22, 304	
(3) 6, 160, 564 1, 058 (8) 16, 258, 620 3, 885, 480 17, 565, 609	152, 979, 080	(6)	\$312,141 5,047,928 2,146,760 2,189,600 2,898,768 (3)	104, 274 (8), 774 2801, 708 280, 880 28, 883 19, 710 7, 540, 780	54, 577, 000
8, 276, 356, 11, 169 (3), 1907 9, 081, 907 16, 676	NOE	(e) (e)	259, 421 689, 831 3, 740 62, 560 3, 800 11, 064 (3)	32, 107 (1) 182, 885 321, 895 4, 438, 239 6, 331 83, 786	
(1) 5, 556, 953 (1) 16, 969, 952 4, 454, 788 15, 898, 799	164, 679, 000	\$240 908	352, 576 5, 986, 129 2, 108, 788 1, 917, 160 29, 625 3, 781, 568 (3)	(4) 1111,386 19,422,117 2855,717 2856,717 (6) 14,008 6,673,864 19,955,089	56, 139, 000
7, 136, 112 (4) 9, 670, 961 13, 409		120	291, 134 844, 197 84, 357 (*) 7, 900 11, 744 11, 744	42, 580 18, 322, 276 312, 276 4, 523, 234 (0) 20, 102	
Petroleum (crude)———thousand 42-gallon barrels. Sand and gravel Silver (recoverable content of ores, etc.)——troy onness. Silver (exceverable content of ores, etc.)——troy onness. Stone (except limestone for enemat and lime, 1962-53) Stone (except limestone fores, etc.)——troy on the orea grave in orea ore (1962-64), in or dide pigments (1964-65), kranite, mics, pyrites, salt, ground sand and snafstone (1962-63), tale and sospetone, titanium concentrate and or	Total Viginia	g	Olaysa. Clays. Const. Copplex (recoverable content of ores, etc.). Epscounte. Gold (recoverable content of ores, etc.)	Manganiferous ore (5 to 35 percent Mn)	Total Washington.

See footnotes at end of table.

TABLE 5,-Mineral production in the United States, 1952-55, by States !--Continued

		Value	\$2, 563, 289 653, 388, 287 49, 915, 000	2, 352, 000 6, 376, 000 7, 080, 000	9, 779, 288 9, 714, 168	12, 929, 982	4 755, 512, 000		(8) \$166, 030 (8) 580, 504 1, 767, 563 7, 330	19, 958, 450 18, 843, 272 4, 508, 196
	1955	Short tons (unless otherwise stated)	707, 433 139, 167, 889 212, 403	35, 756 286, 871 2, 320 638, 390	5, 171, 399 5, 898, 585				(3) 165, 088 1, 886, 029 134, 635 14, 087	27, 978, 335 12, 180, 452 18, 326
	1954	Value	\$1, 450, 539 541, 369, 652 45, 601, 000	2, 593, 000 5, 035, 000 8, 500, 000	743,	10, 504, 113	4 636, 311, 000		(3) \$174, 438 (3) 345, 514 1, 557, 579 9, 817	17, 396, 438 16, 187, 738 3, 355, 344
	•	Short tons (unless otherwise stated)	587, 120 115, 996, 041 191, 601	41, 076 142, 884 2, 902 471, 516	4, 073, 991				(3) 180, 233 1, 428, 910 1, 261 115, 397 19, 607	ష్య
	1953	Value	\$2, 488, 938 693, 593, 645 44, 009, 000	3, 245, 000 6, 743, 000 11, 570, 000	6, 070, 847 8, 924, 411	11, 974, 948	790, 110, 000		(3) \$175, 276 (3) 548, 628 1, 566, 085 7, 327	16, 253, 302 15, 979, 756 3, 870, 900
WEST VIRGINIA	1	Short tons (unless otherwise stated)	968, 838 134, 105, 310 186, 477	44, 352 153, 090 3, 038 419, 907	3, 162, 776 8 5, 501, 148	1 1 1 1 1 1 1 1 1		NSIN	(3) 176, 311 1, 665, 331 2, 094 123, 997 16, 871	23, 664, 086 7, 450, 396 16, 830
	1952	Value	\$2, 421, 669 741, 421, 131 35, 475, 000	3, 069, 000 6, 187, 000 9, 780, 000 1, 438, 490	7, 275, 370 8 6, 826, 113	11, 838, 988	825, 733, 000	WISCONSIN	\$17, 352 134, 493 (3) 644, 000 1, 388, 556 8, 833	(°) 16, 938, 228 16, 754, 675 6, 835, 216
	19	Short tons (unless otherwise stated)	982, 030 141, 713, 059 180, 995	43, 302 199, 794 2, 602	4, 120, 105 8 4, 869, 442		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		134, 453 1, 485, 845 2, 000 107, 813	24, 895, 947 8, 578, 882 20, 588
		Mineral	Olays. Goal. Natural gas. million cubic feet.	Natural-gas liquids: Natural gasoline	Sand and gravel Stone (except limestone for ement and lime, 1952-53) Traine (except limestone for ement and lime, 1952-53)	value of retails have callulo to use covered. An assist solved, the solved center, as and 1965), bromine, calcium-magnesium chloride, cement, lime, calcareous marl, ground sand and sandstone (1962-63), stone (dimension limestone, 1962-53), and recovered elemental sulfur. Excludes value of clays used for cement (1962-63).	Total West Virginia		Abrasive stone: Pebbles (grinding)  Olays  Iron ore (usable)  Load (recoverable content of ores, etc.)  Lime  Marl, calcareous (except for cement).	Foat, and gravel. Stone (except limestone for cement and lime, 1962–53) Zinc (recoverable content of ores, etc.)

sandstone (1962–53), stone (crushed basait, 1955), and values indicated by footnote 3.		13, 008, 759	1	16, 810, 752		15, 839, 813		20, 528, 430
Total Wisconsin.		55, 710, 000		55, 212, 000		4 54, 286, 000		4 65, 813, 000
		WYOMING	MING					
Clays  Condition  Gons stones  Intro ce (usable)  Natural gas  Natural gas liquids:  Lagases  La	6, 706, 748 6, 088, 421 (9) 1 484, 945 76, 313 51, 402 88, 976 88, 976 88, 976 88, 976 18, 714 18, 714 18, 714 18, 716 18, 716 19, 7	\$9, 176, 507 26, 451, 530 (9) 35 (9) 36 (14) 400 1, 281, 000 1, 281, 000 1, 281, 000 1, 281, 685 1, 788, 548 1, 788, 548 1, 788, 548 (9) (9) (9) (9)	852 651 6, 244, 572 (0) 1 6, 493 654, 286 76, 262 (3) (3) (3) (4) (4) (4) (4) (4) (4) (4) (5) (4) (7) (4) (8) (1) (9) (1) (1) (1) (1) (1) (1) (1) (1) (2) (1) (1) (1) (3) (4) (1) (1) (4) (4) (1) (1) (1) (5) (4) (1) (1) (1) (1) (6) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1	\$10, 036, 727 23, 743, 996 (*) 574 (*) 35 (*) 36 (*) 000 (*) (*) (*)	2, 831, 430 1 1 1 407 7, 408 46, 884 46, 884 46, 884 41, 166, 91 113, 101	\$9, 534, 087 11, 641, 312 590 14, 245 29, 612 (3) 770, 000 2, 128, 000 2, 2128, 000 (3) (3) (4) (5) 2, 681, 527 1, 685, 302 2, 977, 954	1, 035, 560 2, 926, 563 22, 373 748, 831 77, 819 40, 290 46, 106 99, 483 64, 968 (9) 1, 303, 399 1, 20, 697	\$10, 923, 521 11, 846, 262 57, 000 1, 829 8, 488 6, 615, 000 289, 776, 000 289, 776, 000 289, 776, 000 346, 461 3, 977, 678 8, 977, 678 8, 206, 383
Total Wyoming		206, 828, 000		255, 906, 000		4 6 281, 306, 000		4 297, 752, 000

\* Excludes pozzolan cement, value for which is included with "Value of thems that cannot be disclosed."

Figure withheld to avoid disclosing individual company confidential data.

4 Total adjusted to eliminate duplicating the value of clays and stone.

Weight not recorded.

Beyled figure.

Refundes certain stone, value included with "Value of items that cannot be Final figure. Supersedes preliminary figure given in commodity chapter, is 5old or used by producters. Quantity and value of ground material included. If Mine production of crude material.

Hindudes value of nonmetals; excludes value of clays used for cement.

\*\*Includes natural cement, value for which is included with "Value of items that cannot be disclosed,"

\*\*Definition of the properties of t <sup>19</sup> Beginning with 1954, sand and sandstone (ground) included with sand and gravel

if Included with bituminous coal.

Recoverable zinc valued as the yearly average price of Prime Western slab zinc, also market. Represents value established after transportation, smelting, and manufacturing charges have been added to the value of ore at mine.

Pass than 1 ton.

Original weight of millistones not recorded. disclosed."

TABLE 6.—Mineral production in Territories of the United States, 1952-55 by individual minerals be not recommended.

						25 25 20 1 2 CO	and \$1,500 to 30	125
	1952	22	#	1953		7,004		Age out shounds
Territory and mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	de Janes de Cesta	Short tons (trilless otherwise stated).	or <b>Value</b> r second
Alaska: Antimony ore and concentrategross weight Chromitedodo	420	(3)			2,958	(c)	1,1112 1,1112 1,1112	50 (0.580) 840 3.836
Copper (recoverable content of ores, etc.)troy ounces	686, 218 240, 557	\$5, 779, 428 8, 419, 495	861, 471 253, 783	\$8, 451, 542 8, 882, 405	666, 618 4 248, 511	6, 443, 414 2, 360 8, 697, 885	249, 294	8, 725, 290
114111	28 10, 781, 926 32, 968 (3)	8, 650, 582 29, 854 (2) 220, 956	7, 689, 278 35, 387 47, 086	2, 721 5, 079, 681 32, 027 169, 711 106, 917	1,046 6,639,638 33,697 283,734 199	276, 562 6, 301, 939 30, 497 465, 423 409, 840	(3) 9, 793, 214 83, 693 265, 740	(2) 8, 242, 344 30, 494 289, 589 182, 484
	∞	(3) 8, 195, 836		1, 520, 782		1, 672, 150	\$ 00 EV. F	1, 862, 427
Total Alaska	1	26, 302, 000		24, 252, 000		• 24, 407, 000	270 E	25, 412, 000
Hawaii: Lime Pumilioe Sand and grayel.	8, 894	240, 786	7, 431	223, 575 156, 853	8, 375 (3) 119, 121 1, 485, 427	251, 610 (2) 318, 754 2, 993, 032	6, 453 130, 306 165, 981 1, 414, 304	202, 006 75, 906 425, 760 2, 884, 354
Stone. Value of items that cannot be disclosed: Other nonmetals and values indicated by footnote 2.	100, 901	17, 164	130 (201)	297,				21, 818
		1,947,000	1	8, 332, 000		· 3, 596, 000	-505-570,	s 3, 592, 000

Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
Pigure withheld to avoid disclosing individual company confidential data.

\* Revised figure.

\* Exactless exacts stone value for which is included with "Value of Items that cannot be disclused."

\* Total has been adjusted to eliminate duplicating the value of limestone used in lime.

000,380

TABLE 7.—Mineral production in possessions of the United States, 1952-55, by individual minerals 12

	Ŧ	1952		1953	-	1954	1955	<b>19</b>
Possession and mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
American Samoa: Sand and gravel Stone			\$ 1,320 \$ 74,750	\$ \$425 \$ 16, 500	1,800	\$675 15,000	1, 278 9, 011	\$552 3,948
Total American Samoa				\$ 17,000		16,000		5, 000
Canal Zone: Sand and gravel Stone (crushed)	<b>56</b> , 600 86, 000	\$53,000 152,000	85, 914 171, 908	95, 590 231, 752	187, 446	245, 170	85, 910 169, 485	47, 229 239, 280
Total Canal Zone.		200,000		921,000		240,000		000,107
Canton: Stone (crushed) Guan: Stone Johnston: Stone Midway: Stone (crushed)	150 948,000 8 7, 200	870, 000 870, 000 8 6, 000	4, 200 2, 080, 650 204	8, 750 5, 573, 169 638	2, 600 842, 660 98 490	5, 275, 182 2, 275, 182 300 1, 500	1, 241, 466 12, 080	1, 560 3, 351, 958 32, 550
Puerto Rico: Cement	3, 994, 483	10, 517, 894	3, 641, 135	9, 335, 421	3, 682, 187	9, 663, 445	4, 116, 739	12, 506, 784
Lange (open-market) Salt (common). Sand and gravel. Stone (except limestone for cement and lime, 1962-53). Value of items that cannot be disclosed: Other non-metals.	8, 57,0 12, 676 122, 730 4 689, 320	122, 100 122, 158 164, 166 4 1, 807, 388 6, 328	7, 558 13, 692 226, 586 4 648, 400	131, 490 131, 490 250, 202 41, 237, 236	8, 384 8, 758 374, 690 4 1, 751, 996	198, 402 98, 110 833, 654 42, 492, 827 164, 331	10, 592 10, 496 433, 017 1, 783, 910	2, 121 112, 399 112, 399 2, 515, 760 121, 763
Total Puerto Rico. Virgin Islands: Stone (crushed) Wake: Stone (crushed)	12,900	13, 610, 000 (113, 610, 000 (113, 610, 000 (113, 610, 000 (113, 610, 000)	10, 789	11, 401, 000 45, 863 20, 615	3,939	4 12, 381, 000 17, 134 1, 300	1,000	4 14, 917, 000 4, 900 3, 000

1 Production as measured by mine shipments, sales, or marketable production (including consumption by producers) a reduction data for Controls and Wake furnished by the U. S. Department of Commerce, Clyll Accounties Administration; Midway and Johnston, by the U. S.

Department of the Navy; Guam, by the Government of Guam; American Samos, by the Government of American Samos.

Fishmate.

Fishmate.

Fishudes certain stone value included with "Value of items that cannot be disclosed."

Total has been adjusted to eliminate duplicating the value of stone.

TABLE 8.—Principal minerals imported for consumption in the United States, 1954-55

[Compiled by Mae B. Price and Elsie D. Page, Division of Foreign Activities, Bureau of Mines, from records of the U. S. Department of Commerce]

	198	i <b>4</b>	195	5
Mineral	Short tons (unless otherwise stated)	Value (thou- sand dollars)	Short tons (unless otherwise stated)	Value (thou- sand dollars)
METALLIC				
Aluminum: Metal	215, 250	1 83, 573	177, 652	1 74, 695
Plates, sheets, bars, etc.	215, 250 14, 845 13, 655	1 4, 675 1 8, 042	177, 652 40, 779 20, 972	1 74, 695 1 16, 364 1 13, 973
Antimony: Ore (antimony content) Needle or liquated. Metal	4, 722	1, 290	7, 470	1,850
Metal	33 2, 802	17 1, 349	3, 667	19 1, 860
Oxide	1.476	645	2, 210 7, 222	926
Arsenic: WhiteBauxite:	4, 848	545		765
Crudelong tons_ Calcined, when imported for manufacture of fire brick	<sup>3</sup> 5, 258, 530	<sup>2</sup> 36, 289	5, 221, 008	36, 629
long tone 1	2 99, 421	2 2, 361	107, 694	2, 453
Bismuth pounds. Boron carbide do	5, 816 628, 833	2, 574 1, 235	6, 037 603, 649	2, 226 1, 128
Boron carbidedodo	24, 209	50	40, 837	75
Metal do do Flue dust (cadmium content) do	402, 299	654	927, 495	1, 320
Fine dust (cadmium content)dodo	1, 482, 565	1,078	1, 832, 827	1, 146
Metaldo	685, 417	728	699, 799	835
Chromite:	1, 547	51	1,844	58
Ore and concentrates (Cr <sub>2</sub> O <sub>3</sub> content) Ferrochrome (chromium content) Metal	<sup>3</sup> 608, 578 9, 563	<sup>2</sup> 34, 197 3, 502	763, 401 19, 397	37, 854 8, 011
MetalCobalt:				
Allow (ashalt somtout)	2, 360, 360	(3)	2, 464, 336 223	(3)
Ore (conait content)	3, 349 14, 227, 868	35, 391	223 15, 535, 040	(4) 38, 585
Oxide (gross weight)do	430, 400	723	1, 072, 950	1,792
Columbium ore do	353, 094 6, 804, 076	211 14, 191	361, 600 9, 612, 576	249 19, 852
Analy (cobait content) pointeds. Ore (cobalt content)				1.
Ore	6, 182 2 114, 353	3, 399 <sup>2</sup> 62, 675 3, 089 <sup>2</sup> 150, 791 <sup>2</sup> 127, 130	7, 476 105, 045	4, 948 68, 406
Regulus, black, coarse	5, 408 2 257, 393	3,089	6, 386	4, 515
Refined in ingots, etc	* 215, 118	2 127, 130	253, 693 201, 640	182, 073 153, 604
Old and scrap	4, 752 3, 657	1 2, 081 1 1, 568	12, 597 8, 284	1 9, 058
Refined in ingots, etc	3, 760	1, 244	5, 963	1 5, 145 1 1, 993
Gold: Ore and base bulliontroy ounces Bulliondo	822, 684	28, 721	1, 071, 270	37, 340
Bulliondolron ore:	260, 321	9, 112	1, 858, 736	67, 080
Orelong tons	<sup>2</sup> 15, 792, 450	<sup>12</sup> 119, 459	23, 459, 660	177, 329 1 16
Pyrites cinderdolron and steel:	898	4	3, 879	1 16
Pig iron	290, 716	13, 315	283, 559	14, 564
Semimanufactures	2 258, 084	1 2 21, 749	394, 093	1 34, 780
Manufactures	<sup>2</sup> 616, 483	1 2 75, 969	675, 985	1 91, 013
ScrapTin-plate scrap	206, 316 2 32, 719	<sup>1</sup> 5, 116 <sup>1</sup> 832	196, 394 32, 167	1 6, 199 839
Lead: Ore, flue dust, matte (lead content)	196, 054	1 47, 967	156, 433	1 28, 143
Base bullion (lead content)	41	10		
Reclaimed, scrap, etc. (lead content)	274, 286 7, 217 397	<sup>1</sup> 68, 420 <sup>1</sup> 1, 450	263, 977 18, 944	73, 032 1 3, 931
		1 129 1 1, 946	18, 944 2, 048 1, 236	535
Babbitt metal and solder (lead content) Type metal and antimonial lead (lead content)	1, 572 3, 367	1, 946 1, 251 1 149	1, 236 13, 213	<sup>1</sup> 1, 819 <b>4, 3</b> 79 <sup>1</sup> 164
Manufactures		i 149		i 164
Metallia and garan	733	338	1, 844	1, 034
Allows (magnesium content)				
Metallic and scrap Alloys (magnesium content) Sheets, tubing, ribbons, wire and other forms (magnesium content)	6	30	9	52

TABLE 8.—Principal minerals imported for consumption in the United States, 1954-55—Continued

	19	54	195	55
Mineral	Short tons (unless otherwise stated)	Value (thou- sand dollars)	Short tons (unless otherwise stated)	Value (thou- sand dollars)
METALLIC—continued				
Manganese: Ore (35 percent or more manganese)—(manganese con-				
tent) Ferromanganese (manganese content)	2 1, 029, 614 44, 744	2 75, 787 10, 903	1, 047, 151 52, 650	69, 821 12, 022
Mercury: Compoundspounds Matel	35, 008	1 93	20, 408	77
Metal flasks Minor metals: Selenium and salts pounds Molybdenum:	64, 957 209, 596	1 10, 784 1, 154	20, 354 191, 928	5, 149 1 1, 468
Ore and concentrates (molybdenum content)do	154, 288	180	134, 395	142
Ore and matte Pigs, ingots, shot, cathodes	14, 135 97, 263	5, 358 124, 179	9, 088 109, 404	3, 264 148, 925
Oxide	32, 264	276 25, 234	435 32, 896	597 30, 124
Platinum group: Unrefined materials:				
Ore and concentrates troy ounces Grain and nuggets, including crude, dust, and	2, 714 2 42, 596	191	407	29
residuestroy ounces_ Sponge and scrapdo Osmiridiumdo	4, 230 2, 988	<sup>2</sup> 2, 666 <sup>1</sup> 367 290	40, 713 8, 362 1, 471	2, 787 1 653
Refined metal:	2 345, 081	1 2 26, 560	450, 270	115 34, 419
Palladiumdo Iridiumdo	188, 839 432	1 3, 468	487, 174 271	8, 185 24
Osmiumdo Rhodiumdo	199 13, 197	1 20 1, 336	528 17, 783	38 1, 787
Rutheniumdo Radium: milligrams	6, 168	333	2, 961	124
Radium saltsmilligrams Radioactive substitutes Rare earths: Ferrocerium and other cerium alloy _ pounds	57, 879 5, 736	857 150 22	65, 545 6, 234	975 189 25
Ore and base bullion troy ounces				- 10 m
Bulliondo Tantalum: Ore	49, 008, 443 41, 888, 631 981, 872	40, 404 35, 541 1, 972	55, 658, 175 28, 861, 015 1, 907, 686	45, 755 25, 413 4, 634
Tin: Ore (tin content)long tons	22, 140	41, 725	20, 112	<sup>1</sup> 36, 773 131, 397
Ore (tin content) long tons.  Blocks, pigs, grains, etc. do Dross, skimmings, scrap, residues, and tin alloys, n. s. p. f. pounds.  Tinfoll, powder, flitters, etc. long tons.	<sup>2</sup> 65, 599	133, 186 2 9, 358	64, 718	
Tinfoll, powder, flitters, etclong tons Titanium:		1 785	13, 764, 531	1 10, 435 559
Ilmenite Rutile	275, 005 14, 965	1 4, 993 1, 323 1, 371	353, 351 19, 526	7, 031 1, 984
Metal pounds Ferrotitanium do Compounds and mixtures do	385, 045 10, 000	4	19, 526 1, 134, 098 63, 400	<sup>1</sup> 3, 433 27
Tungsten:	10, 500	7	338, 061	83
Ore and concentrates (tungsten content) do Metal (tungsten content) do Ferretungsten (tungsten content)	154, 096	1 2 76, 251 1 343	20, 699, 528 89, 221	56, 155 1 241
Ferrotungsten (tungsten content) do Other (tungsten content) do Vanadium:	500, 204 65, 650	837 101	676, 988 44, 861	1, 276 152
Ore (vanadium content)do Salts and compoundsdo	395, 287 4, 000	238	184, 737	104
Zinc: Ores (zinc content)	2 480, 918	1 52 482	384, 648	36, 811
Ores (zinc content) Blocks, pigs, and slabs Sheets Old, dross, and skimmings Dust	160, 138 259	1 2 33, 714 88	195, 059 431	46, 452 1 148
Old, dross, and skimmings Dust Manufactures	1, 087	103	284 72	32 1 18 1 190
Zirconium: Ore, including zirconium sand	18, 657	1 487	29, 091	813

TABLE 8.—Principal minerals imported for consumption in the United States, 1954-55—Continued

	195	4	195	5
Mineral control of the second	Short tons (unless otherwise stated)	Value (thou- sand dollars)	Short tons (unless otherwise stated)	Value (thou- sand dollars)
NONMETALLIC	10.00			
brasives: Diamonds (industrial)carats	13, 991, 151	1 48, 703	15, 100, 136	66, 28
sbestosarite:	678, 390	<sup>1</sup> 55, 857	740, 423	1 60, 95
Crude and ground	317, 345 4, 415	1 2, 284 153	359, 931 2, <b>363</b>	1 2, 19
Chemicals	<sup>2</sup> 3, 483	2 446	4, 464	4!
Chenicals pounds ement 376-pound barrels	77, 649 450, 248	121 1 1, 763	692 5, 219, 700	1 14, 34
lays:	ا في و مدده م	a silino d	Addition to the second	100
	163, 157 1, 543	1 2, 445 40	189, 138 3, 244	1 2,8
Raw Manufactured long tons eldspar: Crude do. huorspar	18,876	2, 216	19,625	3, 1
eldspar: Crudedodo	79	3	105	
	293, 320	1 8, 962	363, 420	18,5
Diamonds	2 1, 482, 474	² 122, 182	1,772,791	151, 5
Emeraldsdo	24, 460	1 21, 022	45, 235	1, 5 1 22, 1
Other raphite	40, 839	1 2, 281	48, 800	2, 3
ypsum:	3, 368, 817	1 4, 903	3, 966, 786	1 6, 3
Manufactures		2 474		9
dine, crudepounds	945, 985 49, 262, 027	1,034 1 2,219	1, 231, 994 66, 067, 549	1, 5 1 2, 8
Ornos, ground, catched.  Manufactures.  dine, crude.  pounds  number  yanite.	4, 826	1 197	7, 581	
Me: Hardroted	1, 259	1 17	1,359	1
Other	30, 613	538	30, 264	5
Dead-burned dolomite	4, 426	345	7, 993	5
lagnesium: Magnesite	70, 650	4, 250	106, 253	6,8
Compounds	10,092	1 308	12, 357	1 3
Uncut sheet and punch pounds. Scrap Manufactures	1, 829, 457	1 3, 198 1 63	1, 747, 106	3,3
Scrap.	4, 647 3, 363	1 5, 449	9, 461 6, 156	17,8
lineral-earth pigments:	,,,,,,	-,	, , , , ,	
Iron oxide pigments: Natural	2.546	121	3, 702	1 1
Synthetic	7,000	603	6, 394	. 18
Ocher, crude and refined	154	9	218 840	1
Synthetic. Ocher, crude and refined. Sienns, crude and refined. Umber, crude and refined.	338 2, 598	35 74	2, 654	1
Vandyke brown	89	5	151	1
itrogen compounds (major)	1, 913, 200 122, 016	1 89, 321 1 3, 081	1, 577, 099 117, 256	175,0
Vandyke brown  fitrogen compounds (major) hosphate, crude hosphate fertilizers do	26, 316	1 1, 507	29, 239	2,7
igments and salts:	1	1.100	1 140	2
genens and satts:  Lead pigments and salts.  Zine pigments and salts.	712 3, 178	1 169 1 582	1, 146 4, 749	9
etash	225, 230	8, 387	329, 389	11,7
nmice.	l	117	29, 938	1 1 1
Crude or unmanufactured	20, 951 950	1 21	1, 497	1
Manufactures, n. s. p. f.		17		1
Manufactures, n. s. p. f	780, 556 160, 770	1, 579 1 879	227, 573 185, 653	1 1, 2
and and gravel:	1	1		1
	10, 329	93 1 298	170 317, 947	13
Other sand	271, 364 2, 387	12	1.680	(1
Other sand	118, 512	2, 141	124, 474	2,5
tonetrontium: Mineral	3, 291	1 5, 216 53	6, 125	1 5, 5 1
ulfur and pyrites:	0, 201		, , , ,	-
Sulfur:	110	2	94 159	[
Orelong tons_ Other forms, n. e. sdo	110 1, 104	1 56	24, 152 373	1
Other forms, n. e. sdo Pyritesdo	46, 649	1 5 292	§ 80, 305	1 5 5
Calc: Unmanufactured	22, 157	1 678	29,079	1 9

TABLE 8.—Principal minerals imported for consumption in the United States, 1954-55—Continued

	19	54	195	5
Mineral grade for the state of	Short tons (unless otherwise stated)	Value (thou- sand dollars)	Short tons (unless otherwise stated)	Value (thou- sand dollars)
FUELS	1000000	rae Jana	real	
Asphalt and related bitumen	4, 244	102	4, 988	110
Acetylene black pounds Gas black and carbon black do Coal:	7, 715, 875 74, 659	1, 282 9	8, 097, 358 53, 600	¹ 1, 331 11
Anthracite Bituminous, slack and culm, lignite Briquets.	198, 799	105 11,608	170 337, 145	2, 640
Coke Pest:	239 115, 781	1, 258	126, 342	1, 405
Fertilizer grade	220, 768 20, 172	7, 911 925	217, 624 11, 686	1 8, 683 1 579
Gasoline 6thousands of barrels_	<sup>2</sup> 242, 645 <sup>3</sup> 1, 360 (4)	12 544, 550 1 6, 967 (4)	294, 170 5, 081	662, 038 1 26, 342 166
	132, 283	2 13, 211 240, 225	5, 089 155, 301	1 15, 550 1 305, 180
Asphalt (liquid and solid) do Miscellaneous do	8, 257 3, 397 4	17, 107 6, 508 1 100	6, 616 3, 324 (4)	15, 540 7, 571 1 36

1 Owing to changes in tabulating procedures by the U. S. Department of Commerce, data known to be not comparable to other years.

2 Revised figure.

3 Data not available.

4 Less than \$1,000.

4 Less than \$1,000.

5 In addition to data shown an estimated 232,920 long tons (\$627,620) were imported in 1954 and 277,860 long tons (\$711,740) in 1955.

6 Includes naphtha but excludes benzol: 1954—291,000 barrels (\$3,968,000); 1955—764,000 barrels (\$7.163,000).

o includes naphena bus contained.

(87,168,000).

7 Includes quantities imported free of duty for supplies of vessels and aircraft.

8 Includes quantities imported free for manufacture in bond and export, and for supplies of vessels and

TABLE 9.—Principal minerals and products exported from the United States, 1954-55

[Compiled by Mae B. Price and Elsie D. Page, Division of Foreign Activities, Bureau of Mines, from records of the U. S. Department of Commerce]

	195	4	195	) (1995)   <b>(</b> 1995)
Mineral	Short tons	Value	Short tons	Value
	(unless	(thou-	(unless	(thou-
	otherwise	sand	otherwise	sand
	stated)	dollars)	stated)	dellars)
Aluminum: Ingots, slabs, crude Scrap Plates, sheets, bars, etc Castings and forgings Antimony: Metals and alloys, crude Arsenic: Calcium arsenate Bauxite, including bauxite concentrates long tons Aluminum sulfate Other aluminum compounds Beryllium pounds. Bismuth: Metals and alloys	4, 044	1, 691	5, 969	2, 773
	39, 338	12, 985	18, 290	6, 601
	6, 050	4, 803	8, 009	7, 518
	619	1, 795	1, 139	2, 425
	44	26	204	71
	1, 975, 894	125	1, 885, 582	115
	16, 174	666	14, 117	528
	14, 503	576	19, 594	733
	6, 390	1, 674	8, 497	1, 974
	21, 151	68	36, 124	1,55
	137, 856	186	203, 667	363
	62, 581	268	66, 683	218
	998, 959	1, 422	1, 333, 915	1, 938

TABLE 9.—Principal minerals and products exported from the United States, 1954-55—Continued

	1954	ı	195	5
Mineral	Short tons (unless otherwise stated)	Value (thou- sand dollars)	Short tons (unless otherwise stated)	Value (thou- sand dollars)
metallic—continued				
Chrome: Ore and concentrates:				
Ore and concentrates:  Exports  Reexports  Chromic acid	864 427	50 8	1, 341 2, 950	76 87
Chromic acid	397	216	701	374
Ferrochrome	2, 105	996 1, 173	4, 693 3, 823, 167	2, 267 1, 231
refrocurome pounds.  Cobalt pounds, and other forms do	3, 067, 386 278	1, 175	6, 370	1, 20
Ores, concentrates, composition metal, and unrefined	2, 369	1, 309	7, 648	7,326
copper (copper content)Refined copper and semimanufactures	1 217 423	1, 309 1 197, 051	259, 942	207, 742
Renned copper and semimantiactures Other copper manufactures Copper sulfate or blue vitriol	250 29, 762	308 5, 781	234 37, 382	309 8, 382
Copper base alloys	20, 102	57, 086	01,002	46, 976
Formoollows:	1	365	9 977 940	309
Ferrophosphorus pounds Ferrophosphorus do	4, 160, 243 48, 683, 806	793	3, 377, 349 106, 109, 167	1,346
				1
Ore and base bulliontroy ounces	3,495	122 19, 230	11, 206 151, 008	395 6, 56
Gold: Ore and base bullion troy ounces Bullion, refined do Iron ore long tons	3, 495 490, 462 3, 145, 714	24, 784	4, 516, 828	36, 99
Iron and steel:		762	34, 989	1,91
Pig iron	10, 247	102	34, 969	1, 510
Iron and steel products (major): Semimanufactures	1 1, 868, 217	1 303, 905	3, 309, 011	482, 81
Manufactured steel mill products	1 1, 205, 456	1 247, 654 1 122, 746	1, 125, 291	255, 708 144, 388
Advanced products		- 122, 140		
materials	1 1, 695, 861	1 51, 612	5, 147, 428	177, 520
Lead: Ore, matte, base bullion (lead content)	1	25	14	
Dire hare annues	I.		1	
Exports	596 3,894	208 838	403 2, 983	15 1,34
Metal and alloys	3,096	1 1, 767 605	7, 611 236	4, 38 51
Magnesium: Metal and alloys Semifabricated forms, n. e. c Powder	161 34	45	14	3
Manganese:				
()re and concentrates	6, 112 1, 732	592 615	6, 279 1, 789	61 64
Ferromanganese	1	010		1
Exports flasks Rexports do do	. 890	183	451	15
		257	267	'
Molybdenum: Ores and concentratespounds. Metals and alloys, crude and scrapdo. Wiredodo	13, 546, 510 34, 358	13, 989	14, 580, 358	15, 78
Metals and alloys, crude and scrapdo	34, 358 10, 563	37 196	22, 564 11, 482	1 17
		34	3, 952	1
Seminabricated forms, if. e. e	15, 423 247, 763	20	21, 173 349, 193	35
Ferromolybdenumdo	247, 763	238	349, 193	90
Nickel: Alloys and scrap (including Monel metal), ingots, bars,			10.004	15.01
sheets, etc Nickel-chrome electric resistance wire		10, 865 522	19, 964 208	15, 61
Semifabricated forms, n. e. c	336	1,069	429	1,48
Platinum.	1	2		
Ores and concentrates troy ounces.  Bars, ingots, sheets, wire, sponge, and other forms in-	7			-
duding scraptroy ounces_	1 16, 980	1 1, 218	<sup>2</sup> 17, 073	2 1, 30
Palladium, rhodium, iridium, osmiridium, ruthenium,				
and osmium metals and alloys, including scrap troy ounces_	11, 443	287		2 47
Platinum-group manufactures except jewelry.  Radium metal (radium content)milligrams.	419	1 1, 731 15		2 1, 30
		1		1
Cerium ores, metal and alloy pounds Lighter flints do	29, 461	129	19, 296	
Lighter flintsdo	7, 954	56	10,772	1 7

TABLE 9.—Principal minerals and products exported from the United States, 1954-55—Continued

	195	4	195	5
Mineral	Short tons (unless otherwise stated)	Value (thou- sand dollars)	Short tons (unless otherwise stated)	Value (thou- sand dollars)
METALLIC—continued				
ilver: Ore and base bulliontroy ounces Bullion, refineddo	29, 917 1, 672, 618	25 1, 451	71, 074 4, 821, 635	4, 37
Cantalum: Ore, metal, and other formspounds Powderdo do	52, 461 110	93 5	3, 390 594	10 2
Ingots, pigs, bars, etc.:	271 551	467 1, 125	254 853	50 1,74
Reexports do do Tin scrap and other tin-bearing material except tin-plate scrap long tons. Tin cans finished or unfinished do Tin compounds pounds	8, 269	3, 341	6, 190	2, 44 11, 51
.icantum;	23, 878 342, 146	11, 022 511 86	26, 490 311, 005	11, 54
Ores and concentrates	663 48 1 171	1, 108 1 3, 587 40	1, 143 45 245	1, 24
Ferrotitanium	63, 802 39	23, 281 111	54, 353 34	18, 3
Exports	149 1 42, 935	239 1 120	283	5: 3, 70
ine: pounds Slabs, pigs or blocks	24, 994	5, 394	1, 729, 103 17, 904	4, 1
Slabs, pigs or blocksSheets, plates, strips, or other forms, n. e. cScrap (zinc content)	4, 045 16, 689 509 543	2, 183 2, 023 151 257	3, 657 21, 612 445 651	2, 1 2, 2 1 2
Circonium: Ores and concentratespounds Metals and alloys and other formspounds	692 39, 680	43 6	779 106, 778	1
NONMETALLIC		1.5		
Orindstones and pulpstones pounds Diamond dust and powder carats Diamond grinding wheels do Other natural and artificial metallic abrasives and	714, 227 90, 665 129, 868	47 238 554	904, 683 215, 787 180, 405	5 8
productssbestos: Unmanufactured:		19, 856		23, 4
Exports	1, 847 47 411, 228, 805	276 15 12, 904	2, 161 626 445, 176, 000	2 14, 5
Reexports Stron: Boric acid, borates, crude and refinedpounds romine, bromides, and bromatesdo lement376-pound barreislay:	5, 082, 437 1 1, 859, 012	2, 308 1 6, 652	445, 176, 000 3, 649, 861 1, 795, 448	1, 6 7, 0
Kaolin or china clay	49, 199 77, 913 1 200, 860 1 77	946 815 1 6, 588 24 50	49, 830 109, 312 247, 397 155 874	1, 0 1, 3 8, 5
luorspar traphite: Amorphous Crystalline flake, lump or chip	643 608 49	67 19	1, 141 141	1
Natural, n. e. c	141 22, 384	20 762	22, 539	7
Crude, calcined, crushed Plasterboard, wallboard, and tile square feet. Annufactures, n. e. c.	20, 968, 956 338, 258	689 150 488	8, 686, 854	4 1 3
Manufactures, n. e. c. dodner, and the square feet- Manufactures, n. e. c. dodner, inc. pounds.  yanite and allied minerals.  ime.	1, 147 73, 246	58 1,300	243, 686 1, 716 82, 461	1, 4
Unmanufacturedpounds_ Manufactured:	318, 518	79	447, 491	_
Ground or pulverizeddododo	6, 058, 118 280, 415	343 1, 093	5, 808, 347 372, 548	3 1,3

TABLE 9.—Principal minerals and products exported from the United States, 1954-55—Continued

831	en como la compania que enconario de			195	4	195	5
rois i and ro won for seed. force of the	Mineral	SOTA SECRETARIA PROJECTO PROJE		Short tons (unless otherwise stated)	Value (thou- sand dollars)	Short tons (unless otherwise stated)	Value (thou- sand dollars)
N	ONMETALLIC—CO	ntinued			. et aks		
dineral-earth pig	ments: Iron oxid	de, natural and i	nanu-	1		i na a sa ta	
factured	ers	long	tons	3, 554 332, 655 2, 385, 013 1 396, 077	1 19, 478 21, 169 1 11, 869	4, 744 828, 117 2, 267, 741 377, 629	89 44, 79 20, 30 11, 99
Lead pigments Zinc pigments Lead salts Lead salts	S			1 2, 601 6, 124 355	1 895 1, 352 162	2, 774 4, 541 540	999 1, 077 21
Fertilizer Chemical Quartz crystal (ra- Radioactive isotor	w) oes, etc			111, 184 6, 202 (3) (3)	4, 134 1, 330 41 536	222, 499 6, 804 (3) (3)	7, 950 1, 24 60 1, 28
Salt:, Crude and ref Shipments to	ned noncontiguous T	erritories		<sup>1</sup> 385, 259 9, 650	1 3, 086 782	407, 131 10, 019	3, 022 72
Sodium and sodiu Sodium sulfate Sodium carbon Stone:	) <u>.</u>			24, 965 163, 548	823 5, 527	24, 561 151, 799	870 <b>4,</b> 88
Limestone, cri	shed, ground, b	roken		1 570, 013	703	936, 766	1, 14
Stone, crushed Manufactures		cubic	feet	466, 177 1 142, 622	1, 009 2, 396 406	437, 644 169, 074	1, 02- 2, 92- 39-
ulfur: Crude Crushed, grou	nd, flowers of	long	tons	<sup>1</sup> 1, 645, 000 30, 130	<sup>1</sup> 50, 362 2, 162	1, 597, 951 34, 701	48, 61 2, 45
Crude and gro	n. e. c. m (face and com	paet)		23, 348 259	745 111 1,076	35, 230 135	85 10 1, 24
	FUELS				Para Maria		
Asphalt and bitum	nen, natural:			00.000		60 400	
Manufactures, Carbon black	n. e. č	thousands of po	unds	29, 868 (3) 402, 777	1, 474 716 36, 163	32, 723 (3) 454, 181	1, 444 714 40, 735
Coal: Anthracite Bituminous				2, 851, 239 31, 040, 564 98, 908	51, 699 252, 621 1, 627	3, 152, 313 51, 277, 256 106, 294	48, 429 436, 559 1, 564
Coke				1 387, 575	1 6, 302	530, 505	8, 238
CrudeGasoline Kerosine Distillate oil		thousands of ba	do do	13, 599 26, 618 1 4, 049 21, 931 20, 338	45, 026 184, 626 1 16, 282 80, 876	11, 470 25, 992 2, 497 21, 854	38, 366 177, 470 10, 213 80, 068
Lubricating oi Asphalt Liquefied petr	l oleum gases		do do	14, 482 1 1, 599 3, 912	39, 438 1 197, 867. 1 10, 025 15, 692	27, 507 13, 663 1, 477 4, 231	55, 470 188, 933 8, 024 15, 649
Wax Coke Petrolatum			do do	1, 340 1 3, 198 293	25, 983 1 12, 120 5, 793 16, 152	1, 248 4, 463 330	24, 253 15, 64 6, 30 16, 31

Revised figure.
 Owing to changes in classifications, data known to be not strictly comparable to earlier years.
 Weight not recorded
 Includes naphtha but excludes benzol: 1954—Revised figure 153,000 barrels (\$2,071,000); 1955—59,000 barrels (\$990,000).

TABLE 10.—Comparison of world and United States 1 production of principal metals and minerals, 1954-55

[Compiled under the supervision of Berenice B. Mitchell of the Division of Foreign Activities, Bureau of Mines]

		1954			1955	
Mineral	World	United	States	World	United	States
		and short	Percent of world		and short	Percent of world
					275,136	WOLL
Coal:				a sare i		
Bituminous	1, 459, 100	391, 706	§ 27	1, 613, 300	} 464, 663	29
Lignite Pennsylvania anthracite Coke (excluding breeze):	546, 000 153, 900	29, 083	19	591, 000 152, 700	26, 205	17
Gashouse 3	47, 000	256	(2) 26	49.000	(4)	(4)
Gashouse <sup>3</sup> Oven and beehive.  Fuel briquets and packaged fuel.  Natural gas million cubic feet.	233, 000	59, 662	26	49,000 266,000 125,000	75, 302	. 28
Natural gas million cubic feet	123, 000 (5)	1, 701 8, 742, 546	(8)	125,000	1,699	1
Peat Petroleum (crude) thousand barrels	58,000	244	(2)	66,000	9, 405, 351 274	(2)
Petroleum (crude)thousand barrels_	5, 006, 205	2, 314, 988	46	5, 634, 412	2, 484, 428	44
Nonmetallic minerals: Asbestos	1,530	48	3	1, 755	45	3
Barite	2, 300	926	40	2,600	1,108	43
Asbestos. Barite Cement thousand barrels Corundum Diamonds thousand carats Feldspar (thousand long tons Fluorspar Graphite Gypsum Magnesite	1, 146, 200	275, 857	24	1, 277, 500	314, 913	25
Diamonds thousand carats	20, 440			21, 540		
Feldspar 6thousand long tons_	830	411	50	950	465	49
Graphite	1, 330	246 (4)	(4)	1, 400 290	(4)	(4)
Gypsum	30, 200	8, 996	30	33, 700	10, 684	32
Magnesite Mica (including scrap)	4, 300	284	6	4, 700	486	10
thousand pounds	285, 000	162, 815	57	330,000	191, 506	58
Nitrogen, agricultural	5, 732	1, 515	26	6, 173	1,700	i 28
Phosphate rockthousand long tons	29, 400	13, 821 1, 949	47 28	29, 900	12, 265	41
Pumice	7,000 3,600	1, 647	46	3, 800	2,065 1,804	28 47
Potash KaO equivalent Pumice Pyrites thousand long tons Salt Sulfur, native thousand long tons	14, 400	909	6	7, 500 3, 800 16, 000	994	6
Sulfur native thousand long tone	64, 500 6, 300	20, 669	32	68,000	22,704	33 83
raic, pyrophymic, and soapstone	1.000	5, 579 619	89 <b>39</b>	7,000 1,760	5, 800 726	41
vermiculite •	243	196	81	264	204	77
Metals, mine basis:						
Antimony (content of ore and concentrate)*  Arsenic * Bauxite thousand long tons.	45	· (8)	2	50	(8)	1
Arsenic 6	41	13	32	37	11	30
Bervilium concentrate	15, 550 7	1,995	13 9	16, 750 9	1,788	11 6
Beryllium concentrate	3,600	(9)	(4)	3, 800 17, 920	(a)	(4)
Cadmiumthousand pounds_	15, 900	9, 552	60	17, 920	9, 944	55
ChromiteCobalt (contained)	3, 600 14	163	5 7	3, 900 15	153 1	7
Columbium-tantalum concentrates			1			
thousand pounds Copper (content of ore and concentrate)	9, 590 3, 100	33 835	(2)	11, 730 3, 405	13 999	(2)
Goldthousand fine ounces	35, 100	1,859	5	36, 400	1, 877	5
Goldthousand fine ounces_ Iron orethousand long tons_	300, 700	78, 129	26	366, 400	102, 999	5 28
Lead (content of ore and concentrate)	2, 220 10, 250	325 206	15 2	2, 370	338 287	14
Manganese ore (35 percent or more Mn) Mercurythousand 76-pound flasks_	10, 250	19	10	10, 600 196	19	10
Molybdenum (content of ore and concentrate) thousand pounds.  Nickel (content of ore and concentrate)						
Nickel (content of ore and concentrate)	63, 900 192	58, 668 (10)	(2) 92	67, 200 216	61, 781	92 2
Platinum group (Pt. Pd. etc.)	182	(-9)		210	7	
thousand troy ounces	850	24	3	950	23	2
Silverthousand fine ounces Tin (content of ore and concentrate)*	213, 000	35, 585	17	221, 500	36, 470	16
thousand long tons	179	(11)	(2)	180	(11)	(2)
Titanium concentrates:	1 000	F00			' '	
Ilmenite Rutile	1, 232 58	532 7	44 12	1, 418 76	573 9	40 12
Rutile	78	14	20	82	16	20
Vanadium (content of ore and concen- trate)	,			,		***
Zinc (content of ore and concentrate)	2,960	474	75 16	3, 200	3 515	75 16
,	_,			4, 200	0.0	

TABLE 10.—Comparison of world and United States <sup>1</sup> production of principal metals and minerals, 1954-55—Continued

		1954		1955			
Mineral	World	United	States	World United		l States	
	Thousato	Percent of world	Thousand short tons		Percent of world		
Metals, smelter basis: Aluminum Copper Iron, pig (incl. ferroalloys) Lead Magnesium Steel ingots and castings Tin. thousand long tons Zine.	3, 050 3, 275 175, 500 2, 190 246, 900 187 2, 710	1, 461 946 59, 806 487 70 88, 312 27 802	48 29 34 23 50 36 14 30	3, 340 3, 640 211, 500 2, 220 140 297, 600 182 2, 990	1, 566 1, 107 79, 264 479 61 117, 036 22 964	47 30 37 22 44 39 12 32	

Including Alaska and noncontiguous Territories.
 Less than 1 percent.
 Includes low- and medium-temperature and gashouse coke.
 Bureau of Mines not at liberty to publish United States figure separately.
 Data not available.
 World total, exclusive of U. S. S. R.
 World total, exclusive of U. S. S. R.
 In 1954 United States production of antimony was 766 short tons and 633 short tons in 1955.
 In 1954 United States production of beryl was 669 short tons and 500 short tons in 1955.
 In 1954 United States production of nickel was 831 short tons.
 In 1954 United States production of tin was 200 long tons and 100 long tons in 1955.

### Employment and Injuries in the Mineral Industries

By John C. Machisak!



THIS CHAPTER of the Minerals Yearbook contains overall injury and related employment experiences at coal mines, coking plants, metal and nonmetal mines, metallurgical plants, and stone quarries in the United States for the calendar year 1955. Volume I of the Yearbook includes experiences in the metal and nonmetal mining industries and those in the quarry industry. The injury experience and employment in the solid- and liquid-fuel industries—anthracite, bituminous coal, lignite, coke, and oil and gas—are presented in Volume II.

The Bureau of Mines was authorized to collect injury and employment data from all sections of the mineral industries; as no Federal law, except the one applying to the coal-mining industry, requires operators to supply the data, this information was voluntarily supplied. Every effort has been made to make the figures presented herein as complete as possible for all mineral industries of the Nation, and the figures are believed to be representative of the hazards to which

workers in the industries are exposed.

The average of 464,657 men working daily in the mineral industries in the United States during 1955, compared with 515,640 employed in 1954, declined 10 percent. The decline in number of men working, off-set by an increased number of work days per man resulted in a small increase over 1954, in total man hours worked. In 1955, the average employee worked 252 days, or 30 more than in the previous year; he was employed 2,013 hours, 248 more than in 1954. The length of the working shift at the mineral plants in 1955 was 7.99 hours a day, almost the same as the 7.96-hour shift in 1954.

The injury-frequency record in the mineral industries was not as favorable in 1955 as in 1954, as the total of 582 fatalities was an increase of 33, and the 33,171 nonfatal injuries reported was an increase of 2,837 in number over the previous year. The greater number of fatal and nonfatal injuries accompanied by a slight rise in man-hours of exposure increased the combined (fatal and nonfatal) injury rate by 6 percent. The 582 fatal injuries in the mineral industries in 1955 resulted in a frequency rate of 0.62 per million man-hours; in 1954 the comparable rate was 0.60. The 33,171 nonfatal lost-time injuries in 1955 resulted in a frequency rate of 35.46 per million man-hours.

<sup>&</sup>lt;sup>1</sup> Acting chief, Branch of Accident Analysis, Division of Safety.

No major disaster (a single accident in which five or more men are

killed) occurred in the mineral industry during 1955.

The fatality experience in the mineral industries as a whole in 1955 was not as favorable as in 1954 since the rate of occurrence showed a slight increase. Increased frequency of fatalities was reported by the coal-mining, nonmetal mining (except stone quarries), and stone-quarrying industries; an improvement was reported by the metal-mining and the metallurgical industries. Coking plants reported identical frequency rates (0.15) for both 1955 and 1954. Increased nonfatal frequency rates in 1955, were reported by all branches of the mineral industries. The nonfatal rate per million man-hours was 35.46, or an increase of 6 percent from the previous rate of 33.33 in 1954.

TABLE 1.—Salient statistics of employment and injury experience in the mineral industries in the United States, 1951–55, by industry groups

		,			
	1951	1952	1953	1954	1955
1 1 1 1 1					
Average number of men working daily:1 Coal mines 2	441, 905	401, 329	351, 126	283, 705	236, 200
Metal mines 3.	71, 603	74, 626	72, 529	66, 610	63, 590
Nonmetal mines (except stone quarries)	12, 500	12, 447	12, 765	12, 810	10, 290
Stone quarries	84, 802	81, 879	83, 641	78, 910	75, 980
Core plants	25, 715	25, 241	23, 440	19, 209	20, 681
Coke plants Metallurgical plants 4	48, 019	49, 032	55, 283	54, 396	57, 916
Total	684, 544	644, 554	598, 784	515, 640	464, 657
Average number of active mine days:5	202	189	187	175	216
Coal mines Metal mines 3	202 278	265	270	245	272
Nonmetal mines (except stone quarries)	298	288	292	284	282
Stone quarries	277	279	278	273	275
Coke plants	344	315	345	342	352
Metallurgical plants 4	318	319	318	307	305
Metanurgical plants	910		910		
Total	235	226	230	222	252
Man-days worked, in thousands:					
Coal mines	89, 365	76, 003	65, 688	49, 598	51, 087
Metal mines 3	19, 913	19,770	19, 559	16, 294	17, 312
Nonmetal mines (except stone quarries)	3, 729	3, 588	3, 727	3,638	2,902
Stone quarries	23, 470	22, 844	23, 248	21,506	20,864
Coke plants	8, 834	7, 939	8, 086	6, 567	7, 279
Metallurgical plants 4	15, 247	15, 628	17, 603	16, 713	17, 680
Total	160, 558	145, 772	137, 911	114, 316	117, 124
Man-hours worked, in thousands:					
Coal mines.	697, 247	593, 698	513, 594	387, 950	400, 870
Metal mines 3	159, 417	158, 649	156, 605	130, 489	140,006
Nonmetal mines (except stone quarries)	30, 130	28, 955	30, 488	29, 564	23, 495
Stone quarries	191, 113	186, 552	189, 776	175,817	170, 808
Coke plants	70, 191	62, 803	64, 677	52, 482	58, 164
Coke plants Metallurgical plants 4	122, 088	124, 967	138, 811	133, 675	142, 061
Total	1, 270, 186	1, 155, 624	1, 093, 951	909, 977	935, 404
Number of injuries:					
Fatal:					
Coal mines	785	548	461	396	417
Metal mines 3	95	117	92	86	79
Nonmetal mines (except stone quarries)	17	14	22	9	11
Stone quarries	57	74	43	34	53
Coke plants	10	8	8	8	9
Coke plants Metallurgical plants •	16	16	12	16	13
Total	980	777	638	549	582
	l	l <del>=====</del>	<del></del>		

TABLE 1.—Salient statistics of employment and injury experience in the mineral industries in the United States, 1951-55, by industry groups-Continued

	1951	1952	1953	1954	1955
Number of injuries—Continued					
Nonfatal:		i			
Coal mines	35, 553	30,074	24, 258	17, 718	19, 570
Metal mines 3	6, 824	6, 684	6, 164	4, 994	5, 795
Nonmetal mines (except stone quarries)	1, 351	1, 171	1, 419	956	908
Stone quarries	4, 945	4, 503	4, 450	3, 834	3,778
Coke plants	768	546	425	254	325
Metallurgical plants 4	2,714	2,853	2, 824	2, 578	2, 795
Wietantingtoar plants	2, 114	2,000	2, 02 7	2, 010	2, 180
Total	52, 155	45, 831	39, 540	30, 334	33, 171
Injury rates per million man-hours: Fatal:					
Coal mines	1. 13	0.92	0.90	1.02	1.04
Metal mines •	. 60	.74	. 59	. 66	. 56
Nonmetal mines (except stone quarries)	. 56	.48	.72	.30	. 47
Stone quarries	.30	.40	.23	. 19	.31
Coke plants	.14	.13	.12	. 15	. 15
Coke plants Metallurgical plants 4	. 13	.13	. 09	. 12	.09
Total	.77	. 67	. 58	. 60	. 62
Nonfatal:					
Coal mines.	50, 99	50, 66	47, 23	45. 67	48, 82
Metal mines 3	42.81	42.13	39. 36	38, 27	41. 39
Nonmetal mines (except stone quarries)	44.84	40.44	46. 54	32. 34	38. 65
Stone quarries.	25.87	24. 14	23. 45	21.81	22, 12
Coke plents	10.94	8. 69	6. 57	4.84	5, 59
Coke plants Metallurgical plants 4	22. 23	22. 83	20.34	19. 29	19. 67
Total	41.06	39. 66	36. 14	33. 33	35. 46

<sup>&</sup>lt;sup>1</sup> Average number of men at work each day mine was active. Absenteeism and labor turnover are taken into consideration; therefore, this number is lower than number of men available for work as measured by a count of names on payroll.
<sup>2</sup> Fatals for 1955 coal are preliminary; all other data for 1955 coal are estimated.

Work Stoppages.—Bureau of Labor Statistics reports reveal 359 work stoppages in the mineral industries during 1955. As in 1954, most of these (292) occurred in the bituminous-coal-mining industry, causing a loss of 273,000 man-days of work; in the anthracite industry 17 stoppages were reported, with a loss of 9,000 man-days of work. Nonmetal mining and quarrying reported 18, with 164,000 man-days lost, while metal mining reported 19, with a loss of 638,000 man-days. The remaining 13 work stoppages occurred in cement plants (4), coke and byproduct plants (1), and petroleum refining (8), which caused a loss of 47,420 additional man-days. There were 78 more work stoppages in 1955 than in 1954; however, the man-days lost increased 13 percent.

Average Earnings.—The average hourly earnings increased slightly in all the mineral industries for 1955. The largest percentage increase in hourly wages was reported by the lead-zinc-mining industry, followed by the iron-mining and copper-mining industries.

Labor Turnover.—Reports from the Bureau of Labor Statistics show increases for 1955 in the accession rates in all the mineral industries, while the separation rates declined with the exception of copper, cement, and petroleum; slight increases were noted in these.

 <sup>4 1955</sup> metallurgical plant total, preliminary; includes nonmetal mills for the first time.
 5 Average operating time of each mine is weighed by average number of workers in mine.

TABLE 2.—Work stoppages, average earnings, and labor turnover in certain mineral industries in the United States, 1951-55

[U. S. Department of Labor]

	Work s	toppages 1	Average earnings 2		Labor-turnover rates 3	
Industry and year	Number	Man-days lost (thousands)	Weekly	Hourly	Accession	Separa- tion
Coal mining:						
Anthracite: 1951 1952	30 41	81 104	\$66.66 71.19	\$2, 20 2, 26	1.9 1.4	2. 3 2. 2
1953	24 19 17	108 76 9	72, 91 4 75, 05 84, 50	2. 48 4 2. 51 2. 53	1. 4 1. 3 1. 8	3. 1 5. 2 4. 5
1951 1952 1953 1954	549 560 392 208	887 2, 760 418 344	77. 79 78. 09 85. 31 80. 85	2. 21 2. 29 2. 48 2. 48	1.9 1.9 1.3 1.2	2. 6 2. 8 2. 6 3. 2
1955	292	273	96. 26 74. 56	2. 56 2. 56 1. 71	1.6	1. 5 4. 9
1962 1963 1964 1965 1ron:	29 15 9 19	1, 300 255 392 638	81. 65 88. 54 84. 46 92. 42	1.86 2.04 2.07 2.19	5. 8 4. 3 3. 2 4. 5	5. 7 4. 7 4. 1 3. 9
1951	(5) (5) (5) (5) (6)	(5) (6) (5) (5) (5)	72. 68 80. 34 90. 74 82. 03 92. 46	1.71 1.83 2.14 2.17 2.30	2.8 2.9 1.9 1.6 2.8	2. 5 2. 9 2. 1 4. 3 1. 6
Copper: 1951	(5) (5) (5) (5) (5)	(9) (6) (6) (5)	78. 54 85. 73 91. 60 4 87. 13 95. 70	1.70 1.88 2.00 2.05 2.17	5. 1 5. 4 4. 8 3. 6 5. 2	4. 8 5. 1 4. 8 3. 9 4. 8
Lead-zine: 1951 1962 1963 1964 1955	(5) (5) (5) (5) (5)	(9) (9) (9) (9) (9)	76. 11 81. 60 80. 06 4 76. 92 83. 82	1. 77 1. 92 1. 92 1. 89 2. 01	5. 2 4. 4 2. 7 2. 1 2. 5	4. 7 4. 8 4. 9 2. 2 2. 1
Nonmetal mining and quarrying: 1951	24 17 26 14 18	53 94 63 33 164	67. 05 71. 10 75. 99 77. 44 80. 99	1. 49 1. 58 1. 70 1. 76 1. 82	(5) (5) (5) (6) (5)	(5) (5) (5) (5) (5)
1951 1952 1953 1954	12 ( <sup>5</sup> ) 5 20 4	(5) 20 113 4	4 65. 12 67. 72 73. 39 75. 71 78. 85	1. 56 1. 62 1. 76 1. 82 1. 90	2.9 2.7 2.5 1.6 2.0	2. 8 2. 6 2. 6 1. 5 1. 7
Coke and byproducts:  1951	(5) 2 1 1	(5) 11 (7) (6)	69. 39 73. 74 78. 81 4 80. 93 86. 31	1. 66 1. 76 1. 89 1. 95 2. 06	(8) (5) (6) (9)	(5) (5) (5) (6) (6)
Petroleum refining: 1951 1952 1953 1954 1955	8 4 9 10 8	37 46 50 36 43	84. 66 88. 44 94. 19 96. 22 100. 37	2. 08 2. 20 2. 32 2. 37 2. 46	1. 2 1. 0 . 8 . 5 . 7	. 8

<sup>1</sup> Number of stoppages beginning during the year and man-days of work lost from only these stoppages

<sup>1</sup> 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, military, and miscellaneous separations.

4 Revised figure.

5 Figure not available.

6 Less than 1,000 man-days.

#### 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. An inspiring number of mineral plants (690) enrolled in the National Safety Competition, and the National Sand and Gravel Competition reported outstanding safety records in 1955. Of the operations enrolled in these two contests, 290 (42 percent) attained injury-free records. The aggregate worktime of these injury-free operations was more than 22.5 million man-hours, or 16 percent of the total time worked at all participating plants in these 2 national competitions. The total man-hours worked in 1955 was 140,788,696. In addition, the Bureau of Mines conducted three other competitions, sponsored annually by national associations connected with the mineral industries. These associations were: National Lime, National Crushed Stone, and National Slag. In these contests, of the 162 plants enrolled in 1955, 69 (43 percent) had injuryfree records during an aggregate worktime of more than 6.25 million man-hours.

Trophy awards for the best safety record in each of the six groups in the 1955 National Safety Competition were made to the following: Anthracite Underground Mines.—The Germantown colliery of the

Raven Run Coal Co., Centralia, Pa.

Bituminous-coal Underground Mines.—The Labuco mine of the Alabama By-Products Corp., Birmingham, Ala.

Metal Underground Mines.—The Zenith mine of Pickands Mather

& Co. (the Vermillion Mining Co.), Ely, Minn.
Nonmetal Underground Mines.—The Bell mine, of Warner Co., Bellefonte Division, Bellefonte, Pa.

Open-Pit Mines.—The Erie Commercial mine of Pickands Mather

& Co. (the Erie Mining Co.), Aurora, Minn.

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

TABLE 3.—Employment and injury experience of the mineral industries in the United States, 1931-55

Year	Men working daily	Average active days	Man-days worked	Man-hours worked		er of inju- ies	millio	rates per on man- ours
		,			Fatal	Nonfatal	Fatal	Nonfatal
1931 1932 1933 1934 1935 1936 1936 1937 1938 1939 1940 1941 1942 1944 1945 1948 1949 1950 1960	677, 722 739, 817 783, 139 824, 514 859, 951 774, 894 788, 925 801, 926 835, 095 802, 640 747, 486 676, 254 721, 792 740, 988 723, 390 719, 862 684, 544 644, 554 598, 784	188 165 181 195 216 2217 187 202 219 234 260 277 287 240 256 249 205 221 235 221 235 226 220 220 220 2220 2220 2220 2222	147, 602, 799 110, 655, 616 122, 787, 658 144, 566, 133 152, 354, 170 177, 920, 334 186, 790, 283 145, 056, 875 159, 388, 490 175, 663, 792 195, 425, 228 208, 739, 906 207, 350, 634 194, 512, 359 172, 672, 431 162, 630, 674 185, 076, 018 184, 551, 937 148, 304, 347 159, 443, 478 160, 558, 417 145, 771, 805 137, 910, 860 114, 314, 878	1, 288, 135, 808 962, 924, 915 1, 058, 245, 650 1, 167, 723, 543 1, 215, 316, 764 1, 426, 233, 543 1, 482, 241, 908 1, 144, 137, 296 1, 251, 169, 210 1, 385, 128, 234 1, 541, 335, 277 1, 653, 234, 620 1, 668, 340, 394 1, 618, 479, 042 1, 437, 533, 530 1, 354, 822, 190 1, 496, 101, 097 1, 457, 690, 518 1, 170, 590, 880 1, 259, 436, 140 1, 270, 186, 435 1, 155, 623, 605 1, 093, 950, 835 909, 977, 122	1, 707 1, 368 1, 242 1, 429 1, 495 1, 686 1, 759 1, 369 1, 379 1, 716 1, 621 1, 799 1, 570 1, 167 1, 227 760 843 980 777 638 549	94, 021 66, 028 70, 168 79, 211 80, 070 90, 608 94, 466 69, 940 73, 253 80, 856 87, 911 76, 79 83, 441 72, 805 76, 919 70, 939 70, 939 71, 576 72, 831 73, 241 74, 831 75, 831 76, 939 76, 939 76, 939 77, 939 78, 831 78, 831	1. 33 1. 42 1. 17 1. 22 1. 18 1. 19 1. 20 1. 07 1. 24 1. 08 . 97 1. 24 1. 08 . 97 . 67 . 67 . 67 . 58 . 60	72. 99 68. 57. 66. 33 67. 838 63. 53 63. 73 61. 13 58. 55 58. 37 57. 04 55. 44. 55 51. 57 51. 44. 06 42. 28 41. 06 33. 66. 14 33. 66 33. 33. 33. 33. 33. 33. 33. 33. 33. 33.

<sup>&</sup>lt;sup>1</sup> Includes estimated data for coal and preliminary data for metallurgical plants and metal mines.

#### The Mineral Industry of Alabama

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

By Avery H. Reed, Jr., 1 and Walter B. Jones 2



SUBSTANTIAL gains in coal and iron-ore production and record output for stone and cement highlighted Alabama mineral-industry development in 1955. Despite increased output of iron ore from Alabama mines, the steel-industry imports of ore increased at a higher rate. Among the States, Alabama ranked second in bauxite output and third in the production of iron ore.

The mineral industry was dominated by iron and coal mining and processing operations centered near Birmingham. Leading companies were Tennessee Coal & Iron Division of United States Steel Corp., Woodward Iron Co., Alabama Power Co., Ideal Cement Co., and

Southern Cement Division of American Marietta Co.

TABLE 1.—Mineral production in Alabama, 1954-55 1

	19	954	1955		
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	
Cement (portland)	(2) 1, 330, 900 10, 282, 506 5, 913, 462 421, 807 87 1, 584 3, 966, 345 7, 393, 530	\$28, 582, 683 (2) 2, 258, 211 67, 338, 242 33, 327, 083 4, 488, 167 5, 000 3, 690, 000 3, 450, 858 11, 608, 937	11, 782, 095 1, 938, 520 (e) 13, 088, 477 6, 813, 670 462, 194 282 1, 411 3, 680, 173 8, 269, 355 1, 500	\$31, 517, 373 6, 832, 671 (9) 79, 337, 006 44, 657, 215 5, 185, 706 20, 000 2, 910, 000 3, 523, 524 11, 867, 191 8, 000 4, 325, 207	
Total Alabama 4		154, 639, 000		186, 453, 000	

<sup>&</sup>lt;sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Not reported separately in 1954.
Figure withheld to avoid disclosure of individual company confidential data.
The total has been adjusted to eliminate duplications in the value of clays and stone.

Chief, Knoxville field office, Region V, Bureau of Mines, Knoxville, Tenn.
 State Geologist, Alabama Geological Survey, Tuscaloosa, Ala.

TABLE 2.—Average unit values of minerals produced in Alabama, 1946–50 (average) and 1951–55  $^{\rm 1}$ 

Mineral	1946-50 (average)	1951	1952	1953	1954	1955
Bauxitelong dry ton_	\$5.60	\$6,02	\$6.20	\$7.31	\$6,50	\$6, 31
Cement:			1.00			
Portland 376-pound barrel	1.95	2.32	2.36	2.46	2.57	2. 68
Masonrydo	(2)	(2)	(2)	(2)	(2)	3. 52
Pozzolando	2.89	3.16	2.96	3.16	3.30	2.90
Clays: short tonshort ton	0.00	0.40				
Kaolindo	2.00	3.48	3.44	2.88	4.18	5. 10
Miscellaneous do	9. 50	5.00	5.00	9.67	9.94	10.45
Cool		. 84	1.07	. 99	1.04	. 90
Coaldododo	5. 74 88. 71	6.06	6. 22	6. 33	6. 23	5. 68
Iron ore:	88.71		117. 92			<del></del>
Hematitelong ton	3, 43	4.08	5, 16	F 50	1	
Limonitedo	3.06	3, 29	5. 71	7. 70	5.74	6.86
Limeshort ton_	8.36	9, 64	10. 51	5. 35	5.12	4.70
Limestone.		9.04	10. 51	10.66	10.64	11. 22
Crusheddodo	1.37	1.89	1, 57	1, 51	1 00	
Dimensiondo	44. 33	53, 47	47. 90	145.14	1.28	1.12
Marhle:	41.00	00.41	47.90	145, 14	43.75	38. 96
Crusheddodo	3, 85	(3)	(3)	9.02	4.00	
Dimensiondo	151, 41	149, 25	112.04	98.14	4.83 124.09	6.34
Mica:	101. 11	110. 20	112.04	90, 14	124.09	97. 53
Scrapdo			16, 55		20.00	21. 10
Sheetpound			1.41	6, 09	2.75	14. 44
Natural gas million cubic foot	50, 00	50.00	40,00	48. 78	60.00	70. 92
Petroleum 42-gallon barrel Salt short ton	(3)	(3)	1.81	1.94	2.33	2.06
Saltshort ton_			1.08	1.08	1.08	3, 11
	77.		2,00	2.00	1.00	5.11
Sanddo	. 70	. 83	.71	. 76	.87	. 84
Graveldodo	. 67	. 77	.86	.84	.87	1.05
Sandstone:				•01		1.00
Crusheddo	4.98	8, 90	8, 90	9.09	5, 64	1, 90
Dimensiondo			15.85	13. 46	17.43	15. 52
Taledo_					110	5. 33

For greater detail on prices by grades and markets, see volume 1, Minerals Yearbook, 1955.
 Data not available.
 Figure withheld to avoid disclosure of individual company confidential data.

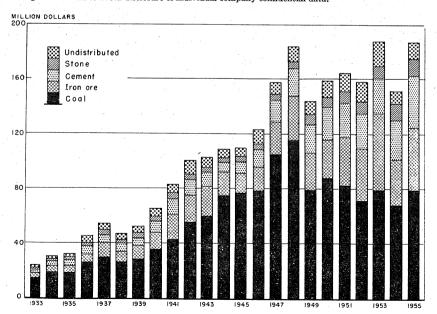


FIGURE 1-Value of mineral production in Alabama, 1933-55.

Value of mineral production increased 20 percent over 1954, owing mainly to recovery of the coal-mining industry and to increased production of iron ore and cement. Total value was 1 percent below 1953, the record year. Alltime highs were recorded in the cement, salt, and stone industries.

Defense Minerals Exploration Administration (DMEA) activity

consisted of a sheet-mica project in Randolph County.

# **REVIEW BY MINERAL COMMODITIES**

#### **METALS**

Bauxite.—Three companies mined crude bauxite in Barbour County for chemicals and refractories; the leading producer was R. E. Wilson. Imported bauxite was converted to alumina by Aluminum Co. of

America in Mobile County.

Iron Ore.—Total shipments of iron ore increased 15 percent above 1954. Of the total quantity shipped, 55 percent was direct shipping ore, 32 percent was concentrate, and 13 percent was sinter, compared with 54, 36, and 10 percent, respectively, in 1954. The number of mines decreased from 33 to 32, and average usable production per mine increased from 179,000 tons to 212,000.

Six companies mined red iron ore near Birmingham at seven mines. The leading producer was the Tennessee Coal & Iron Division, United States Steel Corp., Wenonah mine. During the year Woodward Iron Co. purchased the Muscoda property from United States Steel Corp. Republic Steel Corp. completed a concentrating plant at the Spaulding mine. Total shipments of red iron ore increased 19

percent over 1954.

Nineteen companies mined brown iron ore at 25 mines in 8 counties. The leading producer was Shook & Fletcher Supply Co., with mines in Bibb, Blount, and Franklin Counties. Leading districts were the Russellville, Woodstock, and Greenville. Total shipments of usable brown ore decreased 2 percent below 1954.

TABLE 3.—Mine production and shipments of crude iron ore, 1954-55

	1	954	1955	
	Number of mines	Long tons	Number of mines	Long tons
Mine production by varieties:  Hematite. Brown ore. By mining method:	9	5, 016, 274	7	6, 165, 458
	24	4, 669, 553	25	3, 802, 275
Open-pit. Underground	26	4, 730, 954	27	3, 892, 766
	7	4, 954, 873	5	6, 074, 967
Shipments from mines: Direct to consumers	8	3, 470, 060	8	3, 773, 781
	25	6, 225, 836	24	6, 184, 108

Pig Iron.—Four companies produced foundry and basic pig iron near Birmingham and Gadsden, using domestic and foreign iron ore. Imports of foreign ore, mainly from Venezuela and Labrador, exceeded those in any previous year.

TABLE 4.—Production and shipments of usable iron ore, 1954-55

	1954		1955	
	Long tons	Iron content, natural (percent)	Long tons	Iron content, natural (percent)
Production of usable iron ore by varieties:  Hematite Brown ore	4, 925, 272	36	5, 819, 568	36
	978, 049	47	970, 699	47
Shipments of usable iron ore by types:  Direct shipping ore  Concentrate  Sinter	3, 188, 438	36	3, 773, 781	36
	2, 118, 824	39	2, 157, 889	39
	606, 200	40	882, 000	42

TABLE 5.—Shipments of usable iron ore, 1946-50 (average) and 1951-55

Year	Long tons	Value	Year	Long tons	Value
1946-50 (average)	7, 188, 364	\$25, 984, 921	1953	7, 446, 130	\$55, 640, 338
	8, 181, 737	34, 799, 951	1954	5, 913, 462	33, 327, 083
	7, 243, 214	37, 940, 412	1955	6, 813, 670	44, 657, 215

#### **NONMETALS**

Cement.—Portland cement was produced by 7 companies at 8 plants in 5 counties. Shipments increased 6 percent over 1954 and established a new record. The leading producer was Ideal Cement Co. in Mobile County.

Masonry cement was produced by 7 companies at 7 plants in 3 counties. The leading company was Southern Cement Division, American Marietta Co., in Jefferson County.

Southern Cement Division, American Marietta Co., and Cheney Lime & Cement Co. produced pozzolan cement in Jefferson and Blount Counties, respectively.

TABLE 6.—Shipments of portland cement, 1946-50 (average) and 1951-55

Year	376-pound barrels	Value	Year	376-pound barrels	Value
1946-50 (average)	9, 499, 916	\$18, 684, 047	1953	10, 427, 542	\$25, 701, 421
1951	10, 586, 825	24, 523, 073	1954	11, 121, 599	28, 582, 683
1952	10, 642, 409	25, 084, 379	1955	11, 782, 095	31, 517, 373

Clays.—Eleven companies mined fire clay at 11 mines in 7 counties. The leading producer was Natco Corp. in Walker County.

TABLE 7.—Fire clay sold or used by producers, 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	146, 942	\$291, 493	1953.	252, 926	\$727, 439
1951	203, 339	707, 030	1954.	235, 731	985, 960
1952	220, 009	757, 451	1955.	216, 289	1, 102, 776

TABLE 8.—Fire clay sold or used by producers, 1954-55, by uses

Use	195	4	1955	
	Short tons	Value	Short tons	Value
Heavy elay products Firebrick and block Foundries and steelworks Fire-clay mortar Art pottery	103, 694 (1) 43, 499 (1) 50	\$656, 349 (1) 99, 956 (1) 250	95, 864 (1) 50, 329 (1)	\$629, 883 (1) 107, 736 (1)
Stoneware Other	88, 448	200 229, 205	70, 096	365, 157
Total	235, 731	985, 960	216, 289	1, 102, 776

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosure of individual company confidential data. Included with "Other."

The production of Thomas Alabama Kaolin Co. in Marion County, the only producer of kaolin in the State, decreased 11 percent. The kaolin was used for high-grade tile, paint, fertilizer, insecticide and other filler, and for refractories.

Twenty-three companies mined miscellaneous clay for cement and heavy clay products at 24 mines in 12 counties. Ideal Cement Co. in Mobile County was the leading producer. Production was 1,257,500 tons valued at \$1,131,000, compared with 1,080,000 tons valued at \$1,126,000 in 1954.

Lime.—Eight companies produced lime at 8 plants in 3 counties; production increased 10 percent. Southern Cement Division, American Marietta Co. in Shelby County was the leading producer.

TABLE 9.—Lime sold or used by producers, 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	355, 306	\$2, 989, 698	1953	470, 541	\$5, 018, 156
1951	455, 953	4, 395, 922	1954	421, 807	4, 488, 167
1952	424, 028	4, 458, 604	1955	462, 194	5, 185, 706

TABLE 10.—Lime sold or used by producers, 1954-55, by uses

Use	1954		1955	
	Short tons	Value	Short tons	Value
Chemical and industrial Building Other	333, 101 81, 888 6, 818	\$3, 503, 887 892, 880 91, 400	374, 369 (1) 87, 825	\$4, 014, 365 (1) 1, 171, 341
Total	421, 807	4, 488, 167	462, 194	5, 185, 706

<sup>1</sup> Figure withheld to avoid disclosure of individual company confidential data. Included with "Other."

Mica.—Eight or more companies or individuals mined crude mica at 11 mines in 6 counties; production was considerably less than in 1954. Dixie Mines, Inc., with mines in Cleburne and Talladega Counties, was the leading producer. Ellis Inlow mined scrap mica for grinding. Sheet-mica production declined 88 percent in quantity and 35 percent in value.

Salt.—Mathieson Chemical Corp. produced salt from brine at its plant in Washington County; production increased 2 percent, estab-

lishing a new record for the State.

Sand and Gravel.—Twenty-nine companies mined sand and gravel at 32 mines in 20 counties. Production decreased 7 percent below 1954, the record year. Montgomery-Roquemore Gravel Co. in Elmore and Montgomery Counties was the leading producer.

TABLE 11.—Sand and gravel sold or used by producers, 1946-50 (average) and 1951-55

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1946-50 (average)	(1) (1) (1) 1, 570, 826 1, 516, 997 1, 652, 076	(1) (1) (1) (1) \$1, 196, 831 1, 316, 769 1, 384, 113	(1) (1) (1) 2, 139, 881 2, 449, 348 2, 028, 097	(1) (1) (1) \$1, 805, 852 2, 134, 089 2, 139, 411	3, 391, 151 3, 535, 871 3, 722, 555 3, 710, 707 3, 966, 345 3, 680, 173	\$2, 269, 349 2, 806, 540 2, 955, 630 3, 002, 683 3, 450, 858 3, 523, 524

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosure of individual company confidential data. Included with total.

TABLE 12.—Sand and gravel sold or used by producers, 1954-55, by uses

Use	19	154	1955	
	Short tons	Value	Short tons	Value
Structural sand and gravel	1, 396, 766 1, 997, 670 271, 598 74, 754 65, 982 159, 575	\$1, 391, 841 1, 592, 660 135, 435 37, 333 112, 357 181, 232	1, 843, 913 1, 314, 203 (1) (1) 41, 958 480, 099	\$1, 747, 724 1, 314, 651 (1) (1) 74, 616 386, 533
Total	3, 966, 345	3, 450, 858	3, 680, 173	3, 523, 524

<sup>1</sup> Figure withheld to avoid disclosure of individual company confidential data. Included with "Other,"

Stone.—Alabama Asphaltic Limestone Co. mined native asphalt

in Colbert County for roads.

Twenty-five companies produced crushed limestone at 30 quarries in 12 counties. The leading producer was Tennessee Coal & Iron Division, United States Steel Corp., in Jefferson County. Production increased 12 percent over 1954 and established a new record. During the year the Woodward Iron Co. purchased the No. 5 limestone mine from Tennessee Coal & Iron Division, United States Steel Corp.

TABLE 13.—Crushed limestone sold or used by producers, 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946–50 (average) <sup>1</sup>	2, 334, 308	\$3, 191, 132	1953 1	3, 815, 076	\$5, 779, 804
1951 <sup>1</sup>	2, 700, 064	5, 103, 858	1954	7, 195, 748	9, 237, 726
1952 <sup>1</sup>	2, 936, 029	6, 051, 287	1955	7, 943, 152	8, 888, 665

<sup>1</sup> Except for cement and lime.

TABLE 14.—Crushed limestone sold or used by producers, 1954-55, by uses

Use	19	1954		1955	
	Short tons	Value	Short tons	Value	
Cement manufacture. Fluxing stone. Concrete and roads. Lime manufacture. Agriculture Rock dusting (coal mines). Other.	3, 238, 835 1, 952, 840 704, 510 625, 709 404, 896 45, 397 223, 561	\$3, 489, 099 2, 979, 938 901, 800 765, 894 553, 784 192, 117 355, 094	3, 676, 392 1, 859, 090 1, 145, 037 511, 059 329, 389 63, 492 358, 693	\$2, 485, 459 2, 926, 606 1, 316, 905 809, 124 473, 425 265, 414 611, 732	
Total	7, 195, 748	9, 237, 726	7, 943, 152	8, 888, 668	

Alabama Limestone Co. quarried dimension limestone for rubble, rough architectural, and sawed and cut dressed building stone in Franklin County.

Three companies crushed marble at three quarries in Talladega County for terrazzo, whiting, and other uses; Thompson-Weinman &

Co. was the leading producer.

Two companies quarried dimension marble at two quarries in Talladega County for rough building stone, cut and sawed dressed building stone, and rough and dressed monumental stone; the leading producer was Moreitti-Harrah Marble Co.

Five companies crushed sandstone at 5 quarries in 3 counties for concrete and roads, refractories, foundries, and cement; production was 136,000 tons valued at \$258,000, compared with 44,000 tons valued at \$248,300 in 1954; Alabama State Highway Department in Cullman and Jackson Counties was the leading producer.

Two companies quarried dimension sandstone at two quarries in Blount and DeKalb Counties; the leading producer was DeKalb

Stone Co.

TABLE 15.—Dimension sandstone sold or used by producers, 1954-55, by uses

	1		1	
Use	1954		1955	
	Short tons	Value	Short tons	Value
Building stone: Rough architectural	(1) (1) 1, 820	(1) (1) \$52, 818	2, 000 872	\$40,000 6,107
Flagging.	250	<sup>(1)</sup> 5, 000	1,000	14, 000
Total	5, 329	92, 899	3, 872	60, 107

<sup>1</sup> Figure withheld to avoid disclosure of individual company confidential data. Included with total.

Talc.—American Talc Co. reopened the old Winterboro talc mine and mined 1,500 tons valued at \$8,000; the talc was ground for insecticide and other uses.

#### MINERAL FUELS

Coal.—Coal was mined at 239 mines in 12 counties; leading counties were Jefferson, Walker, and Tuscaloosa; leading companies were Tennessee Coal & Iron Division of United States Steel Corp., Alabama

Power Co., Alabama By-Products Corp., Woodward Iron Co., U. S. Pipe & Foundry Co., and Republic Steel Corp. Coal production increased 27 percent over 1954, owing mainly to increased use of coal for power generation, but was 31 percent below 1947, the record year.

TABLE 16.—Coal production, 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average) 1951 1952 1953	16, 277, 623 13, 596, 982 11, 383, 427 12, 532, 061	\$93, 047, 492 82, 465, 625 70, 759, 815 79, 370, 036	1954 1955 Earliest record to date	10, 282, 506 13, 088, 477 897, 583, 000	

<sup>&</sup>lt;sup>1</sup> Data not available.

Natural Gas.—Marketed production of natural gas continued to increase, owing to improved pipeline facilities.

TABLE 17.—Marketed production of natural gas, 1950-55

Year	Thousand cubic feet	Value	Year	Thousand cubic feet	Value
1950	2, 000	\$100	1953	41, 000	\$2,000
	1, 000	50	1954	87, 000	5,000
	4, 000	160	1955	282, 000	20,000

Petroleum.—Production of crude petroleum decreased 11 percent below 1954 and was 17 percent below 1953, the record year.

TABLE 18.—Production of crude petroleum, 1946-50 (average) and 1951-55

Year	Thousand 42-gallon barrels	Year	Thousand 42-gallon barrels
1946-50 (average)	488 1, 020 1, 279 1, 694	1954	1, 584 1, 411 9, 660

# REVIEW BY COUNTIES

Jefferson County dominated the mineral industry of the State,

furnishing 66 percent of the value of production.

A small quantity of sheet mica was mined; county origin is not known. Marketed production of natural gas was 282 million cubic feet valued at \$20,000, compared with 87 million cubic feet valued at \$5,000 in 1954. Crude-petroleum production was 1,377,000 barrels valued at \$2,840,000, compared with 1,584,000 barrels in 1954. Atlanta & West Point Railroad Co. mined 400 tons of engine sand.

Baldwin.—Fairhope Clay Products Co. (Fairhope mine) mined 5,591 tons of miscellaneous clay for heavy clay products. Hinote

Sand Supply Co. mined 9,720 tons of structural sand.

Barbour.—Alcoa Mining Co., D. M. Wilson Bauxite Co., and R. E. Wilson mined crude bauxite for chemicals and refractories; production increased 63 percent.

Bibb.—Coal production was 85,500 tons valued at \$435,000, compared with 41,300 tons valued at \$260,000 in 1954; of the 12 active mines, Black Diamond Coal Co. (Blocton No. 9 mine) and H. E. Hicks Coal Co. (Belle Ellen No. 9 mine) were the largest producers. Shook & Fletcher Supply Co. (Adkins mine) mined brown iron ore for sale to iron and steel plants; production increased 11 percent.

Blount.—Cheney Lime & Cement Co. produced pozzolan cement at its Graystone mill. Harbison-Walker Refractories Co. and Lehigh

TABLE 19.—Value of mineral production in Alabama, 1954-55, by counties 1 and minerals produced in 1955

County	1954	1955	Minerals produced in 1955, in order of value
Baldwin	(3)	\$12, 232	Cond and grovel misselleneous sleep
Barbour	(2)		Sand and gravel, miscellaneous clay.
Bibb		(2)	Bauxite.
Blount			Iron ore, coal.
		(2)	Coal, cement, iron ore, fire clay, sandstone.
Butler		(2)	Iron ore.
Calhoun		282, 198	Sand and gravel, fire clay, miscellaneous clay
Cherokee		(2)	Iron ore.
Chilton		(2) (2) (2)	Mica.
Clay	13, 869	(2)	Do.
Cleburne		(2)	Do.
${f Colbert}_{}$	(2)	(2)	Asphalt (native), sand and gravel, limestone.
Coosa	(2)	1, 933	Mica.
Covington	15,000	1, 500	IVIICa.
Crenshaw	(2)	(2)	The same and
Cullman	(2)	(2)	Iron ore.
Dollog	1 22	257, 731	Coal, sandstone.
Dallas	544, 594	408, 816	Sand and gravel.
De Kalb	(2) (2) (2)	488, 425	Coal, sandstone, limestone.
Elmore	(2)	(2) (2)	Sand and gravel.
Escambia	(2)	(2)	Sand and gravel, miscellaneous clay.
Etowah	(2)	(2)	Limestone, sand and gravel.
Fayette	2, 100	1, 616	Miscellaneous clay.
Franklin	(2)	(2)	Iron ore, limestone, sand and gravel, fire clay
Greene	(2)	(2)	Sand and gravel.
Houston		(-)	Danu and graver.
Jackson		107 076	Completence and
Vefferson	99, 317, 680	197, 976	Sandstone, coal.
	99, 517, 080	120, 034, 968	Coal, iron ore, cement, limestone, lime, mis cellaneous clay, fire clay, sandstone.
Limestone	68, 920	56, 000	Limestone.
Macon	106, 669	104, 718	Sand and gravel.
Madison			
	(2)	(2) (2)	Limestone, miscellaneous clay.
Marengo	(2)		Cement, limestone.
Warion		(2)	Coal, kaolin, sand and gravel.
Marshall	15, 000		
Mobile	(2)	(2)	Cement, lime, miscellaneous clay, sand and
· Common	` (0)		gravel.
Monroe	(2)	5, 450	Sand and gravel.
Montgomery	(2) (2) (2)	(2)	Sand and gravel, miscellaneous clay.
Morgan	(2)	(2)	Limestone, sand and gravel.
Pickens	(2)		
Pike	(2) 574, 826	402, 725	Iron ore.
Randolph	(2) (2)	(2)	Mica.
Russell	(2)	(2)	Miscellaneous clay, sand and gravel.
St. Clair	(2)	(2)	Cement, limestone, miscellaneous clay, coal
	(7)	. (-)	fire clay, sand and gravel.
Shelby	(2)	(2)	Lime, limestone, cement, coal, miscellaneous
,11010J	(-)	(-)	clar fra clar
tumtor	4 500	001	clay, fire clay.
humter	4,500	801	Sand and gravel.
Calladega	1, 282, 156	(2)	Marble, iron ore, tale, mica.
Cuscaloosa	(2)	3, 110, 000	Coal, sand and gravel.
Valker	<sup>8</sup> 14, 338, 373	17, 923, 175	Coal, fire clay.
Vashington	(2)	(2)	Limestone, salt, miscellaneous clay.
Wilcox		312	Sand and gravel.
Winston		6,000	Coal.
Indistributed 8	37, 529, 987	43 157, 924	
Total Alabama	4 154, 639, 000	186, 453, 000	

<sup>&</sup>lt;sup>1</sup> Individual county figures exclude petroleum and natural gas. The following counties are not listed because no production was reported: Autauga, Bullock, Chambers, Choctaw, Clarke, Coffee, Conecuh, Dale, Geneva, Hale, Henry, Lamar, Lauderdale, Lawrence, Lee, Lowndes, Perry, and Tallapoosa.

<sup>2</sup> Figure withheld to avoid disclosure of individual company confidential data; included with value of tems that cannot be disclosed.

Includes petroleum, natural gas, and values indicated by footnote 2.

4 Revised figure.

Coal Co. mined fire clay for firebrick and block and for heavy clay products. Coal production was 199,600 tons valued at \$1,229,000, compared with 174,900 tons valued at \$1,172,000 in 1954; of the 8 active mines, Robbins Coal Co., Inc. (Southview strip mine), and Alabama Coal & Ore Co. (Hopewell strip mine) were the largest producers. Shook & Fletcher Supply Co. (Taits Gap mine) mined brown iron ore for sale to iron and steel plants; production increased 10 percent. A. O. Brown quarried 900 tons of dimension sandstone for rough building stone.

Butler.—Greenville Mining Co. (Greenville mine) mined brown iron ore for sale to iron and steel plants; production decreased considerably.

Calhoun.—Donoho Foundry Co. (Anniston mine) mined 24,000 tons of fire clay for foundries and steelworks. Agricola Brick Co. (Piedmont mine) mined 22,000 tons of miscellaneous clay for heavy clay products. John B. Lagarde, Inc., mined 107,000 tons of paving sand and gravel.

Cherokee.—Erwin & Mashburn (Spring Garden mine) and Margemma Mining Co. (Laney Hollow mine) mined brown iron ore for sale to iron and steel plants; production decreased 30 percent.

Chilton.—Ellis Inlow (Inlow mine) mined scrap mica for grinding;

production decreased 75 percent.

Clay.—S. P. Lett (Barfield, Euka, and Bob Lee mines), James W. Starrett & Co. (M & G mine), C. M. Shirey, and S. G. Traylor mined sheet mica.

Cleburne.—Dixie Mines, Inc. (Indian mine), mined sheet mica.

Colbert.—Alabama Asphaltic Limestone Co. (Margerum quarry) mined native asphalt for road metal; production increased 69 percent. Tri-State Limestone Co. crushed limestone for concrete and roads, filter beds, and agriculture. Tennessee Valley Sand & Gravel Co. (Sheffield mine) mined structural and paving sand and gravel; production increased 22 percent.

tion increased 22 percent.

Coosa.—H. W. Saunders (Bentley mine) mined 127 pounds of sheet

mica.

Crenshaw.—Arrington Mining Co. (Glenwood mine) and Luverne Mining Co. mined brown iron ore for sale to iron and steel plants;

production increased 4 percent.

Cullman.—Coal production was 29,300 tons valued at \$188,500; 6 mines were active, Freeman Butler (Butler No. 3 mine) being leading producer. Alabama State Highway Department (Duck quarry) crushed 36,000 tons of sandstone for concrete and roads.

Dallas.—Dallas Sand & Gravel Co. and Southeastern Sand & Gravel Co. mined structural and paving sand and structural, paving,

and other gravel.

De Kalb.—Georgia-Alabama Ore Co. opened the Gibson's Gap Strip mine and mined 78,500 tons of coal valued at \$404,400. Miller Limestone Co. crushed 20,000 tons of limestone for concrete and roads. DeKalb Stone Co. quarried 3,000 tons of dimension sandstone for rough architectural building stone.

Elmore.—Alabama Gravel Co., Alabama State Highway Department, and Montgomery-Roquemore Gravel Co. (No. 1 mine) mined paving, molding, blast, structural, and engine sand and structural,

paving, railroad ballast, and other gravel; production was considerably more than in 1954.

Escambia.—Keego Clay Products Co. (Brewton mine) mined 12,000 tons of miscellaneous clay for heavy clay products. Dixie, Sand & Gravel Co., Flomaton Gravel Co., and Henderson Gravel Co. mined structural and paving sand and gravel; production was 128,000 tons.

Etowah.—Alabama Aggregate Co. (Cobb City quarry) crushed limestone for concrete and roads, riprap, fluxing stone, and agriculture. Milner Sand Co. mined molding, structural, and paving sand and structural and paving gravel; production increased 2 percent.

Fayette.—Columbus Brick Co. mined 1,800 tons of miscellaneous

clay for heavy clay products.

Franklin.—Tennessee Valley Sand & Gravel Co. (Spruce Pine mine) mined 1,000 tons of fire clay for fire-clay mortar. A. G. Britton (Britton mine), Robert Fuller (Fuller mine), Shook & Fletcher Supply Co. (Blackburn and Warner mines), and U. S. Pipe & Foundry Co. (Belgreen and Russellville No. 14 mines) mined brown iron ore for use in iron and steel plants; production increased 8 percent. Limestone Co. (Rockwood quarry) crushed limestone for concrete and roads, agriculture, coal dust, mineral food, and other uses and quarried dimension limestone for rubble, rough architectural, and sawed and cut dressed building stone. Tennessee Valley Sand & Gravel Co. (Spruce Pine mine) mined structural and paving sand and gravel; production increased 59 percent.

Greene.—Bigbee Block & Gravel Co. (Gainesville mine) mined structural and paving sand and gravel; production increased 7 percent. Houston.—L. C. Smith Sand & Gravel Co. (Dothan mine) mined

structural sand; production decreased 8 percent.

Jackson.—Coal production was 25,500 tons valued at \$63,900, compared with 3,300 tons valued at \$21,600 in 1954; 3 mines were active, Widows Creek Coal Co. (Armstrong mine) being the leading producer. Alabama State Highway Department (Central quarry) and Jackson County Highway Department crushed 65,000 tons of sandstone for concrete and roads.

Jefferson.—Alpha Portland Cement Co. (Phoenixville mill), Lehigh Portland Cement Co. (Birmingham mill), Lone Star Cement Corp. (Birmingham mill), and Universal Atlas Cement Co. (Leeds mill) produced portland cement; production exceeded that of any previous year. Alpha Portland Cement Co., Southern Cement Division, American Marietta Co., Lehigh Portland Cement Co., Lone Star Cement Corp., and Universal Atlas Cement Co. produced masonry cement, and Southern Cement Division, American Marietta Co. (North Birmingham mill) produced pozzolan cement.

Bibby Coal, Shale & Clay Co. (Bibby mine), Dixie Fire Brick Co., Inc. (Warrior mine), and J. E. Moore mined fire clay for firebrick and block, fire-clay mortar, and foundries and steelworks; production increased 28 percent. Miscellaneous clay was mined by Alpha Portland Cement Co., Birmingham Clay Products Co., Lehigh Portland Cement Co., Lone Star Cement Corp., Stephenson Brick Co. (Lovick mine), Universal Atlas Cement Co., and Watkins Brick Co. for cement and

heavy clay products.

TABLE 20.—Portland cement shipments in Jefferson County, 1948-50 (average) and 1951-55

Year	376-pound barrels	Value	Year	376-pound barrels	Value
1948-50 (average)	6, 014, 420	\$12, 744, 720	1953	6, 090, 801	\$15, 255, 438
1951	6, 229, 623	14, 845, 395	1954	6, 577, 320	16, 865, 621
1952	6, 289, 918	15, 007, 623	1955	6, 784, 814	18, 155, 302

TABLE 21.—Miscellaneous clay sold or used by producers in Jefferson County, 1948-50 (average) and 1951-55

Year Short		Value	Year	Short tons	Value	
1948-50 (average) <sup>1</sup>	153, 445	\$128, 677	1953 <sup>1</sup>	87, 508	\$87, 508	
1951 <sup>1</sup>	149, 365	140, 163		285, 255	341, 015	
1952 <sup>1</sup>	111, 373	207, 995		299, 004	259, 685	

<sup>1</sup> Except clay for cement.

Coal production was 9,065,000 tons valued at \$54,094,000, compared with 6,981,000 tons valued at \$47,580,000 in 1954; 69 mines were active; United States Steel Corp. (Concord No. 1, and Edgewater and Short Creek mines), Woodward Iron Co. (Mulga mine), Alabama By-Products Corp. (Maxine mine), and U. S. Pipe & Foundry Co. (Flat Top mine) were the largest producers. Republic Steel Corp. (Edwards mine), Shelby Coal Co. (Griffin mine), Southeastern Coal & Iron Co. (Trussville mine), Tennessee Coal & Iron Division, United States Steel Corp. (Wenonah mines), U. S. Pipe & Foundry Co. (Sloss Red Ore mine), and Woodward Iron Co. (Songo and Pyne mines) mined red iron ore for use in iron and steel plants. During the year Woodward Iron Co. purchased the Muscoda mines from Tennessee Coal & Iron Division of United States Steel Corp.

TABLE 22.—Shipments of red iron ore in Jefferson County, 1946-50 (average) and 1951-55

Year	Long tons	Value	Year	Long tons	Value
1946-50 (average) <sup>1</sup>	6, 581, 538	\$22, 656, 258	1953	6, 713, 606	\$51, 720, 060
1951 <sup>1</sup>	7, 320, 147	32, 357, 022	1954	4, 938, 188	28, 332, 968
1952	6, 179, 937	31, 879, 360	1955	5, 853, 755	40, 140, 749

<sup>1</sup> Mine production.

Tennessee Coal & Iron Division of United States Steel Corp. (Ensley Works) produced lime for refractory, chemical, and industrial use; production increased 19 percent. Alpha Portland Cement Corp., Dolcito Quarry Co., Lehigh Portland Cement Co., Lone Star Cement Corp., Tennessee Coal & Iron Division of United States Steel Corp. (Dolonah quarry and No. 5 Limestone mine), Universal Atlas Cement Co., and U. S. Pipe & Foundry Co. (Sloss North Birmingham quarry) crushed limestone for cement, fluxing stone, lime, refractories, concrete and roads, agriculture, coal dust, foundries, and other uses; production was 3,651,000 tons, compared with 3,859,000 tons in 1955; during the year Woodward Iron Co. purchased the No. 5 Limestone mine. Sam

P. Acton, Enos E. Vann, and Universal Atlas Cement Co. crushed 35,000 tons of sandstone for foundry, refractory, and other uses.

Limestone.—The Limestone County Board of Revenue crushed

40,000 tons of limestone for concrete and roads.

Macon.—Macon County Sand & Gravel Co. (Tuskegee mine) and Sharp Sand & Gravel Co. mined structural and paving sand and

gravel; production was 103,000 tons.

Madison.—Alabama Brick & Tile Co. (Farley mine) and Huntsville Brick & Tile Co., Inc., mined miscellaneous clay for heavy clay products; production increased 99 percent. Madison Limestone Co. crushed 463,000 tons of limestone for concrete and roads and for agriculture.

Marengo.—Shipments of portland cement from Lone Star Cement Corp. Spocari mill decreased 11 percent. Lone Star Cement Corp. crushed limestone for cement; production increased 16 percent.

Marion.—Thomas Alabama Kaolin Co. (Hackelburg mine) mined kaolin for high-grade tile, paint filler, firebrick and block, high-alumina brick fertilizers, insecticides, and other fillers; production decreased 11 percent. Coal production was 317,600 tons valued at \$2,097,000, compared with 277,000 tons valued at \$1,407,000 in 1954; 48 mines were active; Wood & Burleson Coal Co. (No. 1. mine) was the leading producer. Marion County Highway Department mined 300 tons of

structural sand and gravel.

Mobile.—Aluminum Co. of America used bauxite imported from Surinam at its alumina plant at Mobile, the largest in the United States. Shipments of portland cement from Ideal Cement Co. Mobile mill, active throughout the year, increased 27 percent over 1954. Ideal Cement Co. mined miscellaneous clay for cement; production decreased 3 percent. This company also produced lime for chemical and industrial uses; production increased 1 percent. Southern States Sand & Gravel Co. mined structural sand; production increased 3 percent.

Monroe.—Mannings Sand & Gravel Co. produced 5,800 tons of

structural sand and gravel.

Montgomery.—Excelsior Brick Co. and Jenkins Brick Co. mined miscellaneous clay for heavy clay products. City Sand & Gravel Co., Montgomery County Highway Department, Montgomery-Roquemore Gravel Co. (No. 2 mine), and Vandigriff Construction Co. mined structural, paving, blast, and engine sand and structural, paving, railroad-ballast, and other gravel; production decreased 12 percent.

Morgan.—Holland & Woodard Co., Trinity Stone Co., and Waters Construction Co. crushed limestone for riprap, concrete and roads, and agriculture; production was 301,000 tons. Decatur Sand & Gravel Co. mined structural and paving sand and gravel; production increased

7 percent.

Pike.—Arrington Mining Co., Bibb Co., Big Creek Mining Co., B & R Mining Co. (Searcy mine), Conner & Archer, Glenwood Mining Co., Mill Creek Mining Co. (Goshen mine), Pike County Mining Co., and L. S. Speed mined brown iron ore for sale to iron and steel plants; production was 96,200 tons.

Randolph.—J. J. New mined a small quantity of sheet mica. Dixie Mines, Inc., conducted a DMEA project for sheet mica at the Liberty mine.

Russell.—Bickerstaff Brick Co. (Brickyard mine), Bickerstaff Co., Inc. (Ceramic Mine), and Dixie Brick Co. mined miscellaneous clay for heavy clay products; production increased 11 percent. Consolidated Gravel Co., Inc. (Dixieland mine), and Jones Sand & Gravel Co. (Kendricks mine) mined paving sand and gravel; production was

263,000 tons.

St. Clair.—Shipments of portland cement from National Cement Co. Ragland mill, active throughout the year, decreased 4 percent; masonry cement was also produced. Riverside Clay Co. produced 12,800 tons of fire clay for foundries and steelworks. National Cement Co. and Ragland Brick Co. mined miscellaneous clay for cement and heavy clay products; production decreased 4 percent. Coal production was 9,700 tons valued at \$50,000; of the 4 active mines, Roland Kirkland (Kirkland mine) was the largest producer. National Cement Co. crushed limestone for asphalt filler and for cement; production increased 9 percent. Wolf Creek Sand Co. opened a new

mine and produced 6,000 tons of molding sand.

Shelby.—Southern Cement Division, American Marietta Co., operated the Calera mill throughout the year; shipments of portland cement increased 11 percent. Montevallo Clay Co. mined fire clay for foundries and steelworks. Southern Cement Division, American Marietta Co., mined miscellaneous clay for cement; production increased 90 percent. Coal production was 84,300 tons valued at \$560,600, compared with 77,200 tons valued at \$474,000 in 1954. Twenty-one mines were active; River Valley Coal Co. (No. 3 and No. 8 mines) was the leading producer. Alabaster Lime Co. (Scotrock limekiln), Cheney Lime & Cement Co. (Landmark limekiln), Dixie Lime & Manufacturing Co., Inc. (Pelham limekiln), Keystone Lime Works, Longview Lime Corp. (Saginaw limekiln), and Southern Cement Division, American Marietta Co. (Roberta limekiln), produced lime for building, agricultural, refractory, chemical, and industrial uses. Alabama Aggregates Co. (Pelham quarry), Alabaster Lime Co., Cheney Lime & Cement Co., Dixie Lime & Manufacturing Co., Inc., Keystone Lime Works, Longview Lime Corp., Montevallo Limestone Co., Southern Cement Division of American Marietta Co., and Stockbridge Stone Co. crushed limestone for riprap, fluxing stone, concrete and roads, cement, lime, railroad ballast, agriculture, paper filler, fertilizer filler, coal dust, and other uses, production was 1,438,000 tons.

TABLE 23.—Lime sold or used by producers in Shelby County, 1948-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1948-50 (average) <sup>1</sup>	175, 796	\$1, 666, 206	1953 1	303. 303	\$3, 281, 875
	249, 429	2, 583, 869	1954	287, 912	3, 125, 013
	274, 842	2, 914, 493	1955	312, 645	3, 661, 509

<sup>&</sup>lt;sup>1</sup> Sales only.

Sumter.—Sumter County Highway Department mined 24,000 tons

of paving sand and gravel.

Talladega.—DeShor Mining Co., Inc. (Parker No. 1 mine), and Rucker Mining Co. (Munford mine) mined brown iron ore for sale to iron and steel plants; production was considerably more than in 1955. Alabama Marble Co., Moretti-Harrah Marble Co., and Thompson-Weinman & Co. (Hill quarry) crushed marble for terrazzo, whiting, and other uses; production increased 23 percent. Alabama Marble Co. and Moretti-Harrah Marble Co. quarried dimension marble for rough and dressed building stone and rough and dressed monumental stone; production increased 40 percent. Dixie Mines, Inc. (Shefner mine), mined a small quantity of sheet mica. American Talc Co. reopened the old Winterboro talc mine and shipped 1,500 tons of talc.

Tuscaloosa.—Coal production was 697,000 tons valued at \$2,987,000, compared with 621,600 tons valued at \$2,666,000 in 1954. Thirteen mines were active; Twin Seam Mining Co. (Kellerman No. 4 Strip mine), Mitchell Bros. Construction Co. (Mitchell No. 2 Strip mine), and Center Coal Co. (Brookwood Strip mine) were the largest producers. Yazoo Gravel Co. minel assured and structural and other converte mediants.

other gravel; production was 131,400 tons.

Walker.—Natco Corp. and Russell Coal & Clay Co. mined fire clay for firebrick and block and for heavy clay products. Coal production was 2,495,000 tons valued at \$12,247,000, compared with 2,083,500 tons valued at \$10,315,000 in 1954. Fifty-two mines were active, Alabama Power Co. (Gorgas mine), DeBardeleben Coal Corp. (Empire No. 3 mine), McCoy Coal Co. (Mary Lee No. 7 Strip mine), Bankhead Mining Co., Inc. (Aldridge Strip mine), DeBardeleben Coal Corp. (Empire Strip mine), and Marigold Coal Mining Co. (Marigold Strip mine) were the largest producers.

TABLE 24.—Fire clay sold or used by producers in Walker County, 1948-50 (average) and 1951-55

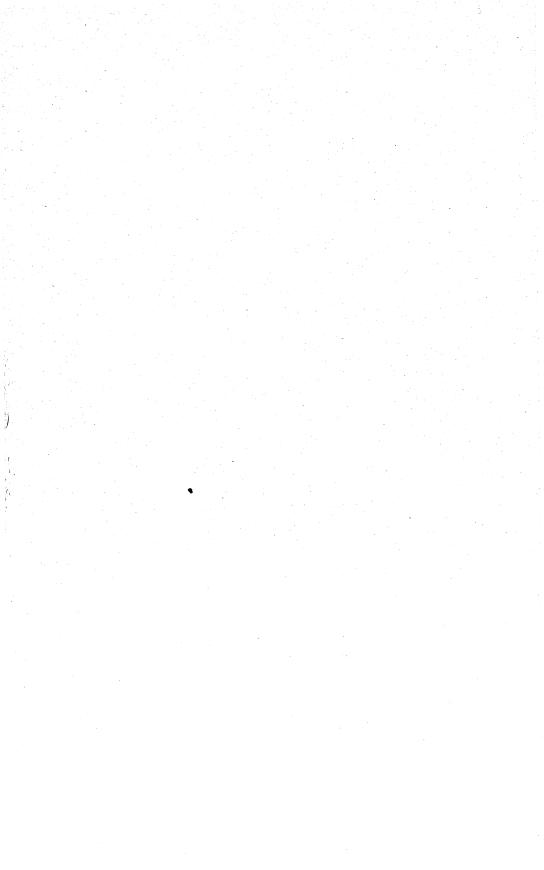
Year	Short tons	Value	Year	Short tons	Value
1948-50 (average)	75, 412	\$142, 731	1953	126, 492	\$330, 779
1951	101, 660	523, 192	1954	141, 190	714, 604
1952	105, 407	500, 194	1955	111, 297	798, 125

Washington.—Lone Star Cement Co. mined 65,500 tons of miscellaneous clay and produced crushed limestone for use in cement; limestone production increased 3 percent. Mathieson Chemical Corp. produced salt from brine near McIntosh; production reached a new peak, increasing 2 percent over 1954.

Wilcox.—Alabama State Highway Department mined 600 tons of

paving sand and gravel.

Winston.—Coal production by Twin Arrows Coal Co. (No. 1 mine) was 1,200 tons valued at \$6,000.



# The Mineral Industry of Alaska

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Department of Mines, Territory of Alaska.

By William H. Kerns,<sup>1</sup> Alvin Kaufman,<sup>2</sup> Anthony Evans,<sup>2</sup> Phil R. Holdsworth<sup>3</sup>



THE VALUE of Alaska mineral production increased \$1 million in 1955 over 1954, despite a drop of \$683,000 in the value of coal output. The decline in coal value resulted largely from a drop in the average unit value. A larger sand and gravel production, mostly for paving purposes, explanied most of the increase in value. Production of gold remained virtually the same as in 1954. Gold mining was the major mineral industry, followed by sand and gravel mining and coal mining. The output of these three commodities—gold, sand and gravel, and coal—comprised 89 percent of the total value of minerals produced.

A small quantity of copper and lead was produced in Alaska as a result of the cleanup of mills at inactive mines. The output of mercury declined in 1955 because a fire late in 1954 at the Red Devil mine prevented work. Chromite production increased almost 2½ times that in 1954, because 1955 was the first full year of mining for the Territory's only producer, Kenai Chrome Co. The output of tin in 1955 was less than half of that in 1954. United States Tin Corp. ceased work at its Lost River tin mine on Seward Peninsula in Septem-

ber 1955.

Government Assistance.—The mineral industry of Alaska continued to face a shortage of risk and development capital in 1955. Government assistance, primarily through the Defense Minerals Exploration Administration (DMEA), helped to stimulate the exploration and development of strategic and critical materials. During 1955 DMEA authorized \$344,203 in new contracts or amendments to old contracts for exploration and development of mercury, copper, tin, tungsten, antimony, nickel-copper, and tungsten-lead-zinc ore bodies. This brought the total amount of contracts in force during the year to \$1,077,402.

United States Tin Corp. continued to function on a Defense Minerals Procurement Agency (DMPA) advance against production. Kenai Chrome Co. mined and shipped chromite ore on a General

Services Administration advance against production.

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 Commodity-industry analyst, Region I, Bureau of Mines, Juneau, Alaska.
 Commissioner of Mines, Department of Mines, Territory of Alaska, Juneau, Alaska.

TABLE 1.-Mineral production in Alaska, 1954-55 1

	19	054	1955		
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	
Chromite	2, 953 (2) 666, 618 4 248, 511 1, 046 6, 639, 638 33, 697 283, 797	\$208, 257 (2) 6, 442, 414 3 2, 360 8, 697, 885 276, 552 6, 301, 939 30, 497 465, 423 3 409, 840	7, 082 1, 112 639, 696 1 249, 294 1 (2) 9, 793, 214 33, 693 265, 740 86	\$625, 340 3, 836 5, 759, 000 8, 725, 290 298 (2) 8, 242, 344 30, 494 289, 589 182, 484 1, 552, 427	
Total Alaska		3 24, 407, 000		25, 412, 000	

<sup>&</sup>lt;sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption

by producers).

2 Value included with "Items that cannot be disclosed."

Revised figure.

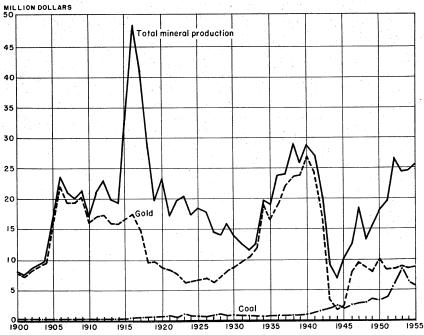


Figure 1.—Value of total mineral production, gold, and coal in Alaska, 1900–55. From 1911–31 copper production supplied most of the value of minerals other than gold and coal.

TABLE 2.—Prices of selected mineral commodities produced in Alaska, 1954-55 1

Commodity	1954	1955	Commodity	1954	1955
Coal <sup>2</sup> short ton— Copper <sup>3</sup> pound— Gold <sup>4</sup> troy ounce— Lead <sup>3</sup> pound— Mercury <sup>5</sup> 76-pound flask—	\$9. 66 . 295 35. 00 264. 39	\$9.00 .373 35.00 .1492 290.35	Sand and gravel <sup>2</sup> short ton Silver <sup>6</sup> troy ounce Stone <sup>2</sup> short ton Tin (Straits quality) <sup>5</sup> pound	\$0.95 .905 1.64 .9181	\$0.84 .905 1.09 .9473

1 Prices are discussed in detail in the commodity chapters in the Minerals Yearbook.

1 Prices are discussed in detail in the commodity chapters in the Minicials 1 carbo 2 Average unit price, f. o. b. mine or quarry, 3 Annual average weighted price of all grades of primary metal sold by producers. 4 Price under authority of Gold Reserve Act of Jan. 31, 1934. 5 Annual average American Metal Market quoted price. 6 Treasury buying price for newly mined silver.

Prospecting and Exploration.—The most outstanding feature of Alaska mineral industry in 1955 was the accelerated tempo of exploration activities, particularly for petroleum and natural gas. Several large American oil companies were drilling for petroleum or natural gas, primarily in the Birchwood, Icy Bay, and Goose Bay areas. In addition, Texas Gulf Sulfur Co., Quebec Metallurgical Industries, United States Steel Corp. (Columbia Iron Mining Co.), Climax Molybdenum Corp., Kennecott Copper Corp., and others were actively engaged in a search for ores of iron, copper, and other minerals throughout Alaska.

Flow of Products.—All ores and concentrates produced in Alaska were shipped to smelters or to buyers in the United States. Producers of gold and silver sold nuggets, dust, bars, or amalgam to banks and gold buyers in Alaska or shipped them to mints in the United States. Some unrefined gold in nugget or dust form was used to manufacture nugget jewelry and sold locally.

Tin concentrate from the Lost River mine on Seward Peninsula was shipped to the tin smelter in Texas. Chromite ore from the Star Four mine on Kenai Peninsula was bought by the GSA for the Na-

tional Strategic Stockpile in the United States.

Sand and gravel and stone were used mostly for paving purposes. Clay was employed for manufacturing brick and tile, which were sold and used in the Anchorage area. Coal was consumed only in the Anchorage, Fairbanks, and Railroad Belt areas for generating power

and for heating and cooking purposes.

Transportation.—Inadequate, high-cost transportation facilities to, from, and within the Territory were among the chief deterrents to development, exploration, and exploitation of its mineral resources. Ocean- and rail-transportation rates remained among the highest in Transportation cost of goods per hundred pounds from Seattle to Seward (port of Anchorage) was \$1.05 for machinery, 99 cents for diesel oil, and \$3 10 for dynamite, plus the cost of transportation from the port to the final destination by rail, truck, or airplane. The cost per hundred pounds from Seattle to Fairbanks via Valdez (combination sea and land rate) was \$3.43 for machinery, \$3.51 for diesel oil, and \$6.66 for dynamite. In some instances the rates were higher than those quoted above because the steamship line had the option of calculating charges by volume or by weight, whichever produced the higher total revenue.

TABLE 3.—Defense Minerals Exploration Administration activities, 1955

Govern- ment	partici pation (percent)		75		26		2.2	(8)		<b>3</b>		80 823/2		76
ict	Total amount		\$118,720		41, 530	,	81,000	231, 232 2 30, 000		290, 600		120, 000 96, 120		6, 200 62, 000
Contract	Date		Aug. 18, 1955		Apr. 2, 1954		June 2, 1953	Aug. 10, 1953		Aug. 25, 1952		Sept. 14, 1951 May 3, 1954		Sept. 28, 1954 Aug. 25, 1952
	Commodity 1		Mercury		Copper		Mercury	doPlatinum		Tin		Nickel-copperTungsten-lead-zinc	· · · · · · · · · · · · · · · · · · ·	TungstenAntimony
	Property		Red Top		Kathleen-Margaret		DeCoursey	Red DevilRed Mountain		Lost River		Mertie LodeRiverside		Yellow PupStampede
	Location		Marsh Mountain		MacLaren River		North of Crooked	West of Sleitmute Red Mountain		Lost River		Funter Bay		Gilmore Dome Stampede Creek
	District		Bristol Bay		Valdez Creek		Aniak	doodnews Bay		Port Clarence		Admiralty		FairbanksKantishna
	Region and contractor	BRISTOL BAY	Moneta Porcupine Mines, Ltd	COOK INLET-SUSITINA	Alaska Copper Mines, Inc	KUSKOKWIM RIVER	DeCoursey Mountain Mining Co	Do. T. Howard	SEWARD PENINSULA	United States Tin Corp	SOUTHEASTERN ALASKA	Admiralty-Alaska Gold Mining Co Alaska Mining & Exploration Co., Inc.	YUKON RIVER	Alaska Metals Mining Co., Inc Barl R. Pilgrim & Co

<sup>1</sup> All contracts were for lode deposits.
2 Contract closed after \$20,016 expenditure.
3 Phase I of the contract—90 percent; phase II—75 percent.

The Alaska Road Commission and the Federal Bureau of Public Roads continued to enlarge and improve the road system of the Territory; however, vast areas known to contain mineral deposits were not served by roads. This resulted in extensive use of airplanes to service outlying areas. Most Alaska mines not served by the road system received all of their supplies and equipment by airfreight. Airfreight rates were lowered, compared with 1954, as a result of competition between airline companies and the enlargement of existing airfields to accommodate larger aircraft.

The Government-owned Alaska Railroad served the interior of Alaska on 530 miles of track from tidewater at Seward and Whittier

to Fairbanks; most of the freight was incoming.

Labor.—The active working season at most mines in Alaska in 1955 continued to be limited to 5 months or less (June through October) as a result of climatic conditions. At some placer operations 110 days constituted the working period. The short season necessitated working the men as many or more overtime hours at premium pay as at regular pay. At many placer mines the men worked 12 hours a

day, 7 days a week, throughout the season.

The seasonal nature of mining in Alaska was shown by the variation in monthly employment figures published by the Employment Security Commission. The Commission reported that 740 persons were employed in January 1955 by mining companies covered by the Employment Security Act, compared with 1,856 persons employed in the same companies in June 1955. The Employment Security Act covers only those companies that have 4 or more employees working at least 20 weeks during the year. Mining firms in the Territory experienced difficulty in hiring outside labor because of competition from the construction industry. Most of the contractors were working under Government contracts. The average weekly earning in the mining industry, as reported by the Employment Security Commission, was \$126.09. The Commission reported that average earnings in the construction industry were \$190.06. The average for all industries in Alaska was \$122.16.

Power.—New York Alaska Gold Dredging Corp. used hydroelectric power supplemented by diesel-electric power to run three gold dredges at Nyac in the Kuskokwim River region. United States Smelting, Refining & Mining Co. Fairbanks and Nome units used coal and diesel oil, respectively, as fuel for their centralized powerplants.

Mine power rates remained above normal for the United States, primarily because of the relatively high cost of fuel. The cost of fuel was high because of transportation costs.

<sup>&</sup>lt;sup>4</sup> Employment Security Commission, Annual Report, Fiscal Year 1955: Juneau, Alaska, Oct. 1, 1955, 42 pp.

## REVIEW BY MINERAL COMMODITIES

### **METALS**

Antimony.—Earl R. Pilgrim & Co., only active antimony producer in Alaska, completed its DMEA contract for exploratory work at the Stampede mine in the Kantishna district, Yukon River region, and produced 14 short tons of ore, containing 62 percent antimony. None of this material was shipped. The favorable world antimony-supply position reduced short-term prospects for Alaska properties and resulted in virtual cessation of exploratory activity. The number of miners doing assessment work to hold claims dropped from 5 in 1954 to 2 in 1955.

Chromium.—Kenai Chrome Co., Star Four mine, Homer district, Kenai Peninsula region, was the only active producer of chromite ore in the Territory in 1955. The output of ore more than doubled, compared with 1954. Kenai Chrome Co. had spent most of 1954 constructing camp, road, and other facilities; 1955 was the first full year of production. The total output of this property was sold to the GSA Grants Pass, Oreg., Government Purchase Depot, under a contract negotiated in 1953. Ore-shipping costs were reduced substantially in 1955, compared with 1954, by using barges instead of ships. The barges were loaded by conveyor belts and unloaded by cranes and clamshell buckets.

Northern Construction & Mining Co. and Mineral Development & Exploration Co., Inc., engaged in prospecting and development. Northern Construction & Mining Co., lessee of the Seldovia Chrome Co., Inc., Chrome-Maverick property in the Homer district, built a road to the mine. Mineral Development & Exploration Co., Inc., was engaged primarily in organizing the company and on reconnaissance work in the vicinity of the Chrome Queen mine, also in the Homer district.

TABLE 4.—Shipments of chromite ore, 1943-55

	Material pro weight, sl		
Year	Under 45 percent Cr <sub>2</sub> O <sub>3</sub>	45 percent Cr <sub>2</sub> O <sub>3</sub> and over	Value
1943	5, 569 1, 845		\$186, 251 64, 456
1945-53 1954. 1955.	2, 943	10 7,082	208, 257 625, 340

Copper.—A small quantity of copper was recovered from Alaska concentrate and ore in 1955. The concentrate came from 2 active gold mines, from 1 mine reworking old tailing from an inactive mine, and from a mill cleanup at 1 inactive mine. Copper-bearing ore was shipped directly from one active gold mine to a smelter in the United States.

Prospecting and exploratory activity by individuals and by mining companies for copper was considerably intensified as compared with recent years. In addition to the numerous mine examinations and preliminary prospect developments, several substantial exploration programs were active: Alaska Copper Mines, Inc., did exploration, with DMEA assistance, at the Kathleen-Margaret mine in the Valdez Creek district, Cook Inlet-Susitna region; Admiralty-Alaska Gold Mining Co. conducted diamond drilling on the Mertie lode, a nickel-copper deposit at Funter Bay on Admiralty Island in southeastern Alaska; Texas Gulf Sulfur Co. did exploration of cupriferous pyrite deposits on Latouche Island, Prince William Sound; and the Federal Bureau of Mines investigated the mineralized area between Ellamar and Landlocked Bays in the northeastern part of the Prince William Sound area.

Granduc Mines, Ltd., a partnership of the Newmont Mining Corp. and Granby Consolidated, continued its exploration program throughout 1955. The property is at the head of the Leduc River in Northwestern British Columbia, 4 miles east of the Alaska-British Columbia boundary line. Reports received that a large deposit has been indicated may provide additional stimulation to prospecting and exploration on claims located on the Alaskan side of the boundary line.

This rejuvenation of prospecting and exploration activity is highly significant in the light of past history. Copper mineralization is distributed widely throughout most of Alaska. Copper has been mined extensively from deposits in the Ketchikan district in southeastern Alaska and from Prince William Sound and Nizina districts of the Copper River region. The fabulous copper bonanza at the Kennecott mine has had world renown. The Territory copper production for 1915 to 1927 did not fall below 25,000 short tons a year, with a value of more than \$7 million annually; in 1916 output reached a peak of almost 60,000 short tons valued at more than \$29 million.

Gold.—The gold industry in terms of output value ranked first among the Territory mineral industries in 1955, and increased production 783 ounces over 1954, despite a drop of 507 ounces in placermine output. The increment resulted from the recovery of gold from the cleanup of mills in southeastern Alaska.

During the year 142 placer mines and 4 lode mines were active, compared with 146 and 5, respectively, in 1954. Placer mines were virtually the entire source of gold; this method of mining supplied more than 99 percent of the total production. Bucketline dredging was the principal mining method utilized. The 17 dredges run by 10 companies yielded 78 percent of the gold in the Territory. This large output from so few units resulted primarily from the larger materials-handling capacity of each dredge, compared with other production methods. The importance of dredges to gold output is illustrated further by the fact that, of the 5 producers supplying 77 percent of output, 4 operated dredges.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc, 1946-50 (average), 1951-55, and total 1880-1955, in terms of recoverable metals <sup>1</sup>

Year	Mines 1	producing	Material sold or	Gold (lode	and placer)	Silver (lode and placer)		
	Lode	Placer	treated 2 (short tons)	Fine ounces	Value	Fine ounces	Value	
1946-50 (average) 1951 1952 1953 1954 1955	18 6 6 3 5 4	246 140 119 148 146 142	33, 642 13, 870 411, 459 475 19, 747 3, 884	254, 770 239, 637 240, 557 253, 783 248, 511 3 249, 294	\$8, 916, 964 8, 387, 295 8, 419, 495 8, 882, 405 8, 697, 885 8, 725, 290	52, 796 32, 870 32, 986 35, 387 33, 697 3 33, 693	\$46, 971 29, 749 29, 854 32, 027 30, 497 30, 494	
1880-1955			(4)	28, 434, 955	707, 255, 481	20, 160, 219	14, 431, 758	
Year	Co	pper	Le	ad	Zi	ine	Total	
Year	Co Short tons		Short tons	ead Value	Short tons	value	Total value	
1946-50 (average) 1951 1952			Short tons  182 21 1	\$55, 046 7, 266 6 322		1	\$9,025,142 \$8,425,158 \$8,449,671	
1946-50 (average)	Short tons	Value \$3, 341	Short tons	Value \$55, 046 7, 266	Short tons	Value \$2,820	\$9, 025, 142 \$ 8, 425, 158	

<sup>&</sup>lt;sup>1</sup> 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.

Figures not available.
Revised figure.

The 90 mines utilizing nonfloating washing plants produced 20 percent of the total gold yielded by Alaska mines. Nonfloating placer plants are those in which the gravel is delivered to sluice boxes on bedrock or to elevated sluice boxes with bulldozer or dragline excavation equipment.

Fifteen hydraulic, 25 small-scale hand, and 2 drift placer mines supplied 1 percent of the total output. The remaining 1 percent

of production was contributed by lode mines.

Output from lode mines includes a small quantity of gold recovered from Alaska Juneau Gold Mining Co. mill tailing at Juneau by Howard Hayes, using placer-mining methods. A bulldozer was used to deliver the tailing to sluice boxes, where the gold and heavy mineral concentrate were separated by gravity concentration. Gold was produced also as a result of a mill cleanup by Alaska Juneau Gold Mining Co. While doing assessment work, Renshaw & Brown recovered a few ounces of gold from ore mined and milled at the Gold

 <sup>2</sup> Does not include gravel washed.
 3 Includes 1,786 fine ounces of gold, 290 fine ounces of silver, and 2,000 pounds of copper recovered from mill cleanup at 3 inactive lode properties; ore was mined (and reported) in years before 1955.

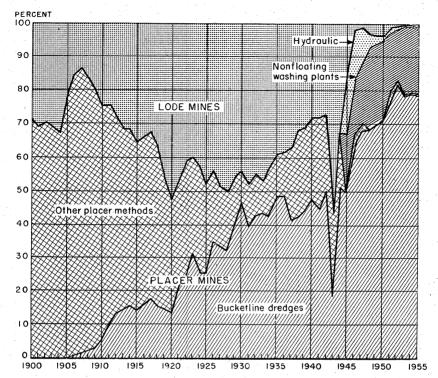


FIGURE 2.—Percentage of total Alaska gold produced at lode and placer mines and by various methods of placer mining, 1900-55; "other placer methods" includes hydraulic and nonfloating washing plants for which separate data are not available before 1943.

Cord mine in the Willow Creek district, Cook Inlet-Susitna region. Other lode mines recovering small quantities of gold were: William Quitsch at a property 4 miles from the mouth of Mineral Creek in the Prince William Sound district, Copper River region (mill cleanup); Bogan & Massoz at the East Point mine on Kenai Peninsula, Kenai Peninsula region; and Island Cove Mining Co., Chichagof mine, Chichagof district, Southeastern Alaska region (mill cleanup).

To withstand the economic squeeze resulting from steadily increasing operating costs and a fixed price for gold, the placer-mining segment of the industry continued to use more materials-handling equipment and fewer men. In most instances companies were being run by two or more partners or members of a family and an occasional

hired man.

TABLE 6.—Fifteen leading gold-producing mines in 1955, in order of output

Source of gold	Dredges (6).  Dredges (6).  Dredge.  Nonflost.  Nonflost.  Dredge.  Do.  Do.  Do.  Do.  Do.  Do.  Do.  D
Operator	1 United States Smelting, Refining & Mining Co  2 New York-Alaska Dredging Corp. 4 Gold Placers. Inc 5 Gollinsville Mines. 11 Havenstrie Oil Co., Mining Division. 8 Strandberg & Sons., Mining Co 13 Alder Creek Mining Co (1) Thatheson & New bauer. (2) Strandberg & Sons (3) Alder Creek Minins (4) Miscovich Bros (5) Give Creek Minins (6) Oilve Creek Mining Go (7) Strandberg & Sons (8) Strandberg & Sons (9) Strandberg & Sons (10) Strandberg & Sons
Rank in 1954	
Region	Yukon River. Seward Peninsula. Kuskokwim River. Yukon River. Seward Peninsula. Yukon River. do. do. do. do. do. do. do. do.
District	Fairbanks Nome Aniak Circle Circle Ventua Rairbanes Hughes Fairbanks Fairbanks Fairbanks Thunko Ruby Ruby Hot Springs
Mine	Fairbanks unit.  Nome unit. Now York-Alaska New York-Alaska Coal Creek Coallmay the Flat Creek Indian River Big Creek Golorado Creek Patrbanks Oreek Poorman Creek Poorman Creek Loug Creek Loug Creek Eureka Greek
Rank	122 123 121 121 121 132 133 134 135 135 135 135 135 135 135 135 135 135

Not among the 15 highest in 1954.

TABLE 7.—Gold produced at placer mines, 1946-50 (average), 1951-55, and total, 1880-1955, by classes of mines and methods of recovery

			Material	Gold recovered				
Class and method	Mines produc- ing 1	Washing plants	treated (cubic yards)	Fine ounces	Value	Average value per cubic		
	1					yard		
Surface placers: Gravel mechanically handled:	1							
Bucketline dredges:	100							
1946-50 (average)		28	11, 345, 000	174, 458 187, 216	\$6, 106, 030 6, 552, 560	\$0.538		
1951 1952		23 23	14, 560, 000 13, 470, 000	198, 524	6, 948, 340	. 450 . 516		
1953		23	14, 080, 000	197, 701	6, 919, 535	.491		
1954		24	11, 936, 100	196, 028	6, 860, 980	. 575		
1955	. 10	17	11, 030, 100	194, 131	6, 794, 585	. 616		
Dragline dredges:	1	1	40 600	1, 286	44, 996	1.056		
1946-50 (average) 1951-55		1	42, 600	1, 280	44, 990	1.050		
Nonfloating washing								
plants:2	1			1	•			
1946-50 (average)	. 96	96	3, 493, 300	53, 153	1, 860, 341	. 533		
1951		84 78	2, 667, 000	47, 244 39, 661	1, 653, 540 1, 388, 135	. 620 . 650		
1952 1953		87	2, 137, 000 3, 591, 000	53, 991	1, 889, 685	. 526		
1954		85	2, 866, 300	48, 880	1, 710, 800	. 597		
1955	90	91	2, 866, 300 3, 390, 000	51, 023	1, 785, 805	. 527		
Gravel hydraulically han- dled:	1 .							
1946-50 (average)			1, 220, 400	17, 767	621, 852	. 510		
1951			166, 500 39, 000	2, 798 660	97, 930 23, 100	. 588		
1952 1953			36,000	820	28, 700	.797		
1954	17		97, 400	1, 481	51, 835	. 532		
1955	. 15		58, 900	908	31, 780	. 540		
Small-scale hand methods (Wet):	1							
1946-50 (average)	- 51		38, 400	878	30, 737 35, 910	.800 2.112		
1951			17, 000 16, 400	1, 026 422	14, 770	. 901		
1952 1953				604	21, 140	1. 244		
1954			30, 400	1, 106	38, 710	1. 273		
1955			35, 200	898	31, 430	. 893		
Underground placers (drift):					0.115	4, 450		
1946-50 (average)			700 500	89 243	3, 115 8, 505	17.010		
1951 1952			600	23	805	1.342		
1953								
1954			200	14	490	2.450		
1955	. 2		400	42	1, 470	3. 675		
G 1 4 .4 .11								
Grand total placers: 1946-50 (average)	246		16, 140, 400	247, 631	8, 667, 071	. 537		
1940-50 (average) 1951			17, 411, 000	238, 527	8, 348, 445	. 479		
1952			15, 663, 000	239, 290	8, 375, 150	. 535		
1953	148		17, 724, 000	253, 116	8, 859, 060	. 500		
1954	. 146		14, 930, 400	247, 509	8, 662, 815	. 580		
1955	142		14, 514, 600	247, 002	8, 645, 070	. 596		
1880-1955			(3)	(3)	4 489, 285, 752	(3)		

<sup>1</sup> Excludes itinerant prospectors, "snipers", "high graders", and others who gave no evidence of legal right to property.

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."

Complete data not available.

4 Data for 1880 through 1936 from published records of Federal Geological Survey.

The Fairbanks district, Yukon River region, was the principal gold-Mines in this district furnished 59 perproducing area in Alaska.

cent of the gold production.

United States Smelting, Refining & Mining Co., Fairbanks unit of 6 dredges and Nome unit of 2 dredges, was the leading gold producer in Alaska in 1955. The company dismantled a dredge and moved it from the Livengood Placers property at Livengood in the

TABLE 8.—Mine production of gold, silver, copper, and lead in 1955, by months, in terms of recoverable metals 1

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)
JanuaryFebruary	4	2		
MarchApril	836 3	135		
MayJune	7, 299 20, 678	1, 063 2, 568		
JulyAugust	39, 537 40, 839	5, 041 5, 407		
September October	52, 139 44, 586	6, 870 6, 829	1	1
November December	36, 429 6, 944	4, 824 954		
Total	249, 294	33, 693	1	1

<sup>&</sup>lt;sup>1</sup> Derived mostly from mint and smelter receipts; data are adjusted to exclude receipts during the first part of 1955 previously credited to 1954 production and to include expected receipts in 1956, which are part of actual output in 1955; no zinc produced in 1955.

TABLE 9.—Mine production of gold, silver, copper, and lead in 1955, by regions, in terms of recoverable metals 1

Region		s pro- cing	Gold (lode	and placer)	Silver (lode and placer)		
	Lode	Placer	Fine ounces	Value	Fine ounces	Value	
Cook Inlet-Susitna Copper River Kenai Peninsula Kuskokwim River Northwestern Alaska Seward Peninsula Southeastern Alaska Yukon River	1 1 1 1	8 5 7 1 25	5, 747 3 258 318 19, 750 554 29, 009 4 1, 908 191, 750	\$201, 145 9, 030 11, 130 691, 250 19, 390 1, 015, 315 66, 780 6, 711, 250	924 3 43 89 1, 900 127 3, 283 4 303 27, 024	\$836 39 81 1, 720 11,6 2, 971 274 24, 458	
Total	4	142	249, 294	8, 725, 290	33, 693	30, 494	

Region	Cor	oper	Le	Total	
	Pounds	Value	Pounds	Value	value
Cook Inlet-SusitnaCopper River	(2)	(2)			\$201, 981 9, 069
Kenai Peninsula Kuskokwim River	(2)	(2)			11, 211 692, 970
Northwestern Alaska Seward Peninsula					19, 505
Southeastern Alaska Yukon River	5 2, 000	\$746	300 1, 700	\$45 253	1, 018, 286 67, 845 6, 735, 961
Total	2, 000	746	2,000	298	8, 756, 828

<sup>1</sup> No zinc produced in 1955.

Tolovana district. The dredge was to be installed on the company property on the Hogatza River, a tributary of the Koyukuk River in the Koyukuk district. In addition, the company continued its stripping program on Chicken Creek in the Fortymile district to prepare the ground for dredging.

<sup>No Emergioured in 1955.
Less than 100 pounds; quantity and value included with Southeastern Alaska region.
Includes 26 ounces of gold and 10 ounces of silver from mill cleanup at 1 inactive lode mine in 1955.
Includes 1,760 ounces of gold and 280 ounces of silver from mill cleanup at 2 inactive lode mines in 1955.
Includes production from Cook Inlet-Susitna and Kenai Peninsula regions, as indicated by footnote 2.</sup> 

Placer-mining producers reported sales of 1,299 ounces of crude natural gold in the open market (not included in the production figure for gold to avoid duplication at a later date). All gold sold in its natural state (nuggets, grains, and dust that have not been melted or amalgamated) was disposed of to buyers and jewelers for use in manufacturing "nugget" jewelry. Prices received for crude gold in nugget form ranged from \$28 to \$33 an ounce. This was approximately \$3 to \$5 an ounce above the price that would have been received from the mint.

TABLE 10.—Mine production of gold, silver, copper, and lead in 1955, by classes of ore or other source materials, in terms of recoverable metals 1

Source	Number of mines	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)
Lode ore: Dry gold	2 1	103 1	<sup>2</sup> 2, 143 1	<sup>2</sup> 381 122	² 2, 000	1, 700
Total Other "lode" material: Old talling 3	3	104 3, 780	<sup>2</sup> 2, 144 148	<sup>2</sup> 503 23	<sup>2</sup> 2, 000 ( <sup>4</sup> )	1, 700 300
Total "lode" materialGravel (placer operations)	4 142	3, 884 ( <sup>6</sup> )	2 2, 292 247, 002	<sup>2</sup> 526 33, 167	2 2, 000	2,000
Total, all sources	146	3, 884	2 249, 294	2 33, 693	2 2, 000	2,000

<sup>1</sup> No zinc produced in 1955.

TABLE 11.—Mine production of gold, silver, copper, and lead in 1955, by types of material processed and methods of recovery, in terms of recoverable metals 1

Type of material processed and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)
Lode: Amalgamation: OreOld tailings	³ 1, 931 83	<sup>2</sup> 325 14		
Total recoverable in bullion	2 2, 014	2 339		
Concentration and smelting of concentrate: OreOld tailing	³ 62 65	³ 14 9	\$ 2,000 (4)	30
Total	127	23	3 2, 000	300
Direct smelting: OrePlacer	151 2 3 247, 002	164 2 8 33, 167	(4)	1,700
Grand total	249, 294	33, 693	<sup>3</sup> 2, 000	2,00

<sup>1</sup> No zinc produced in 1955.

<sup>• 100</sup> zanc produced in 1990.
Includes 1,786 ounces of gold and 290 ounces of silver recovered from cleanup of mills at 3 inactive mines; copper was recovered from 2 active mines, from a mill cleanup at 1 inactive mine, and from old tailing, as indicated in footnote 4 (dry gold ore was mined and reported in years before 1955).

<sup>3</sup> Dry gold.
4 Less than 100 pounds; included with dry gold ore.
5 14,514,600 cubic yards.

No zmc produced in 1900.
 Includes 1,773 owness of gold and 285 owness of silver recovered from cleanup of mills at 3 inactive mines in 1955 (ore was mined and reported in years before 1955).
 Includes 13 owness of gold and 5 owness of silver recovered from a mill cleanup at 1 inactive mine; copper was recovered from 2 active mines, from a mill cleanup at 1 inactive mine, and from old tailing, as indicated in fortpact. in footnote 4. 4 Less than 100 pounds; included in figure indicated by footnote 3.

TABLE 12.—Mine production of gold, silver, copper, and lead in 1955, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals <sup>1</sup>

# A. For material treated at mills

#### BY REGIONS

	Material		rable in lion	Concentrate shipped to smelters 2 and recoverable metal						
	treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)		
Cook Inlet-Susitna Copper River Kenai Peninsula	56	20 4 26	1 10	3	19	1	(3)			
Kenai Peninsula Southeastern Alaska	35 3, 780	138 1,830	39 5 289	4 7	30 6 78	8 6 14	(3) 6 2, 000	300		
Total: 1955 1954	3, 871 19, 719	7 2, 014 971	<sup>7</sup> 339 191	14 6	<sup>7</sup> 127 26	<sup>7</sup> 23	7 2, 000 100	300		
	ВУ	CLASSE	S OF MA	TERIAL	TREATI	ED		•		
Dry gold: OreOld tailings	91 3, 780	<sup>7</sup> 1, 931 83	<sup>7</sup> 325 14	10 4	<sup>7</sup> 62 65	<sup>7</sup> 14	<sup>7</sup> 2,000	300		
Total: 1955	3, 871	7 2, 014	7 339	14	7 127	7 23	7 2, 000	300		
ВУ	CLASS O	F CONC	ENTRAT	E SHIPP	ED TO S	MELTER	s			
Dry gold				14	<sup>7</sup> 127	7 23	7 2, 000	300		
Total: 1955 1954		- <b>-</b>		14 6	7 127 26	7 23 1	<sup>7</sup> 2, 000 100	300		

# B. For ore shipped directly to smelters BY REGIONS

	BOTOTIO				
	Ore	Re	coverable	metal cont	en <b>t</b>
	shipped (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)
Kenai Peninsula. Yukon River.	12 1	150 1	42 122	(3)	1,700
Total: 1955	13 28	151 5	164 37	(3) 8, 300	1,700
BY CLASSES OF	ORE TR	EATED		<del> </del>	<del>'</del>
Dry gold: Ore	12 1	150 1	42 122	(8)	

Total: 1955\_\_\_\_\_

No zinc was produced in 1954 or 1955.
 Excludes concentrates treated only by amalgamation and/or cyanidation.
 Less than 100 pounds.

4 Recovered from a mill cleanup at an inactive mine in 1955 (ore was mined and reported in years before

13

151

164

(8)

1,700

1955).

§ Includes 1,747 ounces of gold and 275 ounces of silver recovered from cleanup at mills at 2 inactive mines in 1955 (ore was mined and reported in years before 1955).

§ Includes 13 ounces of gold and 5 ounces of silver recovered from a mill cleanup at 1 inactive mine in 1955; copper recovered from old tailings at 1 inactive mine, from a mill cleanup at 1 inactive mine, and from 2 active mines as indicated in footnote 3.

§ Includes quantities of gold, silver, and copper, as indicated in footnotes 3, 4, 5, and 6.

TABLE 13.—Mine production of gold, silver, copper, and lead in 1955, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content 1

#### CONCENTRATE SHIPPED TO SMELTERS

	Quantity	* .	Gross met	al content	
Class of material	shipped or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)
Dry gold: 1955	14 6	<sup>2</sup> 127 26	<sup>2</sup> 23 1	<sup>2</sup> 2, 062 103	556
ORE SHIPPE	ED DIREC	TLY TO SM	MELTERS		
Dry gold: Crude ore Lead: Crude ore	12 1	150 1	42 122	(3)	1,717
Total: 1955	13 28	151 5	164 37	(3) 4 8, 247	1,717

<sup>1</sup> No zinc produced in 1954 or 1955.

4 Revised figure.

Iron Ore.—No iron ore was mined in Alaska in 1955, but scouting and exploration continued. Efforts were stimulated by the geographical proximity of southeastern Alaskan magnetite iron deposits to the United States west coast. Quebec Metallurgical Industries, Ltd., and the W. S. Pekovich & Robert Coughlin partnership were active at Klukwan and Snettisham, respectively. Columbia Iron Mining Co. (United States Steel Corp. subsidiary) began a drilling program at Union Bay, Cleveland Peninsula, in an effort to outline a magnetite ore body.

Lead.—A small quantity of lead was recovered from concentrate produced by Howard Hayes from old tailing at the Alaska Juneau mine in Juneau, Southeastern Alaska region, and from lead ore shipped by Fred M. Wackwitz from Flume Creek in the Fairbanks district, Yukon River region. The concentrate and ore were shipped to smelters in the United States. There was very little prospecting or

exploration activity for lead deposits in Alaska in 1955.

Mercury.—The output of mercury declined from 1,046 flasks in 1954 to fewer than 100 flasks in 1955, because a fire on October 22, 1954, closed operations at the Territory's leading producer, the Red Devil mine near Sleitmute in the Aniak district, Kuskokwim River region. Consequently in 1955, the owners were engaged in rebuilding the mill and mine buildings, installing a furnace, and additional shaft sinking and exploration work. The Red Devil mine was expected to produce again in 1956 under the management of DeCoursey-Brewis Minerals, Ltd., an amalgamation of the DeCoursey Mountain Mining Co., former owners of the property, and Brewis Red Lake Mines, Inc., a Canadian company.

I No Zinc produced in 1994 of 1995.

I Includes 13 ounces of gold and 5 ounces of silver obtained from a mill cleanup at an inactive mine (ore was mined and reported in years before 1955); copper was obtained from 3 active mines, mill cleanup at 1 inactive mine, and dry gold ore shipped from 1 active mine (indicated in footnote 3).

Less than 100 pounds; included with dry gold concentrate.

TABLE 14,—Mine production of gold, silver, copper, and lead in 1955, by regions and districts, in terms of recoverable metals 1	sold, silv	er, copp	er, and	ead in 1	955, by	regions	and dist	ricts, in	terms of	recove	rabie me	tals 1
	Mines pr	Mines producing 8	Ore and	Gold	Gold (fine ounces)	(sec	Silve	Silver (fine ounces)	(soo	Copper	Lead	Total
Region and district a	Lode	Placer	ings (short tons)	Lode	Placer	Total	Lode	Placer	Total	(spunod)	(spunod)	value
Cook Inlet-Susitna region: Willow Creek. Yentna	1	00	56	39	5, 708	39 5, 708	23	922	922	•	i 1 i 1 i 1 i 1 i 1 i 1 i 1	s \$1, 367 200, 614
Copper River region: Ohistochina 6 Nalahina		1			မ ဆွ	98		19	19			3,097
Nizina Prince William Sound 7		2		26	88	2882	10	00 K	∞ ဥ <sup>κ</sup>			2,982 919 860
Kenal Peninsula region: Hope	1	4 4-	47	318	19, 384	318 19, 384 554	68	1,895	1,895 1,895 127	•		8 11, 211 680, 155 19, 505
Seward Perinsula region: Council Fatrhaven					962	962 2,864		95	95	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	33,756
Kougarok Koyuk		r-00	1 4 5 1 1 1 1 1 1 1 1 1 1 1		1, <del>42</del> 0 353 410	1, 420 353 410		115 61 2.602	115 61 602			49, 804 12, 410 821, 705
Southeastern Alaska region: Juneau 8	-		3, 780	1,870	2	1,870	291	, , , , , , , , , , , , , , , , , , , ,	291	€	300	6 65, 758

71, 492 352, 291 18, 366 5, 159, 453 61, 083	105, 602 82, 858 215, 794 349, 475 9, 911	20, 283 20, 282 23, 575 16, 310	67, 200 16, 449 8, 756, 828
1, 700			2,000
			10 2, 000
334 1, 294 67 20, 485	208 208 1, 315 161	25 8 9 8 9 8 9 8 9 8 9 8 9 8 9 9 9 9 9 9	193 25 33, 693
334 1, 294 20, 363 280	24.2 208 910 1, 315	24 24 39 30 30 30 30 30 30 30 30 30 30 30 30 30	193 13 33, 167
122			12 626
2, 034 10, 032 523 146, 876 1, 738	2, 382 2, 362 6, 142 9, 951 279	496 677 672 465 4, 646	1, 915 448 249, 294
2, 034 10, 032 146, 875 1, 738	2, 362 2, 362 6, 142 9, 951	496 672 465 4,646	1, 915 410 247, 002
			2, 292
1			3,884
102182		10 7 4 4	142
1			4
Yukon River region: Chandalar Otrole Engle Forbanks Forbymile	Hoto Springs. Highes. Iditarod Innoko. Kantishna.	Koyukuk Marshall • Malozitna Rampart Ruby	Other districts • Total II.

<sup>1</sup> No zinc produced in 1955.

\*\*Only those districts are shown separately for which Bureau of Mines is at liberty to publish figures: others producing are listed in footnote 9 and their output included with "Chor districts," "thigh graders," and others who gave no evidence of legal right to property.

\*\*Includes litherant prospectors, "snipers," "thigh graders," and others who gave no evidence of legal right to property.

\*\*Incomplete figure; value of copper included with "Other districts," "No producting mines; production was made earlier but not reported until 1955.

\*\*No producting mines; production was from a mill eleanup at an inactive mine (one was mined and reported in years before 1955).

\*\*Includes 1,722 onness of soil and 289 onness of silver recovered from a mill eleanup at an inactive mine (one was mined and reported in years before 1955).

\*\*Includes the following districts for which quantities and values cannot be shown separately (number of operations in parentheses): Goodnews Bay (2), McGrath (1), includes production indicated in footnote 6), Southeastern Alaska region; Chisana (see footnote 6), Yukon River region.

11 Includes quantities of gold, silver, and copper recovered from inactive mines in 1955, as indicated in footnotes 6, 7, and 8,

The only mercury-producing property in 1955 was Russel R. Schaefer, Broken Shovel mine, Aniak district. In addition to the mercury sold to buyers in the United States, part of its output was

sold to local placer-gold-mine operators for amalgamation.

Exploration for mercury, with DMEA aid, was undertaken by Moneta Porcupine Mines, Ltd., Bristol Bay district, Bristol Bay region. In 1955 this company operated Red Top Mercury mines on Marsh Mountain near Aleknagik. Other active prospectors were Robert Guck, Kisaralik River; Western Alaska Mining Co., Russian Mountain; and George H. Willis and Robert Lyman, owners of the Alice and Bessie mine, all in the Aniak district.

TABLE 15.—Production of mercury, 1946-50 (average) and 1951-55

Year	Producing mines	Flasks (76 pounds)	Price 1 (per flask)	Value
1946-50 (average)	_ 1	205	\$83.84	\$17, 187
1952 1953 1954 1955	1 2 2 2 1	28 40 1, 046 (2)	199. 10 193. 03 264. 39 290. 35	5, 575 7, 721 276, 552 ( <sup>2</sup> )

Average yearly price, New York, from Engineering and Mining Journal.
 Figure concealed to avoid disclosure of individual company confidential data.

Nickel.—Admiralty-Alaska Gold Mining Co. continued exploratory activity with DMEA assistance on the Mertie lode, a nickel-copper deposit at Funter Bay on Admiralty Island, southeastern Alaska.

Platinum.—Goodnews Bay Mining Co. was the only active producer of platinum-group metals as a primary product in the United

States or its Territories.

A. L. Howard closed out a DMEA contract issued in 1953 for exploration of a placer-platinum prospect on the Red Mountain claims,

Goodnews Bay district, Kuskokwim River region.

Silver.—Silver was produced in Alaska in 1955, as in previous years, entirely as a byproduct of gold output. Virtually all (98 percent) of the silver was derived from placer-gold mining. The 5 leading gold producers were also the major producers of silver, supplying 73 percent of total silver output in 1955. United States Smelting, Refining & Mining Co., still the principal producer, recovered this metal as a byproduct of gold from dredging in the Fairbanks district, Yukon River region, and in the Nome district, Seward Peninsula region. Silver production remained virtually constant compared with 1954; it declined only 4 ounces.

Tin.—The only producer of tin in Alaska in 1955 was the United States Tin Corp., Lost River mine, Port Clarence district, Seward Peninsula region, yielding 14,141 short tons of ore during the year. Its mill produced 173 short tons of concentrate, containing 86 long tons of tin. Mining at Lost River ceased on September 24; the mill closed September 26; the mine, mill, equipment, and buildings were

turned over to a caretaker October 27.

There was very little prospecting or exploration activity for tin during 1955. Clyde Larsen and Robert Isaacson reported that they spent approximately 2 months prospecting on Deep Creek in the Hot

Springs district, Yukon River region. The Federal Bureau of Mines conducted a trenching, sampling, mapping, and radioactivity survey on the north flank of the Hot Springs district tin belt along the spurs separating the headwaters of Miller and Idaho Creeks from the Idaho and Tofty Creeks in an attempt to determine the bedrock source of cassiterite and various radioactive minerals.

TABLE 16.—Production of tin, 1946-50 (average), 1951-55, and total, 1902-55

Year	Long tons (tin content)	Value	Year	Long tons (tin content)	Value
1946-50 (average) 1951 1952	27 69 82	\$59, 491 197, 163 220, 956	1954 1955	199 86	1 \$409, 840 182, 484
1953	49	105, 917	1902–55	2, 182	3, 107,

<sup>1</sup> Revised figure.

Tungsten.—No tungsten ore or concentrate was shipped from Alaska mines in 1955. However, 500 short tons of crude ore containing 1.4 percent WO<sub>3</sub> was mined at the Yellow Pup mine, Fairbanks district, Yukon River region, by Alaska Metals Mining Co. This company continued its exploration program under a DMEA contract and prepared to purchase and erect a 25-ton mill on the Yellow Pup property in 1956. A small quantity of tungsten concentrate also was recovered by Rocky Mountain Mining Co., Nome district, Seward Peninsula region.

The Hyder Mines, Inc. (successor to Alaska Mining & Exploration Co., formerly Pacific Northern Minerals Co.), Riverside mine, Hyder district, Southeastern Alaska region, conducted rehabilitation work on the buildings and mine, preparing for further exploration in 1956 under a DMEA contract. Exploration also was conducted by Kodiak Exploration Co. in the Kodiak region and by Lloyd Lounsbury at the Tungsten Hill mine in the Fairbanks district, Yukon River region. The latter property was leased to E. J. Cook, Boulder, Colo., during

the year.

Uranium.—Discovery of commercial-grade uranium ore in Alaska was reported in 1955. Jan and Don Ross, a husband and wife team, using a nucleometer mounted in a Piper Cub for aerial reconnaissance, made the discovery on a slope of Bokan Mountain in the vicinity of Kendrick Bay and Moira Sound on the south end of Prince of Wales Island, Ketchikan district, Southeastern Alaska region. Soon after the discovery Climax Molybdenum Co. moved onto the property to do preparatory work for a drilling and exploration program. In addition to this, Uraluck Exploration Co. (R. Alvord) staked 48 claims in the old railroad loop between Seward and Anchorage. Many other prospectors were active during the year.

#### **NONMETALS**

Clays.—Basic Building Products, Inc., Anchorage, produced clays from its Eagle River and Sheep Mountain pits in 1955, utilizing the output in manufacturing building brick and firebrick. These two commodities were sold locally.

Gem Stones.—Jade was the principal Alaskan gem stone in value in 1955. It was collected in the Dahl and Cosmos Creeks area near Kobuk and Shungnak in the Northwestern Alaska region by Eskimos and other collectors and was sold in Kotzebue and Fairbanks. Leading sales agencies were Empire Jade Co. and Shungnak Jade Products, both in Kotzebue. Empire Jade Co. sent part of its jade to Germany for cutting and polishing; most of it was then returned to Alaska for jewelry settings and distributed to stores in the Territory and United States. A small quantity of Alaska jade, carved in the shape of various animals was sold as knickknacks and souvenirs. Shungnak Jade Products Co. (a group of Eskimos of Kotzebue and Shungnak, original sponsors of the Alaska Native Service) cut and polished jade at Kotzebue and Shungnak throughout the year. Its products were marketed locally to tourists and distributed for sale throughout Alaska and the United States.

Norton's Gem Shop, Seward, produced pyrite-spangled red jasper, plasma, and epidote from detritus. A small quantity of Alaska petrified wood and agate also was collected, cut, and polished for

jewelry by Alaska Lapidary Service, Baranof.

Sand and Gravel.—Ten commercial and 5 Government-and-contractor producers, principally the United States Army Corps of Engineers and the Alaska Road Commission, were active in Alaska in 1955. Eighty-five percent of the total output was produced by Govern-

ment agencies or their contractors.

The output of sand and gravel rose 47 percent in 1955 over the previous year, owing primarily to a rise in paving-material production. In particular, the Alaska Road Commission more than doubled its output of sand and gravel for paving purposes in 1955 compared with 1954. The average value of sand and gravel declined from 95 cents in 1954 to 84 cents in 1955 owing to the increased production of paving materials, which have a lower unit value than other types of sand and gravel.

TABLE 17.—Sand and gravel sold or used by producers, 1954-55, by uses

	19	54	1955		
	Short tons	Value	Short tons	Value	
Sand: Structural Paving Blast Engine Filter Other Gravel: Structural Paving Railroad ballast Other	(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	\$254, 631 911, 096 (1) (1) 1, 111, 374 3, 698, 469 (1) 173, 548 152, 821 6, 301, 939	166, 363 228, 119 270 405 40 3, 780 612, 995 7, 880, 784 384, 121 516, 337	\$360, 744 361, 854 1, 800 4, 6, 450 856, 40, 6, 097, 044 285, 354 272, 35	

<sup>1</sup> Included with "Undistributed."

Stone.—Basalt, granite, and miscellaneous stone were produced in Alaska in 1955. By far the leading single use, was for riprap, although output also was utilized for roadstone and miscellaneous purposes. The Alaska Road Commission, the leading producer, reported output of miscellaneous stone and basalt, primarily for riprap. Stone production declined 6 percent in 1955 under 1954.

TABLE 18.—Stone sold or used by producers, 1954-55, by uses

	195	<b>4</b> ; (	195	55
	Short tons	Value	Short tons	Value
Crushed and broken: Riprap Concrete and road stone Other	157, 244 123, 375 3, 115	\$208, 938 254, 808 1, 677	229, 011 8, 726 28, 003	\$248, 02 17, 00 24, 56
Total	283, 734	465, 423	265, 740	289, 58

## MINERAL FUELS

Coal.—Alaska coal production came from three fields in 1955: Matanuska, Cook Inlet-Susitna region; Nenana, Yukon River region; and Point Barrow, Northern Alaska region. Coal from the Matanuska and Nenana fields was marketed in Anchorage and Fairbanks; Point Barrow field, producing under the sponsorship of the Alaska Native Service, sold its output in the Point Barrow area.

Most coal-mine output in the Territory was utilized for heat and power at Ladd and Eielson Air Force bases near Fairbanks and at Fort Richardson and Elmendorf Air Base in the Anchorage area. Local utilities used the remaining coal output as a source of heat and

power for public use.

Eight coal companies mined 6 underground and 7 strip mines. Most of the underground production was shot from the solid or cut by hand. Two continuous miners were active; one was in the Rosalie No. 1 mine of Usibelli Coal Mines, Inc., and the other in the Jonesville mine of Evan Jones Coal Co. Mechanical equipment—5 mobile loaders, 2 scraper loaders, and 6 hand-loaded conveyors—loaded 27 percent of underground coal production into mine cars.

TABLE 19.—Production of coal, 1946-50 (average), 1951-55, and total 1880-1955

Year	Short tons	Value	Year	Short tons	Value *
1946-50 (average) 1951 1952	396, 385 494, 333 686, 218	\$2, 808, 354 3, 766, 987	1954 1955	666, 618 639, 696	\$6, 442, 414 5, 759, 000
1953	861, 471	5, 779, 423 8, 451, 542	1880-1955 1	9, 377, 992	65, 664, 374

<sup>&</sup>lt;sup>1</sup> Production data for 1880-1940 from Federal Geological Survey published records.

Seven strip pits in Alaska supplied 63 percent of the coal produced in the Territory. The average value of strip coal was \$8.44 per ton; underground coal was valued at \$9.94 per ton. Of the total output 56 percent was cleaned, mostly by heavy-medium methods. Evan Jones Coal Co., Mrak Coal Co. (both in the Matanuska field) and Usibelli Coal Mines, Inc. (Nenana field) ran cleaning plants.

During 1955 the Federal Bureau of Mines continued its investigation of coal reserves in the Matanuska field and made a reconnaissance of the Beluga field, which apparently contains many thick, strippable beds of subbituminous coal, possibly suitable for onsite power

production.

The Federal Bureau of Mines moved its coal analysis laboratory to Elmendorf Air Force Base during the year. The laboratory analyzes samples of coal sold to Fort Richardson and Elmendorf Air Force Base to assure compliance with Government specifications. Prospectors' samples also are analyzed. Samples of the coal purchased for Eielson and Ladd Air Force bases were expected to be processed in this laboratory in 1956. The Bureau of Mines conducted schools at military installations to teach proper coal-sampling methods to Army Air Force personnel.

Petroleum and Natural Gas.—No crude petroleum or natural gas was produced commercially in Alaska in 1955; however, the base camp at Point Barrow used a small quantity of natural gas from one of the wells drilled during the United States Navy exploration program on Naval Petroleum Reserve No. 4 in the Northern Alaska region.

Exploration in other sections of Alaska continued intensively during the year. Seaton at Northway on the Alaska Highway in 1955 discovered gas while drilling for water. The gas, containing 96.3 percent methane, was found at 200 feet. Alaska Propane Gas & Oil Co. drilled a shallow well near the Seaton site and encountered a gas flow (94 percent methane) of 12,000 cubic feet per day. There was considerable speculation at to whether this gas was marsh gas and so likely to be limited in quantity.

The Birchwood area, 20 miles north of Anchorage, became the most recently prospected area in 1955. Alaska Natural Gas & Petroleum Co. and a group of three Birchwood residents each filed oil claims. The former company also was expected to drill for natural gas in the Chugiak area. Alaska Gulf Oil & Gas Development Co. announced its intention to drill a well near Goose Bay across Knik Arm from Anchorage. Anchorage Gas & Oil Development Co., Inc.,

began drilling at Houston, 30 miles north of Anchorage.

After a thorough testing of the Sullivan No. 1 well in the Icy Bay area, Yakataga district, Copper River region, to a depth of 10,000 feet, Phillips Petroleum Co. announced that it would move its rig to the Katalla area in the same district. Shell Oil Corp. applied for 60,000 acres in addition to the 40,000 already requested in the Wide Bay area of the Alaska Peninsula. Richfield Oil Co. leased 90,520 acres; Shell Oil Corp., 90,000 acres; 9 Anchorage residents, 65,000 acres; and General Petroleum Corp., 38,400 acres, all on the Kenai Peninsula. In addition, Sunray Oil Corp. of Los Angeles optioned 100,000 acres.

REVIEW BY REGIONS

Regions and districts used in this report conform to a pattern previously established; boundaries are defined in a report published in 1954.<sup>5</sup>

<sup>&</sup>lt;sup>5</sup> Ransome, Alfred L., and Kerns, William H., Names and Definitions of Regions, Districts, and Subdistricts in Alaska; Bureau of Mines Inf. Circ. 7679, 1954, 91 pp.

Alaska Peninsula, Aleutian Islands, Bering Sea.—No mineral production was reported from the Alaska Peninsula, Aleutian Islands. or Bering Sea regions during 1955. Prospecting for oil continued on the Alaska Peninsula; Shell Oil Corp. applied for 60,000 acres, in addition to 40,000 acres already requested in the Wide Bay area.

Bristol Bay.—Production of sand and gravel under Government contract was the only mineral activity in the Bristol Bay region during 1955. Red Top Mining Co., owners of the inactive Marsh Mountain mercury property near Aleknagik, reorganized as Red Top Mercury Mines (Frank Waskey, Clarence Wren, Jim Putvin, and Charles Wolfe, partners). The Marsh Mountain property was leased by Moneta Porcupine Mines, Ltd., a Canadian company. The latter company obtained a DMEA contract and completed 113 linear feet of drifts and crosscuts to begin underground exploration of the deposit. Earlier exploration had been limited to surface trenching.

TABLE 20.—Value of mineral production in Alaska, by regions, 1954-55

Region	1954	1955	Minerals produced in 1955 in order of value
Bristol Bay	\$6, 717	\$10, 200	Sand and gravel.
Cook Inlet-Susitna	<sup>2</sup> 5, 619, 391	5, 115, 559	Coal, sand and gravel, gold, stone, clays,
Copper River	E40 100	9 169 750	silver.
Kenai Peninsula	548, 182 437, 062	3, 163, 758 833, 618	Sand and gravel, stone, gold, silver.
ronai i ommana	457,002	099, 010	Chromite, sand and gravel, gold, silver, gem stones.
Kodiak	(2)	141, 360	Stone, sand and gravel.
Kuskokwim River	2, 552, 029	2, 256, 397	Platinum-group metals, gold, sand and
			gravel, mercury, silver.
Northern Alaska	(8)	14, 400	Coal.
Northwestern Alaska	67, 683	81, 030	Sand and gravel, gold, gem stones, silver.
Seward Peninsula	1, 447, 367	1, 200, 770	Gold, tin, silver.
Southeastern Alaska	² 663, 228	229, 667	Sand and gravel, gold, stone, gem stones,
Yukon River	12, 836, 204	12, 365, 089	copper, silver, lead.
Takon invol	12, 000, 204	12, 300, 009	Gold, sand and gravel, coal, silver, stone, lead.
Undistributed 4	229, 454		leau.
Total Alaska	1 24, 407, 000	25, 412, 000	

1 No mineral production from Alaska Peninsula, Aleutian Islands, and Bering Sea regions.

Revised figure.

3 Included with "Undistributed" to avoid disclosure of individual company operations.

4 Includes values from regions which must be concealed for particular years (indicated in appropriate column by footnote reference 3).

Cook Inlet-Susitna.—The value of coal, sand and gravel, gold, stone, clays, and silver (in order of value of output) in the Cook Inlet-Susitna region in 1955 was 20 percent of that for the total Alaska mineral output. Coal produced by three companies in the Matanuska field near Anchorage furnished 53 percent of the value of minerals marketed in the region.

Sand and gravel, mostly produced under Government contract, ranked second in value of output and was utilized by the United States Army Corps of Engineers in military construction and by Anchorage Sand & Gravel Co., Alaska Aggregate Corp., and Birch-

Green Co. in the civilian market.

Gold was recovered by 8 placer-mining companies (11 in 1954) in the Yentna district; 1 lode mine in the Willow Creek district ranked third, in terms of value.

Uranium prospecting and exploration activities were conducted in the Redoubt district. Uraluck Exploration Co. (R. Alvord) staked 48 uranium claims near the old railroad loop between Seward and Anchorage.

A small quantity of clays, produced by Basic Building Products Co. from open pits at Eagle River and Sheep Mountain, was used in manufacturing refractory and building brick and tile, which were

sold in the Anchorage area.

Several companies and private groups prospected for oil and gas in the region near Anchorage. Anchorage Gas & Development, Inc., and Alaska Gulf Oil & Development Co. plan to drill in the Goose

Bay area.

Willow Creek district.—Coal was the most valuable mineral commodity produced in the Willow Creek district. Forty percent of the coal produced in Alaska during 1955 came from the following underground and strip mines in the Matanuska field: Evan Jones Coal Co., Jonesville; Mrak Coal Co., Inc., near Eska; and Pioneer Mining Co., Pioneer Mine. Evan Jones Coal Co., leading producer in the district, was the successful bidder on 320 acres adjacent to its present holdings. A new washing plant, in addition to the Evan Jones Coal Co. plant, was installed at Eska by the Mrak Coal Co., Inc. No production was reported from the Houston Coal Co. (strip mine operators) in 1954.

Gold Cord Mine, 1 of 4 lode mines active in the territory and the only active gold producer in the Willow Creek district in 1955, mined and milled 56 tons of gold-bearing ore that yielded a small

quantity of gold and silver.

Yentna district.—Collinsville Mines, Mills Creek, was the leading gold producer in the Yentna district. Recovery of 4,267 fine ounces of gold and 636 fine ounces of silver was obtained from 189,000 yards of gold-bearing gravel mined by dragline excavator. Of this quantity, 3,983 ounces of gold was deposited with the mint, and 284 ounces was sold on the market to individual buyers. Other active gold miners were Robert Dahl, Raymond Gatz, and the Englehorn-Brandl partnership, all at Cache Creek; Gagnon Placers, Big Willow Creek; Harold Stanton, Thunder Creek; and Frank J. Rafcheck, Pass Creek.

A small quantity of gold was reported from Bird Creek mine.

Copper River.—The value of mineral commodities produced in the Copper River region increased approximately 6 times over 1954 output. Sand and gravel for road construction and paving purposes supplied 89 percent of the total value of mineral production from the region. Five placer mines, one in the Nelchina district, and two each in the Nizina and Yakataga districts, produced a small quantity of gold and silver. The George Belanger and Jack Cameron partnership, Albert Creek, Nelchina district, was the leading producer in the region. Other placer miners included Walter L. Holmes, Dan Creek, Nizina district; Harvey Cline and B. B. Watson at Yakataga Beach, Yakataga district.

Several mine operators performed cleanup or assessment work in the region during 1955. In the Prince William Sound district, William Quitsch cleaned up a mill and did assessment work on his lode mine in the Little Giant Group. Bear Creek Mining Co.,

exploration subsidiary of Kennecott Copper Corp., continued assessment work on the Martin Radovan Glacier Creek properties, Nizina district.

Phillips Petroleum Co. completed unsuccessful drilling tests at a depth of 10,000 feet on the Sullivan No. 1 well at Icy Bay, Yakataga district. The drill rigs were moved to the Katalla area to begin exploration under a special agreement with the United States Department of the Interior.

A general survey was conducted by the Federal Bureau of Mines along the northeast shore of Prince William Sound. Soil samples were taken across the Ellamar Fault zone, and an investigation was made of mineralization between Ellamar and Landlocked Bay.

Texas Gulf Sulfur Co. continued exploration for cupriferous pyrite deposits on Latouche Island in the Prince William Sound

district.

Kenai Peninsula.—In 1955, minerals produced in the Kenai Peninsula region, in order of value, were: Chromite, sand and gravel, gold, silver, and gem stones. Chromite shipped by Kenai Chrome Co., Homer district, represented 75 percent of the value of mineral commodities produced in the region. One lode mine produced gold and silver in the Hope district.

Four oil companies conducted exploration for oil: Richfield Oil Co., 90,520 leased acres; Shell Oil Corp., 90,000 acres; Sunray Oil Corp. (Los Angeles), 100,000 acres; and General Petroleum Corp., 38,400 acres. In addition, 9 Anchorage residents applied for a lease

on 65,000 acres.

Homer district.—Seldovia Chrome Co., Inc. leased its Fish Creek properties to Northern Construction & Mining Co. of Anchorage for a period of 5 years. The latter company prospected on the property, and built access roads to the Chrome-Maverick mine at Fish Creek.

Kenai Chrome Co. completed a GSA contract with a shipment of 6,323 long tons of chromite from its mine on Red Mountain near Seldovia during 1955. Progress at the Red Mountain mine was delayed until July 1 because of inclement weather and heavy snow

accumulation.

Hope district.—The East Point mine of Patrick W. Bogan and George Massoz, Hope district, yielded 318 fine ounces of gold and 89 fine ounces of silver from 47 short tons of gold-bearing material. Ore was mined by the open-stope method, crushed, and amalgamated

to recover the gold.

Kodiak.—Stone and sand and gravel were the only mineral commodities produced in the Kodiak region during 1955. Output from the pits and quarries of the 17th Naval District and the United States Army Corps of Engineers on Kodiak Island was utilized for con-

struction and road building.

Peninsula Exploration Co. (R. E. Krauter and associates), purchased by G. H. Cornelius and H. Lawhead, and renamed Kodiak Exploration Co. by the new owners, conducted exploration and assessment work on copper claims at Sitkalidak Island and exploration work on a tungsten prospect on Kodiak Island.

Kuskokwim River.—As in previous years, platinum-group metals mined by Goodnews Bay Mining Co. ranked first in value of mineral

commodities marketed from the region during 1955. Gold ranked second in value, followed by sand and gravel, mercury, and silver. Mercury production in the region was sharply curtailed because of a fire at DeCoursey Mountain Mining Co. property in the Aniak district late in 1954. Rebuilding was nearing completion, and the mine was expected to reopen in 1956. New York-Alaska Gold Dredging Co., the leading gold producer in the region, mined with two hydroelectric-powered dredges.

Goodnews Bay district.—Goodnews Bay Mining Co., the only primary patinum-group-metals producer in the United States or its Territories, worked its Yuba electrically powered bucketline dredge (ninety-three 8-cubic-foot buckets) on Salmon River near Platinum, recovering a moderate quantity of gold as a byproduct. A. L. Howard closed out a DMEA contract initiated in 1953 for exploration for platinum-group metals on McCann Creek near the Goodnews Bay

Mining Co. mine.

McGrath district.—Leonard Zaiser, Birch Gulch, was the only active

gold producer in the McGrath district during 1955.

Northern Alaska.—Mineral production in the Northern Alaska region was confined to 1,100 tons of coal mined by Meade River coal mine at Meade River, and trucked to Barrow for use locally. A small quantity of natural gas from a well drilled on the naval petroleum

reserve nearby also was used for heating in Barrow.

Northwestern Alaska.—The Stout and Thomas partnership, Kobuk Mines, dissolved after the 1954 season. The newly formed Dahl Creek Mines (C. E. Stout) mined the property in the Shungnak district during 1955. A bulldozer delivered gravel to an elevated sluice box and removed overburden and tailing. The company recovered 552 fine ounces of gold and 126 fine ounces of silver from 13,500 cubic yards of gold-bearing gravel. Small quantities of jade, produced in the Northwestern Alaska region, were obtained by selection from detritus and sold for manufacturing jewelry.

Seward Peninsula.—During 1955 the value of gold produced in the

Seward Peninsula.—During 1955 the value of gold produced in the Seward Peninsula region comprised 12 percent of the Alaskan gold output. Eighty-one percent of the gold produced in the region was

obtained from 8 placer mines in the Nome district.

Tin output declined but still ranked second in total value of minerals produced in the region. United States Tin Corp. ceased mining in September; the property was turned over to a caretaker in October. Silver, byproduct of gold operations, was the remaining mineral com-

modity marketed from the region.

Council district.—Northern Mining Co. (D. P. Stewart) on property acquired from the Alaska Placer Co. in May 1955, recovered a substantial quantity of gold by dredging on Niukluk River. It used an oil-powered flume dredge to handle 97,000 cubic yards of gold-bearing gravel. A bulldozer removed overburden. Coplin Consolidated Enterprises, inoperative during 1955, returned its leased property to Council Dredging Co. (Fred K. Dent). Last Chance Mining Co. (William Munz) also was idle during the year. Pancake Mining Co. did assessment work on its Pancake Creek property.

Fairhaven district.—Havenstrite Oil Co. Mining Division recovered substantial quantities of gold with a hydraulic giant bulldozer dragline on Candle Creek. The bulldozer delivered gravel to the hopper and

stacked tailing. Other gold producers in the district were Jack Hoogendorn on Inmachuk River and Otto F. Weinard on Mud Creek. Henry M. Xavier completed his annual assessment work at

the Gold Run Mines.

Kougarok district.—N. B. Tweet & Sons, on property leased from Maurice Kelliher, was the leading gold producer in the Kougarok A substantial quantity of gold was recovered by using hydraulic giants to remove overburden and bulldozers to deliver goldbearing gravel to sluice boxes. Rainbow Mining Co. (Frank Whaley) at Rainbow mine on Grouse Creek and Atlas Mines (George J. Waldhelm) on Dahl Creek recovered gold by using nonfloating washing plants. The latter placer mine used a bulldozer for delivering gravel to three 18-foot sluice boxes and for removing overburden. Tailing was removed and stacked with a dragline excavator.

Other gold placer mines in the district were: Andrew Wirum at Dome Creek; McMann Corp. (Esch & Quisberg) on Kougarok River near Mascot Gulch; George Bodis, Bryan Creek; and Midnight Sun Mines (Erick Kveven), Miller Creek. Tiger Talisman Placers, Dahl

Creek, was not active in 1955.

Koyuk district.—Swanson Bros. & Merrifield formed a temporary partnership to produce a small quantity of gold from a drift mine in frozen placer ground on Dime Creek. Three hundred fifty-three cubic yards of gold-bearing gravel was washed through 5 iron sluice boxes; a bulldozer removed the tailing. Patrick J. Bliss recovered gold by placer mining on Sweepstakes Creek. Other individuals operating placer mines were Oscar and Ferdie Swanson, Dime Creek; and the Baldwin & Moon partnership, Sweepstakes mine, Sweepstakes Creek.

Nome district.—The Nome district produced 81 percent of the gold recovered in the Seward Peninsula region. Eight placer mines were active in the district: 2 of these used bucketline dredges; 1 used a nonfloating washing plant; 1 used a hydraulic giant; and 4 used small-

scale handtools for recovering gold.

The Nome unit of United States Smelting, Refining & Mining Co. was (as in previous years) the leading producer of gold in the Seward Peninsula region. The company mined with two Yuba electrically powered bucketline dredges throughout the season. The largest dredge (with 134 9-cubic-foot buckets) had been repaired following the damage incurred in 1954 when a bank caved on it. In addition, equipment salvaged from a dredge overturned in 1953 was expected to be installed in a new hull being built on Submarine Beach.

Lee Bros. Dredging Co., second-ranking gold producer in the district in 1954, did not mine by dredge in 1955. Instead, the company used its earth-moving equipment on Army contract work in the Unalakleet

Kougarok Freight & Mining Co., the Towner & Erbele partnership (formerly Straub & Towner), recovered gold by using a flume-type diesel-powered dredge on Buster Creek. The early part of the mining season was spent in cleaning and making minor repairs to its unique dredge built in 1950 from various parts of abandoned mechanical equipment. Herbert Engstrom recovered gold from placer mining on Basin Creek; gold-bearing gravel was trucked to the washing plant. Woodrow Spagnole (Otter Creek), Roy Nelson (Bear Creek), B. F.

Gillette (Anvil Bench), Erick Kveven (Nome Beach), and the Brown & Davis partnership at the Davis Placer Mines each recovered small quantities of gold by small-scale hand methods.

Rocky Mountain Mining Co. produced (but did not ship) a small quantity of tungsten concentrate recovered by placer-mining methods

on Rocky Mountain Creek.

Southeastern Alaska.—In 1955 minerals produced in the Southeastern Alaska region, were in order of value: Sand and gravel, gold, stone, gem stones, copper, silver, and lead. A marked increase was noted in exploration and prospecting for iron, copper, uranium, tungsten, and nickel-copper ores. Two DMEA contracts totaling \$216,120 helped to stimulate the development of strategic minerals. Those rehelped to stimulate the development of strategic minerals. ceiving DMEA assistance were Admiralty-Alaska Gold Mining Co., nickel-copper ore development at Funter Bay, Admiralty district; and the Alaska Mining & Exploration Co., Inc., tungsten-lead-zinc lode north of Hyder. The principal companies engaged in exploration and development work during 1955 included Columbia Iron Mining Co. (subsidiary of United States Steel Corp.) on Cleveland Peninsula and Climax Molybdenum Co., on the Ross-Adams uranium property, both in the Ketchikan district; and Quebec Metallurgical Industries, Ltd., Klukwan iron deposits near Haines.

Admiralty district.—Admiralty-Alaska Gold Mining Co. continued exploration and development work on a nickel-copper deposit near Funter Bay under a DMEA contract issued in 1952. The company purchased a gas-powered, electrically driven, Longyear-Wolverine drill for a diamond-drilling program on the Mertie lode deposits. Fred Magill did development work at his copper-lode discovery on the

Brown Bear and Little Brown Bear claims.

Juneau district.—Exploration for uranium continued in the Juneau Several claims were staked on Lynn Canal near William Henry Bay, and claim holders drilled to determine the radioactivity of minerals. Magnetic iron deposits near Haines were investigated by Quebec Metallurgical Industries, Ltd. The company engaged in a churn-drilling-exploration program on placer portions of the Klukwan iron deposits. W. S. Moore Co. of Duluth, Minn., located claims on the low-grade magnetite deposits in Port Snettisham. A small quantity of gold was recovered by Howard Hayes as a result of reworking Alaska Juneau Gold Mining Co. mill tailings. The Alaska Juneau mine and mill remained inactive.

Ketchikan district.—Uranium ore, discovered (by Ross and Adams during aerial reconnaissance with a nucleometer mounted in a Piper Cub) on the southeast end of Prince of Wales Island near Moira Sound, has been optioned by the Climax Molybdenum Co. This company planned drilling to determine mineralization. I & L Mining Co. (Irma and Les Hollenbeak) uncovered a promising uranium prospect adjacent to the Ross and Adams discovery on the southeast end of Prince of Wales Island. Other companies prospecting for uranium in the district were Kendrick Bay Mining Co., Juneau Exploration Co., and Minerals Research, Inc.

Robert Novatney recovered a small quantity of gold from handmilled ore mined from the Miller ledge and lode at Helm Bay.

Columbia Iron Mining Co., a subsidiary of United States Steel Corp., continued drilling magnetite ore bodies at Union Bay, Cleveland Peninsula. Beneficiation studies of three copper-iron ores from Prince of Wales area are being conducted by the Federal Bureau of Mines.

Yukon River.—The Yukon River region again led all others in the value of mineral commodities produced (50 percent of the Alaska total). Gold output from 96 placer mines represented 54 percent of the value of mineral commodities produced in the region and 77 percent of the value of gold produced in Alaska. Seventy-nine percent of the gold produced in the region was recovered by 5 companies using 10 bucket-line dredges. Nonfloating washing plants, hydraulicking, small-scale handtool mining, and 1 drift mine supplied the remaining 21 percent of gold produced in the region. Sand and gravel, coal, silver, stone, and lead, in order of value, comprised the remaining mineral commodities produced in the region.

Four coal companies produced 60 percent of the coal mined in Alaska

from 4 strip and 2 underground mines in the Bonnifield district.

Earl R. Pilgrim & Co. did exploration work under DMEA contracts on an antimony deposit in the Kantishna district, and by Alaska Metals Mining Co. on a tungsten deposit in the Fairbanks district.

Bonnifield district.—Usibelli Coal Mine, Inc., producing from a strip mine and an underground mine at Healy River, was the leading coal producer in the Yukon River region in 1955. Second-ranking coal producer in the region was Suntrana Mining Co. at an underground mine in the Nenana field. The remaining coal produced in the district was mined by surface methods by Arctic Coal Co. in the Nenana field (a new lease on 2,440 acres near Lignite) and the Cripple Creek Coal Co. at Cripple Creek.

Chandalar district.—Gold production in the Chandalar district came from two placer mines at Big Creek. Chandalar Mining Co. (Hugh J. Matheson and Jack Neubauer) recovered a substantial quantity of gold, using a nonfloating washing plant. A. W. Amero, one of Alaska's few remaining veteran prospectors, used small-scale hand-placer methods to obtain a small quantity of gold and silver from a claim on

Big Creek.

Circle district.—Gold Placers, Inc., leading gold producer in the Circle district, used a diesel-powered bucketline dredge (sixty 4\%cubic-foot buckets) on Coal Creek in 1955. P. R. & H. Mining Co., second-ranking gold producer in the district, removed overburden and tailing and delivered gravel to sluice boxes by bulldozer. company mined from May 1 until October 15 at Mastodon and Harrison Creeks. K. C. Spaid and H. L. Stout mined Timberline Placers at Porcupine Creek and recovered 568 fine ounces of gold and 134 fine ounces of silver from 15,000 cubic yards of gravel. cubic-yard dragline excavator and 2 bulldozers removed 86,000 cubic yards of overburden. After bulldozers delivered gold-bearing gravel to the sluice boxes the excavator removed and stacked the tailing. Robert R. Wilkinson recovered moderate quantities of gold and silver at Miller Creek. A bulldozer removed overburden, delivered gravel to sluice boxes, and stacked tailing. Lucky Seven Mining Co. (Walter Roman) sold 578 fine ounces of gold and 127 fine ounces of silver to Northern Commercial Co. The gold was recovered from Mastodon Creek by placer-mining methods, utilizing a nonfloating washing plant. The Frasca & Hering partnership (formerly Frasca

& Gibson) continued mining on the McGowan Bench, Eagle Creek. Moderate quantities of gold and silver were recovered from gold-bearing gravel delivered to a string of 4 sluice boxes by a bulldozer and 4 hydraulic giants. The bulldozer also removed and stacked tailing.

Placer mines that yielded gold in 1954 but were inactive during 1955 included Alluvial Golds, Inc., Woodchopper Creek; Central Mining Co. (H. E. Roslund) and Paul Bittner, both on Deadwood Creek; H. C. Carstens and Delta Alaska Co., Portage Creek; and

Circle Dredging Co., Crooked Creek.

Eagle district.—A new partnership (the only active mining company in the district) Burnett F. Hansen and Wallace T. Brown, operated the Lucky Eight Mining Co. at Crooked Creek from May 20 until September 20. Bulldozers (1 D6 and 1 TD14) removed overburden and delivered 11,930 cubic yards of gold-bearing gravel to the sluice boxes. The partnership recovered 367 fine ounces of gold and 41 fine ounces of silver, which was sold to the United States Mint at Denver.

Fairbanks district.—During 1955, 59 percent of the gold produced from Alaska mines and 77 percent of the gold produced in the Yukon River region came from 22 placer mines in the Fairbanks district.

Six dredges of United States Smelting, Refining & Mining Co. in the Fairbanks district (considered a unit) recovered more gold than any other company in Alaska Territory. A central coal-burning plant in Fairbanks generated the electricity for powering the company dredges and pumps. Water for company operations north of Fairbanks was supplied by the Davidson Ditch (from Chatinika River at Fairbanks); dredge operations in the Ester area were supplied from the Chena River. A newly purchased dredge was moved from Livengood to the town of Hog River via Fairbanks. The dredge was moved from Fairbanks down the Yukon River, up the Tanana and Koyukuk Rivers and over a quarter mile of road to the new dredging ground near Hog River. The company also completed moving another dredge from Eldorado Creek overland to Dome Creek.

Alder Creek Mining Co. continued placer mining at Fairbanks Creek. Bulldozers removed overburden, and dragline excavators delivered gravel to sluice boxes and stacked tailing. During the mining period (May 1 to October 1) the company recovered 2,000

fine ounces of gold and 328 fine ounces of silver.

Other mining companies that produced substantial quantities of gold in the district included Wolf Creek Mining Co., Wolf Creek; Hope Mine (Robert V. Watkins), Faith Creek; Hassel Mining Co., Ready Bullion Creek; and Chatham Creek Mining Co., Chatham Creek. Combinations of bulldozers, hydraulic giants, and dragline excavators removed overburden and tailing and delivered gravel to sluice boxes. Denny G. Breaid, Gold Stream Mining Co., Gold Stream Creek, delivered gold-bearing gravel to a 12- by 28-foot bedrock sluice plate and removed the tailing with a diesel-powered dragline excavator. The company recovered 392 fine ounces of gold and 35 fine ounces of silver during the May-to-October mining period. Three bulldozers also helped to deliver gravel and remove overburden.

During the mining season (May 28 to September 15) No Grub Mining Co. recovered 398 fine ounces of gold and 53 fine ounces of

silver from placer mining at No Grub Creek. Hydraulic giants and bulldozers delivered 28,000 cubic yards of gravel to a bedrock sluice plate (4 by 52 feet).

Gold was produced from placer mining in the Fairbanks district by Cliff Mining Co., Caribou Creek; Sleeper & McCharles, Buckeye Creek; Albert Patrick, Ester Creek; Ernest L. Maurer, First Chance

Creek; and Helmer Johnson, Cleary Creek.

Fred M. Wackwitz recovered a small quantity of gold from a test run made from placer mining at Bedrock Creek. Gold-bearing gravel was delivered to an elevated sluice box with a power shovel; tailing and overburden were removed by bulldozer. Tin and tungsten concentrates recovered as byproducts of gold-placer mining were stock-piled until sufficient quantities accumulated to warrant separation. In addition, prospecting was continued in an attempt to discover the lode source of placer tin. Flume Creek mine, also owned by Fred Wackwitz, made a test shipment of lead ore from lode deposits at Flume Creek.

Fortymile district.—The LaCross Mining Co. (Jack LaCross and Fred Whitehead) placer mine at Walker Fork yielded 956 fine ounces of gold and 137 fine ounces of silver from 20,000 cubic yards of gold-bearing gravel during the mining season from June until October. The company used 3 hydraulic giants to remove 50,000 cubic yards of overburden and 2 TD18 bulldozers to deliver gold-bearing gravel to sluice boxes.

The Vern Weaver and John Rambaud partnership recovered 113 fine ounces of gold and 18 fine ounces of silver from placer mining at Napoleon Creek. Three hydraulic giants and a bulldozer delivered 50,000 cubic yards of gravel to the sluice box. The partnership also sold 299 ounces of natural gold to buyers for use in manufacturing jewelry.

Engbret Johansen recovered 49 fine ounces of gold and 8 fine ounces of silver from 1,560 cubic yards of gold-bearing gravel washed through a bedrock sluice box by 2 hydraulic giants. Johansen mined his Gold Hill claims at Ingle Creek from July 1 to September 20.

Small to moderate quantities of gold were recovered from bulldozer-hydraulic giant placer mining by William Meldrum, Chicken Creek; Chicken Hill Mines, Inc., Lost Chicken Hill; Squaw Creek Mining Co., Canyon Creek; and Purdy Bros., Myers Fork. Other producers selling placer gold were Dan Manske, Ingle Creek; Robert McComb at the South Fork of Fortymile River; and George F. Robinson, Jack Wade Creek. Robert McComb experimented with a small trommel screen to determine its efficiency in recovering gold. If the unit proved successful, a larger trommel screen would be installed as a replacement for sluice boxes.

Hot Spring district.—Johnson & Isaacson used two bulldozers to deliver gold-bearing gravel to sluice boxes during placer mining at Eureka Creek. The gravel yielded 149 fine ounces of gold and 42 fine ounces of silver; this output was sold to the United States Mint at San Francisco. The Eureka Creek property was mined from May through Sentember.

through September.

The Tony Lanning and Stanley Dayo partnership, Shirley Bar, used a hydraulic giant to strip overburden; 2 bulldozers delivered 9,260 cubic yards of gravel to sluice boxes and removed tailing.

During the mining season (May 10 to September 10) the partnership recovered 555 fine ounces of gold and 141 fine ounces of silver.

Gold was recovered by placer-mining methods at Rhode Island Creek by A. W. Pringle and at Eureka Creek by Strandberg & Sons. Various combinations of bulldozers, dragline excavators, and hydraulic equipment were used to strip overburden, remove tailing, and deliver gold-bearing gravel to sluice boxes or to "dryland dredges."

Dallas Wright and the Clyde Larsen & Norman Suckling partner-ship recovered small quantities of gold by placer-mining methods at

American and Deep Creeks, respectively.

The Federal Bureau of Mines, working near Tofty, attempted to determine the bedrock source of cassiterite and radioactive minerals. Trenching, sampling, mapping, and radioactive surveys were made on the north flank of the Tofty tin belt between the headwaters of Miller and Idaho Creeks and Idaho and Tofty Creeks.

Hughes district.—Strandberg & Sons, only active placer-mining company in the Hughes district, recovered substantial quantities of cold from plains near Indian River during the mining season.

gold from claims near Indian River during the mining season.

Iditarod district.—North American Dredging Co. on the Mohawk Association claims on Flat Creek and Otter Dredging Co. on Otter Creek used bucketline dredges to recover substantial quantities of gold from stream gravel and old tailing and bulldozers to remove overburden. Gold recovered from these dredging operations was deposited with the United States Mint at San Francisco. Arnold Kobler joined John Ogriz as a partner in the Otter Dredging Co.

Miscovich Bros. placer mine on Otter Creek yielded substantial quantities of gold and silver. Gold recovered from 121,000 cubic yards of gravel was sold to the San Francisco Mint. A dragline excavator removed and stacked tailing from the nonfloating washing

plant.

Gust Backstrom recovered 96 fine ounces of gold and 14 fine ounces of silver from 1,300 cubic yards of gold-bearing gravel at Idaho Mine, Flat Creek. J. Frank Hatton and George H. Turner mined the Singing Bird placer claim at Chicken Creek from July 1 until August 28. A small quantity of gold was recovered from 15,000 cubic yards of stream and bench gravel delivered by 2 bull-dozers. Gold recovery was made in a 60-foot sluice box.

Other gold placer mines in the district included Prince Creek Mining Co. (Harry Agoff) at the Nugget claim on Prince Creek; Julian Stuver, Happy Creek; and W. A. Williams at Granite Creek. These companies used combinations of hydraulic giants, bulldozers, and sluice boxes to remove overburden, deliver gravel, recover gold,

and stack tailing.

Innoko district.—Gold recovered in the district came from the gravel processed by 10 placer-mine companies in 1955. Strandberg & Sons, using a portable, nonfloating washing plant ("dry-land dredge") fed by dragline, recovered gold from gravel mined at Colorado Creek. Uotila & Hard used a similar process in washing gravel at Ophir Creek. At Yankee Creek the Rosander & Reed partnership washed 133,330 cubic yards of gravel through bedrock sluice boxes. The gold-bearing gravel yielded 1,358 fine ounces of gold and 145 fine ounces of silver by placer mining from May 1 to October 1. In

addition, 21 ounces of gold recovered as nuggets and grains were

sold to individual buyers on the open market.

Ophir Mining Co. used a small bucketline dredge on Ganes Creek from May 15 to September 1, recovering 1,067 fine ounces of gold and 146 fine ounces of silver from 210,000 cubic vards of stream gravel. Bulldozers stripped overburden ahead of the dredge. Colorado Creek Mining Co. washed 85,000 cubic yards of gold-bearing gravel through portable, elevated sluice boxes at Colorado Creek. It produced by placer mining 1,092 fine ounces of gold and 148 fine ounces of silver during the mining period, April 28 to October 7. A 2-cubic-vard. diesel-powered dragline fed the elevated sluice boxes and removed overburden; 4 D8 bulldozers also removed overburden and stacked tailing. Degnan Mining Co. (Joseph A. and Caroline Degnan), Esperanto Creek, used a dragline excavator to deliver 19,260 cubic yards of gold-bearing gravel to bedrock sluice boxes. The 704 fine ounces of gold recovered from this placer mine was sold to Alaska National Bank in Fairbanks. The dragline and a TD18 bulldozer removed 130,000 cubic yards of overburden.

Combinations of hydraulic pumps, bulldozers, dragline excavators, and sluice boxes were used by four placer mines to recover gold. Those working placers were Waino Puntila at the Gold Run Group of claims, Little Creek; Ivor C. Carlson, also at Little Creek; Hjalmer Lindquist at Bedrock and Ester Creeks; and Eric Hard at the Hum-

ming Bird claim on Cripple Creek.

Kantishna district.—Earl R. Pilgrim & Co. completed exploration work at the Stampede antimony mine. In 1955 the company drove 63 feet of raise to complete work on a DMEA project begun in 1952. An accumulated stock of 53 short tons of antimony ore, recovered at the mine in 1954 and 1955, may be marketed next year. Paul Omlin, Little Moose Creek, worked the only active gold placer mine in the district.

Koyukuk district.—Mascot Creek Mining Co., Mascot Creek, was the leading producer of gold in the district. Prospectors, Inc., recovered a small quantity of gold during 75 days of placer mining at Myrtle Creek. In addition to 11 fine ounces of gold sold to Northern Commercial Co., 14 ounces of natural gold was sold on the open market. This company, Mascot Creek Mining Co., and Slate Creek Mining Co. recovered gold from gravel delivered to sluice boxes by bulldozers. The remainder of the gold produced in the district was recovered from gravel mined by hydraulic giants and small hand tools. E. J. Ulen worked claims in the Nolan Creek area alone this year.

Melozitna district.—Grant Creek Mining Co., Grant Creek, the only active mining company in the district, recovered a moderate quantity of gold by placer mining; it was sold to the San Francisco Mint.

Rampart district.—Seven placer mines in the district recovered gold in 1955. Melo Jackovich, Hunter Creek, recovered 204 fine ounces of gold and 15 fine ounces of silver from 10,000 cubic yards of gravel delivered to a bedrock sluice box by bulldozers. The two bulldozers also removed tailing and overburden. Harry F. Havrilack Mining Co., Ruby Creek, used the same placer-mining method to recover 61 fine ounces of gold from 3,000 cubic yards of gravel.

Swanson Bros. Mining Co. and Weisner Trading Co. at Hunter Creek and Little Minook, Jr., Creek, respectively, also used nonfloating washing plants in the district to recover gold. Martin & Bernard partnership, Little Minook Creek, and Sam Barton, Big Minook, used

small-scale hand placer-mining methods to recover gold.

Ruby district.—Gold was recovered from four active gold-placer mines by handling gravel with combinations of bulldozer-dragline-hydraulic equipment. Northern Lights Mining Co., Long Creek, and Miscovich Bros., Poorman Creek, recovered substantial quantities of gold. Long Creek Mining Co., Long Creek, and Clarence Zaiser, Greenstone Creek, were the remaining two gold producers in the district.

Tolorana district.—Gravel mined by Olive Creek mines at Olive Creek yielded 1,483 fine ounces of gold and 151 fine ounces of silver. The gold was recovered from 80,000 cubic yards of gravel delivered to sluice boxes by bulldozer. Tailing and overburden were removed

with 2 D8 bulldozers and a 1%-cubic-yard dragline excavator.

Yukon Placer Mining, Inc., used bulldozer-dragline-hydraulic giant equipment to recover 282 fine ounces of gold from 29,500 cubic yards of gravel at Livengood Creek. Gold-bearing gravel was delivered to the washing plant by dragline excavator; tailing was removed by bulldozer. Bentley Falls (Wilbur Creek Mines) and the Mandich, Jurich & Car partnership (Lillian Creek) produced gold with hydraulic gold placers. Both mines used hydraulic giants to thaw and strip overburden and bulldozers to deliver gravel to sluice boxes.

# The Mineral Industry of Arizona

By Frank J. Kelly, William H. Kerns, Breck Parker, and Alfred L. Ransome<sup>2</sup>



THE VALUE of mineral production in Arizona (exclusive of uranium) in 1955 established an alltime record of \$378.3 million—47 percent above the previous record of \$256.6 million in 1953. Arizona was the leading copper-producing State, and its copper output alone was greater in value than all minerals in any previous year. Copper supplied 90 percent of the total value compared with 88 percent in 1954 and 1953.

In the Arizona mineral industry the quantity and value of all metals except molybdenum and all nonmetals except mica (scrap) and fluorspar increased. Columbite-tantalite concentrate was produced for the first time in Arizona. Although the quantity of barite output was less than in 1954, value of production was greater.

The value of metals produced in 1955 was \$360.2 million (95 percent of the total value), nonmetals \$19.0 million (5 percent), and mineral

fuels (coal and natural gas) \$60,000.

Uranium prospecting, development, and mining activities continued during the year but on a smaller scale than in the adjoining States—Utah, Colorado, and New Mexico. A comprehensive review of the mineral resources of the Navajo-Hopi Reservations was published.<sup>3</sup>

During 1955 an average of 13,900 persons was employed in the Arizona mining industry. The 11,800 persons in copper mining alone represented 40 percent of the national average for copper mining. Labor difficulties at several of the larger copper producers in the

State caused a month-long shutdown.

Some important developments in the mineral industry were the completed construction of its concentrator and surface plant by San Manuel Copper Corp., completion of the copper-precipitation plant by Phelps Dodge Corp., the \$5.66 million metallurgical improvement project begun by Inspiration Consolidated Copper Co. late in the year, closing of the Wenden manganese-purchasing depot in April, and the opening of a uranium ore-buying station at Globe in July.

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 Kiersch, Geo. A., and others, Mineral Resources, Navajo-Hopi Reservations, Arizona-Utah, vol. I, Metalliferous Minerals and Mineral Fuels, 75 pp.; vol. II, Nonmetallic Minerals, 105 pp.; vol. III, Construction Materials: Univ. of Arizona Press, Tucson, Ariz., 1955, 81 pp.

TABLE 1.—Mineral production in Arizona, 1954-55 1

	19	54	19	55
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays Coal Copper (recoverable content of ores, etc.) Gem stones Lead (recoverable content of ores, etc.) Lime Manganese ore (35 percent or more Mn)-gross weight Mercury	(2) 114, 809 8, 385 88, 932 163 1, 682 1, 538 1, 296 80, 883 3, 764, 080	2, 297, 490 1, 131, 334 43, 096 17, 773 1, 524, 936 6, 990 125, 927 3, 667, 076 3, 890, 641 1, 914, 315 456, 965 4, 635, 576	1, 497 10, 568 92, 136 7, 755, 347 4, 634, 179 1, 600, 939 181	\$868, 664 59, 286 338, 762, 330 97, 000 4, 466, 560 2, 925, 466 1, 437, 632 (3) 138, 497 8, 742 1, 510, 521 83, 956 372, 735 6, 518, 905 4, 194, 166 676, 389 5, 580, 264
Total Arizona 4		254, 479, 000		378, 277, 000

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Value of low-grade manganese ore shipped to General Services Administration Purchase Depots and uranium ore is excluded.

2 Weight not recorded.

3 Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

4 The total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing cement and lime.

TABLE 2.—Average unit value of selected mineral commodities in Arizona, 1954-55 1

short ton	\$8. 272 4. 045 . 841 . 905-1 1. 455
n	1 in 60-percent WO <sub>8</sub> ntrate57.917 pound57.917

<sup>1</sup> Prices are based on average value f. o. b. mines or mills reported by the producers, except as otherwise

Federal Government assistance in financing exploration projects in search of reserves of strategic and critical minerals continued to be available during 1955. Details of projects undertaken in Arizona during 1955 are given in table 3. No Defense Minerals Exploration Administration (DMEA) projects were written for Arizona properties during 1954.

cement and lime.

<sup>1</sup> Treasury buying price for newly mined silver July 1, 1946, to date—\$0.905005 (\$0.905 used in 1947 for cal-

TABLE 3.—Defense Minerals Exploration Administration contracts executed in 1955

				Contract	
Contractor	Property	Commodity	Date	Total amount	Govern- ment partici- pation, percent
Arizona-Globe Uranium, Inc Hillside Mining CoGeorge W. Kaske. Marble Canyon Uranium, Inc Western Mining & Exploration Co.	Sue mine Black Pearl mine Austin tungsten claims Red Wing and other claims. Black Brush claims.	Uranium Tungstendo Uranium	June 20 Feb. 2 Oct. 10 June 13 Dec. 5	\$49, 285 127, 285 10, 000 32, 440 50, 640	75 75 75 75

## **REVIEW BY MINERAL COMMODITIES**

#### **METALS**

Beryllium.—Small quantities of beryllium concentrate (beryl), handsorted from pegmatite, were produced in Arizona by several individuals and marketed through Beryl Ores Co., Arvada, Colo., and Mrs. Gladys Wells McKinley, Custer, S. Dak. The total output in

the State was virtually the same as in 1954.

Copper.—Arizona continued to be the "Copper State" by holding first place in copper production in the United States. Output increased 20 percent and value, 52 percent, compared with 1954. A new peak was established for copper production, which furnished 90 percent of mineral-production value in the State. This new record was attained in spite of losing more than a month's production because of labor strikes at several large mines. The higher price for copper stimulated output during the 11 months that the mines were producing.

Morenci Branch of Phelps Dodge Corp. continued to be Arizona's leading copper producer; New Cornelia and Copper Queen-Lavender Pit mines, also operated by Phelps Dodge Corp., ranked second and third, respectively. Output from each of the 3 mines increased substantially above the 1954 output. Production from the Lavender Pit began in July 1954. The new precipitating plant for recovering

copper from leaching lower grade ores was completed in 1955.

Ray Mines Division of the Kennecott Copper Corp. increased copper output significantly and ranked fourth as a copper producer. The mine was converted to an open pit at the end of 1954; underground mining was terminated January 28, 1955, when leaching of the

caved areas of the underground workings was begun.

Late in 1955, Inspiration Consolidated Copper Co. began a \$5.7-million improvement project to convert its metallurgical plants at the Inspiration mine to the "Dual Process," which will include first leaching the ore to recover the oxide-copper content, then flotation to recover the sulfide-copper content. The conversion will not only

increase the ore-treatment capacity but also improve the recovery of copper from the ore and make possible the treatment of lower grade ores. The Inspiration mine ranked fifth as copper producer in the State in 1955.

The Copper Cities mine (Porphyry Reserve) of Copper Cities Mining Co. and the Silver Bell mine of American Smelting and Refining Co., new producers in August and March 1954, respectively, produced for the full year in 1955 and ranked sixth and eighth as copper producers in the State. Other major copper producers in order of output were Magma, Miami, Bagdad, Mineral Hill-Daisy-Copper Queen, Republic-Mammoth-Moore, Castle Dome (dump), and United Verde mines.

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Production facilities at the San Manuel mine of San Manuel Copper Corp., which included the mining, milling, and smelting plants for a 30,000-ton-per-day ore-treatment capacity, were completed, and testing was begun in December. The company planned to be in full operation (70,000 tons of copper a year) by mid-1956.

Pima Mining Co. continued developing its property as an open-pit mine. Stripping 200 feet of overburden from the deposit was begun by year end, and plans for constructing the 3,000-ton-per-day flotation plant for copper recovery, which was scheduled to be completed in 1956, were well advanced.

Gold.—Arizona ranked fourth in gold production in 1955. The gold output of the State increased 11 percent because of the greater quantity of gold recovered as a byproduct from copper ore. Eighty-three percent of the gold production came from this source (copper ore). Output from gold and silver ores remained at virtually the 1954 figure, furnishing 1 percent of the entire gold output in 1955. The remainder was recovered chiefly from lead-zinc ore.

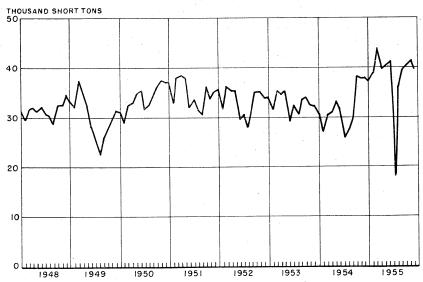


Figure 1.—Mine production of copper in Arizona, 1948-55, by months, in terms of recoverable metal.

The same six mines in the same order of output as in 1954—Copper Queen-Lavender Pit, New Cornelia, Iron King, Magma, Morenci, and Ray mining—produced 97 percent of the gold output in 1955. of gold from each of these mines except Magma was greater than in 1954.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc, 1946-50 (average), 1951-55, and total, 1860-1955, in terms of recoverable metals <sup>1</sup>

	Mines pro	oducing		terial	(	old (lode	e an	d placer)	Silver (lod	e and placer)
Year	Lode	Placer	(s	ated 2 hort ons)		Fine ounces		Value	Fine ounce	s Value
1946–50 (average) 1951 1952 1953 1954 1955	265	32 18 7 6 5	43, 8 45, 3 45, 7 43, 4	40, 459 20, 353 85, 327 00, 618 60, 477 10, 060		102, 335 116, 093 112, 355 112, 824 114, 809 127, 616		\$3, 581, 739 4, 063, 255 3, 932, 425 3, 948, 840 4, 018, 315 4, 466, 560	4, 594, 35 5, 120, 98 4, 701, 33 4, 351, 42 4, 298, 81 4, 634, 17	5 4, 634, 750 0 4, 254, 941 9 3, 938, 263 1 3, 890, 641
1860-1955			. 1	(3)	11	, 884, 509	3	03, 452, 970	335, 497, 14	256, 009, 440
	C	opper			1	ead		2	Zine	
Year	Short tons	Valu	ie	Shorton		Value	3	Short tons	Value	Total value
1946-50 (average) 1951 1952 1953 1954 1955	358, 575 415, 870 395, 719 393, 525 377, 927 454, 105	\$143, 909 201, 281 191, 527 225, 883 222, 976 338, 762	l, 080 7, 996 8, 350 6, 930	8,	394	\$8, 375, 6 6, 018, 3 5, 319, 4 2, 470, 1 2, 297, 4 2, 925, 4	324 140 136 190	56, 785 52, 999 47, 143 27, 530 21, 461 22, 684	\$14, 613, 752 19, 291, 636 15, 651, 476 6, 331, 900 4, 635, 576 5, 580, 264	\$174, 574, 913 235, 289, 045 220, 686, 278 242, 572, 489 237, 818, 952 355, 928, 786
1860-1955	14, 718, 888	5, 115, 545	, 718	554, (	)17	104, 053, 7	736	689, 547	167, 279, 273	5, 946, 341, 137

<sup>&</sup>lt;sup>1</sup> 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.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in 1955, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January February March April May June July August September October November December	10, 796 10, 728 12, 392 11, 175 11, 742 10, 968 6, 073 10, 600 10, 800 11, 463 11, 382 9, 497	369, 950 376, 316 452, 641 437, 939 428, 566 421, 652 177, 202 357, 305 367, 965 428, 576 438, 773 377, 294	37, 124 38, 485 43, 586 39, 771 40, 200 40, 690 18, 160 35, 937 39, 366 40, 245 41, 036 39, 505	670 656 696 916 850 826 761 947 917 868 864	1, 764 1, 700 1, 933 2, 032 2, 290 1, 983 1, 967 1, 658 1, 890 1, 884
Total	127, 616	4, 634, 179	454, 105	9, 817	22, 684

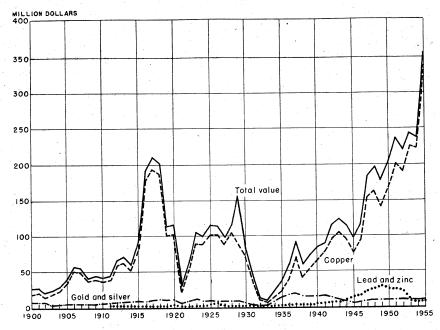


FIGURE 2.—Value of mine production of gold, silver, copper, lead, and zinc in Arizona, 1900-55.

TABLE 6.—Gold and silver produced at placer mines, 1946-50 (average) and 1951-55, in fine ounces, in terms of recoverable metals.

	Small	l-scale	Grave	l mechar	nically ha	andled	Under pla	ground ers	То	tal
Year  1946-50 (average)	hand m		Nonfl washing	oating plants 2		line and dredges		ift		
	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver
1951 1952	137 89 11	7	257 61 58	40 11 10	37 49	9	20 6 1	(3)	451 156 70 109	50 1. 10
1953 1954 <sup>4</sup> 1955 <sup>4</sup>	60 78 79	6 5	4		49				78 83	

<sup>1</sup> Includes all operations in which hand labor is the principal factor in delivering gravel to sluices, long toms, dip boxes, pans, rockers, drywashers, 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 Less than 1 ounce.

4 1954: Represents 5 producing mines, 1,300 cubic yards of material treated, at an average value of \$2.10 per cubic yard. 1955: Represents 7 producing mines, 2,060 cubic yards of material treated, at an average value of \$1.41 per cubic yard. For similar data for years before 1953, see table 6, Minerals Yearbook 1953 vol. III, p. 107.

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TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1955, by counties and districts, in terms of recoverable metals	oductio	n of gold,	silver, c	opper, le	ad, and	zinc in	1955, by c	ounties a	nd district	s, in ter	ms of rec	overable	metals
County and district	Mines produc- ing 1			Gold (lode and placer)	Silver (lode and placer)	ode and ser)	Copper	per	Lead	ī	Zinc	o	Total
	(lode and placer)	treated 2 (short tons)	Fine	Value	Fine	Value	Pounds	Value	Pounds	Value	Pounds	Value	value
Cochise County: Cochise (Dragoon)	1	75, 128			34, 046	\$30, 813	3, 896, 500	\$1, 453, 394			6, 590, 500	\$810, 632	\$2, 294, 839
Tevis  Tevis  Douglas  Turquolas  Warren (Bisbee)  Whetstone (Benson).	(8)	141 174 17, 939 4, 977, 246 313	1 10 249 42, 351	\$35 350 8,715 1,482,285	165 193 14, 704 1, 208, 553 213	149 175 13, 308 1, 093, 801 193	7, 600 58, 400 381, 200 116, 289, 600 12, 700	2, 835 21, 783 142, 188 43, 376, 021 4, 737	364, 300	\$54, 281 1, 147	509, 500	62, 668	3, 019 22, 308 281, 160 45, 953, 254 5, 000
Total	11	5, 060, 941	42, 613	1, 491, 455	1, 257, 874	1, 138, 439	120, 646, 000	45, 000, 958	372, 000	55, 428	7, 100, 000	873, 300	48, 559, 580
Coconino County: Coconino Plateau Francis White Mesa	121	3 222 699			3 28 401	25 363	1,000 14,200 42,800	373 5, 297 15, 964					876 5, 322 16, 327
Total	4	. 924			432	391	58,000	21, 634		1	-		22, 025
Gila County: Banner (Christmas). Globe-Mismi. Green Valley. Pioneer 4.	241	2, 857 11, 480, 258 164 2	1, 202	42, 070	129 93, 919 30 42	85, 001 38	70, 100 173, 150, 100 9, 700 100	26, 147 64, 584, 988 3, 618	12, 000	1, 788			28, 052 64, 712, 059 3, 680 75
Total	18	11, 483, 281	1, 203	42, 105	94, 120	85, 183	173, 230, 000	64, 614, 790	12,000	1, 788			64, 743, 866
Graham County: Aravalpa and Clark <sup>5</sup> . Lone Star	6001	19, 030	2	20	15,806	14, 305	96,300	35, 920 634	1, 364, 000	203, 236	3, 340, 000	410, 820	664, 351
Total	20	19,071	2	70	15,829	14, 326	98,000	36, 554	1, 364, 000	203, 236	3, 340, 000	410, 820	665,006
Greenlee County: Copper Mountain (Morenci)	22	15, 905, 573	8, 033	281, 155	634, 330	574, 101	249, 260, 000	92, 973, 980					93, 829, 236
Marloopa County: Cave Creek and Camp Creek Goldfields New River. Vulture		24 112 423	2 1	70 35	-	1	700 2, 900 2, 400	261 1,082 895					261 71 1, 082 930
Total	4	79	က	105	1	1	6,000	2, 238					2,344
See footnotes at end of table.	table.												

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1955, by counties and districts, in terms of recoverable metals—Continued

	Total value		\$422 7,778 2,137	7,864	71, 588	91, 396	54, 228, 609 1, 377 8, 584 30, 099 2, 709 215, 983	4, 199, 199 16, 213, 304	74, 899, 864	5, 695 14, 112 2, 587 27, 128, 286 37, 128, 286 162 18, 700, 014 4,992	271 55, 854, 575
	90	Value			\$246	246	1, 648	322, 236 22, 976	346, 860	2,706	2,706
	Zinc	Pounds			2,000	2,000	13, 400	2, 619, 800 186, 800	2, 820, 000	22, 000	22,000
	Į.	Value		\$1,341	4, 619	5,960	1, 132 4, 053 1, 982 89	302, 366	309, 622	4, 217	48, 276
	Lead	Pounds		9,000	31,000	40,000	7,600 27,200 13,300 600	2, 029, 300	2, 078, 000	28, 300	1,600
Continued	per	Value	\$410 7,348	671 4, 663	65, 126 112	78, 330	52, 385, 500 37 783 224 209, 514	3, 442, 790 16, 011, 324	72, 050, 172	5, 670 8, 989 634 746 36, 684, 028 149 17, 865, 133 17, 865, 133	54, 567, 662
De.	Соррег	Pounds	1, 100	1,800	174, 600	210,000	140, 443, 700 100 2, 100 600 561, 700	9, 230, 000 42, 925, 800	193, 164, 000	15, 200 24, 100 1, 700 98, 348, 600 4, 896, 800 47, 895, 800 1, 300	146, 294, 000
Continue	Silver (lode and placer)	Value	\$12 430 2	390	1, 177	2, 030	442, 059 33 1, 995 8, 924 328 5, 786	131, 807 173, 509	764, 440	25 891 1, 883 11, 11 318, 107 13 29 439, 416	
	Silver (I	Fine ounces	13 475 2	431	1, 301	2, 243	488, 436 36 3, 204 9, 860 362 6, 392	145, 636 191, 712	844, 638	28 984 2,081 12,081 351,480 14 32 485,515	840, 197
	Gold (lode and placer)	Value	\$2, 135	1, 470	420 805	4,830	1, 401, 050 175 105 21, 175 595	5, 495	1, 428, 770	315 70 79, 625 395, 465	475, 510
		Fine	61	42	12 23	138	40,030 5 3 605 17	157	40,822	2, 275 2, 275 11, 299	13, 586
	Material sold or	treated 2 (short tons)	(6) 60 60	28 528	2, 785 38	3,447	10, 299, 786 34 198 3, 573 8, 573 7, 800	2, 780, 638	13, 271, 223	404 557 553 47 4, 840, 375 187 187 187 458, 831	5, 301, 018
	Mines produc- ing 1		844	- 67	1	14	H-8-1-12	מיט	21	on ro □ u on 4 on 4	27
	County and district		Mohave County: Bentley (Grand Wash Cliffs) Cedar Valley	: '	Cerbat, Stockton Hill)	Total	Pima County: Alo Antiole Arivaca Fresnal Greaterville Helwetta (Rosemont) Pima (Sterritas,	Buttes)	Total	Pinal County: Bunker Hill (Copper Cheek) Casa Grande Crouter Peak Martinez Canyon Mineral Creek (Ray) Old Hat (Oracle, Mammoth) Plosefto Ploneer '	Total

2, 116, 189 2, 133 733 5, 715 180, 504 16, 019 2, 712	2, 324, 005	2, 622, 658 6, 622, 658 7, 733 107, 349 8, 394, 644 15, 941 15, 941 16, 601 19, 600 1, 268 1,	14, 892, 899	31, 842 3, 509 5, 370 2, 595 674	43, 990	355, 928, 786
1, 005, 882 443 67, 219	1, 073, 544	109, 224	2, 872, 788			5, 580, 264
8, 177, 900 3, 600 546, 500	8, 728, 000	22, 467, 000 888, 000 1, 000	23, 356, 000		•	45, 368, 000
893, 851 268 28, 459	922. 608	1, 374, 272 16 16 16 17 179	1, 376, 462	1, 043	2,086	2, 925, 466
5, 999, 000 1,800 191, 000	6, 192, 000	6, 223, 300 1, 223, 300 6, 000 1, 900 1, 200 1, 200	9, 238, 000	7, 000	14,000	19, 634, 000
76, 876 1, 790 5, 707 68, 035 14, 883 1, 305	168, 596	3, 021 157, 108 3, 954 107, 349 8, 236, 101 11, 973 12, 288 18, 799 678, 040 678, 040 1, 902	9, 219, 814	22, 231 1, 156 3, 581 634	27,602	338, 762, 330
206, 100 4, 800 15, 300 182, 400 39, 900 3, 500	452,000	8, 100 421, 200 10, 600 287, 800 1, 300 22, 080, 700 32, 100 50, 400 1, 817, 800 1, 100 5, 100	24, 718, 000	59, 600 3, 100 9, 600 1, 700	1 11	908, 210, 000
135, 415 203 22 8 16, 651 1, 136 1, 307	154, 742	173 9.076 1.076 1.273 1.273 1.273 1.608 1.60	699, 545	168 253 116 5	547	4, 194, 166
149, 622 224 24 24 18, 398 1, 255 1, 444	170,976	191 3,390 3,390 1,406 1,406 1,406 236 236 278 17,768 17,768 189 189 189 189 189	772, 935	185 280 129 5	1 11	4, 634, 179
4, 165 140 140 170	4, 515	2, 695 175 105 175 175 175 175 175 175 175 175 175 17	724, 290	8, 400 2, 100 2, 590 35	1 11	4, 466, 560
119	129	19, 942 25, 25, 25, 25, 25, 25, 25, 25, 25, 25,	20,694	240 60 18 74 1	393	127, 616
51, 637 67 22 177 3, 450 1, 539 93	56, 985	222,909 222,909 2 786 6,307 20 1,355,494 18 18 18 18 18 18 20 668 18,489 18,489 18,489 18,489 18,489 18,489 20 20 20 20 20 20 20 20 20 20 20 20 20	1, 605, 848	1,240 79 323	1,670	52, 710, 060
4000100	20	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	37	77 30	17	180
Santa Cruz County: Harshaw and Tyndald (1916) Orgales (Gold Hill) Oro Blanco (Ruby) Palmetto. Parkgorla (Duquesno) Rain Mountain. Wrightson.	Total	Agus Fra.  Agus Fra.  Big Bug'.  Big Bug'.  Black Canyon.  Black Rook.  Castle Creek.  Copper Bash.  Copper Bash.  Copper Creek.  Eureka (Bagdad).  Hassayampa (Pres.  cott, Groom Creek!'.  Kirkland'.  Lynx Creek'.  Tigr.  Tip Top.  Tip Top.  Tip Top.  Walker:  Walker:  Walker:	Total	Yuma County: Castle Dome and Cienega enega Elisworth Plomosa and Santa Maria Trigo ! Weaver ?	Total	Grend total

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All lode mines except for 7 placer mines as indicated in footnote 7. Does not include gravel washed or tomage of precipitates shipped. Not counted as a mine, production from cleanings. I ploneer district lies in both Glia and Pinal Counties. Bureau of Mines not at liberty to publish separately by districts.

<sup>9</sup> Byproduct of tungsten ore. Includes placer production by districts as follows: Big Bug—1 fine ounce gold (value \$85); Hassansupa—1, gold (\$85); Kirkland—4, gold (\$140); Lynx Greek—1, gold (\$25); Weaver (Yarpai County)—1, gold (\$35); Trigo—74, gold (\$2,590) and 5 fine ounces silver (\$5); Weaver (Yuna)—1, gold (\$35).

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1955, 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)
Lode ore: Dry gold Dry gold-silver Dry silver Total	16 12 22 49	3, 315 67, 516 25, 511 96, 342	746 713 34 1,493	798 15, 303 17, 186 33, 287	70, 700 1, 217, 950 459, 400 1, 748, 050	1,400	
Copper-lead-zinc Copper-lead-zinc Copper-zinc Lead Lead-zinc Zinc	91 5 6 25 11 2	52, 189, 728 676 76, 568 4, 635 310, 771 807	105, 330 3 106 20, 082 3	3, 629, 191 3, 179 33, 622 23, 590 902, 817 482	856, 270, 850 22, 800 3, 678, 000 12, 500 956, 500 20, 500	40, 400 10, 800 1, 880, 000 17, 664, 000 1, 200	55, 700 126, 600 7, 580, 100 36, 100 37, 321, 100 237, 700
Total Other "lode" material: Old tailings, etc. <sup>2</sup> Copper precipitates	133	30, 533 33, 155	125, 524 516	8,006	375, 900 45, 124, 900	36, 200	10, 700
Total "lode" material Gravel (placer opera-	180	63, 688 52, 743, 215		1	45, 500, 800 908, 210, 000	36, 200 19, 634, 000	10, 700 45, 368, 000
Total, all sources.	187	52, 743, 215	127, 616	4, 634, 179	908, 210, 000	19, 634, 000	45, 368, 000

Detail will not necessarily add to totals because some mines produce more than 1 class of material.
 Old tailings: Copper, 29,580 tons; lead, 32 tons. Cleanings: Copper, 174 tons. Mill cleanings: Gold, 2 tons; copper, 19 tons; copper-lead-zinc, 54 tons; lead, 39 tons. Smelter cleanings: Copper, 633 tons.
 1 operation counted as a mine, the remainder of precipitates recovered from mines included in mine

count of copper ore.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery and types of material processed, in terms of recoverable metals

Type of material processed and method of recovery	Material treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode: Amalgamation <sup>1</sup> Cyanidation <sup>1</sup>	83	67 2, 653	31, 730			
Total recoverable in bullion		2, 720	31, 733			
Concentration and smelt- ing of concentrates 1	48, 537, 875	92, 218	3, 474, 383	746, 829, 600	17, 729, 700	45, 078, 800
Direct-smelting: OreOld tailings, etcCopper precipitates	649, 716 30, 533 33, 155	32, 079 516	1, 120, 052 8, 006	56, 362, 100 375, 900 3 45, 124, 900	1, 868, 100 36, 200	278, 500 10, 700
Total	713, 404	32, 595	1, 128, 058	101, 862, 900	1, 904, 300	289, 200
Other: Straight leaching of copper ore 4	3, 491, 853	83	5	59, 517, 500		
Grand total	52, 743, 215	127, 616	4, 634, 179	908, 210, 000	19, 634, 000	45, 368, 000

Ore only; no old tailings, etc., processed by this method in 1955.
 Included with concentration and smelting of concentrates.
 Distributed as follows: Occhise County, 392,700 pounds; Gila County, 23,534,200 pounds; Greenlee County, 6,106,000 pounds; Pinal County, 15,092,000 pounds.
 All from 1 plant in Gila County.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

A. For ore treated at mills

	Ore treated	Recoverabl	Recoverable in bullion		Concentrate	Concentrate shipped to smelters and recoverable metals	lters and reco	verable metals	
	(short tons)	Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
			BY COUNTIES	TIES					
Cochise Gila Graham Greenlee	4, 632, 319 7, 965, 407 18, 960 15, 838, 702			288, 961 141, 041 4, 667 491, 663	12, 756 1, 189 7, 970	256, 554 90, 696 15, 388 631, 228	75, 582, 600 89, 647, 700 96, 300 241, 627, 000	120, 700 12, 000 1, 356, 700	7, 068, 800
watutopa Monave Pima. Pinal Sants Cruz Xavapal	13, 206, 406 5, 247, 042 51, 988 1, 577, 030	61	31, 730	339, 316 265, 428 12, 238 76, 081	39, 864 13, 010 17, 323	796, 274 810, 777 152, 077 720, 678	21, 500 189, 940, 900 127, 377, 900 261, 100 22, 274, 600	2, 020, 900 4, 986, 400 9, 231, 800	2, 806, 600 8, 713, 200 23, 148, 900
Total: 1955 1984	- 48, 537, 958 - 42, 733, 153	2, 720 2, 337	31, 733 29, 301	1, 619, 458 1, 337, 628	92, 218 77, 302	3, 474, 383 2, 834, 323	746, 829, 600 654, 094, 635	17, 729, 700 14, 651, 200	45, 078, 800 41, 752, 200
		BY CLA	SSES OF O	BY CLASSES OF ORE TREATED	Q,				
Dry gold Dry silver Copper Copper-lead-zinc Copper-zinc Lead Lead Zinc	83 750 48, 149, 190 75, 616 310, 771	2, 653	31,730	(1) 24 1, 543, 362 12, 891 12, 891 13 62, 726	74, 759 74, 759 3 17, 429	3, 392 2, 562, 674 3, 179 33, 486 871, 087	8, 500 742, 250, 900 3, 570, 300 9, 670, 500 966, 500 20, 500	40, 400 10, 800 13, 300 17, 664, 000 1, 200	9, 300 126, 600 7, 384, 100 37, 321, 100 37, 321, 100
Total: 1956	- 48, 537, 958	2, 720	31, 733	1, 619, 458	92, 218	3, 474, 383	746, 829, 600	17, 729, 700	45, 078, 800

See footnote at end of table.

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able 10.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery (except placer) and classes	material processed, in terms of recoverable metals—Continued	TO THE RESERVE OF THE PROPERTY
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BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS	E SHIPPED	區	CTERS			
Dry gold Copper-lead Lead Zino.	(!) 1, 549, 260 25, 659 44, 465	74, 780 15, 616 1, 816	2, 591, 306 3, 509 768, 159 111, 402	745, 537, 000 25, 100 645, 270 622, 230	5, 700 41, 600 16, 671, 850 1, 010, 550	127, 400 2, 000 3, 387, 900 41, 561, 500
Total: 1955	1, 619, 458	92, 218	3, 474, 383	746, 829, 600	17, 729, 700	45, 078, 800
B. For copper ore treated by straight leaching	by straight	leaching				
	Ore treated		Reco	Recoverable metal content	ontent	
	(short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES	TIES					
Gila	3, 491, 853			59, 517, 500		
Total: 1986 1984	3, 491, 853 3, 127, 298			59, 517, 500 53, 812, 100		
C. For material shipped directly to smelters	directly to	smelters				
	Material		Reco	Recoverable metal content	ontent	
	shipped (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)

BY COUNTIES

31, 200	200	13,400 22,000 14,800 207,100	289, 200 1, 169, 800		46, 400 800 19, 900 196, 000 36, 100
251, 300	7,300	38,800 57,100 324,000 1,205,600 6,200 14,000	1, 904, 300 2, 118, 800		1, 400 1, 400 2, 700 17, 300 1, 866, 700 6, 500 6, 500 1, 904, 300
45, 063, 400 58, 000	24, 064, 800 1, 700 7, 633, 000	3, 223, 100 18, 916, 100 18, 916, 100 2, 443, 400 74, 000	101, 862, 900 101, 759, 365		70, 700 1, 217, 950 460, 900 64, 502, 450 45, 124, 900 188, 800 188, 800 188, 800 107, 700 12, 400 13, 900 101, 862, 900
1, 001, 320	3, 424 441 3, 102	1, 530 48, 364 29, 420 18, 899 20, 527 599	1, 128, 058 1, 435, 181		788 115, 303 13, 794 1, 066, 517 503 503 2, 789 2, 789 2, 789 1, 170 1, 170 1, 170 1, 128, 688
29, 857	14 2 63	77 958 976 576 23 706 318	32, 595 35, 092	נ	673 28 28 16 16 10 10 11 157 319 319 4
429, 038 924	45,021 111 71,236	3, 346 64, 817 63, 350 63, 350 4, 997 1, 670	713, 404 751, 639	MATERIA	3, 232 67, 516 67, 516 68, 685 68, 685 7, 686 83, 166 83, 166 83, 166 83, 166 84, 570 85, 580 85, 580
Cochise Coemino	Gila Graham Greniee. Vorione	M. M	Total: 1955. 1954.	BY CLASSES OF MATERIAL	Dry gold: Crude ore- Mill leanings Dry gold-silver ore- Dry gold-silver ore- Copper: Crude ore- Cleanings Mill cleanings And cleanings Copper-lead-sinc mill cleanings Copper-lead-sinc mill cleanings Crude ore-

1 Less than 1/2 ton.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

	Quantity					
Class of material	shipped or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zine (pounds)
CON	CENTRAT	E SHIPP	ED TO SM	ELTERS		, ,
Dry gold Dry silver	(¹) 24	6 18	7 3, 392	8,728	3	
Copper. Copper-lead-zinc. Copper-zinc.	1, 543, 362 180 12, 891	76, 192	2, 684, 030 3, 252 33, 828	762, 640, 554 28, 632 3, 716, 376	41, 997 15, 717	68, 560 142, 487 8, 779, 290
Leâd Lead-zinc Zinc	62, 726 262	18, 219 4	917, 268 522	1, 231, 101 22, 284	13, 581 18, 825, 558 1, 365	42, 753, 502 272, 912
Total: 1955 1954	1, 619, 458 1, 337, 628	94, 442 78, 614	3, 642, 375 2, 924, 307	767, 647, 793 615, 918, 474	18, 898, 221 15, 616, 848	52, 016, 751 48, 907, 202
ORE	TO STRAI	GHT LE	ACHING P	LANT		
Copper	3, 491, 853			67, 714, 874		
Total: 1955 1954	3, 491, 853 3, 127, 298			67, 714, 874 62, 368, 033		
ORES, E	TC., SHIP	PED DIR	ECTLY T	O SMELTE	RS	<del>'</del>
Dry gold:	9, 000	670	F00	74.000		
Crude ore Mill cleanings Dry gold-silver	3, 232 67, 516	673 25 720	788 19 15, 641	74, 260 80 1, 279, 405	162	
Dry silver Copper: Crude ore	24, 761 548, 685	30, 599	13, 794 1, 068, 806	463, 099 58, 953, 021	1,860 80	345, 96
CleaningsMill cleanings	174 19 <b>33,</b> 155	10 1	193 50	60, 252 6, 666 46, 013, 442		5, 994
Smelter cleaningsOld tailingsCopper-lead-zinc mill cleaningsCopper-zinc	633 29, 580 54	157 319	2,838 2,799 1,170	173, 641 169, 843 5, 417	4, 510 17, 620	12, 75
Copper-zinc Lead: Crude ore Mill cleanings Old tailings	952 4, 570 39 32	106 4	136 23, 514 409 528	109, 892 16, 437 1, 103 1, 609	1, 910, 768 9, 790 6, 630	251, 32 47, 21
Total: 1955	713, 404 751, 639	32, 630 35, 096	1, 130, 685 1, 435, 399	107, 328, 167 106, 348, 544	1, 951, 420 2, 169, 435	663, 26 1, 751, 41

<sup>1</sup> Less than 1/2 ton.

Lead.—A 5-year (1950-54) trend of declining lead output was reversed in 1955, when quantity increased 17 percent and value 27 percent over 1954. Despite this gain in 1955, output was only 29 percent of the 1949 figure, highest in the State history. The advance in prices for lead and zinc was the primary stimulus that increased output.

Shattuck Denn Mining Corp. at the Iron King lead-zinc mine in the Big Bug district (Yavapai County) continued to be the leading lead producer in Arizona. The American Smelting and Refining Co. Flux mine, in Harshaw district (Santa Cruz County), ranked second in lead output. The San Xavier mine (owned by Eagle-Picher Co.) in the Pima district (Pima County) was reopened in February and

operated throughout the remainder of the year by McFarland & Hullinger (lessee). The mine, ranking third in lead production, was idle in 1953 and 1954 because of the low market prices for lead and zinc. Output from these 3 mines, together with the Aravaipa mine operated by Athletic Mining Co. and the Glove mine operated by Sunrise Mining Co., furnished 95 percent of Arizona lead production.

Manganese and Manganiferous Ores.—Synthetic battery-grade manganese ore produced by the American Potash & Chemical Corp., Henderson, Nev., from ore mined by H. D. Abbot and manganese ore mined by the White Canyon Mining Co. and shipped to the General Services Administration (GSA) under the "carlot" program (40 percent or more manganese content) furnished the recorded

manganese-ore production.

In addition to this ore, 116,000 long dry tons of low-grade manganese and manganiferous ore valued at \$5.3 million was shipped from Arizona deposits to GSA at Deming, N. Mex., and Wenden, Ariz. Requirements were that this type of ore be purchased from domestic origin, amenable to beneficiation according to National Stockpile specifications, and contain 15 percent or more manganese. This ore was mined and shipped by many individuals and companies in 13 counties and will be recorded as production in the year the ore is treated and shipped as a useful product from the depot. The 6-million recoverable long-ton-unit quota for each depot under the low-grade manganese program was filled during 1955; the Wenden depot was closed April 29, whereas the Deming depot terminated purchase contracts November 30.

Mercury.—Output of mercury in Arizona, which was relatively small compared with national production, increased threefold over 1954. It came entirely from 2 counties—6 operations in Gila County and 2 in Maricopa County. The leading producer was the Pine Mountain mine in Maricopa County operated by the International Ore Corp.

Molybdenum.—As in 1954, all molybdenum produced in Arizona was a byproduct of copper mining by Bagdad Copper Corp. in Yavapai County, Miami Copper Co. in Gila County, and Morenci Branch of Phelps Dodge Corp. in Greenlee County. Shipments of molybdenum concentrate from the 3 mines were 3 percent less than 1954. Morenci continued to be the leading producer of molybdenum.

Silver.—The 8-percent increase in silver output over 1954 reflected directly the gain in copper production, because 78 percent of silver was recovered as a byproduct of treating copper ore. Of the remainder, 19 percent came from lead-zinc ore, 1 percent from ores of silver and gold, and the remainder from mixed ores of copper, lead, and zinc and from old tailings. The Copper Queen-Lavender Pit copper mine was by far the leading silver producer in Arizona followed (in order of output) by the Iron King lead-zinc mine and Morenci, New Cornelia, and Magma copper mines.

Tungsten.—Tungsten concentrate (60-percent WO<sub>3</sub> equivalent) produced by at least 70 individual mines in 8 counties in Arizona in 1955 was less than in 1954. Eighty-two percent of output came from Mohave and Yavapai Counties. The Boriana mine in Mohave County, operated by Dye & Bathrick, and the Tungstona mine in Yavapai County, operated by Hillside Mining & Milling Co., were

by far the principal producers of tungsten in the State.

Uranium.—Mining of uranium ore remained concentrated in Apache County; small quantities were shipped from Gila, Maricopa,

and Coconino Counties.

Two-thirds of the totaling 950,000 feet of exploration drilling was carried out in the Cameron district of Coconino County; the other third was conducted primarily in Apache County, but some drilling was also reported from Gila, Graham, Navajo, Pima, and Santa Cruz Counties.

Ore from Arizona was shipped to mills at Durango, Colo., and Shiprock, N. Mex., for processing. At Cutter, Gila County, an Atomic Energy Commission (AEC) buying station was established in July; at Tuba City, Coconino County, construction was begun on a buying station and mill.

Vanadium.—Vanadium was mined in Arizona as a coproduct of uranium from the Monument No. 2 mine of Vanadium Corp. of

America; ore was shipped to Durango, Colo., for processing.

Zinc.—After the decline in 1954 under 1953, zinc output rose in 1955, increasing 6 percent in output and 20 percent in value. The Iron King mine at Humboldt, operated by Shattuck Denn Mining Corp. (Iron King Branch), continued to be the leading zinc producer. Other major zinc producers in order of rank were Flux (American Smelting and Refining Co.), Republic-Mammoth-Moore (Coronado Copper & Zinc Co.), and Aravaipa (Athletic Mining Co.). After being closed down during 1953 and 1954 the San Xavier mine was reopened in 1955 and became a substantial zinc producer.

#### **NONMETALS**

Asbestos.—Output of asbestos continued to rise, increasing 41 percent over 1954. Mainly because a local market was established at the Globe Depot by GSA in conformance with the national strategic stockpiling program, mining activity increased during the year. properties operated during both 1954 and 1955. The average price received for all grades of asbestos dropped from \$345.13 a ton in 1954 to \$237.47 in 1955 owing mainly to considerably increased production of Grade 4, filter fiber, and shorts. The Western Chemical Co., working the dumps and underground mines of the old Chrysotile group, was the leading shipper. It reactivated the mines and mill operated by Johns-Manville Co. during World War II and produced shorts for the west coast market. A significant quantity of Grades 2 and 3 fiber was sold to the Government depot at Globe. Jaquays Mining Corp. ranked second as a producer in terms of tonnage and was the leading shipper of Grades 1, 2, 3, and filter fibers. Throughout the year, crude fiber-bearing material from the Regal mine was trucked 47 miles to the company mill at Globe. Metate Asbestos Corp. was also an important producer, followed by Phillips Asbestos Mines, American Fiber Corp., Kyle Asbestos Mines of Arizona, and many other smaller companies, all in Gila County.

Barite.—Macco Corp. discontinued mining and milling at the Granite Reef mine on July 5, 1955, because of low-grade ore and moved part of the mill machinery to California. Output was considerably below that in 1954; ground barite was used mainly in oil-well-drilling

mud and glass manufacture.

Cement.—Shipments of types I and II portland cement by Arizona Portland Cement Co. at Rillito increased 16 percent over 1954. Demand for cement by the construction industry in the State remained strong. Employment reached an average of 111 men who worked 365 days. Forty-two men were engaged in quarrying and crushing limestone; and the labor of 69 men was utilized in cement, auxiliary,

and administration at the manufacturing plant.

Clays.—Output of all types of clays in 1955 increased only slightly over 1954; value of bentonite (nonswelling type) furnished most of the income. The Sanders open-pit mine of C. A. McCarrell, Apache County, was sold to Alba Mining Corp., subsidiary of Filtrol Corp. of Los Angeles, Calif. Miscellaneous clay ranked second in production and came from Maricopa and Pima Counties; 4 tons of fire clay was reported by the Gila Pottery Co., Gila County. Bentonite from Apache County was shipped to a processing plant in California and used in oil refining. Miscellaneous and fire clay were mined by companies also engaged in brick manufacturing; output was used in making building and other structural-clay products, pottery, and high-grade tile.

Diatomite.—Superlite Builders Supply Co. of Phoenix reported production of ground diatomite at the White Cliffs open-pit deposit in Pinal County. All diatomite was crushed to ½-inch at the mine and

used as an extender in manufacturing concrete blocks.

Feldspar.—Feldspar production increased 28 percent over 1954; the entire output was consumed in manufacturing pottery, enamel, and other ceramic uses. Consolidated Feldspar Department, International Minerals & Chemical Corp., sole producer of this mineral commodity, ground the crude material at its mill at Kingman.

Fluorspar.—The closing of the fluorspar custom mill at Deming, N. Mex., operated by the Allied Chemical & Dye Corp., forced all Arizona mines to suspend mining in 1955. The closing of the mill, the only local outlet for fluorspar producers of the region, was due

to competition from foreign producers.

Gem Stones.—In 1955 the Bureau of Mines expanded its statistical canvass of gem- and ornamental-stone producers to include all collectors, mineralogical societies, and dealers. Arizona ranked fourth in production of gem or ornamental stones with a value of \$97,000. Gila County led in production which was reported in nine counties. Maricopa ranked second, followed by Apache, Yavapai, Yuma, and Greenlee Counties. Some material was reported in Coconino, Pima, and Pinal Counties. Turquois led in value followed by amethyst. Jasper, serpentine, peridot, agate, chalcedony, quartz crystals, petrified wood, hypersthene, and white jade were also reported.

Gypsum.—Sales of gypsum gained 13 percent over 1954. Arizona Gypsum Corp., Pinal County, was the chief producer; all output went into manufacturing cement. Garcia & Peters Gypsum Co., Pinal County, reported the sale of a few thousand tons of agricultural

gypsum.

Lime.—The demand for lime in treating base-metal ores and in a multitude of chemical applications continued in 1955. Sales of hydrated and quicklime increased 26 percent. Four plants—Paul Lime Plant (Cochise County), Hoopes & Co. (Gila County), Phelps

Dodge Corp. (Greenlee County), and United States Lime Products Corp. (Yavapai County)—supplied the entire output. Quicklime, used mainly at copper-flotation mills and smelters, was the principal type of lime produced. Of the 112,000 tons of lime sold or used in Arizona in 1955, producers sold 80,000 tons and used 32,000. Shipments of lime were made to consumers in California, New Mexico,

Texas, Mexico, and Hawaii.

Mica.—Output of scrap mica dropped from 1,700 tons in 1954 to 1,400, decreasing 18 percent. Production declined because of the cost of producing and shipping good-quality ground mica to west coast markets. Buckeye Mica Co., near Buckeye in Maricopa County, the only active producer, mined its mica deposits and ground the scrap mica at its mill. Ground mica was shipped to consumers for use in paint, roofing, rubber, wallpaper, axle grease, insulation, plastics, and pipeline enamel. The Mica Hill mine and the grinding plant at Kingman of Huntly Industrial Minerals, Inc., were idle in 1955.

Perlite.—Production and shipments of perlite increased sevenfold over 1954; output reached one of the highest peaks in recent years. This remarkable increase was due mainly to the activities of Perlite Industries of Arizona, Inc., at its Tony pit in Pinal County and its expanding plant in Maricopa County. For this company, crude production rose from 964 tons in 1954 to 9,500 in 1955; expanded perlite (used in plaster and concrete aggregate) increased from 200 tons to 1,400; sales of crude moved from none in 1954 to 8,000 tons in 1955. Lee's Perlite Industries, Inc., also reported production from the Little Gem mine and from the expanding facilities in Pinal County. Superior Industries, Inc., worked the Mary T and Sandy No. 2 mines also in Pinal County. The latter mines were leased from Chemi-Cote Perlite Corp., which stopped mining at the beginning of 1955.

Pumice.—Utilization of scoria in concrete aggregate and in manu-

Funice.—Utilization of scoria in concrete aggregate and in manufacturing concrete blocks increased slightly over 1954. Superlite Builders Supply Co. of Phoenix was the chief producer in Yavapai County. Gila Valley Block Co., Graham County, produced several thousand tons of scoria in connection with its block-manufacturing

activity.

Sand and Gravel.—Income to the mineral industry of the State from the quarrying, preparation, and use of sand and gravel amounted to \$6.5 million in 1955. Sand and gravel ranked second in value of output in the State. Of the 7.8 million tons produced, 3.8 million tons was classed as commercial production; 4 million tons was Government-and-contractor output used for highway construction. Maricopa County led in production, supplying 37 percent of the entire output. Pima County ranked second, followed by Pinal, Gila, and Yuma. The five leading commercial producers were Superior Sand & Gravel Division of Fisher Contracting Co., Arizona Sand & Rock Co., Acme Materials Co., Union Rock & Materials Co., Inc., and San Xavier Rock & Sand Co. An average of 516 men was employed by commercial producers; length of employment ranged from 30 to 300 days.

Stone.—Arizona stone production rose from 1.2 million tons in 1954 to 1.6 million tons. It was comprised of 1 million tons of crushed limestone, 315,000 tons of crushed sandstone, 199,000 tons of crushed miscellaneous stone, 42,000 tons of dimension sandstone, 39,000 tons

of crushed granite, and 40 tons of crushed marble. Increased construction activity was the reason for the 33-percent gain in output in 1955. Government-and-contractor stone used in highway construction showed the largest percentage increase. Sixty-three percent of crushed limestone was used mainly as a fluxing medium and was quarried in Cochise, Gila, Greenlee, Pima, and Yavapai Counties. Large quantities of limestone were also consumed in manufacturing cement and lime and in concrete aggregate. Dimension and crushed sandstone supplied 22 percent of output for use in highway construction and building purposes; miscellaneous stone and crushed granite furnished 12 and 2 percent, respectively.

Vermiculite.—No crude vermiculite was reported in Arizona during 1955, but the Ari-Zonolite Co. exfoliated crude vermiculite from

Montana at its plant at Glendale, Maricopa County.

### MINERAL FUELS

Keams Canyon No. 4 and Cow Spring No. 2 mines in Navajo

County produced 8,898 tons of coal.

In the Boundary Butte area of Apache County, Humble Oil & Refining Co. drilled Arizona's only completed well in 1955. The well, No. 1 Navajo Tribal (sec. 4, T. 1 N., R. 28 E.), was successful, with an initial test of 4 million cubic feet of gas and 47 barrels of oil with an initial test of 4 million cubic feet of gas and 47 barrels of oil

per day. Production came from the Paradox formation.

A review of the mineral-fuels resources of the Navajo and Hopi Indian Reservations of northern Arizona and part of Utah was published. The review included a description of coal mines of the area, coal reserves, and their possible utilization under varying economic conditions. Additionally, the stratigraphy, geologic structure, and oil and gas potential of the Black Mesa and Paradox Basins were discussed.

## REVIEW BY COUNTIES

Apache.—The mining of bentonite from an open pit near Sanders by Alba Mining Corp. (formerly C. A. McCarrell) was the principal operation in Apache County during 1955. Production of noncommercial sandstone by the Federal Bureau of Indian Affairs ranked second as a source of income to the mineral industry; output of gem or ornamental stone ranked third. Ben Cash and Petrified Wood Products Co. produced peridot and petrified wood, respectively. The Federal Forest Service let contracts to private contractors for production of a small tonnage of sand and gravel.

Apache County supplied almost the entire Arizona uranium production in 1955. Vanadium Corp. of America produced more than half of the entire output from the Monument No. 2 mine. It upgraded the ore and shipped the product by truck to its mill at Durango, Colo. Vanadium Corp. of America also produced considerably smaller quantities from the Cove Mesa and Rattlesnake mines.

Following the Monument No. 2 mine in importance were the Bee Sho Shee (Bee Sho Shee Mining Co.), the Mesa Group (Kerr-McGee Oil Industries, Inc.), the Frank No. 1 (Climax Uranium Co.), and the

Work cited in footnote 3.

Cisco (Walter Duncan Mining Co.). Most of the ore from these and other mines was shipped to the mill at Shiprock, N. Mex.

A small quantity of low-grade manganiferous ore was mined by Emilio Garcia from the Garcia mine and shipped to the Deming, N. Mex., Government Purchase Depot.

TABLE 12.—Value of mineral production in Arizona, 1954-55, by counties 12

County	1954	1955	Minerals produced in 1955 in order of value
Apache	\$775,886	\$731,066	Clays, stone, gem stones, sand and gravel.
Cochise	30, 369, 213	49, 677, 664	Copper, gold, silver, zinc, lime, stone, lead, tung sten.
Coconino	179, 244	64, 045	Stone, copper, silver, sand and gravel, gem stones
Gila	39, 533, 953	66, 684, 347	Copper, asbestos, molybdenum, lime, stone, silver sand and gravel, gem stones, gold, mercury, lead clays.
Graham	591,743	674, 745	Zinc, lead, copper, silver, pumice, tungsten, gold
Greenlee	69, 597, 064	95, 328, 130	Copper, molybdenum, silver, lime, gold, stone sand and gravel, gem stones.
Maricopa	2, 376, 203	3, 315, 210	Sand and gravel, barite, stone, clays, mercury, gen stones, mica, copper, tungsten, gold, silver.
Mohave	263, 508	427, 067	Tungsten, copper, stone, feldspar, lead, gold, silver zinc.
Navajo	31, 301	104, 443	Coal, sand and gravel.
Pima	54, 747, 243	82, 748, 688	Copper, cement, gold, sand and gravel, silver stone, zinc, lead, clays, tungsten, gem stones.
Pinal	41, 165, 484	56, 209, 900	Copper, silver, gold, sand and gravel, perlite, gyp- sum, stone, lead, tungsten, diatomite, zinc, gen stones.
Santa Cruz	1, 930, 426	2, 324, 005	Zinc, lead, copper, silver, gold.
Yavapai	11, 774, 272	16, 510, 609	Copper, zinc, lead, gold, silver, stone, pumice tungsten, lime, molybdenum, gem stones, beryl columbium-tantalum, sand and gravel.
Yuma	78,909	99, 088	Tungsten, copper, sand and gravel, gold, gen stones, lead, silver.
Undistributed	1, 746, 876	4, 332, 066	
Total	3 254, 479, 000	3 378, 277, 000	

<sup>&</sup>lt;sup>1</sup> Value data of some beryl (1954), gem stones (1954 and some in 1955), 35 percent or more manganese concentrate (1955), natural gas (1955), some sand and gravel (1955), some stone (1954), some tungsten (1954), and vanadium that cannot be assigned to specific counties are excluded from county totals and included with "Undistributed."

Value of low-grade manganese ore shipped to GSA Purchase Depots and uranium ore is excluded.
 The total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing cement and lime.

Cochise.—As in 1954, Cochise County was the leading gold and silver producer, ranked third in zinc output, and ranked fifth in copper and lead production. These 5 metals were produced by 11 mines

in the county; output was greater than in 1954.

The Copper Queen-Lavender Pit of Copper Queen Branch of Phelps Dodge Corp. at Bisbee in the Warren district continued to lead in value of overall mineral output in the county and in gold and silver output in the State; it ranked third in copper production in the State. The corporation stated in its annual report for 1955 that 56,425,391 and 59,862,955 pounds of copper was produced from the Copper Queen underground and Lavender open-pit mines, respectively, compared with 63,001,554 and 17,056,589 pounds, respectively, in 1954. During 1955, 546,001 tons of ore was mined from the Copper Queen and 4,433,218 tons of ore, 3,538,246 tons of leach material, and 4,475,715 tons of waste were removed from the Lavender Pit. According to the corporation, at this rate of ore production, the estimated remaining life of the pit on the basis of ore reserves was about 8 years.

The Republic-Mammoth-Moore mine near Dragoon in the Cochise district, operated by Coronado Copper & Zinc Co., ranked second in mineral output in the county and was one of the chief zinc and copper producers in the State in 1955; it ranked third and twelfth in zinc and copper output, respectively. A total of 73,311 tons of copperzinc ore was mined and milled in its 200-ton-per-day flotation mill; the yield of 5,682 tons of copper concentrate and 6,207 tons of zinc concentrate was shipped to El Paso, Tex., and Bartlesville, Okla., smelters, respectively. In addition, 1,817 tons of copper ore was

shipped directly to the smelter.

Mines that were idle in 1955 were the Hilltop lead-zinc mine in the California district (operated by Queen Mining Co. in 1954), the Scribner lead mine in the Swisshelm district, and all mines producing small quantities of gold, silver, copper, lead, and zinc in the Tombstone district. Six mines were active producers of gold, silver, copper, lead, and zinc in the Turquoise (Dragoon Mountains) district; the Shannon mine operated by Shannon Mining Co. was the largest mine. In the Whetstone district, the Nevada and Mascot mines were operated throughout the last half of 1955 and Wilson & Schaaf made a small shipment of copper ore to the smelter from the Shaddock No. 1 mine.

Coconino.—Three nonmetals, stone, gem stones, and sand and gravel, as a group furnished 66 percent of value of the entire mineral output of Coconino County. Maintenance crews of the county highway department produced the entire output of sand and gravel. Coconino County continued to be one of the few sources of good-quality dimension sandstone in the State. Rough and dressed building stone, rubble, and flagging comprised the stone products used by the local building trades and California consumers.

Superlite Builders Supply Co. suspended scoria-mining activities because of the high cost of shipping low-quality material to the Phoenix market. M. Baker of Flagstaff produced a small quantity

of petrified wood.

Although little uranium ore was produced in the county during the year, the Cameron area was the center of most of the State drilling activity directed toward the search for and blocking out of new ore reserves. Most producers preferred to withhold production until completion of the buying station and mill at Tuba City rather than pay for long-distance shipment to Shiprock and Bluewater, N. Mex.

Exploration and development drilling totaled 650,000 feet in the Cameron district and was carried out primarily by Arrowhead Uranium Co. (subsidiary of Rare Metals Corp. of America), Minerals Engineering Co., Utco Uranium Corp., A & B Mining Corp., and

McCary-Beacon Co.

Rotary noncore and wagon drilling was used extensively. Because of the flat and easily drilled ground, the shallow depths (50–100 feet) and the high footage per rig-day (1,000–2,000 feet), contract costs in general were low (\$0.60–\$0.80 per foot). Consequently, drilling was used as a reconnaissance exploration tool to a much greater extent than in other parts of the Colorado Plateau.

In the Marble Canyon area, exploration was carried out at the Thomas No. 1 mine (Gunsite Butte Uranium Corp.) and on the Sun

Valley group of claims (Upetco Uranium Petroleum Co.)

Rare Metals Corp. of America began constructing a buying station and processing mill at Tuba City. The company, controlled by El Paso Natural Gas Co., was granted an Office of Defense Mobilization (ODM) permit of rapid tax amortization to the extent of 80 percent of \$2.4 million for the Tuba City mill.

Small quantities of low-grade manganese and manganiferous ore were mined and shipped to the Deming, N. Mex., and Wenden, Ariz.,

Government Purchase Depots.

Gila.—The value of mineral production in Gila County increased 69 percent above 1954, mostly because of the 71-percent gain in copper output. Copper supplied 97 percent of the value of mineral production in the county and 19 percent of the value of copper output in Arizona. Other metals produced in the county included gold, silver,

molybdenum, lead, and mercury.

The Inspiration Consolidated Copper Co. Inspiration mine in the Globe-Miami district continued to be the leading copper producer in the county and ranked fifth in the State. According to the report for the year ended December 31, 1955, the company produced 76,228,125 pounds of copper by treating ore from the Inspiration open pit, by leaching-in-place of ore in mined-out areas, and by leaching copper-bearing material in dumps stripped from the open pit. This copper output was 12 percent more than in 1954. For the first full year in the history of the company, the entire production of ore came from surface mining. The company reported that 3,731,027 tons of ore was mined and 11,517,613 tons of overburden stripped (11 and 10 percent, respectively, above 1954). The ore mined averaged 0.974 percent copper, compared with 1.001 percent in 1954. An intensive development program, consisting of driving underground openings and diamond drilling from the surface and underground at the Christmas mine, was conducted during the latter half of the year by the company.

The Copper Cities mine of Copper Cities Mining Co., wholly owned subsidiary of Miami Copper Co., completed its first full calendar year of production and rose from tenth in copper production in the State in 1954 to sixth in 1955. The company annual report stated that 55,097,164 pounds of copper, 38,824 fine ounces of silver, and 356 ounces of gold were recovered from the 4,004,052 tons of ore (total copper content of 0.824 percent) mined by open-pit methods from the Copper Cities deposit in 1955. In addition, 181,294 pounds of copper was recovered from the lime treatment of industrial water. Overburden stripped from the ore body totaled 3,347,720 tons.

The Miami Copper Co. Miami mine ranked third in copper production in Gila County and produced 39,166,321 pounds of copper in 1955, according to its annual report for 1955. Further progress was made in the transition from mining in the old section of the mine to mining the low-grade ore body, so that by the end of the year the latter was contributing 81 percent of the ore mined. Copper recovered by acid leaching of previously mined areas furnished 14 percent of Miami's production. Small quantities of copper were recovered as hydroxide precipitates by lime treatment of industrial waters, and also were recovered by lessees on company claims. In addition to the copper output, the company produced 425,239 pounds of molybdenum by re-treating copper-sulfide concentrate.

Castle Dome Copper Co., Inc., subsidiary of Miami Copper Co., at the Castle Dome mine, confined its activity to water-leaching the mine dumps. Recovery was increased by installing material-handling equipment and by expanding the system of solution distribution to the dumps. Copper recovered in 1955 totaled 2,229,277 pounds.

In addition to these 4 mines, 14 smaller mines produced gold, silver, copper, and lead. Many of these were worked as part- or spare-time

jobs or as assessment work only on the claims.

Probably more than 40 mines obtained and shipped manganese and manganiferous ore from deposits in the county to the Deming, N. Mex., Government Purchase Depot under the low-grade manganese purchase program. A total of 4,516 long dry tons of ore containing an average manganese content of 25.7 percent and 99 tons of ore averaging 42.9 percent manganese was shipped during the year.

A small quantity of mercury was produced by six producers in Gila County in 1955. Uranium Enterprises, Inc., and Arizona Cinnabar Corp. were the two principal mercury producers and furnished most

of the output.

Asbestos, lime, sand and gravel, stone, gem stones, and clays supplied only 2 percent of mineral-production value. The county continued to be the only asbestos-producing area in Arizona and, as in past years, output came from 13 mines and 7 mills near Globe. Mostly grades 4, 5, 7, and filter fiber were sold, but production of Grades 1, 2, and 3 for the Government stockpile continued. Companies processing asbestos-bearing rock included Western Chemical Co., Jaquays Mining Corp., Phillips Asbestos Mines, Metate Asbestos Corp., Crown Asbestos Mines, Inc., Kyle Asbestos Mines of Arizona, and American Fiber Corp.

Lime ranked second in nonmetals and was produced at the Globe plant of Hoopes & Co.; output was nearly three times greater than in 1954. Chemical quicklime only was sold mainly for use as a reagent in milling copper ore. All 60,000 tons of sand and gravel was quarried by the Gila County Highway Department from pits near Globe. The remainder of the county nonmetallic output was mainly limestone used in manufacturing lime, in concrete aggregate, and for miscellaneous stone in highway construction. A small quantity of dimension sandstone used as building stone was also produced. Gila Pottery Co. reported 4 tons of fire clay used in pottery and tile.

Gila County led in production value of gem or ornamental stones turquois, peridot, serpentine, and hypersthene. The Globe-Miami

region was the center of production.

Exploration and development of uranium deposits north of Globe in the Dripping Springs quartzite deposit were carried out; initial shipments of ore were made. In July an AEC buying station was opened at Cutter on the Southern Pacific Railway east of Globe to receive ore from the Globe area. Some of the properties reporting shipments were: Hope and Workman (Arizona Continental Uranium, Inc.), Lost Dog (Blue Bonnet Uranium Corp.), Lucky Stop (Lucky Stop Mining Co.), Sue (Arizona Globe Uranium, Inc.), and Black Brush (Western Mining & Exploration Co.).

Graham.—Lead-zinc ore from the Athletic Mining Co. Aravaipa group in the Aravaipa district continued to be the main source of mineral-production value. The company reported that 18,960 tons of ore containing 1,949,104 pounds of lead and 4,804,505 pounds of zinc was mined. The ore, treated in the company 125-ton-per-day selective flotation mill, yielded 1,380 tons of lead concentrate containing 1,384,301 pounds of lead and 3,287 tons of zinc concentrate containing 3,623,578 pounds of zinc. At the mine, the company conducted development work which included 375 feet of shaft, 900 feet of drifts, and 850 feet of diamond drilling.

Grant Godfrey and Ace Building & Roofing Supplies mined and shipped manganiferous ore from the Crescent No. 1 and No. 2 mines to the Deming, N. Mex., Government Purchase Depot under the

low-grade manganese purchase program.

The low price for domestic fluorspar resulted in the closing of the last mine in the county. Spar Mining Co. at Fort Thomas, active during 1954, was forced to cease mining activity owing to increasing costs and lack of a local market. Gila Valley Block Co. produced pumice (scoria) from a pit near Safford and used the entire output in manufacturing concrete block.

Near Safford, A. H. Haralson, Jr., did exploratory churn drilling and tunneling in search of uranium on the Flat Tire and Canute

claim groups.

Greenlee.—The value of copper output in Greenlee County increased from \$67.5 million in 1954 to \$93.0 million in 1955 and supplied 98 percent of mineral-production value. The Morenci mine of the Morenci Branch, Phelps Dodge Corp., supplied most of this copper, and ranked first in copper and molybdenum, third in silver,

and fifth in gold output in the State.

The Phelps Dodge Corp. annual report to stockholders stated that 49,048,202 tons of material was removed from the Morenci open-pit mine in 1955; 15,899,410 tons was ore and the remainder waste and leach material. The concentrator treated 15,838,702 tons of ore and the smelter 500,027 tons of concentrate. The corporation produced 248,826,556 pounds of copper from the Morenci. The molybdenum plant produced 891 tons of molybdenite concentrate as a byproduct of the copper concentrate.

In the nonmetallic field, the mineral industry of the county produced lime, stone, gem stones, and sand and gravel. The county ranked second in the State in the production of limestone, which led

in value of production in the county.

In addition to lime, large quantities of crushed sandstone used as a fluxing medium and crushed limestone used in manufacturing lime were produced by Phelps Dodge Corp. in connection with its coppermining operations.

The fluorspar industry of the county was dormant in 1955 owing to the lower price for domestic fluorspar. Gem and ornamental stonesagate, chalcedony, and jasper-collected in the region were valued at

\$2,500.

Manganese and manganiferous ore were obtained from 12 mines in the county and shipped to GSA at Deming, N. Mex., under the low-grade manganese purchase program. A total of 676 long dry tons of ore averaging 25.3 percent manganese and valued at \$21,000 and 1,011 tons averaging 37.6 percent manganese and valued at \$74,000 was mined and shipped.

Maricopa.—Nonmetals supplied 96 percent (\$3.2 million) of mineral-production value in Maricopa County during 1955. In terms of value, sand and gravel continued to be the leading mineral commodity. Production, amounting to 2.9 million tons, was classified as commercial. The principal commercial producers were Superior Sand & Gravel Division and Glendale Sand & Gravel Division of Fisher Contracting Co., Arizona Sand & Rock Co., Acme Materials Co., and Union Rock & Materials Co.

Because of low-grade ore, the Granite Reef mine of Macco Corp. shut down; the mill equipment was moved to California. During the first half of 1955 several thousand tons of ground barite was

produced for use in oil-well drilling.

Clay production consisted entirely of miscellaneous clay used for manufacturing building brick and other structural-clay products. Output of raw clay continued to climb, increasing 7 percent over 1954. Wallapai Brick & Clay Products, Inc., and Western Clay Products Co., Inc., both of Phoenix, were the only mining companies. A third company, Phoenix Brick Yard, used only clay purchased from out-of-State sources to manufacture brick.

Output of ground mica in Maricopa County decreased somewhat from the 1954 total. Buckeye Mica Co. mined and shipped all the crude mica to its Buckeye plant for grinding. The ground mica was sold to west coast consumers for use as insulation, and in paint, roofing, axle grease, wallpaper, and plastics. The Ari-Zonolite Co. exfoliated crude vermiculite that had been mined in Montana at its Glendale plant.

In Maricopa County, 174,000 tons of stone was produced for constructing and maintaining highways. Phil Allen Sand & Gravel Co. crushed granite, the State highway department crushed limestone, and W. R. Skousen crushed miscellaneous stone. All material was

used as a constituent in concrete aggregate.

Gem and ornamental stone produced in the county, valued at \$19,000, included jasper, agate, chalcedony, amethyst, and marble. Bickle & Manley shipped a small quantity of uranium ore from the

B & M No. 1 mine.

Substantial quantities of mercury were produced in the county from the Pine Mountain mine by International Ore Corp. and from the Sunnyside mine by West End Opoteca Mines Co. in 1955. The mercury was shipped to Chemical Manufacturing Co., Inc., and Mefford Chemical Co.

Because the mining of manganese and manganiferous ore from deposits in the county for shipment to GSA at Wenden, Ariz., and Deming, N. Mex., under the low-grade manganese purchase program provided employment for a large number of persons, this Government program was important to the mineral industry of the county. Shipments totaled 6,515 long dry tons of ore averaging 25.4 percent manganese valued at \$268,000 and 2,118 tons averaging 42.3 percent manganese valued at \$192,000.

Mohave.—Fourteen tungsten producers supplied over half of the mineral-production value in the county; Dye & Bathrick at the Boriana mine was the leading producer. Three others (A. D. Allen, Allen & Harper, and Wothree Mines) each had outputs exceeding 100

units of WO<sub>3</sub>.

Mohave County continued to lead in quantity of low-grade manganese and manganiferous ore mined and shipped to GSA Depots at Wenden, Ariz., and Deming, N. Mex. A total of 48,450 long dry tons of ore averaging 30 percent manganese valued at \$2,276,000 and 948 tons averaging 37.6 percent valued at \$73,000 was shipped. The ore came mostly from the Black Jim McGregor, McGregor, Price, Priceless, and Needle Eye mines; the leading producers were F. A.

Sitton and Mohave Mining & Milling Co.

Stone and feldspar comprised the nonmetallic minerals produced in 1955, and these minerals furnished 21 percent of the value of all minerals for the county, compared with 34 percent for nonmetals in 1954. Silica (quartz), the only stone reported, was quarried at the International Minerals & Chemical Corp. pit near Kingman. All output was shipped to west coast markets and used in manufacturing enamel, pottery, and other ceramics. In connection with its silicamining operations, International Minerals & Chemical Corp. continued to mine, process, and sell feldspar from its Kingman properties. The grinding plant near the mine employed 7 men for 320 days; 8 men worked 310 days at the mine.

Huntley Industrial Minerals, Inc., Mica Hill mine and its grinding

plant at Kingman were idle throughout 1955.

The combined value of gold, silver, copper, lead, and zinc output in the county increased from \$35,000 in 1954 to \$91,000 in 1955. The number of active mines increased from 11 to 14. Edwin P. Dillard, at the Cleopatra mine, Mohave Enterprises, Inc., at the Emerald Isle mine, and Fontaine-Cupel Uranium Co. at the De La Fontaine

mine were the three leading producers of these metals.

Pima.—The value of mineral production increased 51 percent (\$28 million) above 1954 mostly because of a 55-percent increase (\$25.6 million) in the value of copper output. Copper furnished 87 percent of the mineral-production value in the county. New Cornelia (Phelps Dodge Corp.), Silver Bell (Silver Bell Unit of American Smelting and Refining Co.), and Mineral Hill-Daisy-Copper Queen (Banner Mining Co.) mines produced 99 percent of the copper in Pima County and 21 percent in the State.

According to the Phelps Dodge Corp. annual report, the New Cornelia open-pit mine at Ajo produced 24,938,608 tons; 10,274,836 tons was ore and the remainder waste. The concentrator treated 10,269,236 tons of ore and the smelter 234,838 tons of concentrate. Copper production from the New Cornelia mine was 140,443,730

pounds compared with 123,170,133 pounds in 1954.

The Silver Bell mine ranked second as a copper producer in the county and eighth in the State and was operated by the American Smelting and Refining Co., for its first full year in 1955. Banner Mining Co. at the Mineral Hill-Daisy-Copper Queen mine ranked third in its substantially increased copper output, compared with 1954. The company completed the 500-ton-per-day flotation mill, which began producing in May 1954 and was active throughout the year.

Cement was the principal nonmetal produced in Pima County in 1955. The Arizona Portland Cement Co. plant at Rillito was active throughout the year; shipments were 15 percent greater than in 1954.

Demand for construction materials by the building trades in the

county was reflected in the sand and gravel, stone, and clay industries; significant gains were reported for each commodity in 1955. Of the 911,000 tons of sand and gravel produced, only 97,000 tons was produced by construction and maintenance crews of the county highway department; the remainder came from commercial operators. The commercial producers, supplying 81 percent of the entire output, were Tucson Rock & Sand Co., San Xavier Rock & Sand Co., and L. M. White Contracting Co. Limestone, used to manufacture cement, was the principal stone reported; all output was quarried and consumed by Arizona Portland Cement Co.

Brick companies, in addition to manufacturing building brick and other structural-clay products at its plants, furnished the entire clay output from Pima County in 1955. The leading miscellaneous-clay (the only type of clay mined) producers, in order, were Grabe Brick Co., Tucson Pressed Brick Co., and Louis DeVry & Son, all of

Tucson.

Most of the lead and zinc output came from the San Xavier mine operated by McFarland & Hullinger (lessee). This mine, reopened in February 1955 following 2 years of inactivity, ranked third in lead production and fifth in zinc output in the State. Other mines that produced smaller quantities of lead and zinc included the Tiger, Conglomerate, Tit-For-Tat, and Atlas mines.

Tungsten was produced by at least 15 mines. The leading Big Banana mine was operated by W. H. Coplen. Small quantities of low-grade manganese and manganiferous ore valued at \$46,700 were mined by 6 companies in Pima County and shipped to GSA at Deming, N. Mex., and Wenden, Ariz., during 1955. A large part of the ore

came from the Black Widow mine.

Thornburg Bros. was active developing the Blue Rock uranium mine on the east slope of the Tanque Verde Mountains. An incline

shaft and drift were driven and some material was stockpiled.

Pinal.—The value of mineral production in Pinal County increased \$15 million (37 percent) above 1954 because of a similar increase in value of copper output, which furnished 97 percent of the value of all mineral commodities produced in 1955. Pinal County ranked third in silver and fourth in copper and gold in value of State output. Other commodities, in order of value of output, included: Sand and gravel, perlite, gypsum, stone, lead, tungsten, diatomite, zinc, and

gem stones.

The Ray mine (operated by the Ray Mines Division of Kennecott Copper Corp.), ranking fourth as producer of copper in Arizona, supplied a large part of the copper output in the county. The corporation annual report for 1955 stated that the Ray mines produced 48,983 tons of copper, compared with 40,259 tons in 1954. A total of 4,818,358 tons of ore was mined and milled in 1953, compared with 4,425,120 tons in 1954. The mine was converted to an open pit at the close of 1954; all underground mining was terminated January 28, 1955. Leaching of the caved areas of the old underground workings was begun early in the year and resulted in recovering an increased quantity of precipitate copper. In 1955, 7,546 tons of precipitate copper was produced, compared with 3,644 tons in 1954.

The San Manuel Copper Corp. completed constructing its concentrator at the San Manuel mine in September 1955; trial runs on stock-

piled ore were begun. By the end of the year, plant construction was completed, except for minor details. Smelting of copper concentrate

was scheduled for soon after the close of the year.

The Magma mine of Magma Copper Co. ranked second in county output. According to its annual report for 1955, the company produced 48,001,819 pounds of copper; output was considerably below the 54,185,953 pounds in 1954. In addition to copper, 486,782 fine ounces of silver and 11,377 ounces of gold were recovered from Magma ore in 1955.

The Copper Butte mine, operated throughout the year by Copper Butte Mining Co., was a substantial producer of copper. Most of the lead and zinc output came from the Ray Silver Lead mine. Gold, silver, copper, lead, and zinc were produced from 23 mines in Pinal County in addition to the 4 mines described—Ray, Magma, Copper

Butte, and Ray Silver Lead mines.

Pinal County was the source of all the gypsum and perlite produced in Arizona. Gypsum was sold by Arizona Gypsum Corp. and Garica & Peters Gypsum Co. Production of this commodity continued to increase owing to a strong demand for gypsum in manufacturing cement. Arizona Gypsum Corp., the chief producer, employed 6 men for 249 days. The demand for perlite for plaster and concrete aggregate resulted in a phenomenal increase in output—from 1,300 tons in 1954 to 9,000 tons in 1955. The leading producer was Perlite Industries of Arizona, Inc.

Superlite Builders Supply Co. again reported diatomite production at a property near Mammoth, which was leased from Arizona Diatom Corp. The crude material was trucked to its block plant at Phoenix

for use in manufacturing concrete blocks.

Most of the sand and gravel was classified as commercial output and was sold on the local market for building and other structural purposes by Coolidge Sand & Rock Co. and Eddie Givens Ditching Co. The county highway department also reported some production by its maintenance crews. Coolidge Sand & Rock Co. quarried and sold stone for use in concrete aggregate.

Manganese and manganiferous ore was obtained from 18 mines in Pinal County and shipped under the low-grade manganese-ore purchase program to GSA at Deming, N. Mex., Wenden, Ariz., and Butte, Mont. The shipments totaling 23,431 long dry tons of ore contained 27.8 percent manganese valued at \$870,000 and 3,589 tons averaging

47.7 percent manganese valued at \$396,000.

Tungsten ore was produced from the Maudina, Morning Star, and Baldy No. 1 mines in Pinal County. Don Lieberman Enterprises, Inc., treated most of the ore. Value of tungsten output in the county increased from \$2,000 in 1954 to \$33,000 in 1955 under the stimulus of the Government tungsten-buying program.

Santa Cruz.—Output of the metals—gold, silver, copper, lead, and zinc—comprised the entire mineral output. Output value of the first three metals listed decreased slightly; the latter two increased. Lead and zinc were the leading mineral products; the county ranked

second in lead and zinc output in the State.

Most lead and zinc came from the Flux mine operated by American Smelting and Refining Co. The mine ranked second in lead and zinc production in the State. The company treated substantial quantity

of lead-zinc ore from the Flux mine at its 200-ton-per-day flotation mill and shipped the lead and zinc concentrates to its smelters at El Paso, Amarillo, and Corpus Christi, Tex. Substantial quantities of gold, silver, and copper were recovered from the ore in addition to lead and zinc.

The Glove mine of Sunrise Mining Co. was also an important producer of lead in the county and the State; Edward A. Mack purchased a one-half interest in this mining company. Other important gold, silver, copper, lead, and zinc mines included the Duquesne group of claims (operated by 13 lessees), Three R, Santo Nino, and Rock Candy Mountain.

Small quantities of manganese and manganiferous ore were shipped from three mines in Santa Cruz County to GSA at Deming, N. Mex. The composite value of this ore, shipped under the low-grade manganese Government purchase program, was \$31,000.

Northeast of Nogales, uranium exploratory drilling was carried out by Ross Cabeen & Associates in conjunction with Utah Construction Co.

Yavapai.—The value of the mineral production in Yavapai County increased 40 percent above 1954 mainly because of the 65-percent advance in copper-output value. The combined value of copper, lead, and zinc output furnished 82 percent of the total value of mineral output in the county. The county led in value of output of lead and zinc in the State.

The Shattuck Denn Mining Corp. Iron King mine, leading lead and zinc producer in the State, supplied most of the lead and zinc output in the county. The corporation mined and milled 222,909 tons of ore with an original content of 31,301 ounces of gold, 885,155 ounces of silver, 762,267 pounds of copper, 12,154,716 pounds of lead, and 32,882,952 pounds of zinc. This ore yielded 2,651 fine ounces of gold and 31,720 ounces of silver by cyanidation and 18,634 tons of lead concentrate and 22,682 tons of zinc concentrate, which were smelted. The concentrates contained 18,066 fine ounces of gold, 705,109 ounces of silver, 525,798 pounds of copper, 9,841,306 pounds of lead, and 25,835,962 pounds of zinc. Exploration, conducted by the corporation in 1955, included 158 feet of shaft and 7,203 feet of diamond drilling. The No. 7 shaft was placed in operation and the mill capacity was enlarged.

The Bagdad Copper Corp. Bagdad open pit, active throughout the year, ranked 10th as a copper producer in the State and furnished most of the copper output in the county. The corporation mined and shipped 717 tons of ore containing 65,266 pounds of copper directly to the smelter and mined and milled 1,351,513 tons of ore containing 26,936,470 pounds of copper. The ore yielded 33,913 tons of concentrate containing 22,391,160 pounds of copper. In addition, 150 tons of molybdenum concentrate, containing 158,616 pounds of molybdenum, was recovered from the copper ore milled.

Smaller quantities of gold, silver, copper, lead, and zinc were produced from 30 lode and 5 placer mines in Yavapai County. Tungsten ore from which a total of 4,900 units of WO<sub>3</sub> was produced (valued at \$308,000) came from 6 mines in the county. The Tungstona, operated by Hillside Mining & Milling Co., was the principal tungsten producer. Manganese and manganiferous ore were mined from 12

mines in the county and were shipped to the GSA at Wenden, Ariz., and Deming, N. Mex., under the low-grade manganese purchase program. A total of 9,000 long dry tons of ore averaging 24.5 percent manganese with a value of \$341,000 and 65 tons averaging 44.6

percent manganese and valued at \$6,300 was shipped.

Stone was the principal nonmetal mineral commodity in value, but output declined from 202,000 tons in 1954 to 88,000 in 1955 because of lessening demand for stone in highway construction in this region. Crushed granite and limestone used in concrete aggregate and in manufacturing lime composed most of the output, followed by dimension sandstone used for rough and dressed construction stone and flagging. Some leading producers were W. J. Henson (granite), Arizona Quarry & Stone Co. (limestone), and Dunbar Stone Co., Richard Terrell, and Ulmer's Quarry (sandstone).

Volcanic scoria required for manufacturing concrete blocks ranked second in nonmetals. Three men were employed 260 days in mining volcanic scoria near Ashfork. No scrap mica or clay was produced. Only a small quantity of sand and gravel was sold commercially.

Grand Canyon Lime & Cement Co. at Nelson ranked third in output of lime, which remained at relatively the same level as in 1954. Hydrated lime was sold mostly for use in chemical industry; some quicklime was used for ore concentration, insecticides, conditioning agent in oil-well drilling, and open-hearth furnaces.

P. C. Brashear, Scholz & Cazier, and Earl & Sidney Anderson recovered and sold beryl concentrate from mines in the county to Beryl Ores Co. and Mrs. Gladys W. McKinley. A small quantity of columbium-tantalum concentrate was also recovered and marketed.

Yuma.—Yuma County ranked third, after Mohave and Pinal Counties, in the quantity and value of manganese and manganiferous ore mined and shipped to GSA at Wenden, Ariz., and Deming, N. Mex. At least 45 individuals marketed ore under the low-grade manganese Government purchase program. A total of 9,738 long dry tons of ore averaging 23.6 percent manganese and valued at \$372,000 and 1,554 tons averaging 42.4 percent manganese and valued at \$144,000 was shipped from the county in 1955.

Most operations were small, but some mined and shipped sizable quantities of manganese ore. The leading mines in the county included Black Diamond, Doyle, Power No. 1, 2, and 3, Angora, John P., Jr., M. A. Mines, Manganese Canyon, Metate, and Self

No. 1.

Tungsten output in the county decreased, compared with 1954, despite an increase from 14 active mining operations to 21 in 1955. All mines were small and produced less than 100 units of WO<sub>3</sub>. L. A. Aplington, George W. Campbell & Son, A. R. Floreen, Paul Henderson,

and John J. Stetler were among the leading producers.

The value of sand and gravel and gem stones, the only nonmetals produced in 1955, amounted to only \$26,000 contrasted with the output value of \$29,000 in 1954 and \$101,000 in 1953. The closing of all fluorspar operations in the region was responsible for this decline. Contracts for highway construction by State and Federal agencies and sporadic collection of gem or ornamental stones are now the mainstay of the mineral industry.

# The Mineral Industry of Arkansas

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Arkansas Geological and Conservation Commission, Norman F. Williams, director and State geologist, Little Rock, Ark.

By Robert S. Sanford 1



RKANSAS mineral production in 1955 set a new value record of \$132.8 million, increasing \$1.1 million over the previous high of \$131.7 million in 1954. Declines in bauxite, petroleum, natural gas, natural-gas liquids, and sulfur were more than offset by increases in barite, coal, cement, lime, manganese, sand and gravel, and stone. The output of liquid and gaseous fuels, which comprised 63 percent of the State total mineral value, decreased 3 percent from 1954 as a result of allocations. The State of Arkansas Oil and Gas Commission regulated petroleum production to prevent too rapid depletion of declining reserves and to curtail overproduction in the State.

Nonmetals, as a group, were valued at \$28.7 million, 22 percent of the State total in 1955; this was an increase of \$4.6 million (20 percent) over the \$24 million value in 1954. Construction materials, particularly stone, sand and gravel, cement, and lime were prominent in this advance, largely because of the need for these basic materials in the increased building, highway, and water-resource developments within the State. The consumption of lime, produced from Arkansas limestone, for aluminum, chemical, and construction industries increased. The yield of byproduct sulfur decreased slightly, paralleling the decline in natural-gas liquids extracted from natural gas.

Production of metallic ores, bauxite, manganese, and iron was valued at \$15.7 million (12 percent of the State total) in 1955, a decrease of \$1.3 million (7 percent) from the \$17 million value in 1954. Bauxite production declined; manganese increased. The one small iron mine that had been worked for several years closed.

<sup>&</sup>lt;sup>1</sup> Chief, Division of Mineral Industries, Region IV, Bureau of Mines, Bartlesville, Okla.

TABLE 1.—Mineral production in Arkansas, 1954-55 1

	19	54	19	55
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Barite (crude) Bauxite long tons, dried equivalent Clays Coal Gem stones Iron ore (usable) long tons, gross weight Manganese ore (35 percent or more Mn) gross weight Natural gas million cubic feet Natural gas liquids: Natural gasoline and cycle products LP-gases do Petroleum (crude) thousand 42-gallon barrels Sand and gravel Slate Stone Value of items that cannot be disclosed: Abrasive stone, cement, gypsum, lime, soapstone, recovered elemental sulfur, and values indicated by footnote 5	617, 450 477, 268 716 13, 728 33, 471 50, 778 58, 506	2 \$3,488, 483 15,993, 887 2,556,367 3,589,217 (5) 1,020,752 1,841,000 2,521,000 79,520,000 6,566,806 379,076 5,929,638 5,742,325	462, 986 1, 721, 243 738, 637 577, 726 (3) 23, 744 32, 123 47, 483 57, 088 28, 369 9, 003, 162 (6) 6, 176, 313	\$3, 755, 094 14, 026, 199 2, 375, 882 4, 319, 144 4, 000 1, 727, 286 1, 799, 000 2, 169, 000 2, 169, 000 76, 880, 000 76, 682, 942 (9) 8, 025, 634
Total Arkansas 6		131, 745, 000		132, 822, 0

<sup>&</sup>lt;sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption) 1 Production as measured by mine snipments, sales, or marketable production (measured by producers.

2 Value partly estimated.

3 Weight not recorded.

4 Final figure; supersedes preliminary figure given in commodity chapter.

5 Figure withheld to avoid disclosing individual company confidential data.

6 Value has been adjusted to eliminate duplication in the value of clays and stone.

TABLE 2.—Average unit value of mineral commodities produced in Arkansas, 1951-55

	1951	1952	1953	1954	1955
A brasive stoneshort tons_	\$187.63	\$180.94	\$109.70	\$301.54	\$269.01
Rorita (oruda) do	9.25	9. 25	10.36	9.41	8. 11
Bauxite (long tons, dried equivalent)	6.75	6.38	8.48	8.20	8. 15
Cement376-pound barrels	2.51	2.44	2.58	2.61	2.73
Clavs:	1				
Fireshort tons_	3.20	3.46	4, 60	4.99	2.61
Kaolindo	(1)	(1)	(1)	10.00	10.00
Miscellaneousdo	1.08	1.06	`í.06	2, 18	1.36
Coaldo	7.85	7. 83	7. 93	7.52	2 7, 48
Gyrneum do	2.75	2, 75	3. 27	3, 27	2, 89
Manganese ore (35 percent or more)short tons	(1)	(1)	86.01	74.36	72.75
Natural gasthousand cubic feet	.040	.041	. 053	. 055	. 05
Natural-gas liquids:	.010	.011	.000	.000	
Natural gas and cycle productsgallon_	.073	. 074	.071	.064	. 068
T D do			.046		
LP-gasesdo Petroleum (crude)42-gallon barrels_	2.48	2.46	2, 60	2.73	2.71
Petroleum (crude)42-galion parreis	. 92	. 99	1.01	. 99	. 85
Sand and gravelshort tons_	6.44		9. 15	9.06	9.07
Slatedo	0.44	(1)	9. 13	9.00	9.01
Stone:	1	1 177	1 77	1.34	1,08
Crushed limestonedo	1.57	1.17	1.71 1.17	$\frac{1.34}{2.77}$	2.06
Crushed standstonedodo		(1)		2.11	15. 42
Dimension sandstonedodo		4.07	(1)		
Crushed granitedodo				. 99	1.00
Marbledodo	62.42	45. 45	27. 22	50. 18	1. 39
Miscellaneous stonedodo	1.07	1.07	1. 25	1. 26	
Soapstonedodo	(1)	(1)	2.47	2.68	4.00
Soapstone do Sulfur, recovered elemental do	(1)	(1)	23.08	26. 75	26. 49
			l		

Data not available.
 Estimate.

#### DEFENSE MINERALS EXPLORATION ADMINISTRATION

The DMEA program, designed to provide Government aid and new sources of strategic and critical minerals in the United States, was initiated May 16, 1951. Two applications were submitted in Arkansas, 1 for manganese and 1 for uranium.

#### EMPLOYMENT, INJURIES, AND WAGES IN MINERAL INDUSTRIES

Employment.—Industrialization, especially the growth of the aluminum industry since 1942, has contributed to increased employment and wages in Arkansas. The Arkansas Employment Security Law in 1955 covered 239,156 workers, a 64-percent increase over 1940. During the same period average weekly earnings increased from \$16.37 to \$53.05.

Average annual employment in the mineral industries was 6,444, a 4-percent increase over 1954. Metal-mining employment increased 1 percent to an average of 910; nonmetallic, 13 percent to an average of 2,089; coal, 16 percent to an average of 536. Employment in the crude-petroleum and natural-gas-extraction industries was 2,909, a 2-percent decrease from 1954.

Injuries.—No fatalities occurred in quarries, 1 fatality occurred in coal mines, and 1 in metal mines; there were 4 fatalities in the petro-

leum industry during the year.

Wages.—The average weekly wage in the metal-mining industry was \$86.17, an increase of 13 percent; in the nonmetallics industry, \$70.16, an increase of 6 percent; in the coal industry, \$70.05, an increase of 5 percent; in the petroleum industry, \$80.70, a decrease of 2 percent from 1954.

### **REVIEW BY MINERAL COMMODITIES**

#### MINERAL FUELS

Coal.—Production of coal in Arkansas increased to 578,000 short tons, reversing a 5-year downward trend. Of the 27 mines, 19 were underground and 8 open pit. Production of 45.1 percent came from strip mines and 54.9 percent from underground mines. In the order of importance, coal was produced in Johnson, Sebastian, Logan, and Franklin Counties. The average number of days worked in 1955 at all coal mines was 114, increasing 17 days over the 1954 average. The following improvements were made in various coal mines during the year: A direct-current generating unit for underground-haulage locomotives, a German-made coal planer, heavier steel rails, additional coal-cutting machines, and improved wash houses.

<sup>&</sup>lt;sup>2</sup> Bland, J. L., Administrator, Arkansas Department of Labor, Employment Security Division, letter to Bureau of Mines May 1, 1956.

TABLE 3.—Coal production, 1946-50 (average) and 1951-55

		Val	ue			Valu	1e
Year	Shorttons	Total	Average per ton	Year	Shorttons	Total	Average per ton
1946-50 (average) 1951 1952	1, 459, 038 1, 106, 705 873, 088	\$10, 253, 150 8, 686, 410 6, 839, 113	\$7. 03 7. 85 7. 83	1953	775, 207 477, 268 577, 726	\$6, 143, 757 3, 589, 217 4, 319, 146	\$7. 93 7. 52 7. 48

Petroleum and Natural-Gas Development.—The search for petroleum and gas fields in Arkansas during 1955 was not encouraging. 1955, despite completion of 854 wells of all types (compared with 617 wells in 1954), the proved reserves of petroleum decreased 6 percent: natural-gas liquids reserves decreased 4 percent; natural-gas reserves remained unchanged. North Arkansas produced mostly dry gas from the relatively shallow sands of Pennsylvanian age. In South Arkansas most oil- and gas-condensate production is from the Upper and Lower Cretaceous and the Jurassic formations at depths from 6,000 to 8,000 feet. Most of the increased drilling activity took place in southern Arkansas, where 815 holes were completed. Of the 854 current-year completions, 632 were in proved fields and included 426 oil and 8 gas wells and 198 dry holes; of the 222 exploratory tests, 38 discovered oil and 6 gas, while 178 were dry. new oil and 1 gas field were discovered during 1955, none apparently of major importance.

Reports indicate that some producers in Arkansas direct their entire activity toward pressure maintenance or secondary recovery methods. According to the Arkansas Oil and Gas Commission, almost 15 times as many oil- and gas-condensate wells were produced by artificial lift as by natural flowing.

Natural Gas.—In 1955, marketed production of natural gas which amounted to 32,100 million cubic feet valued at \$1.8 million, continued to decline in Arkansas. Of the 12 producing counties, the first 5, in order of productivity, were: Franklin, Columbia, Calhoun, Union, and Sebastian. Uncertainty, mainly over the threat of Federal control of producers' prices for gas moving in interstate commerce, curtailed drilling for natural gas during 1955, because the industry continued to await clarification or revision of natural-gas laws. Only 20 wells were completed in the dry-gas fields of northern Arkansas. Of these, 3 development wells in proved fields were productive; 5 exploratory wells were productive, 12 were dry holes. According to estimates by the American Gas Association, proved reserves at the year end amounted to 1,164,367 million cubic feet, about the same as in 1954.

TABLE 4.—Oil- and gas-well drilling in Arkansas in 1955 1

County	Prov	red field	wells	Exp	loratory	wells		Total		Grand
	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	total
Boone Bradley Calhoun Chloto Chicot Cleveland Crawford Crittenden Drew Franklin Hempstead Howard Independence Jefferson Lafayette Lincoln Little River Madison Miller Nevada Ouachita Pope Randolph Scott Sebastian Sevier Union Washington White	20 50 50 21 19 37	3		3 6 7 3 1	1	1 2 6 6 2 2 16 6 3 1 2 2 2 4 1 1 38 8 22 2 1 1 1 27 1 2 2 7 1 2	23 	1 1 1 1 4	1 3 6 6 2 2 2 2 2 3 3 1 2 2 2 2 4 4 1 1 8 5 3 2 3 3 4 0 5 3 3 4 0 5 3 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1
Total: 1955 1954	426 313	8 4	198 159	38 17	6 3	178 121	464 330	14 7	376 280	854 617

<sup>&</sup>lt;sup>1</sup> National Oil Scouts and Landmen's Association, Oil and Gas Field Development in United States: Vol. 26, 1956, pp. 24, 37.

TABLE 5.—Estimated proved reserves of crude oil, natural-gas liquids, and natural gas  $1954-55^{1}$ 

	Proved reserves, Dec. 31, 1954	Changes in proved reserves, due to extensions and new discov- veries in 1955	Proved reserves, Dec. 31, 1955 (production was deducted)	Change from 1954, percent
Crude oilbarrels Natural-gas liquids <sup>3</sup> do Natural gasmillion cubic feet	351, 420, 000	-4, 524, 000	329, 539, 000	-6.0
	46, 919, 000	-314, 000	45, 124, 000	-4.0
	1, 165, 379	-38, 624	1, 164, 367	1

<sup>1</sup>American Petroleum Institute, Petroleum Facts and Figures: 12th ed., 1956, pp. 158-159, 161.

<sup>2</sup>Includes condensate, natural gasoline, and LP-gas.

TABLE 6.—Marketed production of natural gas, 1946-50 (average) and 1951-55, in million cubic feet <sup>1</sup>

Year	Quan- tity	Value	Value per thousand cubic feet	Year	Quan- tity	Value	Value per thousand cubic feet
1946-50 (average)	49, 118	\$1, 788, 000	\$0.036	1953	41, 510	\$2, 200, 000	\$0.053
1951	44, 656	1, 786, 000	.040	1954	33, 471	1, 841, 000	.055
1952	42, 325	1, 735, 000	.041	1955	32, 123	1, 799, 000	.056

<sup>&</sup>lt;sup>1</sup> Comprises gas either sold or consumed by producers including losses in transmission, amounts added to storage, and increases in gas pipelines.

TABLE 7.—Gross withdrawals and disposition of natural gas, 1950-55, in million cubic feet

	Gro	ss withdraws	als 1		Disposition	
Year	From gas wells	From oil wells	Total	Marketed production <sup>2</sup>	Repress- uring	Vented and wasted 3
1951 1952 1953 1954 1955	37, 060 40, 400 38, 100 36, 000 19, 000	30, 050 27, 200 27, 000 20, 000 36, 000	67, 110 67, 600 65, 100 56, 000 55, 000	44, 656 42, 325 41, 510 33, 471 32, 123	18, 911 22, 070 20, 003 18, 568 16, 649	3, 543 3, 205 3, 587 3, 961 6, 228

1 Marketed production plus quantities used in repressuring, vented, and wasted.

Includes direct waste on producing properties and residue blown to air.

Natural-Gas Liquids.—Production of natural-gas liquids in Arkansas—104.6 million gallons with a value of \$5.4 million—was 4 percent less in quantity and 6 percent less in value than in 1954. total gallons, 45.4 percent was natural gasoline and cycle products, and 54.6 percent was LP-gases. The five producing counties, in order of their importance, were: Columbia, Lafayette, Union, Miller, and Hempstead. Arkansas ranked 10th in the United States in the production of natural-gas liquids.

TABLE 8.—Natural-gas liquids produced, 1946-50 (average) and 1951-55

		soline and roducts	LP-	gases	To	tal	
Year	Quantity	Value	Quantity	Value	Quantity	Value	
	(thousand	(thousand	(thousand	(thousand	(thousand	(thousand	
	gallons)	dollars)	gallons)	dollars)	gallons)	dollars)	
1946-50 (average)	56, 884	\$3, 841	36, 549	\$1, 364	93, 433	\$5, 205	
	58, 212	4, 247	40, 404	1, 606	98, 616	5, 853	
	61, 782	4, 580	49, 098	2, 079	110, 880	6, 659	
	58, 422	4, 123	55, 188	2, 562	113, 610	6, 685	
	50, 778	3, 234	58, 506	2, 521	109, 284	5, 755	
	47, 483	3, 239	57, 088	2, 169	104, 571	5, 408	

Petroleum.—Petroleum is the most important mineral resource of In 1955, the State ranked 11th in the Nation in the value of petroleum output. Seven counties produced; the first 5, in order, were: Union, Columbia, Ouachita, Lafayette, and Miller Counties. Output of 28.4 million barrels was valued at \$76.9 million, a 3-percent decrease in quantity and value, compared with 1954. In 1954, 4,410 wells in the State averaged 18.6 barrels of oil per day; in 1955, 4,610 wells averaged 17.2 barrels of oil a day. Six refineries in the State had a total daily crude-oil capacity of 74,400 barrels.

Pipeline Construction.—Arkansas Western Gas completed 3 miles of 8-inch pipeline from White Oaks field to the main line at Fayetteville and 2,280 feet of 3-inch line from Aetna field to the Charlestown-Paris

system.

TABLE 9.—Natural gasoline and cycling plants 1

				Daily	Daily capacity, gallons	gallons			
Company	Location			LP-gases			Natural gasoline		Process
		Propane	Butane	Iso- butane	Iso- pentane	LP-gas mixture	and other products	Total	
Arkansas-Louisiana Gas Co.	Magnolia Rodassa	26,000	34,000	25,000	15,000		32,000	132,000	Absorption.
Atlanta das Co Memolle Petroleum Co	Magnolia		000	1 1 3 1 4 1 1 1 1 1 1 1 1 1		10,500	10,500	2000	ÄÄ
Lion Oil Co. Wekamie Gas Cleaning Co.	El Dorado	4, 500	8,000	10 500			34,000	38,50	Combination.
J. R. Querbes Oil Co	El Dorado Memolia	18 000				17 076	900	(o,0	Absorption.
Sunray Oil Corp	Patmos	4, 900	5,000	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2,000		4,800	16, 700	Ď.
Total		72,300	66, 100	35, 500	17,000	29, 326	183, 974	404, 200	
									***************************************

1 Avery, I. F. and Harvey, L. V., Natural Gasoline and Cycling Plants in the United States: Bureau of Mines Inf. Cir. 7790, 1956, p. 5.

TABLE 10.—Production of crude petroleum, 1946-50 (average) and 1951-55

		Va	lue			Va	lue
Year	Thou- sand barrels	Total (thou- sand dollars)	Average per barrel	Year	Thou- sand barrels	Total (thou- sand dollars)	Average per barrel
1946-50 (average) 1951 1952	30, 220 29, 798 29, 440	63, 942 73, 900 72, 420	\$2.12 2.48 2.46	1953	29, 681 29, 130 28, 369	77, 170 79, 520 76, 880	\$2.60 2.73 2.71

TABLE 11.—Production of crude petroleum, 1951-55,1 by fields

(Thousand barrels)

Field	1951	1952	1953	1954	1955
Atlanta Buckner Dorcheat-Macedonia El Dorado Fouke Horsehead Magnolia McKamie Midway Schuler Smackover Stephens Village Wesson Other fields Total Arkansas	719 875 486 929 4, 407 1, 175 2, 684 2, 626 3, 910	810 722 877 649 1, 053 29 4, 223 1, 446 2, 674 2, 377 3, 814 1, 308 1, 018 3, 510 4, 930	649 645 841 711 1, 429 1, 369 2, 642 2, 318 3, 892 1, 223 840 3, 296 5, 603	554 529 624 838 1, 210 706 3, 289 1, 480 2, 262 2, 599 4, 370 1, 077 850 2, 699 6, 043	483 478 617 857 1, 241 816 2, 890 1, 331 2, 048 2, 593 4, 678 1, 014 846 6, 637

<sup>&</sup>lt;sup>1</sup> Includes oil consumed on leases and net change in stocks held on leases for entire State.

TABLE 12.—Sales of petroleum products, 1951-55

(Thousand barrels)

Product	1951	1952	1953	1954	1955	Change from 1954, percent
Gasoline <sup>1</sup>	10, 119	10, 672	11, 025	11, 530	12, 320	+7
Kerosine.	1, 777	1, 736	1, 390	1, 394	1, 216	-13
Range oil.	1, 050	1, 051	876	830	674	-19
Distillate fuel oil.	2, 244	2, 325	2, 222	2, 136	2, 357	+10
Residual fuel oil.	2, 051	1, 497	1, 006	415	419	+1

<sup>&</sup>lt;sup>1</sup> Consumption compiled by American Petroleum Institute.

#### **METALS**

Aluminum.—Arkansas ranked fourth in the Nation in aluminum production. Despite record United States production, aluminum was in short supply, and plans were made to increase the capacity of producing and fabricating facilities. Reynolds Metals Co. planned to increase the capacity of its Jones Mills, Ark., plant 6,000 short tons to a total of 103,000 tons a year.

Bauxite.—Arkansas contributed 96 percent of the Nation's bauxite production; the remainder was mined in Alabama and Georgia. Domestic mines supplied about 26 percent of the bauxite require-

ments. The State production in 1955 was 1.7 million long tons (dry equivalent), valued at \$14 million. Two alumina, 2 aluminum, and 6 companies, which dry, calcine, or activate bauxite, produced in

the State.

Alumina was shipped by rail from the Hurricane Creek, Ark., plant of Reynolds Metals Co., under a long-term purchase contract, to the new Anaconda Aluminum Co. plant at Columbia Falls, Mont. This plant, with a capacity of 60,000 tons annually, was dedicated August 15, 1955.

TABLE 13.—Mine production of bauxite and shipments from mines and processing plants to consumers, 1946-50 (average) and 1951-55, in long tons

	Mine production			Shipments from mines and proc- essing plants to consumers		
Year	Crude Dried- bauxite equivalent		Value	As shipped	Dried- bauxite equivalent	Value
1946-50 (average)	1, 429, 358 2, 153, 786 1, 903, 101 1, 802, 797 2, 296, 528 2, 049, 623	1, 200, 302 1, 815, 274 1, 603, 833 1, 529, 976 1, 949, 368 1, 721, 243	\$7, 085, 359 12, 259, 742 10, 235, 254 12, 975, 992 15, 993, 887 14, 026, 190	1, 309, 824 1, 583, 320 2, 067, 241 1, 889, 206 1, 978, 216 1, 938, 811	1, 180, 329 1, 493, 557 1, 849, 287 1, 689, 207 1, 711, 386 1, 660, 263	\$8, 272, 518 11, 994, 882 14, 084, 274 15, 042, 236 1 15, 239, 244 14, 844, 798

<sup>1</sup> Revised figure.

Manganese.—Manganese mining in Arkansas, stimulated by the Government purchase and stockpile program, attained a record high of 23,744 short tons of ore, which had a manganese content of 11,685 short tons valued at \$1.7 million. This was a gain of 73 percent in quantity, 116 percent in manganese content, and 69 percent in value over 1954. There were 14 producers, all in Independence County. Arkansas ranked fourth in manganese production in the United States.

TABLE 14.—Manganese ores shipped from mines, 1946-50 (average) and 1951-55. in short tons

	Manga	nese ore 1	Value	
Year	Gross weight	Mn con- tent	Total	Average per ton
1946-50 (average)	1, 246 3, 718 2, 246 6, 123 13, 728 23, 744	546 1, 442 1, 007 2, 812 5, 407 11, 685	(2) (2) (2) \$526, 647 1, 020, 752 1, 727, 286	\$86. 01 74. 36 72. 75

Containing 35 percent or more manganese (natural).
 Data not available.

#### **NONMETALS**

Abrasive Stone.—Oilstones and whetstones were produced in Arkansas. The quantity increased 51 percent and the value, 35 percent over 1954.

Barite.—Arkansas remained the leading producer of barite, supplying 42 percent of United States output. Production was 463,000 short tons valued at \$3.8 million, an increase of 26 percent in quantity and 8 percent in value from 1954. The oil-well drilling industry again consumed the largest quantity of ground and crushed barite.

TABLE 15.—Primary barite sold or used by producers 1946-50 (average) and 1951-55

		Va	lue			Val	lue
Year	Short tons	Total	Average per ton	Year	Short tons	Total	Average per ton
1946-50 (average) 1951 1952	346, 665 407, 085 428, 522	\$2, 626, 191 3, 765, 536 3, 963, 828	\$7. 58 9. 25 9. 25	1953 1954 1955	380, 763 370, 621 462, 986	\$3, 945, 583 3, 488, 483 3, 755, 094	\$10. 36 9. 41 8. 11

Cement.—Shipments of portland cement from the Ideal Cement Co. plant near Okay, Howard County, increased 14 percent in quan-

tity and 19 percent in value over 1954.

Clays.—The production of all types of clays (738,637 short tons) in Arkansas increased 20 percent over 1954. Fire clay was used to manufacture refractories, high-quality face brick, and heavy clay products. Miscellaneous clay was used to manufacture heavy clay products. Kaolinitic clay was used to manufacture refractories. Three percent of all clay was used to produce cement.

TABLE 16.—Clays sold or used by producers, 1946-50 (average) and 1951-55, by kinds

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	437, 272 491, 459 552, 576	\$956, 797 1, 206, 858 1, 513, 934	1953 1954 1955	529, 126 617, 450 738, 637	\$1, 734, 414 2, 556, 367 2, 375, 882

Gypsum.—Gypsum production, entirely from Pike County, Ark., increased 7 percent in quantity and decreased 6 percent in value over 1954.

Lime.—Lime production increased 15 percent during the year. Lime was used by the aluminum, paper, water-purification, petroleum, sugar-refining, and other industries in the State.

Perlite.—No crude perlite was mined in Arkansas; however, perlite was expanded and used for aggregate by the construction industry.

Sand and Gravel.—Sand and gravel was produced in 45 of the 75 counties; Miller, Hot Springs, Izard, Greene, and Calhoun Counties, in order, were the chief producers. Output of sand and gravel amounted to 9 million short tons valued at \$7.7 million. This gain of 36 percent in quantity and 17 percent in value over 1954 resulted from the highway and building-construction programs.

Slate.—Slate production in Arkansas increased in quantity and

value over the previous year.

Soapstone.—Output and value of soapstone increased during 1955.

TABLE 17.—Sand and gravel sold or used by producer, 1954-55, by class of operations and uses

	tions ar	iu uses					
		1954			1955		
	Short	Short		Short	Value		
	tons	Total	Average	tons	Total	Average	
COMMERCIAL OPERATIONS							
Sand: Building Paving	632, 011 644, 048	\$635, 880 573, 568		1, 157, 483 1, 295, 244	\$811, 942 906, 394	\$0.70 .70	
Gravel: Building Paving	389, 031 1, 978, 594	428, 712 2, 251, 567	1. 10 1. 14 . 87	983, 226 2, 873, 730	880, 440 2, 535, 240	. 90 . 88	
Railroad ballastOtherUndistributed 2	132, 862 23, 468 311, 463	115, 570 31, 513 654, 844	1. 34 2. 10	144, 915 275, 655	170, 347 575, 050	1. 18 2. 09	
Total commercial sand and gravel	4, 111, 477	4, 691, 654	1. 14	6, 730, 253	5, 879, 413	. 87	
GOVERNMENT-AND-CONTRACTOR OPERATIONS							
Sand: PavingGravel:				178, 462	156, 918	. 88	
PavingStructural	2,500,383	1, 875, 152	.75	2, 034, 804 59, 643	1, 613, 817 12, 794	.79	
Total Government-and-contractor sand and gravel	2,500,383	1, 875, 152	.75	2, 272, 909	1, 783, 529	. 78	
Grand total	6,611,860	6, 566, 806	. 99	9, 003, 162	7, 662, 942	.85	

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosing individual company confidential data.
<sup>2</sup> Include glass, molding, engine and other sands, and railroad-ballast gravel (1955); Bureau of Mines not at liberty to publish separately.

Stone.—Production of stone attained a record high of 6.2 million short tons valued at \$8.0 million. Crushed granite was quarried and used for concrete and road metal. Uses of crushed limestone, in order of importance, were: Road and highway construction, other miscellaneous uses, manufacture of concrete, limestone for flux, and agriculture. Only 96,000 tons of limestone was used as a soil conditioner; apparently, an excellent market exists in this field because the National Agricultural Limestone Institute, Inc., estimates that Arkansas farmers need 758,000 tons of limestone a year. All dimension limestone was used by the building industry. Crushed sandstone was used for concrete or road metal and as a refractory stone. The uses for miscellaneous stone, in order of importance, were: Concrete and road metal, riprap, and railroad ballast.

TABLE 18.—Stone sold and used by producers, 1951-55

		Val	ue			Val	16
Year	Short tons	Total	Average per ton	Year	Short tons	Total	Average per ton
1951 1952 1953	2, 535, 746 1 2, 967, 479 3, 545, 350	\$3, 216, 426 1 3, 346, 201 5, 069, 750	\$1. 27 1. 13 1. 43	1954 1955	4, 604, 067 6, 176, 313	\$5, 929, 638 8, 025, 634	\$1. 29 1. 30

<sup>&</sup>lt;sup>1</sup> Incomplete figure; excludes dimension miscellaneous stone.

Sulfur, Recovered Elemental.—Recovery of byproduct sulfur from gas-cycle plants continued with only a slight decrease in quantity and value from 1954. All of the elemental sulfur was recovered at plants in Columbia and Lafayette Counties.

#### **REVIEW BY COUNTIES**

Mineral production was reported from 54 of the 75 counties in Arkansas. Petroleum was produced in 7 counties, natural gas in 12, natural-gas liquids in 5, clay in 12, coal in 4, sand and gravel in 45, stone in 12, bauxite in 2, sulfur in 2, abrasive stones in 1, lime in 2, and manganese, slate, gypsum, and soapstone each in 1 county.

Calhoun.—Calhoun County ranked third in the production of natural gas and fifth in sand and gravel in the State. St. Francis Materials Corp., Crawford Gravel Co., S. M. Dickson, Ouachita Aggregate Co., and W. W. Grant quarried sand and gravel and produced structural sand and gravel, paving gravel, and railroad ballast. Petroleum was produced from four fields.

Clark.—Hope Brick Works mined clay for manufacturing, building, face, floor and sewer brick, structural clay tile, and unglazed facing tile. Structural and paving sand and gravel were produced by Arkadelphia Sand & Gravel Co., R. & E. Barringer, W. R. Britt, Austin F. Freeman, and Charles McMillan.

Columbia.—The petroleum industry dominated the economy of Columbia County. The county continued to lead in producing natural-gas liquids, ranked second in the State in overall minerals value and second in petroleum, and moved from third to second place in natural gas. The first commercial oil well was completed in 1922 in the Stephens field. Most of the gas produced in the county is solution gas associated with the petroleum from limestone reservoirs of Jurassic age. Gas from these limestone formations in the county contains objectionable quantities of hydrogen sulfide and is unsuitable for domestic use unless the sulfur is removed; this is done by Lion Oil Co. and Mathieson Agricultural Chemical Division, which produce byproduct elemental sulfur.

Craighead.—Hall Wheeler Brick Co. mined red clay for manufacturing building and face brick at the plant near Jonesboro. Cox Gravel Co. produced washed gravel for paving. R. D. Davenport produced washed gravel for railroad ballast. Mississippi Valley Construction Co. and Southeastern Construction Co. produced paving sand and gravel.

Franklin.—Franklin County led in producing natural gas in the State. Coal also was produced, chiefly for steam generation. Three exploratory wells drilled all proved gas productive.

Garland.—Novaculite, composed almost entirely of silica, occurs in beds ranging from a few inches to 15 feet in thickness and was quarried for whetstones by R. C. Neighbors and Lewis Whetstone Co. Paving sand and gravel was produced by L. C. Eddy & Son and Smith Bros. Construction & Material Co. Syenite, which occurs in the county, is a potential source of stone and roofing granules. Quartz crystals from deposits near Jessieville, were sold to tourists, mineral collectors, and museums.

Greene.—Greene County ranked fourth in production of sand and gravel in the State. Paving sand and gravel was produced by Arkansas Gravel Co., B. & S. Gravel Co., Ted Cline, Ben M. Hogan, Mississippi Valley Construction Co., and St. Francis Materials Corp.

TABLE 19.—Value of mineral production in Arkansas by counties, 1954-55 1

County	1954	1955	Minerals produced in 1955 in order of value
Ashley		(2) \$150, 202	Sand and gravel.
Benton	(2)	\$150, 202	Sand and gravel, stone.
Bradley		(2)	Cond and graval
Bradley	\$570, 645	938, 534	Sand and gravel, natural gas, petroleum.
Calhoun	\$570,0±5	(2)	Sand and gravel.
Carroll		(2)	Do.
Chicot			Sand and gravel, clays.
Clark	(2)	51, 983	Cand and marel
Clay Columbia	(2)	166, 449	Sand and gravel.
Columbia	24, 124, 608	21, 656, 951	Petroleum, natural-gas liquids, natural gas, sulfur, sand and gravel.
	1		Sulfur, Sand and graver.
Conway Craighead		(2) 37, 747	Sand and gravel.
Craighead	60,847	37, 747	Sand and gravel, clays.
Crawford	(2)	29, 669	Natural gas.
Crittenden		(2)	Sand and gravel.
Cross		142, 566	Do.
Desha		57, 401	Do.
Drew	(2)	(2)	Do.
Drew		585, 954	Natural gas, coal.
Franklin	3(0,041	53, 932	Sand and gravel, abrasive stone.
Garland	(2)	20, 904	Sand and gravel.
Grant		(2)	
Greene	(2)	372, 229	Do.
Hempstead	412,057	248, 538	Natural-gas liquids, clays.
Hot Spring	6, 225, 063	5, 807, 661	Barite, clays, sand and gravel, stone.
Howard	(2)	(2)	Barite, clays, sand and gravel, stone. Portland and masonry cement, sand and gravel
Independence	2, 034, 056	2, 633, 040 1, 066, 332	Manganese, lime, sand and gravel. Stone, sand and gravel. Sand and gravel.
Izard		1, 066, 332	Stone, sand and gravel.
Jackson		(2)	Sand and gravel.
Jackson		- (2)	Do.
Jefferson		2, 239, 040	Cool stone natural cas clays
Johnson	2, 153, 895		Petroleum, natural-gas liquids, sulfur, sand and
Lafayette	15, 919, 611	14, 985, 053	remoleum, natural-gas ilquids, suriar, suria uni
		(0)	gravel.
Lawrence	(2)	(2)	Sand and gravel, stone. Sand and gravel.
Lincoln	J	(2) 31, 968	Sand and gravei.
Little River	(2)	(-)	Sand and gravel, stone.
Logan	513, 944	485, 949	Coal, stone, sand and gravel.
Madison		(2)	Stone.
Marion		10, 645	Sand and gravel.
Miller	5, 445, 506	5, 577, 588	Petroleum, sand and gravel, natural-ga
MIIIIGI	0, 110, 000	0, 0, 0	liquids, clays, natural gas.
2.511	(2)	100, 877	Sand and gravel.
Mississippi	(2) 379, 076	(2)	Slate
Montgomery	0.547.070	0.067.205	Petroleum, sand and gravel, natural gas.
Nevada	2,047,000	2, 967, 325 46, 000	Ctono
		46,000	Petroleum, sand and gravel, natural gas, clays
OuachitaPerryPhillipsPike	10, 303, 658	14, 834, 985	Petroleum, sand and graver, natural gas, crays
Perrv		(2)	Sand and gravel, stone.
Phillips		(2)	Sand and gravel.
Pike	(2)	(2)	Gypsum, sand and gravel.
Poinsett	1	32, 936 24, 323	Sand and gravel.
Polk	(2)	24, 323	Clays.
TOIK	66, 714	149, 153	Sand and gravel natural gas.
Pope Pulaski	4, 870, 308	8, 064, 544	Stone, bauxite, clays, sand and gravel.
Pulaski	4,010,000	181, 547	Cond and grown
St. Francis	14 044 705	14, 053, 992	Bauxite, lime, clays, sand and gravel, soar
Saline	14, 944, 785	14, 000, 502	stone.
		0 101 040	Cool gond and gravel natural gas, and clavs.
Sebastian	1, 243, 250	2, 161, 049	Coal, sand and gravel, natural gas, and clays. Petroleum, natural-gas liquids, natural gas
Union	30, 384, 096	25, 192, 074	Petroleum, natural-gas numus, natural gas
			clays.
Washington	(2)	(2)	Stone, natural gas, sand and gravel.
Yell	"   }_(	(2)	Sand and gravel.
Undistributed	7, 891, 296	7, 683, 764	
OHORSHING	.,001,200		
Total	131, 745, 000	132, 822, 000	

<sup>&</sup>lt;sup>1</sup> The following counties are not listed, because no mineral production was reported: Arkansas, Baxter, Boone, Cleburne, Cleveland, Dallas, Faulkner, Fulton, Lee, Lonoke, Monroe, Prairie, Randolph, Scott, Searcy, Sevier, Sharp, Stone, Van Buren, White, and Woodruff.

<sup>2</sup> Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

Hempstead.—Hempstead County ranked fifth in the production of natural-gas liquids in Arkansas. Sunray Oil Corp. processed natural gas produced outside the county at a natural-gasoline plant near Patmos. Clays were mined south of Hope and blended with clays from nearby counties by the Hope Brick Works, one of the largest in the State, for manufacturing brick, structural clay tile, unglazed face tile, and sewer brick and drain tile.

Hot Spring.—The entire barite production of 1955 in Arkansas came from the Hot Spring County Baroid Sales Division of the National Lead Co. and Magnet Cove Barium Corp. The county led in producing clay, ranked second in sand and gravel, and stood third in stone in the State. Malvern Brick & Tile Co. manufactured face and refractory brick and building tile from buff-firing Wilcox clay. The usable clay averages about 30 feet in thickness and is covered by 5 to 15 feet of overburden. The Malvern plant of Acme Brick Co. has produced building brick more than 50 years. Common red brick and rough face brick are manufactured from a ground mixture of one-third shale and two-thirds silty clay. The Perla plant of Acme Brick Co. has produced brick and tile since 1920. Current products are face and refractory brick and building and hollow tile. Buff-firing Wilcox clay is mined and used to manufacture face and refractory brick and building and hollow tile. Freshour Bros. and Malvern Gravel Co. produced structural and paving sand and gravel. Coogan Gravel Co. quarried and crushed novaculite, which it sold to Harbison Walker Refractories Co. for use in manufacturing refractories.

Reynolds Metals Co. operated a large aluminum-reduction plant at Jones Mills, about 5 miles northwest of Malvern, using alumina from the Hurricane Creek plant in Saline County. Plans were made

to increase the plant capacity.

Howard.—Chalks and marl were mined by Ideal Cement Co. and used in manufacturing portland and masonry cement at its Okay plant. This was the only cement-manufacturing plant in Arkansas. Structural and paving sand and gravel were produced by S. M. Dixon, Mississippi Valley Construction Co., and John Watson.

Independence.—Manganese, mined by 14 producers, was the most important mineral. Lime for building, chemical, and other industrial uses was produced by Batesville White Lime Co. Building sand and

gravel was produced by Galloway Sand & Gravel Co.

Izard.—Izard County ranked second in the production of stone and third in sand and gravel in the State. Glass and molding sands were produced by Silica Products Co., Inc., near Guion. Crushed limestone for flux, concrete and road metal, agriculture, and other purposes was produced by Aluminum Co. of America and Arkansas Limestone Co.

Jackson.—Sand and gravel for paving and building was quarried by Allbright Bros. Construction Co. and Mobley Construction Co.,

Inc., from deposits near Newport.

Johnson.—Johnson County led in the production of coal. Coal mined in the western part of the county was sold exclusively to steel mills owing to its coking qualities; coal from the eastern part of the county was for domestic consumption. Dimension sandstone was quarried by Texas Ledge Stone Co. near Lamar. Clay was mined by Eureaka Brick & Tile Co. near Clarksville and manufactured into building brick. Natural gas was also produced.

Lafayette.—Lafayette County led in the production of byproduct elemental sulfur and ranked second in output of natural-gas liquids, third in the value of total minerals produced, and fourth in petroleum in the State. Out of 44 exploratory wells drilled in 1955, only 6 proved oil productive. McKamie Gas Cleaning Co. operated its natural-gasoline and cycle plant near McKamie. Paving and struc-

tural sand and gravel were produced by Meriwether Gravel Co., Inc., Lambert & Barr, International Paper Co., Graves Bros. Construction Co., and R. H. Davis.

Lincoln.—Structural and paving sand and gravel were produced by

S. M. Dixon, Glover Bros., Willie Keel, and Linwood Smith.

Logan.—Logan County ranked third in the production of coal. Sand and gravel was produced by Monroe Machinery Co. Dressed dimension sandstone was produced by Logan County Building Stone

Co. and Schwartz Bros.

Miller.—Miller County led in the production of sand and gravel and ranked fourth in natural-gas liquids, and fifth in petroleum in Exploratory drilling in 1955 provided 7 oil wells and 18 Gifford-Hill & Co., Inc., Graves Bros. Construction Co., and Lambert & Barr produced sand and gravel for structural, paving, and railroad ballast. W. S. Dickey Clay Manufacturing Co. mined fire and miscellaneous clay for manufacturing heavy clay products at its plant in Texarkana, Tex. Arkla Oil Co. ran its natural-gasoline and cycling plant at Rodessa.

Montgomery.—Slate, marketed in the form of granules and flour produced by Bird & Son, Inc., was the only mineral produced in the

county during 1955.

Nevada.—Nevada County, with seven productive oilfields, is the second oldest oil-producing area in the State; sand and gravel and natural gas also were produced during 1955. Barry Asphalt Co. operated its skimming and asphalt refinery at Waterloo. Out of 25 exploratory wells drilled during the year, 3 were oil productive. Paving sand and gravel was produced by Campbell Construction\_Co., Graves Bros. Construction Co., Hignight Nursery, and Stevens Bros. S. & G. Sand & Gravel Co. Mineral resources known to exist in Nevada County but not exploited in 1955 included clays and iron ore. A small quantity of iron ore was produced from 1952 through 1954, but none was mined in 1955.

Ouachita. Ouachita County ranked fourth in the value of total mineral production and third in petroleum in the State. The economy of the county depended largely upon the petroleum industry; 11 oilfields were completely or partly within the county. Solution gas was marketed from four oilfields. Barry Asphalt Co. processed part of the oil from the county at its petroleum refinery near the town of Thirteen exploratory wells were drilled in 1955; only one

discovered oil.

Paving sand and gravel was produced by B. & G. Dredging & Towing Co., Graves Bros. Construction Co., and Standard Gravel Co. Hope Brick Works mined clays for manufacturing brick and structural tile.

Pike.—Mining activities in Pike County in 1955 were confined to gypsum production by Arkansas Gypsum Co. from a mine 6 miles southwest of Murfreesboro. Paving and structural sand and gravel

were produced by Arkansas Gypsum Co. and Lucille M. Frey.

Pike County is the only locality in the United States where diamonds have been found in place in the rock in which they were formed. 1955, only tourists and collectors produced diamonds. Tourists were permitted to search for diamonds for 8 hours at a fee of \$1.50 and

allowed to keep diamonds up to 5 carats in weight. Diamonds above 5 carats were appraised, and the mineowner paid an additional fee. Polk.—W. S. Dickey Clay Manufacturing Co. mined clays for manufacturing heavy clay products, the only mining activity in Polk County during 1955.

Pope.—Structural and paving sand and gravel were quarried by Mobley Construction Co., Inc., and the Pope County Highway Department. Natural gas also was produced. Exploratory drilling re-

sulted in the discovery of one gas well.

Pulaski.—Pulaski County led in producing stone and ranked second in output of high-alumina clays in the State. Significant quantities of bauxite and sand and gravel also were produced during the year. Bauxite was mined by American Cyanamid Co., Consolidated Chemical Co., and Dulin Bauxite Co. Several calcining, chemical, and activating plants processed bauxite for abrasives, chemicals, and other industrial uses. The extensive deposits of syenite and hard sandstone in Pulaski County are favorably situated for quarrying and for transportation. Big Rock Stone & Material Co. produced quartzitic sandstone and nepheline syenite used for riprap, concrete, road metal, and railroad ballast. Frank Treger quarried crushed limestone used for concrete and road metal. Limestone and sandstone were produced by United States Corps of Engineers, State highway department, and Lonoke County Highway Department. Minnesota Mining & Manufacturing Co. produced artificially colored roofing granules. Consolidated Chemical Industries and A. P. Green Fire Brick Co. produced high-alumina bauxitic and kaolinitic clays from large residual deposits south and southwest of Little Rock. These clays are associated with the bauxite and nepheline syenites of the area. Sand and gravel was quarried by Big Rock Stone & Material Co., Monroe Machinery Co., and Mike Richards Equipment Co.

Vermiculite, exfoliated by Zonolite Co., and perlite, expanded by Tennessee Products & Chemical Corp., were mined outside the State

and processed in Arkansas.

Saline.—Saline County led the State and Nation in producing High-alumina clays, lime, soapstone, and sand and gravel also were produced. Bauxite occurs in Saline County in an area of about 48 square miles in the vicinity of Bauxite, mainly east, north, and south of the town. The ore bodies range in thickness up to 60 feet (average thickness of the minable deposits is about 13 feet) at depths ranging from a few feet to more than 500. Bauxite was mined either by open-pit or underground methods by Aluminum Co. of America, American Cyanamid Co., Dickinson-McGeorge, Inc., Dulin Bauxite Co., Inc., Norton Co., and Reynolds Mining Corp. Approximately 85 percent of the bauxite was used in producing alumina in two large plants in Saline County. The remainder was processed in calcining and chemical plants. A. P. Green Fire Brick Co. mined kaolinitic clay. The Milwhite Co., Inc., quarried soapstone for use as asphalt filler, insecticide, and roofing and in rubber. Structural and paving sand and gravel were produced by BuctonConstruction Co., H. L. Green, Mrs. Daisy Nalley, Newcomb & West, and Mrs. Kenneth Pelton, and the Saline County Highway Department.

Sebastian.—Sebastian County ranked second in the production of coal, which was shipped mostly to steel mills. Natural gas, clays, and sand and gravel were produced commercially. Arkhola Sand & Gravel Co. produced structural and paving sand and gravel. Acme Brick Co. mined clay for manufacturing brick and structural clay products. Athletic Mining & Smelting Co. ran a horizontal retort

zinc smelter at Fort Smith.

Union.—Union County led in overall mineral production (valued at \$25.2 million) and in petroleum production; it ranked fourth in natural gas and third in natural-gas liquids in the State. The county is the oldest and one of the most prolific petroleum and gas producers in Arkansas. The first commercial oil well in Arkansas was completed in January 1, 1921 in the Eldorado field; soon thereafter, the important Smackover field was discovered and subsequently was found to extend over a large area in both Union and Ouachita Counties. Exploratory drilling in 1955 furnished 18 oil wells, 1 gas well, and 27 dry holes. Four petroleum refineries in the county were operated by Henry H. Cross Co., near Smackover; Lion Oil Co., near Eldorado; MacMillan Petroleum Corp., near Norphlet; and Pan-Am Southern Corp., near Eldorado. Magnolia Petroleum Co., Lion Oil Co., and J. R. Querbes Oil Co. operated natural-gasoline and cycle plants in the county. Eldorado Brick Works produced common and face bricks from clay mined near Eldorado.

# The Mineral Industry of California

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 California Department of Natural Resources, Division of Mines.

By L. E. Davis 1 and Warren C. Fischer 1



ALIFORNIA mineral production set a new value record in 1955. Although mineral fuels dropped below 1954 figures, the increase in metals and nonmetals more than offset the loss. Only natural gas, among the mineral fuels, increased in both quantity and value. While only minor discoveries were made in the oilfields, natural-gas fields were substantially expanded or extended. The output of mineral fuels in California has become a billion-dollar business in an integrated industry, comprising almost 77 percent of the State's total mineral-production value. This industry was the controlling factor in maintaining California in second place among the Nation's

mineral producers.

The State's greatest advance in mineral production for 1955 was in nonmetals. Sand and gravel declined appreciably in both output and This was due to floods in the north at the year end and to the 3-month haulers' strike in the southern section of the State. Value of boron meterials and clays declined: volume increased. In the of boron materials and clays declined; volume increased. case of boron, this decline was due to decreased output of the higher priced products compared with 1954, rather than a drop in unit prices. The most notable production increases in nonmetallic commodities were boron minerals, cement, magnesium compounds, pumice, pumicite and volcanic cinder, strontium minerals, and byproduct sulfur. Production value of these commodities remained on a percentage par with the previous year, amounting to nearly 10 percent of the State total.

The position of metal and metal-ore production was much improved; output of most metal commodities was increased. Copper, lead, manganese, molybdenum, silver, and zinc showed the most marked advances. Although the dollar value was comparatively small, these increases were quite significant in that the production advances ranged from almost 70 percent (copper) to nearly 400 percent (zinc). The quantity of tungsten, gold, and iron-ore production rose less abruptly (about 30 percent), but their value constituted over 75 percent of the total value of California metal output. Declines were noted in

chromite and mercury.

<sup>&</sup>lt;sup>1</sup> Commodity-industry analyst, Region II, Bureau of Mines, San Francisco, California.

TABLE 1.—Mineral production in California, 1954-55 1

		1954		1955
Mineral	Short tons (unless otherwise stated)	Value	Short ton (unless otherwise stated)	Value
Boron minerals	- 30, 661	\$26, 714, 440 98, 251, 245 2, 285, 250 4, 477, 174 (³) 213, 580	35, 087, 213 22, 105	3 103, 803, 894 1, 834, 277 5, 027, 381 76, 500
Gypsum (crude) troy ounces.  Iron ore (usable) long tons, gross weight. Lead (recoverable content of ores, etc.) Lime (open-market) Magnesium compounds from sea water and bitterns (partly estimated). MgO equivalent	1, 161, 502 1, 270, 292 2, 671 212, 381	8, 326, 010 2, 803, 862 (3) 731, 854 3, 387, 981	251, 737 1, 307, 625 1, 776, 536 8, 265 268, 009	3, 273, 724 (3) 2, 462, 970 4, 372, 789
Marl, calcareous gross weight.  Mercury 76-pound flasks Natural gas million cubic feet. Natural-gas liquids: Natural-gas liquids:	831 5, 464 11, 262 507, 289	2, 715, 689 45, 091 21, 965 2, 977, 560 104, 502, 000	58, 042 3, 136 (³) 9, 875 538, 178	270, 519 (8) 2, 867, 206
LP-gases thousand gallons thousand gallons do— Perlite do— Petroleum (crude) thousand 42-gallon barrels. Pumice Salt (common) Sand and gravel. Silver (recoverable content of ores, etc.)	14, 811 355, 865 566, 664	89, 293, 000 22, 262, 000 103, 148 907, 460, 000 651, 638 6, 126, 194 68, 138, 578	929, 649 360, 902 15, 653 354, 812 797, 306 1, 314, 535 64, 878, 648	89, 003, 000 19, 379, 000 125, 113 887, 030, 000 1, 099, 459 6, 751, 420 66, 820, 360
Stone		280, 181 37, 541, 114 300 (3) 1, 211, 201 13, 209, 371 305, 640	954, 181 <sup>2</sup> 24, 708, 321 177 199, 599 166, 551 4, 383 6, 836	863, 582 <sup>2</sup> 37, 164, 384 4, 425 (3) 1, 552, 783 16, 200, 924 1, 681, 656
nessus (1965), Darite, bromine, calcium-mag- nesium chloride, carbon dioxide, diatomite, feld- spar, fluorspar (1955), abrasive garnet, gem stones, iodine, lithium minerals (1954), magnesite, manga- niferous ore (1954), mica, molybdenum, platinum group metals (crude), peat, potassium salts, py- rites, rare earth metal concentrate, slate, sodium carbonate and sulfate, recovered elemental sulfur, titanium iron concentrate, foon titanius sum.				
and values indicated by footnote 3.  Total California 5.		43, 737, 983 1, 429, 627, 000		

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Excludes uranium and monazite.

2 Final figure. Supersedes preiminary figure given in commodity chapter.

3 Figure withheld to avoid disclosing individual company confidential data.

4 Excludes shipments to Government low-grade depots and custom mills, quantity and value of this material is as follows: 1954—manganese ore, 8,704 short tons, \$572,193, and low grade manganese ore, 28,116 short tons, \$925,983; 1955—manganese ore, 4,244 short tons, \$292,637, and low grade manganese ore, 18,395 short tons, \$638,651.

5 Total adjusted to eliminate duplicating value of clays and stone.

TABLE 2.—Average United States prices of selected mineral commodities produced in California, 1946-50 (average) and 1951-551

Commodity	1946-50 (aver- age)	1951	1952	1953	1954	1955
Cement (average net mill realization)  dollars per barrel  Copper 2	19, 5 33, 95 35, 00 4, 03 14, 0 83, 84 49, 6 88, 6	2. 54 24. 2 41. 41 35. 00 5. 46 17. 3 210. 13 60. 0 90. 5+ 61. 02 18. 2	2. 54 24. 2 46. 35 35. 00 6. 09 16. 1 199. 10 60. 0 90. 5+ 63. 44 16. 6	2. 67 28. 7 49. 48 35. 00 6. 76 13. 1 193. 03 60. 0 90. 5+ 6 62. 46 11. 5	2. 76 29. 5 50. 21 35. 00 6. 99 13. 7 264. 39 60. 1 90. 5+	2. 86 37. 3 45. 04 35. 00 7. 12 14. 9 290. 35 63. 1 90. 5-

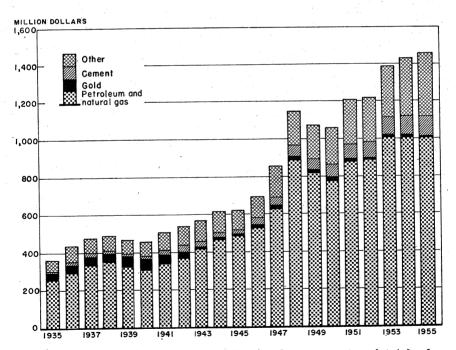


FIGURE 1.—Value of gold, petroleum and natural gas, cement, and total value of mineral production in California, 1935-55.

Prices are discussed in detail in the commedity chapters of volume I, Minerals Yearbook.
 Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946-47 includes bonus payments by Office of Metals Reserve for overquota production.
 Price under authority of Gold Reserve Act of Jan. 31, 1934.
 Average quoted price at New York.
 Treasury buying price for newly mined silver, 1943 to June 30, 1946-\$0.71111111; July 1, 1946 to Dec. 31, 1947-\$0.905; 1948-55-\$0.9050505.
 Based on average of GSA purchases.

#### CONSUMPTION AND MARKETS

California was its own best market for mineral commodities, being one of the Nation's chief consumers. In spite of its firm hold on second place in mineral production, only in those commodities where the State is the sole or chief producer does production exceed consumption. The continued rapid growth of population has called for increased construction and the rapid expansion of industries. Although California has abundant mineral resources, it is not self-sufficient in the mineral materials required.

The mineral products and industries were rather widely dispersed in the State both as to type and geographical distribution and required many kinds of marketing. Producers of some minerals dealt directly with the Government, as in the sale of chromite ore and tungsten concentrate to General Services Administration (GSA). In other instances, integrated industries mined the raw commodity and converted it into a finished product; the producer was also prospector, developer, transporter, refiner, manufacturer, wholesaler, and retailer. A good example of this integration was the oil company in the mineral-fuel industry. Consumption through local markets has increased at a greater rate than production of the necessary mineral commodities.

Custom Mills, Grinding Plants, Smelters.—Plants that received ores, concentrates, and nonmetallic commodities for processing on a custom basis, which includes any physical treatment, metallurgical processing, and chemical change, are listed in this chapter. The Selby plant of American Smelting & Refining Co., Selby, Contra Costa County, was the only California custom smelter treating primary nonferrous material, domestic ores and concentrates, and also considerable tonnages of imports. Nonmetallic processing plants such as Industrial Minerals & Chemical Co., Alameda County, may custom grind the mineral for another company, purchase the material and process it for resale, or purchase the commodity for resale without treating or processing before reselling. In the latter instance, the plant assumes the role of a buyer or broker.

# **NEW PLANTS AND PROJECTS**

Several new cement plants were planned or in the process of construction during the year. Permanente Cement Co. was to build a new \$12-million cement plant near the Kaiser Steel Co. Cushenberry limestone deposit in Bear Valley district, San Bernardino County. This deposit would also supply the Kaiser steel mill at Fontana with its limestone requirements. California Portland Cement Co. was constructing a new 2-million-barrel annual capacity plant 8½ miles west of Mojave, Kern County, expected to produce by January 1956. Calaveras Cement Co. completed construction of eight 110- by 36-foot cement storage silos, the first major unit of a \$4 million expansion, which was to include a fifth kiln and related equipment near San Andreas, Calaveras County.

TABLE 3.—Principal custom mills, commercial grinding plants, and primary smelters in California in 1955

Name	County	Nearest city or town	Minerals processed	Remarks
Industrial Minerals & Chemical Co.	Alameda		Nonmetallics	Contract grinding—minerals purchased.
Yuba Milling Co	Contra Costa	Emeryville Selby	Gold, silver, cop- per, lead, zinc.	Do. Smelter, refinery, and fum- ing plant.
El Diablo Mining Co.	Inyo	Bishop		50-ton-a-day gravity con- centrator.
Union Carbide Nuclear	do	Pine Creek	do	1,000-ton-a-day flotation and chemical plant.
Burton Bros	Kern	Rosamond	Gold and silver	300-ton-a-day cyanide plant.
Macco Corp.	do	do	Nonmetallics	Commercial fine grinding.
Butte Lode Mining Co.	do	Randsburg	Gold, silver, tungsten.	36-ton-a-day gravity con- centrator.
American Minerals Co. Hill Bros. Chemical	Los Angeles do	Los Angelesdodo	Nonmetallicsdo	Commercial grinding. Custom mill.
Co. Southern California Minerals Co.				
Kennedy Minerals Co.	do	do	do	Commercial grinding. Contract grinding.
Los Angeles Chemical				
Sun Valley Tungsten			Tungsten	centrator.
Piute Mining & Mill- ing Co.	Mono		do	Do.
Empire Star Mines Co., Ltd.	Nevada		Gold and silver	tion-cyanide mill.
Commercial Minerals			Nonmetallics	erals purchased.
Wildberg Bros. Smelt- ing & Refining Co.		1	Gold, silver, plat- inum.	Smelting, refining, manu- facturing.
Palo Alto Mining Co	Santa Clara	Coyote	Chromite	100-ton-a-day gravity con- centrator.

Kaiser Gypsum Co. projected plans to build its new board and plaster plant at Antioch, Contra Costa County, to replace the facilities lost by fire at Redwood City, San Mateo County, in June. Pabco Products, Inc., began constructing a gypsum-wallboard, lath, and sheathing plant at Newark, Alameda County. This plant was part of a \$2.5 million program that was to include development of a gypsum quarry in Nevada. Shipments of agricultural gypsum were made from Superior Gypsum Co. new crushing and screening plant, 30 miles northwest of McKittrick, Kern County. The plant was completely automatic, with an hourly capacity of 65 tons of 20-mesh material.

automatic, with an hourly capacity of 65 tons of 20-mesh material.

Pacific Coast Borax Co. planned an \$18-million program to construct new concentrating and refining facilities at Boron, Kern County, and to change to open-pit mining methods. Preparations were underway for renewing production at a borax mine near Boron, Calif., on the estate of Harvey S. Mudd. This property has been improved by constructing a testing laboratory, machine shop, blacksmith shop,

and housing facilities.

California Spray-Chemical Corp., subsidiary of Standard Oil Co., began constructing 4 plants, part of a 6-plant \$16-million fertilizer program, in Richmond, Contra Costa County, to produce ammonium

nitrate, ammonium sulfate, and ammonia. Production of ammonium nitrate has begun by Brea Chemicals, Inc., a Union Oil Co. subsidiary. The \$2-million plant at Brea, Orange County, has a capacity of 50,000 tons of fertilizer-grade ammonium nitrate a year.

Blue Diamond Corp. plans expenditure of \$1 million to construct a rock and sand plant near Palmdale, Los Angeles County, to supply its

California cement plant.

Verdi Development Co. acquired all the assets of Crystal Dome Uranium Co. and began treating California ore on an experimental basis, at its new uranium mill near Mojave, Kern County.

Kaiser Steel Corp. planned a multimillion-dollar addition to its Eagle Mountain iron-ore mining facilities in Riverside County, to supplement the beneficiation plant that began producing in 1954.

E. I. duPont de Nemours & Co., Inc., announced plans for a multimillion-dollar addition to the plant under construction near Antioch, Contra Costa County. The new unit will manufacture freon and tetraethyl lead from materials shipped to Antioch from company plants outside the State.

Wah Chang Mining Corp. completed 12 miles of transmission line from the Los Angeles No. 1 power plant on Owens River to its Black Rock mine in Mono County and converted from company-produced

power to use of this power.

Plans are underway for a new Idaho-Maryland Mine Corp. mill at its tungsten workings between Grass Valley and Nevada City in Nevada County.

California Industrial Minerals Co. will process pumice at a new

plant constructed during 1955 in Madera County near Friant.

In August, the Metropolitan Water District of Southern California began treating brine from wells and the dry lake at a new salt plant in the Danby Lake district, San Bernardino County.

#### FLOW OF MINERALS

All modes of transportation are used in moving California minerals, although, percentagewise, waterways move a comparatively small Intrastate transportation was mostly by motortruck because it is flexible, extra labor was not normally required for dumping or moving to the dumping point, and in inclement weather there is no danger of demurrage charges. In 1955, by far the greater tonnage of minerals moved was in the nonmetallic classification that cost as much to transport as the cost of the commodity itself. A large percentage of interstate long-haul movements of minerals, was handled Exceptions were combined railroad-motortruck haulby railroads. age, as in the case of concentrates from mills, which were hauled by truck to railheads and by railroad to smelters. Examples of long haul by motortruck are tungsten ore and concentrates to custom mills and chromite and manganese ores to depots outside the State. Transportation of minerals by water, formerly of considerable importance in intrastate movements, were at a minimum and confined, in some instances, to local distribution from imports.

Interstate Shipments.—The rapid rise in California production of raw materials required for continued industrial expansion more than offset the State's growth in mineral production. Material needs were probably greater in the base-metal commodities—copper, lead, and zinc. California was not self sufficient in any of these metals; basic requirements in lead and zinc were obtained from foreign ores treated at a smelter in the State. Important commodities supplied from other States were: Asbestos, barite, coal, special clays, fluorspar, gypsum, limestone, natural gas, perlite, petroleum, phosphate rock, silica sand, sulfur, and vermiculite. Surpluses exist in some minerals and processed mineral materials shipped to consumers outside the State. These commodities included cement, chromite, diatomite, feldspathic sands, magnesia, mercury, molybdenum concentrates, natural saline products, rare-earth concentrate, talc, and tungsten concentrate.

Imports and Exports.—Certain raw materials were imported in considerable quantity for some California industries; the manufacture of refractories required a grade of chromite not produced in sufficient quantity in the State: bauxite and kyanite were needed as high-alumina materials. To meet requirements of the building trades, gypsum was imported from Lower California and vermiculite from Portuguese East Africa. Fluorspar was obtained from Mexico to help supply the steel and chemical industries. Other foreign imports included crude petroleum. The chief commodities produced in California for export, primarily to United States Territorial possessions, were cement, salt, and petroleum products.

TABLE 4.—Sand and gravel, crushed stone, and portland cement sold or used in 1955, by method of transportation

	Tonnage transported, by method						
Material	Railroad	Motor- truck	Waterway	Not stated 1	Total		
Sand and gravel (commercial)	6, 063, 987 1, 198, 930 1, 487, 666	44, 630, 037 18, 167, 436 4, 929, 409	39, 600 1, 769, 519 160, 873	2, 355, 191 584, 534 17, 923	53, 088, 815 21, 720, 419 6, 595, 871		
Total	8, 750, 583	67, 726, 882	1, 969, 992	2, 957, 648	81, 405, 10		

<sup>&</sup>lt;sup>1</sup> Includes interplant transfers to batching units, etc.

## GOVERNMENT PARTICIPATION

Defense Minerals Exploration Administration (DMEA).—Government assistance for developing 12 projects, active in California for all or part of 1955, was provided by the DMEA program. This program was designed to give financial aid in the exploration and development of sources of strategic and critical minerals in the United States. Five new projects were initiated in the State during the year, 4 for mercury and 1 for copper-zinc.

TABLE 5.—Defense Minerals Exploration Administration contracts active during 1955

				Contract	
County and contractor	Property	Commodity	Date	Total amount	Govern- ment par- ticipation (percent)
ALPINE					
W. C. Morrison & Sons BUTTE	Valpine	Tungsten	Sept. 22, 1954	\$16,000	75
Helmke, Thomas & Janssen	Lambert	Chromite	Dec. 17, 1954	51, 474	50
Jonas & Johnson	Mt. Diablo	Mercury	June 5, 1953	73, 571	75
Vance H. Hongola	Obelisk	Tungsten	Dec. 8, 1955	12,000	
HUMBOLDT			200. 0,1800	12,000	75
Providence Tuolumne Gold Mines, Inc.	Copper Bluff	Copper, zinc	June 18, 1953	58, 820	50
H. E. Briggs	Red Cloud	Lead, zinc	Mar. 24, 1952	23, 980	50
California Quicksilver Mines, Inc.	Abbott	Mercury	Sept 15, 1951	163, 540	75
Hugh H. Simmons NEVADA	Granada	do	June 28, 1955	17, 800	75
Idaho-Maryland Mines, Corp PLUMAS	Brunswick	Tungsten	Dec. 28, 1954	67, 850	75
Lakeview Manganese Mines SAN BENITO		Manganese	Nov. 17, 1952	13, 000	75
New Idria Mining & Chemical		Mercury		129, 331	75
Do	do	do	July 18, 1952	365, 126	75
Frank Vollmer	Occanic				
SHASTA	Oceanic	do	Feb. 28, 1955	6, 639	75
Glidden Co Shasta Copper & Uranium Co., Inc.	Bully HillShasta King	Copper, zinc	Oct. 18, 1951 May 24, 1955	294, 300 104, 572	50 50
L. A. Smith & B. C. Austin	Altoona	Mercury	June 27, 1955	95, 260	75

General Services Administration.—The Government Defense Minerals Purchase Program continued under the administration of GSA. Purchases were made of chromite ore and concentrate, manganese ore and concentrate, and tungsten concentrate. The program included mercury, but the open-market value of this commodity was above the purchase minimum set up by the program; only 1 purchase of 5 flasks was made in 1955 by GSA. Shipments of purchases were made to depots and stockpiles maintained at designated places. Chromite was shipped to the depot at Grants Pass, Oreg., while manganese ores and concentrates went to depots in Montana, Arizona, and New Mexico, and on the "carlot" program. The depots at Wendem, Ariz., and Deming, N. Mex., were closed in May and November, respectively. Most purchases of tungsten concentrate were f. o. b. the milling point, and shipping instructions were issued to the producer by GSA.

### MINERAL INDUSTRY LABOR STATISTICS

Employment.—Preliminary figures indicated a slightly increased number of employees for all phases of the mineral industry in 1955.

TABLE 6.—Estimated number of nonsupervisory personnel in the mineral industry 1946-50 (average) 1951-55 <sup>1</sup>

Year	Metal mining	Mineral- fuel pro- duction	Nonmetallic mining and quarrying	Total
1946-50 (average)	3, 500	25, 100	5, 400	34, 000
	3, 400	25, 000	6, 600	35, 000
	3, 300	26, 100	6, 600	36, 000
	3, 200	27, 400	6, 600	37, 200
	3, 000	26, 800	6, 400	36, 200
	3, 300	27, 400	6, 600	37, 300

<sup>&</sup>lt;sup>1</sup> Data from Division of Labor Statistics and Research, California Department of Industrial Relations, in cooperation with the Bureau of Labor Statistics.

Wages.—The average hourly wage rate for all employees of the mineral industry continued the upward trend of the past several years. The same trend was shown in average weekly earnings, indicating the average number of hours worked per week to be substantially the same.

TABLE 7.—Average wages and hours worked in the mineral industries, 1953-551

1953			1954			1955		
Hours worked per week	Week- ly earn- ings	Hour- ly rate	Hours worked per week	Week- ly earn- ings	Hour- ly rate	Hours worked per week	Week- ly earn- ings	Hour- ly rate
43. 8 39. 7	\$83. 18 92. 33	\$1.90 2.33	44.5 39.3	\$86.65 94.26	\$1.95 2.37	44. 4 39. 7	\$90.31 97.36	\$2.03 2.45 2.32
	worked per week	Hours worked ly earnings week  43.8 39.7 \$83.18 92.33	Hours worked ly earn- ly rate week 43. 8 \$33. 18 \$1. 90 2. 33	Hours worked yearnings ly rate week  43. 8 \$83. 18 \$1. 90 \$44. 5 \$39. 7 \$92. 33 \$2. 33 \$39. 3	Hours   Week-worked   Hours   Hours   worked   per week   Hour   ly rate   week   Hours   worked   y earnings   Hours   worked   y earnings   Hours   worked   y earnings   Hours   worked   y earnings   Hours   Week   y earnings   Hours   Hours   worked   y earnings   Hours   Hours   worked   y earnings   Hours   Ho	Hours worked per week Hour- ly rate week Hours week 43.8 \$83.18 \$11.90 \$44.5 \$86.65 \$1.95 \$39.7 \$94.26 \$2.37	Hours worked ly earn- per week	Hours   Week-   Hour-   worked   per week   Hour-   y rate   week   Hour-   per week   Hour-   hour-   y rate   week   Hour-   y rate   per week   hour-   y rate   per week   y earn-   per week   y earn-   y rate   per week   y earn-   per week   y earn

<sup>&</sup>lt;sup>1</sup> Data from Division of Labor Statistics & Research, California Department of Industrial Relations, in cooperation with the Bureau of Labor Statistics.

Injuries.—Accident analysis for California during 1955 showed no appreciable change for their mineral industry as a whole, but it does indicate some rather interesting trends in certain categories of the industry.

TABLE 8.—Fatal and nonfatal disabling work injuries, mineral industry, 1954-55!

Industry		1954		1955			Disabling work injuries per 1,000 workers <sup>2</sup>	
	Fatal	Nonfatal	Total	Fatal	Nonfatal	Total	1954	1955
Metal mining Mineral fuel production Oil and gas-field contract services Rock, sand, and gravel quarrying Other nonmetallic mining and quarrying	6 6 10 3	407 778 1, 196 424 104	413 784 1, 206 427 108	12 7 4 7	523 750 1, 308 336	535 757 1, 312 343	138 74 84	162 76 71
Total mineral industry	29	2, 909	2, 938	32	3, 038	3, 070	81	82

<sup>1</sup> California Department of Industrial Relations, Division of Labor Statistics and Research: California Work Injuries, 1955.

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

# **REVIEW BY MINERAL COMMODITIES**

#### METALS

Antimony.—Annual assessment work was carried on at two antimony properties in Kern County. Antimony metal was recovered from base-metal ores at smelters outside the State. Smelter returns show that ores from 16 counties in the State contained recoverable antimony metal.

Cadmium.—Smelter returns on base-metal concentrate from the Darwin (Coso) district, Inyo County, show several tons of recoverable cadmium.

Chromite.—Chromite production came from 113 producers at 115 properties in 20 counties, fewer than in 1954. Over 50 percent of the State production came from 5 counties and was shipped to Government stockpiles at Grants Pass, Oreg. Ore was obtained from Del Norte and Siskiyou Counties and concentrates from Butte, Fresno, and San Luis Obispo Counties. California contributed about 14 percent of domestic chromite production amounting to approximately 28 percent of the value of smaller proportions than in 1954. The tonnage and value of more than 45-percent-grade concentrate were above 1954.

The leading producers of shipping-grade ore were: Tulare Mining Co. and Harold T. Funk, Del Norte County, High Plateau and Rattlesnake districts; J. T. & James W. Eastlick and J. A. Richter, Siskiyou County, Klamath River and Shasta River districts, respectively. The leading producers of chromite concentrate that was shipped to Government stockpiles were: Castella Mining & Milling Co., Magalia district, Butte County; J. R. Holman, Idria district, Fresno County; and Pierce Bros. and International Metallurgical Chrome Corp.,

Santa Lucia district, San Luis Obispo County. A small tonnage of chromite ore from the Mother Lode district was consumed locally in manufacturing refractories. The fact that many small mines were closed by July 1955 was one of the chief reasons for the production decline.

TABLE 9.—Shipments of chromite ore and concentrates by counties in 1955

		Rank in State (by	e treated 1	Materia					
County	Active mines and pros-			Total wet	Under 45 percent Cr2O3		Over 45 percent Cr <sub>2</sub> O <sub>3</sub>		Total value
	pects	value)			Ore	Concen- trate	Ore	Concen- trate	
AlamedaButteColusa	1 1	14 5 19	500 (2)	80 (2) (2)	(2)	(2) (2)	(²)	73	\$8, 889 (2) (2)
Del NorteEl DoradoFresnoGlenn	22 2 4 4	3 10 2 6	703 (2) 7, 320 (2)	2, 493 (2) 3, 378 (2)	606 (2) 31	1, 611 (2) 177 (2)	31 (2) 186 (2)	201 (²) 2, 701 (²)	267, 372 (3) 335, 631 (2) 15, 000
Humboldt Lake Napa Placer	2 2 7	12 16 11 13	462 704	157 92 250 110	30 31 25	126 56 85	14	91 141	7, 401 26, 065 12, 522
San Benito San Luis Obispo Santa Barbara Santa Clara	1 10 2 1	7 1 8 17	1, 950 16, 939 (2) 416	732 6, 404 (²) 57	206 (²)	85 (²)	2, 964 	2, 708 (2) 52	77, 983 482, 367 (*) 6, 326
ShastaSiskiyouTehamaTrinity	1 23 17 9	20 4 9 15	928 1, 336 284	(3) 2, 204 529 94	(2) 154 23 11	1,764 118 17	65 22 20	182 345 44	249, 303 54, 639 7, 675
Tuolumne Undistributed	1	18	8, 176	2, 994	163 76	457	1, 197	1, 112	3, 303 279, 801
Total Long tons Short tons	115		39, 718 44, 484	19, 737 22, 105	1, 356 1, 519	4, 496 5, 036	4, 553 5, 099	8, 268 9, 260	\$1, 834, 277

<sup>&</sup>lt;sup>1</sup> Partly estimated.
<sup>2</sup> Figure withheld to avoid disclosing individual company confidential data, included with "Undistributed."

Copper.—California produced 613 short tons of copper from all sources in 1955, considerably above 1954 output but less than one-fifth of the average production for the past 25 years. Production of copper from straight copper ore came from 11 mines in 7 counties, mostly from the West Belt district in Amador, Calaveras, and El Dorado Counties. The Ironwood district, Riverside County, and the Cow Creek district, Shasta County, also contributed small tonnages of copper from copper ore and smelter flue dust, respectively. More than 75 percent of byproduct copper in the State was produced in Inyo County; the remainder came principally from gold and lead ores of Inyo and San Bernardino Counties. The tungsten ores of the Pine Creek district were the most productive followed by the lead-zinc ores of the Darwin (Coso) district.

Gold.—Bucketline dredging in the Trinity River (Weaverville) district, Trinity County; the American River (Folsom) district, Sacramento County; and the Yuba River district, Yuba County, produced virtually all the placer gold in the State. The remainder was obtained from small operations in 23 counties by all other methods of placer mining. Compared with 1954, 28 fewer placer mines were producing; output was greater by more than 6,000 fine ounces of gold obtained by washing more than 4 million fewer cubic yards of gravel.

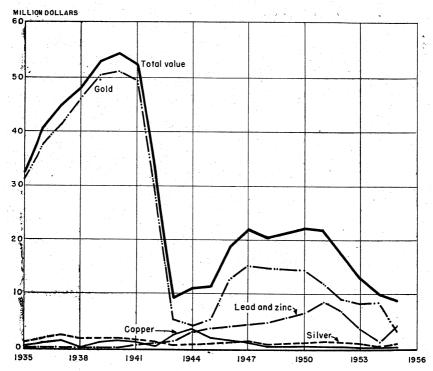


FIGURE 2.—Value of mine production of gold, silver, copper, lead, and zinc and total value in California, 1935-55.

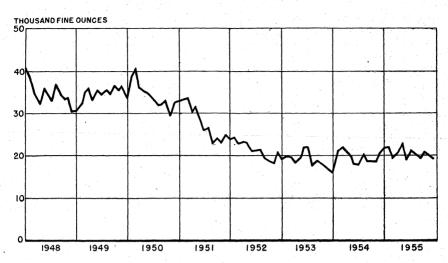


FIGURE 3.—Mine production of gold in California, 1948-55, by months in terms of recoverable gold.

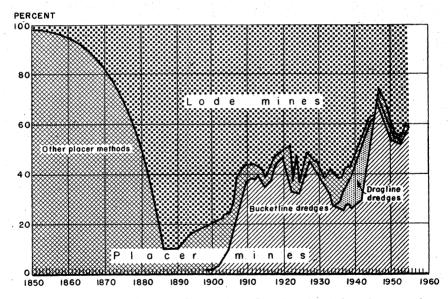


Figure 4.—Percentage of total California gold produced at lode and placer mines and by various methods of placer mining, 1850-1955.

TABLE 10.—Gold production at placer mines, 1946-50 (average), 1951-55, and total 1848-1955, by classes of mines and methods of recovery <sup>1</sup>

			Material		Gold recovered				
Class and method	Mines produc- ing 2	Washing plants (dredges)	treated (cubic yards)	Fine ounces	Value	A verage value per cubic yard			
0 4									
Surface placers: Gravel mechanically handled: Bucketline dredges:									
1946-50 (average)	20	32	86, 897, 220	244, 603 175, 870 131, 806 119, 022 134, 096 142, 548	\$8, 561, 119 6, 155, 450 4, 613, 210 4, 165, 770 4, 693, 360 4, 989, 180	\$0.09			
1951	13	25	68, 714, 600 49, 881, 800 45, 528, 800 44, 910, 720 40, 810, 210	175, 870	6, 155, 450	.09			
1952 1953	6 3	16 14	45 528 800	131,800	4, 613, 210	.09			
1954	3	15	44, 910, 720	134, 096	4, 693, 360	.10			
1955	3	11	40, 810, 210	142, 548	4, 989, 180	.12			
Dragline dredges: \$ 1946-50 (average)	30	07				١			
1951	13	27 11	3,876,900	18, 139 6, 652 6, 655	634, 851 232, 820 232, 925	.16			
1951 1952	13 7	7	1, 363, 000 1, 447, 700	6, 655	232, 925	.16			
1953	8	7	302,600	935	32, 725 51, 310	.10			
1954		9	179, 400	1,466	51, 310	.28			
1955 Suction dredges:	7	7	131, 710	589	20, 615	. 15			
1946-50 (average)	8	7	139, 240	764	26, 747	. 19			
1951 1952	13	9	180, 500	704	25, 095	.13			
1952	9	1 9	74, 100	305	10, 675	.14			
1953 1954	7	8	87, 700	341	11, 935	.13			
1954	3	3	3,800	53	1,855	.48			
Nonfloating washing	5	5	2, 400	46	1, 610	. 67			
1955 Nonfloating washing plants: 3 4				1					
1946-50(average)	22	22	233, 840	2,879	100, 772	. 11			
1951 1952	16	16	99, 900	2, 210	1 77, 350	. 56			
1952	18	18	11.600	1.462	51, 170	2.04			
1953 1954	24	24	40,800	1, 143	1 40.005	. 48			
1955	24 18	24 18	8,820	2, 298	80, 430 65, 275	.83			
Gravel hydraulically han-	10	10	80, 140	1,865	05, 275	. 28			
dled:			*						
1946-50 (average)	25		393, 920 55, 000 53, 100 216, 200	1,436	50, 260 15, 400 14, 315	. 12			
1951	13		55,000	440	15, 400	. 28			
1952 1953	9 16		53, 100	409	14, 315	. 27			
1954	8		43, 600	469 235	16, 415 8, 225	.07			
1055	8 7	7	115, 520	230	8,050	.07			
Small-scale hand methods: 8	1			1					
Small-scale hand methods: 5 1946-50 (average)	75		369, 742	5, 292	185, 227	. 50			
1952	43 48		59, 200	1.513	52, 955	. 89			
1953	53		51, 900 76, 500	1, 576 1, 271	185, 227 52, 955 55, 160 44, 485	1. 06 . 58			
1954	46		119, 800	1, 271	63, 070	. 52			
1955	28		94, 130	1, 182	63, 070 41, 370	. 439			
Underground placers: Drift:									
1946-50 (average)	11		6, 440	230	0.40	1 04			
1951	10		2, 800	230	8, 043 7, 770	1. 249 2. 778			
1952	ii		3, 700	130	4,550	1, 230			
1953	12		3, 330	165	5, 775	1. 734			
1954 1955	17		6, 580	247	8,645	1. 313			
	14		4, 780	153	5, 355	1. 120			
Frand total placers:									
1946-50 (average) 1951	191		91, 917, 302 70, 475, 000	273, 343	9, 567, 019	. 10			
1952	121		70, 475, 000	187, 624 142, 343	6, 566, 840	. 09			
1953	108 123		46 255 020	142, 343	4, 982, 005 4, 317, 110	. 097 . 098			
1954	110		45, 272, 720	123, 346 140, 197	4, 317, 110	. 106			
1955	82		51, 523, 900 46, 255, 930 45, 272, 720 41, 238, 890	146, 613	5, 131, 455	. 122			
848-1955									
			(6)	67, 369, 862	1, 493, 682, 816	(6)			

 <sup>1</sup> 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

Excludes titierant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
 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.
 Includes all placer operations using power excavator and washing plants, both on dry land; when washing plant is movable outfit is termed "dry-land dredge."
 Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, rockers, dry washers, etc.
 Complete data not available.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc 1946-50 (average), 1951-55, and total, 1848-1955, in terms of recoverable metals <sup>1</sup>

	Mines	producing 2	Material sold or	Gold (lode	and placer)	Silver (lode and placer)			
Year	Lode	Placer	treated (short tons) <sup>3</sup>	Fine ounces	Value	Fine ounces	Value		
1946–50 (average)	217 173 141 150 131 130	191 121 108 123 110 82	569, 096 494, 151 424, 783 390, 583 231, 517 304, 519	407, 812 339, 732 258, 176 234, 591 237, 886 251, 737	\$14, 273, 427 11, 890, 620 9, 036, 160 8, 210, 685 8, 326, 010 8, 810, 795	1, 104, 132 1, 145, 219 1, 099, 658 1, 036, 372 309, 575 954, 181	\$973, 218 1, 036, 481 995, 246 937, 966 280, 181 863, 582		
1848-1955			(4)	104, 885, 578	2, 373, 098, 882	116, 923, 103	95, 035, 630		
	C	opper	I	ead	Zin	ıc	Total value		
Year	Short tons	Value	Short tons	Value	Short tons	Value			
1946-50 (average) 1951 1952 1953	1, 685 921 800 382 362	\$623, 579 445, 764 387, 200 219, 268 213, 580	11, 052 13, 967 11, 199 8, 664 2, 671	\$3, 172, 498 4, 832, 582 3, 606, 078 2, 269, 968 731, 854	6, 475 9, 602 9, 419 5, 358 1, 415 6, 836	\$1, 667, 437 3, 495, 128 3, 127, 108 1, 232, 340 305, 640 1, 681, 656	\$20, 710, 150 21, 700, 570 17, 151, 792 12, 870, 230 9, 857, 260 14, 276, 300		
1954 1955	613	457, 298	8, 265	2, 462, 970	0,000	1,001,000	14, 210, 00		

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 12.—Mine production of gold, silver, copper, lead, and zinc in 1955, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zine (short tons)
January February March April May June July August September October November December Total	22, 276 22, 330 19, 882 20, 635 23, 473 19, 643 21, 383 20, 861 19, 730 21, 109 20, 533 19, 882	44, 151 64, 955 76, 924 74, 275 73, 104 83, 055 79, 646 100, 998 99, 972 84, 135 84, 657 88, 309	46 58 46 34 68 62 46 50 45 56 53	365 737 803 766 732 696 667 661 692 648 780 718	305 628 679 619 862 585 544 562 562 557 575 638

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery and types of material processed, in terms of recoverable metals

Type of material processed and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode: Amalgamation: OreOld tailings	1 52, 976 6	9, 390 1			
Total	52, 982	9, 391			
Cyanidation: OreOld tailings	41, 722	73, 734 25			
Total	41, 726	73, 759			
Total recoverable in bullion	1 94, 708	83, 150			
Concentration, and smelting of concentrates:	9, 376	663, 466	1, 160, 900	13, 327, 700	13, 213, 900
Total	9, 376	663, 466	1, 160, 900	13, 327, 700	13, 213, 900
Direct smelting: OreOld tailings, etc. <sup>3 4</sup>	1, 039 1	199, 093 747	43, 700 21, 400	3, 197, 200 5, 100	448, 100 10, 000
Total	1,040	199, 840	65, 100	3, 202, 300	458, 100
Placer	146, 613	7, 725			
Grand total	251, 737	954, 181	1, 226, 000	16, 530, 000	13, 672, 000

<sup>1</sup> Includes gold recovered as "natural gold."

TABLE 14.—Mine production of gold, silver, copper, lead, and zinc in 1955, by classes of ore or other source materials, in terms of recoverable metals

							JULIS
Source	Num- ber of mines <sup>1</sup>	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore: Dry gold Dry gold-silver Dry silver	106 2 8	154, 153 1, 155 2, 521	103, 531 424 1	85, 329 9, 731 16, 806	3, 600 200 800	46, 000	22, 700
Total	116	157, 829	103, 956	111, 866	4,600	214, 600	93, 800
CopperLeadLead	11 6 5 1	9, 315 5, 731 131, 132 38	166 66 766	9, 415 154, 626 611, 174 309	378, 000 10, 900 227, 800	9, 500 2, 620, 400 13, 680, 100 300	138, 900 13, 409, 000 20, 300
Total	23	146, 216	998	775, 524	616, 700	16, 310, 300	13, 568, 200
Other "lode" material: Old tailings 2 Copper precipitates and	4	379	10	330		2,000	1,800
tungsten ore 3. Flue dust	2 1	4 50 45	159 1	58, 303 433	600, 800 3, 900	3, 100	8, 200
Total	7	474	170	59, 066	604, 700	5, 100	10,000
Total "lode" material Gravel (placer operations)	130 82	304, 519 ( <sup>5</sup> )	105, 124 146, 613	946, 456 7, 725	1, 226, 000	16, 530, 000	13, 672, 000
Total, all sources	212		251, 737	954, 181	1, 226, 000	16, 530, 000	13, 672, 000

<sup>2</sup> Includes tungsten ore concentrate.
3 Includes copper precipitates and flue dust.
4 Combined to avoid disclosing individual company confidential data.

Detail will not necessarily add to total because some mines produce more than one class of material.
 Metal recovered, by class of old tailings, as follows: Gold, 341 tons—10 ounces of gold, 26 ounces of silver; silver, 38 tons—304 ounces of silver, 2,000 pounds lead, 1,800 pounds zinc.
 Combined to avoid disclosing individual company confidential data.
 Tungsten ore tonnage not included.
 41,238,890 cubic yards. Does not include material washed at commercial gravel plants and tungsten mines to produce 1,025 ounces of byproduct gold and 178 ounces of byproduct silver included in placer totals.

TABLE 15.—Mine production of gold, silver, copper, lead, and zinc in 1955, by counties, in terms of recoverable metals

	Min	e pro-	Gold									
County		ducing 1		ode	P	lacer	To	Total				
	Lode	Placer	Fine ounces	Value	Fine ounces	Value	Fine ounces	Value				
Amador <sup>2</sup> Butte	4	2 5	298	\$10, 430	(²) 90	(²) \$3, 150	<sup>2</sup> 298 90	<sup>2</sup> \$10, 430				
Calaveras Del Norte	4	(4)	43	1, 505	356 4	12, 460	399 4	13, 965 140				
El Dorado	8	1 3	6, 688	234, 080	57 2 80, 645	1, 995 22, 822, 575	6, 745 2 80, 645	236, 075 22, 822, 575				
side, and San Diego 3 Inyo	5 24		421 1, 787	14, 735 62, 545			421 1, 787	14, 735 62, 545				
Kern Los Angeles	14 3	1 3	4, 203 75	147, 105 2, 625	371 318	12, 985 11, 130	4, 574 393	160, 090 13, 755				
Madera Mariposa Merced	10	3	554	19, 390	15 52	525 1,820	15 606	525 21, 210				
NevadaPlacer	7	(4) 7 9	51, 106	1, 788, 710	686 191	24, 010	51, 792	1, 812, 720				
PlumasSacramento	1	5 7			113 55, 762	6, 685 3, 955 1, 951, 670	191 113 55, 762	6, 685 3, 955				
San Bernardino Shasta	22 6	2 2	78 114	2, 730 3, 990	35 220	1, 225 7, 700	113 334	1, 951, 670 3, 955 11, 690				
SierraSiskiyou	5	8 2	17, 748 21, 868	621, 180 765, 380	647 48	22, 645 1, 680	18, 395 21, 916	643, 825 767, 060				
Trinity Tuolumne 2	3 5 8	9	103 38	3, 605 1, 330	7, 002 (2) (2)	245, 070 (2)	7, 105 2 38	248, 675 2 1, 330				
Yuba ²	1	2				(2)	(2)	(2)				
Total	130	82	105, 124	3, 679, 340	146, 613	5, 131, 455	251, 737	8, 810, 795				

			Si	lver		
County	1	Lode	P	acer	Т	otal
	Fine ounces	Value	Fine ounces	Value	Fine ounces	Value
Amador <sup>2</sup> Butte	8, 933	\$8, 085	(²) 11	(²) \$10	<sup>2</sup> 8, 933	2 \$8, 085 10
Calaveras Del Norte	36	33	28	25	64 1	58
El Dorado	3, 233	2, 926	<sup>3</sup> 4, 118	2 3, 727	3, 238 2 4, 118	2, 931 2 3, 727
Diego <sup>3</sup>	1, 555 838, 412	1, 407 758, 805			1, 555 838, 412	1, 407 758, 805
Kern Los Angeles Madera	51	26, 415 46	76 41 3	69 37 3	29, 262 92 3	26, 484 83
Mariposa Merced	155	140	9	8	164	3 148
NevadaPlacer	14, 623	13, 235	101 21	91 19	14, 724 21	13, 326 19
PlumasSacramento	58	52	21 2, 444	19 2, 212	79 2, 444	71 2, 212
San Bernardino	2, 642	2, 391	7	6	2, 649	2, 397
ShastaSierra	456 3, 581	413 3, 241	23 68	21 62	479 3, 649	434 3, 303
Siskiyou Trinity	43, 512 16	39, 381 14	6 742	5 672	43, 518	39, 386
Tuolumne <sup>2</sup>	7	6	(2)	(²)	758 7 (2)	686 6 (2)
Total	946, 456	856, 590	7, 725	6, 992	954, 181	863, 582

See footnotes at end of table, p. 178.

TABLE 15.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties, in terms of recoverable metals—Continued

County	Cop	per	Le	ad	Ziı	16	Total
	Pounds	Value	Pounds	Value	Pounds	Value	value
Amador 2	353, 600	\$131, 893	9, 500	\$1,416			<sup>2</sup> \$151, 824 3, 160
ButteCalaveras	17, 500	6, 527	100	15			20, 565 141
Del Norte El Dorado Fresno and Stanislaus <sup>2 3</sup>	4, 800	1,790	45, 000	6, 705	19, 100	\$2, 349	249, 850 22, 826, 302
Imperial, Mono, Riverside, and San Diego	4, 900 821, 100 200	1, 828 306, 270 75	16, 383, 900	2, 441, 201	13, 594, 500	1, 672, 124	17, 970 5, 240, 945 186, 649
Los Angeles					100	12	13, 838 528 21, 370
Nevada Placer	600	224	700	104	2, 100	258	1, 826, 632 6, 704
PlumasSacramento	600	224					4, 250 1, 953, 882
San Bernardino Shasta Sierra	3, 900	7, 012 1, 455	87, 700 3, 100	13, 067 462	46, 600 8, 200 1, 400	5, 732 1, 009 172	32, 163 15, 050 647, 300
Siskiyou Trinity Tuolumne <sup>2</sup> Yuba <sup>2</sup>		l					806, 446 249, 361 2 1, 336 (2)
	1, 226, 000	457, 298	16, 530, 000	2, 462, 970	13, 672, 000	1, 681, 656	14, 276, 301

<sup>1</sup> Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal

TABLE 16.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

### A. For material treated at mills

	Mate- rial							đ	
	treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
			BY (	COUNT	IES				,
Amador	9, 015	92	19	1, 133	204	8, 724	347, 000	9, 300	
Calaveras El Dorado Imperial and San	9, 790	996	156	357	5, 692	3, 077	4, 800	45, 000	19, 100
Diego 2 Inyo Kern	62 135, 384 6, 535	20 746 3, 955		27, 757	899	650, 641	808, 500	13, 272, 500	13, 191, 300
Los Angeles Mariposa Mono	3, 469	75 496 10	51	1	13	ī			
Nevada Riverside	68, 366		13, 768	661	2, 182	855	600	700	2, 100
San Bernardino	139		17	3	4	27		200	
ShastaSierraSiskiyou	26, 257 33, 926	17, 376	3, 446	94	372	135			1, 400
Trinity Tuolumne Yuba	59 58	39	8						
Total: 1955	293, 309 221, 030				9, 376 13, 153	663, 466 140, 583	1, 160, 900 541, 700	13, 327, 700 2, 879, 200	13, 213, 90 2, 456, 80

See footnotes at end of table, p. 180.

right to property.

2 Amsdor, Tuolumne, and Yuba Counties placer gold and silver combined with Fresno and Stanislaus Counties to avoid disclosing of individual company confidential data.

3 Combined to avoid disclosure of individual output.

4 From property not classed as a mine.

TABLE 16.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

## A. For material treated at mills—Continued

		i T		T					
	Mate- rial	Recove	erable in llion		Concen	trate shi recove	pped to s rable me	melters <sup>1</sup> a tals	nd
	treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds
	вч	CLASSI	ES OF M	ATER	IAL TR	EATEI	)		
Dry gold: Crude oreOld tailings Dry gold-silver ore	341	´ 10	26	1, 144	8, 343 	4, 089	700	45, 900	22, 6
Dry silver ore Copper: Crude ore and		176	3, 507	1		19			
tungsten ore 2 3 Lead zinc ore	8, 931 129, 741			2, 260 26, 605	295 738		225, 200	13, 272, 500	13, 191, 30
Total: 1955	293, 309	94, 708	83, 150	30, 010	9, 376	663, 466	1, 160, 900	13, 327, 700	13, 213, 90
BY CLAS			ī						
Ory gold Ory silver Copper				797 1 4 2, 260	2, 647 4 295	1,014 19	4 935, 000	700 9, 300	
Lead.				347	5, 696	3, 075	100	45, 200	19, 10
Lead-zinc Zinc				15, 621 10, 984	676 62	547, 511 44, 832	164, 600 60, 600	12, 590, 600	1, 733, 40 11, 457, 90
Total 1955				30, 010	9, 376	663, 466	1, 160, 900	13, 327, 700	13, 213, 90
7	For a	nateri	al ship	pped a	lirectly	u to sr	nelters		
В.									
В.				Mate- rial				al content	

#### BY COUNTIES

Amador Calaveras Imperial Inyo Kern Mariposa Mono and Riverside 2 Plumas	23 80 146 9, 206 565 23 128	272 142 248 45	30 156 187, 518 7, 441 16	17, 500 12, 600 200 4, 900	3, 111, 400	
San Bernardino Shasta Trinity  Total: 1955 1954	980 48 8 11, 210 10, 487	84 64	451 8 199, 840	3, 900  65, 100	3, 100	

TABLE 16.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

# B. For material shipped directly to smelters-Continued

	Mate-	Recoverable metal content					
	shipped (short tons)	Gold (fine)	Silver (fine)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	
BY CLASSE	S OF M	ATERI	AL				
Dry gold: Crude ore Dry gold-silver: Crude ore	448 564	666 248	1, 623 6, 224	2, 900 200	100	100	
Dry silver: Crude ore	2, 521 38	1	16, 787 304	800	168, 600 2, 000		
Copper: Crude ore	384 50	30	693 10	26, 300 17, 500			
Copper zine: Flue dustLead: Crude ore	45 5, 731	1 66		3, 900 10, 900	3, 100 2, 620, 400	138, 900	
Lead-zinc: Crude oreZinc: Crude ore	1, 391 38	28	18, 831 309		407, 600 300		
Total 1955	11, 210	1, 040	199, 840	65, 100	3, 202, 300	458, 100	

TABLE 17.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

	Quantity shipped		Gre	oss metal c	ontent	
Class of material	or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCE	NTRATE	SHIPPE	о то ѕм	ELTERS		
Dry gold Dry silver	1	2, 647	1, 014 19	925 6	780 3	4, 45
CopperLeadLeadLeadLeadLeadLeadLeadLeadLead	1 2, 260 347 15, 621	1 295 5, 696 676	1 67, 015 3, 075 547, 511	1 957, 767 142 193, 401	16, 936 45, 732 12, 808, 347 717, 830	24, 20 2, 194, 14 11, 727, 89
Zine Total: 1955 1954	30, 010 9, 615	9,376 13,153	44, 832 663, 466 140, 583	61, 798 1, 214, 039 564, 083	13, 589, 628 2, 939, 107	13, 950, 69 2, 624, 04
ORE, ETC.,	SHIPPE	D DIREC	TLY TO	SMELTE	RS	
Dry gold: Crude ore Dry gold-silver:	448	. 666	1,660	3, 045	127	17
Dry gold-sliver: Crude ore Dry silver: Crude ore		248	6, 224 16, 787	242 1, 195	170, 384	90, 10
Old tailings	. 38		304		2,054	2, 28
Orude ore	384	30	695 10	27, 053 18, 043		
Flue dustLead:	1	66	434 154, 626	4, 610 13, 777	3, 178 2, 780, 010	10, 38
Lead-zinc: Crude ore	'	28	18, 831	3, 441	411, 994	275, 51
Zinc: Crude ore	38		339		343	22, 6
Total: 1955 1954		1, 040 950	199, 910 112, 390	71, 406 189, 453	3, 368, 492 2, 562, 190	582, 37 482, 96

<sup>&</sup>lt;sup>1</sup> Includes concentrate and contained metal from tungsten ore.

Excludes concentrates treated only by amalgamation and/or cyanidation.
 Combined to avoid disclosing individual company confidential data.
 Tungsten ore tonnage not included with material treated.
 Includes concentrate and contained recoverable metal from tungsten ore.

TABLE 18.—Mine production of gold, silver, copper, lead, and zinc in 1955, by counties and districts, in terms of recoverable metals 1

County and district	Mines in	Mines produc- ing 2	Lode material (short	Gol	Gold (fine ounces)		Silver (lode	Copper	Lead	Zinc	Total value
	Lode	Placer	tons)	Lode	Placer	Total	fine ounces)		,	<u>)</u>	
Amador County: Bast Belt 4 Mokelumne River	6	9 1	174	14	9-	74	14				\$2,603
West Belt 6 Butte County:	-	2	8,863	138		138	8, 902	353, 600	9, 500		35 146, 196
Butte Creek Yanke Hull Calavara County					15	15	81				527 596
East Belt 4	<u>ေ</u>	<u>-</u>	98	33 10	128	138	82	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	100		1,258 4,848
Del Norte Comty: Patricis Ortek El Docedo Courter	1	້ ອ	3		4	4	S -1	17, 500			14, 459
American River (Folsom) * Rate Bule 7 Mother Lode 7		<u>වෙ</u>	8,976	5,722	%°75	5,724	3,070	100	45,000	19, 100	1, 193 212, 210
West Belt 6 Imperial County: Cargo Minchacho	- 100	1	100	211	77	211	787	4, 700			27, 284 9, 163
Inyo County: Coso.	1 10		129, 786	699		699	150	229 700	13.652.900	13 263 500	9, 661
rish Springs Lee. Modoc. Wildrose.	-0-0		1, 320 1, 365 1, 365 429	388°		8888	18, 448 39, 506	2, 600 4, 000	385, 300 639, 700	208, 900	101, 506 136, 381
Kern County: Olear Oreek Kern River	. =	(9)	82	24	-	7.	10				6, 301 849
Mojave Radamacher Randsburg *	7-14		6, 389 10 640	3, 281 1 896	370	3, 281	28, 943	200			35 141, 105 35 44, 550
Los Angeles County: Cedar. Saugas Madera County:	1	1	R	1	1						35 35 35 35 35 35 35 35 35 35 35 35 35 3
San Joaquin Mariposa County:		-			-	-					38
Bast Belt * Mother Lode ? West Belt *	4.0	e 9	2, 760	274	(a) 2 4	11 280 4	11 58			100	9,748
See footnotes at end of table, p. 23.							•		, 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		1

totion of gold, silver, copper, lead, and zinc in 1955, by counties and districts, in terms of recoverable	
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production of	•
3.—Mine	
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TABLE	

Lode Placer Total fine ounces   Process   Proc		Mines produc- ing 2	roduc-	Lode material	Gold	Gold (fine ounces)		Silver (lode	Copper	Lead	Zinc	Total value
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Lode	Placer	tons)	Lode	Placer	1	fine ounces)				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Sounty:		0			1	-	1				\$35
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	ounty:	<u>ව</u>			01		10	7	1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1	356
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Oounty: s Valley-Nevada City ington.		ව 4	68, 316	50, 446 (10)	195 407 31	50, 641 12 407 31	14, 420 12 58 5	009	(01)	(10)	1, 785, 856 12 14, 297 1, 090
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	ounty: rican River (Folsom) <sup>8</sup>					410	14					494
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	lrn Canyon X					17.	17					176 597
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	y Farm Hill Chance		_			* 9 <u>2</u> 9	4 5 <u>7</u> 9					1,964
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Jounty: a Valley					15	15	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1	1		525
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	see. 1yille orte.	1		ေ		199	199	59	009			487
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	cy it Flat		€ (E)			8 8	8 8	14				1, 280 1, 280
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	) County:	<sup>(</sup> ଚ			6		6	က				317
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	to County: ican River (Folsom) <sup>§</sup>	1	9	1	1	55,746	55, 746					1, 953, 320
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	ardino County: K Hawk Mountein			10	L			1.485	2, 100	85, 200	24, 500	252
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	mb.	) <del></del>	-	7	160	6						105
2 1 (10) ** 33 13 3 12 13 30 8.200 13 3 3 13 13 30 8.200 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Woman Mountains.	60-	1	46	, , , , , , , , , , , , , , , , , , ,	1	•		100	2,000	1,800	1,058
	lactics	-0100	1	(10)	(10)	33	12 33	=	8,200			3,680

Snasta Coutony Octomycod Creek Dog Creek French Gulch Igo Redding Shasta.	11110	<b>5</b> 000 0	(10)	64 6 6 6 (01)	17 2 3 3 6 189 3	17 2 82 15 198 198	5 17 2 2 19				600 70 70 5, 885 6, 947 1105
	1 22	89 99 99 99	(10) 7,815	12,346	371 (10) 44 190 190	12,371 11 12,346 44 6 190 15	12,48 11,2,660 1 1 14			(01)	13 13, 028 11 434, 517 1, 544 211 6, 663
		© (3)	33, 620 (10) 6	21, 851 (10) 12	25 16 1	21, 857 12 25 28 1	43, 509 12 4 4				804, 373 12 878 984 35
	CO "	6	94 5	114 5	7,002	7,006	742				388 245, 882
	- m	(S)	12	28	(10)	11 20	+ co				11 703
	-	(E)	7		(m)	100					105
	32	(e) 20	31, 273	7, 426	81, 208	88, 634	98, 125	602, 000	1, 710, 300	130, 100	3, 686, 385
	130	88	304, 519	105, 124	146, 613	251, 737	954, 181	1, 226, 000	16, 530, 000	13, 672, 000	14, 276, 301

<sup>1</sup> 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 "Undistributed."

Frouped as "Undistributed."

Excludes itinerant prospectors, "snipers," "high-graders," and others who gave

no evidence of legal right to property. § Source of total silver as follows: 946,456 ounces from lode mines and 7,725 ounces

from placer mines.

\* East Belt district lies in Amador, Calaveras, El Dorado, Mariposa, and Tuoumne Counties.

 From property not classed as a mine.
 West Belf districtlies in Amador, Calayeras, El Dorado, and Mariposa Counties.
 Mother Lode district lies in Calayeras, El Dorado, Mariposa, and Tuolumne <sup>§</sup> American River (Folsom) district lies in El Dorado, Placer, and Sacramento Counties.

• Randsburg district lies in Kern and San Bernardino Counties

10 Figure withheld to avoid disclosing individual company confidential data, in-

eluded with "Chalistributed."

In Exclusive of placer output, which is included with "Undistributed."

In Exclusive of placer output, which is included with "Undistributed."

In Exclusive of placer output, which is included with "Undistributed."

In Exclusive of lode output, which is included with "Undistributed."

In Exclusive of lode output, which is included with "Undistributed."

In Exclusive of lode output, which is included with "Undistributed."

In Exclusive of lode output, which is included with "Undistributed."

In Exclusive of lode output, which is included with "Undistributed."

In Exclusive of lode output, which county; Rings River and Ban Joaquini, French County; Picacho. Imperial County; Rings River and Ban Capter and Capter

A little over 300,000 tons of ore obtained at 130 lode mines in 20 counties yielded about 100,000 fine ounces of gold. Of this total, less than 200 ounces of gold was recovered from treating old tailings. By far the greater part of the total recoverable gold was obtained as bullion from amalgamation and cyanidation processes and some through the smelting of concentrate. A very small quantity of gold was produced by the direct smelting of approximately 11,000 tons of ores of several types. Less than 200 fine ounces was recovered in treating tungsten ore.

Iron Ore.—Iron-ore production increased considerably in 1955, owing almost entirely to the output at the Kaiser Steel Corp. Eagle Mountain property, Riverside County. The tonnage upgraded at the heavy-medium plant was over 1.6 million long tons as compared with less than 700,000 tons in the previous year, and shipping-grade ore direct from the mine increased over 10 percent. In addition to ores shipped to the Fontana plant in San Bernardino County, approximately 65,000 tons of the Eagle Mountain ore was exported. The only other iron-ore production of note within the State was in the Cave Canyon district, San Bernardino County, by Mineral Materials Co., this ore was destined to cement plants in the State. All mining was by open-pit methods on both magnetite and hematite ores. The average shipping grade of all ore produced was over 54 percent iron.

TABLE 19.—Iron ore and other metallic materials consumed and pig iron produced, 1946-50 (average) and 1951-55, in net tons

Year	Iron and n erous ire		Sinter 1	Miscel- laneous	Total	Pig iron produced
	Domestic	Foreign				
1946-50 (average)	407, 102 862, 977 952, 606 987, 471 752, 766 1, 008, 256	2, 888	315, 722 623, 836 612, 356 805, 938 650, 609 800, 929	80, 020 121, 854 172, 227 150, 504 134, 768 132, 872	805, 732 1, 608, 667 1, 737, 189 1, 943, 913 1, 538, 143 1, 942, 057	453, 383 921, 695 977, 121 1, 095, 118 860, 162 1, 122, 091

<sup>&</sup>lt;sup>1</sup> Excludes recycled materials.

Iron and Steel.—Pig-iron production in California was limited by the blast-furnace capacity at the Kaiser Steel Corp. Fontana plant. These furnaces have been producing at or near 1 million short tons annually. United States Steel Corp. shipped pig iron from its Geneva plant in Utah to its Columbia Geneva Steel Division for consumption at the Pittsburg, Contra Costa County, and Torrance, Los Angeles County, open-hearth facilities in compensation for the deficiency of California production in relation to consumption. Kaiser Steel Corp. at open-hearth furnaces in Fontana used company-produced pig iron and raw materials but not scrap. Pacific States Steel Co. and Judson Steel Corp. ran open-hearth furnaces in Niles and Emeryville, respectively, Alameda County. All companies, including Bethlehem Pacific Coast Steel Corp. at its South San Francisco plant, operated their own rolling mills. At open hearths, with the exception of Kaiser Steel Corp., mill (roller) scale from company rolling mills, rather than iron ore, was utilized for oxidation and the finishing of heats.

Nearly 1 million tons of pig iron and over 1.5 million tons of iron and steel scrap were utilized to produce approximately 2.5 million net tons of steel, in all forms, by open hearth in California in 1955. An unknown tonnage of cast iron and steel was produced by many

foundries throughout the State.

Lead.—The more than 200-percent rise in lead production over the previous year reflected improved market value. The Darwin group of mines in the Darwin (Coso) district and the Shoshone group of mines in the Resting Springs district, Inyo County, operated by The Anaconda Co., normally produce about 85 percent of California lead from all sources. The Shoshone mines were idle from March 1953 until October 1955, while the Darwin mines were idle for the last three quarters of 1954 and were reopened early in 1955. Other operators in Inyo County, particularly in the Coso, Lee, Modoc, and Ubehebe districts, contributed appreciably to California lead production. This county produced almost the entire State total. Fifteen other counties furnished the remaining 1 percent. Lead-zinc ore yielded by far the greatest amount of lead while copper ore from the West Belt district, Amador County, and gold ore from the East Belt district, El Dorado County, were the principal sources of the remaining output.

Manganese.—Shipments to Government high-grade stockpiles actually increased more than 400 percent while the tonnages shipped to low-grade stockpiles decreased approximately 50 percent. The State's

entire production of manganese ore was metallurgical grade.

Tonnages of low-grade manganese ores mined declined very appreciably, and the average shipping grade of these ores dropped almost 2 percent in manganese content. No manganiferous iron ores were

produced during the year.

Several factors indicated that production in California might soon decline. The distance to Government stockpiles presented a problem from the standpoint of transportation cost and was emphasized by the fact that there was little or no local market for manganese ore. The complete absence of any activity in manganese exploration under the DMEA program during 1955 was indicative of very low interest in the manganese program. No battery-grade manganese was produced in the State during 1955. All these features persisted in spite of a continuing domestic stockpile price almost double that paid for imports of equal quality. When the stockpile goal for national security has been met and special Government prices have been discontinued, California manganese production was expected to fall off drastically in the absence of a rise in open-market prices.

Seven counties supplied California's entire production of manganese ore; the Ironwood district of Riverside County contributed most of

the total.

Mercury.—Mercury production in California declined as compared with an overall increase in national production. The State continued to contribute more than half the mercury produced in the United States. The several reasons for this decline were: Average grades of ores mined were lower by about 1.5 pounds per ton; end stocks remained substantially the same; certain major producers, during the last quarter of the year, found it expedient to give exploration and development programs priority over production.

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Although 16 counties contributed the State output, only 7 produced more than 100 flasks each. As in the past year, the leading producers continued to be New Idria Mining & Chemical Co., San Benito County; Sonoma Quicksilver Mines, Inc., Sonoma County; and California Quicksilver Mines, Inc., Lake County.

Activity under the DMEA program continued at properties in Lake and San Benito Counties. New activity in cinnabar exploration under DMEA was begun in Napa, San Benito, San Luis Obispo, and

Trinity Counties.

TABLE 20.-Mercury produced in 1955, by counties

	Producing	Ore	Mercury re	covered
County	mines	treated (short tons)	Flasks (76 pounds)	Value <sup>1</sup>
Fresno	1 <sub>5</sub>	863	75 57	\$21, 776 16, 550
NapaSan Luis ObispoSanta Barbara	8 1	6, 306	272 15	78, 975 4, 355
Santa Clara	3 1	3, 964 120	830 12	240, 991 3, 484
Trinity Undistributed <sup>2</sup>	1 29	73 117, 593	52 8, 562	15, 098 2, 485, 977
Total	49	128, 919	3 9, 875	2, 867, 206

TABLE 21.—Mercury produced, 1946-50 (average) and 1951-55, by method of recovery

	Furn	áced 1	Reto	orted	Unclas- sified 2	To	otal	Operat-
Year	Ore (short tons)	Flasks (76 pounds)	Ore (short tons)	Flasks (76 pounds)	Flasks (76 pounds)	Flasks (76 pounds)	Value 3	ing mines
1946–50 (average)	74, 731 54, 316 82, 431 95, 325 110, 445 122, 937	10, 271 3, 837 6, 992 8, 874 10, 525 8, 671	859 1, 440 1, 239 1, 556 10, 100 5, 982	302 170 202 343 724 1,077	323 275 47 73 13 127	10, 896 4, 282 7, 241 9, 290 11, 262 9, 875	\$941, 987 899, 777 1, 441, 683 1, 793, 249 2, 977, 560 2, 867, 206	20 27 24 28 35 49

A deposit of mercury ore was developed in the outskirts of Redwood City, San Mateo County. The mine yielded about 125 flasks of

mercury a month during the latter half of the year.

Molybdenum.—Molybdenum production in the State came as byproduct concentrates (oxide and sulfide) from tungsten production by Union Carbide Nuclear Co. (formerly United States Vanadium Co.), a division of Union Carbide & Carbon Corp. in the Pine Creek area, Bishop district, Inyo County. Molybdenum minerals, powellite and molybdenite, appear in association with the scheelite mined and concentrated by the company. The entire output of molybdenum

Value calculated at average price at New York, \$290.35 per flask.
 Includes Inyo, Kings, Lake, Marin, Merced, San Benite, San Mateo, and Sonoma, to avoid disclosing individual company confidential data.
 Includes mercury from dump and placer material treated.

Includes ore and mercury from dumps not separable.
 Includes mercury recovered from miscellaneous dump material, placer, and cleanup operations.
 Value calculated at average price at New York.

concentrate was sold for export. The increase in production over 1954 was due, primarily, to a higher average percentage of molybdenum in ore treated.

Platinum-Group Metals.—Nearly 300 ounces of crude platinum was recovered by dredging at two places in Sacramento and Yuba Counties. The bench gravels of the American River (Folsom) district in Sacramento County proved the most productive. Output increased

more than 70 percent over that in the previous year.

Rare-Earth Metals.—The Molybdenum Corp. of America Mountain Pass open-pit mine and flotation mill in the Clark Mountain district, San Bernardino County, continued to be the only source of rare-earth metal concentrate in the State. This deposit of bastnaesite (fluo-carbonate of cerium metals), the world's largest, is one of the few domestic sources.

Much of the production has gone to research for increased industrial utilization. Most promising is the possibility of using the contained

minerals as additives in steelmaking.

Silver.—Although silver production in California did not reach 1 million fine ounces, it increased over 200 percent in 1955 as compared with 1954. This sudden and marked rise was due to reactivation of the Darwin group of mines in Inyo County by The Anaconda Co. Inyo County led in California silver production; contributing 72 percent from the Darwin (Coso) district and approximately 7 percent from the Pine Creek district, which was a byproduct from treating tungsten ore. The State's lead and lead-zinc ores contributed over three-fourths of the total silver produced from all sources. Less than 8,000 fine ounces came from placer mines; however, 146 separate operations, of all types, in 20 counties, furnished the total production.

TABLE 22.—A. Tungsten concentrate produced in 1955, by counties in which ore was milled

	Producing		Ore 1		Concen-	Contained
County	mines and prospects	Mined (short tons)	To mills (short tons)	Milled 2 (short tons)	trates pro- duced <sup>1</sup> (pounds)	WO <sub>2</sub> <sup>1</sup> (units)
Alpine Calaveras El Dorado Fresno Imperial Inyo Kern Los Angeles Madera Marin Marinoss Mono Nevada Riverside San Bernardino San Diego Shasta Tulare Tuolumne Undistributed	9 19 2 80 81 	(*) 450 (*) 450 20, 702 457 320, 544 6, 047 24, 373 (*) 113, 687 7, 513 72 (*) 25, 101 (*) 1, 764	(*) 450 (20, 702 24, 457 311, 960 5, 697 24, 423 (*) (*) 142, 704 3, 087 71 17, 513 72 (*) (*) (*) (*)	(*) 450 (20, 702 20, 702 24, 67 4 324, 069 5, 447 4 425 24, 423 (*) (*) 137, 845 3, 086 17, 430 61 (*) (*) (*) (*) (*)	(1) 1, 153 (2) (3) 165, 014 6, 987 44, 281, 618 152, 766 47, 767 430, 417 (2) 2, 126, 448 72, 000 72,	(3) 36 (2) 407 5, 407 226 4 152, 237 4, 706 4 243 14, 594 (3) (3) (65, 275 2, 522 31 15, 552 (4) 7, 719 (5)
Total	297	533, 868	553, 999	560, 145	8, 015, 098	268, 854

See footnotes at end of table, p. 188.

TABLE 22.—B. Production and shipments of tungsten concentrate in 1955 credited to California counties in which ore was mined-Continued

		(	Concentrates		
County	Produ	iced 1		Shipped	
	Pounds	Units	Pounds	Contained WO <sub>3</sub> Units	Value 4
Calaveras Fresno Imperial Inyo Kern Madera Mono Nevada Riverside San Bernardino San Diego Tulare Undistributed 6	165, 014 6, 987 4, 026, 520 157, 357 430, 417 2, 208, 203 72, 023 1, 111 512, 639 894 248, 898	36 5, 407 226 143, 081 4, 857 14, 594 68, 189 2, 523 33 15, 584 30 7, 708 1, 249	1, 153 165, 014 6, 987 4, 017, 786 157, 357 430, 417 2, 173, 533 72, 023 1, 111 551, 071 8,94 248, 898 37, 281	36 5, 407 226 142, 776 4, 857 14, 594 66, 810 2, 523 33 16, 753 30 7, 708 1, 249	\$2, 21; 333, 07. 13, 92; 8, 795, 00; 299, 19 898, 99 4, 115, 41; 2, 03; 1, 031, 98, 1, 84; 474, 81; 76, 93;
Total	7, 868, 497	263, 517	7, 863, 525	263, 002	16, 200, 92

Tungsten.—Production and shipments of tungsten concentrate continued to increase in 1955. California still ranked second in the Nation in mine production, which came from 323 producers at 297 mines in 19 counties. Inyo County produced the greatest quantity because of the output from Union Carbide Nuclear Co. (formerly United States Vanadium Co.), division of Union Carbide Corp. at Pine Creek. Output within the State combined with its tungsten production outside California made this company the leading producer in the Nation as well as in the State. Mono County ranked second in the State chiefly because of production at the Black Rock mine of Wah Chang Mining Corp., which ranked second as an individual producer in California and the Nation. Surcease Mining Co., Randsburg district, the State's fourth ranking individual producer, contributed greatly to the production of San Bernardino County, third in California tungsten production. The Strawberry mine in the Bass Lake district was the controlling factor in causing Madera County to rank as the State's fourth largest producer. New Idria Mining & Chemical Co. was the third largest individual producer in the State.

State shipments exceeded mine production in that considerable tonnages of ore and low-grade flotation concentrate from Nevada were treated and upgraded in California plants. Union Carbide Nuclear Co. at Pine Creek used a chemical digestion section and concentrator facilities for treating appreciable tonnages of custom material.

Tungsten exploration continued under the DMEA program in the Grass Valley district, Nevada County, and in the Hope Valley district,

Alpine County.

<sup>&</sup>lt;sup>2</sup> Ore actually milled in county.

<sup>3</sup> Figure withheld to avoid disclosing individual company confidential data, included with "Undistributed."

<sup>4</sup> Includes material from Nevada mines.
5 Based on GSA weighted average at San Francisco of \$61.60.
6 Includes Alpine, El Dorado, Marin, Mariposa, Shasta, and Tuolumne Counties.

The Domestic Tungsten Program authorized GSA to purchase 3 million units of domestic tungsten at \$63 per short-ton unit. Import prices were quoted from almost \$34, at the beginning of the year, to a little over \$42 at the year end. GSA reported delivery of nearly 2,380,000 short-ton units as of December 31, 1955. At the late 1955 rate of delivery, the domestic quota could be filled before the close of the fiscal year ending June 30, 1956. Unless the program is continued beyond the 3 million units specified, State production could be seriously affected if open-market prices were made the basis of all sales, as most domestic production comes from comparatively low-

grade deposits.

Uranium.—The interest in uranium prospecting did not decline, but the publicity associated with this important commodity moderated considerably. Uranium-strike rumor reporting gave way to activity reports on known prospects where exploration and development work had indicated relatively good possibilities of production. The uranium minerals autunite, torbernite, and carnotite were found in Lassen, Kern, Riverside, San Bernardino, Tulare, and Tuolumne Counties. Nearly 100 authenticated uranium occurrences were reported in California in 1955. Finds of uranium-bearing minerals have been made throughout the State from Imperial County in the south to Plumas County in the north; Kern County contains the most significant deposits. Most activity was centered in the Kern Canyon area of the Greenhorn mountain district and in the Clear Creek, Keyes, and Green Mountain districts. During 1955, ore shipments were made from properties in the Dry Lake, Greenhorn Mountain, and Clear Creek districts of Kern County; the Morongo district, San Bernardino County; the Mule Mountain district, Riverside County; and the Red Rock district, Lassen County.

Zinc.—The Anaconda Co. reopened the Darwin and Shoshone groups of mines, which supplied most of the approximately 400-percent increase in zinc output over the previous year. Only 4 other counties, in addition to Inyo County, contributed more than 1 ton of zinc each to the total output. A California smelter-fuming plant recovered a few tons of zinc from gold ore of the East Belt district in El Dorado County. Nevada County contributed a little over 1 ton of the metal, obtained from gold ore from the Grass Valley-Nevada City district; zinc was also recovered at a fuming plant. San Bernardino County ranked a poor second, with a few tons of zinc coming from silver ore (Clark Mountain district), zinc ore (Ivanpah district), and gold ore (Old Woman Mountains district). Copper-zinc flue dust from abandoned smelters of the Cow Creek (Ingot) district, Shasta County, furnished a small tonnage. In Sierra County, several hundred pounds of the metal was obtained from gold ore mined in the Alleghany

district and treated at a smelter-fuming plant.

Other Metals.—Selenium in lead-zinc concentrate from Coso district, Inyo County, was recovered at smelters outside the State.

Ilmenite was recovered from the beach-sand deposits in the Torrance district, Los Angeles County, and used for manufacturing roofing material.

Considerable interest was displayed in prospects in various sections of the State on showings of nickel-cobalt and zirconium-hafnium

minerals. Exploration had not yet reached the stage of determining the possibilities of these prospects.

#### SECONDARY METALS

Iron and Steel Scrap.—The iron and steel scrap business, of major importance in California, used approximately 2.8 million tons of iron and steel scrap during 1955. A little more than 1 million tons was home scrap produced by the consuming industry. The remainder was purchased from suppliers within and outside the State. At least 80 percent of this total was used in steelmaking by the principal producers. Many foundries throughout the State required considerable

tonnages of scrap to produce cast iron and steel.

Nonferrous Metal Scrap.—California production of nonferrous metal ores, such as copper and zinc and to a lesser extent lead, was extremely small compared with the State needs. Many other nonferrous metals, required by industry throughout the State, had little or no production, causing the nonferrous-secondary and scrap-metal offerings to compete directly with the primary metal market. Scrap in the form of white metals, type metal, antimonial lead, and other alloys was produced chiefly in the San Francisco and Los Angeles areas. However, foundry consumption figures show that the largest tonnages have been in leaded red brass and copper scrap. In most categories, nonferrous consumption figures were well above those of 1954.

TABLE 23.—Consumption of ferrous scrap and pig iron, 1946-50 (average) and 1951-55

Year	Total scrap used (short tons)	Pig iron used (short tons)	Year	Total scrap used (short tons)	Pig iron used (short tons)
1946-50 (average)	1, 915, 159	678, 407	1953	2, 574, 840	1, 233, 898
1951	2, 638, 565	1, 271, 574	1954	2, 185, 451	1, 000, 576
1952	2, 470, 169	1, 288, 561	1955	2, 777, 589	1, 223, 264

TABLE 24.—Consumption of ferrous scrap and pig iron, 1954-55, by types of furnaces and miscellaneous uses, in short tons

Ferrous scrap and pig iron charged to—	1954	1955	Ferrous scrap and pig iron charged to—	1954	1955
Steel furnaces: 1 Scrap	1, 764, 068 845, 976 2, 610, 044 373, 168 154, 600 527, 768	2, 264, 324 1, 026, 216 3, 290, 540 457, 530 197, 048 654, 578	Miscellaneous uses: \$ Scrap  Total scrap  Total pig iron  Grand total	48, 215 2, 185, 451 1, 000, 576 3, 186, 027	55, 735 2, 777, 589 1, 223, 264 4, 000, 853

Includes open-hearth and electric furnaces.
 Includes cupola, air, and blast furnaces; also, direct castings.
 Includes rerolling, copper precipitation, nonferrous, and chemical uses.

### **NONMETALS**

Asbestos.—The marked increase in production and sales of asbestos over 1954 is noteworthy. Sales overshadowed production and were assumed to have come from stockpiles. Production increased in the Ubehebe district, Inyo County (amphibole), and in the Monticello district, Napa County (chrysotile). Tremolite was produced in Placer County and amphibole in Riverside County. A carload sample of chrysotile asbestos was shipped from Calaveras County to Globe, Ariz., for determining fiber content and gravity. Exploration and development were conducted on claims in Inyo and Siskiyou Counties.

Barite.—Production of crude barite exceeded the combined tonnages of the 3 previous years and came primarily from Nevada and Tulare Counties. In most instances, the ore was shipped to companyowned plants. Tonnages crushed and ground in California plants far exceeded those of previous years and included shipments from Nevada. The following plants processed crude barite for various uses: Barium Products Ltd., Modesto; Oil Base, Inc., Compton; Chemical & Pigment Co., Oakland; Baroid Sales Division, National Lead Co., Merced; Industrial Minerals & Chemical Co., Berkeley; Macco Corp., Rosamond; Metals Disintegrating Co., Emeryville; and Olsen Mud Service Co., Harbor City. The processed material was consumed chiefly for use in drilling mud, paint filler, chemicals, and glass.

chiefly for use in drilling mud, paint filler, chemicals, and glass.

Boron Minerals.—California's arid regions continued to produce the entire United States supply of boron minerals, and most of the world boron supply. A large part of the production came from bedded deposits of kernite and borax in the Dry Lake (Muroc) district near Kramer, Kern County. The remainder was recovered mostly from the brines of Searles Lake in San Bernardino County as borax, boric acid, anhydrous sodium tetraborate, and hydrous calcium borate. The four firms producing most of the natural boron minerals and compounds were the Pacific Coast Borax Co. plants in Kern and Los Angeles Counties; and American Potash & Chemical Corp., United States Borax Co., and West End Chemical Co., all in San Bernardino County.

Bromine.—Production of bromine and bromine compounds did not increase appreciably over 1954. American Potash & Chemical Corp. produced elemental bromine from dry-lake brines at Searles Lake; however, it had discontinued manufacturing potassium bromide. Westvaco Mineral Products Division, Food Machinery & Chemical Corp., continued to produce ethylene dibromide from seawater bitterns in the Fremont district, Alameda County, in the San Francisco Bay area, for use principally in gasoline antiknock additive. Usually, a relatively small quantity of liquid bromine output is sold as such; it is consumed mostly as ethylene dibromide, sodium and potaccium bromides and other harmines.

potassium bromides, and other bromine compounds.

TABLE 25.—Finished portland cement produced, shipped, and in stock, and estimated consumption, 1946-50 (average) and 1951-55

				Ship	ments from	mills		
Year	Active	Esti- mated capacity	Produc- tion (thou-	Thou-	Valu	е	Estimated consumption	Stocks at mills De- cember 31
1 car	plants	(thou- sand barrels)	sand barrels)	sand bar- rels	Total	Aver- age per barrel	(thousand barrels)	(thousand barrels)
1946-50 (average) 1951 1952 1953 1954	11 11 11 11 11 11	29, 228 32, 620 35, 120 35, 220 35, 845 37, 173	23, 285 29, 918 29, 585 32, 145 32, 599 35, 450	23, 414 28, 956 29, 786 32, 002 32, 762 35, 087	\$52, 182, 000 77, 754, 000 79, 458, 000 90, 873, 000 98, 251, 000 103, 804, 000	\$2. 23 2. 69 2. 67 2. 84 3. 00 2. 96	20, 133 25, 192 25, 361 27, 733 28, 761 31, 643	846 1, 776 1, 575 1, 708 1, 563 1, 929

TABLE 26.—Production, shipments from mills, and stocks at mills of finished portland cement in 1955, by months, in thousand barrels

	Month	Mill pro- duction	Mill ship- ments	Shipments to Cali- fornia <sup>1</sup>	Stocks at mills (end of month)
May June July August		2, 371 2, 447 3, 080 3, 139 3, 125 3, 085 3, 097 3, 238 3, 221 3, 165 2, 693 2, 699	2, 136 2, 547 3, 270 3, 006 3, 101 3, 268 3, 115 3, 617 3, 243 2, 934 2, 626 2, 129	1, 857 2, 239 2, 912 2, 737 2, 837 2, 973 2, 784 3, 275 2, 964 2, 638 2, 412 1, 925	1, 798 1, 697 1, 506 1, 640 1, 665 1, 482 1, 463 1, 084 1, 062 1, 292 1, 358 1, 929

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Calcium Chloride.—The entire California production of calcium chloride came from dry-lake brines of the Bristol Lake district, San Bernardino County. Hill Bros. Chemical Co. and National Chloride Co. of America produced flake and liquid calcium chloride, respectively. Both volume and value were below those of the previous year. A considerable quantity of production was used for dust and ice control on gravel-surfaced roads, in accelerators for concrete, and for "freezeproofing" materials shipped in bulk in open railroad cars or stockpiled in the open. No production of calcium-magnesium chloride was reported in 1955.

Cement.—A notable gain in producing cement in the State was due to increased construction activity; 11 plants furnished this output. Extensive modernization, combined with the construction of two additional plants indicated that the State's cement-producing capacity is expected to keep pace with the growing demand. Increased shipments by motortruck as compared with railroad was clearly a

continuing trend throughout the State.

Clays.—Clay for heavy products represented one-half and cement, one-quarter of the moderate increase in State production during 1955.

<sup>1</sup> Includes interstate and intrastate shipments.

TABLE 27.—Clays produced by counties and total clays produced, 1954-55

County	19	54	1955	
	Short tons	Value	Short tons	Value
Alameda. Amador. Calaveras. Contra Costa. Humboldt. Imperial. Inyo. Kern. Los Angeles. Mono. Orange. Placer Riverside. Sacramento. San Benito. San Bento. San Benardino.	28, 763 138, 686 228, 637 63, 405 486 6, 087 131, 171 589, 767 3, 674 38, 792 107, 922 406, 311, 484 148, 005	\$18, 817 490, 312 253, 222 77, 902 12, 140 31, 631 518, 899 417, 978 25, 718 119, 083 240, 873 939, 852 24, 322	44, 032 180, 173 123, 180 74, 145 284 1, 613 15, 125 124, 136 586, 811 2, 042 41, 918 (1) 385, 456 (1)	\$29, 144 606, 943 152, 400 101, 145 71 11, 155 85, 818 533, 936 641, 734 10, 210 155, 885 (1) 785, 503 (1)
San Diego.         San Joaquin.         Santa Clara.         Stantislaus.         Tulare.         Ventura.         Undistributed i	148, 005 26, 255 (1) 133, 128 3, 135 4, 869 57, 590 573, 615	398, 754 13, 200 (1) 101, 576 11, 556 2, 435 105, 577 660, 973	102, 935 22, 070 8, 132 (1) 4, 267 6, 210 113, 768 1, 024, 148	362, 399 22, 070 13, 556 (1) 15, 989 6, 210 145, 116 1, 347, 987

<sup>&</sup>lt;sup>1</sup> Fresno, Marin, Placer (1955), Sacramento (1955), San Joaquin (1954), San Luis Obispo (1955), San Mateo, Santa Barbara, Santa Clara (1955), Santa Cruz, Solano, Sutter and Yuba Counties included with "Undistributed" to avoid disclosing individual company confidential data.

Most clay consumption was used to manufacture ceramic products; large tonnages of bentonitic clays were utilized in other industrial processes, supplying an increasingly significant part of California clay production for chemicals and concrete admixtures. Fuller's earth, used increasingly as a carrier for insecticides and in drilling muds, tripled in production volume and value over 1954. output came principally from San Bernardino County, where Southern California Minerals Co. was the chief producer. Most fire clay came from Amador County deposits; significant quantities came from Placer and Riverside Counties. Gladding, McBean & Co. and Lincoln Clay Products Co., Inc., were the principal producers of fire clay. Sierra Talc & Clay Co. and Rook & Mason Co. were the principal producers of fuller's earth, obtained only from Inyo County. One-third of miscellaneous clay was produced in the Los Angeles area, and the remaining output was dispersed throughout the State. Gladding, McBean & Co. and Calaveras Cement Co. were the chief producers. Miscellaneous clay companies consumed nine-tenths of their own mine production in 1955.

Diatomite.—California continued to lead in United States diatomite production which showed an appreciable gain over 1954. The leading producers within the State were Johns-Manville Products Corp., at open pits in the Lompoc district, Santa Barbara County; and Great Lakes Carbon Corp., Lompoc district, and Palos Verde Hills, Los Angeles County. These two counties contribute nearly all of the State production. A few thousand tons of material, called basalt pozzolan, was dug in Napa County by Basalt Rock Co., Inc., for use in reducing segregation and bleeding of concrete. By far the largest

use for this diatomaceous-earth production was as a filter aid. Other important uses were as fillers in paints and rubber, insulation products, lightweight aggregate, and as an abrasive in metal polish and dental powders. The industry lists over 300 uses, which, in California,

include diatomite, concrete, stucco, and a dynamite filler.

Feldspar.—The production of feldspar continued its upward trend, reaching an alltime high in 1955, nearly double that of 1954. Most of this increase was as a flotation product from Monterey County dune sands. The availability of suitable raw material has created significant out-of-State shipments in addition to supplying its own needs. Besides utilizing potash-soda feldspar in manufacturing glass, small tonnages were consumed in enamels and vitrified-clay products.

Fluorspar.—Owing to a lack of adequate deposits, small intermittent quantities of fluorspar were produced during 1955. Both Acidgrade and Metallurgical-grade fluorspar production showed little

promise of growth.

Nevada and, more recently, Mexico have been the chief sources of the State's fluorspar requirements; Mexico will probably become

increasingly important.

Garnet.—In 1955 garnet in California was produced from a single deposit and was a constituent of the tungsten-bearing rock of the Pine Creek district, Inyo County. The ore was obtained as a byproduct from tungsten mill tailings. The commodity was utilized in sandblasting ships and for concrete-block surfacing. The demand dropped before the end of the year, however, and production was curtailed.

Gem Stones.—Precious stones were not produced commercially in the State in 1955. As regards semiprecious stones, however, the State contains one of the few notable gem-producing areas, which in previous years has contributed 23 percent of the Nation's production. This area encompasses the gem- and lithium-bearing pegmatites of San Diego and Riverside Counties that yielded some specimens of

tourmaline and spodumene.

In the Mother Lode area of central California, substantial quantities of vesuvianite, rhodonite, and garnet were produced. Benitoite was recovered from the Idria district of San Benito County. Nephrite, a form of jade, continued to be produced in substantial quantities from Monterey County, where the Nation's largest deposit of this mineral occurs. Throughout the State, quantities of the quartz-family minerals, such as agate, onyx, jasper, and crystalline quartz, were pro-

duced in varying amounts.

Gypsum.—Gypsum production increased moderately in both value and quantity, reaching a new high in 1955. The State contained the largest number of gypsum mines in the Nation; the addition of 3 new plants next year and the expansion of 2 others should increase California's capacity for producing gypsum products significantly. The growth of the industry was closely tied to construction and agriculture, and the increased demand for gypsum industrial products resulted in an overall gain in production. A considerable tonnage of gypsum, shipped from Mexico, was consumed in the State.

TABLE 28.—Crude gypsum mined, 1946-50 (average) and 1951-55

Year	Active mines	Short tons	Value	Year	Active mines	Short tons	Value
1946-50 (average) 1951	11 10 13	812, 827 1, 092, 885 1, 236, 430	\$1, 996, 260 2, 602, 750 2, 721, 134	1953 1954 1955	16 15 11	1, 199, 489 1, 161, 502 1, 307, 625	\$2, 855, 983 2, 803, 862 3, 273, 724

The principal producers of gypsum were United States Gypsum Co. in Imperial and Riverside Counties and H. M. Holloway, Inc., in

Kern County.

Iodine.—California produced all of the crude iodine recovered in the United States in 1955. Deepwater Chemical Co., Ltd., and Dow Chemical Co. recovered iodine from waste oil-well brines in the Los Angeles Basin. The most promising field for expanded consumption was the addition of potassium iodide to stock feed.

Iron Oxide Pigments.—A small tonnage of natural iron oxide pigment was produced in Amador County. A moderate tonnage of crude natural-pigment material was shipped into the State for utiliza-

tion by one manufacturer, in Alameda County.

Lime.—The substantial increase in lime production in 1955 represented a recovery of almost two-thirds the loss sustained in the previous year. Chemical and industrial utilization of lime doubled from the previous year; refractory, building, and agricultural uses followed in the order named. Limekilns were operated in El Dorado, Monterey, San Bernardino, and Tuolumne Counties.

Lithium.—Production of lithium compounds continued to increase in 1955, coming entirely from Searles Lake, where crude dilithium-sodium phosphate was recovered from processing for soda and potash.

Magnesite and Magnesium Compounds.—The small tonnage of magnesite produced in 1955 represented an intermittent and decreasing

production.

The State furnished the chief domestic supply of magnesium compounds, gaining over the previous year. Kaiser Aluminum & Chemical Corp. produced magnesium compounds from a sea-water calcined-dolomite mixture in Monterey County. Westvaco Mineral Products Division, Food Machinery & Chemical Corp., extraction plant in Alameda County utilized dolomite sea-water bitterns to produce magnesium compounds, and the plant in San Diego County produced magnesium chloride directly from sea-water. The Marine Magnesium Products Division, Merck & Co., Inc., South San Francisco, San Mateo County, used dolomite with limestone in its sea-water ponds to produce magnesium salts.

Mica.—A low-grade mica ore was quarried and ground from the large reserves of mica schist for use as a surfacing agent in prepared roofing. California imported a considerable quantity of mica, some

of which was ground in a Los Angeles County mill.

Perlite.—Production of crude and expanded perlite in the State increased moderately; the yield of crude perlite was augmented by shipments from Nevada to the California plants that expanded this material. Crude perlite was quarried in Inyo, Napa, and San Ber-

nardino Counties and expanded at plants in Fresno, Los Angeles, Marin, Napa, Riverside, San Bernardino, and San Diego Counties for use in plaster aggregate, oil-well grouting, rotary-drilling fluids, filter aid, insulation, concrete aggregate, and horticultural materials.

Potassium Salts.—Except for some potassium sulfate recovered as a byproduct in the flue-dust accumulation of a cement plant, the production of potassium salts in California came from a single plant in the Searles Lake district, San Bernardino County.

The production of potassium sulfate and potassium chloride increased moderately. Utilization of potassium salts by the chemical

industry evidenced the most notable advance.

Pumice and Volcanic Cinder.—The production of pumice and volcanic cinder as a group increased substantially over the previous The moderately increased output of pumice and pumicite was used principally as a lightweight aggregate and was also utilized as a filler, abrasive, soil conditioner, insulation, and pesticide diluent.

Volcanic cinder was in increased demand for use in concrete blocks, road ballast, railroad beds, and was also used for roofing granules and

highway seal coat.

TABLE 29.—Pumice and pumicite 1 sold or used by producers in 1955, by counties

County	Crude		Prepared		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
InyoLakeLassenMaders	6, 027 116, 943	\$11, 620 65, 839	144, 976 612 (²) 4, 889	\$472, 705 4, 432 (2) 65, 888	144, 976 6, 639 (2) 4, 889	\$472, 705 16, 052 (2) 65, 888
Modoc Mono	33, 852	39, 045	3, 640 18, 955	23, 400 106, 827	37, 492 18, 955	62, 445 106, 827
ShastaSiskiyouOther counties 2	85, 470 332, 937	46, 971 90, 878	(2) 29, 868 19, 137	63, 215 108, 639	362, 805 221, 550	(2) 154, 093 221, 449
Total	575, 229	254, 353	222, 077	845, 106	797, 306	1, 099, 459

TABLE 30.—Pumice and pumicite 1 sold or used by producers, 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	152, 505	\$932, 543	1953	433, 105	\$647, 910
	264, 411	1, 288, 569	1954	566, 664	651, 638
	129, 780	793, 716	1955	797, 306	1, 099, 459

<sup>1</sup> Includes volcanic cinder.

Pyrite.—In 1955, the State was one of the Nation's largest producers of pyrite. The entire output came from the Mountain Copper Co., Ltd., Hornet mine in Shasta County, which was recently converted to an open pit, and was shipped to Contra Costa County sulfuric acid plants. Some of the pyrite cinder from these plants was utilized as an ingredient in quicksetting portland cement.

Salt.—The California salt industry, one of the world's largest producers by solar evaporation, substantially increased its production. Continued expansion and development programs were conducted to

Includes volcanic cinder.
 Imperial, Kern, and San Bernardino, and parts of Lassen and Shasta Counties included with "Other counties" to avoid disclosing individual company confidential data.

meet the forecasted demand. In addition to an increased intrastate demand, the industry shipped to five States and Alaska, and exported to Canada, Mexico, Central America, and the Pacific area, which

included Japan and the Philippines.

Production was centered in the San Francisco Bay area; much smaller quantities came from other points along the coast and from dry lakes in the California desert. While a small percentage was extracted from brines of terrestrial saline lakes and excavated as rock salt from an open pit, most salt was produced by solar evaporation of sea water.

Three types of salt were marketed; most of the State's production was sold in crude form, and the remainder was kiln-dried and vacuum-packed. One-half of the entire production of crude salt was sold in bulk to the expanding chemical industry, greatly increasing salt production in 1955. Other principal uses of the commodity included food processing, refrigeration, livestock, and water softening. A Nevada chemical plant processed most of the salt in the arid south-eastern part of the State. The Metropolitan Water District of Southern California built a new plant in 1955 and used its entire production in water treatment.

TABLE 31.—Salt sold or used by producers, 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	848, 965	\$3, 804, 721	1953	1, 123, 365	\$6, 263, 059
1951	1, 275, 574	5, 261, 780	1954	1, 185, 844	6, 126, 194
1952	1, 148, 693	4, 880, 392	1955	1, 314, 535	6, 751, 420

Sand and Gravel.—Following population growth and more specifically construction expansion, California led the Nation in producing sand and gravel. However, a 3-month strike in the leading producing area of Los Angeles and vicinity, despite the worst flood in years in northern California brought on a slight decline both in value and quantity under the previous year's output. Problems of transportation were serious, owing to zoning laws and the new and changing requirements and specifications for these construction materials. Portable plants and truck units offered many producers ar apparent solution to the transportation problem. The quantity of molding sand dropped moderately, and the quantity of gravel used for railroad ballast and in glass manufacture increased.

TABLE 32.—Sand and gravel sold or used by producers, 1946-50 (average) and 1951-55

Year	s	and	Gı	ravel	Total	
1946-50 (average) 1951 1952 1933 1954 1955	Short tons  14, 904, 301 19, 009, 895 20, 434, 017 22, 129, 931 25, 094, 671 25, 506, 919	\$12, 047, 782 16, 640, 752 18, 060, 627 21, 232, 885 25, 655, 359 26, 856, 865	19, 209, 309 27, 917, 557 32, 617, 243 36, 299, 597 45, 429, 941 39, 371, 729	\$15, 967, 192 24, 639, 083 25, 572, 498 31, 991, 318 42, 483, 219 39, 963, 495	Short tons 34, 113, 610 46, 927, 452 53, 051, 260 58, 429, 528 70, 524, 612 64, 878, 648	Value \$28, 014, 974 41, 279, 835 43, 633, 125 53, 224, 203 68, 138, 578 66, 820, 360

TABLE 33.—Sand and gravel sold or used by producers 1954-55, by commercial and Government-and-contractor operations and by uses

		1954			1955	
		Valu	9		Value	9
	Short tons	Total	Aver- age per ton	Short tons	Total	Aver- age per ton
COMMERCIAL OPERATIONS		<u></u>				
Sand:						
Glass	(1) 63, 666	(1)	(1) \$4.48	(1)	(1) \$168, 034	(1) \$3.91
Molding	63,666	\$285, 123	\$4.48	43,018 16,520,270	16, 241, 357	98
Building	15. 092, 777	15, 114, 218	1.00 .88	5, 749, 733	5, 512, 871	.96
Paving.	5, 327, 995	4, 711, 404 654, 513	4.62	0, 143, 100	(1)	(1)
Blast	141, 693 66, 006	98, 548	1.49	74, 571	152, 926	2.08
Engine Filter	(1)	(1)	(1)	52, 976	95, 899	1.8
Other 1	607, 034	2, 440, 584	4.02	1, 556, 088	3, 643, 029	2.34
		23, 304, 390	1.09	23, 996, 656	25, 814, 116	1.07
Total commercial sand	21, 299, 171	23, 304, 390	1.09	20, 830, 000	20, 011, 110	
Gravel:						
Building	16, 673, 759	18, 217, 166	1.09	15, 148, 728	17, 521, 842	1.1
Paving Railroad ballast	12, 036, 903	12, 937, 697	1.07	11, 182, 713	12, 862, 144	1.1
Railroad ballast	426, 344	374, 604	.88	1, 239, 699	1,021,534	1.1
Other	354, 746	406, 704	1.15	1, 521, 019	1, 713, 157	1.1
Total commercial gravel	29, 491 752	31, 986, 171	1.08	29, 092, 159	33, 118, 677	1.13
Total commercial sand and gravel	50, 790, 923	55, 240, 561	1.09	53, 088, 815	58, 932, 793	1.1
GOVERNMENT-AND-CONTRACTOR OPERATIONS 2						
Sand:		404 004		104 970	113, 579	1.0
Building Paving	215, 532 3, 579, 968	180, 206 2, 170, 763	.84	104, 378	929, 170	.6
	3, 07 5, 500	2,210,100	-	-,,-		-
Total Government-and-con- tractor sand	3, 795, 500	2, 350, 969	. 62	1, 510, 263	1, 042, 749	. 6
Gravel:						1
Building	2, 497, 925	2, 269, 338	. 91	160, 886	170, 902	1.0
Paving	13, 440, 264	8, 277, 710	. 62	10, 118, 684	6, 673, 916	6
Total Government-and-con-	** 000 *00	10 545 040	. 66	10, 279, 570	6, 844, 818	
tractor gravel	15, 938, 189	10, 547, 048	.00	10, 210, 010	0,011,010	<u>`</u>
Total Government-and-con-	10 700 600	10 909 017	. 65	11, 789, 833	7, 887, 567	
tractor sand and gravel	19, 733, 689	12, 898, 017	.00	11, 100, 000	-, 55, 66	-
COMMERCIAL AND GOVERNMENT- AND-CONTRACTOR OPERATIONS						
Sand	25, 094, 671	25, 655, 859	1.02	25, 506, 919	26, 856, 865	
Gravel	45, 429, 941	42, 483, 219		39, 371, 729	39, 963, 495	1.0
Grand total	70, 524, 612	68, 138, 578	. 97	64, 878, 648	66, 820, 360	1.0

Figure withheld to avoid disclosing individual company confidential data, included with "Other."
 Includes figures for State, counties, municipalities, and other Government agencies.

TABLE 34.—Production of sand and gravel in 1955, by counties

County	Short tons	Value	County	Short tons	Value
Alameda. Alpine Amador Butte Colusa. Contra Costa. Del Norte. El Dorado. Fresno Glenn	14, 150 162, 656 672, 499 344, 383 117, 649 305, 666 172, 689 992, 151 368, 273	\$7, 955, 858 11, 443 513, 921 779, 418 314, 123 126, 555 294, 802 154, 711 1, 053, 145 279, 379	Nevada Orange Placer Riverside Sacramento San Benito San Benito San Diego San Francisco San Francisco San Jaquin	4, 585, 285 149, 149 895, 286 3, 549, 040 178, 845 2, 657, 200 2, 793, 511 52, 381	35, 773 3, 844, 108 161, 014 1, 337, 400 3, 844, 078 95, 089 2, 731, 792 4, 557, 591 88, 792 1, 747, 066
Humboldt. Imperial Inyo Kern Kern Lake Lassen Lassen Madera	- 715, 075 - 482, 658 - 216, 068 - 923, 785 - 4, 865 - 227, 401	570, 611 331, 739 178, 618 1, 205, 055 2, 785 154, 836 210, 945 17, 564, 223	San Luis Obispo Santa Clara. Santa Cruz Shasta Sierra. Siskiyou. Stanislaus Tehama.	573, 954 998, 667 706, 525 612, 677 87, 925 193, 436 506, 147	352, 602 1, 059, 875 672, 847 581, 396 60, 764 163, 197 456, 036
Madera Mariposa Mendocino Merced Modoc Mono	77, 332 303, 596 951, 617	61, 178 146, 259 355, 261 1, 087, 909 182, 685	YenturaYoloYubaOther counties 1	410, 443 4, 021, 006 878, 698 431, 625 3, 814, 027	874, 674 3, 764, 249 806, 218 513, 202 4, 029, 110
Monterey Napa	694, 193	88, 740 1, 880, 132 120, 055	Total	64, 878, 648	<b>66, 82</b> 0, 360

<sup>&</sup>lt;sup>1</sup> Includes Calaveras, Marin, Plumas, San Mateo, Santa Barbara, Solano, Sonoma, Sutter, Trinity, Tulare, and Tuolumne Counties, combined to avoid disclosing individual company confidential data.

Slate.—Slate from El Dorado and Mariposa Counties was utilized as flagging, rock flour, and granules. Output of this commodity in-

creased substantially compared with 1954.

Sodium Compounds.—California was the leading producer of natural sodium compounds in the Nation. Sodium carbonate and sodium sulfate were recovered from ore mined in Kern County and treated there and in Los Angeles County, and from brines in Inyo and San Bernardino Counties. Among the manifold uses of sodium compounds, glass and paper manufacturing required a large percentage. The State contains vast reserves of natural deposits, and 1955 production rose moderately over 1954; but the California industry has faced limited expansion owing to serious competition from man-

ufactured sodium compounds.

Stone.—Stone production in 1955 increased slightly. The marked decrease in crushed and broken stone, used for riprap and ballast is explained by its supplemental position to gravel that is prepared from alluvium for major construction projects. The demand for basalt in riprap, concrete, and road metal declined, although production by governmental agencies and their contractors increased. The output of crushed granite, including decomposed granite, was less because of the declining use of this material in stucco. Production of dimension stone increased substantially, particularly miscellaneous stone for rubble in the Los Angeles area. Output of crushed marble for terrazzo declined only slightly. Important gains were made in producing sandstone for use as refractory stone (gannister) and for riprap, concrete, and road metal by Government agencies and their contractors.

TABLE 35.—Stone sold or used by producers, 1954-55, by uses

Usa	19	54	198	55
USC	Quantity	Value	Quantity	Value
Dimension stone:  Rough construction and rubble	1.869	\$102, 544 203, 818 75, 028 4, 242	23, 169 70, 252 5, 670 25, 390 2, 083 10, 008 822	\$342, 697 131, 163 158, 038 19, 271
Total dimension stone (quantities approximate in short tons)	21, 500	385, 632	31,744	651, 169
Crushed and broken stone:         short tons           Riprap         do           Metallurgical         do           Concrete and road metal         do           Railroad ballast         do           Agricultural         do           Chemical         do           Miscellaneous 1         do	1, 603, 001 100, 097 10, 272, 626 307, 207 545 14, 640 210, 984, 140	3, 301, 717 320, 223 11, 577, 095 345, 936 3, 700 90, 468 221, 516, 343	727, 866 61, 501 11, 047, 258 168, 823 576 69, 960 \$12, 600, 593	1, 513, 269 223, 682 12, 426, 429 177, 225 4, 653 336, 977 21, 830, 980
Total crushed and broken stonedodo	23, 282, 256	37, 155, 482	24, 676, 577	36, 513, 215
Grand total (quantities approximate in short tons)	23, 303, 756	37, 541, 114	424, 708, 321	4 37, 164, 384

<sup>1</sup> Includes whiting substitute, filler, mineral food, poultry grit, stucco, roofing granules, filter beds, ter-

TABLE 36.—Production of stone 1 in 1955, by counties

			,		
County	Short tons	Value	County	Short tons	Value
Alameda	2, 425; 118, 000 1, 597, 564 75, 750 304, 489 21, 550 16, 060 1, 025, 511 33, 794 3, 650 3, 650 2, 424, 990 57, 781 722, 549 1, 082, 740	\$1, 018, 134 6, 062 66, 500 2, 153, 561 77, 100 277, 039 12, 102 2, 602, 506 77, 736 3, 650 3, 911 2, 910, 651 29, 448 68, 999 998, 170 1, 289 2, 288, 000 1, 342, 783	San Bernardino San Diego San Francisco San Luis Obispo San Luis Obispo San Mateo San Mateo Santa Clara Shasta Siskiyou Solano Sonoma Tehama Trinity Tulare Tuolumne Ventura Other counties 2 Total Total	164, 714 430 169, 139 2, 327, 351 3, 414, 781 71, 575 61, 633 143, 030 235, 041 6, 148 31, 108 168, 702	\$8, 488, 861 397, 803 1, 076 254, 800 2, 685, 722 2, 920, 533 55, 599 159, 69 213, 755 375, 499 29, 31 409, 94 645, 45 428, 89 6, 372, 90

<sup>&</sup>lt;sup>1</sup> Includes stone used in cement and lime. <sup>2</sup> Includes Calaveras, El Dorado, Inyo, Marin, Monterey, Orange, Placer, Santa Barbara, and Santa Cruz, combined to avoid disclosing individual company confidential data.

Strontium Minerals.—Although California's reserves, the largest in the United States, compare favorably in grade with imported materials, strontium mining was uneconomical because of the distance from markets and high transportation costs. The industry was reactivated with a shipment of one car a week during 1955 from San Bernardino County. Celestite (strontium sulfate) was found to be necessary in the metallurgical process in treating certain manganese ores in Nevada.

<sup>1</sup> Includes writing substitute, liner, inhere a root, pointry give, steece, testing guarantees and miscellaneous uses.

2 Revised and includes 9,150,155 short tons of limestone used in cement valued at \$16,017,315 and 417,036 tons of limestone used in lime valued at \$1,212,232.

3 Includes 10,462,734 short tons of limestone used in cement valued at \$15,514,339 and 514,818 tons of limestone used in lime valued at \$917,095.

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

TABLE 37.—Stone sold or used by producers, 1951-55, by kinds

Year			Granite				Basalt and related rocks (traprock)			Marble	
			Short tons			Value		nort tons	Value	Short tons	Value
1951 1952 1953 1954 1955			1, 9 3, 5 3, 0	903, 866   1, 979 565, 847   3, 214 012, 041   3, 480		, 088, 967 , 979, 756 , 214, 767 , 480, 586 , 420, 057	979, 756   1, 996, 836 214, 767   2, 664, 009 180, 586   2, 129, 545		\$1, 921, 527 2, 524, 972 2, 800, 346 2, 786, 035 2, 547, 821	8, 435 7, 168 (1) (1) (1)	\$171, 083 137, 664 (1) (1) (1)
Year			Sandstone			stone	Other stone 2			Total	
	Short tons	Value	e Short t		ons	Value		Short ton	s Value	Short tons	Value
1951 1952 1953 1954 1955	1, 158, 999 1, 631, 369 1, 991, 949 311, 044, 061 412, 472, 285	\$3, 443, 44 4, 033, 24 4, 930, 00 321, 434, 13 421, 075, 6	03 05 89	1, 508, 4 1, 029, 0 2, 093, 2 2, 703, 5 2, 937, 5	84 19 99	\$1, 549, 001 1, 290, 141 2, 835, 693 3, 723, 255 4, 886, 507	1 3 5	6, 298, 794 7, 806, 607 4, 199, 156 4, 414, 510 4, 650, 806	7, 731, 349 4, 698, 341 6, 117, 049	12, 537, 344 14, 374, 930 14, 514, 180 23, 303, 756 24, 708, 321	\$14, 714, 524 17, 697, 085 18, 479, 152 37, 541, 114 37, 164, 384

1 Figures withheld to avoid disclosing individual company confidential data.

Includes light-colored volcanics, schist, serpentine, river boulders, such other stone as cannot properly be classed in any main group, and marble (1963–55).

Includes 9,667,191 tons of limestone valued at \$17,229,547 used in cement and lime.

Includes 10,977,552 tons of limestone valued at \$16,431,434 used in cement and lime.

Sulfur.—California's production furnished only a part of its sulfur consumption. Maintaining an equitable output from the previous year, the Anaconda Co. Leviathan mine in Alpine County, California's only substantially producing sulfur mine, nearly doubled its production from 1953, the first year of operation. This low-grade sulfur ore was utilized for sulfuric acid at its Nevada copper-leaching plant. The recovery of sulfur, a byproduct in the petroleum industry, through selective absorption of hydrogen sulfide gas liquids, reached an all-time high. Ten plants used six different methods of purification to recover this byproduct. With the addition of two new refineries that produce sulfur as a byproduct, the State's output by this method was substantially increased over the previous year. American Smelting & Refining Co. produced liquid SO<sub>2</sub> yielded in the roasting of sulfide ores at Selby, Contra Costa County. Sulfuric acid furnished about three-quarters of California sulfur production, and other uses were in agriculture, insecticides, and fungicides.

Talc, Pyrophyllite, and Soapstone.—With an increasing demand in an already expanding local industry, California experienced a substantial gain in both quantity and value of talc, soapstone, and pyrophyllite for 1955. Talc was produced in Inyo and San Bernardino Counties, and a talc property was developed in Kern County. Pyrophyllite was mined in San Diego County, and also in the counties mentioned. A test shipment was made from Plumas County. stone was produced in El Dorado and Los Angeles Counties. most notable advance was in the insecticide industry, where utilization substantially increased. Talc used in manufacturing paper rose to six times its 1954 consumption. Pyrophyllite found increased use in the paint industry more than double previous consumption.

Vermiculite.-No crude vermiculite was mined in the State, but three exfoliation plants produced the expanded material with a moderate increase in output over the previous year. Lahabralite Co. began manufacturing plaster aggregate from crude material imported from Portuguese East Africa at a plant in Anaheim, Orange County, in September. The California Zonolite Co. plants at Sacramento and Los Angeles received crude material from its mine at Libby, Mont. MINERAL FUELS

Carbon Dioxide.—Production of this nonfuel natural gas has declined steadily the past 2 years, chiefly because of water intrusion in the Salton Sea field in Imperial County. This field ceased producing Output at the Hopland field in Mendocino County has during 1954. increased steadily since production began. The entire supply was used for "dry ice."

Coal (Lignite).—Lignite, from the West Belt district near Ione, Amador County, was mined for nonfuel use. Production increased over 100 percent above that in 1954. The value of this lignite is in its extracted products, chiefly montan wax used in making carbon

paper, phonograph records, polishes, and rubber.

Natural Gas.—Major withdrawals from the Beehive Bend Gas field in Glenn County during the latter part of the year was undoubtedly a contributing factor in increasing production over 1954. Six dry-gas-producing areas were discovered in Sacramento Valley, and several existing gasfields were extended by successful outpost wells. Beehive Bend gasfield was an extension within the Beehive-Willows Trend.

Natural-Gas Liquids.—The production of natural-gas liquids was lower than during 1954. Output of liquefied gases for fuel and chemical use increased somewhat. Production of liquefied-refinery (LR-) gases was considerably above the figures of a year ago. Year

end stocks increased in all categories except condensate.

Peat.—The production of peat in California from all sources more than doubled that in 1954, not for use as a fuel but either directly as a soil conditioner or compounded with fertilizers. State production came from a Hypnum-peat-moss bog at 6,000 feet elevation, in Jess Valley, Modoc County, and from a sedge-grass peat in a lake bottom near Bethel Island, Contra Costa County. Peat was also produced in Orange County. A great deal of so-called "peat dirt," a soil high in organic matter, was obtained from the deltas formed by the Sacramento and San Joaquin Rivers in Central California, but this is not considered a true peat.

Petroleum.—The production of oil decreased compared with 1954; output for the second half was considerably above the first 6 months. Over 2,500 notices of intention to drill new wells were filed, an increase over the previous year. No oilfields of major importance were discovered, but several minor discoveries and extensions to known fields

were made.

TABLE 38.—Natural gas, natural gas liquids and petroleum produced in 1955 by counties

	Marketed natural			Natural-g				
County	ge	as	Natural and cycle	gasoline products		gases plants	Petroleum	
	Million cubic (thousand dollars)		Thou- sand gallons	Value (thou- sand dollars)	Thou- sand gallons	Value (thou- sand dollars)	Thou- sand 42- gallon barrels	Value (thou- sand dollars)
Alameda Butte	6, 034 161	(2) 1, 340						
Contra Costa Fresno Glenn	1, 478 •36, 490 1, 153	(2) (2) 8, 101 256	68, 621	7, 005	53, 934	3, 118	36, 293	91, 13
Humboldt Kern Kings Los Angeles	2, 240 104, 638 10, 122 106, 349	(2) 23, 230 2, 247 23, 609 583	224, 613 (3) 289, 217	21, 837 (2) 28, 708	148, 417 (2) 50, 652	8, 655 (2) 2, 314	94, 455 2, 668 91, 344	233, 512 8, 12- 237, 10
Madera Monterey Orange Sacramento	2, 625 8, 091 39, 731 60, 467	(2) 8, 820 13, 424	118, 636	11, 883	15, 957	780	10, 972 41, 754	16, 42 103, 34
San Benito San Bernardino San Joaquin	26 26 1, 974	(2) (2) 438					23 45	(2) (2)
San Luis Obispo San Mateo Santa Barbara Santa Clara	1, 947 2 22, 637	(2) (2) 5, 025	47, 849	(2) 4, 381	(²) 14, 119	(2) 748	2, 803 4 30, 396	8, 534 (2) 69, 814 (2)
Solano Sonoma Sutter	38, 495 18 1, 188	8, 546 (2) (2)					(8)	(²)
Tehama Tulare Ventura Yolo	1, 545 6, 398 82, 113 2, 227	343 1, 420 18, 229 494	152, 719	12, 553	67, 449	3, 284	64 43, 914	(²) 118, 49
Undistributed		3, 371	27, 994	2, 636	10, 374	480	75	530
Total	538, 178	119, 476	929, 649	89, 003	360, 902	19, 379	354, 812	887, 03

<sup>&</sup>lt;sup>1</sup> Production from those petroleum and natural gas fields that lie in more than one county was prorated among the involved counties.

<sup>2</sup> Figure withheld to avoid disclosing individual company confidential data, included with "Undistributed."

<sup>3</sup> Less than 500 barrels.

### **REVIEW BY COUNTIES**

Seven counties furnished over 80 percent of the State's mineral production, based on dollar value. These counties, all centers of mineral-fuel output and listed according to their production value, were: Los Angeles, Kern, Ventura, Orange, Fresno, Santa Barbara, and San Bernardino. Los Angeles County led the State in producing mineral fuels, followed closely by Kern County. San Bernardino County led in California output of nonmetals, and Riverside County

was the leading metal producer.

Alameda.—At Newark Leslie Salt Co. produced salt from the sea water in San Francisco Bay by solar evaporation. This company and Morton Salt Co. processed crude salt in the same locality. American Salt Co. and Oliver Bros. Salt Co. at Mount Eden obtained salt from sea water by the same method. The Westvaco Mineral Products Division, Food Machinery & Chemical Corp., produced bromine and bromine compounds, refractory magnesia, and caustic-calcined magnesia (with gypsum as a byproduct) from saltworks bitterns at its Newark plant. Dolomite was used in the processing of bitterns to obtain magnesia.

Sand and gravel was prepared by: Bell Sand & Gravel Co., Rhodes & Jamieson, Ltd., Henry J. Kaiser Co., Niles Sand & Gravel, Inc., and Pacific Coast Aggregates, Inc., in the Fremont area; California Rock & Gravel, Inc., near Livermore; Concrete Service Co., at Sunol; and Henry J. Kaiser Co., Pacific Coast Aggregates, Inc., and Dietz Sand & Gravel Co. in the Pleasanton area. A. C. Zaro prepared molding sand. The California Division of Highways and its contractors, the city of Alameda, the East Bay Municipal Utility District, and the Federal Bureau of Reclamation produced sand and gravel from various pits. Basalt was crushed by: Gallagher & Burk, Inc., at Oakland, Niles Quarry Co. near Niles, and Goddard Bros. near Hayward. San Leandro Rock Co. quarried and crushed miscellaneous stone near San Leandro. Government agencies and their contractors crushed sandstone and miscellaneous stone at several sites. Miscellaneous clay was dug by Interlocking Roof Tile Co. and Kraftile Co. at Niles and by M & S Tile Co. at Decoto, for use at their respective local plants and by Bell Sand & Gravel Co. at Irvington and Henry J. Kaiser Co. at Radum for shipment.

TABLE 39.—Value of mineral production in California, 1954-55, by counties

County 1954		1955	Minerals produced in 1955 in order of value <sup>1</sup>					
Alameda\$12, 047,		\$16, 311, 423	Sand and gravel, salt, magnesium compounds, stone bromine, clays, chromite, natural gas.					
AlpineAmador	(2) 622, 127	1, 271, 832	Sulfur ore, tungsten, sand and gravel. Clays, sand and gravel, copper, coal, gold, silver, stone, gem stones, lead.					
Butte	2, 175, 791	2, 284, 585	Natural gas, sand and gravel, chromite, stone, gold, silver.					
Calaveras	8, 455, 643	10, 014, 759	Cement, stone, sand and gravel, clays, gold, copper, tungsten, silver, lead.					
Colusa Contra Costa	88, 409 2, 706, 926	351, 246 3, 895, 712	Sand and gravel, natural gas, chromite. Stone, sulfur (byproduct), natural gas, peat, sand and gravel, clays.					
Del NorteEl Dorado	1, 349, 774 1, 831, 309	639, 415 2, 062, 384	Sand and gravel, chromite, stone, gold, silver. Lime, stone, gold, sand and gravel, slate, soapstone, chromite, lead, tungsten, silver, zinc, copper, gem stones.					
Fresno	117, 662, 874	111, 442, 781	Petroleum, natural gas liquids, natural gas, sand and gravel, chromite, tungsten, stone, clays, mercury, gold, marl, silver.					
Glenn Humboldt	478, 547 1, 098, 383	628, 483 3 1, 100, 517	Sand and gravel, natural gas, chromite. Sand and gravel, natural gas, stone, chromite, manganese ore, clays.					
Imperial	<sup>3</sup> 2, 360, 545	<sup>3</sup> 2, 178, 778	Gypsum, sand and gravel, pumice, manganese ore, mica (scrap), tungsten, stone, clays, gold, silver, gem stones.					
Inyo	<sup>3</sup> 10, 532, 917	3 17, 162, 980	Tungsten, lead, zinc, silver, sodium carbonate, talc, molybdenum, pumice and volcanic cinders, cop- per, stone, sand and gravel, clays, boron minerals, gold, perlite, sulfur ore, garnet, asbestos, gem stones, mercury.					
Kern	<sup>3</sup> 306, 426, 404	325, 852, 614	Petroleum, natural gas liquids, boron minerals, natural gas, cement, stone, sand and gravel, gyp- sum, clays, tungsten, gold, sodium carbonate, salt, pumice, silver, sodium sulfate, gem stones, copper.					
Kings	19, 157, 133	12, 585, 037	Petroleum, natural gas, natural gas liquids, gypsum, stone, mercury, sand and gravel.					
Lake	770, 993	<sup>3</sup> 747, 620	Mercury, sand and gravel, manganese ore, pumice and volcanic cinders, chromite, stone, gem stones.					
LassenLos Angeles	195, 197 329, 254, 165	301, 625 318, 443, 631	Sand and gravel, volcanic cinders, stone.  Petroleum, natural gas liquids, natural gas, sand and gravel, stone, sulfur (byproduct), diatomite, cement, clays, iodine, soapstone, gold, salt, irontitanium concentrates, silver.					
Madera	1, 967, 257	1, 638, 887	Tungsten, natural gas, pumice and pumicite, sand and gravel, stone, gold, silver.					
Marin	1, 277, 141	1, 388, 526	Stone, sand and gravel, clays, mercury, tungsten, gem stones.					
Mariposa Mendocino	<sup>3</sup> 102, 096 <sup>3</sup> 680, 772	185, 108 447, 625	Sand and gravel, gold, tungsten, slate, silver, zinc. Sand and gravel, stone, manganese ore, carbon dioxide, gem stones.					

TABLE 39.—Value of mineral production in California, 1954-55, by counties

County	1954	1955	Minerals produced in 1955 in order of value 1					
Merced	\$860, 097	7 \$1.061.70s	Sond and grovel					
Modoc Mono	445, 772	249, 74	Sand and gravel, gypsum, mercury, gold.  Sand and gravel, pumice and volcanic cinders, pea  Tungsten, pumice, pyrophyllis, sand, and grave					
Monterey	19, 837, 988	1	clays, gold, silver, gem stones.  Petroleum, lime, natural gas, sand and gravel, many					
Napa	1, 073, 640	1, 269, 276						
Nevada	2, 134, 510	2, 018, 522						
Orange	120, 666, 626	129, 490, 855	Cold, barite, tungsten, sand and gravel, silver, ger stones, zinc, copper, lead.  Petroleum, natural gas liquids, natural gas, sand and graval idding allows ottonogoldungs.					
Placer	440, 655	533, 799	Clays, sand and gravel, stone, chromite, gold, asher					
Plumas	111, 095	138, 935	Sand and gravel, manganese ore, gold, stone, connec					
Riverside	24, 279, 619	<sup>8</sup> 29, 273, 556	i suver, pyrophyllite.					
Sacramento	1,,	19, 286, 493	Spar, copper, gold, asbestos, silver.  Natural gas, sand and gravel, gold, clays, platinum silver.					
San Benito	1 / /	5, 046, 904	Cement, stone, mercury, sand and gravel, chromite					
San Bernardino	3 67, 134, 487	<sup>8</sup> 72, 119, 538	potassium salts sodium sulfate sand and manual					
			magnesium chloride lithium clays bromine lime					
			nese ore, lead, copper, natural gas, zinc, strontium gold, pumice and volcanic cinders, gen stones					
San Diego	- 6, 036, 225	5, 456, 730	Sond and morel steers and					
San Francisco San Joaquin	8 2 897 105	39, 938	Sand and gravel, stone, gem stones, tungsten, gold.					
San Luis Obispo	<sup>3</sup> 2, 897, 105 <sup>3</sup> 12, 744, 989	\$ 2, 198, 830 11, 725, 825	salu and gravel, stone, sair, magnesium compounds clays, pyrophyllite, gem stones, tungsten, gold. Sand and gravel, stone, gem stones. Sand and gravel, natural gas, clays, manganese ore Petroleum, natural gas liquids, chromite, natura gas, sand and gravel, stone, sulfur (elemental) clays gypsum, mercury, manganese ore, gem					
san Mateo	7, 741, 122	9, 883, 605	Cement stone magnesium compounds along					
anta Barbara	93, 319, 524	92, 574, 792	Petroleum, diatomite, natural gas liquids, natural gas, sand and gravel, stone, chromite, clays, mer.					
anta Clara	23, 270, 838	21, 403, 152	Cement, stone, sand and gravel mercury magnesita					
anta Cruz	6, 106, 528	8, 052, 923	Cement, stone, sand and gravel, clays, potassium					
hasta	_, =, ==, ===	1, 726, 412	salt. Pyrites, sand and gravel, stone, volcanic cinders, gold, copper, chromite, zinc, lead, silver, tungsten. Gold, and and gravel silver, rips.					
ierra iskiyou	568, 097 1, 354, 579	708, 064 \$ 1, 532, 833	Gold, chromite, sand and gravel, stone, pumice and					
olano onoma	6, 711, 341 2, 528, 448	9, 336, 428 3 2, 422, 739	volcanic cinders, silver, gem stones.  Natural gas, clays, sand and gravel, stone.  Sand and gravel, mercury, stone, manganese ore,					
tanislaus	³ 611, 086	<sup>8</sup> 475, 614	natural gas, petroleum.  Sand and gravel, clays, mercury, manganese ore, gold.					
utterehama	279, 824 505, 889	380, 983 801, 709 3 424, 431	Natural gas, sand and gravel, clays.					
rinity	384, 548	³ 424, 431	Sand and gravel, natural gas, chromite, stone. Gold, manganese ore, sand and gravel, stone, mer-					
ulare	2, 129, 813	3, 018, 334	cury, chromite, silver. Natural gas, sand and gravel, tungsten, stone, petro- leum clays berita com stones.					
uolumne	885, 306	1, 179, 017	Stone, lime, sand and gravel, chromite, gold, tung- sten, silver.					
entura		156, 970, 914	Petroleum, natural gas, natural gas liquids, sand and gravel, stone, clays, gypsum.					
olouba	1, 482, 615 2, 611, 997	1, 300, 534 3, 367, 067	Sand and gravel, natural gas. Gold, sand and gravel, clays, platinum, silver.					
ndistributed 4	1, 675, 892	3, 367, 067 2, 036, 394	and graver, clays, playmum, sliver.					
Total	\$1,429,627,000	1,457,554,000						

<sup>1</sup> Excludes uranium and monazite.
2 Figure withheld to avoid disclosing individual company confidential data, included with "Undistributed."
3 Excludes value of manganese and low-grade manganese ores sold and blended at Government low-grade stockpiles for future beneficiation.
4 Includes sulfur ore, gem stones, tungsten, sand and gravel, mercury, petroleum, and value indicated by footnote 2.

Chromite ore was produced by Palo Alto Mining Co. from the Mendenhall No. 1 open-pit mine in the Cedar Mountain district and concentrated at its mill in Santa Clara County. A small quantity of natural gas was produced from the Hospital Nose area near Livermore. Scrap and pig iron were used in the open-hearth furnaces of Pacific States Steel Co. at Niles and Judson Steel Corp., at Emeryville. C. K. Williams Co. utilized iron ore from Oregon to produce iron oxide pigments at Emeryville. The daily crude-petroleum capacity of Pabco Products, Inc., asphalt plant at Emeryville was 2,500 barrels. Nonmetallic minerals, including California magnesite, were processed by Philadelphia Quartz Co. at Berkeley. The Industrial Minerals & Chemical Co. mill at Berkeley ground the following minerals, produced outside the county on a custom basis: Barite, soapstone, fuller's earth, volcanic ash, clay, feldspar, pinite, and chromite. Chemical & Pigment Co. (Oakland) ground and utilized barite from Nevada at its pigment plant, and Yuba Milling Co. ground Nevada barite, used in drilling fluids, at Emeryville.

Alpine.—The Anaconda Co. Leviathan open pit in the Monitor district produced sulfur ore for use in making sulfuric acid at its Yerington, Nev., copper-leaching plant. Owing to severe winter conditions, the mine was operated on a seasonal basis. Output from this company represented a large percentage of the State's sulfur yield and highlighted the mineral output of this county. Small tonnages of tungsten ore were produced in the Hope Valley district by C. B. Lovestedt from the Alpine mine and the Boneyard Canyon and Dressler leases and by John Gobart from the Three Star mine. D. B. Lemaire operated a portable gravity mill and treated tungsten ores on a custom basis in the same district. Claude C. Wood prepared a small tonnage of structural sand and gravel at a portable

plant.

Amador.—Clays dug in the West Belt district furnished about half the value of the total county mineral output in 1955. Gladding, McBean & Co. produced fire clay, principally for use at its clayproducts plants in several other counties of the State, and shipped miscellaneous clay for use in cement manufacture. A joint milling project of this company with Owens-Illinois, which treated the claysand mixture from the Owens pit, yielded fire clay and glass sand in the first year of production. Western Refractories Co. produced fire clay at its Yosemite group of claims; some of it was utilized at its local plant and the remainder was marketed outside the county. Pacific Clay Products dug miscellaneous clay at the Dosch pit for use at its clay-products plants. Frank Ringer marketed fire clay produced from the Wallen & Ringer pit. Granite was quarried and crushed for roofing granules by Harley T. Kreth in the Mokelumne River (Lancha Plana) district. Sand and gravel was produced by the Amador County Road Department and contractors of the California Division of Highways. Rhodonite was mined in the East Belt district and utilized as a gem stone.

The Copper Hill mine in the West Belt district was the leading producer of gold and silver in the county and was the source of the copper and lead produced in 1955. The copper ore was treated at the Volo mill in El Dorado County, and the concentrate was shipped to a smelter in the State of Washington. Minor quantities of gold and

silver were recovered from gold ore amalgamated at the I. X. L. and Three Horsemen mines in the East Belt district. The relatively small production of placer gold and silver was largely from the Lorentz group of claims in the Cosumnes River district and Garibaldi mine in the East Belt district. Both properties were worked by dragline excavations.

American Lignite Products Co. lignite strip mine and a lignite processing plant in the West Belt district produced principally montan

wax; iron oxide pigment was a coproduct.

Butte.—Natural gas was the principal mineral commodity produced in this county in 1955. A large part of the production came from the Wild Goose field in the southwestern corner of the county; lesser yields came from the Durham and Chico gasfields. Sand and gravel for concrete aggregate and crushed stone for railroad ballast were produced from alluvium by Butte Creek Rock Co. and Henry Kaiser Co. in the Butte Creek and Oroville districts, respectively. producers of aggregate material included: Mathews Readymix, Inc. (sand and gravel), and Farr Bros. (gravel), from the Gridley area; Pentz Gravel Co. (sand), in the Yankee Hill district; Marter Rock Co. (sand), from the Oroville and Chico areas; and Perry & Rowe (gravel), from the Biggs area. The California Division of Highways. the Butte County Road Department, and their contractors produced The Butte County Road Department crushed sand and gravel. granite for road metal.

Helmke, Thomas & Janssen worked the Lambert underground mine in the Magalia district and shipped chromite ore to the Castella Mining & Milling Co. mill in Shasta County for upgrading. chromite concentrate was shipped to the Grants Pass, Oreg., Government Purchase Depot. Exploration for new ore bodies at the property was continued under a DMEA program. Relatively small yields of gold and silver came from several sporadically operated placer deposits which included: the dragline excavator and stationary washing plant at the Ferguson property, Butte Creek district, and the

Jack & Jill drift mine, Yankee Hill district.

Calaveras.—Cement production from the Calaveras Cement Co. plant at Kentucky House in the Mother Lode district was the principal contribution to the county mineral-production value in 1955. A plant expansion program was in project. Limestone, clays, and raw materials for the cement were quarried at the company pits in

the East Belt district.

The West Belt district was the source of fire clay and miscellaneous clay produced by California Pottery Co. and Pacific Clay Products for use at their respective clay-products plants outside the county. Also in the district, American Asbestos Mining Co. developed a deposit of chrysotile asbestos at the Voorhees mine; New Penn Mine, Inc., shipped cement copper precipitated from drainage water at the Penn mine, to a Washington smelter.

Mountain Gold Dredging Co., using a dragline dredge, was the principal producer of gold and silver in the county in the West Belt district. Other placers yielding gold and silver included the Altaville Drift mine and the Padum Corp. dragline dredge on the Martin property, both in the Mother Lode district. The small output of lode gold and silver was largely from direct-smelting gold ore produced at the A. V. G. (Golden Scherer) and Grand Prize mines, in the East Belt district. Ore from the latter mine also contained some recoverable lead. Tungsten concentrate produced at the Moore Creek mine in the Salt Creek area was marketed. Sand and gravel was prepared by Neilson Sand & Gravel Co. near Mokelumne Hill. Beerman & Jones crushed alluvial stone at Angels Camp. County road

crews produced gravel at various locations.

Colusa.—The principal mineral industry in the county was sand and gravel, mostly produced in the Colusa area by Paul Entremont and Cortina Rock, Sand & Gravel Co. The Sutter County Road Commission, the Colusa County Highway Department, and the California Division of Highways and their contractors produced sand and gravel in the county. Natural gas was produced from the Princeton field. Intermittent production of chromite ore continued in the Stonyford district. E. J. Huttman shipped a small tonnage of ore from the Jeff mine to the Grants Pass, Oreg., Government Pur-

chase Depot.

Contra Costa.—The mineral-processing industry centered around petroleum refining in Contra Costa County. Both foreign and domestic crude oils were brought into this area, which is favorably situated for sea and land delivery. Throughput capacity of the crude-oil plants of Standard Oil Co. of California, Shell Oil Co., Tidewater Oil Co., and Union Oil Co. of California was 413,900 barrels daily at the end of 1955. The American Smelting & Refining Co. lead smelter and gold-silver refinery at Selby treated ores, concentrates, and secondary nonferrous metals from domestic mines and plants; but metal production was derived mainly from treatment of South and Central American, Asian, and Australian ores and concentrates. Sulfur dioxide was recovered as a byproduct in smelting sulfide ores. Several major oil refineries produced hydrogen sulfide as a byproduct of the liquid purification of gases. Kaiser Gypsum Co., Inc., manufactured products from crude gypsum, imported from Baja California, Mexico, and recently constructed a new plant in the Pittsburg area. The Columbia-Geneva Steel Division of United States Steel Corp., Pittsburg, utilized ferrous scrap in its open-hearth furnaces and used a substantial quantity of its Utah steel output in coil form, which was cold-rolled into sheets locally. Mountain Copper Co., Ltd., processed copper scrap to produce copper salts in the Martinez area and mined pyrite ore, which was processed for its sulfur dioxide content, at its property in Shasta County. The output of sulfur dioxide was used in manufacturing sulfuric acid by Stauffer Chemical Co., Stege, and the Allied Chemical & Dye Corp. General Chemical Division, Nichols. Considerable tonnages of the resulting pyrite cinder were utilized in manufacturing special cements.

Stone was quarried and crushed by: Pacific Coast Aggregates Inc., Clayton area; Henry J. Kaiser Co., Tunnel Rock quarry, Orinda area; Blake Bros. Co., Richmond area; Serra Bros., Martinez area; and Mount Diablo Rock & Aggregate Co., Mount Diablo district. The delta area at the junction of the Sacramento and San Joaquin Rivers was the source of nearly all peat production in the State. The Vita Peat Co. dredging equipment in tidal areas produced this commodity for use in agricultural compound fertilizers. The Rio Vista gasfield, Sacramento and Solano Counties, was an important source of natural

Marchio Silica Sand Co. prepared molding sand, and Morris Sand Co. produced sand and gravel in the Pittsburg area. Other producers of sand and gravel were: Silver Sand Co., Cowell, and E. W. Thompson, Clayton area. Contractors for the California Division of Highways, the Contra Costa County Road Commission, the East Bay Municipal Utility District, and the Federal Bureau of Reclamation produced sand and gravel. Miscellaneous clay produced by Port Costa Brick Works, Martinez area, United Materials, and Richmond Brick Co., Ltd., Richmond area, were utilized to manufacture com-

mon brick. Gladding, McBean & Co. dug fire clay in Amador County to use at its refractory plant in the Pittsburg area.

Del Norte.—Del Norte County, the largest producer of lump chromite in the United States, contributed more than 14 percent of the State output of chromite ore in 1955. The Government Purchase Depot, Grants Pass, Oreg., made the mining of the small lenses of chromite that typify the area economically feasible. Noteworthy production came from: Waldo Mining Co., Inc. (Big Dipper mine), Simonson Logging Co. (Cowboy mine), Tulare Mining Co. (High Plateau mine), and James L. Perry & H. D. Miller (Azalea mine), in the High Plateau district; L. J. Conley Co. (French Hill mine), and J & W. Mining Co. (J & W mine), in the French Hill district; Harold Funk (Old Doe mine), in the Rattlesnake Mountain area; Sherman Smith (Poker Flat mine), in the Dunn Creek area and R. H. Ellison, (Pyramid mine), in the Red Mountain area.

Sand and gravel was produced for construction in three principal consuming centers by: Marlin Tryon Co. in the Fort Dick area, Peter Kiewit & Sons near Cresent City, and Simpson Redwood Co. in the Klamath River district. The Del Norte County Road Commission, and California Division of Highways, and its contractors produced sand and gravel. Macco-Morrison-Knudson Co., Inc., in the Point St. George area, quarried crushed basalt for use in jetties at Crescent City harbor. Simonson Logging Co. quarried and crushed a small tonnage of miscellaneous stone from pits along the Smith River for use in road building and repairing. Cleanup at a hydraulic mine in

the Patrick Creek district yielded a small gold and silver production.

El Dorado.—Diamond Springs Lime Corp. in the Mother Lode district and Semon Lime Co., Inc., successor to Vertin Lime Co., in the West Belt district quarried limestone used primarily to produce lime for marketing, largely in the San Francisco, Sacramento, and Stockton areas. El Dorado Limestone Co. and California Rock & Gravel Co., mined limestone in the Stockton district for use as flux and road metal and in the agricultural, sugar, and glass industries. Kelsey Slate Co., near Kelsey mined slate for flagging, and Pacific Minerals Co., Ltd., ground slate for stone flour from its underground mine at Chile Bar. Soapstone, mined in the West Belt district by Frank Harris, near Latrobe, and by Pacific Minerals Co., Ltd., near Shingle Springs, was shipped to the San Francisco Bay area for grinding. Hazel Creek Mining Co. at the Hazel Creek mine in the East Belt district, recovered gold and silver by amalgamation at its 30-ton-a-day mill and shipped flotation concentrate to a California smelter-fuming plant. Several thousand ounces of gold and silver plus some copper, lead, and zinc were recovered. Calivada Development Co. in the Mother Lode district (formerly reported in the West Belt district) produced copper

ore from the El Dorado Copper mine. The ore was concentrated at the Volo mill and yielded a copper concentrate, containing silver and gold, which was shipped to a Washington smelter. Gold and silver were recovered by amalgamation at the Atlanta and Monarch mines in this district and at the Sugar Loaf mine in the West Belt district. Gold and silver were also produced from several small-scale placer mines. Pilliken Mining Co. shipped chromite ore and concentrate from the Pilliken mine in the West Belt district to the Grants Pass, Oreg., Government Purchase Depot. Sciaroni Bros. treated small lots of tungsten ore from the Last Hope claim, East Belt district, in a pilot mill at Grizzly Flat. Sand and gravel was prepared by Cold Springs Sand & Gravel Co., Calif. Rock & Gravel Co., and Harms Bros., Placerville area; and by J. T. White, Tahoe area. Contractors for the California Division of Highways and the El Dorado County Commission produced sand and gravel. T. C. Nutt, and Sierra Placerite Corp. in the East Belt district quarried miscellaneous stone used for rubble and rough construction. Idocrase (vesuvianite) and garnet were gathered in the Mother Lode district by gem and mineralspecimen collectors.

Fresno.—The value of petroleum, natural gas, and natural-gas liquids produced from wet gas, particularly from the Coalinga and Kettleman fields, represented more than 98 percent of total mineral production in Fresno County in 1955. Tungsten and chromite ores were produced in such quantity as to represent a significant portion of the State's output of these commodities. The additional fields and areas contributing mineral fuels were: Burrell, Guijarral Hills, Helm, Jacalitos, Pleasant Valley, Raisin City, Riverdale, San Joaquin, Camden, and Cantua Creek. Natural-gasoline and LP-gas plants were operated at Coalinga by Standard Oil Co. of California, and Los

Nietos Co. and at Burrel by General Petroleum Corp.

In the Idria district, which extends into San Benito County, Southwest Oil Co. worked the Butler Estate No. 1 and the James Corbett claims and J. R. Holman the Big Ridge and Mistake mines to produce chromite ore and concentrate for marketing at the Grants Pass, Oreg., Government Purchase Depot. A small quantity of chromite ore came from the Railroad mine. Mercury was produced at the Archer mine. A substantial part of county tungsten production came from the Cal-Tex mine, Blue Bluff mine, Gem Tungsten No. 1 claim, Hill Top mine, Obelisk mine, and Sheridan mine, Dinkey Creek area. This area was also the scene of significant exploration and development: Louis Winfrey began constructing a 50-ton mill and developing 2 new ore deposits at the Blue Bluff mine; Cal-Tex Tungsten Co. installed a new mill at its mine and Neil B. Stever was constructing a 50-ton-a-day gravity mill at Grouse Lake. Other important sources of tungsten ore in the Sycamore Creek area included the Ground Hog, Jackpot, Rabbit Foot, Red Garnet, and Star Dust mines. Tungsten was produced in the Mill Creek area at the Delilah Ridge, V. J. Neilson, and Sequoia mines. A small quantity of tungsten ore was obtained from the Upper Kings River

Sand and gravel was prepared by: Central Rock & Sand Co. and Sanger Rock Co., near Sanger along the Kings River; by Herndon Rock Products Co. on the San Joaquin River; at Herndon, and Pacific

Coast Aggregates Co., in the Friant area. At these plants gold and silver were recovered as byproducts. It was also prepared by the Thompson Materials & Construction Co., Inc., near Avenal, and L. D. Folsom, Inc., in the Coalinga area. The Federal Forest Service, contractors for the Federal Bureau of Reclamation, and the California Division of Highways produced sand and gravel. At Piedra, Sharp & Fellows Construction Co. quarried basalt, used principally for railroad ballast. Basalt, granite, sandstone, and miscellaneous stone were quarried by Government agencies and their contractors for road construction and maintenance. At Fresno Craycroft Brick Co. dug miscellaneous clay, and Perlite Products Co. expanded crude perlite that was produced outside the county. A small tonnage of calcareous marl was produced near Mendota for experimental purposes.

Glenn.—Natural gas was produced from Afton, Ord Bend, Willows, and Beehive Bend fields. Sand and gravel was prepared by Orland Sand & Gravel Co. at Orland and by E. W. Wruck and Harms Bros. at Willows. Southern Pacific Railroad Co. prepared sand and gravel at Wyo for its own use. The Glenn County Board of Supervisors, the California Division of Highways, and their contractors produced sand and gravel. Cro-Tung Co., Inc., treated chromite ore from the Grey Eagle, Black Diamond, and Chromite Creek No. 3 mines, in the company mill, Elk Creek (Red Mountain) area. Harzer Enterprises upgraded chromite ore from the Harzer open-pit mine, by gravity concentration in the Salt Creek area. Chromite concentrate from both properties was shipped to the Grants Pass, Oreg., Government Purchase

Humboldt.—Sand and gravel was prepared by: Eureka Sand & Gravel Co., Fortuna Sand & Gravel Co., and McWhorter & Dougherty, Inc., in the Fortuna area; ABS Aggregates, Inc., Jesse Manley, in the Arcata area; John Burman & Sons, at Garberville; Tom Hull, near Crannell; and Mercer Frasier Co., in the Maple Creek area. The California Division of Highways, the Humboldt County Road Department, the Bureau of Public Roads, and their contractors produced sand and gravel. The Bureau of Indian Affairs, contractors for the California Division of Highways, and the Bureau of Public Roads produced granite, sandstone, and miscellaneous stone, respectively, for road use. Natural gas was produced from the Eureka field. Hindley Clay Products dug miscellaneous clay from its pit near Eureka principally for use in heavy clay products. Chromite ore was shipped to the Grants Pass, Oreg., Government Purchase Depot by: Joseph S. Folsom from the Binder No. 1 mine Horse Mountain district; R. H. Ellison, from the Blue Creek Tunnel and Pyramid mines, Red Mountain district; and Dan Haight from the White Cedar mine, Klamath River area.

Imperial.—The Farmers Gravel Co. dredge in the Brawley area produced filter sand. Other sands and gravel were prepared by Janney Sand & Gravel Co., near Yuma; Nelson Gravel Pit Co., near Holtville; Valley Transit Cement Co., near Brawley; and H. & M. Trucking Service, at El Centro. Western Non-Metallics Co. mined mica schist from the Micatalc property, near Ogilby, for use in preparing roofing material. United States Gypsum Co. operated its gypsum quarry in the Fish Creek Mountain area and a mill and board plant at Plaster City. Natural Mineral Co. and H. & H. Co. dug bentonitic

clay in the Superstition Mountain area. Shipments of manganese and low-grade manganese ores were made to low-grade stockpiles at Deming, N. Mex., and Wenden, Ariz., from the following mines in the Palo Verde district: Angus No. 2, Black Beauty, Black Butch 1 & 2, Black Point, Bright Star, Mary Ellen No. 1, La Esperanza, Tadpole, McIntyre Lugo, and Virginia Dare mines. Shipments were also made from the Red Dot and Pioneer mines in the Paymaster district.

Contractors for the California Division of Highways, the Bureau of Public Roads, the Imperial Irrigation District, and the Imperial County Road Commission produced sand and gravel. Superlite Builders Supply Co. processed pumice near Niland. Tungsten ore was mined from the Nannie claims in the Mountain Springs area and the White Rock mine in the Pot Holes district. Henry Abeyta produced decomposed granite near Plaster City and the Imperial Irrigation District crushed granite at Mount Signal. Jasper and chalcedony were gathered in the Cayo Muchacho district by mineral collectors. Gold and silver were recovered from gold ore shipped from the La Colorado mine in the Cargo Muchacho district to an Arizona smelter and from gold ore amalgamated at the L. P. (Belle) (Mayflower) mine

in the Picacho district.

Inyo.—Union Carbide Nuclear Co., formerly United States Vanadium Co., a division of Union Carbide & Carbon Corp., the Pine Creek tungsten mine and Morgan Creek mill in the Bishop district operated throughout 1955. Custom and company ores were treated in a 1,000-ton-a-day flotation mill. Some low-grade concentrate was further treated in digesters to produce synthetic scheelite. In treating tungsten ores, a molybdenum concentrate was produced, and a copper concentrate containing gold and a substantial quantity of silver was recovered and shipped to a smelter. Also in this district, Brownstone Mining Co. produced tungsten ore from the Brownstone mine, and Ajax Tungsten Corp. treated tungsten ore from Hanging Valley mine in the Benware mill. Other producers of tungsten ore in the district included: Palmer & Decker (Adamson mine), Ki Enterprises & George Lasley (Basin Mountain mine), Al Stevens & Howard Stevens (Big Shot mine), Alphonso Alt & Gene Bellino (Chipmunk and Hollywood mines), L. Brown (L & L mine), R. Moore (Little John mine), E. K. Lovelace (Little Sister mine), Early & Stokes (Moonlite mine), C. E. Lindner (Oomph mine), D. J. Beauregard (Pine Knot, Green Hole, and White Cap mines), Round Valley Tungsten Co. (Robbins mine), David & Lasley (Rossi mine), K. Moore & Nev-Tah Oil and Mining Co. (Sonny Boy mine), David Grassel & J. E. Morhardt (Tarantula mine), T. E. Makinen (White Line mine), Tungsten Hill Mining Co. (Tungsten Hill mine), and C. O. Russell (Fox Hole claims). Contributors of small tonnages of tungsten ore in the Fish Springs district included: G. J. Lewis (All Ray mine), Byrnes & Hitchcock (Hillsdale mine), and D. Beatty (Sixty-Nine mine). Sibley & Tilley operated the St. Charles mine and mill in the Darwin (Coso) district and shipped concentrate. Other producers of tungsten ore in this district included: A. J. Pouch (Bruce mine); Buckner, Kerwin, Walker & Sanders (Custer mine); Finley and Vignich (Darwin mine); Jenson and Hammock (Palo Alto mine); and Manor Mining Corp. (Silver Reef mine). The following companies produced tungsten ore in the Wild Rose district: F. Hinds (Blue Cliff

mine), Harlis & Broady (Chuckawalla mine), R. S. Dahl (High Noon mine), R. & S. Mining Co. (R & S mine), W. Walters (Sunset Group of claims), Grassel, David & Nichols (Tarantula mine), Cross & Caldwell (Three Spot), Sooner Death Valley Mining Co., Ltd., and Tungstar Mining & Milling Co. (V. O. mine), E. K. Thompson (Volkswagon mine); and F. Ahlstrom & T. C. Greene (Walter J. mine). Additional tungsten ore production came from: S. H. Holder (Robbins mine), in the Deep Springs (Eureka Valley) district; J. Wisdom (Bright Star mine), Sylvania district; California Tungsten Mining & Milling Co. (Blue Cliff mine), Furnace Creek district; D. Byrnes (Hope mine) and A. Stewart (Samson mine), Big Pine district.

The Anaconda Co. mined lead and lead-zinc ores from the Darwin group of mines in the Darwin (Coso) district and milled lead-zinc ore, producing lead concentrate containing silver, gold, copper, and zinc, and zinc concentrate, containing silver, gold, copper, and lead. It also mined and milled lead-zinc ore at the Shoshone group of mines in the Resting Springs district, producing lead-zinc concentrate containing silver, gold, and copper. Lead concentrate, lead-zinc concentrate, lead ore, and some lead-zinc ore were shipped to a Utah smelterfuming plant; zinc concentrate went to a Montana smelter. Foreman & Foreman Co. and H. W. Gould & Co. shipped lead ore containing silver, zinc, copper, and gold from the Defense mine in the Modoc district to a California smelter-fuming plant. Lippincott Lead Mines worked the Lead King (Lippincott) mine in the Ubehebe district and produced lead ore, containing silver, which was reduced to lead bullion in its smelter at Ontario, San Bernardino County. In the Lee district lead-zinc ore containing silver, copper, and gold was shipped to smelter fuming plants by McFarland & Hullinger, from the Santa Rosa mine, and by Albert Glenn, from the Silver Reid claims. Argus Development Co. worked the Ruth and Davenport mines in the Sherman district and produced gold and silver by cyaniding gold ore. Other producers of gold and silver from gold ore included: Black Iron mine, Chloride Cliffs district; Del Norte mine, Silver Ball group of claims, Wildrose district; and Cleveland mine, Fish Springs district.

Talc was mined by F. A. Bachich from the Eureka mine in the Deep Springs (Eureka Valley) district and by Wm. Bonham from the White Mountain mine in the Cerro Gordo (Keeler) district. Sierra Talc & Clay Co. ground talc at its plant at Keeler, and clay at its Zurich mill. In the Saline Valley area, Sierra Talc & Clay Co. produced talc from the Rogers mine; Huntley Industrial Minerals, Inc., obtained talc from the White Eagle mine and ground the talc at its Laws mill, in the Bishop area. Kennedy Minerals Co., Inc., produced talc from the Eclipse mine in the Resting Springs (Tecopa) district. Sierra Talc & Clay Co. from the Frisco and Talc City mines, Geo. W. Koest from the Alliance mine in the Darwin (Coso) district; Louise Grantham & Associates from the Big Talc and Warm Springs No. 5 mine, and Multi Mines from the Death Valley mine in the Carbonate district produced talc. The latter company mined nonswelling bentonitic clay in the Confidence district. Harry Adams shipped talc from the Kingston district, which extends into San Bernardino County. Silicates Corp. produced bentonite in the Ash Meadows area. Sierra

Talc & Clay Co. and Rook & Mason mined fuller's earth in the

Darwin (Coso) district.

Crownite Corp. prepared pumice from the Crownite mine near Coso Junction for use as concrete aggregate, soil conditioner, and roofing material. Volcanic cinder was produced near Little Lake by: Volcanic Cinder Co. for use as soil conditioner; Redlite Aggregates, Inc., for use as admixture in concrete. Paul R. Splane Co. International Minerals & Chemical Corp. in the Fish Springs district shipped crude perlite to expanding plants in Los Angeles County.

The Inyo County Highway Department, National Park Service, Los Angeles Department of Water and Power, California Division of Highways, and their contractors produced sand and gravel. ley Industrial Minerals, Inc., produced amphibole asbestos from the Lawrence mine in the *Ubehebe district* and ground it for filler in paint and stucco. D & B Sulfur Co., Inc., produced a small tonnage of sulfur ore from the Gulch mine in the Last Chance Range. Setzer Mining Corp. recovered mercury from ore of the Nancy mine in the Resting Springs district, and Roy Argo shipped low-grade manganese ore to a Government stockpile from the Lilly group of claims in the Slate Range district. Columbia-Southern Chemical Corp. produced soda-ash and trona from dry-lake brines, near Bartlett. Pacific Coast Borax Co., Salt Creek area, and United States Borax Co., Resting Springs district, mined colemanite for shipment to plants in Kern and Los Angeles Counties. Otis A. Kittle & Associates, Ltd., recovered garnet for use as abrasive from tungsten tailings at the Tungsten City mine in the Bishop district. Quartzite, used in gannister, was produced by Mineral Materials Co., contractor for Gladding, McBean & Co., Cerro Gordo (Keeler) district. Onyx, a gem stone, was mined in the Shepard Canyon district and quartz crystal was obtained in the Big Pine district for mineral specimens.

Kern.—Approximately 4 percent of domestic crude-petroleum production was produced from more than 30 separate oil pools in Kern County, comprising a large part of the western half of the county. Natural-gas liquids from wet gas were prepared at plants of the following companies: Bankline Oil Co., Caricopa and Belridge areas; Honolulu Oil Co., Cymric and Taft areas, Standard Oil of California, Taft, Mountain View, Elk Hills, Greeley, and Lost Hills areas; Superior Oil Corp., Rio Bravo area; Union Oil Co., Belgian Anticline area; and Western Gulf Oil Co., Paloma area. The total crude-oil throughput capacity of 9 petroleum refineries (8 in the Bakersfield area and 1 at Maricopa) was 73,900 barrels daily at the end of 1955, an increase of

12,450 barrels over January 1, 1955.

In the Dry Lake district, the Pacific Coast Borax Co. production of tincal and kernite from the Jennifer underground mine, together with some colemanite, mined in Inyo County, was treated at its boron mill; part was shipped to its Wilmington refinery in Los Angeles County. The mill and refinery products were: Borax, boric acid, anhydrous sodium tetraborate, natural calcium borate, natural sodium borate, and miscellaneous boron compounds. Byproducts of milling and refining were sodium carbonate, sodium sulfate, and sodium chloride. Salt, a product of the saline waters of playas and produced by solar evaporation, was harvested in the El Paso (Red Rock) district by Long Beach Salt Co.

Monolith Portland Cement Co. in the Tehachapi district produced the basic raw materials (except gypsum) required for its manufacture of portland cement in Kern County; the required gypsum was quarried in Ventura County. Construction progressed on a new cement plant by California Portland Cement Co. in the Mojave district. Excel Minerals Co. mined diatomaceous clay in the McKittrick area for absorbent uses. Mojave Corp., Dry Lake district, and McKittrick Mud Co., McKittrick area, produced miscellaneous clay for rotary drilling fluids. Gypsite, a low-grade gypsum used in agriculture, was produced by Antelope Valley Agricultural Gypsite Co., El Paso (Red Rock) district; C. L. Fannin Agricultural Gypsum Co., H. M. Holloway, Inc., and Superior Gypsum Co., Lost Hills district.

Sand and gravel was prepared by: Kern Rock Co., Dicco, Inc., Edison Sand Co., Hartman Concrete Materials Co., Kern River Co., Webster Rock Co., Griffiith Co., and George France, Inc., Bakersfield area; W. B. Grosshardt, Inyokern area; and R. A. Spooner, Ridgecrest area. The Federal Bureau of Reclamation, the California Division of Highways, and its contractors produced sand and gravel. Groover Mining & Milling Co. quarried and crushed granite and miscellaneous stone in the Cantil area. Calsico Corp. mined a small tonnage of pumice for abrasive purposes in the El Paso (Red Rock)

district.

The ore shipments from six mining districts in the county, where development and exploration work of uranium deposits was continuing, represented a small but growing mineral industry. Castle Mining Co., Dry Lake district; Mule Mountain Minerals Co. Mule Mountain district; Western Mines Development Co. El Paso (Red Rock) district; Mineral Springs Mining Co., Clear Creek district; and Verdi Development Co., Mojave district, shipped uranium ore to processing plants. The principal producers of tungsten concentrate in Kern County included the following: Green & Thorpe, Tregg Mining & Milling Co. (Billie Burk mine), Mike Tanous (Hard Luck mine), Carl Stibs (King Edward mine), Lila King Mining Co. (Mike Mac, Victory and Patsy claims), and Dean Wilson (Victory No. 2 mine), Randsburg district; Robert Edwards (Snow White No. 2 mine), Paul Siebert (Magnolia mine), Hatter Conference (High Book mine), Indian Wells districts and mine), Hatton-Carlson (High Peak mine), Indian Wells district; and Embree Uranium Co. (Unip Group), Valley View district. Butte Lode Mining Co., Greenhorn district, custom-milled a large quantity of the ore. Lila King Mining Co. worked the Victory and Patsy placer tungsten claims using a dragline excavator. Scheelite was separated from the ore in a gravity concentrator equipped with a magnetic separator. The Ostrenger and Pate custom mills and Kaweah Mining & Milling Co. of Tulare County milled ore produced in Kern County. Numerous small mines in the following districts also contributed: Mojave, Cove, Havilah, Tehachapi; and Keyes.

Recoveries of gold and silver from lode mining were comparatively small; only one produced copper. In the Mojave district, Burton Mines, Inc., processed ore at the 150-ton-a-day Tropico cyanide mill from the company-leased-and-operated Tropico (Kid Shaft) and Cactus Queen mines, milled custom ore including a shipment by George Wegmann, and shipped ore from the Wegmann group of claims. The Standard group of claims produced gold and silver and the Silver Queen mine also yielded copper. In the Randsburg district, the Yellow

Aster mine, worked by Stryker, Harrel & Hogan, produced gold and

silver by amalgamation.

Kings.—The production of petroleum, natural gas, and natural-gas liquids contributed most of the county mineral value. The Kettleman field, which extends into Fresno County, and the Pyramid Hills field were sources of petroleum and natural gas. Natural gas was also produced from the Trico field. Near Avenal, P. S. Magruder operated the Huffman and Western States plants and produced natural gasoline and LP-gases from wet gas. Caminol Co. at Hanford operated the only petroleum refinery in Kings County. The daily crude-oil-throughput capacity of this plant was 5,000 barrels at the close of 1955, an increase of 300 barrels from January 1, 1955.

McPhail Gypsum Co. mined its claims in the Kettleman area, and H. M. Holloway, Inc., worked its Avenal Gap mine to produce gypsite for use as a soil conditioner. Mercury was produced from cinnabar, mined in the Table Mountain area, where Roy Pierce and C. J. Peterson worked the Fredaniva group of claims. The California Division of Highways and its contractors produced sand and gravel,

crushed sandstone, and granite for road maintenance.

Lake.—California Quicksilver Mines, Inc., recovered mercury at the Abbott underground mine in the Sulfur district with Gould 40-ton rotary furnace and two "D" retorts. Near Borax Lake, Bradley Mining Co. treated and shipped ore from the Sulphur Bank mine. Mercury was also produced at the following properties: Baker mine, Lower Lake area; Helen mine, Big Injun group of claims, Joyce prospect, and Mirabel mine, Eastern Mayacmas district.

Sand and gravel was prepared by: F. M. Frazell and Lange Bros. near Kelseyville; Cache Creek Gravel Co., Cache Creek area; and H. L. McCabe, Upper Lake area. The Lake County Highway Commission, the California Division of Highways, and their contractors produced sand and gravel and sandstone for use as road material. Stanley McCosker and James I. Scott shipped chromite concentrate to the Grants Pass, Oreg., Government Purchase Depot and operated the Lucky Seven mine, Knoxville district and the Verbiscio mines, Eastern Mayacmas district respectively. The chromite ore from both mines was treated at the James I. Scott gravity mill near Middleton. Tex Young Mines at the Toy Young mine in the Eel River area and Edward Hadsel at the Grandview mine in the Upper Lake area produced manganese and low-grade manganese ores for shipment to a Government stockpile. Near Lower Lake, Roger Hellgren and V. V. Coleman produced pumice and volcanic cinder for use in lightweight aggregate. Quartz crystal was found in this area by mineral-specimen collectors.

Lassen.—Harms Bros. and Claude C. Wood used portable equipment to produce paving gravel. The California Division of Highways, the Lassen Road Commission, and the Modoc Road Commission produced sand and gravel. Susanville Granite & Marble Works produced dimension granite at Susanville for curbing and flagging. Mount Lassen Cinder Co., formerly Glass Mountain Pumice Producers, mined and prepared volcanic cinder at its mill in the Diamond district for use as concrete aggregate. Contractors for the California Division of Highways produced volcanic cinder for road use. Uranium ore was shipped from the Lola G. claims in the Red Rock district

by H. E. Baker.

Los Angeles.—Los Angeles County led in State mineral production. Several important petroleum refineries and nonmetallic-mineralpreparation plants produced in the county. Petroleum, natural gas, and natural-gas liquids from wet gas provided the greater part of mineral production, mostly from the Los Angeles Basin (which extends into Orange County) and the Newhall and Castaic areas. These plants produced natural-gas liquids: Bankline Oil Co., Santa Fe Springs area; Cowan Oil & Refining Co., Rosecrans area; Inglewood Gasoline Co., Potrero area; Lomita Gasoline Co., Long Beach and Signal Hill area; Signal Oil & Gas Co., Signal Hill area; Sunray Oil Co., Newhall-Potrero area; The Texas Co., Santa Fe Springs, Signal Hill, and Wilmington areas; Shell Oil Co., Brea, Dominguez Hill, and Long Beach areas; Standard Oil Co. of California, Santa Fe Springs, Inglewood, Seal Beach, and Torrance areas; and Union Oil Co. of California, Santa Fe Springs-Bell, Del Valle, Playa del Rey, Dominguez, Rosecrans, and Sansinena areas. The total crude-oil throughput capacity of 25 petroleum refineries in the county (8 at Long Beach, 7 at Wilmington, 2 each at Torrance, Vernon and Santa Fe Springs, and 1 each at Paramount, Newhall, El Segundo, and Norwalk) was 729,100 barrels daily at the close of 1955, an increase of 21,000 barrels over January 1, 1955. Elemental sulfur yielded as a byproduct of the liquid purification of gas from six petroleum refineries in Los Angeles County, represented more than one-quarter of the entire domestic production by this method. Hancock Chemical Co. (Watson), Union Oil Co. of California (Wilmington), and Wilshire Oil Co., Inc. (near Norwalk), furnished this production in 1955. Deep-water Chemical Co., Ltd., and Dow Chemical Co. recovered iodine from oil-well brines at plants in the Dominguez Hill, Venice, and Englewood fields.

Caswell Co. at Torrance and Miller Bros. Trucking Co. at Redondo Beach prepared molding sand. Noteworthy quantities of blast sand were prepared by: Paramount Sand Co. and McIlroy Blasting Sand Co., El Segundo; Gordon Sand Co., near Inglewood; and Bill & Rudy Sand Co. at Walteria. Engine sand was prepared by C & R Sand Co. near El Segundo. Consolidated Rock & Sand Co. was by far the leading county producer of both structural and paving sand and gravel, at five plants in North Hollywood, Irwindale, Azusa, Sun Valley, and Monrovia. Other producers of structural and paving sand and gravel included: Azusa Rock & Sand Co., Livingston Rock & Gravel Co., Azusa; Century Rock Products Co., Arcadia; Graham Bros., El Monte, and Sun Valley; Arrow Rock Co., Duarte; C. O. Sparks Inc., Mundo Engineering Co., Owl Rock Products Co., Pacific Rock & Gravel Co., Blue Diamond Corp. and Sierra Rock Products Co., Monrovia; Lindauer Corp., La Habra; California Materials Co., Sun Valley; John M. Ferry, Littlerock; Granite Materials Co., North Hollywood; Mac Arthur & Sons, Palmdale; Manning Bros. Rock and Sand Co., Irwindale; Torrance Sand & Gravel Products Co., Torrance; West Coast Aggregates, Inc., Pomona; and Edward Sidebotham & Son, Inc., Lomita. The city of Burbank, the Los Angeles Department of Water and Power, the Los Angeles County Road Department, and its contractors produced sand and gravel.

Decomposed granite was quarried by William Bonfield, and California Materials Co., Sun Valley; Los Angeles Decomposed Granite Co. and Owl Rock Products Co., near Montebello; and Livingston Rock & Gravel Co., Inc., at Monterey Park. The last company also quarried and crushed basalt at Palos Verdes. W. W. Davis & Sons, near Azusa, produced and marketed a small tonnage of quartz. Catalina Island, Connolly-Pacific Co. quarried miscellaneous stone, principally for jetties and seawalls, and Graham Bros. crushed stone for aggregate. Near Palos Verdes, Bill & Rudy's Sand & Gravel crushed stone for roofing granules. Palos Verdes Stone Department prepared silicified diatomaceous earth for rubble and flagging. H. A. Jones and Don Poteet near Saugus and Robert Cox at Pasadena quarried miscellaneous stone for building and flagging. Contractors for the Corps of Engineers quarried stone. Miscellaneous clay was dug for use at their respective plants by: Higgins Brick & Tile Co. at Torrance, Santa Monica, and Monterey Park; Maybow Building Materials & Supply, Inc., Los Angeles; Atkinson Brick Co., Compton; Builders Brick Co., Moneta; Gladding, McBean & Co., Pico; Davidson Brick Co., Moneteey Park; Angulo Tile Co., San Valle Kilns, Reseda; Valley Brick & Supply Co., near Van Nuys; Star Brick Co., Gardena; and Castaic Brick Co., near Castaic. Leon Katz shipped clay, used as a filler, from the Tujunga area.

Blue Diamond Corp. manufactured cement from purchased clinker at its Los Angeles plant. Great Lakes Carbon Corp. Dicalite Division, prepared diatomite from the company pits at Walteria, largely for use in filters, insultation, and fillers. Soapstone was produced from the Katz mine near Acton, and the material was shipped to a Los Angeles grinding plant. Pacific Coast Borax Co. shipped crude boron minerals from its mine in Kern County to be processed at its

refinery in Wilmington.

A small output of salt (sodium chloride) was obtained as a by-Lee Axtell produced iron-titanium minerals for use as roofing granules from beach sand in the Torrance area. Gold and silver were recovered in the San Gabriel district as byproducts of sand and gravel processing and at the Walker Ranch in the Placerita district, by dry placering. The relatively small quantity of gold and silver produced resulted from the Rogers & Gentry (Newa) and the Oro Grande mine, Neenach district, was cyanided at a Kern County custom Output from the Black Cargo claims, Cedar district, was amalgamated. At Sun Valley, Sun Valley Tungsten Co. custom-milled tungsten ore and concentrate produced outside the county. International Minerals & Chemical Corp., Marcus McClure Co., Panacalite Pacific, Inc., Redco, Inc., (Los Angeles), Perlite Popped Products Co., (near Santa Fe), and Paramount Perlite Co., Inc. (Paramount) expanded crude perlite that was shipped into the county. Kaiser Gypsum Co. calcined crude gypsum, imported from Mexico, for use in its gypsum-board-products plant near Long Beach. Pabco Products, Inc., calcined gypsum quarried in Nevada for use in manufacturing gypsum products at its Southgate plant. The Columbia Geneva Steel Division of United States Steel Corp. utilized iron and steel scrap in its open-hearth furnaces at Torrance. California Zonolite Co. exfoliated crude vermiculite shipped from Montana at its plant in Los Angeles. The talc-grinding industry was centered in the Los Angeles area and used principally talc and pyrophyllite shipped from

Inyo and San Bernardino Counties.

Madera.—Natural gas was withdrawn from the Moffatt Ranch and Gill Ranch fields, west of Madera, and marketed. New Idria Mining & Chemical Co. produced tungsten ore from the Strawberry mine in the Jackass district and shipped concentrate to an ore buyer. Exploration continued at this property under the DMEA program. McGuire Pierce worked the U.S. Tungsten mine, in the North Fork area; Sierra Mining & Development Co. et al. obtained ore at the Wisseman mine in the Rock Creek area; tungsten concentrate was shipped from both mines. Other properties that produced tungsten ore included: Cedar mine in the Bass Lake area, Sierra mine in Rock Creek area, Ruby mine in the Potters Ridge district, and Washington mine in the Crook Mountain area. In the Friant district of the San Joaquin River area, California Industrial Minerals Co. and the Ol'Rebel Minerals, Inc., constructed new plants for processing pumicite, mined from their open pits. The product was marketed for use as insecticide diluents. Elmer Erickson prepared pumice for concrete Sand and gravel was produced by Thompson Materials & Construction Co., Geo. E. France, Inc., near Kerman; Valley Feed & Fuel Co., at Madera; and San Joaquin Valley Pipe Co. at Chowchilla. The California Division of Highways, the Madera County Road Commission, and the United States Forest Service produced sand and gravel. Cold Springs Granite Co. (formerly the Raymond granite quarries), quarried granite in the Raymond district. The California Division of Highways crushed granite for road use. John Casaurang and Elmer Holiday used suction dredging equipment to recover gold and silver from gravel along the Fresno River in the Dennis area.

Marin.—In the Novato area Marin Rock & Asphalt Co. quarried and crushed basalt; and Black Point Aggregates, Inc., and Harms Bros. produced sand and gravel for paving. Basalt Rock Co. and Hutchinson Co. quarried and crushed sandstone in the San Rafael and Greenbrae areas, respectively. Near San Rafael, McNear Brick Co. produced shale to be expanded at its plant for use in lightweight aggregate and utilized weathered shale for brick manufacture. In the Black Mountain district mercury was produced by retorting ore from the Edwards Bros. and Turner & McFarland mines. Tungsten concentrate was shipped from the Dell Bender prospect in the Inverness district by E. A. Bender. Marine fossils were gathered by

mineral collectors in this district.

Mariposa.—In the Mother Lode district Wm. J. Saye, Sr., used a portable plant to prepare gravel. Mariposa Sand & Gravel Co. recovered gold as a byproduct of sand and gravel. The Mariposa County Highway Department, the California Division of Highways, the National Park Service, and their contractors produced sand and gravel. In the East Belt district Williams Bros. recovered gold and silver from gold ore by amalgamation at the Williams Bros. mine and stamp mill. Other properties in this district producing gold and silver by amalgamating gold ore included the Early, Last Hope, and Sweetwater mines. In the Mother Lode district Harmon & Dozier Mining Co. milled gold ore from the Nelly Kaho mine and recovered gold and silver by amalgamation. Concentrate, containing gold,

silver, and some zinc, was shipped to a smelter-fuming plant. Small quantities of gold and silver were recovered in amalgam from gold ores of the Annabell, Black Spider, Marguerite, and Red Banks mines and the Specimen group of claims. Placer mining was conducted in the county on a small scale and produced small quantities of gold and silver. In the East Belt district near El Portal Incline Mining Co. worked the Blue Dipper and Blue Spot mines and marketed tungsten concentrate; the Lucky Three mine produced tungsten ore. Slate for flagging was produced by Aqua Fria Slate Quarry Co.

in the Mother Lode district.

Mendocino.—Sand and gravel was prepared by: Ford Gravel Co., Ukiah Gravel & Cement Co., and Arthur Siri, Inc., near Ukiah; C. A. Haun and Peter Persico, near Willits; E. T. Boxman, near Fort Bragg; and Hans Hoyer, near Leggett. The California Division of Highways and its contractors produced sand and gravel. Government agencies and their contractors also crushed granite, sandstone, basalt, and miscellaneous stone at several places in the county, largely for road construction and maintenance. The S C Mining Co. worked the South Thomas mine in the Russian River area and shipped manganese ore to a Government stockpile and Henry Wright shipped manganese ore from a claim on the South Fork of the Eel River. In the Hopland area, Cal Dri Ice Corp. produced natural carbon dioxide gas used for manufacturing dry ice. Jade, a gem stone, was mined from a deposit on the Middle Fork of the Eel River.

Merced.—Sand and gravel was prepared by: Le Grand Sand & Gravel Co., Le Grand district; Los Banos Gravel Co., Los Banos area; and Valley Aggregates, Inc., near Cressey district. Contractors for the Merced County Road Department, the California Division of Highways; and the Federal Bureau of Reclamation produced sand and gravel. The Agricultural Minerals & Fertilizer Co. quarried and marketed gypsite from the Panoche pit, near Los Banos for use in reclaiming alkali soils. Burgen & Olson produced mercury from the Stayton mine in the Stayton district. Gold was recovered by small-scale hand methods on the Merced River, Snelling district.

Modoc.—Moyer Gravel Co. sand and gravel plant at Alturas and the California Division of Highways, the Modoc Road Commission, and their contractors produced sand and gravel. In the Glass Mountain area near Tionesta, Boorman Pumice Products prepared pumice from its deposits for use as lightweight aggregate. Near Newell, U. S. Pumice Supply Co., Inc., prepared pumice for abrasives from material quarried at its properties in Siskiyou County. Volcanic cinder for railroad ballast and fill was produced by Great Northern Railroad Co. at its Ainshea Butte quarry. Contractors for the California Division of Highways quarried volcanic cinder for use as seal coat. Peat, was dug from pits in the Jess Valley area by Modoc Peat Moss Co., principally for use in agriculture.

Mono.—Wah Chang Mining Corp. produced tungsten from the Black Rock open-pit and underground mine, Chidago (Clover Patch) (Indian) district and treated most of the ore at its flotation-chemical plant; some was shipped to an Inyo County custom mill for beneficiation. In the Bishop district, which extends from Inyo County, tungsten ore was produced from the Filipelli, Hilton, and Nicoll mines and shipped to a custom mill for beneficiation. Tungsten ore was

also produced from the Apex mine in the Homer district and the Granite Group of mines in the Chidago district. The ore was

beneficiated in nearby custom mills.

United States Pumice Supply Co. produced block pumice from the Frank Sam mine in the Mono Lake district for consumption as scouring blocks. Cowan & McGraw worked the Benton mine in the Blind Spring Hill area and prepared pumice at an open-pit quarry and a mill for use as concrete aggregate. Andrew Boyd prepared pumice for use in lightweight aggregate and acoustic plaster near Bishop. Huntley Industrial Minerals, Inc., produced pyrophyllite from the Pacific Pyrophyllite mine in the White Mountains district, shipped the crude material to its grinding plant at Laws, and also producd kaolin in the Hot Creek district. The Los Angeles Department of Water and Power and contractors for the Mono County Highway Department and the California Division of Highways produced sand and gravel. R. L. Cline obtained gold and silver in a cleanup of the old Syndicate mill, Bodie district. Beauregard & Moore shipped gold ore from the Sierra-Washington claims in the Mammoth Lake district to a smelter.

Monterey.—Kaiser Aluminum & Chemical Corp., near Natividad,

Monterey.—Kaiser Aluminum & Chemical Corp., near Natividad, quarried dolomite and prepared sea water and calcined dolomite, which it used in producing refractory magnesia, caustic-calcined magnesia, and magnesium hydroxide at its Moss Landing plant. Some

of the dolomite was used for metallurgical flux.

Near Pacific Grove, Del Monte Properties Co. produced sand products for a variety of purposes from dune material, recovered feldspar and silica from the natural-sand mixture by flotation; and ground part of each for ceramic uses, and also quarried decomposed granite at Pebble Beach for aggregates. Owens Illinois Glass Co. utilized dune material from the same area to produce sand for glass and miscellaneous uses. Sand for structural and other uses was produced by Monterey Sand Co. near Seaside and Marina and Pacific Coast Aggregates, Inc., near Castroville and Marina. Structural sand and gravel was prepared by M. J. Murphy, Inc., near Carmel. The California Division of Highways, the Monterey County Highway Dept., and their contractors produced sand and gravel. Carmel Stone quarry prepared dimension sandstone for rough construction. Monterey Bay Salt Works recovered salt by solar evaporation from ponds near Moss Landing.

Napa.—Basalt Rock Co., Inc., in the Napa area, crushed basalt from the Pedrotti quarry for riprap and aggregate, prepared an amorphous diatomaceous silica for use in pozzolanic cement from its pit by kiln firing, crushing, and grinding, and bloated shale for use as lightweight aggregate at Napa Junction from its Solano County pit. Sand and gravel was produced by Benson Gravel Plant near Angwin. The Napa County Engineering & Road Department, its contractors, contractors for the Federal Bureau of Reclamation, and the California Division of Highways produced sand and gravel and quarried sandstone and miscellaneous stone in the county. Perlite Aggregates Inc., quarried crude perlite at the Alvo quarry and expanded the material at its St. Helena plant. Tabor Mining Co., Monticello

district, produced chrysotile asbestos from the Phoenix mine.

Ray Adams retorted mercury from cinnabar, recovered from dump material at the Knoxville mine by placer methods. Guy Pye and

Vincent Yracabel produced mercury by retorting placer and dump material from the James Creek and Oat Hill properties. J. G. Goodwin recovered mercury by chemically treating a cinnabar concentrate produced from placer material on the Williamson lease. The concentrate was treated in an alkaline sodium sulfide solution which dissolved the cinnabar. The mercury was then precipitated from a nearly saturated solution on aluminum scrap.

William Allendale and Edward Hadsel shipped chromite ore to the Grants Pass, Oreg. Government Purchase Depot from the Black Charlene underground and open-pit mine. David Chalmers shipped chromite ore and concentrate from the White Angel underground open-pit mine and ran an adjacent gravity mill. Quartz crystal was mined in the Eastern Mayacmas district by gem and mineral collectors.

Nevada.—In the Grass Valley-Nevada City district, Empire Star Mines Co., Ltd., was the leading lode-gold mine and the third ranking producer of gold in California in 1955 at the Empire Star group of mines (Empire, North Star, and Pennsylvania) and 500-ton-a-day Gold and silver were recovered from company-mined gold ore, and some gold concentrate was produced from nearby mines by amalgamation and cyanidation. Idaho-Maryland Mines Corp., secondranking lode-gold mine and fourth in production of gold in the State, worked the Brunswick mine and ran the 600-ton-a-day Idaho Maryland mill. Gold and silver were recovered from the gold ore by amalgamation, and the concentrate, shipped to a California smelterfuming plant, yielded gold, silver, and some copper and zinc. company continued to explore a scheelite ore body at the Brunswick mine under the DMEA program and produced a substantial tonnage of tungsten ore, which was treated at a mill in Nevada. A small tonnage of tungsten ore was mined from the Ullom claim in the same area. Gold ore, milled at the Willow Valley Mines, Inc., group of mines yielded gold and silver by amalgamation and the subsequent cyaniding of concentrate at a custom mill. Other producers of gold and gold ore included the Fippin claims and Little Fort Knox mine. Elsewhere in the county, gold and silver recovered in cleanups at the Ancho-Erie mill near Graniteville and the Middle Yuba placer mine Gold ore from the Red Ledge mine at Washington were marketed. was sold as mineral specimens. Rehabilitation of the German Bar mine and mill at Snow Point continued in 1955. Placer mining was mainly sporadic working of small operations at several localities. Sand and gravel was produced by Arlie O. & Karsten M. Hansen and Robert P. Winkle near Grass Valley, and the Nevada County Highway Departments and contractors for the California Division of After several years of idleness at the Spanish mine in the Washington district, Baroid Sales Division of National Lead Corp. reactivated quarrying and shipped barite to its stockpile in Placer County. Opal was found in the North Bloomfield area and near Nevada City by gem and mineral-specimen collectors.

Orange.—More than 95 percent of county production value was represented by the mineral fuels from the Los Angeles Basin, which extends into Los Angeles County. Natural-gas liquids were produced at the following plants: Brea Canyon Oil Co., Brea-Olinda area; Fullerton Oil Co., Signal Oil Co., Huntington Beach area; Richfield Oil Co., Brea area; Standard Oil Co. of California, Murphy, Coyote,

and Huntington Beach areas; and Union Oil Co. of California, Richfield area. The crude-oil throughput capacity of the county's two petroleum refineries at Huntington Beach was 7,350 barrels daily at the end of 1955, an increase of 250 barrels over January 1, 1955. At Seal Beach Dow Chemical Co. produced iodine from oil-well brines.

Sand and gravel was produced near Anaheim by the following companies: Burris Sand Co., R. J. Noble Co., McClellan & Sons, Longsden Sand Plant, and James Sparks sand pit; near Orange by Orange County Rock Products, California Rock Co., Consolidated Rock Products Co., Foster and Gravel Co., and A. E. Fowler & Sons; near San Juan Capistrano by Graham Bros., Inc.; and at Santa Ana by Miller Bros. Trucking Co. and V. J. Frye Contractors for the city of Santa Ana and the California Division of Highways produced sand and gravel. D. D. Lawhead & Sons quarried decomposed granite at Buena Park. Near El Toro, I. P. Arnold produced a kaolin-silica sand mixture for use in refractory furnace lining; W. A. Schoeppe produced kaolin. In the Corona area, which extends from Riverside County, Pacific Clay Products and Gladding, McBean & Co., produced miscellaneous clay and fire clay, respectively, for use at their plants. Mission Clay Products Corp. near Olive and La Bolsa Tile Co. near Huntington Beach produced and utilized miscellaneous clay. Western Salt Co. harvested salt by solar evaporation of sea water near Newport. R. W. McClellan & Sons, in the Costa Mesa area and Peat Sales Co. in the Huntington Beach area produced peat. Lahabralite Co. processed crude material mined outside the State at a vermiculite-exfoliation plant near Anaheim.

Placer.—Nearly one-third of the State output of fire clay was from the Lincoln district; where Lincoln Clay Products Co., Inc., shipped plastic fire clay, and Gladding, McBean & Co. produced plastic fire clay for use at its Lincoln and other company-owned plants. Bear River Sand & Gravel Co. and Marshall & Miles Gravel Co., Colfax district and Joe Chevreaux, Auburn district, produced small tonnages of structural and paving sand and gravel. The Placer County Road Commission and its contractors and the contractors for the California Division of Highways produced sand and gravel. In the Rocklin district, Union Granite Co. quarried granite for building and monu-

mental stone.

W. E. Wilson used hydraulic methods to produce gold and silver at the Paragon mine, Foresthill district. Additional gold and silver production came from gravel worked at the Dead Deer mine, Dutch Flat district; the Big Stump, Gleason, Occidental, Stockton, and Twenty-one mines, Iowa Hill district; Canada Hill mine, Last Chance district; and Gas Hill mine, Michigan Bluff district. Small tonnages of chromite ore were mined by: Joseph Delmue (Bear Wallow mine), J. J. Stephenson (Eisenhower mine), H. R. Beresford (Pitt 47 mine), Damascus district; Thomas Hancock (Black Nugget mine), Dutch Flat district; and Mining Enterprises, Inc., (Main Load mine), Michigan Bluff district. The ore was shipped to the Grants Pass Oreg. Government Purchase Depot. Zimdars and Delmue produced and marketed a small tonnage of tremolite asbestos from the Noon Day mine in the Iowa Hill district. Nephrite, a gem stone, was mined in the Colfax district.

Plumas.—Although Plumas County mines have yielded substantial quantities of minerals in the past, the value of its production in 1955 was one of the lowest in the State. Sand and gravel for construction work was produced by Yount Sand and Gravel Co., Quincy district, and by the California Division of Highways, the Plumas County Road Department, and their contractors. Western Pacific Railroad Co. quarried granite near Tobin, and the United States Forest Service produced basalt, for use as riprap. Glen Slater consigned a small tonnage of pyrophyllite from Haskins Valley, Granite Basin district, to processors for testing. William Rush shipped a few tons of direct-smelting copper ore containing silver, produced in the course of exploring the Timber Trail group of claims, in the Greenville district. The Mount Hough mine, near the summit of Mount Hough, was the source of 111 tons of manganese ore averaging 48 percent Mn, that was shipped to a Government stockpile. The relatively small output of placer gold and silver was from small mines and prospects in several districts of the county.

Riverside.—Kaiser Steel Corp. shipped iron ore from its Eagle Mountain open pit and sink-float concentrating plant, Eagle Mountain district, to its blast furnaces in San Bernardino County. The Riverside Cement Co. operated the Crestmore portland-cement plant and used limestone from the Crestmore underground mine and the Jensen

quarry, and clay from the latter property.

In the Elsinore area fire clay was produced and marketed by Alberhill Coal & Clay Co. and Elsinore Clay Co. Los Angeles Brick & Clay Products Co. dug fire clay for use at its plant, for market, and produced miscellaneous clay for its own use. Gladding, McBean & Co. and Pacific Clay Products produced fire clay and miscellaneous clay, respectively, for their clay-products plants. In the Corona area Atlas Sewer Pipe Co. dug miscellaneous clay for company use and for sale; Sky Ranch Clay Co. marketed fire clay; and Liston Brick Co., Pacific Clay Products, and Gladding, McBean & Co. produced miscellaneous clay for use at their plants. The latter company also produced fire clay used at its plants.

United States Gypsum Co. manufactured plaster and plasterboard at its Midland plant from gypsum quarried in the Maria area. ganese concentrate, manganese, and low-grade manganese ores were shipped to Government stockpiles from the Bertha group of claims, Langdon, Black Dan, Black Jack, and Manganese Canyon mines, in

the McCoy (Ironwood) district.

Owens Illinois Glass Co. produced colored sand and flint sand for glass, and Minnesota Mining & Manufacturing Co. prepared artificially colored roofing granules from miscellaneous stone in the Corona area. Western Development Co. produced wollastonite near Blythe for use as ornamental building stone. Only float rock was shipped because its weathered surfaces gave it the appearance of driftwood. In the Riverside area, National Quarriers quarried granite for rough building stone, and J. B. Stringfellow, for riprap. Massey Rock & Sand Co. crushed granite from its quarry in the Indio area. Sand and gravel was produced by Desert Rock Co., Garnet; Palm Springs Builders Supply Co., Ltd., Palm Springs; San Gorgonio Rock Products Co., Banning; Shepwells Sand & Gravel Co., Blythe; and Valley Rock & Sand Corp., San Jacinto. The National Park Service, the Riverside County Highway Department, its contractors, and the contractors for the Bureau of Public Roads produced sand and

gravel.

Tungsten ore was mined from the Dumbell mine in the Santa Rosa area, the Matilda group of mines in the Chuckawalla district, and the Pawnee mine in the Beauty area. Fluorspar Mining Co. shipped Metallurgical-grade fluorspar from the Orocopia mine, Chuckawalla district, to a California steel plant. In the Santa Rosa area, amphibole asbestos was mined from the Catherine C. mine near Mountain Center. Figueroa Mining Co. produced copper ore containing gold and silver from the La Perida No. 1 mine in the McCoy (Ironwood) district. Cleanup at the Mission mine in the Dale district yielded gold and silver. Uranium ore was shipped from the Mule Mountain district. The gem stones, fire agate and rose quartz, were mined in the Maria and Cochuila areas by mineral-specimen collectors.

Sacramento.—The flood plains and deltas of the American River district were the source of virtually all sand and gravel production, which was centered in the Sacramento, Perkins, Fair Oaks and Folsom areas. Plants that produced sand and gravel largely for construction purposes—and at some of which gold and silver were recovered incidental to the aggregate output—included: American Aggregates, American River Sand & Gravel Co., Brighton Sand & Gravel Co., Del Paso Rock Products Co., Fair Oaks Gravel Co., Haggin Gravel Co. (J. R. Reeves), Harms Bros., McGillivray Construction Co., Pacific Coast Aggregates, Inc., A. Teichert & Son, Inc., Hard Materials Co., Robert Powell Products, Inc., and Robertson Sand & Gravel Co. The last three named operated dredges. Contractors of the California Division of Highways, the City of Sacramento, and the Federal Bureau of Reclamation also produced sand and gravel. Asta Construction Co. produced sand on the Sacramento River near Rio Vista.

Natomas Co. used five bucketline dredges throughout the year in the Folsom area of the American River district and was the second ranking producer of gold in the State. Silver and crude platinum were recovered incidental to the gold mining. The company annual report to shareholders showed a 9-percent decrease in value of production which was partially offset by a 7-percent reduction in total operating costs. A small production of gold came from several sporadically worked mines, including the suction dredge of Ellis Matherly in the Cosumnes River district.

Cannon & Co. produced plastic fire clay and miscellaneous clay at Michigan Bar in the Cosumnes River district for use in its clay-products plant at Sacramento. Harrison Fait and Sacramento Brick Co. dug miscellaneous clay from pits in the Sacramento area for their respective brick plants.

San Benito.—Ideal Cement Co. produced limestone and shale as raw materials from nearby quarries for cement manufacture at the San Juan Bautista portland-cement plant. Some of the shale requirements in the *Idria district* were produced in Santa Cruz County. New Idria Mining & Chemical Co. worked the New Idria mine and ran four 100-ton-a-day-capacity Gould rotary furnaces and condensing systems. Mercury was produced from company and custom ores. Other mercury producers were Aurora mine and the Wonder mine. James Mining Co. shipped chromite concentrate from the

Saw Mill Creek mine to the Grants Pass, Oreg., Depot. In the Panoche district mercury production came from the Lucky Strike and

the Ortiz properties.

Granite Rock Co. crushed granite at its Logan quarry. Westvaco Chemical Division, Food Machinery & Chemical Corp., quarried dolomite near Hollister, principally for use in producing magnesia at its Alameda County plant. The California Division of Highways, the San Benito County Road Department, and their contractors produced sand and gravel at various localities in the county. Petroleum was produced from the Ciervo, Vallecito, and Bitterwater areas. The Hollister area was the principal source of the county natural-gas yield, and only a small quantity withdrawn from the Vallecito area was utilized.

San Bernardino.—The value of metals and nonmetals produced in the county represented nearly one-half the total value of these mineral commodities in the State in 1955. California Portland Cement Co. used company-quarried limestone at its Colton plant, and it also prepared quicklime and hydrated lime for the building industry. Riverside Cement Co. operated the Oro Grande portland-cement plant, used limestone from the Klondike quarry, and also quarried shale and sandstone for cement. Southwestern Portland Cement Co. quarried sandstone and limestone from the Black Mountain quarry

for cement manufacture at its Victorville plant.

The State saline industry was centered about the Searles Lake playa, where American Potash & Chemical Corp. produced sodium carbonate, sodium sulfate, elemental bromine, borax, boric acid, anhydrous sodium tetraborate, crude dilithium-sodium phosphate, potassium chloride, and potassium sulfate. West End Chemical Co. extracted sodium carbonate, sodium sulfate, and borax from the brines. This yield of natural saline minerals represented a substantial part of domestic production. The Bristol Dry Lake area yielded large tonnages of salt produced by solar evaporation of brines by California Chemical Co. and National Chloride Co. of America. Hills Bros. Chemical Co. recovered calcium chloride from the saline brines. Salt was produced in the Searles Lake area by Pacific Salt & Chemical Co., and at Danby Lake by the Metropolitan Water District of Southern California.

Sierra Talc & Clay Co. shipped talc to company grinding plants in Los Angeles County from the Ibex mine in the Amargosa (Ibex) district, the Sheep Creek Talc mine in the Avowatz Mountains (Silver Lake) district, and the Silver Lake No. 1 and Silver Lake Addenda in the Halloran Springs area. At the Western mine in the Alexander Hills area Western Talc Co. mined talc which it shipped to its grinding plant at Dunn for primary crushing and to its Los Angeles County plant for final grinding. Southern California Minerals Co. produced talc from the following deposits: Superior claims, Amargosa (Ibex) district; Acme, Panamint, and Bonnie mines, Alexander Hills area; Excelsior mine, Kingston district; and the Calmasil mine, Halloran Springs area. The mineral was shipped to the company grinding plant in Los Angeles County. Pomona Tile Mfg. Co. produced talc from the Yucca Grove mine in the Halloran Springs area, and Minerals Materials Co. consigned pyrophyllite to a custom grinding plant from the Victor deposit in the Sidewinder Mountain area.

Three companies produced a large percentage of the State output of bentonite. Inerto Co. prepared hectorite, a bentonite clay recovered from dump material, at the company plant in the Lava Bed district. National Lead Co., Baroid Sales Division, mined bentonite from its underground mine near Daggett. Gladding, McBean & Co. and Southern California Minerals Co. produced kaolin from the Hart claims in the Castle Mountains area. Pomona Brick Co. and Hancock Brick Co. dug miscellaneous clay from pits in the San Bernardino area. California Perlite Corp and Great Lakes Carbon Corp. quarried crude perlite near Ludlow and in the Bristol Mountains area, respectively. Gene De Zan produced strontium-bearing minerals for shipment to Nevada at the Jasper No. 3 open-pit in the Cady Mountains area. Limestone was quarried: West End Chemical Co. in the Trona area for use in preparing lime; Victorville Lime Rock Co., in the Silver Mountain district, principally for whiting; and Mineral Materials Co. in the Bear Valley (Holcomb) district for flux material. California Dolomite Co. produced dolomite in the Adelanto area for roofing granules and ceramics. Mineral Materials Co. quarried quartzite in the Silver Mountain district principally for use at refractory plants. Neal Garrett worked the Pisgah Cinder mine and produced volcanic cinder in the Lava Bed district, and Williams Bros. mined pumice for soil conditioning and concrete aggregate in the Opal Mountain area. Gladding, McBean & Co. mined potash feldspar from the Beck Feldspar mine in the Fremont Peak area for ceramic use.

Structural and paving sand and gravel were prepared by: Barstow Rock & Gravel Co., Mojave Rock Materials Co., Barstow district; Fourth Street Rock Crushing Co., San Bernardino Rock & Gravel Co., San Bernardino area; Holliday Rock Co., Service Rock Co., Colton area; W. J. Smithson & Son, Big Bear Lake area; and Daniel Dixon Co., Earp area. Union Pacific Railroad Co. produced gravel at Baxter for railroad ballast. The United States Forest Service, the Federal Bureau of Reclamation, the San Bernardino County Highway Department and its contractors, contractors for the city of San Bernardino, and the California Division of Highways produced sand and gravel. Miscellaneous stone was crushed for roofing granules by: W. C. Higdon at the Marbolite quarries in the Twenty-Nine Palms district, Rainbow Rock, Inc., in the Barstow district, and White Spot Mining Corp. in San Bernardino area. Sharp and Fellows crushed stone for railroad ballast in the Newburg district. The Federal Bureau of Reclamation, the National Park Service, and contractors for the

California Division of Highways produced granite.

Mineral Materials Co. produced iron ore from the Cave Canyon mine in the Cave Mountain (Baxter) area for use in manufacturing low-heat-hydration cement. Kaiser Steel Corp. utilized iron ore from Riverside County in its blast furnaces at Fontana. Paymaster Mining Co., Inc., shipped low-grade manganese ore from its Paymaster and Van Doren mines in the Cady Mountains to the Wenden, Ariz., and Deming, N. Mex., Government Purchase Depots, and Bert Craig shipped low-grade manganese ore from the Garringer claim in the Cady Mountains area. In the Whipple Mountains district Turtle Mountain Mining Co. and Owl Springs Co., Inc., shipped manganese ore from the Barnett mine to Wenden, Ariz., and Deming, N. Mex., Depots. Surcease Mining Co. worked the Atolia group of mines in

the Randsburg district and treated company and lessee's tungsten ore in a gravity mill. About 85 percent of the ore came from open-pit mining. A flotation section was used for re-treating old tailings. Rainbow Rock, Inc., worked the Bright Outlook tungsten mine in the Cima district and operated a mill on a custom basis. The Star Bright mine in the Lone Mountain area was worked by Davis & Courson and Clyde Aitchison, Jr., who also custom-milled tungsten ore. The Blue Jay No. 2 mine near Barstow and the Lithia claims in the Soda district were operated by Lithia Tungsten Co. El Mirage Mining Co., Adelanto area, worked the Lang mine and shipped tungsten ore to custom mills. Some tungsten ore was also produced in several other districts including: Ivanpah, Clark Mountain, Signal, Calico,

Morongo and Ord Mountains.

A. C. Thaning treated gold ore from the Ivanhoe and Virginia Dale mines, Dale District, and shipped concentrate containing gold, silver, and some copper and lead to an Arizona smelter. Copper ore, containing gold and silver, from the New Trail mine in the Ivanpah district was shipped to a smelter. In this district, Koko Weef Co., Ltd., produced and shipped zinc ore containing lead and silver from the Carbonate King zinc mine to a Utah smelter-fuming plant. the Whipple Mountains district, D. R. Harryman shipped a small tonnage of copper ore from the Islander group of claims to an Arizona smelter and Noblitt, Dilts & Neal Hayden shipped copper ore from the Lake View and Shiploader mines. In the Old Woman Mountains district, Horace G. Reynolds produced silver and copper ore from the Konigen Hildegard mine. In the Clark Mountain district, Uranium Exploration & Mining Co. produced lead ore containing copper and silver from the Iron Horse mine, and Allsop & Johnson shipped lead and zinc ore that contained copper and silver from the Mohawk mine. A small yield of gold and silver also came from sporadically worked mines in various districts throughout the county.

Molybdenum Corp. of America produced a large percentage of the Nation's yield of cerium minerals from its Mountain Pass property in a bulk concentrate separated from the barite-carbonate rock at its 150-ton-a-day flotation mill. Uranium ore was shipped from the Morongo district. The relatively small natural-gas and petroleum production was from the Chino-Soquel area. Gem and specimen collectors found rhodonite in the San Gabriel Mountains area; blue agate, near Needles; amethyst, in the Kingston district; and jasper,

near Kramer Junction.

San Diego.—The value of sand and gravel and stone, predominantly for construction purposes, with some silica sand and miscellaneous industrial sands and gravels being produced, represented a large percentage of the county total mineral output in 1955. In the San Diego-Otay area American Sand Co., Caudell & Johnson, V. R. Dennis Construction Co., Denton Sand plant, F. G. Fenton Materials Co., Mission Sand plant, Nelson & Sloan, and Woodward Sand Co. were the producers. Arnell's Sand plant, El Cajon Sand & Gravel Co., Monarch Materials Co., and Sierra Sand and Gravel Co., produced in the El Cajon-Foster area. Plants in the Escondido-Ocean-side area were Crystal Silica Co., H. W. Rohl Co., Inc., and Smith Construction Co.; and in the Los Pennasquito area Beeler Canyon Sand & Gravel Co., Escondido Sand & Gravel Co., Caudell & Johnson,

C. R. Guthridge, and Carl Niemann Truck Co. The San Diego County Road Department, its contractors, and the United States Forest Service produced sand and gravel. Nelson & Sloan also quarried and crushed basalt for aggregate in the San Diego area. Dimension granite was quarried in the El Cajon area by Arnt Carlson and Clemens Granite Co. and in the Escondido area by Escondido Quarries, Valley Granite Co., and National Quarries. Decomposed granite was quarried near San Diego by M. H. Golden Construction

In the Chula Vista area, Western Salt Co. produced salt by solar evaporation and Westvaco Mineral Products Division of Food Machinery Corp. produced magnesium chloride from sea water. In the same area, Harborlite Corp. expanded crude perlite, mined outside the county, for plaster aggregate. Pyrophyllite, largely for fillers, was mined in the Escondido-Oceanside area by Howard Golem, and Pioneer Pyrophyllite Producers, which also operated a grinding plant at Cardiff. Union Brick Co. dug miscellaneous clay in the San Diego area for use at its brick plant. It also mined beryl, kunzite, tourmaline, and essonite garnet at a number of properties in the Pala district.

In the La Posta district the principal producer of tungsten concentrates was L. B. Spaulding at the Metal Mountain mine. Other producing mines in this district were the Desert Star and Lucky Sue. A small quantity of tungsten-ore was produced from the Sundown and Valley View mines and the Sodders claim in the Cuyamaca (Pine Valley) district. Gold ore amalgamated at the Rose Quartz mine in

this area yielded some gold and silver.

San Francisco.—The city and county of San Francisco and its contractors and contractors for the California Division of Highways produced sand and gravel. The latter also crushed some miscellaneous stone for roads. Mineral collectors recovered a small quantity of

jasper from beach deposits.

San Joaquin.—Natural gas was produced from the Thornton, McDonald Island, Galt, Lodi, Roberts Island, Tracy, and Vernalis The Thornton field extends into Sacramento County. Sand and gravel was prepared by: Pacific Coast Aggregates, Inc., at its Kerlinger plant near Lyoth, A. Teichert & Son, Inc., Tracy area; Rice Bros., Inc., and Claude C. Wood Co., near Clements; H. C. Thomsen Sand Dredging Co., Stockton area; and the S. M. McGaw Co., Inc., near Linden. The San Joaquin County Highway Department and contractors for the California Division of Highways produced sand and gravel. Teekay Mines, Inc., shipped manganese ore and lowgrade manganese ore to the Government stockpile at Wenden, Ariz. from the Ladd mine in the Ladd-Buckeye district, which extends into Stanislaus County. In the Stockton area Stockton Brick & Tile Co.

and Stockton Building Materials Co. produced miscellaneous clay.

San Luis Obispo.—Petroleum, natural gas, and natural-gas liquids from wet gas were produced at the Morales, Russell Ranch, and Taylor Canyon fields. The Arroyo Grande field yielded petroleum. Richfield Oil Corp. prepared natural gasoline and LP-gases at the Russell Ranch field, which also lies in Santa Barbara County. Sulfur was produced as a byproduct of petroleum refining by Union Oil Co. of California in the Arroyo Grande area. This refinery began

production in May 1955.

In the Santa Lucia district Castro Mining Co. operated the Castro open-pit mine by contract and concentrated chromite ore, by agreement, in the International Metallurgical Chrome Corp. mill near Morro Bay. Pierce Bros. worked the Hardface and Trinidad Group of claims in this district and concentrated the ore by gravity methods. Other production of chromite ore was from the London and Seeley-Miller mines in this district and from the Machado mine in the Arroyo Grande area. Molding and structural sand and gravel were prepared by Guiton Foundry Supply, near Oceano; Morro Rock & Sand Co., near Cambria; and L. A. Brisco, near Arroyo Grande. Walter B. Roselip Co., Atascadero, produced sand and gravel for aggregate. The San Luis Obispo County Highway Department and the California Division of Highways and its contractors produced sand and gravel. At Lime Mountain Eaton & Smith quarried limestone for use in sugar refining. Miscellaneous stone was crushed by the San Luis Obispo County road crews. Specimens of agate were gathered by collectors near Nipomo. In the San Luis area miscellaneous clay was dug and used at the San Luis Brick Works, Inc., plant; and Superior Gypsum Co., Carriso Plain area, quarried gypsite for use in agriculture. Fitzhugh & Osborn Mining Co. produced mercury at the La Libertad mine in the Adelaida Additional production of mercury from this district came from the Klau, Eureka, and Buena Vista mines. Mercury was produced from the Keystone mine in the Pine Mountain area and the Oceanic and Steiner Creek mines in the Cambria area. Manganese ore, mined on the George Warren ranch near Cambria, was shipped to the Government on the "carlot" program.

San Mateo.—Ideal Cement Co. produced portland cement at its Redwood City plant, using a natural shell-and-clay mixture dredged from San Francisco Bay for raw material. In South San Francisco, the Marine Magnesium Products Division, Merck & Co., Inc., produced U. S. P. magnesia, magnesium carbonate, and magnesium

hydroxide from sea water.

Limestone for aggregate was quarried by Marks Materials, Inc., at Rockaway Beach and by Skyline Quarries near Half Moon Bay. J. O. Archibald quarried decomposed granite near Pescadero for road surfacing. Sandstone was crushed by Lowrie Paving Co., Inc., for aggregate and other uses near San Francisco. Pacific Coast Aggregates, Inc., at its Brisbane and Junipero Serra (Daly City) plants, and Rockaway Quarry, Inc., at Sharp Park prepared sand and gravel. Near Redwood City McCammon Wunderlich Co. crushed sandstone for aggregate and other uses. Contractors for the California Division of Highways produced sand and gravel and crushed sandstone.

A. F. Oddstad, Jr., produced mercury ore from the Farm Hill No. 2 open-pit mine in Redwood City. The material was trucked to furnaces outside the county for treatment. Petroleum and natural gas were produced in small quantities from the Oil Creek area near La Honda. This was the first recorded production from the field in recent years. Bethlehem Pacific Coast Steel Corp. utilized iron and steel scrap in producing open-hearth steel at its South San Francisco plant. Kaiser Gypsum Co. manufactured gypsum products in Redwood City until June 23, 1955, when the plant was destroyed by fire.

Crude gypsum utilized at the plant came from San Marcos Island in the Gulf of California.

Santa Barbara.—Petroleum and natural gas were produced principally from three areas—the Santa Maria Valley, the Cuyama Valley, and the coastal area near Santa Barbara. Plants for the production of natural-gas liquids were operated by Rice Ranch Oil Co., Orcutt area; Richfield Oil Corp., South Cuyama area; Shell Oil Co., Capitan and Santa Maria areas; Signal Oil & Gas Co., Elwood area; and Union Oil Co. of California, Orcutt and the Santa Maria areas. The total daily crude-oil throughput capacity of the Santa Maria petroleum refineries of Douglas Oil Co. of California, Union Oil Co. of California, and Western Asphalt & Refining Co. was 29,500 barrels at the close of 1955, an increase of 22,500 barrels from January 1, 1955, as a result of the Union Oil Co. of California refinery expansion.

In the Lompoc district, where one of the world's largest deposits of diatomaceous earth occurs, Great Lakes Carbon Corp. and Johns-Manville Products Corp. prepared diatomite from their open pits for use principally in filter aids and insulation material. Structural and paving sand and gravel were produced by H. G. Iliff & Sons Co. and Buellflat Rock Co., in the Solvang area, Southern Pacific Milling Co. in the Santa Maria area, and Valley Rock & Sand Co. in the Lompoc area. The city of Lompoc, the California Division of Highways, and its contractors produced sand and gravel at various localities in the county. G. Antolini & Sons quarried limestone in the Santa Maria area for use as building stone. In the Cachuma (San Rafael) district mercury was produced from the Red Rock and Lion Den mines. Davis Mining Co., at the Davis mine, and Cachuma Mining Co., at the Corrales mine, produced chromite ore for shipment to the Grants Pass, Oreg., Government Purchase Depot. Airox Co., north of Casamalia, quarried and expanded a diatomaceous shale containing bituminous material for use as lightweight aggregate. McNall Building Materials utilized miscellaneous clay, dug near Santa Barbara.

-Near Permanente, Permanente Cement Co. quarried Santa Clara.limestone, sandstone, and part of the clay needed for cement raw

materials at its portland-cement plant.

In the New Almaden district W. L. MacKinnon and his successor, Palo Alto Mining Co., worked sections of the Guadalupe mine to produce mercury; several lessees at the New Almaden mine retorted both newly mined ore and dump material. Palo Alto Mining Co. also produced mercury from the Hillsdale mine near San Jose and mined chromite ore from the O'Connell No. 1 mine, Coyote area. Also near Coyote the company milled chromite ore, produced at its Santa Clara and Alameda County properties, and shipped the chromite concentrate to the Grants Pass, Oreg., Government Purchase Depot.

Sand and gravel was prepared by: Brem's Gravel & Sand Co. and Western Tile & Supply Co., near Gilroy; Los Gatos Sand & Gravel Co., A. J. Raisch Paving Co., and Lone Hill Inc., near Los Gatos; Western Gravel Co., near Campbell; Leo F. Piazza Paving Co., near San Jose; and Pacific Coast Aggregates, Inc., near Coyote. The city of San Jose, the California Division of Highways, and their contractors produced sand and gravel. Miscellaneous stone was

produced by: Sondgroth Bros., near Los Altos; A. F. Voss, near Cupertino; and Mirassou Bros. and John Cuffe near Los Gatos. James McPeters produced and shipped magnesite ore from the Western mine near Livermore to an Alameda County grinding plant. Miscellaneous clay was dug by Remillard-Dandini Co. and Gladding Bros. Manufacturing Co. in San Jose for use at their respective clay-products plants. A small quantity of petroleum was produced from the Sargent and Moody Gulch fields. Natural gas was withdrawn from the Sargent field, but not utilized.

Santa Cruz.—Nearly the entire value of the county mineral output in 1955 was centered around the production of portland cement by Santa Cruz Portland Cement Co. at Davenport in the Santa Cruz area; both Lepol and rotary kilns were used. In this area the company also quarried the limestone, sandstone, and shale utilized in manufacturing cement. Byproduct potash, used in agricultural areas, was recovered in the plant as precipitated flue dust. The Chittendon area supplied some of the clay required by the Ideal Cement Co.

plant in San Benito County.

Sand and gravel was produced by: Hansen, Silvey and Sinnott, Henry J. Kaiser Co., Pacific Coast Aggregates, Inc., and Santa Cruz Aggregates Co., Felton area; Concrete Service Co., Graham & Son, Santa Cruz area; Victor Maddock, and United Builders and Farmers Supply, Soquel area. The Santa Cruz Highway Department produced gravel for paving. Near Santa Cruz, Hansen, Silvey & Sinnott and the Santa Cruz Highway Department quarried granite for road metal; Pacific Limestone Products Co. quarried crushed limestone for

poultry grit and prepared dimension stone.

Shasta.—Mountain Copper Co., Ltd., mined iron pyrites from the Hornet open pit, Flat Creek district, for use in sulfuric acid manufacture at plants in the San Francisco Bay area; some of the resulting pyrite cinder was sold for use in preparing special cements. Sand and gravel was prepared for aggregate in paving and construction by J. H. Hein Co., Oaks Sand, Gravel & Cement Co., Redding Sand & Gravel Co. (fixed plants), Rice Bros., Riley Trucking Co., Claude C. Wood (portable equipment), Redding area; Bert Peeler, near Fall River mills; and Alvin Valentine, near Burney. The National Park Service, Shasta County Highway Department, Federal Bureau of Reclamation, the California Division of Highways, and their contractors produced sand and gravel. County crews quarried basalt and miscellaneous stone for road construction and maintenance. Near Lake Britton, Harry Horr, M. H. Moore, Bert Peeler, and Frederickson & Watson Construction Co. quarried volcanic cinder for use as concrete aggregate. Flue dust, from prior years smelting operations at the Afterthought mine, Cow Creek district, which contained zinc, copper, lead, silver, and gold, was shipped to a Utah smelter-fuming plant. Gold ore, obtained at several small lode mines, including the Plainview mine (Igo Centerville district), Lady Slipper mines (Shasta district), and Jumbo mine (Redding district) yielded gold and silver. Roy S. Olson produced gold and silver from gravel at the Davis property, 18 miles southwest of Redding, by dragline dredging. Other placer mines in the county were small and sporadically worked. Near Castella a small tonnage of lump chromite ore was shipped from the Cascade mine; and Castella Mining & Milling Co. milled chromite ore, which was mined in Butte and Trinity Counties. The chromite concentrate was shipped to the Grants Pass, Oreg., Government Purchase Depot. Under the DMEA program, the Glidden Co. continued to explore for copper and zinc ores at the Bully Hill-Rising Star group of mines, Bully Hill-Shasta Iron district; Shasta Copper & Uranium Co., Inc., explored the Shasta King, Balaklala, and others claims in the Flat Creek district for copper ore. A small quantity of tungsten concentrate produced at a prospect

in Whiskey Gulch, was marketed.

Sierra.—Lode-gold mining was the principal mineral industry in the county in 1955, and Best Mines Co., Inc., Brush Creek mine, Downieville district, led in gold and silver output. The gold ore was amalgamated at its mill and the concentrate cyanided at a custom mill in Nevada County. The Original Sixteen-to-One mine, Inc., was the second-ranking producer of gold and silver in the county at its Original Sixteen-to-One mine in the Alleghany district. Gold and silver were recovered by amalgamating the gold ore and from gold concentrate treated at a California smelter-fuming plant. The concentrate also contained some recoverable zinc. Dickey Exploration Co. worked the Oriental mine in this district which was also the source of noteworthy quantities of gold and silver from amalgamating gold ore and smelting the concentrate. In placer mining, the moderate output of gold and silver resulted from the generally sporadic activity at several small mines and prospects. Of these, the Pioneer Project (Wildrose) mine in the Poker Flat (Port Wine) district, hydraulicked by Sierra Mining & Development Co., and the City of Six Mining Co. Gold Channel drift mine, Alleghany district, were the outstanding producers. Contractors of the California Division of Highways produced gravel and sand for road construction.

Siskiyou.—The Siskon Corp. produced gold and silver from the Siskon open-pit mine and cyanide plant in the Klamath River area. Other production came from the Black Bear mine in the Salmon River area and the Turk group of claims in the Scott River area. Gold and silver were produced from small placer mines on the Klamath

and Scott Rivers in 1955.

In the Klamath River area Ruth Robertson shipped chromite ore from the Cyclone Gap underground mine and to the Grants Pass, Oreg., Government Purchase Depot. J. T. and James W. Eastlick shipped chromite ore from the Charles Tant mine, and S. B. Lewis shipped ore from the Emma Bell underground mine. The Emma Bell ore was upgraded in the Ashland Mining Co. mill at Ashland, Oreg. Production also came from the Fallen Tree mine near Happy Camp. Ashland Mining Co. shipped chromite ore from the Eddy Creek and Parks Creek mines near Weed in the Gazelle district and the Fairview underground and open-pit mine near Scotts Bar in the Scott River area. The ore was concentrated at the company mill at Ashland, Oreg. and shipped to the Grants Pass, Oreg., Government Purchase Depot. Near Callahan in the Scott River area, J. A. Richter shipped chromite ore from the Gazelle Mountain (Masterson) mine. Also in this area Floyd L. Munson worked the Munson mine. In the McGuffy Creek district, Lou Folden shipped ore from the Mary Lou mine; J. S. Hayden worked the Jump Around mine near Fort Jones; Basil Wild shipped chromite ore from the Rocky

Gulch mine. Ernest Hayden, George Harrison, and Munson & Smith produced and upgraded chromite ore from the Little Jack mine in the Gazelle district. Castella Mining and Milling Co. worked the Little Castle Creek mine near Dunsmuir, in the Soda Creek area. The Blue Thorn No. 2 mine in the Liberty area and the S and W

mine near Fort Jones also yielded chromite ore in 1955.

Near Tionesta, John Madsen produced pumice from the Skoria Star quarry and Thompson Pumice Co., from the Thompson quarry for concrete aggregate. Boorman Pumice Products quarried pumice from the Boorman Group of claims and prepared and sized the crude material at its mill in Modoc County. Southern Pacific Co. mined volcanic cinder for railroad ballast from the Kegg quarry near Bray, Orr Mountain area. McCloud River Lumber Co. obtained volcanic cinder from the Porcupine pit near Hambone in the Sacramento River Shastalite Cinder Block Co. prepared volcanic cinder in the Cinder Cove area for concrete admixture in building blocks. Near Mount Shasta, Mount Shasta Gravel Co. prepared sand and gravel as aggregate for building construction. Other aggregate producers included Peter Kiewit & Sons in the Mount Shasta area and Claude Wood & Young in the Yreka district, which prepared structural and paving sand and gravel. The California Division of Highways and its contractors and the contractors for the Siskiyou County Engineering Department, the United States Bureau of Public Roads and the United States Forest Service produced sand and gravel. J. W. Pressler worked the Reynolds open-pit mine near Fort Jones and shipped a small tonnage of low-grade manganese ore to the Butte, Mont., Government Purchase Depot. Jade was produced in the Klamath River area in 1955.

Solano.—Natural gas, the principal item of mineral output in the county, was produced from the Rio Vista, Cache Slough, Kirby Hill, Maine Prairie, Mille Suisun Bay, and Winters fields. The Rio Vista field also lies in Sacramento and Contra Costa Counties, and the Winters field extends into Yolo County. Basalt Rock Co. dug bentonitic clay at the Chabot pit near Vallejo and blasted the material in Napa County for use in lightweight aggregate. Asta Construction Co. prepared sand and gravel near Rio Vista for paving purposes. Cordelia Quarry near Thomasson and Parish Bros., Inc., near Benecia quarried and crushed basalt. Contractors for the California Division of Highways, the Solano County Road Department, and the Bureau of

Public Roads produced sand and gravel.

Sonoma.—Sand and gravel was produced by: Basalt Rock Co., Inc., Russian River Gravel Co., and Arthur Taylor, along the Russian River near Healdsburg; Contractor Supply Co. near Mirabel; Hein Bros. Basalt Rock Co. and Arthur B. Siri, Inc., Windsor; Little Giant Sand & Gravel Co., near Cloverdale; and L. T. Willig, Jenner. Construction Supply Co. and Empire Rock Co. produced sand and gravel in the Santa Rosa area. Basalt was quarried and crushed by Hein Bros. Basalt Rock Co., and Parish Bros., Inc., near Petaluma, and Talbert Rock quarry, Cotati. Contractors for the California Division of Highways produced sand and gravel. Basalt was quarried and crushed by Hein Bros. Basalt Rock Co., and Parish Bros., Inc., near Petaluma. Cliff Reed and Wm. Parnow at Kenwood, and Paul Cabrol near Glen Ellen quarried miscellaneous stone for building and

flagging use; Joe Malugani (near Guerneville), Thomas Graham (at Occidental) and Construction Supply Co. (at Santa Rosa) pro-

duced stone for use as aggregate material.

Sonoma Quicksilver Mines, Inc., Mount Jackson and Great Eastern mines, Guerneville district, was the leading producer of quicksilver in the State. The Buckman Mines at the Buckman Group of claims, and Cloverdale Extension Quicksilver Co. at the Truitt No. 1, Western Mayacmas district, produced mercury by furnace and retort, respectively. A few flasks of mercury came from ore mined at the Socrates mine and Sonoma group of mines also in this district. Manganese ore was shipped to the Deming, N. Mex., Government Purchase Depot from the Aho mine near Fort Ross. Natural gas and petroleum were produced in the Petaluma area.

Stanislaus.—Sand and gravel was produced along the Tuolumne River near Empire and Hickman by American Standard Gravel Co. and Chas. D. Warner & Son, Inc., and at Empire by Norman O. Dean Rock & Gravel Products Co.; near Modesto by Graystone Tile Sand Pit; near Hughson by Hughson Gravel Plant; and near Waterfords by George Reed, and Santa Fe Rock & Sand Co. It was produced on the Stanislaus River near Oakdale by Standard Rock Co. and near Salida by Modesto Sand & Gravel Co.; and in the Orestimba Creek area near Newman Frank Marks. Some gold was recovered incidental to sand and gravel production on the Tuolumne River.

Contractors for the city of Modesto, the city of Stockton, and the United States Forest Service produced sand and gravel. In the Ladd-Buckeye district, which also lies in San Joaquin County, Donald Lockwood shipped low-grade manganese ore from the Brown Hat underground mine and Winston F. Wright shipped manganese ore from the Tip Top open-pit mine to the Government Depot in New Fire clay was produced by Clayton and Lester Raggio at Knights Ferry and sold for use in manufacturing stoneware and architectural terra cotta. Josef Odermatt produced mercury at the Adobe mine in the Red Mountain (Phoenix) district, which extends into Alameda and Santa Clara Counties.

Sutter.-Natural gas withdrawn from the Marysville Buttes was the principal mineral commodity produced in the County in 1955. Sand and gravel was prepared by the Hutchinson Co. in the Yuba City area and by Perry & Rowe in the Live Oak area. The Sutter County Road Commissioner, county contractors, and contractors of the California Division of Highways produced sand and gravel. output of these aggregate materials were curtailed during the latter part of December, owing to severe flood conditions on the Yuba and Feather Rivers. Miscellaneous clay was dug by the Gladding, McBean & Co., near Nicolaus for use at company clay-products plants outside the county.

Tehama.—Sand, gravel, and natural gas yield represented more than 90 percent of Tehama County mineral production. Natural gas continued to be produced from the Corning field in 1955. Used locally in construction, sand and gravel was prepared by: Red Bluff Sand & Gravel Co., and Allen, Paulsen & Halseman, Red Bluff area; and Globe Builders Supply Co., Richfield area. The California Division of Highways and the Tehama County Road Department and their

contractors produced sand and gravel. Contractors for the Federal

Bureau of Reclamation quarried basalt for riprap.

In the Beegum-Tedoc district Beegum Mining Co. (successor to Tedoc Mining Co.) worked the Blue Sky, Lucky Star, Seagraves, North Fork, McArthur, River Divide, Mary Ann, and Sunshine claims and shipped chromite ore and concentrate to the Grants Pass, Oreg., Government Purchase Depot. Other producing chromite mines in the district were the Black Chrome, the Little Meadow, and Tedoc Elder Creek Mining Co., Inc., Elder Creek (Kleinsorge) district, worked the Elder Creek, Grau, and Kleinsorge open-pit mines, and shipped chromite concentrate. Metro Metals, Inc., ran a mill in this district and worked chromite deposits on State school land. Lump chromite ore was produced and shipped from the Elder Creek

No. 1 claim in the Red Bank Creek area.

Trinity.—Fairview Placers, the principal gold producer in Trinity County, operated a Yuba bucketline dredge in the Lewiston area of the Trinity River. C. M. Bennett hydraulicked gold at the Bennett mine at Big Bar on the Trinity River. Other hydraulic mining on the Trinity River included: Brown's Creek mine in the Weaverville area; Seth F. Gambell (Gold Dollar mine), Junction City area; Edward A. Smith (Patterson mine) in the Big Bar area and Brown, Manfield, Eastwood, Young (Rideout mine) in the Minersville area. Small-scale hand methods were used to recover gold at the Betty's Placer mine in the Minersville area, the Happy Home mine in the Dedrick area, and the M and W mine in the Helena area. Small lode gold and silver mines were operated by the following producers: Thomas Kelley (Kelley mine), Layman & Martin (Layman mine), Hayfork district; William Langworthy (Salmon Summit mine) New River area; and F. A. Marcellus (Blue Eagle mine) and Harry Grant (Forty-niner, Wonder and Maybe claims) in the Trinity River area.

Manganese ore was shipped to the Government on the "carlot" program, and to the depots at Butte, Mont., and Deming, N. Mex.; low-grade manganese ore was shipped to the Wenden, Ariz., and Deming, N. Mex. depots. In the Eel River area Bob Harris operated the Frye mine; R. W. Mathews & Ray Pearson, the Pearson claim; Shawnee Manganese Co., the Stockton No. 1 mine; K. P. F. & F. Mining Co., at the Trout Creek mine; Walter Wells and Pat Jordon at their Barry Creek mine, produced some manganese or low-grade

In the Trinity River area C. L. Kalbough treated chromite ore from the Charlene Sue mine at a mill at Crow Creek for shipment to Grants Pass, Oreg., Government Purchase Depot. In the South Fork area R. Jarrett produced chromite ore from the Hillster mine; E. A. Lough worked the Oak Ridge (Happy Go Lucky mine) and shipped chromite Other chromite-producing mines were: The Mumbo open-pit mine near the Mumbo Basin and the Starsteel mine, west of State Mountain. C. F. Starr & L. M. Bugbee shipped chromite ore from the Starr-Bee mine in the Forest Glen district and plan to construct a 150-ton-a-day mill in the early part of 1956. In the Peanut district, chromite ore from the Old Bill open-pit mine was treated at a custom mill; Castella Mining & Milling Co. treated ore from the Costa mine in the Crow Creek area at its mill in Shasta County. Philip Munko shipped mercury retorted from ore mined at the Altoona open-pit mine in the Crow Creek area to a California buyer, Trinity Sand & Gravel Co. and Northwestern Pacific Railroad Co. produced sand, gravel, and stone in the Douglas City area. The California Division of Highways and its contractors produced sand and gravel.

Tulare.—Natural gas withdrawn from the Trico field, which extends into Kern and Kings Counties, was marketed, and crude petroleum

was produced from the Deer Creek area.

In the Cottonwood Creek area Claude Rouch and others treated tungsten ore and tailing from the Consolidated (Harrel Hill) mine and shipped tungsten concentrate. In the Yokohl River area Tulare County tungsten mine milled ore from its Tulare (Big Jim) mine and custom tungsten ore from neighboring mines. Tungsten ore was produced from the Thanksgiving mine. Good Hope Mining Co. operated the Pioneer mine in the Kaweah River area and shipped tungsten concentrate. Other producing mines in this area included: Blossom Peak, Homer, Royal, Buckeye, Hill Top, and Stoney Creek. Elsewhere in the county, mines that produced tungsten ore included: Sherman Peak, Brush Creek No. 1, Christmas, Fairview, Yellow Kid, Jupiter, Great Western and W. M. B. mines in the Kern River area; Credow Mountain and Tungstore tailings in the White River area; and Deer Creek, in the Deer Creek (Hot Springs) area.

Middleton's Sequoia Rock Co. near Porterville and Pacific Coast Aggregates, Inc., near Lemon Cove produced structural and paving sand and gravel. The California Division of Highways, Federal Bureau of Reclamation, and their contractors produced sand and gravel. Oakland Granite & Marble Co. quarried granite near Porterville used as dimension stone; the California Division of Highways and its contractors produced granite for county road projects. S. P. Brick & Tile Co. manufactured clay products from miscellaneous clay dug near Exeter. Macco Corp. in the Kern River area quarried barite from the King group of claims and Bennett and Farrow from the Camp Nelson No. 3 claim in the Tule River area. Topaz, a gem stone, was mined from the Natura claim south of Dunlap, Fresno County.

Tuolumne.—In the Sonora area United States Lime Products Corp. quarried limestone and produced hydrated lime and quicklime, principally for use in chemical industries; Sonora Marble Aggregates Co. quarried and crushed marble of various colors for use in terrazzo and produced some limestone for dimension stone; A. P. Jones prepared sand and gravel as aggregate for paving; and C. D. Bottini produced sand for miscellaneous uses. The California Division of Highways and

its contractors produced sand and gravel.

Sporadically worked lode mines that produced gold and silver included: Fenton claims, Morhman mines, Toughnut mine in the East Belt district; and Hidden Fortune, Stonewall, Lazar, and Tip Top mines in the Mother Lode district. W. R. Williamson, in the Mother Lode district, produced a small tonnage of refractor-grade chromite ore from Mums Pty., which was marketed in the San Francisco Bay area. High Sierra Scheelite Co. in the Pinecrest area mined tungsten ore from the Mary Whittle et al. mine.

Ventura.—The value of petroleum, natural gas, and natural-gas liquids output represented more than 95 percent of the mineral yield

of Ventura County. This production came from an area in the central portion of the county which extends from the eastern border westward to the Pacific Ocean. Natural-gasoline plants were operated by Colina Gasoline Corp. (Rincon area), Continental Oil Co. (San Miquelito area), General Petroleum Corp. (Ventura area), The Texas Co. (Sheills Canyon area), Tide Water Oil Co. (Ventura area), and Union Oil Co. of California (Grimes Canyon area). The combined daily crude-oil throughput capacity of petroleum refineries of Edington-Oxnard Asphalt Co. and Oxnard Oil & Refinery Co. at Oxnard and those of Superior Asphalt Co. and Seaside Oil Co. at Ventura was 8,500 barrels at the end of 1955, an increase of 500 barrels from

January 1, 1955.

Miller Bros. Truck Co. prepared sand and gravel for use as aggregate in paving and building construction near Ventura, as did Independent Rock Co. in the Santa Paula area and Southern Pacific Milling Co. in the Montalvo, El Rio and Santa Paula areas, adjacent to the Santa Clara River. The Ventura County Road Department and contractors for the California Division of Highways produced sand and gravel from various pits in the county. Near Ventura, miscellaneous clay was produced by Shell Oil Co. for use in rotary drilling muds; Rocklite Products, Inc., expanded shale for lightweight aggregate from material produced at the company pit. In Frazier Mountain area, Ridgelite Products Co., produced fire clay from its company pit. Monolith Portland Cement Co. produced crude gypsum at the Quatal Canyon quarry in Cuyama Valley for use as a raw material at its Kern County cement plant.

Yolo.—Initial construction work at the Monticello Dam site in nearby Solano County provided a new market for Yolo County sand and gravel and stimulated production of these materials, particularly in the Cache Creek area. Aggregate plants in the general vicinity of Madison, Woodland, and Yolo included: Madison Sand & Gravel Co., Schwarzgruber & Sons, Lucy Woods, A. Teichert & Son, Inc., and Pacific Coast Aggregates, Inc. Contractors of the California Division of Highways, the Yolo County Highway Department and adjacent Colusa and Sutter Counties produced sand and gravel in

the county.

Natural gas was produced in the Dunnigan Hills, Fairfield Knolls, Pleasant Creek, Sycamore Slough, and Winters fields. The last

field also lies in Solano County.

Yuba.—Alluvial material of the Yuba River Basin was the principal source of minerals produced in 1955. Yuba Consolidated Gold Fields, the leading producer of gold and silver in the State in 1955, mined the auriferous gravels in the Hammonton area of the Yuba River district with 5 bucketline dredges. Platinum was a byproduct of this deepdredging. Sand and gravel, largely for construction purposes, was taken from the bed of the Yuba River in the Marysville area by several companies, including: Yuba River Sand Co., Lester L. Rice & Sons, Rice Bros., Inc., Baldwin Contracting Co., Inc., contractors of the California Division of Highways, and the Yuba County Road Commissioner. Noteworthy tonnages of blast, engine, and filter sand were also prepared and shipped from the area. Gladding, McBean & Co. dug miscellaneous clay from beds in the Wheatland area of the Bear River district for use in its clay-products plants outside of the county.

## The Mineral Industry of Colorado

By Frank J. Kelly, William H. Kerns, Breck Parker, and Alfred L. Ransome 2



INERAL PRODUCTION in Colorado, excluding uranium, increased in value in 1955 for the 10th consecutive year. The \$30.3 million advance reflected a 16-percent gain for the fuels group and 14- and 4-percent increases, respectively, for the nonmetal and metal groups. Although molybdenum, the principal metal commodity, gained both in quantity and value, petroleum among all the commodities made the greatest and most impressive advance in both production and value in 1955. Petroleum again established a new record high, largely as the result of continued rapid development of oilfields in the Denver-Julesburg Basin. Coal production rose 25 percent in 1955, the first recorded increase since 1947. All other mineral fuels gained except peat, for which no production was recorded. All of the principal nonmetals except fluorspar and sand and gravel increased in production value.

Uranium continued to be one of the most important minerals produced. Under existing regulations of the Atomic Energy Commission (AEC), figures on the production of uranium are not available, and therefore the value of uranium output is not included in the total

value of the State mineral production in table 1.

Vanadium, recovered as a byproduct of uranium, increased in both quantity and value in 1955; however, its former position of second rank to molybdenum in value of production was relinquished to zinc, which gained in value even though the quantity was virtually the same. The value of a new record output of molybdenum in Colorado—all from the Climax mine—was over half of the total for all metals. An average of 30,000 tons of ore per operating day (27,500 in 1954) was treated at the Climax mill. Byproduct tungsten, pyrite, and tin were also recovered from the ore.

The combined production value for gold, silver, copper, lead, and zinc during the year advanced 3 percent compared with an equal decrease in 1954. The advance reflected a higher value for zinc and copper which more than compensated for declines in production and

value for gold, lead, and silver.

Cement, sand and gravel, fluorspar, stone, and clays were the principal nonmetal commodities, in that order—all exceeding \$1 million in value of production in 1955. Continuation of the upward trend in building activity resulted in increased output of most of the principal nonmetals except sand and gravel, which declined slightly.

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<sup>2</sup> Chief, Division of Mineral Industries, Region III, Bureau of Mines, Denver, Colo.

TABLE 1.—Mineral production in Colorado, 1954-55 1

	195	4	1955		
Mineral	Short tons (unless other- wise stated)	Value	Short tons (unless other- wise stated)	Value	
Beryllium concentrate gross weight_Clays  Coal	64, 650 6, 049 17, 823 (2) 45, 705 9, 028 46, 206 (2) 13, 552, 406 3, 417, 072 1, 804, 004 927 4, 528, 472 35, 150	\$27, 130 1, 002, 873 16, 078, 581 9, 897 2, 668, 570 3, 197, 252 (2) 3, 365, 110 252, 910 (2) 4, 883, 502 (2) 3, 976, 000 127, 990, 000 (2) 9, 026, 993 3, 092, 623 2, 112, 093 3, 420, 563 (2) 7, 592, 400	(3)  88, 577 76, 649 3, 666 15, 805 699 49, 153  52, 653 70, 530 3, 688 12, 911, 783 2, 772, 073 2, 149, 019 1, 152 4, 595, 359	\$22, 950 1, 117. 901 20, 100, 174 7, 254 3, 224, 958 313, 716 (2) 48, 000 3, 100, 195 329, 321 (2) 4, 709, 890 12, 596 4, 866, 000 162, 605 17, 400 8, 914, 429 2, 508, 866 3, 508, 053 4, 079, 341 (2) 8, 696, 100	
Total Colorado 4		255, 852, 000		286, 121, 000	

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Value of low-grade manganese ore shipped to GSA Purchase Depots and uranium ore is excluded.

2 Figure withheld to avoid disclosing individual company confidential data.

3 Weight not recorded.

4 The total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing cament.

TABLE 2.—Average unit value of selected mineral commodities in Colorado, 1954-551

Commodity	1954 1955 Commodity		1954	1955	
Berylshort ton Claysdo Coaldo Columbium-tantalum pound Copper 2do Gold 3troy ounce Lead 2pound	1. 173 5. 545 1. 993 . 295	\$498. 913 2. 408 5. 634 1. 677 . 373 35. 000 . 149	Natural gas thousand cubic feet. Petroleum 4.42-gallon barrel. Sand and gravel short ton. Silver 5 troy ounce. Stone short ton. Tungsten short ton unit. Zinc 2	\$0.087 2.770 .666 .905+ 1.171 61.473 .108	\$0.099 2.750 .690 .905 1.632+ 58.997 .123

<sup>1</sup> Prices are based on average value f. o. b. mines or mills reported by the producers, except as otherwise

lating purposes).

Prices are based on average value at the form of the foliation of the foli

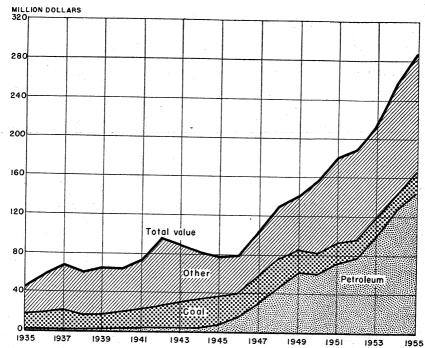


FIGURE 1.—Value of petroleum, coal, and total value of all minerals produced in Colorado, excluding uranium, 1935-55.

Many ores contain valuable minor constituents, such as arsenic, bismuth, cadmium, cobalt, nickel, platinum-group metals, selenium, tellurium, and some minor metals, including gallium and germanium. These quantities often are not known and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages or credited to the mine of origin. These minor constituents are recovered at plants (frequently treating 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 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 American Smelting and Refining Co. continued to operate its Arkansas Valley custom lead bullion-copper matte smelter at Lead-ville on ores and concentrates from Colorado, domestic and foreign concentrates, residues from zinc smelters, and other material. The company also operated its Globe smelter in Denver, which treated flue dust, dross, and other byproduct material shipped to it from other company smelters to recover cadmium, indium, and thallium.

New plant facilities in Colorado in 1955 included construction of

increased capacity of the Idarado Mining Co. Pandora mill (copper-lead-zinc), San Miguel County, and a sulfuric-acid plant at Rico, Dolores County, by Rico Argentine Mining Co.

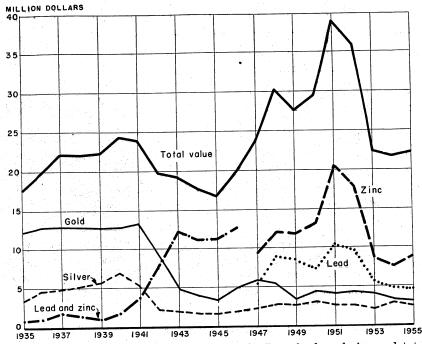


FIGURE 2.—Value of mine production of gold, silver, lead, and zinc and total value of gold, silver, copper, lead, and zinc in Colorado, 1935-55. The value of copper has been less than \$2,000,000 annually, except in a few years.

It was reported <sup>3</sup> that 14,900 persons (yearly average) were employed in the Colorado mining industry during 1955. Of this total, 38 percent were employed in metal mining, 17 percent in coal mining, 40 percent in petroleum and natural-gas production, and 5 percent in other mining and quarrying.

## DEFENSE MINERALS EXPLORATION PROJECTS

The Government, through the Defense Minerals Exploration Administration (DMEA), continued to aid in financing exploration in search of strategic and critical minerals.

<sup>&</sup>lt;sup>3</sup> U. S. Department of Labor, Bureau of Labor Statistics. Employment and Earnings: Annual Supplement Issue, Vol. 3, No. 12, June 1957, p. 135.

TABLE 3.—DMEA contracts executed in 1955

			Contract		
County and contractor	Property	Commodity	Date	Total amount	Govern- ment partici- pation, percent
Boulder					
Mosch & Mosch Reynolds Tungsten Corp	Big Cameron mine Dozer mine	Tungstendo	June 6 Dec. 28	\$8, 280 79, 290	71 71
Gunnison				1	
American Smelting & Refining Co.  Jefferson	Keystone mine	Copper-lead- zine.	Dec. 5	107, 220	50
Foothills Mining Co Joseph Walsh	Wright lease Hoffmeister prospect	Uraniumdo	Sept. 1 Dec. 12	15, 276 18, 734	75 75
Larimer			100		
Exploration San Rafael	Lookout and Challenger	Tungsten	Apr. 28	5, 940	78
Revis & Revis	lode. Spring & Lady Cora,	Uranium	Aug. 11	11,800	78
Mesa	Helen claims.				
Climax Uranium Co.1			June 14	34, 693	78
Simpson Mining Co., et al	J. W. L. groups. Rajah group	do	June 8	36,004	75
Montrose	and the second terminal				
Eula Belle Uranium, Inc	Index Placer, Mesa Creek, Long Shot			12, 603	78
Radium Hill Uranium, Inc Uranium Prospectors Co., Ltd. Western Oil Fields, Inc Yankee Uranium Co	claims. Radium Hill group B. T. M. group Binder group West Paradox Creek claims.	do do do	Apr. 14 June 6 May 4 July 19	10, 124 11, 503 10, 550 33, 828	78 78 78 78
Montrose and San Miguel	Ciaims.				4.7
Golden Cycle Uranium Corp	Harrison, Burnett & Small and Lee groups.	do	Mar. 29	30, 440	78
W. A. Greer	Bachelor group.	do	Apr. 28	37, 535	7!
Ouray		t en e		1	
Hurst Majors	Mineral Farm group	Lead-zinc	Sept. 21	2, 200	50
San Miguel					
Bowles-Heflin Mining Co Simpson Mining Co., et al	J. V. Eaverson lease Doss claims	Uranium	Nov. 28 June 16	19, 228 25, 836	7! 7!
Total				511, 084	60

<sup>&</sup>lt;sup>1</sup> Property located in Mesa County, Colo., and Grand County, Utah. Value of contract has been split 50-50.

## REVIEW BY MINERAL COMMODITIES METALS

Beryllium.—The quantity of hand-sorted beryllium concentrate produced in Colorado from pegmatites in 1955 and shipped to the Beryl Ores Co. of Arvada, Colo., and the Custer, S. Dak., Government Purchase Depot decreased 23 percent below 1954. Fremont,

Gunnison, Jefferson, and Larimer were the principal beryllium-producing counties and International Mineral & Chemical Corp., Beryllium Mining Co., Jessie & Michael Friend, and H. A. Snider the largest producers. The Government domestic purchase program continued in force. The prices paid were \$40 a short-ton unit for material containing 8.0 to 8.9 percent BeO; \$45 for 9.0 to 9.9 percent; and \$50 for 10 percent or over.

Cadmium, Indium, and Thallium.—The Globe smelter of the American Smelting & Refining Co. in Denver recovered cadmium, indium, and thallium from flue dust, dross, and other byproduct material shipped to it from other company smelters in 1955.

Columbium-Tantalum.—Ore and concentrate containing a minimum of 50 percent combined columbium and tantalum pentoxides was shipped from 6 operations in Clear Creek, Fremont, and Jefferson Counties in 1955. It was sold to Beryl Ores Co., Arvada, Colo., and to the Custer, S. Dak., Government Purchase Depot operated by the General Services Administration (GSA). The Government paid a flat rate of \$1.70 a pound for the ore or concentrate with the minimum columbium-tantalum content.

Copper.—Copper output in Colorado decreased 4 percent in 1955 compared with 1954, but the value of the production increased 21 percent because of the rise in the average weighted price per pound for copper. Most of the copper was recovered from complex ores of copper, lead, and zinc. Less than 1 percent came from gold and silver ores and cleanup material. Forty-six percent of the total copper production was recovered from copper ore, and the remaining 53 percent came from complex copper, lead, and zinc ores.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc, 1946-50 (average), 1951-55, and total, 1858-1955, in terms of recoverable metals <sup>1</sup>

Year	Mines 1	producing	Material sold or	Gold (lode	and placer)	Silver (lode	e and placer)
	Lode	Placer	treated 2 (short tons)	Fine ounces	Value	Fine ounces	Value
1946-50 (average) _ 1951 1952 1953 1954 1955 1955 1955	251 196 171 118 123 120	28 21 20 19 19	1, 416, 282 1, 578, 466 1, 548, 815 1, 204, 517 973, 177 908, 416	139, 740 116, 503 124, 594 119, 218 96, 146 88, 577	\$4, 890, 914 4, 077, 605 4, 360, 790 4, 172, 630 3, 365, 110 3, 100, 195	2, 839, 196 2, 787, 882 2, 813, 643 2, 200, 317 3, 417, 072 2, 772, 073	\$2, 526, 108 2, 523, 174 2, 546, 488 1, 991, 338 3, 092, 628 2, 508, 866
1858-1955			(3)	40, 159, 070	899, 444, 414	756, 373, 493	591, 053, 174
	Co	pper	Le	ead	. 2	ine	
Year	Short tons	pper Value	Short tons	Value	Short tons	Value	Total value
Year  1946-50 (average) 1951 1952 1953 1954 1955	Short tons					1	\$26, 144, 92; 38, 931, 53; 35, 997, 23; 22, 247, 78; 21, 602, 20; 222, 240, 00;

<sup>&</sup>lt;sup>1</sup> 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.

<sup>2</sup> Does not include gravel washed.

<sup>3</sup> Figure not available.

The Eagle mine in the Red Cliff (Battle Mountain) district of Eagle County and the Treasury Tunnel-Black Bear group of mines in the Upper San Miguel district of San Miguel County were the principal copper producers in the State in 1955. Most copper produced by the New Jersey Zinc Co. from the Eagle mine was recovered by direct smelting of copper ore. Copper was also recovered as a hyproduct of zinc ore from the mine. The Idarado Mining Co. recovered copper from copper, lead, and zinc concentrates produced from ore from the Treasury Tunnel-Black Bear group of mines.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in 1955, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zine (short tons)
January February March April June June June June June July August September October November December	7, 454 6, 673 7, 568 7, 394 7, 330 7, 689 7, 280 6, 814 8, 543 7, 327 7, 428 7, 077	188, 530 209, 697 380, 689 305, 433 233, 783 260, 937 185, 128 187, 794 230, 525 222, 863 163, 121 203, 573	293 280 408 394 390 387 290 292 399 432 405 353	1, 318 1, 279 1, 507 1, 290 1, 386 1, 515 1, 217 1, 159 1, 352 1, 493 1, 134	2, 800 3, 447 3, 418 3, 030 3, 288 2, 611 2, 417 3, 056 3, 230 2, 862 2, 441 2, 750
Total	88, 577	2, 772, 073	4, 323	15, 805	35, 350

TABLE 6.—Gold and silver produced at placer mines, 1946-50 (average) and 1951–55, in fine ounces, in terms of recoverable metals

		ale hand	Gra	vel mechar	nically han	dled		
Year	meth	ods 1	Nonfloatir plar	ng washing nts <sup>2</sup>		line and dredges	To	tal
er. Agesti	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver
1946-50 average	132 30 28 37 79 61	30 7 7 11 16 11	932 (3) (4) 1, 046 1, 112 1, 125	148 (3) (3) 159 163 181	15, 646 3 13, 563 3 2, 152 546 364 610	3, 122 3 2, 288 3 338 75 47 82	16, 710 13, 593 2, 180 1, 629 1, 555 1, 796	3, 300 2, 295 345 245 226 274

<sup>&</sup>lt;sup>1</sup> Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms,

Gold.—Gold production continued to decline in 1955, and output was 8 percent below 1954. Because of rising costs some gold and gold-silver operations were curtailed while others were closed.

The Cripple Creek district of Teller County, producing straight gold ore, contributed 53 percent of the State gold output in 1955. The largest gold-producing mines in this district were the Ajax (Golden Cycle Corp. Cripple Creek Mining Operation), Cresson (Cresson Cons. Gold Mining & Milling Co.), and Vindicator (United

dip boxes, pans, rockers, dry washers, etc.

I includes all operations in which hand labor is principal factor in delivering gravel to sinces, long tonis, dip boxes, pans, rockers, dry washers, etc.

I 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."

Production by nonfloating washing plants included with that by bucketline dredges; Bureau of Mines not at liberty to publish separately.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1955, by counties, in terms of recoverable metals

County	Mine duc	s pro- cing	Material sold or treated 1	Gold	(lode a	nd plac	er)	Silver (lode a	nd placer)
	Lode	Placer	(short tons)	Fine (	ounces	Valu	ie .	Fine ounces	Value
		5			1, 290	\$45,	150	186	\$168
Adams	5	1	2, 137	1	232	8,	120	45, 680	41, 343
Boulder	4	1 1	36		1		35	979	886
Chaffee Creek Creek	15		8,092	1 .	691	24,	185	23, 191	20, 989
Juster	3		2, 989	1	73	2,	555	1, 927	1, 744
Dolores	š		35, 374	1	156	5,	460	114, 392	103, 531
Eagle	3 2		295, 769		8, 416	294,	560	1, 613, 096	1, 459, 933
Eagle Fremont	2		_ 35					19	17 16, 744
Gilpin	6	1	9, 482		485	10,	975	18, 501 153, 513	138, 937
Gunnison	5		_ 33, 883		51	1,	785	105, 515	78
Hinsdale	1		_  8		394	12	790	70	63
Jefferson			F7 000	-	5, 165	180	775	98, 155	88, 835
Lake	13	1	57, 269 301		426	14	910	1, 167	1,056
La Plata	3 7		28, 596		1, 025	35	875	135, 640	122, 761
Mineral Montezuma	1 4		20,000		19		665	94	85
Мимам Опрам	1 2		41, 471		3, 266	114	310	48, 450	43, 850
Ouray Park	1 4		179		30	1	, 050	647	586
Pitkin	ī		_ 3				-===-	128	116
Rio Grande	. 1		21		28		980	9 101	2, 807
Saguache	. 3		546		12		420	3, 101	32, 427
San Juan	. 8		10, 408		455	10	, 925 , 545	35, 829 453, 745	410, 662
San Miguel Summit	4		274, 782		18, 987 204	004	140	16, 387	14, 831
Summit	14	1 3	6, 482		47, 171	7 1, 650	085	7, 086	6, 413
Teller	_ 13		100, 548		21, 111	1,000	, 000		
								0	9 508 866
Total: 1955 1954	120	1 1			88, 577 96, 146	3, 100 3, 365	, 110	2,772,073 3,417,072	3, 092, 62
Total: 1955	_   123		973, 177 per Value 8		88, 577 96, 146 ead Value	3, 365 e S	, 110	Zinc Value	Total value
County	123	Cop	973, 177 per Value 8	L hort cons	ead Value	3, 365	hort	Zine	value \$45, 318
County  Adams.	123	Cop	973, 177 per Value 8	L hort cons	96, 146 ead Value	8 S t	hort	Zine	Total value \$45, 31 81, 95
County  Adams.	123	Cop	973, 177 per Value 8 \$5, 968	Lons 89	96, 146 ead Value \$26, 1.	8 S t	hort	Zine Value	Total value \$45, 31 81, 95
County  Adams.	123	Cop hort ons	9 973, 177  per  Value \$ \$5, 968  5, 222	Lohort cons	96, 146  ead  Value  \$26, 1, 29.	8, 365 e S t 522 	hort	Zine Value \$1,476	Total value \$45, 31 81, 95 2, 70 81, 37
County  Adams. Boulder. Chaffee Clear Creek.	123   S   t	Cop hort ons  8	9 973, 177  per  Value 8  \$5, 968	L hort cons 89 6 99 11	96, 146  value \$26, 1, 29, 3.	8, 365 e S t 522 	hort tons	Zine Value \$1,476 2,952	Total value \$45, 31 81, 95 2, 70 81, 37 13, 51 1, 401, 38
County  Adams	123   S. t	Cop hort ons	9 973, 177  per  Value 8  \$5, 968  5, 222 2, 984 3, 730	L hort cons 89 6 99 11 2, 202	96, 146  Value \$26, 1, 29, 3, 656.	8 t 522	hort tons 6 12 2, 571	Zine Value \$1,476 2,952 632,466	Total value \$45, 31 81, 95 2, 70 81, 37 13, 51 1, 401, 38 9, 620, 92
County  Adams	123   S. t	Cop hort ons  8  7 4 5 2,247	9 973, 17 Per Value 8 \$5, 968 	L hort cons 89 6 99 11	96, 146  value \$26, 1, 29, 3.	8 t 522	hort tons	Zinc Value S1, 476 2, 952 632, 466 5, 245, 212	Total value \$45, 31. \$81, 95 2, 70 81, 37 13, 51 1, 401, 38 9, 620, 92
County  Adams	123   S. t	Cop hort ons	9 973, 177  per  Value 8  \$5, 968  5, 222 2, 984 3, 730	L hort cons 89 6 99 11 2, 202	96, 146  ead  Value \$26, 1, 29, 656, 944,	8, 365 e S t 522	hort cons 6 12 2, 571 1, 322	Zine  Value  \$1,476 2,952 632,466 5,245,212 4,182	Total value  \$45, 31 81, 95 2, 70 81, 37 13, 51 1, 401, 58 9, 620, 92 1, 50 80, 81
County  Adams	123   S. t	Cop hort ons  8  7 4 5 2,247 24	9 973, 175  Per Value 8  \$5, 968	L hort cons 89 6 99 11 12, 202 3, 171 134 740	96, 146 ead Value \$26, 1, 29, 3, 656, 944, 39, 220,	3, 365 e S t 522	hort cons 6 12 2, 571 1, 322 17 1, 157	Zine  Value  \$1,476 2,952 632,466 5,245,212 4,182 224,622	Total value  \$45, 31 81, 95 2, 70 81, 37 13, 51 1, 401, 38 9, 620, 92 1, 50 80, 81 774, 17
County  Adams. Boulder. Chaffee. Clear Creek. Custer. Dolores. Eagle. Fremont. Gilpin. Grunnison.	123   Si   t	Cop hort ons  8  7 4 5 2, 247 2	9 973, 175  Per  Value \$ \$5, 968  \$5, 968  2, 984 3, 730 1, 676, 262 1, 492 1, 492	L hort cons 89 6 99 11 2, 202 3, 171 134	96, 146 ead Value \$26, 1, 29, 3, 656, 944, 39, 220,	8, 365 e S t 522	hort cons 6 12 2, 571 1, 322	Zine  Value  \$1,476 2,952 632,466 5,245,212 4,182 224,622	Total value  \$45, 31 81, 95 2, 70 81, 37 13, 51 1, 401, 38 9, 620, 92 1, 50 80, 81 774, 17 92
County  Adams. Boulder. Chaffee. Clear Creek. Custer. Dolores. Eagle. Fremont. Glipin. Gonnison. Hinsdale.	123   Si   t	Cop hort ons  8  7 4 5 2, 247 2 4 172	9 973, 173  Per Value 8  \$5, 968	89 6 99 11 2, 202 3, 171	96, 146  Value  \$26, 1, 29, 3, 656, 944, 39, 220,	8, 365 8 t 522 788 502 278 196 958 2 932 520 596	hort cons 6 12 2, 571 1, 322 17 1, 157	Zine  Value  \$1,476 2,952 632,466 5,245,212 4,182 284,622 246	Total value  \$45, 31: 81, 95 2, 70 81, 37 13, 51 1, 401, 38 9, 620, 92 1, 50 80, 81 774, 17 92 13, 85
County  Adams. Boulder. Chaffee Clear Creek Custer. Dolores Eagle Fremont Gilpin Gunnison Hinsdale Jefferson Lake	123   S   t	Cop hort ons  8  7 4 5 2,247 24	9 973, 173  Per Value 8  \$5, 968	L hort cons 89 6 99 11 12, 202 3, 171 134 740	96, 146 ead Value \$26, 1, 29, 3, 656, 944, 39, 220,	8, 365 8 t 522 788 502 278 196 958 2 932 520 596	hort cons 6 12 2, 571 1, 322 17 1, 157	Zine  Value  \$1,476 2,952 632,466 5,245,212 4,182 284,622 246	Total value  \$45, 31 81, 95 2, 70 81, 37 13, 51 1, 401, 38 9, 620, 92 1, 50 80, 81 774, 17 13, 85 11 106, 16
County  Adams. Boulder. Chaffee. Clear Creek. Couster. Dolores. Eagle. Fremont. Gilpin. Gunnison. Hinsdale. Jefferson. Lake. La Plata.	123   S:   t	Cop hort ons  8  7 4 5 2, 247 2 4 172 26	9 973, 17 Per Value S \$5, 968	89 6 99 11 2,202 3,171 134 740 2	96, 146  Value  \$26, 1, 29, 3, 656, 944, 39, 220,	8, 365 e S t 522	hort cons  6 12 2, 571 1, 322  17 1, 157 1  1, 621	Zine  Value  \$1,476 2,952 632,466 5,245,212 4,182 284,622 246 398,766	Total value  \$45, 31 81, 95 2, 70 81, 37 13, 51 1, 401, 58 9, 620, 92 1, 50 80, 81 774, 17 92 13, 85 1, 106, 16 15, 96
County  Adams. Boulder. Chaffee Clear Creek Custer. Dolores Eagle. Fremont Gilpin Gonnison Hinsdale Jefferson Lake La Plata Mineral	123   S. t	Cop hort ons  8  7 4 5 2, 247 2 4 172	9 973, 17 Per Value S \$5, 968	89 6 99 11 2, 202 3, 171	96, 146  Value  \$26, 1, 29, 3, 656, 944, 39, 220,	8, 365 e S t 522	hort cons 6 12 2, 571 1, 322 17 1, 157	Zine  Value  \$1,476 2,952 632,466 5,245,212  4,182 284,622 246 338,766	Total value  \$45, 31: 81, 95 2, 70 81, 37 13, 51 1, 401, 38 9, 620, 92 13, 80, 81 774, 17 72, 17 13, 85 1, 106, 16 15, 96 710, 55
County  Adams. Boulder. Chaffee. Clear Creek. Custer. Dolores. Eagle. Fremont. Glipin. Grunison. Hinsdale. Jefferson. Lake. La Plata. Mineral. Montezuma.	123   S. t	Cop hort ons 8 7 4 5 2, 247 2 4 172	9 973, 175  Per  Value 8  \$5, 968	89 6 99 11 2, 202 3, 171 134 740 2 1, 404	96, 146  Value  \$26, 1, 29, 3, 656, 944, 39, 220, 418, 355,	8, 365 8 t 522 522 5502 578 196 958 2 932 520 596 392 216	6 12 2, 571 1, 157 11, 157 11, 621 745	Zine  Value  \$1,476 2,952 632,466 5,245,212  4,182 284,622 398,766 183,270	Total value  \$45, 31 81, 95 2, 70 81, 37 13, 51 1, 401, 38 9, 620, 92 1, 50 80, 81 774, 17 92 13, 85 1, 106, 16 15, 96 770, 57
County  Adams Boulder Chaffee Clear Creek Custer Dolores Eagle Fremont Glipin Gunnison Hinsdale Jefferson Lake La Plata Montezuma Montezuma Ouray	123   Si   t	Cop hort ons 8 7 4 5 2, 247 2 4 172 26 18 171	9 973, 173  Per  Value 8  \$5, 968  5, 222 2, 984 3, 730 1, 676, 262 1, 492 2, 984 123, 312  19, 396 13, 428  127, 566	B9 6 99 11 2, 202 3, 171 134 740 1, 192 639	96, 146  Value  \$26, 1, 29, 3, 656, 944, 39, 220,	8, 365  e S t  522  788 502 278 196 958 2 932 520 596 392 216 422	hort cons  6 12 2, 571 1, 322  17 1, 157 1  1, 621	Zinc  Value  \$1,476 2,952 632,466 5,245,212  4,182 284,6226 398,766 183,270	Total value  \$45, 31: 81, 95 2, 70 81, 37 13, 51 1, 401, 38 9, 620, 92 13, 80, 81 774, 17 72, 17 13, 85 1, 106, 16 15, 96 710, 55
County  Adams. Boulder. Chaffee Clear Creek Custer. Dolores Eagle Fremont Gilpin Gunnison Hinsdale Jefferson Lake La Plata Mineral Montezuma Ouray. Park	123   Si   t	Cop hort ons 8 7 4 5 2, 247 2 4 172	9 973, 175  Per  Value 8  \$5, 968	89 6 99 11 2,202 3,171 134 740 2 1,404 1,192	96, 146  Value  \$26, 1, 29, 3, 656, 944, 39, 220, 418, 355,	8, 365 8 t 522 522 5502 578 196 958 2 932 520 596 392 216	6 12 2, 571 1, 157 11, 157 11, 621 745	Zine  Value  \$1,476 2,952 632,466 5,245,212 24,182 284,622 246 398,766 183,270 114,390	Total value  \$45, 31 81, 95 2, 70 81, 37 13, 51 1, 401, 51 80, 81 774, 17 13, 85 1, 106, 16 15, 96 710, 55 5, 26 5, 26 41
County  Adams Boulder Chaffee Clear Creek Custer Dolores Eagle Fremont Glipin Gunnison Hinsdale Jefferson Lake La Plata Montezuma Montezuma Ouray Park Pitkin	123   Si   t	Cop hort ons 8 7 4 5 2, 247 2 4 172 26 18 171	9 973, 173  Per  Value 8  \$5, 968  5, 222 2, 984 3, 730 1, 676, 262 1, 492 2, 984 123, 312  19, 396 13, 428  127, 566	B9 6 99 11 2, 202 3, 171 134 740 1, 192 639	96, 146  Value  \$26, 1, 29, 3, 656, 944, 39, 220, 418, 355,	3, 365  e S t  522  788 502 278 196 958 2 958 2 216 392 216 422 4894 298	6 171 6 171 7 171	Zinc  Value  \$1,476 2,952 332,466 5,245,212 4,182 284,622 246 388,766 183,270 114,390 492	Total value  \$45, 31 81, 95 2, 70 81, 37 13, 51 1, 401, 38 9, 620, 92 13, 88 80, 81 774, 17 92 13, 88 71, 106, 16 75, 96 75, 96 55, 26
County  Adams. Boulder. Chaffee. Clear Creek. Custer. Dolores. Eagle. Fremont. Glipin. Gonnison. Hinsdale. Jefferson. Lake. La Plata. Mineral. Montezuma. Ouray. Park. Pitkin. Rio Grande. Sogniecha.	123   Si   t	Cop hort ons 8 7 4 5 2, 247 2 4 172 26 18 171	9 973, 173  Per Value 8  \$5, 968  5, 222 2, 984 3, 730 1, 676, 262 1, 492 2, 984 128, 312  19, 396 13, 428  127, 566 2, 238	89 6 99 11 2,202 3,171 134 740 2 1,404 1,192	96, 146  Value  \$26, 1, 29, 3, 656, 944, 39, 220, 418, 355, 190,	3, 365 e S t 522	hort tons  6 122,571 1, 322 17, 157 1, 621 745 227	Zinc  Value  \$1,476 2,952 632,466 5,245,212  4,182 284,622 398,766 183,270 114,390 492 6,642	\$45, 31 \$1, 95 2, 70 81, 37 13, 51 1, 401, 38 9, 620, 92 1, 50 80, 81 774, 17 92 13, 88 1, 106, 16 15, 96 710, 55 5, 22 4 9, 22, 7
County  Adams. Boulder. Chaffee. Clear Creek. Custer. Dolores. Eagle. Fremont. Glipin. Gonnison. Hinsdale. Jefferson. Lake. La Plata. Mineral. Montezuma. Ouray. Park. Pitkin. Rio Grande. Sogniecha.	123   Si   t	Cop hort ons  8  7 4 5 2, 247 2 4 172 26 18 171 3	9 973, 173  Per Value 8  \$5, 968  5, 222 2, 984 3, 730 1, 676, 262 1, 492 2, 984 128, 312	L L L S S S S S S S S S S S S S S S S S	96, 146  Value  \$26, 1, 29, 3, 656, 944, 39, 220,  418, 355, 190,	3,365  e S S t  1	, 110 hort cons 6 122, 571 1, 322 17 1, 157 1 1, 621 2 27 246 246	Zinc  Value  \$1,476 2,952 632,466 5,245,212 4,182 284,622 2846 398,766 183,270 114,390 492 6,642 6,642 6,642	Total value  \$45, 31 81, 95 2, 70 81, 37 13, 51 1, 401, 38 9, 620, 92 10, 68 80, 81 774, 17 13, 85 1, 106, 16 15, 96 710, 55 590, 55 5, 24 99 28, 77 277, 77
County  Adams. Boulder. Chaffee Clear Creek Custer. Dolores Eagle Fremont Gilpin Gunnison Hinsole Jefferson Lake La Plata Mineral Montezuma Ouray Park Pitkin Rio Grande Saguache San Juan San Mieuel	123   S. t	Cop hort ons  8  7 4 5 2, 247 2 4 172  26 18  171 3 9 1, 607	9 973, 173  Per Value 8  \$5, 968  5, 222 2, 984 3, 730 1, 676, 262 1, 492 2, 984 128, 312	L L S S S S S S S S S S S S S S S S S S	96, 146  Value  \$26, 1, 29, 366, 944, 39, 220, 418, 355, 190, 16, 139, 1, 519,	3,365  e S t  1522 1788 1796 1796 1796 1796 1796 1796 1796 1796	hort cons  12, 5711, 157  17, 157  465, 2  246, 532	Zinc  Value  \$1,476 2,952 632,466 5,245,212 4,182 224,622 246 398,766 183,270 114,390 492 6,642 60,616 1,606,872	Total value  \$45, 31 81, 95 2, 70 81, 37 13, 51 1, 401, 38 9, 620, 92 1, 50 80, 81 774, 17 13, 85 1, 106, 16 15, 96 770, 55 41 92 28, 77 277, 75 5, 400, 11
County  Adams Boulder Chaffee Clear Creek Clear Creek Clear Beagle Fremont Glipin Gunnison Hinsdale Jefferson Lake La Plata Montezuma Montezuma Ouray Park Pitkin Rio Grande Saguache San Juan San Miguel Summit	123   Si   t	Cop hort ons  8  7 4 5 2, 247 2 4 172  26 18 171 3 39	9 973, 173  Per Value 8  \$5, 968  5, 222 2, 984 3, 730 1, 676, 262 1, 492 2, 984 128, 312  19, 396 13, 428  127, 566 2, 238	L L L S S S S S S S S S S S S S S S S S	96, 146  Value  \$26, 1, 29, 366, 944, 39, 220, 418, 355, 190, 16, 139, 1, 519,	3,365  e S S t  1	, 110 hort cons 6 122, 571 1, 322 17 1, 157 1 1, 621 2 27 246 246	Zinc  Value  \$1,476 2,952 632,466 5,245,212 4,182 224,622 246 398,766 183,270 114,390 114,390 6,642 60,516 60,516 1,606,872	Total value  \$45, 31 81, 95 2, 70 81, 37 13, 51 1, 401, 38 9, 620, 92 1, 56 80, 81 774, 17 13, 88 1, 106, 16 15, 96 710, 55 52, 24 92 28, 77 277, 75 5, 400, 10
County  Adams Boulder Chaffee Clear Creek Clear Creek Clear Beagle Fremont Glipin Gunnison Hinsdale Jefferson Lake La Plata Montezuma Montezuma Ouray Park Pitkin Rio Grande Saguache San Juan San Miguel Summit	123   Si   t	Cop hort ons  8  7 4 5 2, 247 2 4 172  26 18  171 3 9 1, 607	9 973, 173  Per Value 8  \$5, 968  5, 222 2, 984 3, 730 1, 676, 262 1, 492 2, 984 128, 312	L L S S S S S S S S S S S S S S S S S S	96, 146  Value  \$26, 1, 29, 366, 944, 39, 220, 418, 355, 190, 16, 139, 1, 519,	3,365  e S t  1522 1788 1796 1796 1796 1796 1796 1796 1796 1796	hort cons  12, 5711, 157  17, 157  465, 2  246, 532	Zinc  Value  \$1,476 2,952 632,466 5,245,212 4,182 224,622 246 398,766 183,270 114,390 492 6,642 60,616 1,606,872	Total value  \$45, 31: 81, 95 2, 70 81, 37 13, 51 1, 401, 38 9, 620, 92 1, 50 80, 81 774, 17 13, 85 1, 106, 16 15, 96 710, 55 50, 55 5, 26 41 92 28, 77 277, 77
County  Adams. Boulder. Chaffee Clear Creek Custer. Dolores Eagle Fremont Gilpin Gunnison Hinsole Jefferson Lake La Plata Mineral Montezuma Ouray Park Pitkin Rio Grande Saguache San Juan San Mieuel	123   Si   t	Cop hort ons  8  7 4 5 2, 247 2 4 172  26 18  171 3 9 1, 607	9 973, 173  Per Value 8  \$5, 968  5, 222 2, 984 3, 730 1, 676, 262 1, 492 2, 984 128, 312	L L S S S S S S S S S S S S S S S S S S	96, 146  Value  \$26, 1, 29, 366, 944, 39, 220, 418, 355, 190, 16, 139, 1, 519,	3,365  e S t  522 788 196 2978 2078 2988 2 216 422 894 422 298 688 762 204 7722	hort cons  12, 5711, 157  17, 157  465, 2  246, 532	Zine  Value  \$1,476 2,952 632,466 5,245,212  4,182 284,6226 398,766  183,270 114,390 492  6,642 60,616 21,606,676 21,53,996	Total value  \$45, 31 81, 95 2, 70 81, 37 13, 51 1, 401, 38 9, 620, 92 1, 56 80, 81 774, 17 13, 58 1, 106, 16 15, 96 710, 55 52 24 28, 77 277, 77 5, 400, 10

<sup>1</sup> Does not include gravel washed.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1955, by classes of ore or other source materials, in terms of recoverable metals

Source	Num- ber of mines 1	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zine (pounds)
Lode ore: Dry gold Dry gold-silver Dry silver	27 1 16	103, 584 180 8, 000	48, 482 163 239	9, 638 3, 741 70, 478	3, 700	10, 000 5, 100 449, 500	400
Total	43	111, 764	48, 884	83, 857	6, 700	464, 600	400
Copper Copper-lead Lead Lead-zinc <sup>2</sup> Zinc	8 2 35 44 2	67, 513 77 19, 462 460, 828 228, 561	7, 350 790 27, 756 1, 069	1, 322, 305 1, 701 83, 825 964, 075 292, 202	4, 008, 800 5, 400 33, 200 4, 061, 700 513, 200	335, 500 18, 100 1, 757, 000 22, 373, 700 6, 009, 200	6, 300 26, 958, 600 42, 654, 000
Total	80	776, 441	36, 965	2, 664, 108	8, 622, 300	30, 493, 500	69, 618, 900
Other "lode" material: Old tailings, etc.3		20, 211	932	23, 834	17,000	651, 900	1, 080, 700
Total "lode" ma- terial Gravel (placer opera-	120	908, 416	86, 781	2, 771, 799	8, 646, 000	31, 610, 000	70, 700, 000
tions)	14		1, 796	274			
Total, all sources	134	908, 416	88, 577	2, 772, 073	8, 646, 000	31, 610, 000	70, 700, 000

 Detail will not add to totals because some mines produce more than 1 class or ore.
 Includes copper-lead-zinc ore, for which the Bureau of Mines is not at liberty to publish separate figures.
 Old tailings: Gold, 2,500 tons; lead-zinc, 15,570 tons. Cleanings: Lead, 1 ton. Mill cleanings: Lead, 4 tons; zinc, 15 tons. Old slag: Lead, 2,072 tons. 44 tons; zinc, 15 tons.

Gold Mines). These mines ranked as the first, third, and fifth largest gold producers, respectively, in Colorado. Upper San Miguel district, San Miguel County, producing complex copper, lead, and zinc ores, supplied 21 percent of the total gold output. The Treasury Tunnel-Black Bear group (Idarado Mining Co.) was by far the leading gold producer (byproduct of copper-lead-zinc ore) in this district and second only to the Ajax mine in the State. Other substantial producers of gold in 1955 were the New Jersey Zinc Co. Eagle mine in Eagle County and the Resurrection Mining Co. Resurrection group of mines in Lake County.

Over half of the total gold output was recovered from gold, goldsilver, and silver ores. Except for small quantities that came from placer-mining operations and from cleanup material, the remainder of the gold was recovered as a byproduct of copper, lead, lead-zinc, and zinc ores. Half of the gold was recovered by cyanidation, onequarter by the smelting of concentrates, and the remainder by amalgamation, direct smelting of ore and cleanup material, and placer mining.

Iron Ore.—During 1955 C. K. Williams & Co. shipped bog iron ore (limonite) from the Iron Springs Placer mine at Ophir in San Miguel County to buyers outside of the State for use in manufacturing paint. Iron ore for the Colorado Fuel & Iron Corp. plant at Pueblo, Colo., was obtained from company mines in Utah and Wyoming.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery and types of material processed, in terms of recoverable metals

m	Material treated		Rec	overable met	als	
Type of material processed and method of recovery	(short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:						
Amalgamation: OreOld tailings	(1) (1)	8, 235 336	2, 893 276			
Total	(1)	8, 571	3, 169			
Cyanidation: OreOld tailings	100, 548 2, 500	47, 018 72	6, 908 486			
Total	103, 048	47, 090	7, 394			
Total recoverable in bullion		55, 661	10, 563			
Concentration; smelting of concentrates: OreOld tailings	711, 510 15, 579	22, 220 406	1, 350, 625 17, 566	4, 622, 000 16, 200	29, 415, 400 578, 600	69, 607, 800 1, 069, 400
Total	727, 089	22, 626	1, 368, 191	4, 638, 200	29, 994, 000	70, 677, 20
Direct smelting: Ore Cleanings Mill cleanings Old slag	76, 147 1 59 2, 072	8, 376 2 94 22	1, 387, 539 32 1, 716 3, 758	4, 007, 000	1, 542, 700 100 20, 700 52, 500	11, 500 11, 300
Total	78, 279	8, 494	1, 393, 045	4, 007, 800	1, 616, 000	22, 80
Placer	(2)	1, 796	274			
Grand total	<sup>3</sup> 908, 416	88, 577	2, 772, 073	8, 646, 000	31, 610, 000	70, 700, 00

¹ Not available; part of the material amalgamated was a hutch product from jigs in ball-mill-classifier circuits used in some flotation mills.

Not available.
Excluding placer gravel.

Lead.—Lead output in Colorado declined again in 1955 for the fourth successive year and was the lowest since 1942. During this interval (1952-55), output dropped 47 percent. Compared with 1954, 1955 production decreased 11 percent, and value of output was

4 percent lower.

The Idarado Mining Co., with mining operations at the Treasury Tunnel-Black Bear group of mines in San Miguel County, was by far the leading lead producer in the State in 1955. Most of the lead was recovered from a lead concentrate produced from the copper-lead-zinc ore mined, but some came from copper and zinc concentrates also produced from the ore. Other leading lead-producing mines in 1955, in order of output, were Eagle (The New Jersey Zinc Co.), Rico Argentine (Rico Argentine Mining Co.), and Resurrection (Resurrection Mining Co.).

Lead output from the Commodore-Amethyst group of mines by the Emperius Mining Co. was reduced for 1955 because of burning of the mill in August. The Keystone mine of the American Smelting & Refining Co. at Crested Butte, a new producer in 1955, was in oper-

ation during the last 6 months of the year.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

## A. For material treated at mills

	Ma- terial	Recover bull		Concent	rate shipp	oed to sme	elters 1 and	d recoveral	ole metals
	treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
			В	Y COUN	TIES		<u>'</u>	<u> </u>	•
					ı			ı	
Boulder Clear Creek Custer	2, 102 8, 009 2, 900	22 332 72	103 486	<sup>2</sup> 705 416 46	167 344 1	44, 450 20, 521 471	15, 900 13, 300		12,00
Dolores	35, 342 228, 488	53	13	8, 100 55, 763	103 1,067 474	114, 247 292, 021 18, 397	10, 000 513, 200 8, 000	4, 392, 000 6, 008, 100	5, 132, 00 42, 644, 00
Gilpin Gunnison Hinsdale	9, 477 33, 501			570 4, 599 4	47	146, 710 55	343, 100	1, 247, 400 2, 400	2, 302, 70 2, 00
Lake La Plata Mineral	49, 783 150 26, 229	2, 111	1, 138	3, 207	10 910	72, 528 21 106, 155	51, 700 36, 000	1, 960, 400	1, 490, 00
Ouray Park Saguache	41, 465 105 485	9 5	1 27	2, 938 6 154	3, 266 10 7	48, 387 56 1, 690	342, 000 300 1, 900	900 95, 500	4,000
San Juan San Miguel Summit	10, 394 274, 696 6, 458	6, 048 2	1, 871 3	2,016	147	15, 676	14,000	10, 176, 400	490, 50 13, 064, 00 1, 252, 00
Feller	100, 548	46, 996	6, 908		175	178			
Total: 1955_ 1954_	830, 137 868, 655	55, 661 58, 956	10, 563 11, 336	<sup>2</sup> 112, 774 114, 845	22, 626 24, 881	1, 368, 191 1, 439, 448	4, 638, 200 4, 630, 100	29, 994, 000 33, 289, 700	70, 677, 200 70, 217, 300
7 3		BY CL.	ASSES C	F MAT	ERIAL T	REATE	D		
Dun mald.			<del>-,</del>						
Dry gold: Crude ore Old tailings_	103, 377 2, 500 3, 337	47, 397 72	7, 011 486		505	1, 952			
Dry silver Copper Lead	3, 337 85 15, 908		4	162 17 1, 744	161 585	52, 599 167 42, 608	3, 000 11, 700 29, 300		<b> </b>
Lead-zinc: Crude ore 3 Old tailings	460, 790 15, 579	7, 855 336	2, 783 276	1,828	19, 901 406	961, 100 17, 566	4, 061, 400 16, 200	22, 359, 400 578, 600 6, 909, 200	26, 947, 10 1, 069, 40
Zinc Total: 1955_	228, 561 830, 137	55, 661	10, 563		1, 068 22, 626			29, 994, 000	
В	Y CLAS	SES OF	CONCE	 NTRATE	SHIPP	ED TO	SMELTE	RS 1	!
Dry gold			<del></del>	29	185	199			
Ory gold-silver Copper Copper-lead Copper-zinc				50	54 3, 912 138	1,759	2, 605, 400 4, 800	30, 260	134, 20
Copper-zinc Lead Lead-zinc				28, 485 198		13 1, 174, 674	300 1, 615, 760	28, 657, 920 64, 100	1, 00 82, 80
Zinc				77, 550	1, 113	5, 087 85, 609	403, 140	971, 480	70, 459, 20
M-4-1, 10FF				112, 774	99 696	11 388 101	14 K332 900	29, 994, 000	170. 677. 20

See footnotes at end of table.

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TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

B. For material shipped directly to smelters

	Ma- terial		Recove	rable met	al content	
	shipped (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds
<b>B</b>	Y COU	NTIES				
Boulder	35	15	1, 227	100	1, 400	
Chaffee	36					
Clear Creek	83	15		700	21, 400	
Custer	89	1	970		1, 600	
Dolores	32		132	2, 500	12,000	10, 00
Eagle	67, 281	7 340	1, 321, 075	3 080 800	333, 900	
Fremont	35	1, 545	19	4,000	999, 900	
Gilpin	5	2		4,000	1 000	
Gunnison	382	4			1, 200	11 50
Hinsdale	362	4		900	232, 600	
			31			
	7, 486	436		300	519, 500	
La Plata	151	416				
Mineral	2, 367	115			423, 600	
Montezuma	5	19				
Ouray	6		63		4, 300	
Park	74	4		5, 700	5, 100	
Pitkin	3		128		2,000	
Rio Grande	21	28	4			
Saguache	61		1, 384	4, 100	16, 500	
San Juan	14	63	239	300	4, 300	1, 50
San Miguel	86	27	827	2,900		
Summit	24		698		3, 400	
Total: 1955	78, 279	8 404	1, 393, 045	4 007 800	1, 616, 000	22, 80
1954	104, 522	10, 754	1, 966, 062	4, 415, 900	2, 356, 300	82, 70
BY CLAS	SSES OF	MATE	RIAL			
Dry gold	207	580	675	300	700	
Dry gold-silver	180	163	3, 741			
Dry silver	4, 663	78	17, 875			
Copper	67, 428	7 250	1, 322, 138	2 007 100		
Copper-lead.		1, 300			330, 300	
Copper-lead-zine	77		1, 701	5, 400		
	6		60	300	2, 300	1, 50
Lead:						
Crude ore	3, 554	205	41, 217	3, 900	789, 900	
Cleanings	1	2	32			
Mill cleanings	44	94	1, 623	750	19, 400	
Old slag	2, 072	22	3, 758		52, 500	
Lead-zinc	32		132		12,000	10,00
Zinc mill cleanings	15		93	50	1, 300	11, 30
Total: 1955	78, 279	8 494	1 303 045	4, 007, 800	1, 616, 000	22, 80

<sup>&</sup>lt;sup>1</sup> Excludes concentrates treated only by amalgamation and/or cyanidation.
<sup>2</sup> Includes lead-silver-gold-copper concentrate recovered as a byproduct in beneficiation of fluorspar at relant

1 plant.
3 Includes copper-lead-zinc ore, for which the Bureau of Mines is not at liberty to publish separate figures.

Molybdenum.—The entire output of molybdenum from Colorado in 1955 was from the Climax Molybdenum Co. mine on Fremont Pass, 13 miles north of Leadville in Lake County. Quantity of output was 7 percent above the 1954 figure and set a new record. In the annual report to the stockholders the company reported that the mine produced and the mill treated 9,227,700 tons of ore during 1955, an average of 30,000 tons per operating day. About 60 percent of the ore was drawn from the Phillipson level, and the balance came from the Storke level.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

	Quantity		Gr	oss metal co	ntent	
Class of material	or treated (short tons)		Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zine (pounds)
CON	CENTRAT	E SHIPPI	ED TO SM	ELTERS		- Jose
Ory gold	29	185	199		80	
Ory gold-silver		54	896		980	
Copper	6, 361	3, 912	99, 954	2, 686, 223	447, 787	999, 14
Copper Copper-lead	91	138	1,759	5, 694	31, 547	11
Copper-zinc	i		7, 13	379	53	1,00
Lead	28, 485	17, 172	1, 174, 674	1, 914, 106	29, 849, 834	1, 683, 64
Lead-zinc		52	5, 087	10, 358	65, 295	104, 71
Zine		1, 484	112, 169	503, 446	1, 216, 635	78, 709, 09
Total: 1955	112, 774	22, 997	1, 394, 751	5, 120, 206	31, 612, 211	81, 497, 72
1954		26, 265	1, 636, 064	5, 760, 025	35, 481, 357	
1954		26, 265	1, 636, 064	5, 760, 025	35, 481, 357	
1954ORES, E	TC., SHIPI	26, 265   PED DIRI	1, 636, 064 ECTLY TO	5, 760, 025 SMELTE	35, 481, 357 RS	
ORES, E	TC., SHIPI	26, 265   PED DIRI	1, 636, 064   ECTLY TO	5, 760, 025	RS 876	83, 165, 91
ORES, E	TC., SHIPI	26, 265   PED DIRI 580 163	1, 636, 064   ECTLY TO 675   3, 741	5, 760, 025 SMELTE 653	876 5, 486	
ORES, E	TC., SHIPI	26, 265 PED DIRI 580 163 78	1, 636, 064 ECTLY TO  675 3, 741 17, 875	5, 760, 025  SMELTE  653	RS 876 5, 486 395, 160	83, 165, 91
ORES, E  Ory gold  Dry gold-silver  Dry silver  Cooper	TC., SHIPI  207 180 4,663 67,428	26, 265   PED DIRI 580 163	1, 636, 064 ECTLY TO 675 3, 741 17, 875 1, 322, 138	5, 760, 025  SMELTE  653  4, 107, 230	85, 481, 357 RS 876 5, 486 395, 160 538, 999	83, 165, 91
ORES, E  Ory gold  Dry gold-silver  ry silver  Jopper  Jopper-lead  Copper-lead-	TC., SHIPI  207 180 4, 663 67, 428 77 6	26, 265 PED DIRI 580 163 78	1, 636, 064 ECTLY TO  675 3, 741 17, 875	5, 760, 025  SMELTE  653	RS 876 5, 486 395, 160	83, 165, 91
ORES, E  Ory gold  Dry gold-silver  ry silver  Jopper  Jopper-lead  Copper-lead-	TC., SHIPI  207 180 4, 663 67, 428 77 6	26, 265 PED DIRI 580 163 78	1, 636, 064 ECTLY TO 675 3, 741 17, 875 1, 322, 138 1, 701	5, 760, 025  SMELTE:  653  4, 107, 230 6, 105	35, 481, 357 RS 876 5, 486 395, 160 538, 999 19, 070	7, 42 1, 92
ORES, E  Ory gold  Dry gold-silver  Dry silver  Copper  Copper-lead  Copper-lead-silve  Crude ore  Cleanings	TC., SHIPI	26, 265 PED DIRE  580 163 78 7, 350	675 3, 741 17, 875 1, 322, 138 1, 701 60	5, 760, 025  SMELTE  653  4, 107, 230 6, 105 388	85, 481, 357 RS 876 5, 486 395, 160 538, 999 19, 070 2, 330 821, 785	7, 42 1, 92
ORES, E  Ory gold  Ory gold.silver  Ory silver  Opper  Opper-lead.zinc  cad:  Crude ore.  Cleanings	TC., SHIPI	26, 265 PED DIRE  580 163 78 7, 350	1, 636, 064  ECTLY TO  675 3, 741 17, 875 1, 322, 138 1, 701 60 41, 217 32	5, 760, 025  SMELTE  653  6, 107, 230 6, 105 388 6, 025	85, 481, 357 RS 876 5, 486 395, 160 538, 999 19, 070 2, 330 821, 785	7, 42 1, 92
ORES, E  Dry gold Dry gold-silver Dry silver Copper-lead Copper-lead Copper-lead Crude ore Cleanings Mill cleanings	TC., SHIPI  207	26, 265 PED DIRE  580 163 78 7, 350 205 2	1, 636, 064 ECTLY TO 675 3, 741 17, 875 1, 322, 138 1, 701 60 41, 217	5, 760, 025 SMELTE 653 6, 105 6, 105 388 6, 025 4	85, 481, 357 RS 876 5, 486 395, 160 538, 999 19, 070 2, 330 821, 785	7, 42 1, 92
ORES, E  Ory gold  Dry gold-silver  Dry silver  Copper-lead  Copper-lead-zinc  Lead:  Crude ore  Cleanings  Mill cleanings  Old slag	TC., SHIPI	26, 265 PED DIRE  580 163 78 7, 350	1, 636, 064  ECTLY TO  675 3, 741 17, 875 1, 322, 138 1, 701 60 41, 217 32 1, 623 3, 758 1, 758	5,760,025  SMELTE:  653  6,105 6,105 888 6,025 4 891  715	876 5, 486 395, 160 538, 999 19, 070 2, 330 821, 785 20, 245 54, 645 12, 210	7, 42 1, 92 15, 60
ORES, E  Ory gold  Dry gold-silver  Dry silver  Copper  Copper-lead  Copper-lead-zinc  Lead:  Crude ore  Cleanings  Mill cleanings  Old slag  Lead-zinc	TC., SHIPI	26, 265 PED DIRE  580 163 78 7, 350	1, 636, 064  ECTLY TO  675 3, 741 17, 875 1, 322, 138 1, 701 60 41, 217 32 1, 623 1, 623 3, 758	5, 760, 025  SMELTE  653  4, 107, 230 6, 105 388 6, 025 4 891	85, 481, 357 RS 876 5, 486 395, 160 538, 999 19, 070 2, 330 821, 785 155 20, 245 54, 645	7, 42 1, 92 15, 60
ORES, E  Dry gold Dry gold-silver Dry silver Copper-lead Copper-lead Copper-lead Crude ore Cleanings Mill cleanings	TC., SHIPI  207 180 4, 663 67, 428 77 6 3,554 44 2, 072 15	26, 265 PED DIRE  580 163 78 7, 350	1, 636, 064  ECTLY TO  675 3, 741 17, 875 1, 322, 138 1, 701 60 41, 217 32 1, 623 3, 758 1, 758	5,760,025  SMELTE:  653  6,105 6,105 888 6,025 4 891  715	876 5, 486 395, 160 538, 999 19, 070 2, 330 821, 785 20, 245 54, 645 12, 210	83, 165, 91 7, 42

Even though the Government contract to purchase the company molybdenum output not sold to industry continued, only commercial demand was supplied, and no excess production was available for offer to the Government. In fact, during the last half of the year, the Government permitted diversion to industry of the concentrate produced from the 5,000 tons per day of so-called low-grade ores, which was under contract for Government purchase. These facts illustrate sharply the extraordinary increase in apparent molybdenum consumption throughout the world.

Silver.—Except for the Rico Argentine, all former major silverproducing mines in Colorado showed substantial declines in silver This would account for the 19-percent drop in silver output in 1955. output in 1955, compared with 1954. The Eagle mine was by far the State's leading silver producer; it was followed by the Treasury Tunnel-Black Bear group of mines. In third place was the Keystone mine, a new producer in 1955. Other substantial silver-producing mines following the Keystone in order of output were Rico Argentine, Commodore-Amethyst group, Resurrection, and Camp Bird.

Tin.—The Climax Molybdenum Co. recovered a small quantity of tin concentrate as a byproduct from the treatment of molybdenum

ore in 1955.

TABLE 12.—Mine production of gold,	ld, si	ver, c	opper, l	sad, ar	ıd zinc	in 195	5, by c	ounties	silver, copper, lead, and zinc in 1955, by counties and districts,	ricts, in te	rms of re	in terms of recoverable	metals
County and district	proc	Mines producing	Material sold or treated 1	Gold	Gold (fine ounces)	nces)	Silver	er (fine ounces)	unces)	Copper (pounds)	Lead (pounds)	spunod)	Total value
	Lode	Placer	(short tons)	Lode	Placer	Total	Lode	Placer	Total			in and a second	
Adams County Boulder County?	2	21	2, 137	\$ 204	1, 290	1, 290 8 232	8 45, 677	186	186 145,680	16,000	178,000		\$45,318 81,953
Ohalk Creek.	<b>→</b> ∞	1 1	223	1		1	591 388		388		11,800		2, 109
,	ଷଷଷ		3,001 125 4,030	73 1 594		73 1 594	3, 518 1, 377 4, 937		3, 518 1, 377 4, 937	6,000	78,600 4,300 70,100	11,600	19, 688 2, 008 39, 778
Montana and Trail Oreas of Freeland Custer County 2. Dolores County: Pioneer.			2, 989 35, 374	22 156		23 73 156	13,359 1,927 114,392		13, 359 1, 927 114, 392	8,000 10,000	45,000 22,000 4,404,000	24,000 5,142,000	19, 900 13, 513 1, 401, 383
Gypsum.  Gypsum.  Break Country:			10 295, 759	8, 416		8, 416	6 1, 613, 090		1, 613, 090	2, 600 4, 491, 400	6, 342, 000	42, 644, 000	975 9, 619, 950
Fremon County: Cotopaxi Hillside		1 1	28.4						16	1,600	8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		611 898
Gilpin County: Southern	949-	1	33, 883 83, 883	479 51	9	51	18, 500 153, 513 86	-	18, 501 153, 513	8,000 344,000	1, 480, 000 4, 000	34,000 2,314,000	80,817 774,176
Jefferson County Lake County: California	13	e	57,269	5, 149	394	394	98, 153	22	98, 155	52,000	2,808,000	3, 242, 000	
La Plata County: California. Miheral County: Creede. Montearina County: California		1 1 1 1 1 1 1 1 1 1	28, 596 28, 596	1,025 195		1,025	1, 167 135, 640 94		1, 167 135, 640 94	36,000	2, 384, 000		15,966 710,550
Ouray County: Red Mountain Sneffels			27	3.266		3 266	110		110	341 400	9,800	4,800	2,374
Park County: Alma Placers-Fairplay		ī	- 1		7	7		63			one from t	202 6020	247
Buckskin Consolidated Montgomery Freshwater			358	19		19	317 57		317 57 74	1, 300 300 300 300	1, 600	4,000	1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1
			 	60		က	197		197	100	3,500 2,000		842 414
Rio Grande County: Summitville and Decatur. Saguache County: Kerber Creek	<b></b> ∞		546	82		82	3, 101		3, 101	6,000	112,000	54,000	984 28. 795

San Juan County													
Animas Eureka. San Miguel County: Lower and Upper San	44	1 1	9, 322 1, 086	372 83		372	32, 206 3, 623		32, 206 3, 623	70, 200	852, 800 85, 200	423, 600 68, 400	247, 523 30, 201
Miguel 4. Summit County:	41		274, 782	18, 987		18, 987	453, 745	1	453, 745	3, 214, 000	10, 196, 000	13, 064, 000	5, 400, 105
Green Mountain	811	2	5, 786	11	55	132	14, 119	. 1	14, 129	13, 500	948, 900	1, 230, 600	315, 193
Ten National Ten William	~ m		228 888 88	ლ ფ		ოფ	1,084		1,084	900	73, 500	17,600	6, 604
Teller County: Oripple Creek	13		100, 548	47, 171		47, 1	707		707	100	1, 900	9,800	3, 852 995 1 887 200
Total Colorado	120	14	908, 416	86, 781	1, 796	88, 577	2, 771, 799	274	2, 772, 073	8, 646, 000	31, 610, 000	70, 700, 000	22, 240, 009

Does not include gravel washed.
 Boulder County: Includes Central (Jamestown), Grand Island, and Ward districts. Custer County: Includes Hardscrabble, Lake Creek, and Rosita Hills districts.
 Bounder County: Includes Elk Mountain, Rock Creek, Taylor Park (Tin Cup), and Tomichi districts. Bureau of Mines not at liberty to show production figures separately by Includes amounts recovered from gold-silver-copper-lead concentrate produced as byproduct of beneficiation of fluorspar at 1 plant.
 Bureau of Mines not at liberty to show production figures separately by district.

Tungsten.—Production of tungsten (concentrate; 60 percent WO<sub>3</sub> equivalent) in Colorado in 1955 increased 24 percent in quantity and 19 percent in value compared with 1954. Most of it was recovered as a byproduct from the Climax Molybdenum Co. milling operation in Lake County. According to the company report, output in 1955 increased 33 percent because of a slightly higher tungsten content in the tailings treated, a modest improvement in metallurgical recoveries, and a greater tonnage of mill feed.

At least 66 individual mining operations produced tungsten ore in Boulder County in 1955 compared with 88 in 1954. Boulder and Lake were the 2 major tungsten-producing counties in the State; but small quantities were produced by 1 operation each in Chaffee, Park,

and San Juan Counties and 4 operations in Gilpin County.

The Cold Spring Tungsten, Inc., second largest producer of tungsten in the State and largest producer in Boulder County, continued to operate the Hetzer mill on custom ore and on ore from its mine. The Tungsten Refining, Inc., and Wah Chang Corp. custom mills were operated throughout the year on ore produced by individual small producers in Boulder County.

Three tungsten-exploration projects, financed jointly by the Government and private capital under DMEA contracts totaling

\$93,500, were started in Colorado in 1955.

TABLE 13.—Shipments of tungsten concentrate (60-percent  $WO_3$ ), 1946-50 (average), 1951-55, and total 1900-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average) 1951 1952 1953	182 336 625 817	\$276, 343 1, 092, 780 2, 354, 664 2, 902, 490	1954 1955 1900-55	927 1, 152 29, 109	\$3, 420, 563 4, 079, 341 1 38, 058, 304

<sup>1</sup> Value estimated for some years.

Uranium.—The mining of uranium ores continued to center in Montrose, San Miguel, and Mesa Counties, although prospecting, exploration, and shipments were reported from an increasing number of areas outside these counties. Properties listed as active by the State commissioner of mines numbered 307, of which 248 were in the 3 major counties and 59 in 17 other counties. Not all listed properties shipped ore, however, as some were only in the exploration and development stages.

Ore was delivered to mills and buying stations by 209 operators. The number of operators is not directly comparable with the number

of producing properties.

Drilling totaled 1 million feet and represented approximately half of the exploration and development effort expended in Colorado during the year. Major areas of drilling activity were in San Miguel, Mont-

rose, Mesa, Moffat, Saguache, and Pueblo Counties.

Uranium ore was processed at five mills in Garfield, Mesa, Montrose, and La Plata Counties and was supplied primarily from Colorado, Utah, and Arizona. At two of the plants (Naturita and Grand Junction) expansions were completed, and at Uravan construction was begun to increase plant capacity.

DMEA approved 14 loans during 1955 for uranium exploration within the State, for a total of \$308,150 (Government participation was 75 percent of the total). The corresponding data for 1954 were 6 contracts for \$232,770.

Vanadium.—Vanadium was mined as a coproduct of uranium, and the major source areas in Colorado were the carnotite deposits of Montrose, San Miguel, and Mesa Counties. All of the five uraniumprocessing plants in the State recovered vanadium as well as uranium.

Beginning with 1955, production of vanadium is reported in terms of recoverable metal. In previous years production had been reported in terms of contained metal. Reference should be made to volume I of the Minerals Yearbook for a more complete discussion of the change

and a recapitulation of data on the new reporting basis.

Zinc.—The quantity of zinc produced in Colorado in 1955 was virtually the same as 1954, but the value of output increased 15 percent as a result of the advance in the price. The leading zinc-producing mines, in order of rank, were Eagle (The New Jersey Zinc Co.), Treasury Tunnel-Black Bear (Idarado Mining Co.), Rico Argentine (Rico Argentine Mining Co.), and Resurrection Mining Co.). The Keystone mine of the American Smelting and Refining Co., a new producing mine in 1955, also had a substantial zinc output.

**NONMETALS** 

Cement.—The demand for cement in Colorado continued to grow in 1955; and following the upward trend of the general building boom in the Rocky Mountain area, total shipments increased 18 percent over 1954. The three cement plants at Portland (wet and dry facilities) and Boettcher (dry process) operated at optimum capacity throughout 1955, producing types I, II, III, oil-well, water-proof, and masonry cements, the bulk of which was shipped by truck. Limestone, clay, gypsum, and sandstone used in manufacturing cement was mined by Ideal Cement Co. and local contractors. Other raw materials were purchased locally or imported from other States as required. The manufacturing facilities consumed 89.6 million kw.-hr. of electrical energy in 1955, and 9 kilns were in operation during the year. In addition to the cement consumed in Colorado, portland, masonry, and other specialized cements were shipped to points in Arizona, Kansas, Nebraska, New Mexico, Oklahoma, Texas, Utah, and Wyoming.

Clays.—Output of all types of clays in Colorado was 464,000 tons in 1955. Due to a change in reporting procedure, the 1955 tonnage cannot be compared with the 855,000 tons reported in 1954. Mining operations in 1955 were conducted at 41 underground and open-pit mines compared with 43 in 1954 (exclusive of cement-clay mines). During 1955 output of all classes of clay except bentonite increased, but the largest percentage gain was in the miscellaneous group. Clays were mined in 11 counties, and the larger producing counties were Jefferson, Boulder, Pueblo, Douglas, and Fremont. Fire-clay production in 1955 remained at the same relative level as in 1954, whereas bentonite dropped from 600 tons in 1954 to 200 in 1955 owing to cessation of mining operations by the Colo-Tex Mining & Engineering Co. in Bent County. The use of fire clay in manufac-

turing building brick and other structural-clay products accounted for 69 percent of the total fire-clay production, followed by the consumption of fire clay in manufacturing firebrick, fire-clay mortar, clay crucibles, zinc retorts and condensers, and foundry molds. Building brick and heavy clay products composed all but a small quantity of miscellaneous-clay output; the exception was consumption of 500 tons in the manufacture of architectural terra cotta.

TABLE 14.—Production of clays, 1954-55, by counties

County	19	54	195	i5
	Short tons	Value	Short tons	Value
Bent.  Boulder.  Delta.  Douglas.  El Paso.  Fremont.  Huerfano.  Jefferson.  Larimer.  Las Animas.  Mesa.  Pueblo.  Other counties.	528 44, 983 8, 393 2 306, 743 6, 270 221, 440 2 130, 274 (1) 4, 551	(1) \$37, 500 \$28, 639 \$28, 639 \$197, 185 \$32, 918 \$377, 545 \$53, 803 \$(1) \$4, 551 \$148, 278 \$29, 076	207 101, 624 831 58, 794 17, 891 18, 807 7, 969 168, 419 7, 082 4, 500 78, 107	\$931 177, 842 1, 454 159, 362 61, 060 41, 837 382, 077 15, 934 7, 875 205, 547
Total	854, 791	1, 002, 873	464, 231	1, 117, 901

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosing individual company confidential data; included with "Other counties."

<sup>2</sup> Including clay used in cement manufacture. <sup>3</sup> Bent, Denver, and Las Animas.

Mining in 1955 was carried on by 30 companies or individuals. Of the 464,000 tons of clays produced, 204,000 tons was sold by producers and 260,000 tons used by producers. Among the largest mine operators of fire-clay deposits were George W. Parfet Estate, Inc., and H. M. Rubey Clay Co. in Jefferson County, Pueblo Clay Products Co. in Pueblo County, and S. A. Whisenhunt, Robinson Brick & Tile Co., and Wm. H. Hedley in Douglas County; the largest producers of miscellaneous clay included Colorado Brick Co. in Boulder County, Robinson Brick & Tile Co. in El Paso and Jefferson Counties, Lakewood Brick & Tile Co. in Jefferson County, and Summit Pressed Brick & Tile Co. in Pueblo County.

The price of raw clay is based on the type, quantity, and geographical location. The average mine price reported to the Federal Bureau of Mines for fire clay in 1955 was \$2.82 a ton, and \$1.88 a ton

for miscellaneous clay.

Feldspar.—The output of crude potash and soda feldspar in Colorado during 1955 continued to expand, along with an increased demand for ground feldspar in glass and pottery manufacture. Another price increase for crude and ground feldspar, following one in 1954, was reported during the year and was a major factor in the sustained high level of mine output. Chaffee County produced the largest quantity, followed by Jefferson, Fremont, Clear Creek, and Park. The mines were worked by open-pit methods, and crude feldspar was shipped to two grinding plants in the State. The M & S, Inc., operated its Homestake mine in the Ute Trail district of Chaffee County and was the largest individual shipper. A grinding

plant at Salida operated by the Western Feldspar Milling Co. processed ore from the Homestake mine. The Denver plant of International Minerals & Chemical Corp. operated during the year, using purchased mill feed.

Fluorspar.—Production and sales of Acid-grade fluorspar concentrate dropped below the \$3 million mark in 1955, despite the strong demand for this commodity; competition with lower priced material produced from foreign sources was a primary reason for this decline.

TABLE 15.—Shipments of fluorspar, 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	26, 641	\$825, 070	1953	53, 276	\$2, 872, 360
1951	20, 661	820, 322	1954	59, 197	3, 197, 252
1952	29, 185	1, 505, 968	1955	(¹)	(1)

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosing individual company confidential data.

The relative importance of the major producers, in terms of tonnages, remained virtually the same as in past years. Decreased output was reported at all mines—the Northgate mines, Jackson County, of Ozark-Mahoning Co. declining the most. Reynolds Mining Corp. discontinued operation of its Poncha Springs property, and the Argo, Blue Jay, and Spartan No. 5 mines of Ozark-Mahoning Co. were idle throughout 1955. The latter company reported mining activity at its Emmett and Afterthought mines in Boulder County, and General Chemical Division, Allied Chemical & Dye Corp., reported activity at its Burlington properties, also in Boulder County. A small quantity of metallurgical-grade fluorspar was sold to a plant in Denver by Warren Prosser, Boulder County, and Eugene Kleinknecht, Park County.

Flotation concentrate was produced at the Jamestown mill of Ozark-Mahoning Co. and the Valmont plant of General Chemical. Shipments of finished concentrate were divided nearly evenly between hydrofluoric-acid manufacturers and the GSA stockpile.

Gem Stones.—In 1955 the Federal Bureau of Mines expanded its statistical canvass on gem and ornamental stones to include all collectors, mineralogical societies, and dealers. The value of production in Colorado was reported at \$48,000 and includes turquois, aquamarine, agate, beryl, topaz, rose quartz, amethyst, tourmaline, phenacite, rhodonite, and jasper. Production was reported in 14 of the 63 counties in the State. Saguache County led important producers in terms of value, with turquois as the major gem stone. San Miguel County ranked second, followed by Kiowa, Chaffee, and Teller Counties.

Gypsum.—Coupled with the general upswing in building construction in Colorado, gypsum production and consumption in building-construction products continued to grow. Mine output in 1955 again was concentrated in Fremont and Larimer Counties. Cement and soil conditioners represented the bulk of the local demand for crude gypsum, whereas a large tonnage was transported out-of-State and used in manufacturing gypsum building products.

The decision of Pabco Products, Inc., to build a gypsum wallboard

plant near Florence, Fremont County, was an important advance for the industry, as well as for the economy of the region, during 1955. Ground-breaking ceremonies took place in July; the new plant, to cost approximately \$2.5 million, will occupy a 47-acre site 4 miles east of Florence at Adobe Siding. Production will begin in July 1956, and gypsum deposits at Coaldale will suppy the new plant with raw material which will be used to produce wallboard, sheathing, lath, and plaster.

Lithium.—No output of lithium was reported during 1955, and the Brown Derby pegmatite, Gunnison County, active in 1954, was

idle throughout the year.

Mica.—Notwithstanding a steady demand for good-quality ground mica by roofing and oil-well-drilling industries, the production of crude scrap mica in Colorado continued to drop in 1955. The micagrinding plants at Pueblo and Arvada experienced some difficulty in securing an adequate feed for their grinding facilities, which can be attributed to increasing mining costs with a relatively stable mica purchase price.

Fremont was the largest producing county, with output reported by five major operators. Larimer, Jefferson, Clear Creek, and Chaffee Counties, in that order, were the next most important. Because of the erratic nature of mining pegmatites containing good-quality mica, no one operation reporting productive activity sold more than 300 tons

during the year.

Perlite.—The Rosita mine, Custer County, of the Great Lakes Carbon Corp. remained the only source of crude perlite in Colorado in 1955. The steady demand for expanded perlite in aggregates and oil-well-drilling mud resulted in a 55-percent increase in sales in 1955, compared with 1954. The Denver plant of Persolite Products, Inc., continued to be the only expanding plant in the State, and the expanded perlite produced was used in plaster and concrete aggregate.

Pumice.—Sales of pumicite and scoria in Colorado for use in concrete aggregate dropped to 71,000 tons in 1955, a moderate decrease from 1954. Production was reported by Colorado Aggregate Co., Inc., in Costilla County and McCoy Aggregates Co. in Routt County; the same operators who reported activity in 1954. The decline in sales resulted from a decrease in the demand for concrete aggregate containing pumicite and for scoria and competition from substitute materials.

Pyrites.—Coupled with the growth of demand for sulfuric-acid production, sales of pyrites in Colorado continued to increase in 1955. The bulk of the output was produced by Climax Molybdenum Co. in Lake County from the treatment of pyrite-bearing concentrate at the company byproducts plant. Pyrite concentrate was shipped to the Denver sulfuric-acid plant of Allied Chemical & Dye Corp. In addition to sales of pyrite to uranium processors, large quantities of pyrite-rich tailing were treated by the Rico Argentine Mining Co. at its beneficiation plant at Rico. The upgraded tailing was consumed at the company sulfuric-acid plant placed in operation late in 1955.

Salt.—For the first time in a number of years, the production of salt in brine was reported in Colorado during 1955. The Union Carbide Nuclear Co. produced a significant quantity of brine from a

well in Montrose County for use in processing uranium ores.

Sand and Gravel.—Output of sand and gravel reported by commercial and Government-and-contractor producers in Colorado in 1955 dropped to 12.9 million tons compared with 13.5 million tons in 1954—a 5-percent decrease. Because the bulk of the output was used in highway construction, small increases or decreases in production can be expected. In 1955, 4.7 million tons was classified as commercial production and 8.2 million tons as Government-and-contractor production. This compares with 3.8 and 9.7 million tons, respectively, in 1954.

Government-and-contractor production was reported in 49 counties and commercial output in 19 counties; sand and gravel was produced in 49 of Colorado's 63 counties. Adams County, with a reported production of 2.1 million tons, was the leading producer, followed by Pueblo, Arapahoe, Jefferson, Delta, El Paso, Boulder, Mesa, Yuma, Routt, Logan, and La Plata Counties, all of which produced 400,000

tons or more of sand and gravel.

Two-thirds of the total sales in 1955 was Government-and-contractor material used by Federal, State, and county agencies on highway and municipal road projects. Of the 4.7 million tons of commercial sand and gravel produced, 92 percent was washed, screened, or otherwise prepared. The leading producing companies included Cooley Gravel Co., Brannan Sand & Gravel Co., Western Paving

Construction Co., and Fountain Sand & Gravel Co.

Stone.—Output of all types of stone produced in Colorado during 1955 rose to 2.1 million tons, a 19-percent advance over 1954. creased production was reported for crushed limestone, which composed 93 percent of the total output, as well as dimension granite and sandstone and crushed sandstone and miscellaneous stone. Slight decreases were noted in the quarrying of crushed granite and dimension marble, whereas a few tons of crushed marble was produced in 1955 compared with none in 1954. The bulk of the total stone tonnage in 1955 was used in manufacturing cement. The next largest use was as a flux, followed by use as concrete aggregate, as a refractory, as riprap, in sugar refining, as a filler, and as rock dust for coal mines. Sandstone accounted for the major proportion of the dimension stone produced; flagging and rough and dressed building stone were the most important uses. The reason for the drop in sales of commercial dimension stone can be attributed to the decrease in use of these materials in building construction. On the other hand, production of commercial and Government-and-contractor crushed stone in 1955 increased owing to the nature of end uses. is used in road construction; and, as the need for crushed stone varies, production, as well as the types of stone quarried and used, will tend to differ from year to year.

The leading producers of limestone were Ideal Cement Co., Fremont and Larimer Counties; Colorado Fuel & Iron Corp., Chaffee and Fremont Counties; Frank H. Norberg Co., Fremont, Garfield, and Larimer Counties; and Golden Cycle Corp., El Paso County.

Vermiculite.—Western Mineral Products Co. continued to operate its exfoliated vermiculite plant at Denver, processing crude material received from Montana mines. The finished product was used as loose-fill insulation, lightweight plaster, and concrete aggregate.

## MINERAL FUELS

Carbon Dioxide.—Carbon dioxide was produced from wells in the McCallum-North field, Jackson County; the Nina View field, Las Animas County; and the McElmo field, Montezuma County. The

Nina View field was new in 1955.

Coal.—Output of coal from 110 underground and 7 strip mines in Colorado was 3.6 million tons, a substantial improvement over the previous year's low of 2.9 million tons. Coal, whose 1955 output was valued at \$20.1 million, was Colorado's third most valuable mineral following petroleum and molybdenum. The industry employed 2,600 men (excluding office workers) for 195 days.

Increased demand for coking coal in Colorado, Utah, and California was responsible for half of the increased production in 1955. Exports of coking coal to Utah continued to increase and amounted to 224,441 tons. Total coal shipped to coke ovens from Colorado was 1.49 million tons compared with 1.12 million tons the previous

year.

Major coal-producing counties were Las Animas, Weld, and Routt. Strip operations supplied 10 percent of the total production; 4 of them were in Routt County and 1 each in El Paso, Fremont, and Jackson Counties. Productivity for the stripping operations averaged 24.3 tons per man-day compared with 6.4 tons per man-day in underground mines.

TABLE 16.—Production of coal, 1954-55, by counties (exclusive of mines producing less than 1,000 tons)

							1.12			
	1954	ŀ	1955				1954		1955	
County	Produc- tion (short tons)	Aver- age value per ton 1	Produc- tion (short tons)	Average value per ton 1	County	Produc- tion (short tons)	Average value per ton 1	Produc- tion (short tons)	Average value per ton 1	
Boulder Delta El Paso Fremont Garfield Gunnison Huerfano Jackson La Plata Las Animas	33, 321 42, 644 (2) 178, 876 29, 800 266, 733 55, 979 (2) 40, 446 (2)	\$6. 07 5. 61 (2) 4. 09 6. 44 5. 27 5. 74 (2) 5. 05 (2)	24, 406 52, 288 73, 384 216, 119 33, 750 326, 173 63, 903 1, 329 54, 728 1, 317, 403	\$6. 42 5. 68 4. 73 3. 86 5. 12 5. 24 5. 82 3. 99 3. 98 7. 11	Mesa	36, 794 (2) (2) (2) 18, 538 444, 233 626, 904 1, 125, 523 2, 899, 791	\$5. 98 (2) (2) (2) 4. 57 4. 36 4. 20 7. 03 5. 54	48, 363 100, 554 1, 108 3, 220 91, 909 20, 046 525, 039 614, 208	\$5. 18 5. 38 3. 98 5. 44 7. 65 5. 86 4. 40 4. 36	

<sup>&</sup>lt;sup>1</sup> 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.
<sup>2</sup> Figure withheld to avoid disclosing individual company confidential data; included in "Other counties."

Colle

Coal from mines in Routt County was shipped overseas to South Korea.

Natural Gas.—Marketed production of natural gas from Colorado fields rose to 49 billion cubic feet in 1955. Major areas of production were the Weber pool of the Rangely field, Rio Blanco County; Barker Dome and Ignacio fields, La Plata County; and Adena field, Morgan County; plus other fields in Logan and Moffat Counties.

Continued intensive drilling for petroleum in the Denver-Julesburg Basin led to discovery of new gasfields as well as oil. Of the 23 gas discoveries reported for the year, 18 were in the Denver-Julesburg Basin area. Drilling in the western part of the State was stimulated by promise of a market through the Pacific Northwest Pipeline, and four of the remaining gas discoveries were in Mesa, Moffat, and Rio Blanco Counties. Following the 1954 extension of the Greenwood field into Colorado, further drilling in the area was carried out, resulting in discovery of the South Greenwood field in Baca County. Development drilling in La Plata County resulted in extension and connection of the Bondad and Ignacio fields.

Colorado Interstate Gas Co. completed a gathering system. The new pipeline fed gas from the Adena, Little Beaver, and other fields of the same general area to the main line supplying gas to Denver

from the Hugoton field in Kansas.

Natural-Gas Liquids.—Production of natural-gas liquids climbed 93 percent in 1955 compared with the previous year as the effect of new plants was felt. During the latter part of 1954 and in 1955, six natural-gasoline and cycling plants were completed and placed in operation.

At the beginning of 1954 capacity to produce natural-gas liquids in Colorado was 105,000 gallons a day. At the end of 1955 this capacity was 470,000 gallons a day. Three of the new plants were in Logan County, 2 in Morgan County, and 1 in Moffat County.

Petroleum.—Crude-petroleum production rose again in 1955 as Denver-Julesburg Basin activity continued at a high pace and production from the Rangely field was increased.

TABLE 17.—Production of crude petroleum, 1954-55, by counties, in 42-gallon barrels 1

County	1954	1955	Principal fields in 1955 in order of production
Adams Archuleta Bent Boulder Elbert Fremont Jackson Jefferson La Plata Larimer Logan Moffat Montezuma Morgan Rio Blanco Routt Washington Weld	2,000 31,000 130,000 114,000 114,000 8,103,000 1,001,000 1,000 5,108,000 25,429,000 45,000 3,411,000	179,000 4,000 2,000 (2) 31,000 278,000 8,000 9,000 130,000 9,021,000	Badger Creek, Middlemist, Badger Creek West. Price Gramps, Chromo. Bent's Fort. Boulder. Bradbury. Florence-Canon City. McCallum-North, Battleship, McCallum. Soda Lakes. Barker Dome, Red Mesa. Wellington, Fort Collins, Clark Lake. Graylin-Northwest, Cliff, Yenter. Powder Wash, Iles, Hiawatha. Dove Creek. Adena, Sand River, Jackpot. Rangely, Wilson Creek. Tow Creek, Oak Creek. Little Beaver, Bobcat, Big Beaver. Black Hollow, Battle Canyon, Roggen-South west.
Total	46, 206, 000	52, 653, 000	
A verage price per barrel	\$2.77	\$2.75	

Distribution by counties effected by adjusting Colorado Oil & Gas Commission data to Bureau o Mines total.
Less than 500 barrels.

TABLE 18.—Production of crude petroleum, 1951-55, by fields, in thousand barrels

Field <sup>1</sup>	1951	1952	1953	1954	1955
Adena			24	4, 626	6,015
Badger Creek-West			455	1,033 137	747 825
Big Beaver Black Hollow			56	500 496	783 1, 200
Bobeat				416	820 677
Divide	53	114	364 157	1, 996 782	1, 588 674
Lewis Creek	239	50 578	2, 539 1, 125	2, 687 892	2, 089 1, 024
Mount Hope-East and NorthPlum Bush Creek	22, 091	22, 443	22,900	22, 780	665 23, 901
Rangely Sand River	2,795	2, 851	2,854	187 2, 640	560 2, 440
Wilson CreekYenter	420 2, 225	962 3,383	1, 503 4, 425	1, 120 5, 912	904 7, 741
Other 2	27, 823	30, 381	36, 402	46, 206	52, 65

Figures by fields supplemented from Rocky Mountain Oil and Gas Operations for 1955.
 Includes crude oil consumed on leases and net change in stocks held on leases for entire State.

Exploration and development drilling was concentrated in Washington, Logan, and Morgan Counties, followed by Weld and Adams Counties. A total of 8 million feet was drilled in 1,500 holes throughout the State, with wildcat drilling exceeding development drilling by 16 percent. Of this total, 85 percent was carried out in the Denver-Julesburg Basin.

Discoveries of note outside the basin area were the Bent's Fort field on the Las Animas Arch in Bent County and development of oil in the Thornburg field, Moffat County, as a result of increasing gas-development drilling stimulated by the Pacific Northwest Pipeline.

The Colorado Oil & Gas Commission, Pure Oil Co., and other interested operators were making studies in December on a proposal to place the Adena field in Morgan County under unit operation.

Seven petroleum refineries operated throughout the year—5 in Denver and 1 each at Alamosa in Alamosa County and at Rangely

in Rio Blanco County.

Shale Oil.—Experimental work by the Federal Bureau of Mines on the mining and retorting of oil shale was carried out at Rifle until midyear, when the operation was partly curtailed for lack of funds. A complete report of activities is to be found in the annual report

of the Secretary of the Interior on synthetic fuels.4

One result of the mining experiments was to show the superiority of rotary drilling over percussion drilling as applied to oil shale. The rotary method was proved to give greater penetration per unit time, increased efficiency for longer holes, and lower materials and power costs.<sup>5</sup> The faster rate of penetration in itself results in significantly lower labor and capital costs per ton of shale mined.

The Union Oil Co. of California began work on an oil-shale pilot plant at its property at Parachute Creek. The retort, although small and still experimental, was considerably larger than the labora-

<sup>&</sup>lt;sup>4</sup> Bureau of Mines, Synthetic Liquid Fuels: Annual Report of the Secretary of the Interior for 1955, part II, Oil from Oil Shale: Bureau of Mines Rept. of Investigations 5237, 1956, 80 pp.
<sup>5</sup> East, J. H., Jr., and Rose, C. K., Oil-Shale Mining Program Does Two Jobs: Min. Eng., vol. 7, No. 10, October 1955, pp. 925–929.

tory models with which the company has been working for several

years in California.

At Haystack Mountain, Sinclair Research Laboratories, Inc., continued, on a larger scale, experiments on underground in-place combustion and distillation of oil shale.

TABLE 19.—Wildcat and development completions in 1955, by counties
[Oil and Gas Journal]

County	Oil	Gas	Dry	Total	County	Oil	Gas	Dry	Total
Wildcat completions					Wildcat completions—	-			<del> </del>
		1			Continued	1		1	
Adams	. 5		54	59	Continued				1
Arapahoe	.	.1	21	21	San Miguel	1	1		
				5	Sedowick			- 1	1 4
Bent	1 1	1	9	4	Sedgwick Washington	10		- 5	5
Boulder	_		ĭ	ì	Weld	10	7		187
Cheyenne	1	1	î	1	Vume	0	3		87
Crowley			1 1	1 1	Yuma			30	30
Delta	1		î	i	Total wildcats				
Dolores		1 1	i	i	10tal windcats	54	23	734	811
1 1011019.8	1	1 :	-	1 1	Domalo				
Eagle			i	1	Development completions	l	1		
EagleElbert			7	8	Adams				
El Paso	1		12	12	Adams	19	1	23	43
CHATTIELL	1	1	9	3	Archuleta			. 2	2
Grand Huerfano			2	2	Baca		2		2
Huerfano			í	i	Bent			. 1	1
Tackson			4	4	Elbert			. 1	1
Jackson Jefferson			2		Garfield Jackson			1	1
Kiowa	1 1	[	2	3 2	Jackson	3		1	4
Kit Carson			6		Jenerson		1 1	1	1
La Plata			1	6	La Plata		25	7	32
Larimer				1	Larimer	1			1
Las Animos	2		2	4	Logan	112	9	71	192
Las Animas			9	. 9	Mesa		1		1
Lincoln			14	14	Мопат	2	6	8	16
Logan Mesa	7	5	127	139	Montezuma		1		1
Magat	2	1	8	11	Morgan	42	. 5	56	103
Moffat	1	2	4	7	Rio Blanco	2	5	8	15
Montezuma	1		3	4	Sedgwick			2	2
Montrose			3	3	Washington	138	5	79	222
Morgan	12	2	136	150	Weld	29	1	28	58
Phillips		1	5	6					
Prowers			2	2	Total develop-			1	100
Pueblo			1	1	ment	348	61	289	698
Rio Blanco		1	11	12					
Saguache			1	1.	Total all drilling	402	84	1,023	1,509
		1						ı-, - <b>-</b> -	-, 000

## **REVIEW BY COUNTIES**

Adams.—Adams County's mineral output gained substantially in 1955, owing mainly to increased production of sand and gravel.

In spite of more intensive drilling and a larger number of producing fields, output of petroleum declined because of reduced production from the Badger Creek field, from which came over half of the county's oil.

Five fields discovered and producing for the first time in 1955 were the Beacon, Busy Bee, Cabin Creek, Muddy Creek, and Windy

Hill.

The gravel bars of Clear Creek in Adams County northwest of Denver were the major source of sand and gravel in the State. The county ranked first in the State as a producer of structural and paving sand and gravel, and 11 sand-and-gravel and 2 sand plants were active during 1955. The larger producers were Western Paving Construction Co., Brannan Sand & Gravel Co., Cooley Gravel Co., and Strauss Sand & Gravel Co.

Gold and silver were recovered as byproducts at some sand-and-gravel washing and screening plants. Most of the output was by Kerkling & Slensker (partnership) from sluice boxes at the stationary plants of Brannan Sand & Gravel Co. (pits 8 and 10), Superior Sand & Gravel Co., and F. S. Rizzuto. The Cooley Gravel Co. recovered placer gold, using sluice boxes on the floating washing plant (fed by dragline) at the North Plant pit.

TABLE 20.—Value of mineral production in Colorado, 1954-55, by counties 12

County	1954	1955	Minerals produced in 1955 in order of value
Adams	\$4, 936, 143	\$5, 179, 207	Petroleum, sand and gravel, gold, silver.
lamosa	74, 775	56, 526	Sand and gravel.
tramosa	485, 025	714, 582	Do.
rapahoe	607, 552	550, 442	Petroleum, sand and gravel.
rchuleta	49 991	33, 166	Sand and gravel.
Baca	43, 331		Sand and gravel, petroleum, clays.
Bent	5, 459	28, 574	Sand and graver, perforeding clays.
Boulder	2, 791, 510	3, 193, 451	Tungsten, fluorspar, sand and gravel, stone clays, coal, silver, lead, gold, copper, petroleum, beryl.
Chaffee	1, 380, 763	988, 339	Stone, feldspar, sand and gravel, gem stones lead, silver, beryl, tungsten, mica, gold.
Cheyenne	13, 725		
Clear Creek	108, 802	109, 980	Lead, gold, sand and gravel, silver, stone copper, zinc, feldspar, mica, beryl, columbite tantalite.
a l	53, 549	21, 474	Sand and gravel.
Conejos	00, 049	87, 005	Pumice and pumicite.
Costilla	93, 201		Cond and grantal
Crowley	7, 898	849	Sand and gravel.
Ouster	483, 376	727, 863	Perlite, sand and gravel, lead, copper, zingold, silver. Coal, sand and gravel, clays.
Delta	363, 254	592, 364	Cond and gravel, Clays.
Denver	1, 119, 083	111, 611	Sand and gravel.
Dolores	1, 358, 309	1, 409, 772	Lead, zinc, silver, pyrites, gold, copper.
DouglasEagle	136, 456	243, 489	Clays, sand and gravel, gem stones.
Ragia	8, 406, 234	9, 651, 425	Zinc, copper, silver, lead, gold, sand and grave
Elbert	13, 708	24,744	Sand and gravel, petroleum.
El Paso	970, 544	1, 073, 474	Sand and gravel, coal, stone, clays, gem stone
	8, 594, 960	11, 524, 720	Cement, stone, gypsum, petroleum, clay
Fremont	0, 094, 900	11, 024, 120	Cement, stone, gypsum, petroleum, clay feldspar, sand and gravel, mica, columbit tantalite, beryl.
Comeold	418 016	297, 477	Coal, sand and gravel, stone.
Garfield	418, 916 31, 783	81, 453	Lead, gold, silver, zinc, copper, tungsten.
Gilpin	31, 783	01, 400	Sand and gravel, stone.
GrandGunnison	61, 368 1, 588, 961	94, 063 2, 512, 057	Coal, zinc, lead, silver, copper, stone, bery gold.
	0.450	14, 720	Sand and gravel, lead, zinc, silver.
Hinsdale	3, 452	119,720	Coal, clays.
Huerfano	354, 321	413, 535	Fluorspar, petroleum, sand and gravel, coa
Jackson	2, 189, 476	2, 642, 267	carbon dioxide
Jefferson	1, 137, 214	1, 131, 279	Sand and gravel, clays, petroleum, gold, bery feldspar, mica, columbite-tantalite, gestones, silver. Sand and gravel, gem stones.
Kiowa	35, 882	59, 252	Sand and gravel, gem stones.
Kit Carson	61, 113	11, 830	Sand and gravel.
Lake	50, 346, 551	52, 323, 801	Molybdenum, tungsten, lead, zinc, gold, silve pyrites, tin, copper, stone.
La Plata	447, 683	534, 080	Sand and gravel, coal, petroleum, gold, ston
Larimer	4, 986, 292	5, 468, 570	Cement, stone, petroleum, sand and grave gypsum, beryl, mica.
Las Animas	6, 475, 547 338, 131	9, 415, 036	Coal, sand and gravel, clays.
Lincoln	338, 131	68, 087	Sand and gravel.
Logan	22, 619, 826	24, 926, 473 669, 793	Petroleum sand and gravel.
Mesa	513, 618	669, 793	Sand and gravel, coal, clays, stone, gem stone
Mineral	1, 156, 181	722, 940	Sand and gravel, coal, clays, stone, gem stone Lead, zinc, silver, gold, copper, sand and grav- gem stones.
Moffat	3, 252, 952	3, 241, 996	Petroleum, coal, sand and gravel.
Montezuma	27, 699	245, 231	Sand and gravel, petroleum, coal, gold, silve
	100 057	115, 106	Sand and gravel, coal, salt, gem stones.
Montrose	108, 857	00 261 057	Petroleum, sand and gravel.
Morgan	14, 223, 951	20, 361, 957	1 coroleum, sanu anu graver.
Otero	27, 591	38, 248	Sand and gravel.
Ouray	14, 223, 951 27, 591 767, 035	1	Lead, copper, zinc, gold, sand and grav
Park	74, 340	97, 081	Feldspar, copper, gold, lead, silver, zir

See footnotes at end of table.

TABLE 20.—Value of mineral production in Colorado, 1954-55, by counties 12. Continued

County	1954	1955	Minerals produced in 1955 in order of value
Pitkin	_ (3)	\$703, 517	Cool lead att
Prowers	\$127 210	55, 255	Coal, lead, silver.
Pueblo	703 880		Sand and gravel.
Rio Blanco	70, 527, 268	949, 396	Sand and gravel, clays.
Rio Grande	- 671		
Routt	2, 216, 632	994	UOIO, gein siones silver
	2, 210, 032	2, 721, 929	Coal, sand and gravel, petroleum, pumice and
Saguache	00.011		i Dumche.
	99, 211	91, 580	
an Juan	171 000		
· · · · · · · · · · · · · · · · · · ·	151, 272	281, 751	Lead, zinc, silver, copper, gold, tungsten, gem
an Miguel	F 000 000	2.4.2.	stones.
an miguel	5, 836, 227	5, 425, 082	Zinc, lead, copper, gold, silver, iron ore, gem
edgwick		,	stones.
ummit	1,074	1,636	Sand and gravel.
allor	686, 472	328, 911	Zinc, lead, silver, gold, conner sand and gravel
'eller		1, 667, 599	CIUIO, SEOTIA, SHVAT gam stones
Vashington	9, 489, 912	16, 032, 243	Petroleum, sand and gravel
Veld	6, 653, 541	7, 279, 865	Petroleum, coal, sand and gravel, stone.
uma	80, 629	162, 212	Sand and gravel.
Indistributed	14, 835, 577	17, 105, 632	sala gravor.
Motol 4			
Total 4	255, 852, 000	286, 121, 000	

1 Value data of some beryl (1954), some columbite-tantalite (1954), gem stones, natural gas, natural-gas liquids, vanadium, and some sand and gravel (1954) that cannot be assigned to specific counties are excluded from county totals and included with "Undistributed."

2 Value of low-grade manganese ore shipped to General Services Administration purchase depots and proprint ore is avoided.

uranium ore is excluded.

3 Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed".

4 The total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing

Alamosa.—State and county highway departments produced sand and gravel.

At Alamosa the Oriental Refining Co. operated its skimming and cracking plant. Reported throughput for the year was 228,000 barrels of oil supplied primarily from the Chromo and Price Gramps fields, Archuleta County, and the Florence field, Fremont County.

Arapahoe.—Sand and gravel was the only mineral commodity produced in Arapahoe County in 1955. Of the 763,000 tons of sand and gravel sold or used during this period, 592,000 tons was sold by commercial producers for building and structural purposes, whereas 171,000 tons was quarried and prepared by private contractors for use on State, county, and city roads and streets. The larger commercial producers were the Cooley Gravel Co., Hall Sand & Gravel Co., Herbertson Sand & Gravel Co., Denver Mortar & Materials Co., and Lester E. Jones.

Twenty-one wildcat wells were drilled in 1955 compared with 9 in As in the previous year, however, no successes were reported, although some traces of oil were found.

Archuleta.—Production from the two county oilfields—Price Gramps and Chromo-declined during 1955. Most of the oil from these fields was shipped to the refinery at Alamosa. One unsuccessful development well was drilled in each of the two fields.

Sand and gravel and minor amounts of coal were also produced during the year. A total of 350 tons of coal was produced from the Bellino and Columbine mines.

Baca.—Natural gas and sand and gravel were produced. development wells were completed successfully in the Greenwood 457678-58-18

gasfield by Carter Oil Co. and Amerada Petroleum Corp. daily production on the latter well was reported to be 7 million cubic

A discovery well, the No. 1 Holt (sec. 21, T. 32 S., R. 41 W.), by Moran Bros., Inc., brought in the South Greenwood gasfield.

Bent.—Bent County was a source of sand and gravel, petroleum,

natural gas, and clay in 1955.

The Clay Productions, Inc., operated its open-pit bentonite property for a short period during 1955 and shipped 200 tons of ground bentonite for rotary-drilling mud. The Colo-Tex Mining & Engineering Co. discontinued operations in 1955.

A discovery well by M. J. Stansbury 10 miles south of Las Animas gave the county its first oil and gas production. The new field, known as Bent's Fort, was the first oil success in southeastern Colorado.

Boulder.—Value of output of tungsten accounted for one-third of the total value of mineral production in the county in 1955. 66 individual operations and possibly more produced tungsten ore. Three tungsten custom mills were operated for upgrading the ore to a marketable product. Cold Spring Tungsten, Inc., treated custom ore, in addition to ore from its mine, in the Hetzer mill (formerly Wolftongue). The Cold Spring mine was the largest tungsten producer in the county. The Tungsten Refining, Inc., mill and the Wah Chang Corp. of New York mill (Marion) treated custom ore

from Boulder County throughout 1955.

Production and sales of nonmetals composed 59 percent of the total value of output in Boulder County during 1955. Fluorspar, sand and gravel, stone, and clay, in order of importance, made up the The Burlington mine of the General Chemical nonmetallic group. Division, Allied Chemical & Dye Corp., was the largest fluorspar producer, followed by the Emmett and Afterthought, operated by Ozark-Mahoning Co. Ozark's Blue Jay, Argo, and Spartan No. 5 mines were idle in 1955. Burlington ore was trucked to the company concentrating plant at Valmont near Boulder, and Ozark-Mahoning Co. operated its mill near Jamestown. Underground operations at the Burlington mine utilized 34 miners who worked an average of 259 days; 7 men worked a like period in surface operations. On the other hand, 15 men were employed an average of 341 days at the mill Employment at the Emmett and Afterthought near Boulder. averaged 10 men working 306 days during the year.

Sand and gravel production was divided almost evenly between commercial and Government-and-contractor output. The bulk of the commercial production was sold by the Golden Transfer Co. and Boulder Gravel Products, Inc., whereas contractors for the State Highway Department produced all but 38,000 tons of the Govern-

ment-and-contractor output.

Boulder County produced the bulk of the dimension and crushed sandstone quarried in Colorado during 1955 from the famous sandstone beds near Lyons. In terms of value, rough construction building stone was the most important product, followed by dressed building stone and flagging. The larger producers included Dewey H. Summers, Loukonen Bros., and Jacobson-Evans Stone Co., Inc. The Colorado Brick Co. operated a number of clay pits near Boulder,

producing miscellaneous clay for use at its brick plant at Valmont.

All mine production was consumed in manufacturing brick and other

heavy clay products.

Metals produced, other than tungsten, in order of value of output, were silver, lead, gold, copper, and beryl. Most of the silver, along with some of the gold, copper, and lead, was recovered from ore mined by Nederland Mines, Inc., from the Caribou mines near Nederland. The large part of the lead and smaller quantities of gold. The large part of the lead and smaller quantities of gold, silver, and copper were recovered from lead concentrate produced as a byproduct of the treatment of crude fluorspar at the Ozark-Mahoning Co. Jamestown operation (Argo, Blue Jay, Emmett, and Escanaba Small quantities of these metals were produced by Fred C. Dopp (New Rival mine), Pandora Metals, Inc. (Comstock and Pandora mines), and Western Uranium Gold, Ltd. (Boston mine). A small quantity of beryl was produced by Everett Bruning and sold to Beryl Ores Co. of Arvada.

Coal was produced from the Black Diamond and Crown mines. Later in the year the Crown mine operated by Wm. E. Russell was

closed.

A small amount of petroleum was produced from the Boulder field. Chaffee. - Except for a small quantity of gold, silver, lead, beryl, and tungsten production, nonmetals composed 99 percent of the value of output by the Chaffee County mineral industries in 1955. nonmetals, only feldspar and stone increased in value of output. whereas a decrease in value was reported for sand and gravel. mica was produced in 1955 compared with none in 1954. Poncha Springs fluorspar mine of Reynolds Mining Corp. was idle throughout the year. In the metals group the value of silver production increased; that of gold and lead declined. A small quantity of tungsten and beryl was produced, whereas none was reported in 1954.

Dimension and crushed stone, the most important mineral commodities produced in the county, increased in value of output from \$554,000 in 1954 to \$757,000 in 1955. The main reason for the increase was resumption of full-scale shipments of crushed limestone from the Monarch quarry of the Colorado Fuel & Iron Corp. Deliveries to the company Pueblo steel plant increased from 314,000 tons in 1954 to 421,000 tons in 1955. The Colorado Granite Co. produced a small quantity of dressed monumental stone for the local

market.

All sand and gravel output in Chaffee County was produced by a private contractor working on a State highway department project and by construction and maintenance crews of the Chaffee County.

Highway Department.

Clear Creek.—The number of mines producing gold, silver, copper, lead, and zinc in the county increased from 9 in 1954 to 15 in 1955. The principal producers were the Grizzly Gulch lead mine (Greater Minerals Corp.), Dixie No. 4 gold mine (LeRoy Giles & Co.), Bald Eagle copper-lead-zinc mine (Bald Eagle Mining Co.), Forge Hill Tunnel lead-zinc mine (C. E. Morrison & Co.), Highlander lead mine (Uncompangre Uranium, Inc.), and Jo Reynolds silver mine (Reynolds Minerals Corp.).

During 1955 Joe Grover produced and marketed small quantities of beryl and columbite-tantalite from his mine on Beaver Creek.

Prospecting for uranium was continued during the year and was generally concentrated in areas previously noted for precious and base-metal mineralization. Occurrences of uranium minerals were reported from the Jo Reynolds, Baltic, Banta, McDonald, and Two Sisters mines.

A small quantity of crude feldspar was shipped to a mill at Denver, and Joe Grover sold some scrap mica to a mica-grinding plant at Pueblo. The Federal Bureau of Public Roads produced dimension sandstone and granite, and contractors for that agency produced paving gravel. The gravel and stone were used in road construction.

Costilla.—Scoria was the only mineral commodity reported produced and sold in the county during 1955. The Colorado Aggregate Co., Inc., operated its open-pit mine for 292 days and employed 2 men. The crushing plant was operated for the same length of time, and 3 men prepared scoria as an ingredient of concrete aggregate. The demand for this commodity declined as a result of competition from substitute materials, and the average price continued to drop.

Custer.—Sale of nonmetallic minerals in 1955 was again the major source of income to the mineral industries of Custer County. Crude perlite extracted from the Rosita open-pit mine of Great Lakes Carbon Corp. headed the list of important minerals produced in the county, and shipments were made to various expanding plants and construction companies throughout the United States. C. J. Barnhisel Construction Co. (contractor for Great Lakes Carbon Corp.) employed 6 men in mining operations an average of 325 days each.

The only production of gravel reported in 1955 resulted from a gravel surfacing contract let by the Colorado Highway Department.

Lead-zinc ore produced by The Defender Mining Co. from the Defender mine 1½ miles northeast of Silver Cliff, operated for the period of May through December, was milled by the Turner Milling Co. Lead and zinc concentrates produced were shipped to the American Smelting and Refining Co., Leadville, Colo., and Amarillo, Tex., smelters, respectively. Substantial quantities of silver, copper, and lead were recovered from ore produced from development work during April at the Passiflora mine by the Passiflora Mining Co. The property is 1½ miles north of Westcliffe. The Metallics Recovery Corp. recovered gold and silver from operation of its 200-ton-per-day cyanidation mill on Bassick mill tailings throughout the year.

Delta.—Coal was produced from 7 mines, which employed 50 men. The King mine, operated by Juanita Coal & Coke Co., and the largest of the seven, produced approximately half of the total tonnage.

Sand and gravel output in Delta County rose to 577,000 tons in 1955, a 96-percent increase over 1954, due largely to activities of the State and county highway departments. Delta Sand & Gravel Co. reported the only commercial production in the area, and its activity centered around structural sand and gravel and paving gravel for the local market.

The only production of clay in Delta County in 1955 was reported by the Delta Brick & Tile Co., which produced 830 tons of miscellaneous clay for its own use in manufacturing building brick and other structural clay products.

Uranium prospecting was continued in the Escalante Mesa area,

and small ore shipments were reported.

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 this and adjacent counties. Denver continued to be the focal point for manufacturing brick and other structural clay products in the State; plants were operated by Clark Brick, Inc., Denver Fire Clay Co., Denver Sewer Pipe & Clay Co., Denver Terra Cotta Co., Overland Pressed Brick Co., Robinson Brick & Tile Co., and Western Tile Manufacturing Co. In addition to brick and other clay products produced by these manufacturing facilities, the Denver Fire Clay Co. and Denver Sewer Pipe & Clay Co. manufactured refractory-grade products. All plants either mined their own raw clay or purchased it from local mine operators. Types of clay not common to Colorado were purchased from out-of-State suppliers.

A considerable quantity of sand and gravel was used in Denver County in constructing and maintaining streets and highways. Private contractors for the State highway department and the city

engineer were responsible for this production.

A number of processing plants for other nonmetals also were active during the year and played an important part in the industrial growth of Colorado. Consolidated Feldspar Department, International Minerals & Chemical Corp., operated its Denver feldspar-grinding plant on crude material from mines in adjacent counties. Western Mineral Product Co. produced exfoliated vermiculite at its Denver plant from crude vermiculite from Montana; and General Chemical Division, Allied Chemical & Dye Corp., operated its sulfuric-acid plant on pyrite concentrate from Lake County.

Of Colorado's 7 oil refineries, 5 in the Denver area were operated by the following companies: The Bay Petroleum Corp., Continental Oil Co., Empire Petroleum Co., Oriental Refining Co., and Skelly Oil Co. The crude-oil supply for the refineries came from fields in eastern Colorado, eastern Wyoming, and Rio Blanco County in

western Colorado.

Dolores.—The Rico Argentine mine operated by the Rico Argentine Mining Co. was the principal producer of gold, silver, copper, lead, and zinc in Dolores County in 1955; it ranked third in output of lead and zinc and fourth in silver in the State. Lead-zinc ore from the Rico Argentine mine was treated in the company 150-ton-per-day flotation mill at Rico; the products (lead and zinc concentrates) were shipped to the Anaconda Company Great Falls, Mont., and United States Smelting, Refining & Mining Co. Midvale, Utah, smelters.

In addition, Rico Argentine produced pyrite for sale and for use in manufacturing sulfuric acid. Mined pyrite was sold to a uranium processor, and the company constructed a small beneficiating plant to upgrade pyrite tailings. The mill product was then introduced into the circuit of Rico's new \$1.5 million sulfuric-acid plant, which began operations in October. During the year the company did considerable exploration and development work, including drifting and diamond drilling at the mine.

The Aztec mine, operated by Edward C. Baer & Robert Topliss, and St. Louis mine, operated by Myron L. & Paul R. Jones, were

smaller producers of base and precious metals.

Douglas.—Mining and preparation of nonmetallic minerals were the sole bases of income to the mineral industries of the county Clay, sand and gravel, and gem stones were mined and during 1955. sold, and the total value of mineral production increased in relation to 1954. Fire clay mined by Robinson Brick & Tile Co., W. H. Hedley, Helmer Bros., and S. A. Whisenhunt was shipped to Denver plants for the manufacture of clay products; output increased to 59,000 tons in 1955 compared with 45,000 tons in 1954. Contractors working on State highway projects and construction and maintenance crews of the county highway department produced 60,000 tons of paving gravel in 1955, a 59-percent drop from 1954.

Topaz and amazonstone were collected by the Colorado Mineral

Society and L. L. Oliver and Joe W. Starr.

Eagle.—The total value of the Eagle County mineral production in 1955 advanced 15 percent above 1954. The county ranked first among the Colorado counties in silver, copper, and zinc, second in lead, and fourth in gold. The Eagle mine of The New Jersey Zinc Co. was operated continuously throughout the year. The company was Colorado's leading producer of silver, copper, and zinc. Its output of lead and zinc was increased, compared with 1954, but output of gold, silver, and copper fell below 1954. The lead-zinc ore from the mine was milled at the company 1,000-ton-per-day underground mill, and the lead and zinc concentrates produced were shipped to the smelters. Other ore high in silver and copper content and carrying gold and lead

was shipped directly to the smelter by the company.

Elbert.—A well drilled by Sinclair Oil & Gas Co., the No. 1 Tom (sec. 28, T. 6 S., R. 61 W.), led to discovery of the Bradbury field from which a small production was recorded. By year end, with

failure of one offset well, the field was abandoned.

El Paso.—Despite an increased output of coal in El Paso County in 1955, sales of sand and gravel, stone, clay, and gem stones supplied most of the value of mineral production. Of the 518,000 tons of sand and gravel sold, 46 percent (237,000 tons) was classified as commercial output, and the balance (281,000 tons) as Government-and-contractor Daniels Sand Co. and Pikes Peak Fuel Division of the Golden Cycle Corp., the largest commercial producers, sold mainly structural sand. On the other hand, contractors for the State highway department produced 199,000 tons of paving gravel, and maintenance and construction crews for the county highway department and the street department of the city of Colorado Springs produced the remaining 82,000 tons of Government-and-contractor output.

Crushed limestone used in concrete aggregate was the only type of stone quarried in El Paso County during 1955, and the Lennox-Breed quarry operated by the Golden Cycle Corp. was the only mine operated.

Output of fire clay and miscellaneous clay in 1955 rose to 18,000 tons compared with 8,000 tons in 1954; mine production came from 3 open pits operated by National Clay Products Co., Robinson Brick & Tile Co. (Apache No. 7 mine), and Standard Fire Brick Co. (Husted mine). The bulk of the output was miscellaneous clay, although some fire clay was mined. All production was used in manufacturing building brick and other structural clay products.

The Valley View and Little Annie pegmatite mines, sources of scrap

mica and feldspar in 1954, were idle throughout 1955.

The Pikes Peak Fuel Division of the Golden Cycle Corp. also operated the Pikeview mine, the largest of the county's two coal mines, and the 12th largest in the State in 1955. The second mine, a strip operation, was operated by the Franceville Coal Co.

Fremont.—Fremont County produced 4 metals and 8 nonmetals, plus coal and petroleum. The nonmetals composed 92 percent of the

total value of mineral output.

Cement ranked first, followed by stone, gypsum, clay, feldspar, sand and gravel, mica, and gem stones. Of the nonmetal group, the value of clay, mica, and sand and gravel declined. Of the mineral-fuels group, coal output increased, and petroleum production remained constant. On the other hand, sales of columbite-tantalite increased, whereas sales of silver and beryl decreased. No gold or tungsten was produced in 1955, and copper output remained approximately the same as in 1954.

One of the two cement plants in Colorado, was operated by Ideal Cement Co. at Portland. The plant, utilizing a wet and dry process and rated at 2.64 million barrels a year, consumed 52.5 million kw.-hr. of purchased electrical energy in manufacturing types I, II, and III, waterproof-portland, and masonry cements. Two 400-foot and five 120- to 125-foot rotary kilns were operated during the year; in addition to cement markets in Colorado, shipments were made to consumers in Arizona, Kansas, Nebraska, New Mexico, Oklahoma, Texas,

Crushed limestone was the most important source of income to the stone industry. The bulk of the output was produced by Ideal Cement Co. and used in manufacturing cement. Crushed limestone was also sold or used for flux, sugar refining, rock dust in coal mines, and terrazzo. Crushed sandstone was used as a refractory stone in manufacturing refractory\_brick for furnace and converter lining at the Pueblo steel plant. Ray B. Sturbaum was the major producer, operating the Burnite Ganister quarry, followed by Laclede-Christy Co. of Colorado at the Ganister quarry and the Standard Fire Brick Co. Penrose and Parkdale quarries. V. D. Coleman & Co. produced a small quantity of rough monumental dimension granite from the Aspen Ridge quarry, and the county highway department quarried a significant tonnage of crushed miscellaneous stone for use in constructing and maintaining county roads. The Cowan Bros. operated the Fleuri Brecha and Travertine quarries producing rough exterior and interior marble.

Crude gypsum was quarried by two mine operators in 1955, and sales increased slightly over 1954 owing to the gain in demand for gypsum in manufacturing cement. Nat Senatore was again the contractor-mine operator for Ideal Cement Co., and 3 men were employed 271 days in the mining operation. The U.S. Soil Conditioning Co. produced 3,500 tons of agricultural gypsum.

Clay mining in Fremont County in 1955 depended upon the market for manufactured clay products in the more populated regions of Colorado. Output of clays rose to 19,000 tons in 1955 and was considerably higher than the comparable 1954 figure. The Rocky Mountain Fire Clay Co. operating the Early Bird mine was the major producer, followed by Laclede-Christy Co. working the Flint mine. John

B. Silengo and Lovisone & Colarelli also reported productive activity.

All output was classified as fire clay.

Sand and gravel production in 1955 consisted largely of paving sand and gravel produced by maintenance and construction crews of the Canon City and county highway departments. In addition to material produced by the city, that agency let contracts with private

contractors for additional small lots of paving gravel.

Feldspar mining continued to be concentrated in the Canon City-Parkdale area of Fremont County during 1955, and production increased to 3,700 tons—a slight gain over 1954. Kenneth Cox, operating the Devil's Hole No. 1 mine, was the largest shipper, followed by Louis Arko (Spike Buck mine); a large number of individuals worked intermittently on the Mica Lode leased from International Minerals & Chemical Corp. All producers shipped to the Parkdale stockpile of International Minerals & Chemical Corp., and the feldspar eventually was processed at that company's Denver grinding plant. A small quantity of rose quartz and agate was reported by W. S. Couch and John H. King.

In conjunction with feldspar-mining operations, a number of porducers recovered 500 tons in all of scrap mica, which was shipped to a grinding plant at Pueblo. Alex Lockhart produced the largest

quantity, followed by Kenneth Cox and Archie Ellis.

Operating coal mines in 1955 numbered 20, including 1 strip operation. Average employment for the year was 125 men.

Crude petroleum was produced from the Florence-Canon City

field and shipped to the refinery at Alamosa. Small quantities of silver and copper were recovered from copper ore shipped to the American Smelting & Refining Co. Garfield smelter from the Copper Glance Lodes No. 1, 2, 3, and 4 by Bill Kleine and

from the Tantalizer mine by the Tantalizer Mining Corp.

Fremont County was the largest columbite-tantalite producer in the State and ranked second to Jefferson County in beryl output. The Mica Lode mine, leased from the International Minerals & Chemical Corp. and operated by a number of individuals, was the largest producer. The material produced was sold to the GŚA and to Beryl Ores Co. Kenneth Cox had an output from the Devil's Hole mine, which he has operated for several years.

Production of uranium ore was reported from the Tallahassee Creek area by the J. M. Huber Co. and Cresent Uranium Co. Juniper Oil & Uranium Co. drilled on its Arctic-Snooper-Thorne group of claims.

Garfield.—In terms of value, coal was the most important mineral commodity in Garfield County during 1955, contributing 58 percent toward the total value of mineral output. There were 7 mines employing 33 men active during the year.

Sand and gravel and stone accounted for 42 percent of the total value of mineral production in 1955 compared with 54 percent in 1954. This decrease can be attributed mainly to fluctuation of activities of private contractors producing sand and gravel for highway uses.

Frank H. Norberg Co. continued to produce crushed limestone during 1955 and supplied the entire output of this commodity. Shipments were made to sugar plants to be used in refining sugar, steel plants for fluxing purposes and to construction contractors for use in concrete aggregate.

Union Carbide Nuclear Co. (formerly United States Vanadium Corp.) operated its uranium-processing plant at Rifle throughout the year and treated ores from Utah, Wyoming, and Mesa County, Colo.

Experimental work in extracting oil from oil shale was continued. Natural gas was produced from the Garmesa and Twin Buttes fields. Gilpin.—Gold, silver, copper, lead, zinc, and tungsten constituted the entire mineral output from Gilpin County in 1955, as in 1954, and the value of these minerals produced in 1955 was 21/2 times that of 1954. Six lode mines producing gold, silver, copper, lead, and zinc, 1 placer gold-silver mine, and 4 tungsten-mining operations were active in the county in 1955, compared with 7, 2, and 1, respectively, The United Mining & Leasing Corp. built a 50-ton-per-day mill, employing selective flotation followed by gravity concentration by tables, during 1955 and treated lead-zinc ore from the Carroll group mine. The Royal Mining & Milling Co. re-treated material from the Dulajene-mine dump in its 75-ton-per-day flotation mill and produced a concentrate from which moderate quantities of gold, silver, and lead were recovered. The Cherokee-Widow Woman and Banta Hill group of mines, operated by the Cherokee Uranium Mining Corp., was the largest producer of gold, silver, and lead in the county and had a small output of copper and zinc. The corporation operated its 75-ton-per-day flotation mill and did exploration and development work on the group during the year. Other producing mines were the Calhoun (The Realty Co.), the Federal group (Central Uranium & Milling Corp.), and the Meeker Success group (Allen Uranium Exploration Co.).

The reported output of tungsten in the county, with a total value of \$636, was produced from the Copeland, Black Metal, and Glendale

Lode mines and sold to Tungsten Refining, Inc.

Exploration drilling was carried out in search of uranium on the Blackhawk Lode at Silver Hill by Minerals Exploration Co. Additionally, numerous other properties known for base and precious metals were re-examined by prospectors.

Grand.—The Lucky Sunday Mining Co. sank the No. 1 shaft on its uranium property, but no production was reported. Newmont Exploration Co. ceased operations at its Undecided group on Beaver Creek. The county was a source of sand and gravel and stone.

Gunnison.—Coal, mined at 10 operations, was the major source of mineral-commodity income to the county, composing two-thirds of the total value. Almost half of the coal produced was shipped out of State, most of it going to Utah coke ovens. Four of the larger mines were the Somerset and Oliver mines operated by Minerals Development Corp., the Bear mine of the Bear Coal Co., and the Hawk's Nest mine operated by the Champion Coal Co. Employment in all 10 mines totaled 234 men.

The Keystone mine, a new metal producer in 1955, placed in operation June 1 by the American Smelting & Refining Co., accounted for most of the metals output and a 58-percent increase in total value of mineral production in the county. The mine had a substantial output of gold, silver, copper, lead, and zinc; it ranked third in silver, fifth in zinc, and seventh in lead output in the State. The ore was treated in the new 200-ton-per-day flotation mill, and the lead and

zinc concentrates produced were shipped to the company Leadville,

Colo., and Amarillo, Tex., smelters, respectively.

Four other mines (Belle of Titusville (Jack O'Brien), Little Darling (Sophie & D. Knight), Petrock (Victor Petrocco), and Star (John Lambertson)) produced smaller quantities of these metals in the county in 1955. The Akron & Erie group of mines of the Callahan Zinc-Lead Co. remained idle in 1955, except for maintenance and repair work and shipment of some mill cleanup material to the smelter.

The Beryllium Mining Co. sold a small output of beryl to Beryl

Ores Co. of Arvada.

The Basic Chemical Corp. reactivated the old limestone and marble quarries at the town of Marble in 1955. Crushed limestone used as rock dust in coal mines, filler for asphalt, poultry grit, stone sand, roofing gravel, and soil additive were reported. The company also quarried 8 tons of crushed marble, which was used as terrazzo.

Although considerable sand and gravel was produced by highway contractors in 1954 no production was reported in 1955. In addition, the Brown Derby pegmatite, which produced lithium and mica in

1954, was idle throughout 1955.

Hinsdale.—Sand and gravel continued to be the major source of income to the mineral industries of the county, and all output was produced by construction and maintenance crews of the county

highway department.

John R. Wagner operated the Czar mine from July 15 to November 15. Lead ore was shipped directly to the Leadville smelter, and leadzinc ore was shipped to the United States Smelting, Refining & Mining Co. Midvale, Utah, mill where lead and zinc concentrates Small quantities of silver were recovered from the were produced. ore and concentrates.

Huerfano.—Coal and clay were the products of the mineral industries of Huerfano County in 1955. Ten coal mines operated during the year, employing an average of 72 men. The Standard Fire Brick Co. operated its Chamblin mine for 260 days and employed 5 men in mining operations. All output was classified as fire clay and was used in making fire brick and block, fire-clay mortar, and other structural clay products.

Occurrences of uranium mineralization were reported in the La Veta Pass area and along the eastern side of the Sangre de Cristo

Mountains.

Jackson.—Fluorspar production again dominated the activity of the mineral industries in Jackson County in 1955. Output from the Northgate mines of Ozark-Mahoning Co. increased 4 percent over 1954. An average of 25 men was employed approximately 310 days during 1955 in underground and open-pit mining operations, and 35 men 310 days at the company mill near Cowdrey. The finished fluorspar concentrate was shipped to GSA stockpile.

All sand and gravel output in 1955 was classified as Governmentand-contractor produced and resulted from contracts let by the State highway department.

Petroleum was produced from the Battleship and McCallum-North fields; the latter was also a source of carbon dioxide gas. The Battleship field, discovered in 1954, underwent further development by Lion Oil Co., which drilled 4 development wells during the year, 3 of them successful. This field was primarily responsible for the large increase in petroleum output from the county.

Coal was produced from the Marr Strip mine operated by George

Jefferson.—The value of output of all mineral commodities produced in Jefferson County in 1955 remained about the same level as in 1954, but the contribution to total value by nonmetallics moved downward from 99 percent in 1954 to 96 percent in 1955. Sand and gravel and clay were the most important commodities in terms of

value, and increases over 1954 were recorded.

Demands by the construction industry caused considerable activity in the construction-materials field. Of the 660,000 tons of sand and gravel produced in 1955, 657,000 was sold as commercial structural and paving sand and gravel by Rio Grande Gravel Co., Brannan Sand & Gravel Co., H. N. Lee Sand & Gravel Co., Lake Sand & Gravel Co., and Suburban Reddi-Mix Sand & Gravel Co., which employed an average of 26 men throughout the year. Contractors for the Colorado Highway Department produced 3,000 tons of paving

gravel in conjunction with highway contracts.

In terms of tonnage, Jefferson County was the most important supplier of fire clay to Denver clay-products manufacturers. Some 15 opencut and underground mines were active, and 60 men were employed for periods of 6 to 300 days, the average being 185. The Rockwell and Apex open-pit mine operated by George W. Parfet Estate, Inc., was the largest producer, and 7 men worked 300 days mining fire clay. H. M. Rubey Clay Co. engaged 4 men for 300 days in mining operations and produced plastic fire clay for its own use. The Lakewood Brick & Tile Co. was the next largest producer; 5 men were employed 250 days mining miscellaneous clay for the company brick plant. The Robinson Brick & Tile Co. operated its Chieftain and Stranger mines 50 and 25 days, and the fire clay produced by 4 miners was for its own account. The Denver Fire Clay Co. and Denver Sewer Pipe & Clay Co. worked the North and South Golden, Strainland, and Johnson mines, respectively, for fire clay, which was used at their Denver plants and sold to other consumers.

Other production was reported by Coors Porcelain Co., Fred S. Caldwell, Golden Fire Brick Co., Christopher Bennetts, and John Harvey. The Denver Terra Cotta Co. employed 2 men for 250 days

in development of its underground clay property.

Feldspar sales in 1955 were 900 tons compared with 13,000 in 1954. V. O. Eagle, the largest producer, operated the Madonna Lode mine. D. W. Powell and Ben Waltz were the next largest mine operators. In conjunction with pegmatite mining, a small tonnage of scrap mica was recovered by Jessie Friend and Ben Waltz and others and shipped to mica-grinding plants at Pueblo and Arvada.

The Beryl Ores Co. reported purchasing small quantities of rare earth minerals—monazite and samarskite—from local producers. This material was processed in part for small job orders; the remainder

was sold or used for experimental purposes.

Bader's Minerals operating near Hartsel and L. L. Oliver operating near Deckers reported producing \$350 worth of tourmaline and amazonstone.

Gold and silver were recovered in the county as byproducts at three sand-and-gravel washing and screening plants. W. B. Kerkling pro-

duced by far the most of the three.

Beryl produced in the county by Ben Waltz and Jessie & Michael Friend was sold to Beryl Ores Co. Columbite-tantalite was marketed by H. L. Colburn from Our Mine No. 2 and by Ben Waltz from the Biggers mine.

Uranium ore was produced from the Schwartzwalder mine on Ralston Creek and from a property of Four Corners Uranium Co.

south of Morrison.

Oil became the county's third most valuable mineral in terms of output with discovery of the Soda Lake field (sec. 7, T. 5 S., R. 69 W.) by S. D. Johnson in May. One offset well to the discovery was dry.

Lake.—Molybdenum, still the principal metal mined in Lake County, came from the Climax Molybdenum Co. mine 13 miles north of Leadville. The company had produced molybdenum since 1918, except for 4 years, 1920-23, inclusive. In the annual report to the stockholders for 1955, the company reported that concentrate produced during 1955 contained 43 million pounds of molybdenum and that sales amounted to 46 million pounds of molybednum contained Byproduct tin and tungsten were produced. serves at Climax were 330 million tons, containing 1.6 billion pounds of recoverable molybdenum, according to the company. In 1955 an average of 30,000 tons of ore was treated each working day. company was adding to the mill unit at a cost of \$1 million to increase the capacity 3,500 tons a day.

Production of gold, silver, copper, lead, and zinc in Lake County was less than in 1954. The Resurrection Mining Co. continued to lease part of the mine to individuals and to operate its mill on custom ore produced by the leasers. The company also treated ore from development work at the Iowa Gulch mine and mill tailings from former operations in its mill. This combined operation was the largest producer in the county and an important one in the State; it ranked

fourth in lead and zinc and sixth in gold and silver output.

Substantial quantities of lead and silver were recovered by the American Smelting and Refining Co. by resmelting lead slag from the Arkansas Valley smelter dump. The company purchased ores and concentrates produced in Colorado and outside the State. The Ibex Operation No. 2, worked by the Little Jonny Mines, Inc., was another important producer in the county. Of the 10 remaining lode mines that produced gold, silver, copper, lead, and zinc, the largest were Antioch (Kaiser Lease), Fanny Rawlings (Fanny Rawlings Lease), Hayden Shaft (Cadwell Mining Co.), Ibex-Sunday Area (Leadville Unit, American Smelting and Refining Co.), and Tucson (Tucson Lease). One placer mine, Columbia, was operated during the period of August 15 to September 30 by the Gold Leaf Mining & Dredging Co., Inc.; small quantities of gold and silver were produced.

Nonmetallics played only a small part in the mineral industries of the county, pyrite and stone being the only commodities in this group that were produced. Pyrite concentrate was recovered as a byproduct in treating molybdenum ore and shipped to a sulfuric-acid plant at Denver. The Pineview Placer was operated by the Standard Fire

Brick Co., which shipped sandstone (quartzite) to its Pueblo plant

for manufacture in refractory brick.

La Plata.—Sand and gravel was reported produced for the Colorado Highway Department by private contractors, as well as a small quantity of commercial structural sand and gravel for local building purposes by Burnett Construction Co. Eight hundred tons of crushed miscellaneous stone used in concrete aggregate was produced by Burnett Construction Co.

Coal was mined from 13 operations employing 45 men in all.

Zodomok Mines, Inc., shipped 149 short tons of gold ore from the Bessie G group of mines to smelters at Midvale, Utah, and Leadville, Colo. Small quantities of gold and silver were recovered from ore mined by the Sylvania Mining & Milling Co. from the Western Bell and by Herman Dalla from the Muldoon.

The Vanadium Corp. of America operated its uranium-vanadium processing mill at Durango. Ore for the mill was supplied from company mines in Apache County, Arizona (Monument No. 2 and Rattlesnake mines), San Juan County, N. Mex., and other areas of southwestern Colorado. Some uranium ore was reportedly produced in

the La Plata district.

Crude oil was produced from the county's two oilfields-Barker Dome and Red Mesa. The bulk of drilling activity, however, was aimed toward the development of natural-gas fields. The Bondad and Ignacio fields were extended by the Pacific Northwest Pipeline Co., United States Smelting, Refining and Mining Co., and others, with the result that the two fields were eventually joined. Southern Union Gas Co. was active in the Blanco field.

Larimer.—Except for some beryl and petroleum sales, nonmetals accounted for the major part of the value of mineral output of the county. Cement led the list of minerals in terms of value, followed by stone, petroleum, sand and gravel, and gypsum. Sales of cement, gypsum, and stone showed gains, whereas sand and gravel and beryl output declined; no clay or feldspar was reported in 1955. The total value for the county in 1955 increased 10 percent compared with 1954.

Ideal Cement Co. operated its dry-process plant at Boettcher during 1955 at optimum capacity, and shipments increased 2 percent over 1954. The plant, rated at 1.2 million barrels per year, consumed 37.1 million kw.-hr. of electrical energy in operating two 175-foot kilns and other plant facilities. Types I, II, and III, oil-well, waterproof-portland, and masonry cements were produced; in addition to supplying the Colorado market, the company made shipments

to points in Nebraska, Oklahoma, Texas, and Wyoming. Crushed limestone quarried by Ideal Cement Co. at its Boettcher quarry and Frank H. Norberg Co. at the Rex quarry led the list of most important stone types produced during 1955. Dimension and crushed sandstone was the second most important stone, followed by dimension granite and some Government-and-contractor crushed Although some commercial structural and paving sand and gravel were sold to local building contractors, the major portion of the output resulted from highway contracts let by State and county highway departments. Of the 333,000 tons produced in 1955, 193,000 tons was used for highway construction and maintenance; Loveland Ready Mix Concrete, Inc., and Sterling Sand & Gravel Co. produced

139,000 tons of structural and paving sand and gravel for local con-

sumption.

The demand for gypsum as a raw material in manufacturing cement continued to climb, and output of this mineral commodity increased 14 percent over 1954. E. W. Munroe continued to operate his Goodwin quarry, and a large tonnage of gypsum was also mined by the United States Gypsum Co. at its Loveland quarry and used in manufacturing plaster products.

Clark Edmunds, H. A. Snider, and other operators produced small lots of scrap mica in connection with assessment and development The crude material was shipped to the mica-grinding plant of

Beryl Ores Co., Arvada.

Two oil discoveries were made during the year, both in older fields. In the Loveland gasfield, oil was found in the Lakota formation. the Fort Collins field a second productive zone, the Lyons horizon, was

Production of beryl was reported by three operators—Clark Edwards, H. A. Snider, and Melvin Milmer-from mines in the county in 1955. Output was sold to Beryl Ores Co. of Arvada.

Las Animas.—Las Animas County was Colorado's main source of coking coal, and the major portion of the output was shipped to coke ovens of the Colorado Fuel & Iron Corp. at its steel mills in Pueblo. Thirteen mines employing 1,302 men were active in 1955. the mines (Allen, Frederick, and Morley) were operated by CF&I and were among the largest coal mines in Colorado, ranking respectively first, second, and seventh.

Sand and gravel provided the bulk of the income from nonmetallic minerals to the mineral industries of Las Animas County during 1955; all production resulted from construction and maintenance of roads

by the State and county highway departments.

Fire clay mined in 1955 was produced in conjunction with coalmining activities of the Scott-Ruiz Coal Co. The Trinidad Brick & Tile Co. and the Colorado Alabaster Lamp Manufacturing Co., which mined clay and alabaster, respectively, in 1954, were idle in 1955.

Carbon dioxide gas was produced from the Nina View field in 1955. Nina View was discovered in 1948 but was not placed in production

Logan.—Logan County was an important source of crude petroleum in Colorado during 1955. Associated products of the county petroleum industry were natural gas and natural-gas liquids from three

processing plants at Sterling.

There were 52 petroleum-producing fields in the county during the year, of which the following were most significant in terms of production (years of discovery shown in parentheses): Graylin-Northwest (1953), Cliff (1955), Yenter (1950), Lewis Creek (1953), Divide (1954), Mount Hope (1950), and Mount Hope-East (1954). These 7 fields produced 58 percent of the total.

Exploration and development activity was not as intense as in the previous year, wildcat drilling declining 12 percent and development

drilling 19 percent as the area reached a more mature status.

At the year's closing, the major new development appeared to be the Cliff field, discovered by Anderson Prichard Oil Co. et al. with the No. 1 Hiscock in (sec. 32, T. 12 N., R. 54 W.). The field was developed by the discovering firm, British American Oil Co., Sinclair Oil & Gas Co., Gibralter Oil Co. et al., and a group including the T & T Oil Co. and the Union Pacific Railroad Co. At year end the field had 28 producing wells and had yielded 900 thousand barrels of oil.

Two other discoveries of note were the Winston field and Atwood-East field.

At Sterling, Ginther, Warren, & Ginther operated two natural-gasoline plants and the Kansas-Nebraska Natural Gas Co. a third.

Mesa.—Expansion of Climax Uranium Co. mill at Grand Junction was completed in midsummer. Capacity of the plant to process uranium-vanadium ores was more than doubled by the new construction, which included new crushing, sampling, and filtration installations. The plant used sand-slime separation to eliminate two-thirds of the waste before acid treatment.

The company was active in the Calamity Mesa, Outlaw Mesa, and Beaver Mesa (partly in Utah) areas. Most of the company ore came from the first 2 areas, where mining was subcontracted to independent producers, except for the G-1 and G-2 mines on Outlaw Mesa. At

Beaver Mesa Climax reported an ore discovery.

A total of 57 properties was reported active within the county, most

of them were in the above areas and on Tenderfoot Mesa.

Sand and gravel was the most valuable mineral commodity (excluding uranium) produced in the county during 1955. Structural and paving gravel and structural sand were sold by the Whitewater Sand & Gravel Co., United Sand & Gravel Co., and Charles Tilton. The Grand Junction Brick Co. mined a small quantity of miscellaneous clay for use at its brick plant.

Seven mines produced coal during the year; the largest was the

Cameo mine, operated by the Kerr Coal Co.

Great Basins Petroleum Co. discovered the Hunters Canyon gasfield approximately 5 miles north of the Asbury Creek field. In the Bar-X area The American Metal Co., Ltd., well was proved successful, with an initial test of 4 million cubic feet per day of gas and 120

barrels per day of oil.

Mineral.—The Emperius Mining Co., operating the Amethyst, Commodore-Wedge, New York-Volunteer-Del Monte-Aspen, and Equinox properties, supplied most of the output of gold, silver, copper, lead, and zinc in Mineral County in 1955, as it has for the past 15 years, and was one of the major silver, lead, and zinc producers in the State. Production was considerably less than in 1954 because the concentrating mill was destroyed by fire on August 15, 1955. Construction of a new mill was begun in October 1955 for planned completion in April 1956. The Outlet Mining Co. operated the Cassino and Phoenix mines throughout the year and produced gold, silver, and lead.

Sand and gravel production in Mineral County in 1955 resulted from activities of the State and county highway departments; all output was quarried and prepared by construction and maintenance crews. Ex Mineral Products and William Jackson, Jr., reported selling 85 pounds of amethyst and agate.

Moffat.—Petroleum production from 12 fields totaled 950 thousand barrels in 1955; most productive were Powder Wash, Iles, Hiawatha,

and Maudlin Gulch. Three of the 7 wildcat wells drilled during the year were successful, and resulted in establishing 2 gasfields and 1 oilfield.

Mountain Fuel Supply Co. completed the Shell Creek field discovery well (sec. 1, T. 11 N., R. 100 W.) in the Fort Union formation with

an initial daily flow of 7.5 million cubic feet of gas.

In the Lay Creek area (sec. 13, T. 8 N., R. 93 W.), Halbert, Jennings, & Simic and United States Smelting, Refining & Mining Co. also had a

productive gas discovery.

An oil discovery in the Thornburg gasfield by Continental Oil Co. and Sinclair Oil & Gas Co. attracted the most attention. Natural gas has been known in the field (which also lies partly in Rio Blanco County) since 1925, and traces of oil had been noted. Owing to the lack of market for gas, the field had never been fully developed. With advent of the Pacific Northwest pipeline, further development of the gas potential of the field was carried out. Oil production was from the Weber sandstone, and one confirmation well had been drilled by the close of the year.

Coal was produced from the county's one mine—the Red Wing—operated by Colowyo Coal Co. The firm employed 35 men and

shipped 40 percent of its production out of State.

Prospecting and exploration for uranium were active in Moffat County during 1955, and production of ore was reported. Trace Elements Corp. did extensive drilling on its Maybell group of claims and shipped ore to the mill at Rifle. The corporation also negotiated a mill contract with the AEC in August and at year end was requesting renegotiation to increase the size of the proposed plant. Other active organizations were Shawano Development Co. and Front Range Mines, Inc., which conducted exploration drilling on its Eskridge group.

One natural-gasoline plant was operated by the Mountain Fuel Supply Co. Daily capacity of the plant to produce natural gasoline

was 3,500 gallons.

Montezuma.—Sand and gravel, petroleum (from the Dove Creek field), a minor amount of coal, precious metals, and carbon dioxide gas (McElmo field) were produced in the county during 1955.

One shipment of ore containing small quantities of gold and silver was made to the Leadville smelter by the First National Oil & Mineral

Co. from the Gold Dollar mine during 1955.

Montrose.—Montrose was the leading uranium county in the State, and 120 properties were reported active during the year. Processing mills were operated at Uravan by Union Carbide Nuclear Co. and at Naturita by Vanadium Corp. of America. Expansion of the Naturita plant was completed in 1955, and construction was begun at the Uravan mill to expand its capacity.

Major ore-production areas were the Atkinson Mesa, Bull Canyon, Club Mesa, Gypsum Valley, Long Park, Monogram Mesa, and

Paradox.

Contractors for the Colorado Highway Department were responsible for the 154,000 tons of paving gravel produced in Montrose County in 1955.

San Miguel Woodcraft & Gem Shop reported production of 20

pounds of covellite collected from its Cachin property.

In addition to the above, coal and salt were mined during the year. The salt was produced by Union Carbide Nuclear Co. for use in

roasting uranium-vanadium ores at Uravan.

Morgan.—Petroleum production continued to rise as output from the Adena field increased from 4.6 million barrels in 1954 to 6.0 million in 1955. In December a proposal was under study to unitize operation of the Adena field. Such unit operation would, it was calculated, yield 30 to 100 percent more oil, depending upon the degree of cooperation between the various royalty owners and operators. The Adena field supplies 80 percent of Morgan County's oil production.

Drilling activity declined sharply in the county in 1955 after the intensive development of the previous year associated with the Adena field. The number of wildcat holes was 13 percent less and develop-

ment holes 62 percent less than in 1954.

Two natural-gasoline plants were constructed at Fort Morgan during 1955. One plant, placed in operation in February by the Continental Oil Co., processed gas from the Little Beaver, Bobcat, Badger Creek, Badger Creek-West, and Middlemist fields in neighboring Washington and Adams Counties. The second plant, which went into initial production in August, was operated by Pure Oil Co. and was supplied with gas from the Adena field. Dry gas from these plants was fed into the newly constructed gathering system of Colorado Interstate Gas Co. and thence to Denver via the Hugoton-Denver line.

Ouray.—The King Lease, Inc., at the Camp Bird mine, principal producer of metals in Ouray County since the mine was reopened by Joseph King in 1926, was active throughout 1955. A total of 41,444 short tons of lead-zinc ore was mined and milled in 1955, which contained 3,315 fine ounces of gold, 51,522 ounces of silver, 404,471 pounds of copper, 1,332,806 pounds of lead, and 1,050,620 pounds of zinc. Earl & Linnie Alexander produced silver, copper, lead, and zinc from small shipments of lead ore and lead-zinc milling ore from the Lost Day mine.

The 900-ton-per-day mill of the Idarado Mining Co. at the portal of the Treasury tunnel near Red Mountain Pass in Ouray County was operated on ore mined from the company properties in San

Miguel County.

Park.—Nonmetals composed the dominant commodity group in Park County in 1955 in contrast to 1954, when metals supplied the bulk of output. Production of gold, silver, copper, and lead declined substantially; no zinc output was reported in 1955 compared with 99 tons in 1954.

Of the \$97,000 value of mineral production in 1955, 94 percent represented nonmetals. Operation of the Lone Lode feldspar pegmatite by R. V. McGuire accounted for nearly all of this percentage, and a small quantity of metallurgical-grade fluorspar shipped to Den-

ver by Eugene Kleinknecht represented the remainder.

The Phillips group of mines in Buckskin Gulch near Alma, operated by the Buckskin Joe Mines, Ltd., the largest producer of gold, silver, copper, lead, and zinc in Park County in 1954, conducted exploration work in 1955 but had no production. The 1955 recorded production of these metals came from small shipments of ore and concentrate from the Sweet Home, Ling group, Betty, and Hock Hockings

mines. Leslie Ducommun operated the Alma placer mine between June 3 and September 30, 1955, from which small quantities of gold

and silver were recovered.

Pitkin.—All but a small fraction of the value of minerals produced in Pitkin County was derived from the coal output of the No. 1 and No. 3 mines of the Thompson Creek Coal & Coke Corp. Coal from these operations was shipped via the Denver & Rio Grande Railway to Utah coke ovens. Average employment at these mines in 1955 was 66 men.

Three tons of ore mined from the Montezuma-Tam O'Shanter group by the Borealis Mining Co. was shipped to the Leadville smelter, where small quantities of silver and lead were recovered. The mine

was operated from July 1 to September 20, 1955.

Pueblo.—Sand and gravel and clays were the only raw mineral commodities produced in Pueblo County during 1955. Commercial sand and gravel output composed 632,000 tons out of a total of 986,000, and was used by local contractors in residential and industrial construction. Contracts let by the State, county, and city highway

departments resulted in production of the remainder.

Mine production of fire and miscellaneous clay provided employment for 30 miners, who worked 85 to 300 days during 1955. The demand for clay for manufacturing clay products increased in 1955, and output rose to 78,000 tons compared with 68,000 tons in 1954. Larger scale mining activity of the Summit Pressed Brick & Tile Co. was largely responsible for the gain in output, although more mine production was reported in 1955 by the Colorado Fire Clay Co., Standard Fire Brick Co., and Freeman Fire Brick Co. Summit Pressed Brick & Tile Co. employed 6 men 120 days in open-pit and miscellaneous clay-mining activities; 3 men operated the company plant 300 days. Pueblo Clay Products Co. was the largest producer of fire clay and employed 10 men working 260 days in underground operations; 3 men worked 260 days at the brick plant. General Refractories Co. of Lehi, Utah, was engaged in exploration and in developing fire-clay products in Pueblo County during 1955. The company made several shipments to its refractory plant at Lehi.

At Turkey Creek, the Cliff & Creek Uranium Co. carried out exploration drilling in search of carnotite uranium ore bodies in the Dakota

sandstone.

Rio Blanco.—Petroleum supplied 98 percent of the total value of Rio Blanco minerals produced in 1955. Production came from the Weber, Shale, and Shinarump horizons of the Rangely field and from the Wilson Creek field. Production from the Rangely field was increased 1 million barrels in 1955. Most Rangely oil was transported by pipelines to Salt Lake City refineries; smaller amounts were refined locally or shipped to The Texas Co. refinery in Casper, Wyo.

Drilling activity increased in 1955 over the previous year. The number of wildcat wells increased from 5 to 12, and of development wells from 3 to 15. One new gasfield, Piceance Creek—South, was discovered by Equity Oil Co. The field is 6 miles south of the Piceance Creek gasfield discovered in 1930. As was the case in Moffat County, the increased wildcat and development drilling was stimulated by the

promise of new market outlets.

Wesco Refining Co. operated its 1,700 barrel-per-day refinery at Rangely on crude supplied from the Rangely field.

Also at Rangely, natural-gas liquids were produced by Continental

Oil Co.

Three coal mines operated during the year to produce 20,000 tons, of which a third was marketed outside of Colorado. The mines were the Blue Streak, Rienau, and White River.

Production of sand and gravel and stone was recorded, and shipments of uranium ore from the Uranium Peak area east of Meeker

were reported.

Rio Grande.—The South Mountain Mining Co. (Frank E. Siegfried & W. I. McAtee) shipped 21 tons of gold-silver ore to the Leadville smelter from the Trench Tunnel. This ore was produced as a result of spare-time prospecting and mining between October 23 and November 17 by the partnership.

Routt.—Coal, sand and gravel, petroleum, and pumice and pumicite, in order of value, comprised the county mineral output in 1955. In addition, uranium exploration was carried out in the Fish Creek Falls area north of Steamboat Springs, and some production was reported.

Nine coal mines—5 underground and 4 strip—produced 525,000 tons of coal and employed 270 men. The largest of these mines were the Osage and Edna strip operations and the Harris, Keystone, and Crowbar underground mines. The first 3 shipped approximately 20,000 tons of coal to South Korea during the year.

The McCoy Aggregate Co. operated the McCoy open pit in 1955 and shipped scoria to manufacturers of concrete blocks and concrete-aggregate producers in the Denver area. Mine sales decreased considerably during the year owing to rising costs of mining and trans-

portation, as well as competition from substitute materials.

The Tow Creek and Oak Creek oilfields yielded 42,000 barrels of oil, some of which was shipped to the Bay Petroleum Co. refinery in Denver. No exploration or development drilling was reported for the year.

Saguache.—Saguache County ranked first in the value of gem stones produced in Colorado during 1955. The Villa Grove Turquoise lode produced 650 pounds of turquois valued at \$33,000. R. E. Meinzer

also reported production of a small quantity of agate.

The Rawley mine, operated by the Costello Lease throughout the year, continued to be the largest metal producer in the county. Copper-lead ore was shipped to the American Smelting and Refining Co. Leadville plant for direct smelting, and lead-zinc ore was shipped to the Resurrection Mining Co. mill for concentration. Gold and silver in addition to copper, lead, and zinc were recovered from the ore. Smaller quantities of these metals were recovered from ore mined by the Johnston Mining Co. from the Little Jennie mine and by W. O. Fortenberry from the Whale mine.

Uranium-ore production was reported from the Los Ochos mine of the Gunnison Mining Co. This company acquired, by purchase, properties of the MAT Mining Co. which adjoins the Los Ochos mine. Additional exploration activity was reported in the surrounding Cochetopa area and along the county line south of Monarch Pass.

San Juan.—Total value of gold, silver, copper, lead, and zinc output in San Juan County in 1955 more than doubled that in 1954. The

bulk of the production of these metals came from 5 of the 8 active mines in the county in 1955. These mines and the respective operators of each follow: Osceola (Argyle Mining & Milling Co. and Tech Ser-Mining Co.), Lark (D. W. Ruhter), Pride (Argyle Mining & Milling Co. and Barney Blackmore), Lead Carbonate (Wyoming Tungsten Mines), and Mogul Lease (Mogul Lease).

Harold Williams & Ed Walby had a substantial production of tungsten, which was sold to the Tungsten Refining, Inc., from the Adams mine. The output of tungsten in the county in 1955 was

more than 4 times that for 1954.

Eight hundred pounds of rhodonite was produced in the region during 1955 by the D'Anne Jewelry Originals and the San Miguel

Woodcraft & Gem Shop.

San Miguel.—The bulk of the gold, silver, copper, lead, and zinc output in the county in 1955 was produced by the Idarado Mining Co. from the Treasury Tunnel-Black Bear group of mines. This group was the leading lead producer in the State and second ranking gold, silver, copper, and zinc producer. The quantity of ore mined and output of metal by this company in 1955 were below the 1954 figure. The ore was treated in the company 900-ton-per-day flotation mill on the Ouray County side of the divide between the San Miguel River and Uncompangre River drainages. The mill products were goldsilver bullion (obtained by amalgamating a jig hutch product) and copper, lead, and zinc concentrates. Considerable exploration and development were conducted by the company at the Treasury Tunnel-Black Bear group of mines and at the Smuggler-Union group of mines during 1955. The latter group was taken over by the Idarado Mining Co. in May 1953 and has been closed since February 1954. During 1955 the company rebuilt the Pandora mill at Telluride and raised the daily capacity from 800 tons to 1,400. The company planned to mill all of the ore from both groups of mines at this mill during 1956.

Other active mines in the county that produced smaller quantities of gold, silver, copper, lead, and zinc included El Capitan (Grunwald Mining Co. & William Oliver), Andrus (East Ridge Co.), and Bradley (Mt. Wilson Mining Co.). Albert McClusky shipped material containing gold, silver, copper, and lead from a cleanup of the Alta-

St. Louis mill.

The entire output of iron ore in Colorado in 1955 was from the Iron Springs Placer deposit in San Miguel County by C. K. Williams & Co. The quantity produced was 39 percent below that in 1954. The ore was classed as bog iron (limonite) and used in manufacturing paint.

Seventy-one uranium properties were reported active in 1955; most of them were in the Slickrock district. New discoveries were reported in the Legin, Ham Canyon, and O'Neill areas. Union Carbide

Nuclear Co. was one of the major operators in the county.

San Miguel County was the second ranking producer of gem or ornamental stones in Colorado during 1955. Output consisted of dinosaur and sloth bone and jasper.

Summit.—The Wellington mine at Breckenridge, operated without interruption by W. L. Davenport since 1947, was again in 1955 the

main producer of metals in Summit County. The lead-zinc ore mined was shipped to the United States Smelting Refining and Mining Co. Midvale, Utah, mill, where lead and zinc concentrates were produced containing gold, silver, and copper in addition to the primary and most important metals of lead and zinc. Thirteen other lode mines in the county produced smaller quantities of these metals in 1955. Two placer mines (Boss Lode and Key West), both operated by Max Hugh Ostrander, were reported active in the Breckenridge

district of the county in 1955.

Teller.—The Golden Cycle Corp. continued to operate its 1,000ton-per-day Carlton custom flotation-cyanidation mill, to mine and mill ore from its Ajax group of mines, and to mine and re-treat material from the Buckeye Mines & Milling Co. waste-ore dump in the Cripple Creek district, Teller County, in 1955. The entire output of gold ore and mine-dump material from the district, which came from 13 active mines (including the 2 Golden Cycle Corp. operations) in 1955 (compared with 22 in 1954), was treated at the Carlton mill. Despite the drop in the number of active gold-silver mines in the county, the combined value of the gold and silver output declined only 4 percent.

The Ajax group of mines operated by the Golden Cycle Corp. was the largest producer of gold in the county and in the State in 1955. Following Ajax in the county and third largest in the State (Treasury Tunnel-Black Bear mine ranked second) was the Cresson mine, operated by the Cresson Consolidated Gold Mining & Milling Co. The United Gold Mines Co. Vindicator group of mines, Copeland & Knight El Paso group of mines, and LeClair Consolidated Mines Co. Grace Greenwood mine were also producers of substantial quantities of gold in the Cripple Creek district in Teller County in 1955.

Output of nonmetallics in Teller County consisted of stone and gem stones, but as a group these commodities constituted only a small portion of the income of the mineral industries of the county. mension monumental granite was produced for the local market by the Pikes Peak Granite Co., and gem-stone output consisted of amazon stone collected in the Colorado Springs, Florissant, and

Lake George area.

Washington.—Petroleum production for the year was 5.8 million barrels from 31 fields compared with 3.4 million barrels from 13 fields Major fields were Little Beaver, Bobcat, and Big Beaver, followed by Plum Bush Creek and Little Beaver-East. Except for the Little Beaver, the remaining four fields were 1954 discoveries.

Washington County led the State in drilling activity, with 187 wildcat holes and 222 development holes, or 27 percent of all holes drilled during the year in Colorado. In 1954, 106 wildcat and 75 development holes were drilled in the county. In proportion to the exploration effort, 23 of Colorado's 77 discoveries were also in Washington County.

Weld. Weld County was a source of petroleum, coal, sand and gravel, and stone, in order of value of output; fuels composed 97 percent of the total. Oilfields producing more than 100,000 barrels in 1955 were Black Hollow, Battle Canyon, Roggen-Southwest, and

Keota.

Drilling activity increased in 1955, with 145 exploration and development holes (a 24-percent increase over 1954) resulting in 5 oil and 3 gas discoveries.

Four miles northeast of the Black Hollow field The California Co. found oil in the Lyons formation; the discovery was named Pierce

Great Basins Petroleum Co. and Sorelle & Sorelle made a gas discovery, the Riverside field (sec. 19, T. 5 N., R. 61 W.). Initial

tests indicated a daily flow of 15 million cubic feet of gas.

In terms of coal production, Weld County ranks second only to Las Animas County. Eight mines were active in 1955 and employed 317 men. One of the eight, the Graden mine, was closed down at

year end by the operator, Wm. E. Russell.

The bulk of the sand and gravel produced in Weld County during 1955 was classed as Government-and-contractor output and was used in highway projects under the supervision of the Colorado Highway Department. Commercial output was reported by Doran Concrete Ready-Mix Co., Edward Selander, and Max Torrez, Jr.

# The Mineral Industry of Connecticut

By Robert D. Thomson 1 and Mary E. Otte 2



INERAL production in Connecticut in 1955, valued at \$10.4 million, increased 9 percent over 1954. The increased value of output resulted largely from rising demand for stone and Nonmetals dominated the State mineral economy. In 1955 stone replaced sand and gravel as the principal mineral product (also stone in 1951-53) in value. Companies in all 8 counties were producing and marketing minerals; New Haven and Hartford Counties produced over \$3 million in mineral output.

TABLE 1.—Mineral production in Connecticut, 1954-55 1

	1:	954	1955	
Minerals	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate. gross weight. Clays. Feldspar long tons. Lime. Mica. Peat. Sand and gravel. Stone. Undistributed: Columbium-tantalum ore, ground quartz (1954), stone, (crushed granite and dimension limestone) (1955), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2).  Total Connecticut.	13 288, 807 9, 280 (2) (2) (2) (2) (3) (4) 4, 846, 282 3 2, 829, 198	\$7, 976 284, 652 60, 463 (2) 23, 724 4, 314, 557 24, 269, 430 724, 979	324, 832 (2) 34, 917 3 4, 917 3 4, 345, 068 3 3, 641, 992	\$3, 184 314, 577 (2) 503, 253 12, 988 (3) 4, 079, 661 2, 5, 451, 550 123, 084

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2 Value included with "Undistributed."

## REVIEW BY MINERAL COMMODITIES NONMETALS .

Clays.—Greater demand in 1955 for construction materials resulted in increased production of miscellaneous clay, 12 percent over the 1954 tonnage. In the 1946-55 decade, 1953 was the only year that output exceeded 1955 production. Eight companies-6 in Hartford

<sup>Excludes certain stones, value for which is included with "Undistributed."
The total has been adjusted to eliminate duplication in the value of stone used in manufacturing lime.</sup> 

Acting Chief, Division of Mineral Industries, Region V, Bureau of Mines, Pittsburgh, Pa. <sup>2</sup> Statistical clerk, Region V, Bureau of Mines, Pittsburgh, Pa.

County and 1 each in Middlesex and New Haven Counties—operated open-pit mines and used the clay at local plants for making building, facing, and sewer brick. In addition, North Haven Brick Co., New produced clay for manufacturing lightweight

aggregate.

Feldspar.—Production of crude feldspar increased in both tonnage and value over 1954, principally because of greater demand for ground feldspar by the pottery industry. The average price paid for crude feldspar rose from \$6.52 per ton in 1954 to \$7.34 per ton in 1955. Three companies produced crude feldspar in 1955 compared with two Toll Gate Mining Co. sold crude feldspar for use in making cleaning compounds. Eureka Feldspar Mining & Milling Co., Inc., and The Worth Spar Co. produced feldspar from open-pit mines for processing at local company grinding plants. Ground feldspar was

sold to the pottery and soap industries.

Lime.—Sales of lime were greater in 1955 than in 1954, mainly as a result of increased demand for lime in manufacturing magnesium Only New England Lime Co. produced both quicklime and hydrated lime in Connecticut at Canaan, Litchfield County. England Lime Co. also produced high-magnesium limestone from a local open pit and after primary crushing trucked the rock to the lime plant. The lime plant, consisting of 2 rotary kilns and 1 batch hydrator, was operated at about 75-percent capacity. Lime was shipped as mason's lime, agricultural lime, and for manufacturing magnesium metal and insecticides to consumers in Connecticut, Massachusetts, New Hampshire, New York, and Rhode Island.

Mica.—Sales of crude mica decreased greatly in 1955 compared with 1954, mainly because of decreased sales of sheet mica to the Government and declining sales of scrap mica to mica grinders. All of the sheet mica was sold to General Services Administration, (GSA), Franklin, N. H., or Spruce Pine, N. C., Government Purchase Depot, as hand-cobbed mica. Most hand-cobbed mica came from 2 mines in the vicinity of Middletown, Middlesex County; a small quantity came from 1 mine in Litchfield County. Scrap mica from Middlesex County was shipped out of State for further processing.

Sand and Gravel.—The sand and gravel industry decreased 10 percent in tonnage and 5 percent in value, based on the material sold or used in 1955 compared with 1954. Sand and gravel declined from the leading commodity in 1954 to second ranking in the State in 1955. Larger quantities of sand for molding, paving, grinding, and structural gravel were used in 1955 than in 1954. Use of sand for structural, fire, filter, and other applications and of gravel for paving, railroad ballast, and other uses decreased in 1955. Sand as fire or furnace sand was the application for which material was reported in 1954 and not in 1955. Overall, the principal factor in declining business for the Connecticut sand and gravel industry in 1955 was the large drop in gravel sold as paving material. Of sand and gravel production in 1955, the building industry consumed 49 percent of the tonnage, and the paving industry consumed 44 percent compared with 43 and 52 percent, respectively, in 1954. Sand and gravel companies were active in every county except Tolland County. Government-and-contractor production was reported only from Hartford County.

TABLE 2.—Sand and gravel sold or used by producers, 1954-55, by classes of operations and uses

		1954		1955		
Uses		Va	lue		Va.	lue
	Short tons	Total	Average per ton	Short tons	Total	Average per ton
Commercial operations:						
Sand: Molding Building Paving Grinding and polishing Other	777, 120	(1) \$1,135,119 736,727 (1) (1)	\$0. 93 . 95	1, 200 1, 151, 029 911, 097 5, 700 23, 157	\$960 1, 018, 061 778, 006 4, 560 7, 936	\$0.80 .88 .85 .80 .34
Gravel: Building Paving. Railroad ballast. Other. Undistributed <sup>2</sup>	863, 410 694, 015 (1) 189, 038 49, 889	1, 102, 090 780, 833 (1) 215, 951 44, 045	1. 28 1. 13 1. 14 . 88	990, 058 540, 286 5, 400 242, 231 3, 265	1, 255, 182 584, 388 4, 000 284, 965 2, 850	1. 27 1. 08 . 74 1. 18 . 87
Total commercial sand and gravel	3, 793, 577	4, 014, 765	1.06	3, 873, 423	3, 940, 908	1. 02
Government-and-contractor operations: Sand: Paving	112, 280 330 940, 095	16, 676 99 283, 017	.15 .30 .30	144, 990 350 326, 305	20, 610 350 117, 793	.14 1.00 .36
Total Government-and-con- tractor sand and gravel	1, 052, 705	299, 792	. 28	471, 645	138, 753	. 29
Grand total	4, 846, 282	4, 314, 557	. 89	4, 345, 068	4, 079, 661	. 94

<sup>&</sup>lt;sup>1</sup> Included with "Undistributed" to avoid disclosure of individual operations. <sup>2</sup> Includes molding sand (1954), grinding and polishing sand (1954), blast sand, fire or furnace sand (1954), filter sand, other sand (1954), and railroad-ballast gravel (1954).

Stone.—Connecticut stone production in 1955 increased in both tonnage and value compared with 1954. Basalt, limestone, quartz, and granite, in order of decreasing importance, were mined in 1955. Six companies each in Hartford and New Haven Counties and one company in Litchfield County produced crushed basalt. Eightythree percent of basalt tonnage was sold as aggregate; the remainder was used as railroad ballast and riprap. Three companies in Litchfield County and one company in Fairfield County produced limestone. Except for a small quantity sold as dimension stone, the limestone was crushed and sold principally as agricultural limestone, flux, and for manufacturing lime. Lantern Hill Silica Co., New London County, only producer of silica (quartz), sold ground quartz to the glass, foundry, and abrasive industries. Three quarries in New London County and one quarry each in New Haven and Windham Counties were worked for dimension granite. In addition to dimension stone, crushed granite was produced at the Millstone quarry, Waterford, New London County.

TABLE 3.—Stone sold or used by producers, 1954-55, by uses

	19	054	1955		
Use	Short tons (unless other- wise stated)	Value	Short tons (unless other- wise stated)	Value	
Dimension stone: Building stone:					
Rough construction Cut stone, slabs, and mill blocks	2, 081	\$24, 186	(1)	(1)	
cubic feet	2 21, 725	<sup>2</sup> 61, 332	(1)	(1)	
Monumental stonedo	<sup>2</sup> 6, 000	<sup>2</sup> 42,000	(1)	(1)	
Curbing and flaggingdo Undistributed 3	3, 831 1, 378	11, 417 30, 442	4, 550 3, 954	\$14, 517 119, 243	
Total dimension stone (quantities approximate, in short tons)	6, 078	169, 377	4, 332	133, 760	
Crushed and broken stone:					
Agricultural	(1)	(1)	60, 053	238, 270	
Riprap	12, 491	`18, 444	(1)	(1)	
Concrete roadstone, railroad ballast Quartz (ground)	2, 669, 717	3, 589, 999	2 3, 356, 808 24, 500	3 4, 462, 371 178, 880	
Undistributed 4	140, 912	491, 610	196, 299	438, 269	
Total crushed and broken stone	2, 823, 120	4, 100, 053	3, 637, 660	5, 317, 790	
Grand total	5 2, 829, 198	<sup>5</sup> 4, 269, 430	6 3, 641, 992	6 5, 451, 550	

<sup>1</sup> Included with "Undistributed."

<sup>2</sup> Incomplete data; portion not included is combined with "Undistributed."

<sup>3</sup> Includes rough architectural, rubble, rough monumental, rough construction (1955), and dressed con-

Includes agricultural limestone (1954), furnace flux, other crushed and broken stone, riprap (1955), portion of concrete roadstone and railroad ballast (1955).

Excludes quartz.

To avoid disclosing confidential information, total is incomplete and excludes crushed granite and dimension limestone.

### METALS

Beryllium.—For the second year production of beryl in Connecticut dropped about 60 percent in both quantity and value. Of the 10 States producing beryl in 1955, Connecticut ranked seventh. Mines were worked in Fairfield, Litchfield, Middlesex, and New Haven Counties. The entire beryl production was purchased by the GSA Franklin, N. H., Government Purchase Depot. BeO content of the ore ranged from 10.88 to 12.80 percent.

Columbium-Tantalum.—The output of columbite-tantalite decreased slightly in 1955, compared with 1954. All ore from mines worked in Middlesex and New Haven Counties was sold to the

Government.

### MINERAL FUELS

Peat.—For the third consecutive year production of peat in Connecticut decreased in tonnage. Peat was recovered from bogs in Hartford, Middlesex, and Tolland Counties and sold mainly as a soil conditioner. No production was reported from Windham County.

### **REVIEW BY COUNTIES**

Fairfield.—Sand and gravel was the leading commodity produced in Fairfield County in 1955, followed by stone and beryl. companies reported production of sand and gravel. Structural and paving sand and gravel were marketed by John Lomazzo & Sons, Corp., Westport; Peter B. German, Inc., Bridgeport; and Senior Sand & Gravel Co., Bethel. Estate of Bernard J. Dolan, Bethel, produced structural sand and gravel; and Stamford Local Material Co., Stamford, and E. Drenckham produced paving sand and gravel. Long Ridge Development, Stamford, and Ralph L. Vick Co., New Canaan, recovered paving gravel.

Connecticut Agstone Co., Danbury, quarried and marketed crushed limestone as agricultural stone, concrete road material, flux, and also

a small quantity of rough construction limestone.

Carl Denninger at Captain Cook mine, Newtown, mined and sold

a small quantity of beryl to GSA.

Hartford.—Hartford County ranked second in value of mineral production and supplied 31 percent of the State mineral-output value. Leading commodities were stone and sand and gravel, followed by clays and peat.

TABLE 4.—Value of mineral production in Connecticut, 1954-55, by counties

County	1954	1955	Minerals produced in 1955 in order of value
Fairfield Hartford Litchfield Middlesex	\$798, 571 3, 079, 062 1, 183, 350 1 265, 596	\$876, 629 3, 214, 871 1, 318, 332 280, 801	Sand and gravel, stone, beryl. Stone, sand and gravel, clays, peat. Stone, lime, sand and gravel, beryl, mica. Sand and gravel, feldspar, clays, mica, peat, columbium-tantalum, beryl.
New Haven	3, 375, 513	3, 917, 616	Stone, sand and gravel, clays, beryl, columbium- tantalum.
New London Tolland Windham Undistributed 3	619, 023 (2) (2) 259, 786	(2) (2) (2) 819, 731	Stone, sand and gravel. Peat. Sand and gravel, stone.
Total	9, 581, 000	10, 428, 000	

Six companies mined basalt in Hartford County in 1955. & Sons, Inc., Farmington; Materials Services, Inc., East Granby; New Haven Trap Rock Co., Plainville quarry, Hartford; Edward Balf Co., Newington; Sherman Sand & Stone Co., New Britain; and Angelo Tomasso, Inc., Plainville, all produced crushed basalt for concrete and road metal; the first three companies named also produced riprap. In addition, New Haven Trap Rock Co. mined basalt for use as railroad ballast. Flood conditions caused an in-

creased demand for ballast and riprap.

Sand and gravel used for structural, paving, grinding, and blast-sand purposes was reported by 14 companies. The 10 leading companies were Dunning Sand & Gravel Co., Inc., Farmington Sand & Gravel Co., and Sherman Sand & Stone Co., Farmington; Manchester Sand & Gravel Co., and Alexander Jarvis Co., Manchester; Russak Bros., Inc., Plainville; General Sand & Stone Corp., Bristol; Angelo Tomasso, Inc., New Britain; Certified Sand Co., Rocky Hill; and Lake Garda Sand & Gravel, Unionville. Connecticut State Highway Department (Hartford), town of South Windsor, and superintendent of public works (Bristol) produced paving sand and gravel and structural gravel. Quantities of paving gravel were produced under contract to the Connecticut State Highway Department.

Revised figure.
 Included with "Undistributed."
 Includes counties whose value must be concealed for particular years, as indicated by footnote 2, and a quantity unspecified by county.

Captive tonnage of miscellaneous clay from open-pit mines was reported by Edward W. Mack & Son, Windsor; The Eastern Brick Co., Berlin; Clark Brick Co., South Windsor; Kelsey Ferguson Brick Co., Suffield; Donnely Brick Co., Kensington; and Stiles & Reynolds Brick Co., Berlin. The clay was used in manufacturing heavy clay products.

Woodrow Clifford mined humus peat from a bog near Manchester. Litchfield.—Litchfield County ranked third in the State in value of mineral output, producing stone, lime, sand and gravel, beryl, and

mica, in order of decreasing value.

Conklin Limestone Co., Inc., New England Lime Co. (from quarries at Canaan) and United States Gypsum Co. (at Falls Village) reported selling crushed limestone for agricultural purposes. United States

Gypsum Co. produced dolomite for use as flux.

New England Lime Co. trucked sizable tonnages of limestone to a nearby company plant for producing quicklime and hydrated lime, which was sold for building, agricultural, and industrial uses. Woodbury Trap Rock & Concrete Units, Inc., reported sales of crushed basalt for use in concrete and road material.

Sand and gravel was recovered from pits by Benvenuti & Favali Construction Co., Inc., John C. Iffland Lumber Co., Torrington; Johnson Sand & Gravel Co., Terryville; State Line Sand & Gravel, Inc., Canaan; Carlson Construction Co., Inc., New Milford; and Lime Rock Sand & Gravel Co., Salisbury. It was used mainly for structural and paving purposes.

Howard J. Hewitt mined a small quantity of mica and beryl at the Hewitt mine, New Milford. The mica was sold as hand-cobbed mica and the beryl as concentrate to GSA at the Franklin, N. H., Govern-

ment Purchase Depot.

Middlesex.—Sand and gravel, feldspar, clays, mica, peat, columbium-tantalum, and beryl were produced in Middlesex County in

1955

Six sand and gravel plants were active in the county. Butler Sand Service, Portland, reported structural sand and gravel; Richard Lindemark, Portland, structural sand and gravel and paving sand; Sebastian Ortise, Portland, and Stanley Wollock, Essex, structural sand; Shore Line Washed Sand & Stone Co., Killingworth, structural and paving sand and gravel; and C. Otto Heser & Leo Bugg, Jr.,

Clinton, structural sand and paving gravel.

Three companies reported production of feldspar in 1955. Toll Gate Mining Co. produced both potash and mixed potash-soda feldspar from an underground mine near Middletown and sold crude feldspar. The Worth Spar Co. produced both potash and potash-soda feldspar from an open-pit mine near Cobalt and ground the crude at an adjacent company plant. Both companies produced mica as a byproduct, with Toll Gate Mining Co. marketing sheet and scrap mica and The Worth Spar Co. sheet mica. Eureka Feldspar Mining & Milling Co., Inc., recovered mixed potash-soda feldspar from an open-pit mine near Portland, ground all the material at a local company grinding plant, and marketed the product principally for ceramic use. In addition to Toll Gate Mining Co. and The Worth Spar Co., crude mica was produced by Homer Hise and Harry M. Leach, Middle-

All the sheet mica was sold as hand-cobbed at the Franklin, N. H., and Spruce Pine, N. C., Government Purchase Depot.

The Michael Kane Brick Co., Middletown, produced miscellaneous clay used in manufacturing building brick at a local company plant.

The Worth Spar Co. and Walter Busch reported small quantities of beryl produced at the Worth Spar mine, Cobalt, and Rock Landing quarry, Haddam Neck. The latter sold the total production to the Franklin, N. H., Government Purchase Depot. Walter Busch also mined a small quantity of columbium-tantalum, which was purchased by GSA at Franklin.

J. Werden Clark recovered humus peat from a bog near Old Say-

New Haven.—New Haven County continued to lead the State's 1955 mineral production and supplied 38 percent of mineral output value. Stone output in 1955, the largest in the State and county, increased in volume and value over 1954. Sand and gravel ranked second in the county in tonnage and value and decreased slightly compared with 1954. New Haven County led in producing basalt, most of which was crushed for concrete and road materials; other large uses were as railroad ballast and riprap. The six active basalt companies were New Haven Trap Rock Co., Wallingford, and North Branford quarries, New Haven; The York Hill Trap Rock Quarry Co., Meriden; C. W. Blakeslee & Sons, Inc., Pine Rock quarry, Hamden; Foxon Trap Rock Co., Inc., New Haven; A. N. Farnham, Inc., Pine Rock quarry, New Haven; and Barcla Quarries, Inc., New Haven. Stony Creek Granite Quarries, Inc., quarried dimension granite for use as monumental and building stone. Among the 15 companies producing sand and gravel largely for structural and paving uses, the 10 leading firms were: Waterbury Sand & Gravel Co., Waterbury; Beard Sand & Gravel Co., Inc., Milford; Estate of Stillman H. Rice and A. N. Farnham, Inc., New Haven; Meriden Washed Sand & Stone Co., Inc., Wallingford; the Grasso Construction Co., Seymour; D. J. Carten Sand & Gravel Co., Devon; The Iron Ledge Co., Milford; Tony Calabro Sons, Inc., Waterbury; and Elm City Construction Co., New Haven. North Haven Brick Co., open pit near Hamden, produced miscellaneous clay part of which was used for manufacturing building brick at its adjacent plant and the remainder sold for producing lightweight aggregate. Burritt R. Curtis, Southford quarry, Southbury, produced a large quantity of beryl and a small quantity of columbium-tantalum which was purchased by GSA at Franklin, N. H.

New London.—Stone and sand and gravel, the only commodities produced in New London County in 1955, decreased slightly in value

compared with 1954.

Golden Pink Granite Quarry Co., Old Lyme, and Millstone Granite Quarry, Inc., Waterford, produced dimension granite for use as memorials. In addition, Millstone Granite Quarry, Inc., produced rough architectural stone, rubble, and dressed construction stone. E. Locarno & Sons, Niantic, reported a small quantity of dimension granite sold for construction use. Lantern Hill Silica Co. plant in Norwich, produced ground silica (quartz), used mainly in manufacturing glass.

Two sand and gravel companies were active in New London County in 1955. John J. Doyle Sand & Gravel Co., Inc., New London, reported sand and gravel for structural use; and Southern New England Contractors Supply Co., New London, produced sand and gravel for structural and paving purposes.

Tolland.—Humus peat, the only mineral produced in Tolland County in 1955, was produced by Bonair Peat Co., Inc., from a bog

near Ellington.

Windham.—Minerals produced in Windham County in 1955 were

stone, and sand and gravel, in order of decreasing value.

R. B. Marriott & Sons, only producer of stone in Windham County, sold dimension granite for use in rough construction and curbing from a quarry at Oneco.

Dunning Sand & Gravel Co., Wauregan and Moosup, and R. A. Rawson Sand & Gravel, Putnam, both marketed sand and gravel

for structural and paving purposes.

# The Mineral Industry of Delaware

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 Delaware Geological Survey.

By Robert D. Thomson 1 and Mary E. Otte 2



HE VALUE of mineral output in Delaware increased 75 percent in 1955 over 1954. This was the third consecutive year of advance for the mineral industries in Delaware; the gain in 1955 largely resulted from increased demand for sand and gravel for highway construction and Federal Government projects. Sand and gravel, stone, and clays each showed increases in tonnage and value. Every county in the State contributed to the expanded mineral economy in 1955 with New Castle County leading.

TABLE 1.—Mineral production of Delaware, 1954-551

	195	4	1955	
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
ClaysSand and gravelStoneUndistributed	(2) 971, 647 (2) 73, 505	(2) \$752, 528 (3) 194, 706	44, 550 2, 297, 074 78, 791	\$22, 872 1, 407, 196 227, 450
Total, Delaware		947, 000		1, 658, 000

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2 Included with "Undistributed."

## REVIEW BY MINERAL COMMODITIES

### **NONMETALS**

Clays.—The quantity of miscellaneous clay sold or used in 1955 exceeded that in either 1953 or 1954. All the clay came from open-pit mines, and 2 of the 3 producing companies reported captive tonnage. The clay was used for making heavy clay products.

Sand and Gravel.—The output of sand and gravel sold or used in 1955 increased 87 percent in value over 1954, mainly because of greater demand for commercial paving sand and gravel and material

<sup>&</sup>lt;sup>1</sup> Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa. <sup>2</sup> Statistical clerk, Region V, Bureau of Mines, Pittsburgh, Pa.

for Federal Government projects. Ten sand and gravel companies were active in 1955; 6 marketed sand and gravel; 3, gravel; and 1, sand.

Stone.—The demand for stone exceeded production largely because of road construction, with the quantity and value marketed in 1955 increasing 23 percent over 1954. Petrillo Bros., Inc., continuing as the only producer of stone in Delaware, marketed the crushed rock as Blue Granite for use as road material and stone sand.

### **REVIEW BY COUNTIES**

Kent.—Mineral production in Kent County in 1955 consisted of clays and sand and gravel. J. H. Wilkerson & Son at Milford used clays produced from an open-pit mine for manufacturing building brick. Clough & Caulk Sand & Gravel Co. produced sand and gravel for building purposes from an open pit and fixed plant at Wyoming. Fisher M. Carpenter produced unwashed sand and gravel for miscellaneous uses at a pit near Milford; St. Jones River Gravel Co. mined paving sand and gravel from a bank at Dover; and C. J. Langenfelder & Sons, Inc., and Williams Construction Co. produced sand and

gravel near Dover for use on Federal Government projects.

New Castle.—New Castle County, continuing its lead in producing minerals in 1955, supplied 55 percent of the total value of minerals recovered in the State. In order of decreasing value, sand and gravel, granite, and clays were produced in the county. Delaware Sand & Gravel Co. produced sand and gravel for building purposes and paving sand from a pit and fixed plant at New Castle. John C. Green, Jr., Middletown, produced gravel for miscellaneous uses. Building sand, and gravel for fill, were produced by Petrillo Bros., Inc., and Parkway Gravel, Inc., produced paving gravel; each company operated a pit and fixed plant at Minquadale. Whittington's Sand & Gravel Co. produced building sand and paving gravel from a pit and plant near Bear. At its Shellpot quarry near Wilmington, Petrillo Bros., Inc., quarried granite which was crushed and sold as blue granite for use as road material and stone sand. Miscellaneous clay was produced by Delaware Brick Co. near New Castle and by J. R. Simeone of Wilmington for building brick.

Sussex.—Sand and gravel was the only mineral commodity produced in Sussex County in 1955. Lewes Sand Co. produced engine sand from a pit and fixed plant near Lewes, Melvin Joseph produced

gravel for road construction at Georgetown.

# The Mineral Industry of Florida

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, 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



LORIDA mineral-production value in 1955 virtually did not change from 1954, despite sharply declining phosphate-rock production owing to a labor strike in the land pebble field. Increases in both volume and value of the following commodities were reported (percentage increase in value shown in parentheses): Cement (5), clay (44), stone (36), sand and gravel (63), rutile (29), zircon (74), abrasive garnet (111), lime (11), peat (38).

TABLE 1.—Mineral production in Florida, 1954-55 1

	1	1954	1955	
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays. Natural gas. Natural gas. Petroleum (crude)	37, 449	3,000 168,004 (2) 64,499,877 2,661,152 16,832,066 2,411,823	36	\$4, 815, 855 4,000 231, 829 (2), 53, 640, 301 4, 349, 148 22, 966, 008 (2) 1, 122, 000 1, 425, 641 22, 787, 056 108, 957, 000

<sup>&</sup>lt;sup>1</sup> Production as measured by mine shipments, sales or marketable production (including consumption by Production as included by a producers).

Figure withheld to avoid disclosure of individual company confidential data.

The total has been adjusted to eliminate duplication in the value of clays and stone.

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 Geologist, Florida Geological Survey, Tallahassee, Fla.

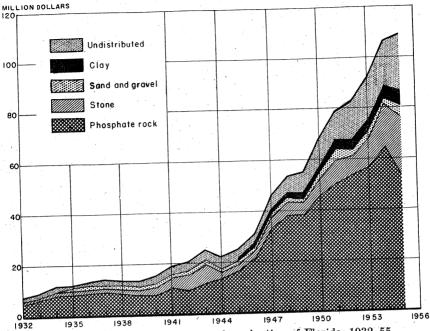


FIGURE 1.—Total value of mineral production of Florida, 1932-55.

TABLE 2.—Average unit value of mineral commodities produced in Florida, 1951-55 <sup>1</sup>

				1	
Commodity	1951	1952	1953	1954	1955
Cement, portland		\$2. 76  17. 37 24. 55 1. 00 46. 44 16. 35 12. 93 .07 6. 50 5. 88 103. 77 1. 34 .75 1. 22 9. 74	\$2. 87  18. 84 23. 92 1. 00 46. 49 15. 37 12. 57 06 6. 70 6. 06 108. 54 1. 27 82 1. 20 9. 00	\$2. 89  19. 82  24. 49  78  30. 00  15. 36  11. 97  08  4. 49  6. 18  119. 05  1. 50  71  1. 25  2. 53	\$2. 96 21. 46 23. 06 1. 03 60. 66 18. 97 12. 06 3. 77 6. 11 122. 26 1. 57 1. 31 143. 9 2. 2 49. 3

<sup>&</sup>lt;sup>1</sup> For greater detail on prices by grades and markets, see volume I, Minerals Yearbook, 1955.

## REVIEW BY MINERAL COMMODITIES

### **METALS**

Monazite.—Monazite was recovered from sand dredged for titanium minerals in Duval County in increased quantity over that in 1954. Production data are security classified and are not included in the State mineral-production total.

Titanium (Ilmenite and Rutile Concentrate).—As in 1954, production was obtained from Clay, Duval, and Indian River Counties. Data are based on the output of the mineral-separation plants, prorated back to the county of origin. The mineral-separation plants were in Brevard, Clay, and Duval Counties. Ore, originating in Indian River County, was processed in Brevard County. Production from E. I. du Pont de Nemours & Co., Inc., Highland plant, on the line between Clay and Bradford Counties, was credited to Clay County. The plant is roughly 17 miles north of Starke and east of Lawty.

Humphreys Gold Corp. ran the Trail Ridge and Highland mines for Du Pont. It also dredged and treated, at a processing plant, ores from the properties of Rutile Mining Co. and the Titanium Alloy Manufacturing Division of National Lead Co. in Duval County

near Jacksonville.

Crane Co. prospected for titanium minerals near Panama City on the west coast, and Union Carbide & Carbon Corp. conducted exploration on Amelia Island near Fernandina Beach, Nassau County, in

the northeast corner of the State.3

The Du Pont Co. increased its leasehold on the rich Trail Ridge titanium-sands deposits from an initial 3,800 acres southeast of Starke to a total of 18,000 acres by acquiring the area between its Trail Ridge and Highland mines. Royalties per gross ton of mineral increased from 30 to 65 cents, to be split between the State and Federal Governments. National Lead Co. increased its ilmenite reserves by purchase of 1,800 acres in Baker, Bradford, Clay, and Duval Counties. Bear Creek Mining Co., exploration subsidiary for Kennecott Copper Co., conducted geological surveys in Bradford, Clay, and Duval Counties.

Ilmenite.—Ilmenite, mined in Clay, Duval, and Indian River Counties and processed in Bradford and Clay Counties, was marketed as a mixture of ilmenite, rutile, and leucoxene. No attempt was made

to recover rutile separately.

Rutile.—Rutile, mined in Duval and Indian River Counties and processed in Brevard and Duval Counties, was recovered by separation from sands, which had been mined for ilmenite, rutile, zircon, garnet, and other minerals. Production was up 26 percent in tonnage and 29 percent in total value above 1954, reflecting a small increase in unit value.

Zirconium.—Zircon was recovered as a byproduct from processing titanium minerals in three plants in Brevard, Clay, and Duval Counties. Production in 1955 increased 61 percent above 1954 in tonnage and 74 percent in total value. This increased tonnage indicated the increased demand anticipated in the 1954 report. The increased value is due in part to an 8-percent increase in unit value.

### **NONMETALS**

Cement.—The portland-cement industry expanded production to an alltime high; quantity increased 2 percent and total value 5 percent above the previous high of 1954.

<sup>3</sup> Chemical Week, Newsletter, vol. 77, No. 1, July 2, 1955, p. 14.
4 Mining World, Du Pont Acquires More Florida Acreage to Substantially Increase Ilmenite Holdings: Vol. 17, No. 10, September 1955, p. 105.

The Bunnell plant of Lehigh Portland Cement Co. used staurolite, recovered as a byproduct from concentrating ilmenite, as an iron and aluminum additive to produce cement clinker. This plant used local coquina shell in place of limestone and during 1955 increased its coquina-shell holding by acquiring 3,000 acres northwest of Ormond Beach.

Clays.—The clay-mining industry again established an alltime high in both tonnage and total value. Tonnage increased 11 percent, and total value increased 44 percent above 1954. Reversing 1954 conditions, increases were recorded in the higher priced clays (fuller's earth and kaolin); miscellaneous clay registered a small loss in tonnage, although maintaining nearly the same total value owing to an increase in unit value.

Fuller's Earth.—Minerals & Chemical Corp. of America, Attapulgus Division, and Floridin Co. mined and prepared fuller's earth. Mining activity in 1955, appreciably greater than in 1954, resulted in increased tonnage and total value; average unit value increased.

Kaolin.—United Clay Mines Corp., Minerals & Chemical Corp. of America (formerly Edgar Plastic Kaolin Co.) mined and prepared high-grade kaolin. The value and tonnage of combined production increased substantially; average unit value decreased slightly.

Miscellaneous Clay.—Most producers utilized miscellaneous clay for manufacturing other commodities, such as brick, tile, other heavy clay products, and portland and other cements, leaving little if any to be sold in the open market. Output for heavy clay products and cement in 1955 exceeded that in 1954 (the previous high) by less than \$1,000 in total value and dropped 8 percent in tonnage, thus reflecting a higher average reported unit value.

Garnet (Abrasive).—Output of abrasive garnet in 1955 by individual producers increased slightly in tonnage; total value rose 100 percent; unit value was nearly double that of 1954 due to production of cleaner

concentrate.

Lime.—Lime production increased 10 percent in tonnage and 11

percent in total value over 1954.

Perlite.—Perlite crude material, not found in Florida, was imported and expanded into a marketable product by Perlite, Inc., in Dade County; Tennessee Products & Chemical Corp., in Duval County; and Airlite Processing Corp., in Indian River County.

and Airlite Processing Corp., in Indian River County.

Phosphate Rock.—The phosphate-rock industry was handicapped by a labor strike in the land-pebble field. As a result, the marketable production in 1955 was 16 percent below the peak of 1954, and total value was down 17 percent—a loss of nearly \$11 million to the State economy.

Land-pebble-phosphate marketable production declined 16 percent below 1954 in tonnage and 17 percent in value, reflecting a small

decline in unit value.

Marketable production of hard rock, on the other hand, exceeded that in 1954 by 15 percent in tonnage and 18 percent in value, recording a slight increase in unit value. All production was used for elemental phosphorus.

Production of soft rock declined 26 percent in tonnage and 21 percent in total value compared with 1954. Unit value rose slightly in

1955. Uses were divided about equally between direct application to

the soil, and feed for stock and poultry.

The same companies and mines produced land-pebble and hardrock phosphate as in 1954. Soft-rock phosphate producers were: Loncala Phosphate Co., Soil Builders (Mincoll mine), Sun Phosphate Co. (Sec. 10 mine), Superior Phosphate Co. (Bar mine), and Kellogg Co. (Kellogg mine). Globe Phosphate Co., Seaboard Phosphate Co., and Knight & Bevis were consolidated into Sun Phosphate Co. Howard Phosphate Co. (Inverness mine) reentered the producers' Camp Phosphate Co. (Hernando mine) succeeded Delta Phosphate Co.

Armour Fertilizer Works, Inc., resumed producing pebble phosphate, but because production was delayed until late December, no

tonnage was credited to 1955.

TABLE 3.—Marketable production of phosphate rock, 1950-55

	Hard	l rock	Soft rock		Land	Land pebble		Total	
Year	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	
1950 1951 1952 1953 1954 1955	70, 500 81, 600 85, 900 68, 200 78, 990 91, 200	\$532, 275 628, 320 662, 289 537, 416 622, 440 733, 800	80, 095 90, 339 83, 001 76, 781 93, 956 69, 788	\$398, 797 486, 424 491, 775 474, 248 575, 537 452, 301	8, 446, 632 8, 039, 881 9, 036, 237 9, 186, 021 10, 264, 251 8, 586, 294	\$47, 446, 909 47, 497, 248 52, 931, 460 55, 513, 037 63, 301, 900 52, 454, 200	8, 597, 227 8, 211, 820 9, 205, 138 9, 331, 002 10, 437, 197 8, 747, 282	\$48, 377, 98 48, 611, 99 54, 085, 52 56, 524, 70 64, 499, 87 53, 640, 30	

TABLE 4.—Land-pebble phosphate rock sold or used by producers, by uses. 1954-55

Use	19	054	1955		
	Long tons	Value <sup>1</sup>	Long tons	Value 1	
Ordinary superphosphate. Triple superphosphate. Direct application to soil. Elemental phosphorus, ferrophosphorus, and phosphoric acid. Phosphoric acid (wet process). Stock and poultry feed. Nitra phosphate. Other uses.	4, 912, 435 1, 036, 406 3 577, 231 622, 563 439, 056 (6) 12, 851	\$30, 757, 020 6, 487, 900 3, 613, 500 3, 299, 417 2, 327, 000 (6) 80, 400	4, 618, 100 2 1, 598, 910 4 640, 193 513, 004 (5) 150, 304 (6) 1, 500	\$28, 816, 900 <sup>2</sup> 9, 703, 600 <sup>4</sup> 3, 994, 800 2, 816, 942 ( <sup>5</sup> ) 968, 932 ( <sup>6</sup> ) 8, 200	
Exports	1, 964, 987	12, 325, 328	1, 879, 157	11, 664, 277	
Total	9, 565, 529	58, 890, 565	9, 401, 168	57, 973, 651	

Sand and Gravel.—An alltime high in sand and gravel production tonnage and value was achieved in 1955, reversing the downward trend since 1951. Tonnage increased 46 percent above 1954 and total value, 63 percent; unit value increased 12 percent. Tonnage was 15 percent above the previous peak year of 1951, but total value exceeded that of 1951 by only 1 percent. The entire output was classified as commercial.

Estimated from company reports.
 Includes phosphoric acid (wet process).
 Includes stock and poultry feed.
 Includes nitra phosphate.
 Included with triple superphosphate.
 Included with direct application to soil.

Sixteen counties reported production of sand, compared with 15 in 1954; however, Hillsborough, Monroe, and Okaloosa Counties reported production in 1954 but none in 1955. On the other hand, Osceola and St. Lucie Counties did produce in 1955 but not in 1954. Fourteen counties reported both years.

Dade, Escambia, and Volusia Counties reported gravel production in 1955, whereas Escambia, Gadsden, Manatee, and Monroe Counties

reported gravel in 1954. In all, 31 operators reported production both years.

TABLE 5.—Sand and gravel sold or used by producers, 1946-50 (average) and 1951-55

Year	Sand		Gravel		Total	
1946-50 (average)	Short tons  (1) 2, 986, 862 (2)	Value (1) \$2, 512, 282 (2)	Short tons  (1) 1,431,711 (2)	Value (1) \$1,788,400 (2)	Short tons 2, 190, 392 4, 418, 573 4, 154, 613	\$2,064,085 4,300,682 3,848,077
1953 1954 1955	3, 386, 329 3, 202, 364 (2)	2, 760, 410 2, 260, 825 (2)	345, 103 266, 478 (2)	438, 958 400, 327 (²)	3, 731, 432 3, 468, 842 5, 065, 503	3, 199, 368 2, 661, 152 4, 349, 148

Data not available.
 Figure withheld to avoid disclosure of individual company confidential data.

Staurolite.—Staurolite was recovered as a byproduct in concentrating sand dredged for producing ilmenite and rutile. It was marketed principally as an iron and alumina additive in manufacturing portland cement. Production was greater than in 1954, and a larger tonnage went into cement manufacture; the remainder was marketed as material for sandblasting monumental stone.

Stone. - Limestone. - Limestone production, exclusive of dimension stone, again set a new alltime high, exceeding that of 1954 by over 2 million tons (15 percent) and nearly \$4½ million (27 percent) over the previous high of 1954.

The relatively insignificant production of Government-and-contractor crushed and broken limestone in 1955 amounted to only 3,350 tons valued at \$2,500.

Commercial crushed limestone was produced from 71 quarries in 20 counties in 1955, compared with 60 quarries in 18 counties in 1954. In all, 55 quarries reported production both years, 16 were added in 1954, and 7 ceased production before 1955.

Oystershell.—Oystershell was recovered from fossil beds offshore on both the Atlantic and Gulf coasts. Production in 1955 totaled 724,000 short tons valued at \$1,650,000; of this, the greater part was marketed for road metal and the remainder as poultry grit.

TABLE 6.—Crushed limestone sold or used by producers, 1946-50 (average) and 1951-55 (exclusive of limestone used for cement and lime)

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	4, 010, 098	\$4, 870, 730	1953	9, 428, 959	\$11, 309, 421
1951	8, 032, 966	9, 419, 682	1954	1 14, 225, 356	1 16, 832, 066
1952	7, 836, 124	9, 572, 575	1955	1 16, 303, 625	1 21, 312, 339

<sup>1</sup> Includes stone used for cement and lime manufacture.

### **FUELS**

Natural Gas. - Production and sale of natural gas showed little

change from 1954.

Peat.—Peat produced for agricultural purposes was 63 percent greater in tonnage and 38 percent greater in total value compared with 1954, reflecting a 16-percent reduction in unit value.

Petroleum.—Petroleum production declined 10 percent in volume and approximately the same in total value as compared with 1954.

Two new test holes for deep-seated (below 10,000 feet) oil strata were begun on offshore sites.

## **REVIEW BY COUNTIES**

Of the 67 counties in Florida (excluding peat, petroleum, and natural gas), 36 reported mineral production.

TABLE 7.—Value of mineral production in Florida, 1954-55, by counties 1

County	1954 2	1955 2	Minerals produced in 1955 in order of value 3
Alachua Bay Brevard Broward Citrus Clay Collier Columbia Dade Duval Escambia Flagler Gadsden Gilchrist Hernando Highlands Hillsborough Indian River Jackson Lafayette Lake Leon Levy Manatee Marion Monre Okaloosa Osceola Palm Beach Pinellas Polk Putnam St. Johns St. Johns St. Johns St. Jucie Sarasota Sumter Suwannee Volusia	\$368, 839 (4) 2, 744, 442 1, 162, 864 (5) 7, 011, 976 (6) (6) (6) (7, 011, 976 (7) (8) (9) (9) (10) 3, 214, 713 10, 800 (9) (10) (10) (11) (11) (12) (12) (13) (14) (15) (15) (15) (16) (17) (17) (18) (19) (19) (19) (19) (19) (19) (19) (19	(4) \$26, 139 (4) 3, 861, 095 1, 119, 701 (5) (6) (6) (6) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7	Limestone. Sand. Zircon, garnet, sand, ilmenite. Limestone. Phosphate rock, clays, limestone. Ilmenite, zircon. Limestone. Phosphate rock. Sand and gravel, limestone, lime. Rutile, oystershell, ilmenite, zircon. Sand and gravel, clays. Cement. Fuller's earth, sand and gravel, clays. Phosphate rock. Limestone. Cement, phosphate rock, oystershell. Rutile, ilmenite, sand. Limestone. Limestone, sand. Sand. Do. Limestone, lime. Limestone. Sand. Limestone, sand. Sand, limestone. Phosphate rock, sand. Sand, limestone. Sand, limestone. Sand, limestone. Sand, sand, sand. Sand, sand. Sand, sand. Sand, sand. Sand. Limestone. Sand. Limestone. Sand. Sand, limestone. Sand. Sand, sand. Sand, sand. Sand, sand. Sand, sand. Sand, sand. Sand. Limestone. Sand. Limestone. Sand. Limestone. Sand. Limestone. Sand. Limestone. Sand. Limestone.
Undistributed	32,520,625 106,510,000	38, 848, 467 108, 957, 000	

<sup>&</sup>lt;sup>1</sup> The following counties are not listed because no production was reported: Baker, Bradford, Calhoun, Charlotte, De Soto, Dixie, Franklin, Glades, Gulf, Hamilton, Hardee, Hendry, Holmes, Jefferson, Lee, Liberty, Madison, Martin, Nassau, Okeechobee, Orange, Pasco, Santa Rosa, Seminole, Taylor, Union, Wakulla, and Washington.

<sup>2</sup> Excludes value of clay and limestone used in the manufacture of cement and lime.

<sup>3</sup> Excludes mineral fuels, included with "Undistributed."

<sup>4</sup> Value included with "Undistributed."

Alachua.—County mineral production for 1955 was appreciably greater in both tonnage and value than in 1954. Williston Shell Rock Co. and Newberry Corp. produced limestone for concrete and road metal. Alachua Corp., active in 1954, did not produce in 1955.

Bay.—Brewton Engineering Co. and Cato Sand Co. both produced sand as in 1954 and increased volume from 10,000 tons to 56,000 tons;

total value decreased \$1,000, compared with 1954.

Brevard.—Florida Ore Processing Co. recovered garnet, ilmenite, rutile, and zircon concentrate from ore obtained in Brevard and Indian River Counties at Palm Bay concentrating plant. Production more than doubled that in 1954.

ABCO Concrete Co. produced a greater tonnage of structural sand; but the total value, below that of 1954, reflected a decrease in value

per ton. C & P Dredging Co. ceased producing.

Broward.—Fifteen quarries reported crushed and broken limestone production in 1955, compared with 12 in 1954. However, E. L. Montgomery, Inc., 1 of 12 producers in 1954, became inactive; L. W. Rozzo added 3 new quarries to the 1 reported in 1954; and Snyder Paving Co., Inc., added 1 more. The 11 quarries producing both years were: Snyder Paving Co., Inc., Meekins, Inc., Hollywood Quarries, Deerfield Rock Corp., Hollandale Rock Corp., Maule Industries, Inc., Finley P. Smith, L. W. Rozzo & Son, Zinke & Smith, Inc., R. H. Wright & Sons, Inc., and Road Rock, Inc.

Production of crushed limestone increased 33 percent in tonnage and 55 percent in total value in 1955, the second year of a one-third increase over the previous year. However, in 1955 the unit value also rose 17 percent above that of 1954 reflecting a continually increas-

ing demand and better price structure.

TABLE 8.—Crushed limestone sold or used by producers in Broward County, 1950-55

Year	Short tons	Value	Year	Short tons	Value
1950	735, 394	\$659, 633	1953	1, 893, 827	\$2, 024, 771
	979, 737	833, 936	1954	2, 512, 541	2, 484, 438
	779, 255	786, 794	1955	3, 342, 348	3, 861, 095

Citrus.—Kibler-Camp Phosphate Enterprises Sec. 17 mine produced hard rock; marketable tonnage was increased 15 percent over 1954. Total value rose 18 percent, reflecting a higher value per ton

than in 1954.

Soil Builders, Inc. (Mincoll mine), Kellogg Co. (Kellogg mine), and Superior Phosphate Co. (Bar mine) produced soft-phosphate rock as in 1954 but at a reduced annual total in both tonnage and value. Globe Phosphate Co. (Calphos mine), Seaboard Phosphate Co. (Manko mine), and Knight and Bevis were taken over by Sun Phosphate Cc. in 1955. Output in 1955 from the combination was less than the separate producers reported in 1954 again, owing in part to labor difficulties. Delta Phosphate Co. (Hernando mine) was taken over by Camp Phosphate Co. in 1955.

Total marketable soft-rock production, as compared with 1954,

decreased 20 percent in tonnage and 15 percent in total value.

Other mineral production from the county consisted of miscellaneous clay mined by General Portland Cement Co., for its own use in manufacturing cement, and a small tonnage of agricultural lime-

stone quarried by Golden Dolomite Co.

Clay.—Humphreys Gold Corp. continued to operate the Trail Ridge mine (dredge pool) for E. I. du Pont de Nemours & Co., Inc., and brought into production the Highlands mine on the line between Clay and Bradford Counties; both produced a mixed concentrate containing ilmenite, rutile, leucoxene, and the byproduct, zircon. Output in 1955 was increased considerably, owing to the added Highlands plant production.

Collier.—Production of natural gas and petroleum continued from

the Sunniland field.

Sunniland Limerock Co. crushed limestone for concrete and road metal at a somewhat reduced rate compared with 1954 and a slightly increased value a ton.

Columbia.—Loncala Phosphate Rock Co. produced soft rock from its Fort White mine. Production in 1955 was lower than in 1954

Dade.—The city of Miami recovered lime as a byproduct of water

purification in virtually the same quantity and value as in 1954.

The same 11 producers, who worked 14 quarries in 1954 with the exception of the Ideal Crushed Stone Co. (Dade County Quarry), crushed limestone in 1955. After two more quarries were opened— Maule Industries, Inc., Homestead and Murphy & Mills Corp. Sec. 32—there were 10 producers with 15 quarries. In general, the same producers continued mining the same quarries. County production of crushed limestone in 1955 was 5 percent below 1954; total value increased 1 percent; and average unit value rose 6 percent. Roughly 95 percent of county production was marketed as concrete aggregate and road metal; the remainder was sold for riprap, railroad ballast,

Des Rochers Sand Co. and Sand Lake Development Co. produced structural sand. The former company marketed some paving sand. Florida Silica Sand Co. ceased production in 1954. However, Ideal Crushed Stone Co. reported that most of its initial production was marketed as structural sand; it sold a small amount of sand for other purposes. Ideal Crushed Stone Co. also produced a substantial quantity of structural gravel. No gravel was reported from Dade County in 1954. County production of combined sand and gravel increased 6 times over that of 1954; average value per ton dropped roughly 14 percent. The value of the county mineral production in 1955 was \$1 million greater than that of 1954.

Duval.—Humphreys Gold Corp. concentration plant near Jacksonville treated ores from Rutile Mining Co. and Titanium Alloy Manufacturing Division of National Lead Co. to recover ilmenite and rutile. Combined shipments of ilmenite and rutile increased appreciably in

both tonnage and value over 1954.

Humphreys Gold Corp. also recovered zircon as a byproduct in concentrating ilmenite and rutile. Shipments in 1955 exceeded those in 1954 in both tonnage and value.

Duval Engineering & Contracting Co. and White Shell Corp. pro-

duced a substantial quantity of oystershell for poultry grit.

Escambia.—Osceola Clay & Topsoil Co. produced and sold about one-third the 1954 quantity of miscellaneous clay from the Alden and

Jackson pits.

Campbell Sand & Gravel Co. produced sand for railroad ballast and sand and gravel for other uses. Ward Gravel Co. confined its product to structural sand and gravel. Clark Sand Co. (Coker J. Clark in 1954) also produced structural sand. E. E. Boone Construction Co., active in 1954, did not produce in 1955.

County production was below that of 1954 in both tonnage and

Flagler.—Lehigh Portland Cement Co. (Bunnell plant) manufactured portland cement; 1955 production increased 2 percent and total

value 5 percent compared with 1954.

Gadsden.—Floridin Co. and Minerals & Chemical Corp. both mined and prepared fuller's earth. County production increased for the second year.

Apalachee Correctional Institute produced miscellaneous clay at

the same rate as in 1954.

Florida Gravel Co. produced paving sand and gravel and more than doubled the tonnage and value over 1954. Unit value increased

more than 7 percent.

Gilchrist.—Loncala Phosphate Co. increased production of soft phosphate rock from its Mona mine, in spite of shutdowns due to labor troubles in the area.

Hernando.—Native Stone Co. produced a small quantity of di-

mension limestone.

Camp Concrete Rock Co., Wm. P. McDonald Corp., and the Brookville Rock Co. crushed limestone for concrete and road metal, and Florida Rock Products Co. began producing from a new quarry. Combined production, 20 percent above 1954 in tonnage and 26 percent in value, reflected 5-percent increase a ton in value.

Hillsborough.—General Portland Cement Co. Tampa mill increased its production by roughly 1 percent in volume and 3 percent in value

compared with 1954.

American Agricultural Chemical Co. and American Cyanamid Co. mined and prepared land-pebble phosphate rock; the 1955 total was lower than in 1954 because of labor trouble.

Bay Dredging & Contracting Co. produced a substantial quantity

of oystershell for road metal and poultry grit.

Indian River.—Florida Ore Processing Co. increased production of ilmenite and rutile sands for shipment to its Palm Bay concentrating plant in Brevard County.

B. M. Walker increased production of structural sand over 1954. Jackson.-Marjax Co. increased its production of agricultural

limestone somewhat above that of 1954.

Lafayette.—Williston Shell Rock Co. nearly doubled crushedlimestone production from its Dell quarry (erroneously reported as the Mayo quarry in 1954) for concrete and road metal.

Suwannee River Sand Co. increased production of paving sand by 14 percent in tonnage and 21 percent in value, representing a 6-percent increase in value a ton.

Lake.—Central Sand Co. produced both structural and paving sand in 1955 and substantially increased both total tonnage and value

over 1954. Unit value decreased slightly.

Leon.—Asa Maige Sand Co., Middle Florida Sand Co., and Johnson Sand Co. increased production considerably in tonnage and value. Maige Co. also marketed paving sand in 1955. Average unit value for the county was somewhat below that of 1954.

Levy.—There was considerable activity in limestone production during 1955. The output of Connell & Shultz, Dixie Lime Products Co., and W. & M. Construction Co. increased approximately 22 percent above 1954, with no change in value a ton. Inactive in 1954, Levy County Lime Rock Co. reactivated three quarries, and United Limerock Co reactivated its Williston quarry. Chas. E. Peacock reported initial production. County crushed-limestone production more than doubled that of 1954, although average value a ton was considerably lower. The reduction in unit value was explained by the proportionately greater tonnage of low-value concrete and road metal, compared with a relatively greater proportion of high-value agricultural stone in 1954.

TABLE 9.—Crushed limestone sold or used by producers in Levy County, 1950-55

Year	Short tons	Value	Year	Short tons	Value
1950	(1)	(1)	1953	320, 415	\$651, 311
1951	387, 353	\$539, 772	1954	(¹)	(1)
1952	400, 543	684, 073	1955	756, 964	958, 230

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosure of individual company confidential data.

Manatee.—Manatee Dolomite Co. and Southern Dolomite Co. produced agricultural limestone at an increased rate over 1954, with

no change in average unit value.

Marion.—Limestone production from the county decreased 7 percent in tonnage under 1954 but increased 8 percent in total value; unit value increased 17 percent. Eighty-five percent was marketed as concrete aggregate and road metal.

Dixie Lime Products Co. lime production for building, agricultural,

and chemical uses increased as compared with 1954.

Cummer Lime & Mfg. Co. quarried and crushed limestone for concrete and road metal and agricultural limestone at its Kendrick quarry. Its Martin quarry production was marketed for concrete aggregate and road metal, railroad ballast, and other uses. Ocala Lime Rock Co. reported concrete aggregate and road metal. Dixie Lime Products Co. produced limestone for concrete aggregate, road metal, agricultural limestone, and chemical stone for its lime kilns from its two quarries. W. L. Cobb Construction Co. produced concrete aggregate and road metal.

No primary production of soft phosphate rock was reported from Marion County in 1955. However, a small tonnage was processed

from previously mined stockpiles.

TABLE 10.—Crushed limestone sold or used by producers in Marion County,  $1950-55^{1}$ 

	Year .	Short tons	Value	Year	Short tons	Value
1950		453, 300	\$546, 952	1953	530, 843	\$722, 369
1951		1, 033, 506	1, 207, 439	1954	1, 171, 124	1, 187, 158
1952		748, 760	1, 010, 099	1955	2 1, 090, 772	2 1, 281, 890

<sup>1</sup> Exclusive of limestone used in manufacturing lime.
<sup>2</sup> Includes limestone used for manufacturing lime.

Monroe.—Keystone Art Co. quarried an initial small tonnage of

dimension limestone.

Charley Toppino & Sons increased production of concrete aggregate and road metal to more than 6 times the 1954 production, and Leo Haskins reported initial production of nearly 90,000 tons of concrete aggregate and road metal. The county total for 1955 was 365,000 tons compared with 38,000 tons in 1954.

Oceola.—A. E. Hoffman reported initial production of a substantial

tonnage of building sand.

Palm Beach.—The Palm Beach County Highway Commission reported the production and use of 3,350 tons of crushed limestone for

road metal, valued at \$2,500.

Of the 4 commercial crushed-limestone producers reporting in 1954, 3 continued operation in 1955—Burnup & Sims, Handley Construction Co., and Belle Glade Rock Co. All stone was marketed as concrete aggregate and road metal. The 1955 county total was 29 percent below that of 1954, and total value dropped 17 percent reflecting a decrease of 19 percent in value a ton.

Hoyt Sand & Muck Co. continued to produce sand for various uses. Tonnage in 1955 more than doubled, and unit value rose 10 percent.

Pinellas.—Charles E. Phillips continued production of crushed limestone for concrete aggregate and road metal; output decreased 40 percent from 1954; value dropped 28 percent; and unit value increased 20 percent.

Largo Washed Sand Co. increased sand production for building and other purposes 29 percent in tonnage and 27 percent in total value over

1954, reflecting a slight drop in average unit value.

Polk.—There was no change in the list of producers and landpebble-phosphate mines from 1954. However, production of marketable rock decreased 15 percent in tonnage and 16 percent in total value, as compared with 1954. Strikes caused several weeks of shutdown.

Output of sand, by the same 7 producers reporting in 1954, increased 27 percent in tonnage and 34 percent in value over 1954, reflecting a 6-percent increase in value a ton. Eighty percent of sand was marketed for building sand and 15 percent for paving sand; the remainder was divided among molding, blast, and engine sands and other uses. Value of county mineral production was nearly \$9 million below 1954.

TABLE 11.—Sand sold or used by producers in Polk County, 1951-55

Year	Short tons	Value	Year	Short tons	Value
1951 1962 1953	698, 101 1, 010, 744 1, 185, 952	\$451, 527 703, 744 843, 124	1954 1955	1, 706, 132 2, 164, 070	\$1, 150, 408 1, 542, 293

Putnam.—The combined kaolin production, credited to United Clay Mines Corp. and Edgar Plastic Kaolin Co., was somewhat above 1954 in tonnage and value.

Production of sand by the same 5 companies reporting in 1954 increased sharply 73 percent in tonnage and 91 percent in value above 1954, reflecting a 9-percent increase in value a ton. Seventy-six percent was distributed for building sand, 23 percent for paving, and the remainder for blast and engine sands.

TABLE 12.—Sand sold or used by producers in Putnam County, 1950-55

Year	Short tons	Value	Year	Short tons	Value
1950	389, 705	\$234, 788	1953	654, 534	\$407, 070
1951	422, 268	249, 362	1954	528, 369	335, 636
1952	595, 473	362, 323	1955	912, 869	639, 417

St. Johns.—Phillip McLeod and E. B. Meade & Sons quarried crushed limestone. Claussen-Lawrence Construction Co. did not produce in 1955. Total county production was about half that of 1954.

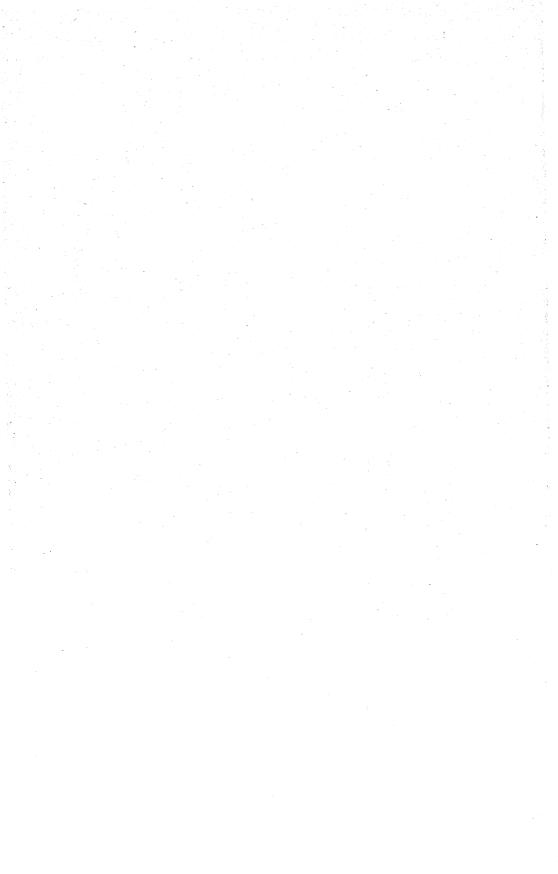
St. Lucie.—Florida East Coast Railway Co. produced a small tonnage of engine sand.

Sarasota.—Florida Dolomite Co. production of crushed agricultural limestone increased 10 percent in tonnage and 11 percent in total value, representing a small increase in unit value over 1954.

Sumter.—Central Quarries, Inc., produced crushed limestone for concrete aggregate and road metal, and W. L. Cobb Construction Co. began producing for the same purpose. Combined output was greater than the county total for 1954.

Suwannee.—Suwannee Limerock Co. increased considerably its production of crushed limestone for concrete aggregate and road metal.

Volusia.—Hauser Concrete Co. reported a small tonnage of building sand, White Sand & Materials Co. marketed both building sand and paving gravel, and E. C. Thompson (formerly H. C. Barbour Co.) marketed a small tonnage for special uses.



# The Mineral Industry of Georgia

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, 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



EORGIA'S mineral industry continued to expand; in 1955 production was valued at \$60.4 million, an 8-percent increase above the \$55.8 million recorded in 1954. Clays and stone represented more than 80 percent and nonmetals 98 percent of the total value. Most nonmetals gained in both tonnage and value over the previous year. Exceptions were: Cement, down slightly in tonnage but with total value remaining about the same as in 1954; sheet mica, down 47 percent in weight but 21 percent higher in value; and slate, with an increase in tonnage but a slightly lower value than in the previous year.

Iron ore and manganese ore gained over 1954, but beryl production was only a fraction of the year before. Coal production was 54 percent above 1954; and, although the tonnage of peat produced

was higher, its value dropped below that in 1954.

Mineral production was reported from 66 of Georgia's 159 counties, 15 of which supplied \$52.9 million or 88 percent of the total production. Rated on value of output, Twiggs, Pickens, Washington, Wilkinson, De Kalb, Houston, Bartow, Polk, Richmond, Gilmer, Decatur, Henry, Elbert, Warren, and Fayette, in the order given and each with an output valued above \$1 million, were the most

important mineral-producing counties in the State.

Four projects were active under the Defense Minerals Exploration Administration (DMEA) program to aid in exploring for and developing strategic minerals; three of them were new in 1955, and the fourth started in 1954. Three contracts were for mica in Cherokee, Union, and Upson Counties and one for beryl in Troup County. These contracts totaled \$26,072, with Government participation 75 percent, compared with 8 exploration projects in 1954, totaling \$47,935, of which the Government's share was 87 percent.

## **REVIEW BY MINERAL COMMODITIES**

#### METALS

Bauxite.—Production of bauxite increased 37 percent in tonnage and 28 percent in value over 1954. American Cyanamid Co., with 5 mines in 3 counties, was the only producer. Initial production was reported from the New Holland mine in Floyd County, and the Julia

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mine in Bartow County was abandoned. Ore from all mines was sent to the company's Halls Station plant for drying before shipment for chemical uses.

TABLE 1.—Mineral production in Georgia, 1954-55 1

	19	054	. 19	55
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
ClaysCoal	2, 711, 422 8, 090	\$24, 106, 926 40, 450	2, 953, 278 12, 471 (²)	\$26, 144, 672 62, 360 400
Jem stones.         Iron ore (usable) long tons gross weight.         Iron oxide pigments (grude)	221, 576 (3) (3)	(3)	256, 700 6, 139	994, 289 35, 607
Mica	5, 150	254, 093 60, 920	(3)	353, 322 (8)
Peat Sand and gravel	2, 703, 281	2, 466, 352	2, 987, 570	
Stone Talc and soapstone (crude)	8, 057, 600 50, 536	21, 384, 227 176, 876	4 7, 488, 452 53, 828	117, 656
Value of items that cannot be disclosed: Asbestos (1954),				1
barite, bauxite, beryllium concentrate, cement, feldspar, lime (1954), manganese and manganiferous			2.5	
ores slate stone (dimension and crushed marble and			1	
crushed sandstone 1955) and values indicated by footnote 2		5 7, 227, 339		17, 141, 698
Total Georgia 6		5 55, 828, 000		60, 417, 000

<sup>&</sup>lt;sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by

producers).

2 Figure withheld to avoid disclosure of individual company confidential data.

3 Weight not recorded.

4 Excludes certain stone, value for which is included with items that cannot be disclosed.

5 Revised figure.

6 The total has been adjusted to eliminate duplication in the values of clays and stone.

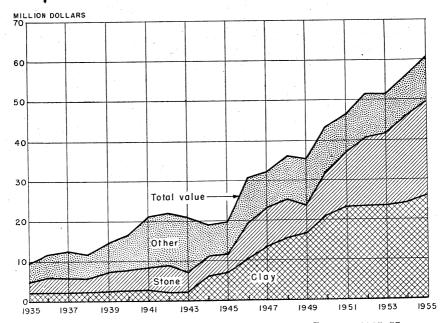


FIGURE 1.—Total value of mineral production in Georgia, 1935-55.

TABLE 2.—Average unit values of mineral commodities produced in Georgia, 1951-55 1

Commodity		1951	1952	1953	1954	1955
Asbestos	short ton	\$100,00	\$100.00	\$100.00	\$100,00	
Barite		11.34	11.75	12.82	13. 91	\$13. 7
Bauxite		(2)	(2)	(2)	(2)	
Beryl	short ton		596.00		654, 75	(2) 394. 5
Cement:	31101 6 1011-		0.00.00		001.10	001.0
Masonry376-pour	ad harrol					3.3
Masonry	du parrer	2. 53	2.54	2, 65	2, 71	2.7
Portland	uo	2.00	2.01	2.00	2.11	~
Clays:	Acres Acres	18.00	18, 11	18, 73	19, 98	21.4
Fuller's earth	SHOLF TOH"	15.35	3 15, 40	15. 89	16. 49	16. 6
Kaolin (china, paper, etc.)	qo		3 6. 37	6.60	7.39	6.8
Kaolin (refractory)	ao	6.16			.80	0. 0
Miscellaneous	do	.90	. 97	. 93		
Coal	do	4.00	5.00	5.00	5.00	5.0
Feldspar	long ton	4.94			8. 22	8. 4
Goldtr	oy ounce	35.00		35.00		
Gravel	short ton		8 1. 53	1.57	1.63	. 6
Iron ore	long ton	3.75	4.50	4. 23	3. 93	3.8
Lime	short ton	9.86	11.15	10. 22	9. 92	
Manganese ore	long ton				(2)	(2) (2)
Manganiferous ore	do	l				(2)
Mica, sheet.	pound	.26	1.45	5. 25	5.01	`11.4
Mica, scrap and flake	short ton	23, 47	25, 88	24.01	(2) 3. 91	(2)
Mineral pigments (crude)	do	(4)	(4)	(4)	3.91	5.8
Peat		18.22	17.67	ìź. 38	11.83	8.9
Sand (ground)	do	10.00	10.00	10.00	(5)	(5)
Structural and paving	do	. 57	. 69	. 65	` . 69	``.6
All other	do	1, 60	1.48	1.70	1, 20	1.5
Slate (flour and granules)	do	7. 23	7.41	7.41	6. 93	6. 2
	uo	1.20	•••		0.00	1000
Stone: Granite:		1				100
Crushed	do	1.46	1.55	1, 56	1, 59	1.4
Crushed	uo	3 20, 68	³ 18. 60	19.04	19. 03	18. 9
Dimension	ao	20.00	10.00	15.04	19.00	10.0
Limestone: Crushed	3	3, 15	2, 87	2, 48	2.06	1.4
Crushed	ao	3. 10		2. 48	2.79	2.5
Dimension	ao		3.76	2.08	2. 19	2.0
Marble:		1			0 40	7. 2
Crushed	do	7. 69		8. 35	8. 43	
Dimension	do	140.75	130.67	136. 65	123.63	123.3
Miscellaneous:	4 4 4					1
Crushed	do	1.50	. 25			
Dimension	do		10.78			
Quartzite, crushed	do		1.66	1.56	1.42	1.4
m-1						1
Crude	do	(4)	(4)	3, 50	3. 50	2.1
Ground	do	(4) 9. 22	(4) 10.24	10.33	10.05	10.0

For greater detail on prices by grades and markets, see volume I, Minerals Yearbook, 1955.
 Figure withheld to avoid disclosure of individual company confidential data.
 Revised figure.

TABLE 3.—DMEA projects in 1955

			Contra	et
County and contractor	Property	Commodity	Date	Total amount 1
Cherokee: J. R. Beam Troup: W. Hugh Allen Union: Tralyta Mining Co Upson: Edwin H. Schwab	Bennett mine	Mica Beryl Micado	July 11, 1955 Nov. 21, 1955 Nov. 1, 1954 Oct. 6, 1955	\$8, 316 6, 516 5, 716 5, 524

<sup>1</sup> Government participation, 75 percent.

Beryllium.—Beryl production declined drastically and was a mere fraction of that in the preceding year. W. Hugh Allen explored the Word mine in Troup County under a DMEA contract.

Iron Ore.—After a 3-year decline, brown-iron-ore shipments im-

proved over 1954 and increased 16 percent in tonnage and 14 percent

<sup>4</sup> Data not available.
5 Included with "All other."

in value to 257,000 tons with a value of \$994,000 in 1955. Production came from the Cartersville district, Bartow County, and the Cedartown district, Polk County, both in the northwestern part of the State.

TABLE 4.—Production and shipments of usable brown iron ore, 1946–50 (average) and 1951–55 <sup>1</sup>

Year Production (long tons)		Shipments		Year	Produc tion	Shipments	
	Long tons	Value		(long	Long tons	Value	
1946–50 (average) 1951 1952	257, 091 357, 754 369, 259	257, 091 357, 754 319, 959	\$684, 789 1, 339, 248 1, 439, 251	1953 1954 1955	210, 664 221, 576 256, 700	259, 964 221, 576 256, 700	\$1, 100, 725 871, 901 994, 289

<sup>&</sup>lt;sup>1</sup> Includes hematite: 1950—213 tons; 1951—266 tons; 1952—200 tons; 1953—250 tons; 1954—217 tons.

Manganese.—Manganese and manganiferous ores were shipped by 2 operators, 1 each in Bartow and Floyd Counties.

### **NONMETALS**

Barite.—Crude barite production, all from Bartow County, increased about 70 percent in tonnage and value over 1954. Increased demands for barite for well-drilling materials and chemical use accounted for the higher output.

Cement.—Masonry cement was included in the tabulation of mineral production of 1955 for the first time; Marquette Cement Mfg. Co., Rockmart, was the only producer in the State. Portland cement was produced by Marquette Cement Mfg. Co., Rockmart, and Penn-

Dixie Cement Corp. at Clinchfield.

Clays.—Clays constituted 43 percent of the value of Georgia's mineral production, continued to rank first in value among the minerals produced, and totaled 2.95 million tons valued at \$26.1 million—increases of 9 percent in tonnage and 8 percent in value over 1954. Kaolin for refractory purposes showed the greatest gains—41 percent in tonnage and 30 percent in value. Kaolin for china, paper, filler, etc., totaled 1.3 million tons with a value of \$22.3 million, advances of 11 percent in tonnage and 13 percent in value. Fuller's earth declined for the fourth consecutive year, with output dropping to 104,000 tons valued at \$2.2 million. Miscellaneous clay, used almost exclusively for brick and other heavy clay products and cement manufacture, increased 6 percent in tonnage, but its value dropped 47 percent.

TABLE 5.—Clays sold or used by producers, 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	2, 115, 688	\$16, 430, 792	1953	2, 651, 153	\$23, 455, 315
1951	2, 603, 338	23, 199, 758	1954	2, 711, 422	24, 106, 926
1952	2, 562, 182	23, 137, 507	1955	2, 953, 278	26, 144, 672

Clays were produced in 17 counties, including fuller's earth in Decatur, Grady, and Twiggs Counties and kaolin in Baldwin, Richmond, Twiggs, Washington, and Wilkinson Counties. Other clays

TABLE 6.—Kaolin sold or used by producers, 1946-50 (average) and 1951-55

Year	China clay, paper clay, etc.		Refractory uses		Total kaolin	
1946-50 (average)	939, 445 1, 147, 865 1, 145, 063 1, 170, 679 1, 196, 211 1, 339, 748	Value \$12, 947, 955 17, 615, 634 17, 635, 838 18, 606, 351 19, 722, 623 22, 333, 808	Short tons  122, 405 175, 945 183, 192 171, 046 108, 654 153, 235	\$695, 375 1, 084, 101 1, 166, 355 1, 053, 274 803, 283 1, 041, 960	Short tons  1, 061, 850 1, 323, 810 1, 328, 255 1, 341, 725 1, 304, 865 1, 492, 983	Value \$13, 643, 330 18, 699, 735 18, 802, 193 19, 659, 652 20, 525, 906 23, 375, 768

TABLE 7.—Miscellaneous clay sold or used by producers, 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	928, 980	\$723, 751	1953	1, 163, 766	\$1, 076, 891
1951	1, 083, 952	978, 727	1954	1, 278, 377	1, 020, 486
1952	1, 050, 792	1, 020, 132	1955	1, 356, 412	542, 608

were mined in Bibb, Columbia, Crawford, Floyd, Fulton, Gordon, Houston, Polk, Richmond, Thomas, and Whitfield Counties.

Feldspar.—Appalachian Minerals Corp. mined feldspar rock from six open-pit mines south of Monticello. The feldspar ore was milled in the new company flotation plant finished late in 1954.

Gem Stones.—Rose quartz, together with several small crystals of amethyst, ruby, and sapphire, were the only gem-stone minerals reported during the year. Their production value was less than \$1,000.

Mica.—Production of mica in 1955 was valued at \$353,000, compared with \$254,000 in 1954, an increase of 39 percent. Sheet mica decreased 47 percent in quantity but was up 21 percent in value; scrap mica (including flake from schists, byproduct mica from feldspar flotation, etc.) increased 26 percent in tonnage and 52 percent in value. The principal sheet-mica-producing counties were Cherokee, Monroe, and Upson; other counties mining smaller amounts were Elbert, Hart, Jasper, Lamar, Pickens, and Pike. Scrap mica came from Cherokee, Hart, Pickens, Pike, and Upson.

Three DMEA mica-exploration projects in Cherokee, Union, and Upson Counties were active. The total amount of the 3 contracts was \$19,556, with Government participation of 75 percent, compared with 8 contracts (including 1 mica-beryl) for \$47,935 and Government participation of 87 percent in 1954.

Mineral Pigments.—Crude iron oxide pigment materials production totaled 6,000 tons valued at \$36,000 in 1955. Sales of crude and finished pigment materials were 2,000 tons valued at \$61,000. New Riverside Ochre Co. at Cartersville, Bartow County, was the only producer in the State.

Sand and Gravel.—Sand and gravel was the fourth most important of the State's minerals in terms of value, with a production of 3 million tons valued at \$2.2 million compared with 2.7 million tons valued at \$2.5 million in 1954, an increase of 11 percent in tonnage but a loss of 11 percent in value. Sand made up 75 percent of the tonnage and 79

percent of the value. Commercial producers supplied 91 percent of all sand reported; Government-and-contractor producers made up the remaining 9 percent. Thirty commercial operators and 8 Government-and-contractor agencies reported production from 26 counties. The principal producing counties were Bibb, Crawford, Dougherty, Effingham, Muscogee, Talbot, and Thomas.

Slate.—Flour and granules were produced by Funkhouser Co. in Bartow County south of Fairmont, and Georgia Lightweight Aggre-

TABLE 8.—Sand and gravel sold or used by producers, 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	1, 044, 445	\$722, 246	1953	2, 051, 058	\$1, 900, 987
	1, 226, 231	1, 041, 561	1954	1 2, 703, 281	<sup>1</sup> 2, 466, 352
	2, 133, 970	2, 029, 367	1955	1 2, 987, 570	<sup>1</sup> 2, 198, 905

<sup>1</sup> Includes ground sand, formerly reported separately.

TABLE 9.—Sand and gravel sold or used by producers by classes of operations and uses, 1953-55

	195	53	1954		1955	
	Short tons	Value	Short tons	Value	Short tons	Value
Sand—commercial: Glass	(1) (1) 1, 037, 669 438, 629 59, 084	(1) (1) \$667, 371 285, 469 180, 047	(2) (2) 1, 233, 216 583, 030 (2)	(2) (2) \$827, 925 423, 591 (2)	56, 903 77, 754 1, 345, 444 330, 386 1, 133 21, 582	\$116, 257 194, 385 910, 549 208, 014 600 107, 910
Blast Engine Filter Railroad ballast Other	27, 077 (1) 27, 008 156, 893	13, 911 (1) 14, 854 174, 718	(2) (2) 8 110, 184	(2) (2) 3 152, 834	115, 177 5, 247 1, 045 3 79, 026	5, 991 26, 235 491 3 106, 452
Undistributed	4 1, 746, 360 1, 350	4 1, 336, 370 750	2, 346, 845	1, 885, 792	2, 033, 697 198, 775	1, 676, 88 59, 65
Total sand	4 1, 747, 710	4 1, 337, 120	2, 346, 845	1, 885, 792	2, 232, 472	1, 736, 53
Gravel—commercial: BuildingPaving Other	(1)	(1) (1)	(5) (5) (5)	(5) (5) (5)	74, 265 (*)	84, 87 (5)
Commercial total	(1)	(1)	351, 686	577, 160	(5)	(5)
Government-and-con- tractor	3, 375	500	4, 750	3, 400	(5)	(5)
Total gravel	4 3, 375	4 500	356, 436	580, 560	755, 098	462, 37
Sand and gravel:  Commercial total Government-and-contractor	1,746,360 4,725	1, 336, 370 1, 250	2, 698, 531 4, 750	2, 462, 952 3, 400	(§) (§)	(5) (5)
UndistributedGrand total	299, 973	1, 900, 987	2, 703, 281	2, 466, 352	2, 987, 570	2, 198, 90

<sup>1</sup> Figure withheld to avoid disclosing individual company confidential data; included with sand and gravel "Undistributed."

2 Figure withheld to avoid disclosing individual company confidential data; included with sand "Undistributed."

3 Includes crowned cond

listributed."

Includes ground sand.

Includes ground sand.

Total is incomplete, the portion not included being combined under sand and gravel "Undistributed."

Figure withheld to avoid disclosing individual company confidential data.

gate Co. quarried and crushed slate for use in its lightweight aggre-

gate plant at Rockmart, Bartow County.

Stone.—Ranking second in importance among the State's minerals, stone production continued to expand in 1955. Crushed granite was up 17 percent in tonnage and 8 percent in value; quartzite and sandstone rose sharply in both tonnage and value. Figures for crushed limestone and marble for 1954 and 1955 are not comparable, as some stone classed as limestone in 1954 was reclassified as marble in 1955. Dimension-granite production decreased 6 percent in both tonnage and value from 1954, but some increase was noted for dimension marble. Only minor quantities of dimension limestone and sandstone were reported.

Granite and quartite supplied 78 percent of the total stone tonnage and 59 percent of the value; limestone 15 percent and 9 percent, respectively, of total tonnage and value; and marble the remaining 7 percent of tonnage and 32 percent of value. Granite was produced in 15 counties, quartzite in Richmond County only, limestone in 8 counties, marble in 2 counties (Gilmer and Pickens), and sandstone

in Pickens County only.

TABLE 10.—Stone sold or used by producers, 1953-55, by kinds

	1953		1954		1955	
	Short tons	Value	Short tons	Value	Short tons	Value
Crushed stone: Granite	5, 866, 434 899, 105 188, 900	\$9, 177, 989 2, 230, 111 1, 578, 008	5, 078, 952 11, 806, 899 218, 678 725, 000	\$8, 080, 493 1 3, 722, 108 1, 843, 530 1, 030, 000	5, 923, 422 1, 379, 607 (2) (2)	\$8, 729, 902 1 2, 041, 352 (2) (2)
Total crushed stone	6, 954, 439	12, 986, 108	1 7, 829, 529	114, 676, 131	3 7, 303, 029	3 10, 771, 254
Dimension stone: Granite. Limestone. Marble. Miscellaneous. Sandstone and quartzite.	137, 817 4, 142 15, 626	2, 624, 233 10, 684 2, 135, 277	193, 270 3, 065 24, 251 7, 485	3, 678, 193 8, 545 2, 998, 031 23, 327	181, 879 2, 247 (²) 1, 297	3, 447, 761 5, 615 (²) 25, 200
Total dimension stone	157, 585	4, 770, 194	228, 071	6, 708, 096	3 185, 423	3 3, 478, 576
Grand total	7, 112, 024	17, 756, 302	1 8, 057, 600	<sup>1</sup> 21, 384, 227	1 8 7,488,452	1 8 14,249,830

Talc and Soapstone.—Production of crude talc and soapstone was 53,800 tons valued at \$117,700, an increase of 7 percent in tonnage but 33 percent lower in value compared with 1954. Sales of ground talc and soapstone were 53,400 tons valued at \$538,900, increases of 7 percent above the previous year. Sales of sawed material were 42 percent and 53 percent higher respectively in tonnage and value than in 1954. All production came from Murray County.

#### MINERAL FUELS

Coal.—Bituminous-coal production came from Dade and Walker Counties in the northwestern corner of the State. Production was 12,500 tons valued at \$62,400, compared with 8,090 tons valued at \$40,450 in 1954.

Includes stone used in cement and lime.
 Figure withheld to avoid disclosing individual company confidential data.

Peat.—Production of peat was higher than in 1954; however, its value was considerably lower. Two operators were active during the year, one each in Lowndes and Screven Counties.

TABLE 11.—Production of peat, 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	2, 348	\$49, 257	1953	2, 305	(1)
1951	2, 250	41, 000	1954	5, 150	\$60, 920
1952	2, 150	38, 000	1955	(¹)	(1)

<sup>1</sup> Figure withheld to avoid disclosure of individual company confidential data.

#### **REVIEW BY COUNTIES**

Baldwin.—General Refractories Co. mined kaolin from the Woods

nine for use in its refractories plant at Stevens Pottery.

Bartow.—Mineral production in Bartow County in 1955 was valued at \$2.9 million, an increase of 20 percent over the total (\$2.5 million) in 1954. In terms of value, barite was the principal mineral of the county in 1955 and recorded increases of 71 percent in tonnage and 69 percent in value over the previous year. New Riverside Ochre Co. and Paga Mining Co. were the chief producers, with B. R. Cain and J. W. Cox producing smaller tonnages. Bauxite production by American Cyanamid Co. was greatly curtailed in the county in 1955; however, the Halls Station plant operated throughout the year, drying bauxite ore produced in Floyd and Macon Counties. Production and shipments of brown iron ore were 185,000 tons valued at \$633,000, 24 percent higher in tonnage and 12 percent greater in value compared with 1954. Producers during the year were: Bartow Mines, Inc., Hodge Mining Co., Lake Mining Co., George Love and Mosteller Bros., all of Cartersville.

TABLE 12.—Value of mineral production in Georgia, 1954-55, by counties 1

County	1954	1955	Minerals produced in 1955 in order of value
Atkinson	(2)		
Baldwin	(2)	(2)	Kaolin.
Bartow	\$ \$2, 463, 890	\$2,934,341	Barite, iron ore, slate, limestone, ocher, man-
	ψ2, 100, 000	42,001,011	ganese, bauxite.
Bibb	713, 140	712, 282	Granite, clays, sand and gravel.
Brooks	110,110	61,750	Sand.
Chatham	(2)	(2)	Da
Cherokee		(2)	Mica.
Cobb	493, 031	494, 018	Granite, sand and gravel.
Columbia		(2)	Clays.
Crawford	1 2	246, 823	Sand and clays.
Dade			Limestone and coal.
Dawson.		(2) (3)	Sand.
Decatur		(2)	Fuller's earth.
De Kalb		3, 839, 858	
Dougherty		123, 268	Sand.
Effingham.		236, 926	Do.
Elbert	1, 629, 198	1, 483, 379	Granite, sand, mica.
Evans		3,850	Sand.
Fannin		83, 178	
Fayette		(2)	Granite.
Floyd		551, 537	Limestone, bauxite, clays, manganese.
Franklin	(2)	301,001	Mica.
Fulton		89,650	Clays, sand.
Gilmer	(2)	(2)	Marble.
Glascock		( )	
G100000	1 (7)	I	I

See footnotes at end of table.

TABLE 12.—Value of mineral production in Georgia, 1954-55, by counties 1—Con.

Glynn	_
Gordon (2) \$11, 290 Clays. Fuller's earth. (2) (2) Fuller's earth. (2) (3) Hancock. (2) (3) (3) (4) (4) (4) (5) (6) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7	duced in 1955 in order of value
Greene	
Greene	
Greene	
Gwinnett	
Hancock   266, 586   (2)	
Harlson	
Hart (2) (3) (4) (3) (4) (5) (6) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7	_9
Lowndes	e1 <b>.</b>
Lowndes	
Lowndes	
Lowndes	tone, clays.
Lowndes	, beryl.
Lowndes	
Lowndes	
Macon         (2)         (3)         Bauxite.           Madison         345, 900         413, 337         Granite.           Mitchell         17, 544         Michael         Michael           Monree         21, 640         (2)         Michael           Morgan         20         Do.         Talc and soapsi Granite, sand a Gran	
Madison.         345, 900         413, 337         Granite.           Mitchell.         17, 544         (*)         Mica.           Monroe.         21, 640         (*)         Mica.           Mongan.         (*)         200         Do.           Murray.         176, 876         117, 656         Tale and soaps:           Muscogee.         932, 737         934, 556         Granite, sand a           Oconee.         (*)         766, 392         558, 627         Granite, sand a           Oglethorpe.         766, 392         558, 627         Granite, mica, sand a           Pickens.         4, 883, 639         (*)         Marble, mica, sand a           Polk.         (*)         (*)         Cement, iron or           Rabun.         (*)         (*)         (*)	
Monroe	• • • • • • • • • • • • • • • • • • •
Monroe	
Montgomery   C  C  Sand.   Sand.   Do.	
Morgan   200   Do.	
Morgan   200   Do.	
Murray         176, 876         117, 656         Tale and soapsi Granite, sand a Soapsi	
Muscogee. 932, 737 934, 556 Grantte, sand a Oconee. (2) 766, 392 558, 627 Grantte. Marble, mica, spike. (2) (2) (2) (2) (2) (2) (2) (2) (3) (4) (5) (6) (6) (6) (6) (6) (6) (6) (6) (6) (6	tone
Ocones         (2)         558,627         Granite.           Oglethorpe         766,392         558,627         Granite.           Pickens         4,883,639         (2)         Marble, mica, states           Pike         (2)         (3)         Mica.           Polk         (3)         (4)         Cement, iron or           Rabun         (3)         (4)         Cement, iron or	nd graval
Oglethorpe         766, 392         558, 627         Granite.           Pickens         4, 883, 639         (2)         Marble, mica, s           Pike         (2)         (2)         Mica.           Polk         (2)         (3)         (2)         Cement, iron or           Quitman         (3)         (3)         (3)         Cement, iron or	and graven.
Fickens	
Pike. (2) (2) Mica. (2) (2) Quitman (2) (2) (2) Rabun (2) (2)	non-datama hamiltan
Polk         (2)         (3)         (4)         Cement, iron or Ce	sandstone, peryllium.
Rabun (2)	
Rabun (2)	re, state, limestone, clays.
Richmond 1, 589, 000 2, 285, 440 Quartzite, clays	
	, sand and gravel.
Screven (2) (2) Peat.	
Stephens 78,831 51,860 Grenite	
Telfair(2) (2) Do.	
Thomas 1 12 1 Du.	
Toombs (2) Sand, clays.	
	yllium.
Union 7, 239 Gravel.	
77, 495 (2) Mica	
Walker (2) 199, 349 Limestone, coal. (2) 26, 074 Sand	
Warren (2) Granite	
Washington 4, 162, 386 4, 543, 775 Kaolin.	
Wayne 80 000 Sand and gravel	L
William (2) Limestone clay	•
WIRINSON 3, 692, 143 4, 235, 741   Kaolin	<b>5.</b>
Undistributed	
Total 3 55, 828, 000 60, 417, 000	
00,000,000	

<sup>1</sup> The following counties are not listed because no production was reported: Appling, Bacon, Baker, Banks, Barrow, Ben Hill, Berrien, Bleckley, Brantley, Bryan, Bulloch, Burke, Butts, Calhoun, Camden, Candler, Carroll, Catoosa, Charlton, Chattahoochee, Chattooga, Clarke, Clay, Clayton, Clinch, Ceffee, Colquitt, Cook, Coweta, Crisp, Dodge, Dooly, Douglas, Early, Echols, Emanuel, Forsyth, Habersham, Harris, Heard, Irwin, Jackson, Jeff Davis, Jefferson, Jenkins, Johnson, Lanier, Laurens, Lee, Liberty, Lincoln, Lumpkin, Marion, McDuffie, McIntosh, Meriwether, Miller, Newton, Paulding, Peach, Pierce, Pulaski, Putnam, Randolph, Rockdale, Schley, Seminole, Stewart, Taliaferro, Tattnall, Taylor, Terrell, Tift, Towns, Treutlen, Turner, Walton, Webster, Wheeler, White, Wilcox, Wilkes, Worth.

2 Figure withheld to avoid disclosing individual company confidential data. Included with "Undistributed."

tributed."
Revised figure.

Hale-Georgia Minerals Corp. produced manganese and manganiferous ores from its property north of Cartersville. Stockbridge Stone Co. crushed limestone at the White quarry, and Funkhouser Co. continued to operate its mine and plant near Fairmont, producing slate flour and granules. New Riverside Ochre Co. at Cartersville produced and shipped both crude and finished ocher for mineral pigments. Ladd Lime & Stone Co. remained inactive throughout the year.

TABLE 13.—Total mineral production, Bartow County, 1951-55

Year	Value	Year	Value
1951	\$2, 236, 276 2, 834, 676	1954 1955	1 \$2, 463, 890 2, 934, 341
1952 1953	2, 834, 676	1900	

<sup>&</sup>lt;sup>1</sup> Revised figure.

TABLE 14.—Shipments of brown iron ore in Bartow County, 1951-55

Year	Long tons	Value	Year	Long tons	Value
1951 1952 1953	161, 883 146, 332 113, 024	\$611, 981 585, 476 447, 169	1954 1955	148, 601 184, 892	\$564, 778 632, 516

Bibb.—The total value of mineral production in Bibb County in 1955 was virtually the same as in 1954—\$712,000 compared with \$713,000 in 1954. Sharp increases in production of crushed granite were offset by lower values for both clays and sand and gravel. Burns Brick Co. and Cherokee Brick & Tile Co. mined clays for manufacture of clay products in their plants at Macon. Macon Brick & Block and Mathis-Akins Concrete Block Co. produced sand, mostly for building purposes. Cornell-Young Co. operated pits for sand and gravel at Macon and Warner-Robbins; Hitchcock Corp., and Macon Quarries (successor to Macon Stone Co.) continued to operate crushed-granite quarries near Macon.

Brooks.—Bannockburn Sand Co. of Valdosta dredged sand from

its pit at Troupeville.

Chatham.—J. W. Fitzgerald Co. Inc. operated its sand pit near

Savannah throughout the year.

Cherokee.—Mica was the only mineral produced in 1955. Thompson-Weinman & Co. mined sericite from the Brady mine and shipped it to its grinding plant at Cartersville. Frank Cook Mining Co. produced and sold hand-cobbed mica from the Bennett mine near Jasper, and A. W. Amphlett produced a small quantity of sheet mica from the Amphlett mine.

J. R. Beam prospected the Bennett mica mine under the DMEA program for assistance in the exploration for and development of strategic minerals. The total amount of the contract was \$8,316,

with Government participation 75 percent.

Cobb.—Kennesaw Stone Co., successor to the Stockbridge Stone Co., operated its quarry for crushed granite throughout the year. Alonzo Field and the county road commission produced sand and gravel.

Columbia.—Georgia Vitrified Brick & Clay Co. mined clay from the

Campania mine for use in its clay products plant at Harlem.

Crawford.—Atlanta Sand & Supply Co. produced sand at the Rolls pit near Roberts, and the Middle Georgia Pottery Co. mined clays for use in its plant at Lizella.

Dade.—Brown Coal Co. was the only coal producer in the county in 1955. Dave L. Brown produced crushed limestone at the Morgan-

ville quarry.

Dawson.—C. M. Lyle Construction Co. produced sand from a pit near Dawsonville.

Decatur.—Minerals & Chemical Corp. of America operated its fuller's earth mine and plant throughout the year, and Superior Clay & Chemical Co. reported initial production of fuller's earth from its

pit near Faceville.

De Kalb.—Mineral production, consisting of crushed and dimension granite, totaled \$3.8 million in 1955, a 4-percent decrease below 1954. Five companies were active during the year. Consolidated Quarries, Inc., produced crushed stone and stone sand. Davidson Granite Co. quarried architectural stone, paving blocks, and curbing. Kellogg Granite Corp. and J. T. Reagan Granite Co. quarried curbing and The Stone Mountain Grit Co. produced aggregates, stone sand, poultry grit, and roofing granules.

Dougherty.—Sand production in 1955 was 145,000 tons valued at \$123,000, compared with 127,000 tons with a value of \$119,000 in 1954—increases of 15 percent in tonnage and 4 percent in value. Active operators, as in 1954, were: Albany Lime & Cement Co., Garrett Base Materials Products Co., Musgrove Sand Co., and

Quick Service Sand Co.

Effingham.—Sand mined at the Eden pit by Dawes Silica Mining Co., Inc., for structural, blast, and filler uses was the only mineral

produced in the county.

Elbert.—Production of dimension granite in 1955 was 38,400 tons (463,000 cubic feet) valued at \$1.4 million, decreases of 11 percent in tonnage and 10 percent in value below 1954. Ten companies operated quarries in the vicinity of Elberton and produced monumental stone exclusively. Rough and dressed stone was produced by Comolli Granite Co., Elberton City Quarries, Inc., Elbert County Granite Co., and Elberton Granite Industries, Inc. Rough monumental stone only was quarried by American Granite Quarries, Inc., Coggins Granite & Marble Industries, Inc., Continental Granite Co., M. W. Kantala & Son, Robin Blue Quarries, Inc., and A. G. and M. H. Veal. Sand was produced by Bond Sand & Gravel Co. and Coldwater Sand Co. Small quantities of sheet mica were produced by H. F. Alexander and Amy Turner.

TABLE 15.—Dimension granite sold or used by producers in Elbert County, 1951-55

Year	Short tons	Cubic feet	Value	Year	Short tons	Cubic feet	Value
1951 1952 1953	37, 967 35, 003 39, 254	457, 422 421, 725 472, 967	\$1, 271, 514 1, 229, 813 1, 212, 089	1954 1955	43, 398 38, 439	<sup>1</sup> 522, 864 463, 123	\$1, 561, 490 1, 401, 114

<sup>&</sup>lt;sup>1</sup> Revised figure.

Evans.—Evans Concrete Products Co. produced sand from its pit

near Daisy for paving and structural uses.

Fannin.—Mineral production in the county totaled \$83,000. Campbell Lime & Stone Co. opened a new quarry at Mineral Bluff and quarried 47,000 tons of limestone for concrete aggregates. Fannin County Highway Department crushed granite at the Coles Crossing quarry, and United States Forest Service produced gravel.

Fayette.—Tyrone Rock Products Co. operated its quarry at Tyrone throughout the year, producing crushed granite for concrete aggre-

gates and railroad ballast.

Floyd.—Mineral production in 1955 was valued at \$552,000 compared with \$354,000 for 1954, an increase of 56 percent. Contributing to this increase was production from two new mines—bauxite from the New Holland mine of American Cyanamid Co. and maganiferous and manganese ores from the Cedartown mine of Kingman Mines, Inc.—as well as a great increase of crushed limestone from the Ledbetter-Johnson quarry of Ready-mix Concrete Co. Crushed limestone was also produced by Floyd County Highway Department. Oconee Clay Products Co. and Rome Brick Co. mined shale for manufacture of brick and other clay products.

Fulton.—Total value of mineral production in Fulton County in 1955 was \$90,000, a 34-percent decrease compared with 1954. Clay was mined by Atlanta Brick & Tile Co. and Chattahoochee Brick Co. for the manufacture of brick. J. D. Jones, C. J. Ross, and Thompson

Bros. Sand Co. produced sand from pits near Atlanta.

Gilmer.—Crushed marble for agricultural use, concrete aggregates, fillers, roofing, and terrazzo were produced by two companies operating underground mines at Whitestone in 1955. Willingham-Little Stone Co. was purchased by the Georgia Marble Co. and was being operated as the Willingham-Little Division of that company. Marble Products Co. of Georgia was a new producer, with three underground mines. Glynn.—Sand dredged by the F. M. Legate Co. was the only mineral

produced in the county.

Gordon.—Plainville Brick Co. mined shale for use in manufacturing

brick at Plainville.

Grady.—Production of fuller's earth was maintained at about the same rate as in 1954 by Cairo Production Co., Inc. and Milwhite Co.,

Gwinnett.—The granite quarry of the Georgia State Board of Corrections produced 108,000 tons of crushed stone for concrete aggregates and road stone.

Hancock.—Weston & Brooker Co. operated its quarry at Granite

Hill and was the only mineral producer in the county.

Haralson.—Haralson County Highway Department produced

54,000 tons of sand and gravel for paving and road purposes.

Hart.—Funkhouser Co. mined mica schist from which it separated and ground flake mica. Payne Bros. produced and sold hand-cobbed mica and A. H. Adams mined a small quantity of sheet mica.

Henry.—Stockbridge Stone Co. crushed granite at the Stockbridge

quarry.

Houston.—Penn-Dixie Cement Co. mined clay and limestone for use in its cement plant at Clinchfield. Cement production was approximately the same as in 1954. Georgia Limerock Co. produced crushed limestone principally for agricultural use.

Jasper.—Appalachian Minerals Co. completed the first full year of operations of its new feldspar-flotation mill near Monticello. Irvin Parker produced some beryl and sheet mica from the Fuller mine.

Jones.—Grinstead Quarries produced crushed granite in the first

half of the year. The company ceased operations and is now out of business.

Lamar.—Empire Mica Co. and Freddy S. Marable mined sheet mica.

Long.—Dawes Silica Mining Co. produced building sand from its Forest Pond mine at Ludowici.

Lowndes.—Georgia Peat Moss Co. was the only mineral producer in the county in 1955.

Macon.—American Cyanamid Co. operated the Cavender, Norris,

and Pierce bauxite mines near Andersonville.

Madison.—Coggins Granite & Marble Industries, Inc., of Elberton quarried granite, principally monumental stone, at the Piedmont quarry near Carlton. Production in 1955 was 11,440 tons (138,000 cubic feet).

Monroe.—Sheet mica was produced by Culloden Mica & Minerals Co. (Battle mine) and Tommy Johnson (Spalding and Thaddeus Persons mines)—only 2 producers, compared with 5 or more in 1954.

Montgomery.—H. H. Vandyke operated a sand pit at Uvalda for

the production of building sand.

Murray.—Production of crude talc in 1955 was 53,800 tons, an increase of 7 percent compared with 50,500 tons in 1954. ground talc were 53,400 tons valued at \$539,000, increases of 6 percent and 7 percent, respectively, in tonnage and value over 1954. Talc Co., Georgia Talc Co., and Southern Talc Co. operated mines east of Chatsworth in Fort Mountain and sawing and grinding plants in Chatsworth.

TABLE 16.—Production of crude and sales of ground talc and soapstone in Murray County, 1946-50 (average) and 1951-55

Year	Production (cr		de) Sales (ground)		
		Short tons	Value	Short tons	Value
946-50 (average 951 952	9)	(1) 78, 500	(1)	<sup>2</sup> 51, 908 77, 623	2 \$606, 51 715, 81
953 954 955		58, 411 57, 891 50, 536	\$202, 619 176, 876	56, 181 57, 581 50, 248	575, 0 594, 9 505, 2

Data not available.
 Includes sawed material.

Muscogee.—The value of mineral production in Muscogee County in 1955 was \$935,000, virtually the same as in 1954. Crushed granite was quarried by Columbus Rock Co. and Alabama Aggregates Co., a division of McCullough Industries, Inc. Alabama Aggregates Co. took over operation of the M-C Granite Co. during the year. guson Sand & Gravel Co. and J. J. Brown Sand & Gravel Co. operated pits just south of Columbus.

Oglethorpe.—Dimension granite, in the form of rough monumental stone, comprised the mineral production of Oglethorpe County; 22,000 tons valued at \$559,000 was quarried in 1955, a decrease of 5 percent in tonnage and 27 percent in value from the previous year. Producers active during the year were: Bennie & Harvey, Dixie Granite Quarries, Enterprise Granite Co., Hoover Granite Quarries, Inc., Liberty Granite Co., and Oglethorpe Quarring Co.

TABLE 17.—Dimension granite sold or used by producers in Oglethorpe County, 1950-55

Year	Short	Cubic feet	Value	Year	Short	Cubic feet	Value
1950–51 1952 1953	(1) 17, 265 22, 527	(1) 208, 003 256, 912	(1) \$368, 655 533, 135	1954 1955	23, 331 22, 196	<sup>2</sup> 267, 595 254, 307	\$766, 392 558, 627

Figure withheld to avoid disclosing individual company confidential data.

2 Revised figure.

Pickens.—Pickens retained its rank as second in the State in terms of value of mineral production. Georgia Marble Co., with quarrying and finishing plants at Tate, marketing dimension, crushed, and ground marble, was the predominant producer in the county. Hardy Johnson, and Carl Johnson produced sandstone (flagstone).

E. Easterwood mined flake mica (sericite) for Thompson-Weinman & Co., Cartersville, from the Martin mine, and Carl Stancil

produced beryl and sheet mica from the Cochran mine.

Pike.—Curtis Marable, mining sheet and scrap mica, was the only

mineral producer in the county.

Polk.—Total mineral production in Polk County in 1955 was 7 percent greater than in 1954, with increases in production values for clay, limestone, and iron ore. Also included in the values for the first time in 1955 was masonry cement.

Cement, both masonry and portland, together with clay and limestone for general sale as well as for cement manufacture, were produced by Marquette Cement Mfg. Co. at Rockmart. Georgia Lightweight Aggregate Co., Rockmart, quarried slate for conversion to lightweight aggregate.

Iron-ore production in the Cedartown area totaled 72,000 tons valued at \$362,000, a decrease of 1 percent in tonnage but an increase

of 19 percent in value compared with 1954.

TABLE 18.—Shipments of brown iron ore in Polk County, 1951-55

Year	Long tons	Value	Year	Long tons	Value
1951 1952 1953	140, 355 165, 522 146, 690	\$541, 929 822, 802 652, 306	1954 1955	72, 635 71, 808	\$304, 682 361, 773

Richmond.—Richmond County mineral production increased from \$1.6 million in 1954 to \$2.3 million in 1955, an increase of 44 percent. All minerals produced in the county except miscellaneous clay showed marked gains over the previous year. Georgia-Carolina Brick & Tile Co. and Merry Bros. Brick & Tile Co. continued to mine clay for use in their clay-products plants, and the Albion Kaolin Division of Interchemical Corp. mined refractory kaolin at Hepzibah. Superior Stone Co. crushed quartzite at the Dan quarry. Augusta Sand &

Gravel Co. (formerly Richmond Sand Co.), and Richmond County Highway Department produced building sand.
Screven.—Atlanta Peat Co., Sylvania, was the only mineral

producer in the county during the year.

Stephens.—Toccoa Construction Co. produced crushed granite for concrete and roadstone.

Sumter.—The Sumter County Highway Department produced 70,000 tons of sand for structural purposes.

Talbot.—Taylor Sand Co. and Brown Bros. operated sand pits near Junction City throughout the year.

Telfair.—Walker Sand Pit north of Lumber City was the only

mineral producer in the county.

Thomas.—Arnold Brick Co. mined clay for use in its brick plant at Thomasville, and Dawes Silica Mining Co. produced building, blast, filler, filter, and molding sand and ground sand (flour) for foundry use. Toombs.—Sand for highway use was produced by the county

highway department.

Troup.—Mineral Processing Co. produced beryl from the Hogg mine near La Grange, and W. Hugh Allen explored the Word mine for beryl under a DMEA contract for \$8,316 with Government participa-

tion of 75 percent.

Twiggs. Twiggs County continued to rank first in the State in terms of value of mineral production. Output of kaolin and fuller's earth totaled 849,000 tons valued at \$14.3 million, increases of 13 percent in tonnage and 14 percent in value compared with 1954. Producing companies were Diversey Corp. (fuller's earth), Pikes Peak; Georgia Coating Clay Co., Macon; Georgia Kaolin Co., Dry Branch; J. M. Huber Corp., Huber; and Southern Clays, Inc., Gordon.

TABLE 19.—Kaolin sold or used by producers in Twiggs County, 1951-55

Year	Short tons	Value	Year	Short tons	Value
1951 1952 1953	541, 974 521, 077 486, 371	\$7,611,121 7,487,877 (1)	1954 1955	750, 441 848, 565	\$12, 543, 07 <b>7</b> 14, 331, 993

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosing individual company confidential data.

Union.—Gravel was produced by the United States Forest Service for its own use in 1955.

Upson.—Value of mica production in the county declined somewhat below 1954 with only 2 active producers compared with 9 or more during the previous year. J. & B. Mining Co. operated the Adams and Mitchell Creek mines, and E. H. Schwab explored the Duke mine under a DMEA contract for \$5,524, with Government participation 75 percent.

Walker.—Coal and limestone made up the mineral production of Walker County in 1955 and totaled \$199,000. Coal production was 11,270 tons valued at \$56,400, compared with 8,090 tons valued at \$40,450 in 1954, an increase of 39 percent in tonnage and value. Walker County Highway Department, Dave L. Brown Co., and Milesway Limestone Co. operated limestone quarries for concrete aggregate and roadstone. The Milesway Limestone Co. acquired the

quarry of Limestone Products Co. in April 1955. Willard Parker and H. R. Perry Stone Co. quarried dimension limestone principally for residential construction near Chickamauga.

Ware.—E. W. Pafford dredged sand near Waycross principally for

building purposes.

Warren.—The Camak quarry of Weston & Brooker was a steady producer of crushed granite for concrete and roadstone, railroad

ballast, stone sand, and riprap.

Washington.—Washington retained its place as third-ranking county in the State in terms of value of mineral production and second in the production of kaolin, its only mineral product. Output was 282,000 tons valued at \$4.5 million, increases of 7 percent in tonnage and 9 percent in value over 1954. Producers were Godfrey L. Cabot, Inc. (Georgia Pigment Division), Champion Paper & Fiber Co., Thiele Kaolin Co., and United Clay Mines Corp., all near Sandersville; J. M. Huber Corp., Huber; and Minerals & Chemical Corp. of America, Gardner.

TABLE 20.—Kaolin sold or used by producers in Washington County, 1951-55

Year	Short tons	Value	Year	Short tons	Value
1951 1962 1963	255, 334 259, 977 302, 250	\$3, 952, 849 4, 069, 357 4, 768, 916	1954 1955	264, 195 282, 411	\$4, 162, 386 4, 543, 775

Wayne.—The county highway department produced sand and gravel for road purposes.

Whitfield.—Dalton Brick & Tile Co. mined 13,800 tons of shale for use in its brick plant south of Dalton. Copper & Maples was sold in February 1955 to Dalton Rock Products Co., which continued operating the limestone quarry and crusher northeast of Dalton.

Wilkinson.—Wilkinson County ranked fourth after Washington in value of its mineral output, which consisted solely of kaolin. Production in 1955 totaled 291,000 tons valued at \$4.2 million, up 20 and 15 percent, respectively, in tonnage and value compared with 1954. Active producers, as in 1954, were: Evans Clay Co. (a division of Thompson-Weinman & Co.), Minerals & Chemical Corp. of America, and M. & M. Clays Co., all mining near McIntyre, produced kaolin for fillers.

D. C. Hardie and Harbison-Walker Refractories Co., both with pits near Gordon, and Oconee Clay Products Co., at McIntyre, mined kaolin for refractory uses. Savannah Kaolin Co. mined kaolin for

pottery and stoneware.

TABLE 21.—Kaolin sold or used by producers in Wilkinson County, 1951-55

Year	Short tons	Value	Year	Short tons	Value
1951 1952 1953	402, 328 435, 528 454, 000	\$6, 465, 212 6, 639, 300 7, 467, 181	1954 1955	241, 198 290, 520	\$3, 692, 143 4, 235, 741

# The Mineral Industry of Hawaii and the Pacific-Island Possessions

By Warren C. Fischer 1



### HAWAII

THE VALUE of minerals produced declined slightly in 1955, owing primarily to a 1-month labor strike that directly affected the output of lime and limestone. Output of the mineral commodities sand, gravel, and stone increased because of the greater demand for

road construction, maintenance, and repair.

The geologic origin of the Hawaiian Islands has limited the mineral resources to calcareous sandstones, clays, coral sand, coral limestones, and lava rock. Although yielding small quantities of material, the mineral industry is an important unit in the economy of the Territory. In recent years, interest in the titania- and alumina-bearing clays has developed, but as yet, no process has been evolved to recover them commercially because of the relatively low metal content.

# CONSUMPTION AND MARKETS

The Territory consumed all of its mineral production. The position of these islands as a military base and a mecca for vacationing tourists, as well as the maintenance of the basic industries, involves certain construction and supply needs requiring the importation of fuels, fertilizers, and additional construction materials. Chief among these imports were petroleum and petroleum products, building cement, potash, natural asphalts, clays, special specification sand and gravel, salt, and other nonmetallic minerals. Most of these commodities were shipped from west coast ports in California, Oregon, and Washington. Ferrous and nonferrous scrap was shipped from the islands to the United States.

## **EMPLOYMENT AND WAGES**

Employment in the mineral industry of the Territory dropped to the lowest figure in several years, averaging only 177 persons. Despite this decline, earnings were higher than in any year since 1950 except 1953. The average weekly wage for mineral-industry employees was \$66.28.

<sup>&</sup>lt;sup>1</sup> Commodity-industry analyst, Region II, Bureau of Mines, San Francisco, Calif.

TABLE 1.—Mineral production in the Territory of Hawaii and the Pacific Island possessions, 1954-55 1

	198	54	1955		
Area and mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	
American Samoa: SandStone (crushed)	1,800 57,600	\$675 15,000	1, 275 9, 011	\$552 3, 948	
TotalCanton: Stone (crushed)Guam: Stone (crushed)	2, 600 842, 660	16, 000 5, 000 <b>2, 2</b> 75, 182	500 1, 241, 466	5, 000 1, 500 3, 351, 958	
Territory of Hawaii: Lime (open-market) Sand and gravel. Stone. Pumiee (volcanic ash and cinder)	8, 375 119, 121 1, 485, 427 (2)	251, 610 318, 754 2, 993, 032 (2)	6, 453 165, 081 1, 414, 304 130, 306	202, 004 425, 76 2, 884, 35 75, 90	
Undistributed nonmetal and minerals indicated by footnote 2		58,778		21, 818	
Total 3	98 490 780	3, 596, 000 300 1, 500 1, 300	12, 090	3, 592, 00 32, 55 3, 00	

<sup>&</sup>lt;sup>1</sup> Production data for Canton and Wake furnished by the U. S. Department of Commerce, Civil Aeronautics Administration; Midway and Johnston by the U. S. Department of the Navy; Guam by the Government of Guam; American Samoa by the Government of American Samoa.

<sup>2</sup> Value included with "Undistributed."

<sup>3</sup> The total has been administration.

3 The total has been adjusted to eliminate duplication in the value of limestone used in lime.

# REVIEW BY MINERAL COMMODITIES

Clays.—Clay production in the Territory increased about 33 percent in 1955 and was confined to Oahu, Honolulu County. Except for a few tons used in pottery and stoneware, the entire production was consigned to heavy-clay-products manufacture. The producers were Gaspro, Ltd. (formerly Hawaiian Gas Products, Ltd.), and Wilsonite

Brick Co. Ltd.

Lime.—Gaspro, Ltd., was the sole producer of lime products in the Territory during the year. A very small tonnage of quicklime was used for agricultural purposes. About one-third of the remaining production (hydrated) was utilized by the building trades; the remainder went to chemical and other industrial uses. The company remainder went to chemical and other industrial uses. kiln and hydrator provided this output. Some "dry ice" resulted as a byproduct carbon dioxide of the kiln. A labor strike of 1-month duration was the cause of the decline in production and resulted in an approximate 10-percent price increase to dealers.

Pumice (Volcanic Ash and Cinder).—Production increased nearly 50 percent in 1955; about 25 percent of the total went for use in concrete aggregate. Three companies, producing volcanic cinder for their own use in road construction, were: Hakalau Plantation Co., Honokaa Sugar Co., and Pepeekeo Sugar Co., all in Hawaii County.

Salt.—A small tonnage of salt was produced from sea water by solar evaporation at Honouliuli, Honolulu County, by Chun Mew Ting Co. Production increased very slightly from the previous year, The product is considered excellent in certain despite little demand. Oriental pickled food.

Sand and Gravel.—Chang's Express at Waialua and Paumalu used a portable plant to produce structural sand for use in concrete and mortar; Pacific Concrete & Rock Co., Ltd., using a portable plant at Waimea, and Honolulu Construction & Draying Co., Ltd., at Kailua produced paving and structural sand, respectively; all in Honolulu County. The National Park Service, Hawaii County, produced paving sand and gravel for its own use. Total production was up nearly 40 percent in 1955.

Stone.—Basalt.—There was a substantial increase in the tonnage of basalt quarried in the Territory over the previous year. National Park Service produced a few hundred tons of dimension basalt for use as rubble at Hawaiian National Park, Hawaii County. The remaining production was quarried for riprap, concrete, and road metal. Principal producers in Hawaii County were James W. Glover, Ltd., the Hawaii County engineer and contractors, and the Territorial Highway Department and contractors. County, basalt was quarried by Clarke-Halawa Rock Co.; Hawaiian Rock & Supply Co., Ltd.; Honolulu Construction & Draying Co., Ltd.; and Pacific Concrete & Rock Co., Ltd. The last two ran crushing mills. Grove Farms Co., Ltd., Kauai Island, and Waimea Quarry, Niihau Island, both in Kauai County, quarried and crushed basalt. Maui County had two producers of basalt, in addition to the Maui County engineer—Kahului Railroad Co. and Molokai Rock & Equipment Co.—which prepared crushed material at their quarries.

Limestone.—Excluding limestone used in lime, production was well above the 1954 figure. Declining production of dimension limestone was more than offset by the crushed limestone produced for concrete and road metal. Kailua Limestone Co., and Gaspro, Ltd., both in Honolulu County, supplied dimension limestone for use as rubble. The principal producers were Grove Farms Co., Ltd., Kauai County: and Gaspro, Ltd., Kailua Limestone Co., and Nanakuli Paving and Rock Co., Honolulu County. All companies operated crushers

at their pits.

Miscellaneous Stone.—Several thousand tons of lava rock was produced by J. M. Tanaka, general contractor, from a quarry in Hawaii County. A portable crushing plant was used to prepare the material for concrete and road metal. Production in the Territory was up approximately 40 percent in 1955.

Vermiculite.—Vermiculite of Hawaii, Ltd., expanded a small tonnage of vermiculite at its plant in Honolulu County for acoustical and insulation use in construction. The crude vermiculite was

obtained from the western United States.

# PACIFIC-ISLAND POSSESSIONS

American Samoa.—The Government of American Samoa quarried coral and basalt for use in concrete and road metal and prepared coral beach sand for paving.

Canton.—The Civil Aeronautics Administration quarried and

graded a small tonnage of coral for use in road construction.

Guam.—The tonnage of coral prepared for use in concrete and asphalt aggregates and road material by the Government of Guam

and the Department of Defense and contractors was considerably above that of the previous year.

Johnston.—An appreciable tonnage of coral for road construction and repair was prepared by Government agencies and their con-

tractors.

Wake.—Coral was quarried and prepared for roofing granules and for use in concrete and road construction by the Civil Aeronautics Administration.

# The Mineral Industry of Idaho

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 Idaho Bureau of Mines and Geology.

By Kenneth D. Baber, Frank B. Fulkerson, and Albert J. Kauffman, Jr.2



ETALLIC mineral production in Idaho during 1955 was much greater than nonmetallic output; the valuation of all mineral production decreased about \$1.2 million below the preceding year. A notable exception was the gain in production of copper of 16 percent accompanied by an increased value of 47 percent, reflecting its premium price during the year. Value of metals constituted 79

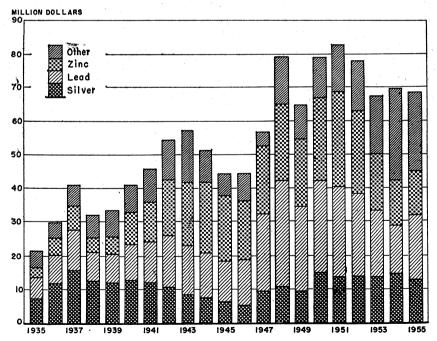


FIGURE 1.—Value of mineral production in Idaho, 1935-55.

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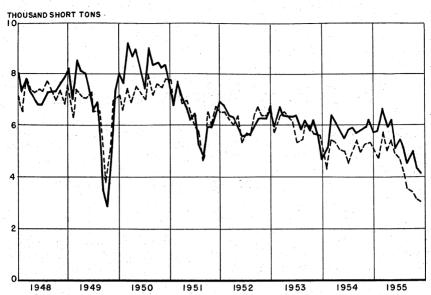


FIGURE 2.—Mine production of lead and zinc in Idaho, 1948-55 by months, in terms of recoverable metals.

TABLE 1.-Mineral production in Idaho, 1954-55 1

			l	
	19	54	19	55
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Antimony ore and concentrate	(2) 1, 702, 272 4, 828 13, 245 69, 302 609 25, 726 500 1, 992, 817 6, 717, 700 15, 867, 414 2, 329, 005	(2) 13, 290, 048 6, 307, 935	64, 163 1, 107 65, 782 (2) 1, 329, 959 8, 652, 138 13, 831, 458 1, 524, 810 1, 330 642	(2) \$29, 910 (2) 4, 191, 028 370, 020 19, 120, 574 321, 417 (2) 6, 038, 088 3, 933, 876 12, 518, 168 1, 866, 076 7, 000 (2) 13, 115, 244
Total Idaho		³ 69, 689, 000		68, 513, 000

Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Some minerals that originated in Idaho cannot be credited owing to lack of information (see last paragraph of introduction.)
 Figure withheld to avoid disclosing individual company confidential data.
 Revised figure.

percent of the State production total; silver, lead, and zinc furnished 65 percent. This closely paralleled the 1954 experience of 77 and 67 percent, respectively. Lead continued as the principal product. The value of zinc exceeded that of silver, reversing the situation of the previous year. Values over \$1 million also were credited to cement, cobalt, copper, phosphate rock, sand and gravel, stone, and tungsten. The phosphate-rock industry prospered, as production increased for the third consecutive year, with a 22-percent advance over 1954.

Renewed activity in mercury began when Rare Metals Corporation of America, subsidiary of El Paso Natural Gas Co., leased the Idaho-Almaden mercury property near Weiser and began open-pit mining. The company also constructed a plant on the property and installed the world's largest single-rotary-kiln mercury-recovery unit. Plant capacity was rated at 175 tons of ore per day. Calera Mining Co. Blackbird mine was the Nation's leading cobalt producer in 1955. The company had a potential daily ore production of 1,000 tons, but a

shortage of labor restricted output to 700 tons per day.

The Idaho State Dredge Mining Protective Act went into effect in January. The legislation transferred the responsibility of interpretation and enforcement of the act from the State mine inspector to the State board of land commissioners. To facilitate the intent of the act, the board sponsored conferences with agencies and groups including the dredge operators, State fish and game department, Federal Bureau of Reclamation, bureau of public health, the attorney general's office, and the United States Forest Service. Periodic inspections of the dredging areas were scheduled. The law stated that all producers with a daily capacity over 500 cubic yards must have a permit. The act had no direct jurisdiction over operations of less than 500 cubic yards per day, but it was expected that all would comply with the intent of the law. Developments indicated that an important technicality needed clarification; the dredging initiative did not specify any standards for clarity of streams. There existed a possibility that the board might revoke a permit in the hope that this action would result in establishing standard of sedimentation.

In the 10-year period 1946-55, Idaho mineral production advanced from \$44 million to \$68 million. Metal commodities supplied most of the increase (from \$38 million to \$54 million); nonmetals increased about \$8 million (from \$6 million to over \$14 million). Considering the four Pacific Northwest States (Idaho, Montana, Oregon, and Washington) as a unit, Idaho's share of the total output value declined from 29 percent in 1946 to 20 percent in 1955. The relative difference in the basic foundation of the mineral industry in each of the States is shown by the fact that metals constituted 79 percent of Idaho value, compared with 63 percent for Montana and only 24 and 8 percent,

respectively, for Washington and Oregon.

Mining industries furnished about 4 percent of covered employment in Idaho and 15 percent of the employment in industrial production (manufacturing and mining). Metal mines provided nearly all the employment in the mining industry; lead- and zinc-ore mining supplied a large share. The 1955 totals in employment covered by the State employment security law averaged 4,400 workers in mining; 4,100 were in metal mining and 300 at nonmetallic mines and quarries. About 2,700 workers were employed in lead- and zinc-ore mining.

Employment at mines decreased by an average of 100 workers com-

pared with 1954.

Mining payrolls totaled \$21.3 million in 1955 compared with \$21.0 million in 1954. Average weekly earnings in the mining industry were \$86.20 in 1954 and \$93.10 in 1955. Increases in the latter part of the year were reflected in the figures for December 1955, which showed average weekly earnings of \$99.36 in mining; other December figures were \$85.97 in manufacturing and \$102.25 in construction. Average weekly hours and average hourly earnings were 40.3 and \$2.31, compared with 40.5 and \$2.13 in 1954.

In mineral manufacturing, data provided by the Idaho Employment Security Agency showed that the 1955 average employment in smelting, refining, and casting was 1,100. Manufacturing of chemicals and allied products also was important in the State economic picture, with 800 workers employed. Stone and clay products, including cement, employed 400 people. Payrolls totaled \$11.1 million. Mineral-manufacturing plants supplied about 9 percent of all employ-

ment in the manufacturing industries of the State in 1955.

TABLE 2.—Employment in mining and mineral manufacturing industries in Idaho,  $1948-55^{-1}$ 

	1948	1949	1950	1951	1952	1953	1954	1955
Mining; Metal	5, 221 14 218	5,073 15 17 204	5, 280 2 15 255	5, 236 1 2 272	5, 231 1 23 307	4,479 10 4 326	4, 206 6 3 283	4, 112  297
Total mining	5, 453	5, 309	5, 552	5, 511	5, 562	4, 819	4, 498	4, 409
Mineral manufacturing: Stone and clay products Primary metals Chemicals and allied products	328 1, 226 76	372 998 137	395 1, 131 272	409 1,094 524	406 1,097 1,054	391 1,041 757	385 1,147 796	427 1, 120 797
Total mineral manufacturing	1,630	1,507	1, 798	2,027	2, 557	2, 189	2, 328	2, 344

<sup>1</sup> Employment covered by Idaho Employment Security Act; compiled from State employment security agency tabulations.

TABLE 3.—Wages paid in mining and mineral-manufacturing industries, 1948-55 <sup>1</sup>

	1948	1949	1950	1951
Mining: Metal Bituminous coal Crude petroleum and natural gas Nonmetallie and quarrying Total mining	\$18, 952, 216 31, 963 702, 137 19, 686, 316	\$19, 272, 283 38, 996 11, 905 644, 800 19, 967, 984	\$21, 039, 850 6, 211 64, 354 841, 742 21, 952, 157	\$22, 170, 789 5, 489 7, 425 1, 026, 720 23, 210, 423
Mineral manufacturing: Stone and clay products	926, 331 4, 611, 195 236, 074 5, 773, 600	1, 121, 793 3, 544, 727 479, 572 5, 146, 092	1, 249, 193 4, 488, 424 1, 036, 433 6, 774, 050	1, 466, 823 4, 732, 661 2, 193, 432 8, 392, 916

TABLE 3.—Wages paid	in mining and	mineral-manufacturing	industries,
<u> </u>	1948-55 1(		

	1952	1953	1954	1955
Mining: Metal	\$24, 580, 580 3, 218 150, 424 1, 327, 175	\$21, 835, 855 18, 489 8, 734 1, 374, 802	\$19, 753, 622 6, 763 5, 027 1, 204, 006	\$20, 012, 000 1, 333, 588
Total mining	26, 061, 397	23, 237, 880	20, 969, 418	21, 345, 588
Mineral manufacturing: Stone and clay products Primary metals Chemicals and allied products Total mineral manufacturing	1, 484, 672 5, 382, 504 4, 774, 938 11, 642, 114	1, 524, 228 4, 800, 556 3, 372, 287 9, 697, 071	1, 499, 787 5, 214, 121 3, 614, 231 10, 328, 139	1, 690, 725 5, 408, 913 3, 993, 813 11, 093, 451

<sup>&</sup>lt;sup>1</sup> Wages in employment covered by Idaho Employment Security Law; compiled from State employment security agency tabulations.

Beginning in June the mining industry again felt the annual shortage of experienced workers. In September about 800 workers were idled by a labor dispute involving the International Union of Mine, Mill, and Smelter Workers and 16 producers in the Coeur d'Alene area. Sunshine Mining Co. and the Steelworkers Union (CIO) agreed on a new contract in September. This was said to be the first time in the history of the Coeur d'Alene region that labor negotiations resulted in a new agreement before expiration of the old contract. A similar contract was signed by Lucky Friday Silver-Lead Mines Co. and the

Steelworkers Union.

Preliminary work was in progress at Idaho Power Co. Brownlee dam site in Hells Canyon; building contracts were awarded to Morrison-Knudsen Co. Construction was continued on the large Palisades Dam near Idaho Falls, except during the winter months, when cold weather forced a shutdown. A \$15 million project was begun in the fall at the Atomic Energy Commission (AEC) test site at Arco. Employment at the engineering reactor being built by Kaiser Engineering Co. was expected to reach 650 men early in 1956. Permanent personnel at Arco totaled 2,250 at the end of the year. Another large construction project, to cost \$6 million, was planned for the Mountain Home Air Force Base, where additional runways and other facilities were to be provided.

During 1955 the program of the Defense Minerals Exploration Administration (DMEA) continued to encourage systematic investigation of strategic and critical mineral occurrences. The projects listed in table 4 were active under the program during part or all of 1955.

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, gallium, and germanium. The 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 fre-

quently treat mixtures of materials from many sources, including residues obtained from refining such metals as copper and lead and those obtained in other ways. It is impossible in many such instances to distribute the mineral products by States of origin; sometimes it is even difficult to obtain accurate separation as to domestic and foreign sources. For example, byproduct sulfuric acid seldom can be separated as to source.

TABLE 4.—Defense Minerals Exploration Administration contracts active during 1955

			Contract				
County and contractor	Property	Commodity	Date	Total amount	Gov- ern- ment partici- pation, percent		
BLAINE							
Silver Star-Queens Mines,	Queen of the Hills.	Lead, zinc	Apr. 25, 1955	\$235, 780	50		
Inc. Sowers and Johnson Triumph Mining Co	Red Leaf Triumph	do	Oct. 19, 1954 Aug. 9, 1954	10, 662 143, 354	50 50		
BONNER							
Whitedelf Mining & Development Co.	Whitedelf	Lead	Oct. 19, 1951	232, 950	50		
BUTTE					1		
Ralph M. Taylor, et al	Copper Mountain	Copper, lead	Oct. 13, 1955	14, 250	50		
CUSTER							
Elmer Enderlin Highland-Surprise Cons.	Meadow View Deer Trail	Zinc Lead, zinc	Apr. 16, 1952 June 17, 1955	27, 120 59, 570	50 50		
Mining Co. Idaho Custer Mines, Inc Salmon River Scheelite Corp. Fred and Earl Shirts	Livingston Tungsten Jim Mountain King	Tungsten Lead, zinc	Apr. 21, 1955	95, 500 39, 040 31, 305	50 75 50		
LEMHI		4.5					
Bitterroot Uranium, Inc	Surprise Ima Blackbird Pope-Shenon Twin Peaks	Uranium Tungsten Cobalt, copper Copper Lead, zinc	Sept. 28, 1954 Oct. 28, 1952 Dec. 9, 1953 Dec. 28, 1953 Nov. 10, 1955	34, 175 224, 400 407, 340 63, 140 17, 370	75 75 70 50 50		
Inc. Idaho Metallurgical Industries, Inc.	Tinkers Pride	Cobalt, copper	Aug. 26, 1955	328, 290	621/2		
Montana Coal & Iron Co Northfield Mines, Inc Roger Pierce.	Black Pine Stevenson Gilmore	Copper Cobalt, copper Lead, zinc	Mar. 25, 1955 June 2, 1952 July 27, 1953	125, 050 233, 150 64, 145	50 70 50		
SHOSHONE		·					
Bunker Hill & Sullivan Mining & Concentrating Co.	Crescent	Lead, zinc, copper_	Feb. 25, 1953	1, 098, 750	50		
Day Mines, Inc.  Hecla Mining Co.  Polaris Mining Co.	Hercules Silver Mountain Polaris East	Copper, lead,	Feb. 5, 1953 Oct. 21, 1954 June 3, 1953	288, 710 1, 058, 370 685, 955	50 50 50		
Sidney Mining Co Silver Buckle Mining Co Spokane-Idaho Mining Co Sunset Mines, Inc	Exploration. Sidney Vindicator Douglas Liberal King	antimony, silver. Lead, zincdodododo	July 3, 1952 Oct. 12, 1953 Jan. 30, 1953 Nov. 22, 1954	523, 440 229, 500 142, 634 101, 125	50 50 50 50		
VALLEY							
Bradley Mining Co	Yellow Pinedo Red Bluff	Antimony do Tungsten	Feb. 27, 1953 Nov. 25, 1952 Sept. 25, 1952	203, 836 53, 000 53, 800	75 75 75		

# REVIEW BY MINERAL COMMODITIES

#### **METALS**

Antimony.—Antimony contained in electrolytic antimony metal produced at Sunshine Mining Co. plant near Kellogg amounted to 633 short tons, compared with 764 tons in 1954. Antimony content of all stockpiled metal at the close of 1955 was 1,700 tons. Processes employed at the Sunshine plant involved initial concentration of ore from the Sunshine mine and adjoining properties on a profit-sharing basis; flotation to produce lead-silver, copper-silver-antimony, and silver-pyrite concentrates; and leaching of the copper-silver-antimony concentrate to remove the antimony. The leach solution subsequently was electrolyzed to produce the cathode antimony metal. The operation was described in an article.<sup>3</sup> The company made the first sale from its antimony stockpile since the antimony plant was activated in April 1953. A trial shipment of 53 tons (contained antimony) was made in October to Bradley Mining Co. antimony smelter at Stibnite, Idaho. If satisfactory results were obtained on this trial shipment, additional quantities from the stockpile were expected to be shipped for refining. Cathode metal produced by Sunshine contained over 95 percent antimony; most of the remainder was arsenic. The company also successfully conducted its own pilotplant-scale experimental runs, designed to purify the cathode metal by removing arsenic.

Cadmium.—Byproduct cadmium was recovered at the Bunker Hill lead smelter and the Sullivan electrolytic zinc plant at Kellogg,

Shoshone County.

Cobalt.—Mining continued at Calera Mining Co. Blackbird mine in Lemhi County throughout 1955, except for the strike of nearly 3 weeks in May. Although the mill was operated at only about two-thirds of its rated capacity of 1,000 tons per day, output of cobalt concentrate was somewhat higher than in 1954. Concentrate from the mill at Cobalt was shipped to the company refinery at Garfield, Utah. During the year the Calera company resumed operation of the refinery, which had been operated by Chemical Construction Co., its builder, since early in 1954 owing to technical difficulties.

Copper.—Copper production advanced, increasing 16 percent over 1954. Calera Mining Co. Blackbird copper-cobalt mine in Lemhi County was the main producer of copper; comparatively large quantities were also recovered at the Sunshine, Silver Summit, and Galena silver mines in Shoshone County and as a byproduct of ores produced

at several large lead-zinc mines.

A number of small mines produced copper. In southwestern Owyhee County, South Mountain Mining & Concentrating Co. worked the South Mountain property most of 1955 and shipped copper-lead ore to a smelter in Utah. Copper ore was shipped from the Valley View mine, Clark County; the Empire mine, Custer County; and the Black Pine, Hungry Hill, and Grandview properties in Lemhi County. Idaho Alta Metals Corp. acquired the Empire mine and began developing this old producer in Alder Creek district,

<sup>&</sup>lt;sup>3</sup> Gould, Wayne D., Sunshine's Tetrahedrite Ores Yield Electrolytic Antimony: Eng. Min. Jour., vol. 156, No. 6, June 1955, pp. 91-94.

8 miles southwest of Mackay. Montana Coal & Iron Co. conducted an exploration and development project at the Black Pine mine, which was reopened in 1952.

One of the principal ore discoveries in the Coeur d'Alene region in 1955 was made at the Crescent mine, where 4 silver-copper ore shoots were opened on the 3,110 level by Bunker Hill Co., as a result of work

under a DMEA contract.

Gold.—Gold production continued to decline; only 10,572 ounces was recovered. The Clearwater Dredging Co. bucketline dredge on the Crooked River near Elk City, Idaho County, remained the leading producer of gold despite a shutdown for about 3 months at the beginning of 1955 because of cold weather. Calera Mining Co. Blackbird mine (copper-cobalt ore), Lemhi County, and Talache Mines, Inc., Boise-Rochester group (gold ore), Elmore County, produced. Five former employees of Talache Mines, Inc., who obtained a lease after company work was discontinued, produced at the Boise-Rochester property. Most of the remaining gold produced in Idaho came from placers and as a byproduct of ores produced at lead-zinc mines.

Lead.—Mine output of lead declined 7 percent despite improved market conditions for lead and zinc. The yearly total was the smallest since 1946 principally because of a prolonged strike in the Coeur d'Alene mining area of Shoshone County from August 23 through December 31. Mines of the "Sixteen Operators" bargaining

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc, 1946-50 (average), 1951-55, and total, 1863-1955, in terms of recoverable metals <sup>1</sup>

	Mines	producing	Material sold or	Gold (lode	and placer)	Silver (lode and placer)		
Year	Lode	Placer	treated 2 (short tons)	Fine ounces	Value	Fine ounces	Value	
1946-50 (average)	168 157 132 114 101 109	81 52 29 34 23 34	3, 387, 804 3, 254, 791 3, 008, 230 2, 090, 185 1, 960, 962 1, 960, 816	64, 778 45, 064 32, 997 17, 630 13, 245 10, 572	\$2, 267, 244 1, 577, 240 1, 154, 895 617, 050 463, 575 370, 020	10, 886, 007 14, 753, 023 14, 923, 165 14, 639, 740 15, 867, 414 13, 831, 458	\$9, 726, 288 13, 352, 231 13, 506, 218 13, 249, 704 14, 360, 811 12, 518, 168	
1863-1955 3			131, 029, 816	8, 241, 174	191, 580, 493	642, 439, 142	469, 405, 755	
	С	opper	Le	Lead		Zinc		
Year	Short tons	Value	Short tons	Value	Short tons	Value	Total value	
1946-50 (average) 1951 1952 1953 1954 1955	2,160	\$634, 602 1, 045, 440 1, 555, 092 1, 800, 064 2, 848, 520 4, 191, 028	81, 360 76, 713 73, 719 74, 610 69, 302 64, 163	\$23, 915, 405 26, 542, 698 23, 737, 518 19, 547, 820 18, 988, 748 19, 120, 574	81, 058 78, 121 74, 317 72, 153 61, 528 53, 314	\$20, 888, 766 28, 436, 044 24, 673, 244 16, 595, 190 13, 290, 048 13, 115, 244	\$57, 432, 305 70, 953, 653 64, 626, 967 51, 809, 828 49, 951, 702 49, 315, 034	
1863-1955 3	133, 551	47, 233, 923	6, 645, 703	870, 315, 484	1, 966, 886	394, 334, 515	1, 972, 870, 170	

Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings and old slag re-treated, and ore shipped to smelters during the calendar year indicated.
 Does not include gravel washed.
 Partly estimated for years before 1901.

group employing about 800 men were affected by the shutdown, including: American Smelting & Refining Co. (Page, Frisco, and Galena), Day Mines, Inc. (Dayrock, Tamarack, and Hercules), and Sidney Mining Co. (Sidney). Also closed were the Golconda, Liberal King, Little Pittsburgh, John George lease, and Hull lease; all had supplied some output earlier in 1955.

TABLE 6.—Gold produced at placer mines, 1946-50 (average), and 1951-55, by classes of mines and methods of recovery

	Mines	Material	Gold recovered			
Class and method	pro- duc- ing 1	treated (cubic yards)	Fine ounces	Value	Average value per cubic yard	
Surface placers: Gravel mechanically handled:						
Bucketline dredges:						
1946-50 (average)	6	2, 924, 968	14,062	\$492, 184 373, 275	\$0.16	
1951	4	1, 729, 500	10,665	373, 275	.21	
1952	3 2	458, 150 904, 000	2, 359 3, 865	82, 565 135, 275	.15	
1953	23	904, 300	4, 832	169, 120	18	
1954	22	434,000	3, 149	110, 215	25	
1955 Dragline dredges:		202,000	0, 110	110, 210		
Dragline dredges: 1946-50 (average)	3	408, 652	1,906	66, 710	.16	
1951	5	137, 000	938	32, 830	. 24	
1952	6	435, 000	1,769	61, 915	. 14	
1953	4	332,000	1,476	51, 660	.15	
1954	2	289,000	1,308	45, 780	.15	
1955	4	63, 900	285	9, 975	.15	
Suction dredges:	_	0.011	38	1, 344	.20	
1946-50 (average)	2	6, 611	- 38	1, 544		
1951-55						
Nonnoating wasning plants:	5	273, 335	2, 237	78, 288	.28	
1940-00 (a verage)	,	210,000	2, 20.			
1961–52 1953	2	16, 200	46	1,610	.10	
1954	4	26, 100	292	10, 220	.39	
1955	3	21, 200	141	4, 935	.23	
Gravel hydraulically handled: 1946-50 (average)						
1946-50 (average)	. 8	30, 829	194	6,776	.22	
1951	9	17, 250	93	3, 255	. 18	
1952	5	10, 100	101	3, 535 14, 875		
1953	9	181, 250 15, 800	425 193	6,755	1 49	
1954	7 13	27, 300	283	9, 905		
1955 Small-scale hand methods:4		21,300	200	3, 500		
Small-scale hand methods: 1946-50 (average)	53	13, 388	212	7, 406	.58	
1951	34	7, 300	154	5, 390	. 78	
1952		2,900	92	3, 220	1.11	
1953		2,800	75	2,625	. 93	
1954	7	2,900	68	2, 380 3, 080	.82	
1955	12	5, 550	88	3,080	. 50	
Underground pleases: Drift:	1		٠	400	.38	
1946-50 (average)	4	1, 370	-14	490		
1951-55						
					1	
Grand total placers:	81	3 650 153	18, 663	653, 198	.17	
1946-50 (average)	52	3, 659, 153 1, 891, 050	11,850	414, 750	.21	
1951 1952	29	906, 150	4, 321	151, 235	.16	
1953	34	1, 436, 250	5, 887	206, 045	.14	
1954		1, 238, 100	6,693	234, 255	.18	
1955		551, 950	3,946	138, 110	.2	
1900	32	002,000	1 3,510	,	1	

Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal

Includes thereaft prospectors, simplers, imparignators, and observed a second registration of the property.

Includes monazite dredge recovering gold as byproduct.
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."
Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long-toms, dip boxes, pans, etc. "Wet" method used exclusively in Idaho.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1955, by counties, in terms of recoverable metals

County	Mines p	producing		ode and cer)	Silver (lode and placer)		
	Lode	Placer	Fine ounces	Value	Fine ounces	Value	
Benewah Blaine Boise Boise Bonner Bonner Bonnerille Butte Clark Custer Elmore Gem Idaho Jerome Latah Lemhi Nez Perce Owyhee Shoshone Twin Falls Valley Undistributed 2	3 1 13 4 4 	1 7 7 1 1 10 (1) 3 2 (1) 2 1 1 3	14 289 157 203 9 1 378 1, 314 2 3, 543 4 105 2, 208 3 1, 777 4 407	\$490 10, 115 5, 495 7, 105 315 32 315 32 45, 990 45, 990 104, 005 105 77, 280 5, 390 62, 190 62, 140	434, 959 960 75, 029 177 232 152, 649 9, 510 713 8 136, 060 29, 508 12, 984, 323 1, 560 5, 765	\$393, 660 \$67, 905 160 210 138, 155 8, 607 645 7 123, 141 26, 706 11, 751, 468 3 1, 412 5, 218	
Total	109	34	10, 572	370, 020	13, 831, 458	12, 518, 168	

	Co	pper	I	ead.	2	line	Total
County	Short tons	Value	Short	Value	Short tons	Value	value
Benewah							\$49
Blaine Boise	27	\$20, 142	2, 458	\$732, 484	1, 897	\$466,662	1, 623, 0 6, 3
Bonner Bonneville	1	746	128	38, 144	9	2, 214	116, 1
Butte	2 35	1, 492 26, 110	1	298			1, 90 26, 3
uster Ilmore	21	15, 666	1, 458	434, 484	858	211, 068	812, 60 54, 59
lemdaho							124, 6
eromeatah							3, 6
emhi lez Perce	2, 842	2, 120, 132	223	66, 454	12	2, 952	2, 389, 9
wyhee hoshone 'win Falls	49 2, 637	36, 554 1, 967, 202	59, 820	5, 662 17, 826, 360	50, 527	2, 214 12, 429, 642	76, 55 44, 036, 86
alley Indistributed 3	4	2, 984	56	16, 688	2	492	1, 4 39, 6
Total	5, 618	4, 191, 028	64, 163	19, 120, 574	53, 314	13, 115, 244	49, 315, 0

From property not classed as a mine.
 Includes values and quantities that cannot be shown separately for Ada, Adams, Boundary, Camas, and Clearwater Counties.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1955, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zine (short tons)
January February March April May June July August September October November December	350 610 440 450 760 1, 290 1, 150 1, 120 1, 300 1, 041 1, 010	1, 277, 100 1, 248, 040 1, 449, 670 1, 277, 040 1, 400, 050 1, 117, 210 1, 135, 040 1, 073, 870 1, 011, 170 1, 004, 940 969, 884 8667, 444	458 459 556 535 512 367 453 420 516 477 435 430	5, 731 5, 766 6, 664 5, 897 6, 195 5, 169 5, 453 5, 167 4, 591 5, 094 4, 305 4, 131	5, 169 4, 767 5, 725 5, 077 5, 421 4, 908 4, 792 4, 204 3, 593 3, 431 3, 161 3, 067
Total	10, 572	13, 831, 458	5, 618	64, 163	53, 31

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1955, by classes of ore or other source materials, in terms of recoverable metals

the state of the s							
Source	Num- ber of mines 1	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
			-				
Ore:  Dry gold  Dry gold-silver  Dry silver	15 3 16	6, 670 298 372, 414	1, 503 209 750	9, 406 5, 877 9, 362, 382	300 4, 456, 900	4, 042, 500	175, 100
Total	34	379, 382	2,462	9, 377, 665	4, 457, 200	4, 042, 500	175, 100
Copper- Copper-lead- Copper-lead-zinc- Lead- Lead-zinc-	10 1 1 28 30	180, 033 202 35 50, 475 1, 161, 085	2, 030 76 482 1, 511	6, 812 19, 961 76 173, 089 4, 044, 612	5, 538, 000 62, 300 2, 400 25, 000 907, 900	300 26, 300 6, 000 4, 687, 500 113, 231, 600	2, 800 3, 900 206, 500 87, 160, 300
Total	70	1, 391, 830	4, 099	4, 244, 550	6, 535, 600	117, 951, 700	87, 373, 500
Other 'lode' material: Dry gold: Mill cleanings Old tailings Copper: Old tailings	2 1 1	25 45 927	4 30	9 24 93	56, 400		
Lead-zinc: Mill cleanings Old tailings 2 Zinc: Old slag	1 3 1	100 3 81, 557 106, 950	31	298 160, 831 47, 059	186, 800	10, 300 1, 458, 900 4, 862, 600	15, 700 762, 900 18, 300, 800
Total	9	189, 604	65	208, 314	243, 200	6, 331, 800	19, 079, 400
Total "lode" material Gravel (placer operations)	109 34	1, 960, 816 (4)	6, 626 3, 946	13, 830, 529 929	11, 236, 000	128, 326, 000	106, 628, 000
Total	143		10, 572	13, 831, 458	11, 236, 000	128, 326, 000	106, 628, 000

Detail will not necessarily add to total, because some mines produce more than 1 class of material.
 Includes production from tungsten ore yielding copper-lead concentrate.
 Tungsten-ore tonnage not included.
 551,950 cubic yards.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery and types of material processed, in terms of recoverable metals

Type of material processed and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zine (pounds)
Lode: Amalgamation	1, 012	779			
Concentration, and smelting of concentrates: OreOld tailings 1	4, 550 31	13, 511, 117 160, 831	10, 720, 900 186, 800	121, 123, 400 1, 458, 900	87, 525, 000 762, 900
Total	4, 581	13, 671, 948	10, 907, 700	122, 582, 300	88, 287, 900
Direct smelting: Ore. Old tailings. Old slag	1, 033	110, 650 93 47, 059	271, 900 56, 400	881, 100 4, 862, 600	39, 300 18, 300, 800
Total	1, 033	157, 802	328, 300	5, 743, 700	18, 340, 100
Placer	3, 946	929			
Grand total	10, 572	13, 831, 458	11, 236, 000	128, 326, 000	106, 628, 000

<sup>1</sup> Includes production from tungsten ore yielding copper-lead concentrates.

The Bunker Hill mine of Bunker Hill Co. was by far the leading lead producer followed by the Star mine of Sullivan Mining Co. Bunker Hill output of lead was somewhat greater than in 1954; Star production decreased slightly. Output of the other principal producers in Shoshone County—the Page, Frisco, Dayrock, and Sidney mines—declined as a result of the strike; salvage of ore pillars at the Morning mine yielded a smaller tonnage than in 1954; the Sunshine-mine total was well under the figure for the previous year; and Lucky Friday output was about the same as in 1954. A large tonnage of lead was recovered at the Bunker Hill smelter from smelter-dump material.

Ore output in Shoshone County advanced slightly despite the strike closing several mines owing to increased ore production by Bunker Hill Co. Shoshone County supplied 93 percent of the lead output. The major producers of the other areas continued to be the Triumph mine in Blaine County and the Clayton mine in Custer County.

Spokane-Idaho Mining Co. terminated mining activity at the Constitution and Douglas lead-zinc mines in the Pine Creek area of the Coeur d'Alene region in June. The mines had been operated for 2 years under a block-leasing system instituted by the company after lead and zinc prices dropped. Highland-Surprise Consolidated Mining Co. in the same mining region closed about May 1.

Lucky Friday Silver-Lead Mines Co. completed its shaft-raising project in 1955. Sidney Mining Co. completed shaft deepening to the 2,300 level before it was closed by strike. One of the principal ore discoveries was the Rambler zinc-lead-silver deposit on the 1,600 level in Day Mines, Inc., Hercules mine, where a DMEA project was in progress. A project at the Vindicator Silver-Lead property was also under agreement with DMEA. Shaft sinking by Hecla Mining Co. at Silver Mountain Lead Mines, Inc., property east of Mullan was scheduled to begin early in 1956 under a \$1.1 million contract with DMEA.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1955, by counties and districts, in terms of recoverable metals

	ddon tr	or, town	and and	H 1000, D	y countes	anu aistrici	s, in terms	or recovers	ole metalis
County and district	Mines p	Mines producing	Material sold or treated	Gold, lode	Silver, lode	Conner	Load	Zho	Total walna
	Lode	Placer	(short tons)	(fine ounces)	(fine ounces)	(spunod)	(spunod)	(spunod)	The state of the s
Ada County: Boise Benewah County: 8t. Joe	1	1	45	30	**				\$1,072
Blaine County: Little Wood River Mineral Hill and Camas	17.		1, 161	45	42 8, 184	1,400	140,300	128,000	142 46, 153
Boise County: Boise Basin Grimae Passin	<b>⊣</b> ಣ-	600	77, 406	100	426, 733 810	52, 600	4, 775, 000	3, 666, 000	1, 576, 768
South Fork of Payette River Burnnit Flat Remner County	7   7	8	10	5°8	128				676 213 927
Clark Fork.  Clark Fork and Pend d'Orellie !  Bonneylle County: Monnt Piscah	64 69		842 10, 666	203	8, 839 66, 190	2,000	175,000	3,700	34, 530 81, 584
	8-1	•	1, 279	D-1	177	70,000	2,000		315 1,985 26,320
Alfa Bayhorse Yankee Fork	H104		35 37, 340 2, 349	53 302	76 142, 057 5, 381	20,400	2, 734, 000	3,900 1,580,700	2, 338 739, 676 15, 562
Black Warrior and Middle Boise 1.  Snake River.  Gem County: West View.	4		4, 311	1,303	9,510				54, 212 385
Idaho County: Dixto. Dixto. Elle City.		(5)	36 20	3, 461	18				35 191 121, 745
Varen Jerome County: Bnake River Letah County: Hoodoo.		3 G		108 4 106					36 987 140 3, 682
Bine Wing Eureka Glibbossville Mobisoss			(8) 975 5	8 8	122, 971 126 8	180,300 63,300 300	280, 000		218, 092 23, 725 189
Rattleanake Creek Yellow Jacket. Nez Perce County: Salmon River.	13	(3)	200 31	30	-282-	300	1,800		246 425 197 106

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1955, by counties and districts, in terms of recoverable metals—Continued

County and district	Mines p	Mines producing	Material sold or treated	Gold, lode and placer	Silver, lode	Copper	Lead	Zine	Total value
	Lode	Placer	(short tons)	(fine ounces)	and placer (fine ounces)	(spunod)	(spunod)	(spunod)	
Owyhee County:				\$					<b>6</b> 3 193
Carson or French South Mountain	1	7	4, 552	88	29, 405	98,000	38,000	18,000	74, 403
Shoshone County:	4		17.396	23	21, 525			1, 698, 400	391,
Evolution	<b>1</b>		312, 254	318	7, 583, 233	2, 945, 000	966,	25 503 700	
Lalanda	4 10		74.871	54	134, 954			8,	686,
Placer Center	40		111,833	272	1, 776, 378	1, 497, 700	4, 386, 200	1, 643, 300	3, 031, 544
Summit Yreka	15		838, 097	889	2, 622, 960	508,000		55, 547, 400	21, 662, 509
Twin Falls County: Snake River	-	-	7	4	1.560				1,412
Valley County: Onorganized (Nation)	19	9	182, 360	2,618	23, 768	5, 467, 100	472, 200	159, 400	2, 242, 333
Total	109	34	1, 960, 816	10, 572	13, 831, 458	11, 236, 000	128, 326, 000	106, 628, 000	49, 315, 034

<sup>1</sup> Combined to avoid disclosing individual company confidential data.

<sup>2</sup> From property not classed as a mine.

<sup>8</sup> Tungsten over yielding copper-lead concentrate.

<sup>8</sup> Tungsten over yielding copper-lead concentrate.

<sup>8</sup> Tunds and quantities which cannot be shown separately for Highland district, Ada County; Seven Devils district, Adams County; Port Hill district,

Boundary County; Beaver Creek and Little Smokey and Carrietown districts, Camas County; Clearwater River and Moses and Independence Creek districts, Clearwater County; Alder Creek and Boulder districts, Custer County; Orogrande and Ten Mile districts, Idaho County; Biackbird, Eldorado, McDevitt, Mineral Hill, Nicholia, and Texas districts, Lemhi County.

Manganese.—The J. R. Simplot Vanza mine, Bannock County, and the Fred Foss Magnida mine, Butte County, shipped small quantities of manganiferous ore to the Govenment low-grade stockpile at Butte, Mont. This ore is not included in State mineral production until it is removed and beneficiated for commercial use.

Mercury.—Mercury output in the State totaled 1,107 flasks, valued at \$321,417. The average monthly price per flask in 1955 varied from a high of \$322 in January to a low of \$254 in August. Prices at the

close of the year were stable at about \$280.

Two major developments occurred during the year. After successful preliminary drilling, Rare Metals Corporation of America began constructing a 175-ton-per-day plant containing an oil-fired, 5½- by 90-foot Gould rotary furnace at the Idaho-Almaden mine in Washington County near Weiser. Stripping of overburden from the deposits to be open-pit mined and construction of the plant were completed and the first mercury produced late in September. Dedication ceremonies for the new facility were held September 30. Production from the Idaho-Almaden property was last reported in 1942. Operations of the Rare Metals firm were described in an article.<sup>4</sup>

At the second development, United Mercury Mines Co. sold the Hermes mine in Valley County near Stibnite to Holly Minerals Corp. for \$1,350,000 after mining through July. The new owner began producing on August 1. In possession of United Mercury Mines Co. since 1949, this mine was the State's only producer during the periods 1945–48 and 1951–54. No mercury was produced in Idaho in 1949 and 1950. Average annual production from the mine during the active

years from 1945 exceeded 700 flasks.

Nickel.—The value of nickel contained in cobalt concentrate produced at Calera Mining Co. Blackbird mine, Lemhi County, was

credited to State mineral production.

Rare-Earth Metals.—Output of monazite concentrate from the Baumhoff-Marshall sand-separation plant in Boise, which processed material produced by Baumhoff-Marshall, Inc., and Idaho-Canadian Dredging Co. dredges near Cascade, Valley County, was halted during the summer owing to lack of a market. Monazite, a rare-earth phosphate containing thorium, had been produced by the company since 1951.

In Bear Valley, Valley County, Porter Bros. Corp. began dredging under a contract with the Government to produce columbium-

tantalum concentrate.

A small quantity of columbium-tantalum concentrate, containing 50-percent combined pentoxides, was shipped to the General Services Administration (GSA) at Custer, S. Dak., by Kenneth Steck and John

Glass of Weiser early in 1955.

Silver.—Output declined 13 percent in Idaho, the leading silver-producing State in the Nation. The largest producers were, in order of output: Sunshine mine and adjacent areas, operated by Sunshine Mining Co.; Bunker Hill mine, Bunker Hill Co.; Galena property, operated by American Smelting & Refining Co.; and Silver Summit, Polaris Mining Co. Of these 4 mines, in the Coeur d'Alene mining

<sup>&</sup>lt;sup>4</sup> Argall, George O., Jr., Rare Metals Makes History with World's Largest Rotary Kiln Furnacing Mercury Ores: Min. World, vol. 17, No. 13, December 1955, pp. 56-60.

region of Shoshone County, Bunker Hill produced lead-zinc ore; the other 3 were mainly silver producers. Production from the Sunshine mine declined; output from the Silver Summit and Galena mines increased; and Bunker Hill output was about the same as in 1954. At the Galena mine, the advance in output was made even though the operation was closed nearly 5 months in the latter half of the year because of strikes. The property was shut down beginning August 5 after a labor dispute over a local issue and on August 23 the mine was involved in the strike which idled several mines in the Coeur d'Alene region. This new mine reached the production stage early in 1955. During several years of exploration and underground and surface development, sizable quantities of silver were recovered from development ore.

The Lucky Friday, Page, Star, Dayrock, and other base-metal mines in Shoshone County and the Triumph lead-zinc mine in Blaine County

added substantial quantities of silver to the Idaho total.

Titanium.—The Baumhoff-Marshall sand plant at Boise produced 9,440 tons of byproduct ilmenite concentrate; 1,330 tons was sold for nontitanium uses (roofing material). The sand separated at the Boise plant was mined by dredges in Valley County. As in previous years the material was stockpiled pending location of a market. The total quantity of material in the stockpile at the close of 1955 was estimated at nearly 77,000 tons. (See also Rare-Earth Metals.)

Tungsten.—Output of tungsten in 1955 was 642 short tons, 60-percent WO<sub>3</sub> basis, recoverable content of ore and concentrate. Output of Bradley Mining Co. high-grade huebnerite (manganese tungstate) at the Ima mine in Lemhi County continued to constitute a large part of annual production. Cordero Mining Co. was also an important contributor at the Wild Horse mine in Custer County.

Bradley Mining Co. recovered scheelite concentrate from the Springfield open-pit mine in Valley County and engaged in a substantial expansion program at the Ima mine, which included remodeling company buildings, constructing a new tramway to the mine entrance,

and installing a new secondary crusher in the mill.

Uranium.—Uranium prospecting and development were conducted in various localities in the State. A small quantity of ore for testing purposes was shipped from the Lucky Win property in Idaho County to Salt Lake City. G & G Mining Co. also shipped from the Donna Lou property in Lemhi County to Vitro Chemical Co. in Salt Lake City. Other activity was reported in these counties, as well as in Benewah,

Blaine, Bonner, Boundary, Owyhee, and Shoshone Counties.

Zinc.—Production of zinc dropped 8,214 tons (13 percent) to the lowest point since 1939 owing to the strike which closed several lead-zinc mines in Shoshone County from August 23 through the rest of the year. The Star mine continued to be the leading zinc producer in the State, followed by Bunker Hill; both of these mines produced throughout the year without interruption by work stoppages. Output from the Star mine decreased; Bunker Hill production was greater than in the previous year. Other large zinc producers included Page, Frisco, Morning, Sidney, and Triumph. Zinc recovered from old slag at the Bunker Hill smelter was credited to Idaho mine-production total. Shoshone County output comprised 95 percent of the State production.

Late in 1955 plans were announced to enlarge the monthly capacity of the Sullivan electrolytic zinc plant at Kellogg to 7,200 tons of special high-grade zinc. Full control of the plant was acquired by Bunker Hill Co. in 1955 in an exchange of stock with Hecla Mining Co.

#### NONMETALS 5

Barite.—J. R. Simplot Co. carried out diamond drilling at its Sun Valley barite mine near Hailey, Blaine County. A small tonnage of ore was mined and shipped to the grinding plant at Pocatello, Bannock County. Ground barite for well drilling was shipped to Montana, Oklahoma, and Texas.

Cement.—Production by Idaho Portland Cement Co. at its Inkom plant, Bannock County, declined slightly compared with 1954, but shipments were greater than in the previous year. Most of the output was used in Idaho; shipments also were made to several Western States.

Clays.—Troy Firebrick Co. mined fire clay and manufactured firebrick at its plant in Latah County. Output of fire clay was increased over the 1954 total. Miscellaneous clay used in manufacturing heavy clay products was mined by Idaho Falls Brick & Tile Co., Inc., Bonneville County; Pullman Brick Co., Ada County; Burley Brick & Sand Co., Inc., Cassia County; and Jensen Brick Co., Payette County.

Garnet.—Idaho Garnet Abrasive Co. at the Emerald Creek placer near Fernwood, Benewah County, produced abrasive garnet at a

reduced rate compared with 1954.

Gem Stones.—Idaho continued to be a source of gem-stone materials that were suitable for cutting and polishing. No mining as such was done during 1955; the gem material was collected mostly by week-end excursionists and vacationers, using handtools for digging. Gem materials most frequently found by collectors were topaz, opal, garnet, sapphire, and zircon.

Gypsum.—A small tonnage of gypsum for agricultural purposes was mined at the Northwest Gypsum Co. property on the Snake River,

20 miles northwest of Weiser, Washington County.

Mica.—The remaining mica mine in the State closed during the year. The Muscovite mine of Idaho Beryllium & Mica Corp. was closed in midyear, and final shipment to GSA at Custer, S. Dak., was made in July. This mine, operated since 1952 by the corporation, shipped mica and beryl concentrate to the GSA for stockpiling.

Phosphate Rock.—Production was increased at most established operations, and two new phosphate mines began producing. Marketable production (rock used directly plus beneficiated and dried material) totaled 1.3 million tons compared with 1.1 million tons in 1954, and phosphate rock sold or used (excludes stocks) equaled 1.1 million tons as compared with 0.8 million tons in the previous year. Approximately 80 percent was used in manufacturing elemental phosphorus and phosphoric acid; 20 percent was used at fertilizer plants.

Bingham County continued as the principal county in mine output, owing largely to the production from the Gay open pit by J. R. Simplot Co., Fertilizer Division. Phosphatic shale was shipped to

<sup>&</sup>lt;sup>5</sup> Norman S. Petersen, Commodity-industry analyst, Region I, assisted in the preparation of this section.

the Westvaco Chemical Division of Food Machinery & Chemical Corp. elemental-phosphorus plant at Pocatello; high-grade rock was used in manufacturing fertilizers at the J. R. Simplot Co. plant, also at Pocatello. During the latter half of 1955, Westvaco Division began producing from its Fort Hall pit in the same area as the Simplot Gay mine. In Caribou County The Anaconda Co. increased output from the No. 3 underground mine and the strip pit at Conda. Although active only in the last 6 months of the year, the stripping operation supplied larger production than the underground mine. Monsanto Chemical Co. produced at a high rate from the Ballard pit, Caribou County, to supply its elemental-phosphorus facility at Soda Springs. Mining was done under contract by Morrison-Knudsen Co., Inc. Production in Caribou County also was recorded by J. A. Terteling & Sons at a new surface mine near Soda Springs. Sales of crude phosphate rock were made to other mining companies, and a large tonnage was stockpiled at the mine. San Francisco Chemical Co. sold the output from its Waterloo open pit in Bear Lake County for use at elemental-phosphorus and chemical-fertilizer plants.

J. R. Simplot Co. planned extensive mining on 3,600 acres of land leased from the Government in the Centennial Mountains in Clark County, Idaho, and Beaverhead County, Mont. Initial production scheduled for the summer of 1956 was to be by open-pit methods, and later an underground mine was to be developed. Further expansion in the industry was indicated by reports that Western Fertilizer Association and Central Farmers Fertilizer Co. planned operations in the State. In 1955 the former organization carried out exploration and development at its Dry Ridge property in Caribou County. Central Farmers Fertilizer Co. completed preparations for mining and constructing an electric-furnace plant in the Georgetown

Canyon area near Montpelier, Bear Lake County.

Pumice.—Production of pumice advanced slightly, although only 2 producers were active, compared with 4 in the previous year. Increased demand for lightweight concrete aggregate in the building industry led to the gain in mine output. A small tonnage of pumice was sold for use in making acoustical plaster. Pumice, Inc., shipped both crude and prepared pumice to building-block manufacturers from its open pit and screening plant in Bonneville County near Idaho Falls. Additional screening equipment of a more efficient type was added to satisfy users requiring more gradations. Gemstone Insulation Products Co. manufactured pumice blocks at Idaho Falls, obtaining pumice from its Albino open pit, 8 miles east of the city. Pumice quarries of Idaho Falls Brick & Tile Co., Bonneville County, and Sun-ite Corp., Blaine County, were idle.

Sand and Gravel.—Production of 8.6 million tons of sand and gravel valued at \$3.9 million represented an increase of 28 percent in quantity and a decrease of 14 percent in value compared with 1954. Output in 1955 was distributed between commercial, 1.7 million tons (\$1.5 million), and Government-and-contractor, 6.9 million tons (\$2.4 million). Comparable figures for 1954 were commercial, 2.7 million tons (\$2.4 million), and Government-and-contractor, 4.0 million tons

(\$2.2 million).

Government-and-contractor production advanced mainly because of increased use of sand and gravel by the Idaho Department of Highways for road building and maintenance, and the large quantities used by the Bureau of Reclamation at the Palisades project in Bonneville County and by the United States Army Corps of Engineers at the Albeni Falls project in Bonner County. The drop in overall value of sand and gravel in spite of large tonnage advance was caused primarily by increased use of lower grade pit-run material for road building by the highway department and by the Bureau of Reclamation at the Palisades project.

About 43 percent of the 1955 tonnage was used for building and construction, excluding roads; 54 percent was used for roads; and the remaining 3 percent was used for railroad ballast and other miscellaneous purposes. Production was reported from 33 of the

State's 44 counties.

TABLE 12.—Sand and gravel sold or used by producers, 1954-55, by classes of operation and uses

		1954			1955		Perce chang	
		Valu	e		Value	3		
	Short tons	Total value	Average per ton	Short tons	Total value	Aver- age per ton	Ton- nage	Aver-7 age value
COMMERCIAL OPERA-								
Sand and gravel: Building Road material Railroad ballast.	551, 695 1, 915, 007	\$686, 748 1, 544, 098	\$1. 24 . 81	759, 977 744, 018	\$905, 408 547, 132	\$1. 19 . 74	+38 -61	-4 -9
Other 2	257, 571	153, 115	. 59	244, 900	53, 787	. 22	-5	63
Total com- mercial sand and gravel	2, 724, 273	2, 383, 961	. 88	1, 748, 895	1, 506, 327	. 86	-36	
GOVERNMENT-AND- CONTRACTOR OPER- ATIONS								*
Sand and gravel: Building Road material	24, 581 3, 968, 846	28, 307 2, 156, 651	1.15 .54	3, 015, 026 3, 888, 217	962, 121 1, 465, 428	.32	+12,166 -2	-72 -30
Total Govern- ment-and- contractor sand and gravel	3, 993, 427	2, 184, 958	. 55	6, 903, 243	2, 427, 549	. 35	<b>+73</b>	-36
ALL OPERATIONS								
Sand and gravel: Building Road material Railroad ballast_	576, 276 5, 883, 853	715, 055 3, 700, 749	1. 24 . 63	3, 775, 003 4, 632, 235 (1)	1, 867, 529 2, 012, 560	. 49 . 43	+555 -21	60 32
Other 2	257, 571	153, 115	. 59	244, 900	53, 787	.22	-5	-63
Grand total	6, 717, 700	4, 568, 919	. 68	8, 652, 138	3, 933, 876	.45	+29	-34

Included with "Other" to avoid disclosure of individual company confidential data.
 Includes blast and engine sands and sand and gravel used for miscellaneous unspecified purposes.

Gem Silica Co., Emmett, Gem County, sold about half its output of washed and ground silica sand for use as blast sand; the remainder

was used as building sand.

Stone.—Production of 1.5 million tons of stone was valued at \$1.9 million, a decrease of about 32 percent in quantity and value compared The 1955 output was distributed between commercial, with 1954. 770,000 tons (\$1,178,000), and Government-and-contractor, 754,000 tons (\$688,000). Output came from 21 of the State's 44 counties.

Production of limestone for industrial uses continued at about the same rate as in 1954. Lewiston Lime Co., Lewis County, and Idaho Portland Cement Co., Bannock County, quarried and crushed limestone for use principally in manufacturing cement and at smelters, sugar refineries, and paper mills. A small tonnage of agricultural limestone also was produced.

Quartzite for furnace flux at phosphate-rock processing plants was mined and crushed by Wells Cargo, Inc., Bannock County, and

Monsanto Chemical Co., Caribou County.

# REVIEW BY COUNTIES AND DISTRICTS®

Ada.—Producing sand and gravel valued at \$316,000 compared with \$397,000 in 1954, Ada County dropped from first to third place in value of output for these commodities. Paving gravel was prepared by Morrison-Knudsen Co., Inc., at Boise and by county highway crews. Structural sand and gravel was marketed by Chaussee Swan Gravel Co. and Quinn-Robbins Co., Inc., also of Boise. same city, building brick and tile were fabricated by Pullman Brick Co., Inc.

Boise District.—Joseph F. Kallas, Sr., treated old tailing by amal-

gamation and recovered gold and silver.

Highland District.—Harry A. Schultz discontinued operating the Rainbow placer mine on the Boise River, October 15, 1954; some gold concentrate was removed in 1955 before the mine was inundated by the backwaters of Lucky Peak Dam.

Adams.—The only reported nonmetal production in Adams County was traprock for concrete and roadstone quarried by Richard Beshey

at Parma.

Seven Devils District.—A small shipment of crude ore was made

from the River Queen copper mine.

Bannock.—J. R. Simplot Co. terminated its work at the Vanza manganese mine above Lava Hot Springs in February. Shipments had been made in 1954 and early in 1955 to the Butte, Mont., Govern-

ment Purchase Depot.

The county ranked second in the State for total output value of all nonmetals, and first for stone (\$564,000). From purchased materials and limestone quarried at its plant near Inkom, Idaho Portland Cement Co., processed cement and continued to be the only producer in the State. Wells Cargo, Inc., crushed quartzite for fluxing purposes. Railroad ballast was prepared from sandstone by Morrison-Knudsen

<sup>&</sup>lt;sup>6</sup> John L. Beh, Commodity-industry analyst, Region I, assisted in the preparation of this section.

Co., Inc., and from basalt by the Union Pacific Railroad Co. Small quantities of road metal were obtained from local shale by county road crews. Gravel was utilized by Mountain States Construction, Inc., Pocatello, and by the Union Pacific Railroad Co. for paving and railroad ballast, respectively. Structural sand and gravel was marketed by Patton & Linton, Inc., Pocatello. Contractors for the Idaho Department of Highways, contractors and municipal crews for the City of Pocatello, and Bannock County highway crews prepared sand and gravel for paving purposes. Near Pocatello, the Westvaco Chemical Division, Food Machinery & Chemical Corp. plant continued to produce elemental phosphorus; J. R. Simplot Co. manufactured phosphate fertilizers from phosphate rock obtained from its operation in Bingham County.

TABLE 13.—Value of mineral production in Idaho, 1954-55, by counties

County	1954	1955	Minerals produced in 1955 in order of value
Ada	- \$421, 088	\$321,049	
Adams		4021, 049	
Bannock	(1)	(1)	Stone, copper, silver.
Bear Lake	_] (1)	1 8	Cement, stone, sand and gravel. Phosphate rock, sand and gravel.
Benewah	(1)	(1)	Garnet, stone, gold.
Bingham	_ (i) ·	l à	Phosphate rock, sand and gravel,
Blaine	1 2 000 402	' \ (i)	Lead, zinc, silver, barite, copper, gold.
Boise	20 201	6, 364	Gold, silver.
Bonner	1 400 227	938, 779	Sand and gravel, silver, lead, gold, zinc, copper.
Bonneville	488, 843	673, 178	Sand and gravel, pumice, stone, clays, gold.
Boundary		73, 064	Stone, sand and gravel, lead, silver, copper, zinc.
Butte	2, 963	13, 689	Stone, copper, lead, silver, gold.
Camas	(1)	58, 348	I DIOLE, gold, lead, silver, conner
Canyon	251, 061	202, 991	Sand and gravel
Caribou	(1)	(1)	Phosphate rock, stone, sand and gravel
Cassia			Sand and gravel, stone, clavs.
Clark	(1)	(1)	U0DDer, sand and gravel cilyer
Clearwater	(1)	(1)	Sand and gravel stone gold silver
Custer Elmore	714, 098		Lead, tungsten, zinc. silver, conner gold
Franklin	128, 138	213. 280	i Saud and gravel, gold, silver
Fremont	26, 046	34, 940	Sand and gravel.
Gem	48, 851	47, 190	Do.
Gooding	166, 968	73, 374	Stone, sand and gravel, gold, silver.
Idaho	69, 833	78, 803	Sand and gravel, stone
Jefferson	960, 698	337, 439	Sand and gravel, gold, stone, silver.
lerome	l òó ree	73, 773	sand and gravel.
Kootenai	63, 317	75, 235	Stone, sand and gravel, gold.
Laran	579 A44	104, 037	Sand and gravel, stone.
Lemhi	4, 931, 452	218, 389 6, 343, 967	Stone, mica, sand and gravel, clays, gold, silver.
	1, 001, 102	0, 040, 907	Copper, tungsten, cobalt, sand and gravel, silver, gold, lead,
Lewis	(1)	m	nickel, zinc. Stone.
_incoln	121, 268	(1)	
Madison	(1)	72,000	Sand and gravel. Sand and gravel, stone.
Minidoka	(1)	34, 610	Do.
Minidoka Vez Perce	137 436	(1) (10	Sand and gravel, gold.
neida	(1)	85, 778	Sand and gravel.
)wybeei	155 075	104, 118	Copper, sand and gravel, silver, lead, gold, zinc.
'avette i	(1)	(1)	Sand and gravel, clays.
ower	181, 475	26, 448	Sand and gravel.
ower hoshone	45, 948, 388	44, 319, 737	Lead, zinc, silver, copper, antimony, stone, gold.
			,, copper, antimony, stone, gold.
win Falls	400, 069	249, 973	Sand and gravel.
alley	395, 291	711, 288	Mercury, tungsten, stone, monazite, ilmenite (titanium
		· 1	
Vashington Indistributed 3		145, 769	Mercury, sand and gravel, gypsum.
maistributed 3	10, 488, 977	12, 841, 238	, , 9. pount.
Total		68, 513, 000	

¹ Included with "Undistributed" to avoid disclosing individual company confidential data.
² Includes the value of sand and gravel, stone, tungsten, and gem-stone production that cannot be assigned to specific counties and value of minerals for counties indicated by footnote 1. (Adjusted to eliminate duplication in the value of stone).

Bear Lake.—Phosphate rock continued to be the dominant mineral commodity. Near Montpelier, San Francisco Chemical Co. obtained phosphate at its Waterloo pit and shipped raw materials to various processors for manufacturing superphosphates and elemental phos-Central Farmers Fertilizer Co. began design work for a 35,000-kw. electric furnace at Georgetown Canyon near Montpelier for processing phosphate rock. Aslett Construction Co. provided the Idaho Department of Highways with paving gravel.

Benewah.—Near Fernwood abrasive-garnet concentrate was recovered by Idaho Garnet Abrasive Co. of Spokane, Wash. Grant Construction Co. prepared a supply of road-building material from

traprock for the State highway department.

Bingham.—The combined yield of phosphate rock and sand and gravel was the principal reason for Bingham County ranking third in output value of nonmetals. J. R. Simplot Co., leading producer of phosphate rock in the State, quarried high-quality rock at its Gay mine near Fort Hall for production of superphosphate and triple superphosphate; phosphatic shale was mined for use in manufacturing elemental phosphorus. Road gravel was processed by county road crews and by two contractors for the State highway department.

Blaine. J. R. Simplot Co. obtained barite from its Sun Valley mine near Hailey and ground the raw materials at its Pocatello plant for use in drilling mud by Oklahoma, Texas, and Montana firms. Manufacturing lightweight aggregate from pumice was temporarily curtailed by Sun-ite Corp.; this plant was expected to resume pro-

duction as demand increased.

Little Wood River District.—Assessment work by Eugene Glahn

resulted in shipment of 1 ton of lead ore from the Scorpion mine. Mineral Hill and Camas District.—The Queen of the Hills lead-zinc

mine was active. George Castle worked the Edres mine for 4 months and shipped lead-zinc ore. Lead was mined at the Star Mountain mine, owned by the Rowley Estate, for a short period. Shepherd & Son of Hailey developed the McCoy mine from May 1 to September 30 and recovered 16 tons of ore containing 37 ounces of gold and 60 ounces The Red Leaf mine was developed intermittently in 1955 by E. H. Sowers and S. G. Johnson; work with a bulldozer and power shovel at a new open pit resulted in shipment of 4 tons of lead ore. shipment of lead ore from the Hailey Trust group was reported.

Warm Springs District.—The Triumph lead-zinc mine, one of the largest metal producers in the State, was operated throughout 1955 by Triumph Mining Co. A gross metal content of 3,520 ounces of gold, 456,000 ounces of silver, 5,106,000 pounds of lead, and 4,827,000 pounds of zinc was recovered from 77,400 tons of ore. Lead output decreased slightly, and zinc production gained substantially compared Production of ore continued at about the same rate as in with 1954.

the previous year.

Boise.—Boise Basin District.—Grimes Creek Dredging Co. discontinued production at its small bucketline dredge on old tailing at the Dessie D. gold-monazite placer mine, February 5. E. D. Culver recovered gold and silver at the Culver No. 1 and No. 2 placer claims from April through June by hydraulicking, ground sluicing, and panning. Golden Age Mines, Inc., developed the Golden Age lead mine and made a test shipment of ore. The Hay Fork and Jackie gold mines were active for brief periods.

Grimes Pass District.—F. A. Johnson developed the Blue Ridge gold

mine for 120 days and shipped crude ore to a smelter.

South Fork of Payette River District.—A. W. Josué hydraulicked bench gravel at his Sunnyside placer claims and recovered 5 ounces of

gold and 2 ounces of silver.

Summit Flat District.—Frank Colson moved 400 cubic yards of stream gravel to a sluice box by ground sluicing and produced 4 ounces of gold and 9 ounces of silver at the Vacation No. 1 and No. 2 claims from July 1 to September 1. Sloper's mine was operated by L. M. Sloper from July 1 to October 20; gold ore was treated by amalgamation.

Bonner.—This county led in production value of sand and gravel. The combined output of these commodities also placed the county fourth in value of all nonmetals (\$823,000), utilized mostly for construction purposes at the Albeni Dam site by the United States Army Corps of Engineers. Paving gravel was prepared for the Idaho Department of Highways. Near Clagston, Spokane International Railroad Co. mined a small quantity of gravel for railroad ballast.

Clark Fork District.—Lead ore was shipped from the Lawrence mine by Don Haefner and Lawrence Consolidated Mines Co. The Whitedelf mine was operated by Whitedelf Mining & Development Co., Spokane, Wash., from January 1 to July 15 and from November 15 to December 31. Under a DMEA contract, exploration of the downward projections of the Thornton and South ore bodies was conducted by driving a drift 976 feet in length. Ore found in the drift was produced. Water in the crosscut made it necessary to in-

stall additional pumping facilities early in the year.

Lakeview District.—Conjecture Mines, Inc., successor by incorporation to the partnership of Funnell & Majer, continued development at the old Conjecture mine at the south end of Lake Pend Oreille. Plant additions included a Deister concentrating table, diesel tractor, pickup truck, drills and stopers, slusher, tugger, pumps, and ore car. About 100 feet of shaft work was done; drifting and raising totaled 650 and 300 feet, respectively. The mine was being developed by an incline shaft to a depth of 500 feet. Ore containing values in silver, as well as gold, copper, lead, and zinc, was processed in a 60-ton flotation mill. Development by New Rainbow Mining Co. at the Weber silver mine, 6 miles southeast of Lakeview, comprised drifting, 1,128 feet; diamond drilling, 292 feet; and raising, 140 feet. additions were trammer, rocker dumpcar, rock drill, 130 feet of snowshed, used 315-cubic-foot diesel-driven portable air compressor, used double-drum hoist with scraper bucket, 2 used stopers, and a changeroom for miners. Ore shipments were made to the Idaho Lakeview mill or direct to smelters, as the Weber mine was not equipped with a concentration plant. Austin-Meyer Corp. continued to produce from its surface operation at the Weber property and shipped ore to the Tacoma smelter, where a low-treatment charge was obtained owing to the high-silica content of the material, making it desirable for copper smelting.

Pend Oreille District.—Lead ore was shipped from the Auxer prop-

erty.

Bonneville.—Bonneville County, fifthin total output of nonmetals (\$673,000), ranked second in the State in value of sand and gravel production (about \$430,000). In addition, the entire yield of pumice for the State came from within the county. Three Idaho Falls operators produced structural sand and gravel for local markets. Contractors and road crews processed gravel to meet the requirements of the county highway department. The Bureau of Reclamation utilized sand and gravel, crushed limestone, and miscellaneous stone at its Palisades project. Pumice was produced by Gemstone Insulation Products Co. at its Albino pit (formerly reported by Clark Concrete Construction Corp., Idaho Falls) and Pumice, Inc., at its Katie Lee pit near Idaho Falls for use in lightweight-concrete aggregate; the latter company also marketed a small quantity of pumice for use in acoustical plaster. Idaho Falls Brick & Tile Co. pumice operation remained inactive throughout the year; however, the company was credited with an output of heavy clay products fabricated from locally mined clays.

Mount Pisgah District.—Wayne Dick, lessee, worked the Stapleman placer from June 1 to July 17 by hydraulicking and pro-

duced a few ounces of gold.

Boundary.—Great Northern Railway Co. produced gravel and crushed stone—the only nonmetallic mineral output in the county; these commodities were used for fill and rubble, respectively.

Port Hill District.—Flotation lead concentrate and crude ore shipped from the Idaho-Continental mine by Jireh Mining Co. and Patchen & Erickson comprised the metal production of the district and county.

Butte.—The Magnida manganese mine, which shipped ore to the Government low-grade manganese stockpile in 1954 and early in 1955, became exhausted and was abandoned.

Road material was processed from local granite for the Idaho

Department of Highways by Twin Falls Construction Co.

Dome District.—Shipments of silver ore, copper ore, and lead ore were made from three small mines.

Camas.—Gem Construction Co. crushed basalt for State Highway maintenance.

Beaver Creek District.—J. R. Davies & Son shipped lead ore from

the Princess Blue Ribbon mine.

Little Smokey and Carrietown District.—Golden Nugget Mines & Milling, Inc., a newly organized concern, did location work on several claims and constructed a new road in the vicinity of the Golden Nugget lead mine on the headwaters of Little Smokey Creek, 25 miles north of Fairfield.

Canyon.—Canyon County ranked fifth in sand and gravel production in the State; output was valued at about \$203,000. Seven producers prepared and marketed structural and paving sand and gravel. A. D. Stanley, Boise, under contract to the Canyon County Road and

Bridge Department, maintained a supply of paving gravel.

Caribou.—Caribou County led in value of stone and all nonmetals commodities and ranked second in value of phosphate rock. Production from the Ballard open pit of Monsanto Chemical Co. was about the same as in 1954. Raw materials were trucked to the elemental-phosphorus plant at Soda Springs. Locally mined silica was utilized

to adjust the slag basicity at the plant. Anaconda Co. increased production over the previous year. Phosphate rock was recovered both at the open pit and at the Conda No. 3 underground mine for use at the company fertilizer plant at Anaconda, Mont.; triple superphosphate and phosphoric acid were manufactured. J. A. Terteling & Sons began producing from open-pit workings near Soda Springs during the second half of 1955 and shipped much of the output to San Francisco Chemical Co.; the remainder was stockpiled. Patton & Linton, Inc., of Pocatello marketed structural sand and gravel, and contractors supplied the Idaho Department of Highways with paving gravel.

Cassia.—In addition to output by crews of the Burley highway district, sand and gravel for highway construction and maintenance was produced by Holmes Construction Co., Heyburn; Bishop Sand & Gravel Co., Rupert; and Long Sand & Gravel Co., Burley. The two last firms also produced structural sand and gravel. Granite and sandstone were prepared by contractors for the Idaho Department of Highways. Building brick and tile were manufactured from clay obtained at the Burley pit by Burley Brick & Sand Co., Inc.

Clark.—Production of paving gravel by road crews was reported

by Clark County.

Birch Creek District.—Don Louderbaugh and Darwin Simons of Ririe, Idaho, and Salt Lake City, Utah, respectively, acquired the Valley View mine under purchase agreement on October 25 from McCune & Worthing of Dubois. Various producers shipped a total of 1,279 tons of dump ore with content of 70,800 pounds of copper from the property in 1955.

Clearwater.—Paving gravel was prepared and marketed by Union Construction Co., a Montana firm. W. G. Cummings Co., Orofino,

crushed stone for use as paving and road material.

Clearwater River District.—Roy Tumelson, Lewiston, recovered a

few ounces of gold while prospecting.

Moose and Independence Creek District.—Stream gravel worked by small-scale hand methods at the Lily No. 1 and No. 2 placer claims by Henry Hellman yielded a small quantity of gold and silver.

Custer.—Cordero Mining Co. continued development and production at its Wild Horse tungsten property, discovered in 1954. Urite Mining Co., lessee, worked the White Elephant tungsten mine and

drove 60 feet of 5- by 7-foot crosscut and 19 feet of 50° raise.

Alder Creek District.—Block leasers worked Mackay Exploration Co. Empire copper mine and shipped crude ore to a smelter. Late in the year, Idaho Alta Metals Corp., a New York concern, became one of the few copper producers in the State at the Empire property, and began a development program with a view to expanding production from the old mine. A substantial tonnage of lead ore was produced from the Champion mine.

Alta District.—Lindburg & Uresti produced a small tonnage of copper-lead-zinc ore from the Custer Copper property from June 1 to

October 1.

Bayhorse District.—The Clayton mine and mill was the largest mineral producer in Custer County. Ore reserves at the close of 1955 were estimated by Clayton Silver Mines at 84,124 tons, an increase of 15,319 tons over reserves at the end of the previous year. The

company annual report also stated that mining and milling were at capacity throughout 1955 and that ore and metal production was slightly greater than in 1954. Ore processed totaled 35,740 tons. Nearly all of the production came from the 400 north stope. concentrate totaling 1,916 tons was produced and sold with content of 39 ounces of gold, 122,500 ounces of silver, 2,471,000 pounds of lead, 177,000 pounds of zinc, and 21,000 pounds of copper. Zinc concentrate sold from November 1 to December 31, after an advance in zinc prices, amounted to 380 tons, containing 467,000 pounds of zinc, as well as values in silver and lead. An additional 872 tons of zinc concentrate was stockpiled at the mill earlier in the year, pending an increase in metal prices. At the end of 1955 the zinc stockpile contained 2,263 tons of concentrate averaging 55 percent zinc. Mine development amounted to 1,229 feet of advance and 11,844 cubic feet of pump-station excavation. Work was concentrated on a new 550 The south end ore shoot was exposed to an additional length of 20 feet, a raise through it was completed from the 550 level to the 400 level, and preparations for stoping had been completed by December 31. About halfway between the shaft and the north ore shoot, a ventilation and escape raise was driven between the 550 and The main 550 north drift was extended to beneath the 400 ore, and at the end of 1955 a raise was in progress to the 400 level from near the face of 550.

Production from other lode mines consisted of small tonnages of lead ore from three mines. Bayhorse Mines, Inc., of Challis produced at the Pacific mine, 2 miles northwest of the old town of Bayhorse for 90 days (January, February, September) and treated the ore in a combination gravity and flotation mill, with capacity of 85 tons in 24 hours, at Bayhorse. Alvin Ellis, George Ellis, and George Wilcox developed the Sky Line mine, 2 miles southwest of Bayhorse, and shipped 5 tons of ore. Elroy Kimball produced at the Turtle mine. Thomas R. Marshall produced 4 ounces of gold and 1 ounce of silver by ground-sluicing 100 cubic yards of gravel at the Treon Creek group along the Salmon River at the mouth of Treon Creek.

Boulder District.—The Livingston lead-zinc mine was operated under

a block-leasing system begun by Idaho Custer Mines, Inc.

East Fork District.—Highland-Surprise Consolidated Mining Co. began an exploration project consisting of 1,200 feet of drifting and crosscutting and 2,100 feet of diamond drilling from the new drifts at its newly acquired Deer Trail property east of Stanley. Tunneling was begun in August. The project, based on promising lead-zincsilver surface indications as well as on encouraging results of diamond drilling in 1954, was approved by the DMEA. Costs were estimated

at \$59,570; the Government was to advance 50 percent.

Yankee Fork District.—D. E. Bell did development at the B & M mine, 45 miles from Sunbeam on Estes Mountain, for 2 months. About 250 feet of tunnel work was done, and 5 tons of gold-silver ore was shipped to a smelter. C. C. Pierce opened old workings at the Copper Lode property 11 miles from Sunbeam and drove a drift of 30 feet. A small tonnage of silver ore was produced. Lucky Custer Mining Corp. produced gold-silver ore from the General Custer-Lucky Boy property. Sluicing and panning by A. W. McGown at the Pocket placer produced 59 ounces of gold and about 40 ounces of silver; 400 cubic yards of stream gravel was handled from May 10

to September 15.

Elmore.—Wesley Shockley, an Oregon producer, prepared sands for use by Union Pacific Railroad Co. Structural and paving sand and gravel were marketed by Wilson & Dodge of Mountain Home. In addition to production by county road crews, contractors supplied the Idaho Department of Highways and the Mountain Home highway district with paving gravel.

Black Warrior District.—J. Q. Wakeman recovered some ore from the Boise River mine dump and produced gold and silver by amalga-

mation at a small mill set up at Atlanta.

Middle Boise District.—The Boise-Rochester operation of Talache Mines, Inc., a principal producer of gold in the State, was active the entire year and yielded 3,900 tons of gold ore. E. T. Seaton produced 50 tons of gold ore from the Golden Stringer property from January 1 to November 23. Little Queen Mines, Inc., mined the Little Queen gold-silver mine from January 1 to November 13.

Franklin.—Crews mined and prepared structural and road-building gravel, and small quantities of paving gravel were processed by a contractor for the State. Charles O. Ainscough & Sons of Preston

marketed a small tonnage of paving gravel.

Fremont.—State highway projects were supplied with paving gravel by Marian J. Hess and Duffy Reed, contractors. Small quantities of structural sand and gravel were processed by Herman

Wurst Transit Mix of St. Anthony.

Gem.—Gem Silica Co. extracted silica sand from its Emmett deposit. Raw material was prepared and marketed as blast and plaster sand. Structural sand and gravel was produced by City Transfer of Emmett, and paving gravel was provided by a contractor for utilization by State highway crews.

Gooding.—Building and highway construction sand and gravel were produced by Titus, Inc., of Jerome; paving materials were prepared by the Hagerman and Gooding highway districts. Under contract to the State, Tiny & Sons crushed basalt for road work.

Idaho.—Sand and gravel was marketed for paving and construction purposes by three producers. The Idaho Department of Highways

utilized gravel and crushed stone for highway maintenance.

Dixie District.—C. F. Shawley and V. E. Anderson opened old tunnels and shipped gold concentrate for a few days at the War

Eagle claims, 13 miles southwest of Dixie on Fitz Creek.

Elk City District.—Mill cleanings were shipped from the Blue Ribbon gold-lode mine. Seven gold-placer mines were active. The Crooked River mine of Clearwater Dredging Co. continued to be the largest producer of gold in the district and in the State. The company used a bucketline dredge from April 25 to December 24; 359,000 cubic yards of gold-bearing gravels was washed, yielding 3,075 ounces of gold and 614 ounces of silver. Behrens Bros. utilized a dragline excavator, bulldozer, and nonfloating washing plant at the Gold Point property on Red River. Wallace B. York operated a dragline excavator, nonfloating washing plant, and bulldozer on placer claims on Little Moose Creek and washed about 6,200 cubic yards of gravel. Other producing mines included Crooked River (Lester J. Strack) and Shuck's placer (J. J. Shuck).

Orogrande District.—The Hematite gold mine was active for part of 1955. Prospectors in the district produced a few ounces of gold from stream gravels.

Ten Mile District.—Dragline dredging by Clare Johnson furnished most of the metal-production value. The Bob gold mine was worked

by Rudolph and Hayes from August 1 to October 1.

Warren District.—Twin Rivers, Inc., worked gold-bearing gravel 14 days at the Golden Rule placer 36 miles east of McCall. About 12,000 cubic yards of bench gravel was moved by a 1½-yard dragline excavator to a Pitcher dry-land dredge with 10 jigs having a daily capacity of 2,000 yards.

Jefferson.—The only reported mineral production in Jefferson County was gravel. Two contractors for the State extracted a considerable tonnage for highway maintenance and construction.

Jerome.—Carl E. Nelson of Logan, Utah, provided crushed basalt locally for the State highway program. County road crews processed

a quantity of gravel for their own use.

Kootenai.—Three Coeur d'Alene firms were credited with output of sand and gravel. Holmen Sand & Gravel Sales Co. and Secaur Cement Products, Inc., prepared structural sand and gravel; Wallace Schmidt marketed paving gravel. County highway crews and the Idaho Department of Highways utilized sand and gravel for maintenance and construction; the latter agency also used crushed stone.

Latah.—The county ranked fourth in the State for value of stone output (\$143,780). J. F. Konen Construction Co. of Lewiston produced crushed basalt for roads and the Idaho Department of Highways prepared crushed granite for concrete and roadstone. Full-trimmed mica and hand-cobbed mica from the Muscovite mine, 35 miles north of Moscow, were shipped to GSA at Custer, S. Dak., by Idaho Beryllium & Mica Corp. Late in July the mine shut down for an indefinite period. Potlatch Forests, Inc., Potlatch, contracted for a supply of paving gravel for logging roads from Bob Haley, Moscow. A quantity of clay was extracted by Troy Firebrick Co. for manufacturing firebrick and fire-clay mortar.

Hoodoo District.—Three gold-placer mines were active for varying

periods in 1955.

Lemhi.—Idaho Department of Highways obtained a large supply of paving gravel from Fife Construction Co. Additional gravel was mined and processed by Voyd Dahle of Salmon for paving and

structural purposes.

Blackbird District.—The Blackbird mine, employing some 250 miners and mill workers, was the largest in the county, as well as the leading copper producer in Idaho and the Nation's principal cobalt mine. Plant expansion included recreation-hall extension, garage extension, additional concentrator capacity, ore-haulage equipment, and transportation equipment. Exploration and development totaled 167 feet of shaft work, 2,928 feet of drifting, and 6,806 feet of diamond drilling. The mine and 1,000-ton mill were shut down by a strike in late May and early June. Montana Coal & Iron Co. of Washoe, Mont., continued development under a DMEA amended contract at the Black Pine copper-cobalt mine, approximately 8 miles from Cobalt. A new bunkhouse and a new shop were erected, mill machinery was purchased, and construction of a 50-ton gravity concentrator was

begun. A test shipment of copper ore was made to a smelter. The cobalt ore in the mine is not associated with the main copper veins.

Blue Wing District.—Bradley Mining Co. produced 63,400 tons of tungsten ore, averaging 0.66 percent WO<sub>3</sub> and containing values in copper, lead, and silver from the Ima property, 1 mile east of Patterson and added facilities for treating old tailing to the 150-ton flotation-gravity concentrator. The ore yielded 30,578 units of WO<sub>3</sub> in hübnerite concentrate, 467 units in scheelite concentrate, and 2,210 tons of copper-lead concentrate. In addition, 387 units of WO<sub>3</sub> in hübnerite concentrate and 178 units in scheelite concentrate were produced from 11,662 tons of old tailing.

Eldorado District.—Copper ore was shipped from the Hungry Hill

mine.

Eureka District.—Lessees shipped old tailing to a smelter from the mill-tailing pond at the Pope-Shenon copper mine.

Gibbonsville District.—Production of copper ore was recorded from

the Garm-Lamoreaux mine.

Mackinaw District.—G. Elmo Shoup recovered gold from the Richardson placer during assessment work; prospecting in the district also produced gold in 1955.

McDevitt District.—Copper ore was mined by Rulon Young at the Grandview property, and the Copper Queen mine yielded gold ore in

1955.

Mineral Hill District.—Magnus Bevin produced gold ore from the Twilite property; H. L. Harolson discontinued the operation of the Golden Eagle placer mine, which had yielded a few ounces of gold.

Nicholia District.—A small tonnage of lead ore was shipped from

the Nicholia mine by Joe E. Zook of Leadore.

Rattlesnake Creek District.—Idaho Consolidated Mines, Inc., of Salmon worked the Twin Peaks group, 18 miles south of Salmon, throughout 1955, and began an exploration project under the DMEA program. About 200 tons of lead ore was processed in the company flotation mill during test runs of the mill machinery, and 2½ dry tons of lead-copper concentrate was shipped in January. No other concentrate shipments were made in the year; however, about 7 tons of concentrate was on hand for shipment after a full load was gained.

Texas District.—United Idaho Mining Co. operated its United Idaho lead mine for only a limited period and shipped 80 tons of ore containing 5 ounces of gold, 1,100 ounces of silver, and 48,000 pounds of lead to a smelter. Approximately 750 feet of shaft work was done in 1955. Shipments of lead ore were made from the Hill Top mine

by Rosebud Mines, Inc.

Yellow Jacket District.—The Comeback mine yielded some silver ore. Hugo A. Simi installed a 10-ton daily capacity mill at the

Tincup mine and processed 30 tons of gold ore.

Lewis.—The only mineral commodity mined within the county was limestone, which Lewiston Lime Co. marketed for utilization by the paper, sugar, agricultural, and metallurgical industries.

Lincoln.—At Shoshone, C. D. Low Sand & Gravel produced pit-run

and prepared gravel.

Madison.—Structural and paving sand and gravel were processed by George Garner & Sons of Rexburg. County highway crews utilized gravel and crushed granite for road-building and road-maintenance work.

Minidoka.—Building sand and gravel was prepared by the McGill Sand & Gravel Co. of Rupert. A quantity of pit-run gravel was mined by the Bureau of Reclamation at the Minidoka project. Several contractors provided a supply of crushed granite to the Idaho

Department of Highways.

Nez Perce.—From its pit near Lewiston, Dunclick, Inc., produced sand and gravel for construction and road building. Asphalt & Paving Co. of Lewiston also produced road gravel. Specializing in structural and blast sands, Hugh P. Terteling plant near Spaulding began production on an experimental basis.

Oneida.—Marion J. Hess Co. processed both prepared and pit-run

gravel for the Idaho Department of Highways.

Owyhee. MacGregor-Triangle Co. furnished gravel under contract

for maintaining the State highway system.

Carson or French District.—Florida Mountain Joint Venture worked the Ontario gold placers from July to October, employing a power shovel to load trucks, a bulldozer for moving overburden, and a 48-inch trommel-screen, gasoline-powered washing plant. Robert H. Lawrence recovered some gold and silver at the Blue Gravel group.

South Mountain District.—South Mountain Mining & Concentrating Co. produced about 4,550 tons of ore containing values in copper, lead, and silver and completed construction of a 125-ton

flotation mill.

Payette.—At its fixed plant near Payette, Logsdon Sand & Gravel Co. produced structural sand and gravel and fill material. Jensen Brick Co. of Payette fabricated heavy clay products from locally mined clay.

Power.—Building sand and gravel was prepared by Patton & Linton, Inc., of Pocatello. Wangsgaard Construction Co. contracted to supply road gravel to the State for highway work. County needs

were provided by county road crews.

Shoshone.—Important deep-level exploration projects were in progress under the DMEA program in the Coeur d'Alene mining region of Shoshone County. Eight projects costing \$4.1 million were active at an equal number of mines. Nearly 50 percent of the value of active DMEA contracts in the 4 Pacific Northwest States and 60 percent of the value of the Idaho contracts were represented by the 8 projects in the Coeur d'Alene region. The exploration programs at the Crescent and Silver Mountain properties were to cost nearly \$1.1 million each to complete and were the 2 largest contracts ever approved by the DMEA at Pacific Northwest mining operations. In contrast to increased exploration was the continued decline in metal production in the county. Production of all three principal metals—lead, zinc, and silver—decreased sharply. Value of output, declining for the fourth consecutive year, dropped to the lowest amount since 1946, despite some gains during 1955 in the price of lead and zinc. Paradoxically the tonnage of ore and other material sold or treated gained slightly, owing to the much larger tonnage of ore at the Bunker Hill mine, although the grade was lower than in previous years. The principal reason for lowered output at

the Coeur d'Alene mines was the strike at several properties from August 24 to December 31. Work stoppages earlier in the year closed the Page and Galena operations.

TABLE 14.—Mine production of gold, silver, copper, lead, and zinc in the Coeur d'Alene region, Shoshone County, 1946-50 (average), 1951-55, and total 1884-1955, in terms of recoverable metals

	Mines p	roducing	Material sold or	Gold lode and placer	Silver, lode and placer	
	Lode	Placer	treated (short tons)	(fine ounces)	(fine ounces)	
1946–50 (average)	67 58 43	3 2	2, 701, 468 2, 393, 939 2, 327, 536 1, 788, 426 1, 630, 250 1, 637, 121	2, 756 2, 684 2, 476 2, 376 2, 047 1, 777	9, 938, 239 13, 639, 808 13, 752, 081 13, 636, 680 14, 898, 699 12, 984, 323	
1884-1955			(1)	416, 450	545, 234, 536	
Year	Copper (s	hort tons)	Lead (short tons)	Zinc (short tons)	Total Value	
1946-50 (average)	1, 8 1, 8 2, 1 2, 8	315 374 362 100 56/5 3/7	76, 209 70, 570 67, 330 69, 885 64, 812 59, 820	78, 191 74, 989 70, 316 68, 650 58, 736 50, 527	\$52, 065, 098 65, 058, 887 58, 459, 368 47, 729, 814 45, 515, 124 44, 036, 867	
1884–1955	82/1	170	6, 188, 980	1, 843, 609	1, 610, 377, 200	

<sup>1</sup> Complete data not available; 1904-1955, 97,9/6,121 short tons.

Depletion of ore reserves at the smaller mines under the prevailing price-cost ratio and the shorter work week adopted at most of the chief mines in the area in 1954 also were factors in lowering production. Several mines were worked on a reduced scale under block-leasing systems adopted in 1953 and 1954 after a decline in lead and zinc

prices.

The contract of Sunshine Mining Co. with United Steelworkers of America, C. I. O., expired September 30 and was replaced with a new contract, which included provision for a 10-cent-per-hour general wage increase plus an increase of 10 cents per shift in the differential between classifications. At mines of Bunker Hill Co., renewal of collective-bargaining agreements with unions also was accomplished without interruption to mining, milling, or smelting. The new contracts provided for an increase of 15 cents an hour, partly through an advance in wage rate and partly through added benefits in provisions relating to holidays, vacations, and the health and welfare program for employees and their dependents.

Bunker Hill Co. undertook studies and completed plans for community development at Kellogg, which involved housing, city planning, new public hospital, and recreational facilities, all directed toward making the community a more attractive place for employees

to live and work.

The lead smelter and zinc plant at Kellogg processed concentrate from domestic mines and from Australia, Canada, and South America. At the lead smelter, production of lead and also zinc-fume output exceeded the alltime records of 1954 because of new charge-preparation facilities and development of electric smelting for producing hard lead from antimonial-arsenical byproducts. Previously these materials had been stored for periodic blast-furnace campaigns during which soft-lead production necessarily was suspended. Production of lead totaled 90,900 tons, and sales comprised 96,000 tons of lead, 18,000 tons of zinc in fume, 154,000 pounds of cadmium, 5,156,900 ounces of silver, 620 tons of copper, and 5,320 ounces of gold. In contrast to past years at the electrolytic-zinc plant, there were no power, labor, or concentrate shortages; all four electrolytic cell units ran throughout 1955 without serious interruption. Production for this record year totaled 56,600 tons of high-grade zinc and 463,400 pounds of byproduct electrolytic cadmium. Sales were 59,300 tons of zinc and 628,700 pounds of cadmium. The sulfuric acid plant, which was shut down in 1954 owing to a lack of a market, was placed in operation in February on a partial basis, and sulfuric acid totaling 48,400 tons was produced.

Production of stone for the Idaho Department of Highways earned Shoshone County fifth place in the State for output value of this commodity (\$92,970). Both sandstone and basalt were crushed for

utilization in road building and maintenance.

Beaver District.—Four properties were operated intermittently by lessees and provided all the production of Beaver district. The Sunset Lease, owned by The Anaconda Co. and leased by Day Mines, Inc., was worked under sublease by Korsage & Smith and Zanetti Bros. Ore mined by the first-named lessees was milled by Golconda Lead Mines; Zanetti Bros. ore was processed at the Rex Mill. Roy Smith worked the Blue Grouse property, W. C. Kennedy and Herb Zanetti operated the Mountain Goat mine, and a small tonnage of lead ore was taken from the Sitting Bull mine by Wallie Norman and L. F. Hull.

Evolution District.—Production and ore reserves at the Sunshine mine declined in 1955. About 225,880 tons of ore was produced, averaging 28.19 ounces of silver to the ton and 0.92 percent lead. Of the total, the Omega area supplied 87,310 tons; the Rotbart area produced 63,370 tons; the Sunshine, Suncon, and Rambo areas yielded 34,430, 25,460, and 15,310 tons, respectively. According to Sunshine Mining Co.'s annual report, ore reserves were estimated at 559,000 tons, a decrease of 119,000 tons from the 1954 estimate. New ore developed was 107,000 tons as compared with 226,000 tons mined. Development work totaled 6,743 feet of drifting, 3,800 feet of raising, and 616 feet of crosscutting; and diamond drilling consisted of 25 holes totaling 4,133 feet. The mill operated 259 days and produced 3,405 tons of copper residue, 4,612 tons of lead concentrate, and 486 tons of iron concentrate. Metals produced totaled 6,178,750 ounces of silver, 2,196,640 pounds of copper and 3,860,200 pounds of lead. An increase in tonnage of silver ore mined by Polaris Mining Co. was recorded at the Silver Summit mine. Recovery of silver advanced substantially; copper output declined slightly. About 64,371 tons of ore containing 22.22 ounces of silver per ton and 0.63 percent copper was mined from the Silver Summit and the New Purim areas. At the end of the year, developed reserves were 42,000 tons, assaying 36.32 ounces of silver per ton and 0.75 percent copper, according to the

company annual report to shareholders. The main heading of the East exploration project was driven 3,323 feet; its program was financed partially by a loan from the DMEA. Several short crosscuts were driven for diamond-drill stations, and several diamond-drill holes, approximately 1,000 feet long, were drilled to explore from the main heading. The drift was expected to be driven some 1,500 to 1,700 feet, additionally, in an effort to find commercial mineralization. Zanetti Bros. worked the DeBlock tailing deposit, along the south fork of the Coeur d'Alene River, from January to September.

Hunter District.—Output of lead-zinc ore by Sullivan Mining Co. from the large Star mine was slightly less than in 1954. Ore milled totaled 208,200 tons, which yielded concentrate containing 7,190 tons of lead, 16,930 tons of zinc, and 214,200 ounces of silver. ore reserve was increased to 1,476,300 tons. Bunker Hill Co., only stockholder of Sullivan Mining Co., liquidated and dissolved the Sullivan concern as of December 31 and took over all its assets and liabilities. Lucky Friday Silver-Lead Mines Co. completed a 3-compartment offset shaft from the 2,400 level to the adit tunnel. The new shaft, which was equipped with a 4,000-horsepower doubledrum hoist, was placed in full operation. It was planned in 1956 to sink the shaft to a greater depth and open 1 or 2 more deep levels. It was also planned to drive an opening due westward for the purpose of exploring the adjacent Gold Hunter property upon which the Lucky Friday company held a mining lease. The company annual report also stated that drifting an additional 859 feet on the vein on the 2,300 level disclosed ore of excellent grade; the length of the ore shoot already proved was 200 feet greater than it was on the 2,000 level. Good ore also was disclosed in drifting on the new 2,150 level and in raising from the 2,300 to the 2,000 level. Output of lead-zinc ore by American Smelting & Refining Co.'s salvage operation at the Morning mine proved to be less than in 1954. The ore was processed in the 1,250-ton Morning flotation mill, which also treated ore from its Frisco mine, and material from Lucky Friday. The Golconda lead-zinc operation, active from January 1 to August 23, was the only mine in Hunter district shut down by the strike in the Coeur d'Alene region of Shoshone County. Mine production for the year was 4,000 tons, and underground progress totaled 300 feet of raising, 200 feet of drifting, 500 feet of long-hole drilling, and 500 feet of old drifts reopened. Ore was treated at the 200-ton flotation mill, which also processed 23,000 tons of custom ore. Hecla Mining Co. completed preliminary diamond drilling from surface stations at Silver Mountain Lead Mines, Inc., property east of Mullan and began sinking a 2,000-foot vertical shaft. The DMEA approved a \$1,058,000 contract for the exploration project and was to finance half of the cost; Hecla Mining Co. and Bunker Hill Co. were to share the remainder of the costs equally. The work was to last approximately 3 years and was to include, in addition to the shaft, approximately 6,400 feet of exploratory drifts and crosscuts on the 2,000 level. Also in the district, Silver Buckle Mining Co. was engaged in a DMEA project at the Vindicator Silver-Lead property.

Lelande District.—American Smelting & Refining Co. ran the Frisco lead-zinc mine from January 1 until shut down by a strike on August 24, and treated ore at its Morning mill. The H. J. Hull lease of a

part of the Frisco mine also was closed by the strike. The Carlson & Jefferies lease in old upper workings of the Frisco mine did not operate in 1955 although ore was shipped from a stockpile. At the Hercules mine of Day Mines, Inc., sublevel slusher-shrinkage stopes were being prepared. The Hercules ore was treated at the Burke mill (formerly called Sherman mill). Under the DMEA program, the Far West Exploration Project at the 1,600 level was successful in opening a 500-foot length of zinc-lead-silver ore on the Rambler vein, according to Day Mines, Inc., annual report. The ore on this level was found to be continuous rather than interspersed with barren areas as was the case on higher levels of the West Hercules veins. Lessees at the Sherman mine produced lead-zinc ore by cleaning up

pillars and old workings.

Placer Center District.—Mines of American Smelting & Refining Co. and Day Mines, Inc., were active in the first 7 months of the year. Production on a regular basis began early in 1955 at the Galena mine after several years of exploration and development. Approximately 350 tons of ore was mined daily. Two vein systems, lead and silver, had been explored and the silver vein was developed for mining. During 1955 the silver vein was explored for a length of over 800 feet on the new 3,400 level and was found to be wider and of better grade than on the 3,000 level. Mine development was by means of a main vertical shaft 3,504 feet in depth and an auxiliary vertical shaft (old Callahan winze) from the surface to the 1,600 level. It was planned to extend the latter shaft to the 2,000 level to improve facilities for production on the silver vein, a silver-copper ore body. A sand-fill plant was completed and put into operation in 1955, and a machineshop building was erected. Lead ore produced from the Dayrock mine was treated in the Dayrock 250-ton flotation plant. Mine development included fully developing the remainder of the 950 level and opening up the first part of the new 1,100 level, disclosing ore of average grade in both instances. Stoping of the ore bodies above the 800-foot level was estimated to be 90 percent completed. Block lessees at the Tamarack mine produced 14,300 tons of lead-zinc ore, which was transported to the mill and processed by Day Mines, Inc.

Summit District.—Lessees reclaimed dump ore at the Orofino mine. Yreka District.—Work at the Bunker Hill mine was maintained at capacity throughout 1955; more tons of ore were extracted than in any previous year in the history of the mine. Bunker Hill Co.'s annual report disclosed that, while the grade of ore was lower, metal production was higher than for many years; Bunker Hill ranked as second in lead production in the United States. About 528,800 tons of ore was milled and 33,940 tons of lead, 9,800 tons of zinc, and 2,197,000 ounces of silver were recovered. Ore reserves were estimated to total 2,809,000 tons compared with 2,740,000 tons in 1954. The John George lease and (beginning in October) the Martin Thompson lease on the upper levels of the Bunker Hill mine also produced. Lateral development under a DMEA contract was continued by the Bunker Hill concern at the Crescent mine. About 10,680 tons of ore was recovered from shoots of silver-bearing ore encountered in drifting, and 80,960 ounces of silver was recovered from this source. At the end of the year, drifting was being continued westward. The

Crescent project, which included deepening the shaft 2,000 feet from the 1,200 level, called for a total expenditure of \$1,098,750 and was among the largest ever approved by the DMEA. The Bunker Hill tailing dump and smelter old slag dump supplied lead and zinc. American Smelting & Refining Co.'s Page mine and mill were operated from January 1 to August 24. At the Sidney mine, sinking of the No. 3 shaft was completed in July, the 2,300 level was opened, and about 50 feet of crosscut had been completed when the mine was closed by a strike; work was being done under DMEA contract. Gross metallic content of concentrates sold was 54,500 ounces of silver, 2,401,000 pounds of lead, and 5,715,000 pounds of zinc. Sidney mine was awarded a plaque by the State mine inspector for a new record in the Idaho mining industry. There were no lost-time accidents among Sidney employees while working a total of 91,000 man-hours. The Constitution lead-zinc mine, on the south fork of the Pine Creek, was worked by Spokane-Idaho Mining Co. until June 15, when the mine was closed. The company also terminated its agreement with Douglas Mining Co., owner, for working the nearby Douglas mine. Cleanup by Newell & Murphy at the Constitution mill produced a small tonnage of lead and zinc. Highland-Surprise Consolidated Mining Co. shut down its Highland-Surprise mine and 300-ton flotation mill about May 1. Sidney Mining Co. obtained an agreement for exploration and development at the property on a profit-sharing basis probably to be carried out from the Sidney shaft and underground workings. Comparatively small tonnages of lead-zinc ore were produced from the Liberal King, Little Pittsburgh, and Nabob mines, and a DMEA project was in progress at the Liberal King property.

Twin Falls.—With output valued at \$250,000, Twin Falls County ranked fourth in the State for producing sand and gravel. Structural sand and gravel was prepared by Colonial Concrete Co. and Sumner Sand & Gravel Co., both of Twin Falls. In addition the latter firm, as well as McCarty Gravel Co. of Kimberly and Twin Falls Construction Co., processed paving and road gravel. Highway districts at Buhl, Filer, and Twin Falls produced gravel for road construction

and maintenance.

Valley.—Dredge mining at monazite deposits near Cascade was closed down in the summer by Baumhoff-Marshall, Inc., and Idaho-Canadian Dredging Co. owing to lack of a market. Porter Bros. Corp. began work late in 1955 at a dredging site in Bear Valley and planned to begin production in 1956 under a Government contract to produce columbium-tantalum concentrates. Bradley Mining Co. produced 10,683 tons of tungsten ore averaging 0.4 percent WO<sub>3</sub> from the Springfield open-pit mine. Concentrate produced in a gravity plant was trucked to Stibnite for magnetic separation. About 2,159 units WO<sub>3</sub> in high-grade concentrate and a small tonnage of lower quality material was recovered at Stibnite. Holly Minerals Corp. acquired the Hermes cinnabar mine near Stibnite and began production in September at the mine and mill, which included two 75-ton-per-day Gould furnaces and a jaw crusher. Part of the mine production was from an open pit.

Duffy Reed Construction Co. supplied the Idaho Department of Highways with crushed basalt for road building and maintenance.

Washington.—Rare Metals Corporation of America acquired the important Idaho-Almaden cinnabar open-pit mine, 18 miles east of Weiser, and recovered the first mercury in its new plant on

September 30.

Melvin Taylor mined a gypsum deposit near Weiser, owned by the Northwest Gypsum Co., on a somewhat reduced scale compared with 1954. Output was utilized for agricultural applications. A small quantity of paving gravel was prepared for State roadwork by A. D. Stanley.

# The Mineral Industry of Illinois

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

By Samuel A. Gustavson<sup>1</sup> and Matthew G. Sikich<sup>2</sup>



N 1955, Illinois minerals, valued at approximately \$533 million, increased 13 percent over 1954, chiefly because production of petroleum gained substantially and supplied 63 percent of the All minerals, except natural gas and peat, increased in value over the previous year. The value for masonry cement was included in the State total for the first time in 1955.

Mineral fuels represented over 78 percent of the aggregate value of 1955 mineral output. Nonmetals contributed over 20 percent, and metals supplied the remainder.

In addition to the value of minerals credited to Illinois in table 1, some are omitted owing to lack of information.

TABLE 1.—Mineral production in Illinois, 1954-55 1

	19	54	195	5
Mineral	Short tons (unless other- wise stated)	Value	Short tons (unless other- wise stated)	Value
Cement: Portland	2, 027, 092 41, 971, 136 107, 830 3, 232 532, 051	\$23, 147, 871 (2) 3, 482, 450 160, 213, 063 5, 989, 219 885, 568 7, 420, 849 1, 345, 000 199, 060, 000 26, 164, 387 1, 050 31, 134, 135 3, 116, 232	8, 654, 735 742, 363 2, 338, 579 45, 932, 114 166, 337 4, 544 644, 181 8, 033 81, 423 26, 362, 360 3, 075 28, 865, 724 21, 700	\$22, 886, 351 2, 145, 170 3, 978, 972 167, 937, 815 7, 838, 471 1, 354, 112 9, 416, 136 1, 036, 940, 000 226, 138, 973 2, 783 35, 621, 394 5, 338, 200
Total Illinois 4		473, 077, 000		533, 464, 000

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption

by producers).

Figures for masonry cement are not given separately for 1954.

Includes friable sandstone.

<sup>4</sup> Total adjusted to eliminate duplication in value of clays and stone.

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Many ores contain valuable minor constituents, such as cadmium and germanium. These quantities sometimes are not known and sometimes, though known by analyses, are not accounted for metal-lurgically in early processing stages or credited to the mine of origin. These minor constituents are recovered at plants, frequently treating mixtures of materials from many sources, including residues from the refining of such metals as copper, lead, and others and obtained in other ways. In many such instances it is impossible 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 of value that usually cannot be separated as to source is byproduct sulfuric acid.

TABLE 2.—Bituminous coal production, value, and number of mines operated in 1955, by counties

N. April 2000	Prod	luction (net t	ons)	v	alue	Number	of mines o	perated
County	Under-	Strip	Total	Average	Total	Under-	Strip	Total
	ground	ourp	10081	per ton	10001	ground	Burb	TOTAL
	ground			per ton	7.5.	ground		
Bureau		791, 623	791, 623	\$4.04	\$3, 199, 532		1	
Christian	6, 162, 935		6, 162, 935	3.14	19, 358, 702	2		
Clark		1, 235	1, 235	4.00	4,945	1	1	
Clinton			170, 795		645, 457	3		
Douglas	1 326, 180		326, 180	4, 22	1, 376, 737	1		
Franklin	4, 528, 018		4, 528, 018	4.24	19, 211, 041	5		2
Fulton	76, 103	5, 320, 277	5, 396, 380	3, 72	20, 069, 224	8	14	2
Gallatin	139, 482	57, 331	196, 813	2,74	540,094	4	3	100
Greene	l	5, 811	5, 811	5, 28	30, 707		1	
Grundy		247, 625	247, 625		1, 179, 222		1	
Hancock		30 387	30, 387	6.15	186, 963		1	
Henry	40, 462		40, 462	5.07	205, 188	3		
Jackson Jefferson	567, 305	592, 783	1, 160, 088	3.42	3, 967, 607	3	3	
Jefferson	1, 582, 907		1, 582, 907	4.06	6, 432, 152	1		
Kankakee		551, 373	551, 373	4.76	2, 624, 722	l	1	
Knox	l	1, 766, 301	1, 766, 301	3.71	6, 554, 682		3	
La Salle	1	2 654	2,654	2, 15	5,706		1	
Livingston Logan Macoupin Madison	l	2, 654 3, 394	3, 394		20, 805	1	1	
Logan	27, 536		27, 536	6.97	191, 820	1		
Macoupin	341, 827		341, 827	3.73	1, 276, 141	2 3	I	
Madison	1, 035, 361		1, 035, 361	3.82	3, 951, 049	3		
Menaro	1 10,080		15, 585	6.14	95, 720	3		
Montgomery	1, 723, 975		1, 723, 975	4.09	7,043,012	1		
Peoria	39, 102	397, 223	436, 325	4, 17	1, 818, 955	7	5	1
Perrv	1, 271, 652	3, 144, 659	4, 416, 311	3, 10	13, 675, 426	4	4	
Randolph	861.018	335, 463	1, 196, 481	3.00	3, 595, 187	2	2	
St. Clair	1. 881, 975	1, 363, 914	3, 245, 889	3.32	10, 779, 095	7	3	1
Saline	2,084,149	798, 614	2, 882, 763	3.81	10, 992, 039	7	. 6	1
Sangamon	78, 357		78, 357	5.49	430, 420	3		
Schuzzlor	12 562	7, 843	21, 406	5. 31	113, 569	3	2	
Tazewell	3, 511		3, 511	4.82	16, 923	1		
verminon	1 28.999	817, 101	876, 100	3.98	3, 484, 305	4	5	٧,
Washington	20, 069		20, 069	5.00	100, 292	2		
Will		153, 205	153, 205	5.02	769, 221		1	
Williamson	4, 205, 629	2, 286, 803	6, 492, 432	3.70	23, 991, 155	23	9	3
Total	27, 256, 495	18, 675, 619	45, 932, 114	3. 66	167, 937, 815	1 102	1 66	1 16

 $<sup>{\</sup>bf 1}\ Total\ has\ been\ adjusted\ to\ eliminate\ duplication\ of\ mine\ count\ for\ operation (s)\ extending\ into\ 2\ counties.$ 

## REVIEW BY MINERAL COMMODITIES

#### MINERAL FUELS

Coal.—Production of bituminous coal was approximately 45.9 million short tons, valued at nearly \$168 million, an increase of 9 percent in quantity and 5 percent in value over 1954. Illinois ranked fourth

in the Nation in output of bituminous coal in 1955. Principal markets for Illinois coal were industrial plants and electric-power utilities.

Although the number of producing mines was less than in 1954, greater output was recorded. Coal was produced from 168 mines in 35 counties. Principal producing counties, in order of decreasing tonnage, were: Williamson, Christian, Fulton, Franklin, Perry, St. Clair, and Saline. The Peabody No. 10 in Christian County was second-ranking bituminous-coal mine in the United States in 1955. Nearly 41 percent of coal produced in the State in 1955 was from strip pits.

Companies in the State reporting production of over 1 million tons of coal in 1955 included the following: Bell & Zoller, Chicago, Wilmington & Franklin Coal Co., Fairview Collieries Corp., Freeman Coal Mining Corp., Midland Electric Coal Corp., Old Ben Coal Corp., Peabody Coal Co., Perry Coal Co., Sahara Coal Co., Southwestern Illinois Coal Corp., Stonefort Corp., Truax-Traer Coal Co., Union Colliery Co., and United Electric Coal Cos.

Crushing and/or treatment of coal was performed at 89 of the mines in 1955. Nearly 85 percent of the 1955 Illinois production was cleaned

at 62 mechanical cleaning plants in the State.

Peat.—The quantity of peat produced in the State in 1955 decreased 24 percent below the previous year. Only one bog in Tazewell County produced. Although classed as a fuel, the entire output of peat was used as a conditioner in mixed fertilizers.

Petroleum, Natural Gas, and Natural-Gas Liquids.—Production of petroleum increased 22 percent in quantity and 19 percent in value over 1954, continuing the upward trend, which began in 1953. Contributing substantially to the increased output were secondary-recovery practices such as water-flooding projects. Hydraulic fracturing of oil formations also contributed. In 1955, water flooding was estimated to furnish 30 percent of annual production in the State.<sup>3</sup>

Petroleum output was widely distributed throughout the State. Of the 34 counties producing oil, 5—Clay, Fayette, Marion, Wayne, and

White—supplied half of the output.4

Natural-gas production in Illinois in 1955 decreased 15 percent in quantity and 23 percent in value below the previous year. Compression and absorption methods were utilized to produce natural-gas liquids; output was 13 percent greater than in 1954, and value increased slightly over the preceding year.

#### **METALS**

Output of lead, silver, and zinc (the only metals produced from minerals mined in Illinois that were credited to State production) was considerably greater in 1955 than in 1954. These metals were coproducts or byproducts of fluorspar mining in Hardin County (southern Illinois) and from zinc and lead mines in Jo Daviess County (northern Illinois). Some rare metals, notably germanium and cadmium, are associated in small quantities with zinc ores of southern Illinois. Germanium and cadmium were recovered during the refining of zinc concentrate.

Illinois Department of Mines and Minerals, Division of Oil and Gas, Seventy-fourth Coal Report: 1955, 151 pp.
 Voskuil, W. H., and Busch, W. L.; Mineral Production in Illinois in 1955: Illinois State Geol. Survey.

Silver was recovered as a byproduct of refining lead to obtain a silver-free lead product from concentrate produced from mines in Hardin County. The principal producers were Ozark Mahoning Co., Minerva Oil Co., Aluminum Co. of America, southern Illinois; and Eagle-Picher Co., and Tri-State Zinc, Inc., northern Illinois.

The average weighted yearly prices were: Silver—\$0.9050505 per fine ounce, lead—14.9 cents per pound, and zinc 12.3 cents per pound. In 1954, the silver price was the same as in 1955, lead was 13.7 cents

per pound, and zinc 10.8 cents per pound.

TABLE 3.—Mine production of silver, lead, and zinc, 1946-50 (average) and 1951-55, in terms of recoverable metals

	Mines	Ma- terial	Sil	ver	L	ead	100	Zine	
Year	pro- ducing	sold or treated <sup>1</sup> (short tons)	Fine ounces	Value	Short tons	Value	Short tons	Value	Total value
1946-50 (average) 1951	22 19 21 21 21 21 13	497, 231 857, 212 930, 526 700, 844 603, 675 839, 555	2, 654 3, 465 3, 781 2, 338 1, 160 3, 075	\$2, 357 3, 136 3, 422 2, 116 1, 050 2, 783	3, 288 3, 160 4, 262 3, 391 3, 232 4, 544	\$956, 039 1, 093, 360 1, 372, 364 888, 442 885, 568 1, 354, 112	15, 398 21, 776 18, 816 14, 556 14, 427 21, 700	\$4, 040, 576 7, 926, 464 6, 246, 912 3, 347, 880 3, 116, 232 5, 338, 200	\$4, 998, 972 9, 022, 960 7, 622, 698 4, 238, 438 4, 002, 850 6, 695, 095

<sup>1</sup> Data for 1946-50 (average) exclude lead-bearing material mined with fluorspar and from which some lead was recovered as a byproduct of the mining and milling of the fluorspar. Data for 1951-55 include fluorspar ore from which lead and/or zinc were recovered, as follows: 1951—332,028 tons; 1952—384,203 tons; 1953—353,570 tons; 1954—202,478 tons; and 1955—309,311 tons.

TABLE 4.—Mine production of silver, lead, and zinc, 1955, by months, in terms of recoverable metals

	Northern	Northern Illinois		thern Illir	nois	Total Illinois		
Month	Lead (short tons)	Zinc (short tons)	Silver (fine ounces)	Lead (short tons)	Zine (short tons)	Silver (fine ounces)	Lead (short tons)	Zinc (short tons)
January February March April May June July August September October November December	180 210 175	990 985 1, 020 1, 065 1, 115 1, 210 850 1, 175 1, 180 1, 205 1, 150 1, 140	215 155 155 150 265 250 300 360 330 285 300 310	180 150 185 245 200 325 280 245 255 225 190 203	310 520 530 525 795 770 660 955 930 890 860 870	215 155 155 150 265 250 300 360 330 285 300 310	340 305 320 425 410 500 395 400 400 340 314	1, 300 1, 505 1, 550 1, 590 1, 910 1, 980 1, 510 2, 130 2, 110 2, 095 2, 010
Total	1,861	13, 085	3,075	2, 683	8, 615	3,075	4, 544	21, 700

#### **NONMETALS**

Cement.—Production of cements declined slightly but still ranked fifth in value among the mineral industries of the State. Three plants produced in La Salle County and one, in Lee County. Shipments of portland cement amounted to 8.7 million barrels, valued at \$22.9 million, an average of \$2.64 per barrel.

The shipment figures are not comparable with those of 1954 because in 1955, for the first time, portland and masonry cements are shown separately. Finished portland cement used in manufacturing masonry

cement is included in the production figure for portland cement but is deducted from the quantity of portland shipped, as shown in table 4. Production of portland cement was 8.8 million barrels, a decrease of less than 1 percent from 1954.

TABLE 5.—Finished portland cement produced, shipped, and in stock, 1946-50 (average) and 1951-55

Voor	Active	Production	Ship	oments from m	ills	Stocks at mills on
Year  1946–50 (average) 1951 1952 1953 1954 1955	1 plants 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	7, 424, 054 8, 483, 783 8, 514, 443 8, 869, 342 8, 841, 848 8, 809, 655	7, 447, 842 8, 377, 387 8, 710, 621 8, 651, 385 9, 109, 076 8, 654, 735	\$14, 726, 539 19, 853, 132 20, 600, 347 21, 961, 761 23, 147, 871 22, 886, 351	\$1.98 2.37 2.36 2.54 2.64	Dec. 31 (barrels) 539, 797 801, 886 605, 708 823, 665 556, 437 435, 818

Clays.—Both the quantity and value of fire and miscellaneous clay produced in 1955 increased over the previous year. Production of these clays amounted to 2.3 million tons, valued at \$4 million, an increase over 1954 of 15 and 14 percent, respectively.

TABLE 6.—Clays sold or used by producers, 1946-50 (average) and 1951-55, by kinds

		- 3				
Year	Fire	Fire clay Miscellane		eous clay	Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1946-50 (average)	373, 740 492, 127 450, 444 367, 385 313, 679 363, 385	\$1, 111, 703 1, 774, 870 1, 544, 668 1, 473, 859 675, 407 747, 660	1, 968, 069 2, 097, 013 1, 886, 299 1, 937, 817 1, 713, 413 1, 975, 194	\$1, 684, 825 2, 249, 324 2, 324, 583 3, 099, 142 2, 807, 043 3, 231, 312	1 2, 365, 393 2, 589, 140 2, 336, 743 2, 305, 202 2, 027, 092 2, 338, 579	1 \$3, 039, 511 4, 024, 194 3, 869, 251 4, 573, 001 3, 482, 450 3, 978, 972

<sup>1</sup> Includes 23,584 tons of fuller's earth valued at \$242,983.

Output of the more valuable fire clay was 363,400 tons valued at \$747,700, as compared with 313,700 tons worth \$675,400 in 1954, a rise in tonnage of 16 percent and value of 11 percent. Fire clay was obtained by 11 producers in 7 counties, principally in Grundy and La Salle Counties; Illinois Clay Products Co. remained the leading producer. The clay was used primarily in manufacturing refractories, zinc retorts, pottery, and stoneware.

Miscellaneous clay, used in manufacturing building brick, heavy clay products, lightweight aggregates, and cement, was produced by 33 operators in 22 counties. Principal sources of the product were deposits in Cook, Livingston, and Vermilion Counties. Production in 1955 was 2 million tons valued at \$3.2 million, a rise of 15 percent in quantity and value over the previous year.

Fluorspar.—The quantity and value of fluorspar exceeded the previous year by 54 and 31 percent, respectively, in spite of much uncertainty among domestic producers as to future outlook and a 15 percent decrease in average value per ton, Illinois retained leadership in producing this important mineral. Imports for consumption of fluorspar again rose sharply over the previous year to establish an

TABLE 7.—Fluorspar shipped from mines, 1946-50 (average) and 1951-55

			Valı	10
	Year	Short tons	Total	Average per ton
1946-50 (average)		153, 949 204, 328 188, 293 163, 303 107, 830 166, 337	\$5, 739, 408 9, 294, 703 9, 481, 223 8, 567, 026 5, 989, 219 7, 838, 471	\$37. 28 45. 49 50. 35 52. 46 55. 54 47. 12

alltime high record. Of total imports of 363,400 tons, nearly 55

percent came from Mexico.

Forty companies produced at an estimated 53 mines; the leading producers were: Aluminum Co. of America, Minerva Oil Co., Ozark-Mahoning Co., and Goose Creek Mining Co. All mines of Rosiclare Lead & Fluorspar Co. were inactive throughout the year. Minerva Oil Co. acquired the assets of Victory Fluorspar Co. from A. H. Stacey & Son in 1955.

Of 2 Defense Minerals Exploration Administration contracts for the exploration of fluorspar deposits, 1 terminated in July, and the other had not been completed at year end. Under a new wage contract retroactive to August 1, 1955, employees of Aluminum Co. of America at Rosiclare received a 7½-cent-per-hour wage increase.

Fluorspar shipped in 1955 for use as a chemical material in manufacturing hydrofluoric acid and producing aluminum declined to less than 54 percent of the total; steelmaking and foundry use increased to almost 28 percent. These figures compare with 64 and 14 percent, respectively, in 1954. Manufacturers of glass, enamel, and brick and tile furnished 13 percent of production; miscellaneous uses used nearly 6 percent. Shipments classified as to grade were: Acid, 54

percent; Ceramic, 15 percent; and Metallurgical, 31 percent.

Average value of Acid Grade, \$58.75 per ton as compared with \$63.26 a ton in 1954, decreased 7 percent; Ceramic Grade, \$42.72 compared with \$48.73 in 1954, declined 12 percent; and Metallurgical Grade, \$29.10 compared with \$33.67 in 1954, decreased 14 percent. The weighted average value of all grades shipped from Illinois, \$47.12 in 1955 and \$55.54 in 1954, decreased 15 percent. Average per ton value declined because of a general weakness in the fluorspar market, large imports of lower price fluorspar, and increased use of the cheaper Metallurgical Grade.

Because importation increased sharply and the United States Government acquired sizable quantities of fluorspar under bartering contracts, the producing industry leaders agitated for tariff or other protection. In response, the United States Tariff Commission began to investigate whether imports threatened serious injury to the

domestic industry.

Lime.—Four companies produced lime at six plants in Adams, Cook, and St. Clair Counties. Output in 1955, 644,000 tons valued at \$9 million, increased 21 and 27 percent, respectively, over the previous year and was spread about evenly among the principal markets. Lime was used principally for building, refractory, chemical, and industrial purposes.

Perlite.—Crude perlite from deposits in Western States was expanded at plants in Champaign, Cook, Lake, and Will Counties. The expanded material was used principally as a lightweight aggregate in plaster and concrete, for filter purposes, and as a soil conditioner. Production sold in 1955 was 16,637 tons valued at \$951,871.

Sand and Gravel.—Production of sand and gravel increased, both in tonnage and value. Output in 1955, 26.4 million tons valued at \$28.1 million, rose 8 percent over 1954 in both quantity and value.

TABLE 8.—Sand and gravel sold or used by producers, 1954-55, by classes of operations and uses

		1954			1955	
Class of operation and use	Short	Val	lue	Short	Vs	alue
	tons	Total	Average per ton	tons	Total	Average per ton
COMMERCIAL OPERATIONS						
Sand: 1			İ .	ì		
Glass	(2)	(2)	(2)	1, 155, 359	\$2,670,748	\$2.31
Molding	731, 664	\$1, 985, 273	(2) \$2. 71	1 X53, 110	1 922 344	2. 25
Building	5, 775, 150	4, 267, 837	. 74	6, 590, 497 1, 962, 809 135, 388	5, 360, 272	. 81
Paving Grinding and polishing	2, 070, 194	1, 548, 895	. 75	1, 962, 809	1, 477, 777	. 75
Blast	(2)	(2)	(2) (2) (2)	135, 388	338, 470	2. 50
Fire or furnace	(2)	(2)	(2)	228, 754	1, 191, 556	5. 21
Engine		(2)		6,005	14, 412	2.40
Filter	24, 940	80, 026 51, 884	. 99	82, 299	100, 693	1. 22
Filter Railroad ballast	(2)	(2)	2.08	15, 399	11, 303	. 73
Ground	252 522	2 403 234	(2) 9. 48	95, 641	68, 982	. 72
Other	841, 562	2, 403, 234 2, 108, 573	2. 51	265, 984 484, 835	2, 441, 256	9. 18
Other Undistributed 3	1, 247, 387	3, 379, 263	2.71	101, 000	1, 148, 230	2. 37
Total commercial sand	11, 025, 434	15, 824, 985	1. 44	11, 876, 080	16, 746, 043	1. 41
Gravel:						
Building Paving Railroad ballast	4, 895, 015	4, 280, 922	07	F 500 450		
Paving	5, 707, 606	4, 271, 289	. 87	5, 766, 453	4, 994, 533	. 87
Railroad ballast	655, 363	398, 934	.61	6, 118, 534 644, 432	4, 765, 494	. 78
Other	412, 972	321, 707	.78	364, 433	449, 069	. 70
		021,101		304, 433	220, 036	. 60
Total commercial gravel	11, 670, 956	9, 272, 852	. 79	12, 893, 852	10, 429, 132	. 81
Total commercial sand and						
gravel	22, 696, 390	25, 097, 837	1. 11	24, 769, 932	27, 175, 175	1. 10
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:	j					
Building Paving			1	950	200	0.5
Paving	200, 861	113, 102	. 56	159, 685	328 100, 991	. 35 . 63
Total Government-and-con-					100, 551	.00
tractor sand	200, 861	**0 **0				
macoor band	200, 801	113, 102	. 56	160, 635	101, 319	. 63
Gravel:						
Building				63, 862	10.010	
Paving.	1, 545, 804	953, 448	. 62	1, 367, 931	19, 918 842, 561	. 31
Matal Co.				-, 001, 001	012, 001	. 02
Total Government-and-con-						
tractor gravel	1, 545, 804	953, 448	. 62	1, 431, 793	862, 479	. 60
Motel Community 1						.00
Total Government-and-con-	1 740 007		i			
tractor sand and gravel	1, 746, 665	1, 066, 550	. 61	1, 592, 428	963, 798	. 61
ALL OPERATIONS						
Sand	11, 226, 295	15 020 007	140	10 000 85-		
Gravel	13, 216, 760	15, 938, 087 10, 226, 300	1. 42	12, 036, 715	16, 847, 362	1.40
	10, 210, 100	10, 220, 300	. 77	14, 325, 645	11, 291, 611	. 79
Grand total	24, 443, 055	26, 164, 387	1.07	26, 362, 360	28, 138, 973	1. 07
				,,	-0, 100, 010	1.07

Includes friable sandstone.
 Included with "Undistributed" to avoid disclosing individual company confindential data.
 Includes glass, grinding and polishing, blast, fire or furnace, and railroad ballast sand, 1954.

The production from 68 of the State's 102 counties was used principally in commercial building and paving, which supplied about 78 percent of the total quantity. Other consumption included glass, molding, grinding and polishing, engine sand, filters, and railroad ballast.

Friable sandstone deposits in La Salle and Ogle Counties were a source of high-purity silica in manufacturing superior glass or ground for use in refractories, fillers, abrasives, and pottery. This production

is included in the sand-and-gravel tables of this chapter.

Principal producing counties were La Salle, Will, Winnebago, McHenry, and Peoria. Principal producers were: Chicago Gravel Co., Consumers Co., Material Service Corp., Wedron Silica Co., Chicago; Elmhurst-Chicago Stone Co., Elmhurst; McGrath Sand and Gravel Co., Lincoln; Ottawa Silica Co., Sand & Silica Co., Ottawa; and Donald Tyrrell.

Stone.—Limestone was crushed in 53 counties; 6 also produced some dimension limestone; and 1 yielded minor quantities of crushed sandstone used as a refractory material. The major producing counties were Cook, Will, and Kankakee. Principal uses of the crushed

limestone were for concrete aggregate and roadstone.

Output of all stone in 1955, 29 million tons with a value of \$35.6 million, increased 9 percent in volume and 14 percent in value over the previous year. Of this total, 20,825,000 tons (72 percent) was used

TABLE 9.—Limestone sold or used by producers in 1954-55, by uses 1

	1954				1955	
		Valu	10		Valt	10
Use	Quantity	Total	Average per unit of measure	Quantity	Total	Average per unit of measure
Dimension: Rough construction Short tons Rubble	750 1, 352 776 2, 646 21, 144 4, 190 100, 418 245, 013 18, 001, 469 652, 212 2, 785, 898 4, 617, 593	\$3, 375 5, 039 325 6, 750 15, 577 31, 066 104, 467 365, 136 22, 484, 898 716, 369 3, 612, 377 3, 813, 332	\$4.50 3.73 .42 2.55 .74 7.41 1.04 1.49 1.25 1.10 1.30 .83	(2) 914 2 8, 371 2, 700 18, 401 3, 419 173, 098 298, 675 18, 900 20, 825, 065 839, 866 2, 600, 215 4, 105, 892	(2) \$4, 883 2, 3, 532 6, 800 12, 427 27, 642 214, 306 531, 206 24, 570 26, 711, 592 987, 725 3, 341, 049 3, 769, 218	(2) \$5.36 2.44 2.55 .66 8.00 1.2 1.7 1.3 1.2 9
short tonsdodo	26, 402, 603	31, 096, 579	1. 18	28, 861, 711 28, 865, 130	35, 579, 666 35, 607, 308	1. 2

<sup>&</sup>lt;sup>1</sup> Includes both commercial and Government-and-contractor production.

<sup>2</sup> Figures for rough construction and rough architectural uses are combined and shown under "Rough architectural" in order to avoid disclosing individual company confidential data.

<sup>3</sup> Average weight of 170 pounds per cubic foot used to convert cubic feet to short tons.

for concrete aggregate and roadstone and 2,600,000 tons (9 percent)

for agricultural purposes.

Figures for crushed limestone are comparable with those for 1954 but not for earlier years. In 1954 and 1955 the production and value of limestone used in manufacturing cement and lime were included under stone, but the State totals have been adjusted to prevent duplication.

Principal producers of limestone were: Allied Chemical & Dye Corp., Syracuse, N. Y.; Columbia Quarry Co. and East St. Louis S one Co., East St. Louis, Ill.; Consumers Co. and Materials Service C., Chicago; Dolese & Sheppard Co., LaGrange; Elmhurst-Chicago Stone Co., Elmhurst; Lincoln Stone Co. and National Stone Co., Joliet; and Lehigh Stone Co., Kankakee. Western Fire Brick Co., Granite City, continued producing sandstone.

Sulfur.—The Pure Oil Co. recovered sulfur as a byproduct at its

Lemont refinery.

Tripoli.—Tripoli was mined in northern Alexander County from nearly horizontal beds of unconsolidated silica. Two companies produced substantial quantities of prepared tripoli, which was used

as an abrasive and a filler material.

Vermiculite.—Crude vermiculite (the mineralogical name for a variety of hydrous aluminum-magnesium silicates) produced outside the State, was exfoliated or expanded at plants in Cook, Macoupin, and Will Counties. The exfoliated product was used in manufacturing insulating materials, as a lightweight aggregate in plaster and concrete, and as a loose insulating filler.

### **REVIEW BY COUNTIES**

Adams.—Mineral products in the county included sand and gravel, lime, and limestone. Marblehead Lime Co. and Menke Stone & Lime Co. produced quicklime and hydrated lime near Marblehead and Quincy, respectively, for building, chemical, and industrial uses. Both companies also produced limestone from underground mines in the county. Output was employed for flux, roadstone, mineral food, and agricultural purposes. Black & White Limestone Co. sold crushed and broken limestone for riprap, flux, concrete aggregate and roadstone, agricultural purposes, asphalt filler, mineral food, and various other uses.

Quincy Sand Co. produced sand and gravel chiefly for building and road purposes. Sand was produced by Blicks Construction Co.

Alexander.—The entire output of tripoli in Illinois in 1955 came from Alexander County. Producers were Ozark Minerals Co. at Elco and Tamms Industries, Inc., near Tamms. Products were used for abrasives, filler, and other purposes.

H. H. Halliday produced sand for building, paving, and engine use and gravel for building purposes at dredge on the Ohio River. The

State highway commission contracted for road gravel.

Ozark Minerals Co. produced clay near Thebes from a pit owned by

Illinois Minerals Co.

Bond.—Cyril Munie produced gravel for building and road use. Greenville Gravel Co., Inc., produced sand and gravel for building use. W. D. Lindsey produced road gravel, at a portable plant.

TABLE 10.—Value of mineral production in Illinois, 1954-55, by counties 1

County	1954	1955	Minerals produced in 1955 in order of value
A dams	\$1,050,343	\$1, 212, 320	Stone, lime, sand and gravel.
AdamsAlexander	598, 260	617, 357	Stone, lime, sand and gravel. Tripoli, sand and gravel, clays.
3ondl	598, 260 82, 730 115, 259 98, 347	617, 357 87, 469 147, 004	Clays, sand and gravel. Sand and gravel, stone, clays.
Boone	115, 259	147, 004	Sand and gravel, stone, clays.
Brown	98, 347	143, 650	Stone, sand and gravel, clays. Coal, sand and gravel, clays.
Dermoore	(")	3, 531, 567 17, 341	Coal, sand and gravel, clays.
Calhoun	13, 140	17, 341	Stone, sand and gravel.
Calhoun Carroll Cass Champaign Christian	111, 543	180, 579	Sand and gravel, stone. Sand and gravel.
Cass		500	sand and gravei.
Champaign	147, 761	170, 449 19, 358, 702 324, 062 133, 500	Do.
Christian	(2)	19, 558, 702	Coal.
ClarkClayClayClintonColes	(2) 458, 151	122 500	Stone, sand and gravel, coal. Stone.
Olay	(2) (2)	659, 642	Coal, stone, sand and gravel.
Cinton	277 458	275, 905	Stone sand and gravel
Coles	377, 458 19, 809, 465	22 757 216	Stone, sand and gravel. Stone, lime, clays, sand and gravel, sulfur.
Cook	(2)	22, 757, 216 97, 870 35, 809	Sand and gravel.
Jrawloru	16 790	35, 809	Do.
Do Zalh	16, 790 279, 913	523, 195	Do.
Ook Orawlord	52, 522	1	
Dougles	(2)	1, 376, 737	Coal.
Du Paga	1, 638, 994	1, 507, 527	Stone, sand and gravel.
Edwards	1, 638, 994 46, 511 90, 957	1, 376, 737 1, 507, 527 53, 250	Clays.
Effingham	90, 957	85 000 1	Stone.
De Witt	82, 367	53, 847 104, 901 19, 211, 041	Sand and gravel.
FordFranklinFultonGallatin	(2)	104, 901	Do.
Franklin	(2)	19, 211, 041	Coal.
Fulton	19, 303, 507	19, 211, 041 20, 257, 683 571, 563 152, 252 2, 356, 962 440, 727 11, 185, 708	Coal, sand and gravel.
Gallatin	1 379 058 1	571, 563	Do.
Greene	1. 129 519 1	152, 252	Stone, clays, coal. Coal, sand and gravel, clays.
Greene Grundy Hancock Hardin Henderson	2, 289, 535	2, 356, 962	Coal, sand and gravel, clays.
Hancock	384, 491	440, 727	Stone, coal.
Hardin	7, 449, 042	11, 185, 703	Fluorspar, zinc, lead, stone, silver. Stone, sand and gravel.
Henderson		147, 378 484, 410	Stone, sand and gravel.
Henry	(2)	484, 410	Sand and gravel, coal.
Iroquois	4, 452	4 110 007	Coal, stone, sand and gravel.
Jackson	(2)	4, 119, 237	Cool
Henry Iroquois Jackson Jefferson	160 204	6, 432, 152	Coal.
Jersey	160, 204 2, 701, 037 644, 105	3, 968, 921	Stone, sand and gravel. Zine, lead, stone, sand and gravel.
Jersey Jo Daviess Johnson Kane Kankakee	644 105	(2)	Stone.
JOHNSOH	976, 629	1, 229, 378	
Kalle	4, 470, 208	4, 477, 631	Sand and gravel, stone. Coal, stone, clays, sand and gravel. Stone, sand and gravel. Coal, stone, clays, sand and gravel.
Vondoll	196, 427 6, 702, 679 553, 876	(2)	Stone, sand and gravel.
Kendall Knox	6, 702, 679	6, 889, 732	Coal, stone, clays, sand and gravel. Sand and gravel, clays.
Lake La Salle Lawrence	553, 876	502, 803	Sand and gravel, clays.
La Selle	29, 490, 666	31, 006, 707	Cement, sand and graver, stone, crays, coar.
Lawrence	74, 665	113, 439	Sand and gravel.
Lawrence Liee Livingston Logan Macon Macoupin Madison Marion Marshall Mason	4, 607, 951 1, 470, 449 759, 092	6, 889, 732 502, 803 31, 006, 707 113, 439 5, 482, 209 1, 561, 257	Cement, stone, sand and gravel, clays.
Livingston	1, 470, 449	1, 561, 257	Stone, clays, sand and gravel, coal.
Logan	759, 092	002,000	Sand and gravel, stone, coal.
Macon	347, 421	1 242, 838	Sand and gravel.
Macoupin	347, 421 2, 628, 454 3, 828, 008	1, 276, 141 4, 991, 689	Coal.
Madison	3, 828, 008	4, 991, 689	Coal, stone, sand and gravel, clays.
Marion	(2)		Cond and graval alone
Marshall	246, 117	(2)	Sand and gravel, clays.
Mason	7,610	100 070	Stone sand and gravel
Massac McDonough McHenry McLean		109, 852 332, 094 1, 514, 744	Stone, sand and gravel. Stone, clays.
McDonough	339, 446 1, 370, 748	1 514 744	Sand and gravel, stone.
McHenry	1,370,748	1, 014, 744	Sand and gravel, stone. Sand and gravel.
McLean	199 956	622, 356 239, 241 168, 175	Stone coal clavs
Wiedard	182, 256 158, 118 715, 924	168 175	Stone, coal, clays. Stone, clays. Stone, sand and gravel.
Monroe	715 094	(2)	Stone, sand and gravel.
Montgomery	(2)	(2)	Coal, stone.
Odlo	1 078 704	1, 197, 135	Sand and gravel, stone.
Peoria	1, 078, 704 3, 010, 690 11, 598, 325 227, 224	1, 197, 135 3, 443, 575 13, 675, 426 240, 705	Coal, sand and gravel, stone.
Perry	11, 598, 325	13, 675, 426	Coal.
Pike	227, 224	240, 705	Sand and gravel, stone.
Pone	227, 650	7,900	Sand and gravel.
Pulaski	153, 042 5, 903, 628 750, 849 12, 530, 914	1 (2)	Stone, clays,
Randolph	5, 903, 628	4, 738, 899 790, 630	Coal, stone, sand and gravel. Stone, sand and gravel, clays.
Rock Island	750, 849	790, 630	Stone, sand and gravel, clays.
St. Clair	12, 530, 914	1 12 020 783	Coal, stone, sand and graver, lime, crays.
Saline	9, 499, 403	10, 992, 039	l Coal.
McLean Menard Menard Meroer Morroe Montgomery Ogle. Peoria Perry Pike Pope Pulaski Randolph Rock Island St. Clair Saline Sangamon Schuyler Scott	1, 053, 032 133, 153	10, 992, 039 847, 441 151, 488	Coal, sand and gravel, clays. Coal, sand and gravel.
Cohumles	133, 153	151,488	Coal, sand and gravel. Stone, sand and gravel.
ochuvier		194, 353	

See footnotes at end of table.

TABLE 10.—Value of mineral production in Illinois, 1954-55, by counties 1—Con.

County	1954	1955	Minerals produced in 1955 in order of value
Shelby. Stark Stephenson Tazewell Union Vermilion Wabash Warren Washington Wayne White. Whiteside Will Williamson Willmebago Woodford Undistributed Total	\$44, 545 18, 800 87, 165 1, 025, 825 405, 368 3, 540, 553 191, 792 98, 700 (2) 179, 609 231, 317 3, 914, 421 22, 185, 405 1, 533, 447 275, 564, 998	(2) \$27, 500 144, 100 855, 402 376, 472 4, 404, 642 20, 430 228, 640 312, 427 5, 340, 752 24, 041, 155 1, 830, 850 261, 263, 104 533, 464, 000	Sand and gravel, stone. Sand and gravel. Stone, sand and gravel. Sand and gravel, clays, peat, coal. Stone, sand and gravel

<sup>1</sup> County figures exclude petroleum, natural gas, natural-gas liquids, and some stone, sand and gravel for which data by counties are unavailable; these are included with "Undistributed." The following counties are not listed because no production was reported: Edgar, Hamilton, Jasper, Morgan, Moultrie, Piatt, Putnam, and Richland.

<sup>2</sup> Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

Paving sand was produced under contract for the State highway commission.

Richards Brick Co. produced clay for use in manufacturing heavy

clay products.

Boone.—Vincent Spencer Sand & Gravel produced sand and gravel for building and road use at a fixed plant near Belvidere. Road gravel was produced by Christensen & Smith and under contract for the county highway department.

Belvidere Lime Quarry produced limestone for agricultural and road use at a portable crushing plant.

Munson Bros. & Co. near Capron, produced common clay for

manufacturing heavy clay products.

Brown.—The county highway department crushed limestone for T. F. Hollembeak & Sons produced sand and gravel at a portable plant for road use. Raymond Bridgewaters produced sand for miscellaneous uses. Frederic Brick & Tile Co. produced clay

near Mount Sterling for use in manufacturing heavy clay products.

Bureau.—Midland Electric Coal Corp. produced bituminous coal from its strip mine near Mineral. Floyd Clapp produced gravel for building and road purposes. Hansen Bros. and Swanson Bros. produced road gravel at portable plants. Western Sand & Gravel Co. produced sand and gravel for road use and gravel for building use at its fixed plant at Spring Valley. Wyanet Sand & Gravel produced sand and gravel for building and other uses. The city of Princeton and the county highway department produced gravel for road use. Sand and gravel for road use was also produced under contract for the county highway department and the State highway commission. Sheffield Shale Products Co. produced clay at Sheffield for use in manufacturing heavy clay products.

Calhoun.—Calhoun Quarry Co. produced crushed limestone for Paul C. Herter reported output of crushed limestone for road use.

roadstone and agricultural purposes. Sand and gravel for road use was produced under contract for the county highway department and

the State highway commission.

Carroll.—Minor Bros. produced crushed limestone for roadstone The county highway department produced and agricultural use. crushed limestone for road use. Rein & Dahl and Howard Nelson produced gravel for road construction at portable plants. Nicol produced sand for molding, engine, and paving use at a fixed plant near Savanna. Road gravel was produced under contract for the county highway department and the State highway commission.

Cass.—Sand for road use was produced under contract for the

State highway commission.

Champaign.—Gibson Bros. and West Champaign Gravel Co. produced road gravel. Mahomet Sand & Gravel Co., Inc., and W. H. Troike & C. R. Plankenhorn produced sand and gravel for building and road purposes near Mahomet. Ryolex Corp. expanded crude perlite at a plant at Champaign for use as lightweight aggregate in plaster and

Christian.—In 1955 Christian County ranked second in the State in bituminous-coal production. Peabody Coal Co., the leading producer of coal in Illinois, operated its No. 10 and No. 17 underground mines near Pawnee and Pana, respectively. The Peabody No. 10 and the Peabody No. 17 ranked second and fourth in production of

bituminous coal, respectively, in the Nation in 1955.

Clark.—Casey Stone Co. and Quality Lime Co. crushed limestone for agricultural and road purposes. Ralph E. Montgomery produced limestone for agricultural use. Barthelomy & Lawrence produced sand and gravel for building and road use at a fixed plant near West The Stanfield Gravel Co. dredge near Darwin produced gravel for building and road construction. Road gravel was produced under contract for the State highway commission.

Tierney Bros. produced coal from the Rock Hill strip mine. The

entire output was shipped by truck for local consumption.

Clay.—İola Stone & Material Co. crushed limestone for agricultural

and road use at a quarry near Iola.

Clinton.—Coal was mined underground by the following companies in the county: Breese Coal Co., Inc. (North Breese mine), Citizens Coal Co. (East Breese), and Marion County Coal Mining Corp. (Glenridge). The Glenridge mine in 1955 produced entirely in Clinton County although the mine extends into Marion County. About 32 percent of the county coal output was shipped by rail to consumers; the remainder was for local consumption.

Huelsman Quarry crushed limestone for road use. The county

highway department produced road gravel.

Coles.—Crushed and broken limestone for riprap, roadstone, and fertilizer filler was produced by Humphres Stone Co. from a quarry near Ashmore. Lang Stone Quarry crushed limestone for agricultural Martin's Sand & Gravel produced sand and gravel for building Verling Pinnell produced gravel for road use and fill.

Cook.—Mineral products included clays, lime, limestone, elemental sulfur, and sand and gravel. Material Service Corp. crushed limestone at its Federal, Riverside, Thornton, and Stearns quarries, chiefly for use as concrete aggregate and roadstone. Consumers Co. produced crushed limestone and dolomite for refractory use, concrete aggregate and roadstone, railroad ballast, asphalt filler, and agricultural purposes at its Bellwood and McCook quarries. Dolese & Shepard crushed limestone for concrete aggregate and roadstone, railroad ballast, flux, and agricultural use.

Quicklime and hydrated lime for building, chemical, and industrial uses were produced by Marblehead Lime Co. at plants in South Chicago and Thornton. Standard Lime & Stone Co. produced quick-

lime at La Grange for refractory purposes.

Miscellaneous clay used to manufacture heavy clay products was produced by the following companies: Carey Brick Co., Chicago Brick Co., Illinois Brick Co., and Tuthill Building Materials Co.

Sand and gravel for building, paving, railroad ballast, and fill was produced by Chicago Gravel Co. at its Hammond plant.

Sulfur was recovered as a byproduct by The Pure Oil Co. at its

Lemont refinery.

Crude perlite produced in Western States was expanded at the American Bildrok Co. and Silbrico Corp. plants for use chiefly as a lightweight aggregate in plaster and concrete.

Zonolite Co. exfoliated vermiculite at its Chicago plant from crude

material mined in other States and South Africa.

Crawford.—Sand and gravel for building and road use was produced by Bowman's Gravel Pit near Palestine. William J. Wyke produced sand and gravel for building and road construction and other uses.

Cumberland.—A. B. C. Gravel Co. and Casey Stone Co. produced sand and gravel for building and road purposes. George Orndorff & George Spence produced gravel for building use at a portable plant

near Greenup.

De Kalb.—Sand and gravel for building and road use was produced by Elmer Larson, Inc., and Donald Tyrrell. Kirkland Gravel Yard produced gravel for building and road use at a fixed plant. gravel was produced under contract for the State highway commission.

Douglas.—Moffat Coal Co. shipped coal from its Murdock mine by

rail and truck, the latter principally for local trade.

Du Page.—Elmhurst-Chicago Stone Co. crushed limestone for concrete aggregate and roadstone, railroad ballast, and agricultural use. It also produced sand and gravel for building and road construction. Purnell's gravel pit produced gravel for road use.

Edwards.—Miscellaneous clay used in manufacturing heavy clay

products was produced by Albion Brick Co. at Albion.

Effingham.—Winters Stone Quarry produced crushed limestone from

a quarry near Altamont for agricultural and road purposes.

Fayette.—Burtschi Sand & Gravel Co. produced sand and gravel for building use at a fixed plant near Vandalia. Charles D. Lutz & Sons produced molding sand near Mulberry Grove. Road gravel was produced under contract for the county highway department.

Ford.-W. V. Williams produced gravel for road construction and other uses at a portable plant. The State highway commission con-

tracted for road gravel.

Franklin.—In 1955, Franklin County ranked fourth in the State in bituminous-coal production. Output was reported by Chicago, Wilmington & Franklin Coal Co. (Orient No. 1 and No. 2 mines) and Old Ben Coal Corp. (Old Ben No. 9, No. 14, and No. 22 mines). All mining in the county was underground. Approximately 94 percent

of the production was shipped to markets by rail.

Fulton.—Coal and sand and gravel were produced in the county in 1955; coal constituted 99 percent of the value of mineral output. Fulton County was the third-ranking coal-producing county in Illinois The following companies mined at 22 mines (8 underground and 14 strip) during the year: Becker Coal Co., Big Ten Coal Co., Bruketta & Son Coal Co., Fairview Collieries Corp., Glore & Fritz Coal Co., J. & J. Coal Co., Inc., Key Coal Co., Laynes Coal Co., Lingenfelter Coal Co., Little Sister Coal Corp., Lump Coal Co., Maccanelli Coal Co., Arthur Malmgren, Pine Bluff Coal Co., Pschirrer Coal Co., Putt Creek Coal Co., Inc., Walter Richard Coal Co., Truax-Traer Coal Co., and United Electric Coal Cos.

Liverpool Materials Co. produced sand and gravel for building and road construction at a dredge near Liverpool. Road gravel was produced under contract for the county highway department and the

State highway commission.

Gallatin.—Coal was produced by the following 7 companies from 4 underground mines and 3 strip pits: B. & W. Coal Co., Blue-Blaz-Bloc Coal Co., Oak Hill Coal Co., Pekin Coal Co., Randall Coal Co., Richardson Coal Corp., and Sunvalley Coal Co. About 93 percent of coal output was shipped to markets by barge on the Ohio River.

Miller Sand & Gravel Co. produced gravel for road use. county highway department produced sand and gravel for building and road purposes. The State highway commission contracted for

sand and gravel for road use.

Greene.—Orton Quarry crushed limestone for agricultural and road use. Lyndall W. Wyatt produced clay near Roodhouse for use chiefly in manufacturing firebrick and block. The only producer of coal was Birch Creek Coal Co., at a strip pit near Roodhouse. Virtu-

ally the entire output was sold to local trade.

Grundy.—Northern Illinois Coal Corp. was the sole producer of coal in the county during the year. The company strip pit also extended into Kankakee County. Nearly 74 percent of the coal output from Grundy County was shipped to markets by rail; the remainder was for local consumption. Material Service Corp. produced sand and gravel for building purposes. The State highway commission contracted for sand for road use. Illinois Clay Products Co. produced clays near Coal City and Morris. Output was used for refractory and heavy clay products.

Hancock.—Colchester Stone Co., The Gray Quarries, W. F. Hamma Quarry, and R. L. O'Neal & Sons produced crushed and broken limestone for riprap, concrete aggregate and roadstone, and agri-

cultural use.

Triple S Mines produced coal for local consumption at a strip pit

near Augusta.

Hardin.—Aluminum Co. of America operated its fluorspar properties in Hardin County throughout the year. Mining was conducted through 7 shafts varying from 160 to 800 feet in depth and was done in shrinkage stopes. Its adjacent mill processed the ore by heavymedium separation followed by flotation concentration. Products were lead, zinc, and fluorspar concentrate. The mill purchased custom ore. Minerva Oil Co., although operating several fluorspar

mines, produced and recovered zinc concentrate only from the Minerva No. 1 mine and mill. An underground primary crushing plant was installed at this mine, and new flotation cells and a zinc-lead circuit were added to the milling equipment. For the first time Minerva Oil Co. loaded zinc concentrate on barges at Cave-in-Rock for shipment to the Pittsburgh area. Hoeb Mining Co. and Goose Creek Mining Co. began producing fluorspar. Ozark Mahoning Co. mined and milled throughout the year. Custom ore was received at the mill and treated by flotation concentration with separate lead, zinc, and fluorspar circuits. A part of certain fluorspar concentrates, several grades being made, were pelletized. Several other small companies in the county produced fluorspar ore containing some lead and/or zinc ore, but it was recovered only when sent to one of the custom In general, the considerable demoralization among fluorspar producers was due to poor markets, low prices, and higher costs. High imports of cheaper foreign ores mostly were blamed for this unhealthy condition.

Silver was recovered from lead concentrate produced in the county. J. L. Bean Stone Co. and Okerson Quarry crushed limestone for agricultural and road use. P. R. Brown Stone Co. crushed limestone for use as concrete aggregate and roadstone. Crushed and broken limestone for riprap, roadstone, and agricultural purposes was pro-

duced by Rigsby & Barnard.

Henderson.—Output of crushed and broken limestone for riprap, concrete aggregate and roadstone, and agricultural use was reported in the county in 1955. Quarries included: R. A. Foll, Galbraith Stone Quarry, F. D. Graham, Olson Bros., and Raid Bros. Gravel for miscellaneous uses was produced by H. B. Graham.

Henry.—Schadt Service Co. produced sand and gravel for building use and other purposes. Oberlaender Sand Co. produced sand for molding, building, and road use. Road gravel was produced by Collinson Bros. and also under contract for the State highway com-

Alpha Coal Co., Bugos-White Coal Co., and Jim Mine, Inc., mined coal at three underground mines. Over 54 percent of the production

was sold to local trade.

Jackson.—Over 1 million tons of bituminous coal was produced in the county in 1955 from 3 underground and 3 strip mines. Companies included: Ed Blumenstock, Elk Coal Co., Red Wing Coal Co., Sunray Coal Co., and Truax-Traer Coal Co. (Burning Star Drift and Burning Star Strip). Nearly 93 percent of the county coal output was shipped to markets by rail. Illinois Quarry Co. produced crushed and broken limestone for riprap, roadstone, and agricultural purposes. The State highway commission contracted for sand for road use.

Jefferson.—During January, Orient No. 3, the only producing coal mine in the county, was mined by Chicago, Wilmington & Franklin Coal Co.; during the rest of the year it was mined by Freeman Coal Mining Corp. Shipments to consumers were principally by rail.

Jersey Quarry, Inc., and Sievers Bros. produced crushed limestone chiefly for agricultural and road use. The county highway

department produced road gravel.

Jo Daviess.—Lead and zinc were the principal mineral products of Jo Daviess County. This county is considered part of the TriState zinc-lead area of Iowa, Illinois, and Wisconsin and also the Northern Illinois zinc-lead district. The two principal producers were Eagle-Picher Co. and Tri-State Zinc, Inc.; others included Hickory Hill Mining Co. and Little Ginte Mining Co. Eagle-Picher Co. operated the Graham & Snyder mines and Graham mill throughout the year. Custom ore was accepted at the mill, which also processed ore from some of the company Wisconsin mines. employed jigs and flotation for concentration. The mine was an open-stope operation with ore hoisted from a 270-foot shaft. Throughout the year, except for the period July 1-15, Tri-State Zinc, Inc., mined ore by a modified shrinkage-stope system at its Gray mine and hauled it in trucks direct to the mill through an inclined adit. Jig and flotation concentration was employed at the mill. Hickory Hill Mining Co. discovered and hand-mined a crevice containing several hundred tons of nearly pure galena, which assayed in excess of 83 percent lead.

W. E. Broege crushed limestone for agricultural use at the Winters and Youngbloth quarries. Elmer G. Wienen & Sons crushed limestone for roadstone and agricultural purposes. The county highway

department produced limestone for road use.

Road sand was produced under contract for the highway commission

Johnson.—Charles Stone Co. and Southern Illinois Stone Co. crushed limestone for roadstone, railroad ballast, agricultural use,

and other purposes.

Kane.—Companies producing sand and gravel for building and road construction and other uses included Krahn Gravel Co., Material Service Corp., Raymond Sand & Gravel, Edward R. Schneider, Warren Sellen, and Fox Valley Gravel Co. The city of Aurora produced road gravel. The county highway department and the State highway commission contracted for sand and gravel for road use.

Fox River Stone Co. produced dimension and crushed limestone for rough construction, rubble, flagging, flux, roadstone, and agricultural

Kankakee.—Mineral products were clays, coal, limestone, and sand and gravel. Northern Illinois Coal Corp., produced bituminous coal from a strip pit, which extended into Grundy County; the greater Almost three-fourths of the output came from Kankakee County. coal was shipped to consumers by rail.

Dimension limestone was produced by Boubonnaise Stone Quarry for use as rubble, house stone veneer, and flagging. Lehigh Stone Co. crushed limestone for roadstone, railroad ballast, and agricultural use. Manteno Limestone Co. crushed limestone for agricultural and road

purposes. Eastern Illinois Clay Co., Kankakee Clay Products Co., and St. Anne Brick & Tile Co. produced miscellaneous clay used in manufac-

turing heavy clay products near Kankakee and St. Anne.

Portage-Manley Sand Co. produced sand for molding use. sand was produced under contract for the State highway commission.

Kendall.—Central Limestone Co. quarried limestone for use as flux, roadstone, and agricultural purposes. Elmer Larson, Inc., produced sand and gravel for building and road use. Road gravel was produced by the county highway department and also under contract for the

State highway commission.

Knox.—Approximately 1.75 million tons of coal was produced from 3 strip pits mined by Midland Electric Coal Corp. (Rapatee and Middlegrove mines) and Stonefort Corp. (Little John mine). Virtually all shipments to consumers were by rail.

Abingdon Rock Co., Inc., crushed limestone for agricultural and road purposes. L. K. Bandy Construction Co. produced sand for fill and road gravel. Purington Brick & Tile Co. produced clay near Gales-

burg for use in manufacturing heavy clay products.

Lake.—Producers of sand and gravel for building and road construction and other uses included Carl L. Barthel, Big Hollow Sand & Gravel Co., Inc., Consumers Co., and Paul Schumaker. The county highway department also produced gravel for building use. National Brick Co. produced clay employed in manufacturing building brick.

Lake Zurich Concrete Products Co. at Lake Zurich expanded crude perlite produced in Colorado for use as a lightweight aggregate in

plaster and concrete and other purposes.

La Salle.—La Salle County led the State in total value of mineral output (except for liquid fuels). Mineral products included sand and gravel, cement, clays, coal, and limestone. Portland and masonry cements were produced by Alpha Portland Cement Co., Lehigh Portland Cement Co., and Marquette Cement Mfg. Co. All three companies produced their own limestone, used in manufacturing cement, from quarries in the county. Sheridan Stone Co., Troy Grove Stone Quarry, Inc., and Utica Stone Co., produced limestone for agricultural and road purposes. Sand was produced in the county for a variety of purposes, including such special uses as glass, molding, blast, foundry, engine, abrasives, enamel, filler, and pottery. Sand and gravel was also produced for building and road construction, railroad ballast, and miscellaneous other uses. Commercial sand and gravel companies included: American Silica Sand Co., Inc., E. C. Bellrose Sand Co., Chicago, Burlington & Quincy R. R., Illinois Silica Sand Co., Ray LaBolle, La Salle County Portable, Inc., La Salle Silica Co., Moline Consumers Co., Edward O. Olson, Ottawa Silica Co., G. H. Pendergast & Co., River Industries, Inc., Spicer Gravel Co., Standard Silica Co., Wedron Silica Co., and Western Sand & Gravel Co. The county highway department and the State highway commission contracted for sand and gravel for road use. Clay producers during the year included Arthur Mart, Alpha Portland Cement Co., Marquette Cement Mfg. Co., Conco-Meier Co., LaClede-Christy Co., Mat-thiesson & Hegeler Zinc Co., and Streator Drain Tile Co. Output of Alpha Portland Cement Co. and Marquette Cement Mfg. Co. was used entirely in manufacturing cement. Other clay production was used for manufacturing firebrick and block, zinc retorts, building brick and other heavy clay products. LaClede-Christy Co. also produced coal near Ottawa for its own use.

Lawrence.—Gregory Gravel Co. sold building sand and gravel, paving gravel, and sand used for fill. Lawrenceville Sand & Gravel Co. produced road gravel. Paving sand and gravel and building gravel was produced by Vincennes Gravel Co., Inc., at its fixed plant near Lawrenceville. The county highway department and Illinois State Highway Commission contracted for paving gravel. Lee.—Limestone for concrete aggregate and agricultural use was produced by Frank N. Butler Co., Wilmer Gerdes Quarry, Ward McGinnis, and Stoneridge Limestone Co. Oregon Stone Quarries produced roadstone at an open quarry. Medusa Portland Cement Co. produced limestone and clay used for manufacturing cement. Butler Sand & Gravel Co. sold sand and gravel for building, engine sand, and road gravel from a fixed plant at Nelson. Building and paving gravel and pit-run gravel for miscellaneous use were produced by C. C. Macklin. Building and paving sand and gravel were produced by Rock River Ready Mix Co. The Illinois State Highway Commission contracted for paving sand. Portland and masonry cements were produced at a plant near Dixon by Medusa Portland Cement Co.

Livingston.—Limestone for use as concrete aggregate and agricultural purposes was quarried by Wagner Stone Co. and Pontiac Stone Co. Livingston Stone Co. sold concrete aggregate, agricultural stone, asphalt filler, and dust for coal mines. Ocoya Stone Co. produced crushed stone for concrete aggregate, agriculture, and asphalt filler. Pontiac Township Quarry produced roadstone. Estep Gravel Co. and Valley View Dirt & Gravel Co. produced paving sand. Diller Tile Co. and Streator Brick Co. mined miscellaneous clays for use in manufacturing brick and tile. Baiett & Talbot Coal Co. produced coal for local trade from a strip mine near Streator.

Logan.—Rocky Ford Limestone Co. produced crushed stone for concrete aggregate and agricultural use. Lincoln Sand & Gravel Co. sold engine and filter sand and building and paving sand and gravel. Contracts were placed by the Illinois State Highway Commission for paving gravel. The only producer of coal in the county in 1955 was Deer Creek Mine at its underground mine near Lincoln.

Macon.—Decatur Sand & Gravel Co. produced building and paving sand and gravel by dredging. Kirk's Gravel Pit and H. M. Rickgauer sold paving gravel. The city engineer, Decatur, and the Illinois State Highway Commission contracted for paving sand and gravel.

Macoupin.—Little Dog Coal Co. and Virden Mining Corp. underground mines near Gillespie and Virden, respectively shipped approx-

imately three-fourths of production to consumers by rail.

International Vermiculite Co. exfoliated vermiculite at Girard from crude material mined in Montana for use in high-temperature block, pipe covering, insulating cements, and industrial loose fill.

Madison.—Coal output was reported from 4 underground mines in the county by the following 5 companies: Livingston-Mt. Olive Coal Co., Mt. Olive & Staunton Coal Co., Lumaghi Coal Co., Bluff Coal Co., and Glen Carbon Mines, Inc. The only mine whose entire production was for local trade was operated by Bluff Coal Co. the first portion of the year, and by Glen Carbon Mines, Inc., the remainder

C. M. Lohr, Inc., and Mississippi Lime Co. of Missouri crushed limestone for agricultural and road use. Reliance Whiting Co. produced dimension, crushed and broken limestone for rough construction, flagging, riprap, mineral food, rock dust for coal mines, asphalt filler, putty filler, rubber filler, pottery, roadstone, and

agricultural purposes.

Alton Sand Co. and Gary Dredging Co. produced sand for building and road construction. Mississippi Lime Co. of Missouri reported output of sand for paving, engine, and other uses. Sand and gravel for road use was produced under contract for the State highway commission.

Clays used in manufacturing heavy clay products and for lightweight aggregate were produced by Alton Brick Co. near Alton.

Western Fire Brick Co. produced sandstone for refractory and

foundry use.

Marshall.—Consumers Co. produced building and paving sand and gravel at a fixed plant at Lacon. Vernon Henry produced building and paving gravel at a portable plant. Hydraulic-Press Brick Co. mined miscellaneous clay for manufacturing heavy clay products.

Massac.—Massac Materials Co. produced crushed limestone for road use. Road gravel was produced under contract for the county

highway department and the State highway commission.

McDonough.—Limestone for use as riprap and concrete aggregate was quarried by Colchester Stone Co. John McClure sold crushed and broken limestone for riprap, roadstone, and agricultural use. Clays were mined by Frank Nelson, J. R. Purtscher, Western Stoneware Co. and the Baird Clay mine for use in art pottery, stoneware,

flowerpots, and heavy clay products.

McHenry.—Limestone for flagging, concrete aggregate, and agricultural use was produced by Garden Prairie Stone Co., Inc. Sand and gravel for building, paving, and railroad ballast was produced by Consumers Co. at plants in Algonquin and Crystal Lake. Paving gravel was produced by Floyd M. Griebel and Wayne Nolan. Chicago & Northwestern Railway Co. produced railroad ballast and sand for miscellaneous uses. Sand for miscellaneous uses and sand and gravel for building and paving were reported by McHenry Sand & Gravel Co., Inc. Building and paving sand and gravel were produced by Crystal Lake Trucking & Excavating Co. O'Leary Construction Co. produced paving sand and building and paving sand and gravel. of building and building and paving gravel were reported by Tonyan Bros. The Illinois State Highway Commission contracted for paving gravel.

McLean. McGrath Sand & Gravel Co. sold sand and gravel for building and paving and gravel for fill. Building and paving sand was dredged by McDowell & Heidelberg. Paving sand was produced by Rowe Construction Co. Paving and road gravel was produced by the county highway department. Contracts for road gravel were

placed by the Illinois State Highway Commission.

Menard.—Athens Stone Quarry crushed limestone for roadstone

and agricultural purposes.

Four underground coal mines were in operation in the county in Lloyd Coal Co. mined near Tallula, and the Indian Creek Coal Co., Wilcox Verna Coal Co., and Forden Coal Co. mined near Petersburg. The entire output was for local consumption.

Springfield Clay Products produced clay for use in manufacturing

heavy clay products.

Mercer.—Independent Materials Co. crushed limestone for road use and other purposes. Clay used in manufacturing heavy clay products was produced near Aledo by hydraulic-Press Brick Co.

Monroe.—Columbia Quarry Co. crushed limestone for metallurgical uses, roadstone, dust for coal mines, mixed feeds, and agricultural purposes. Maeystown Quarry Co. crushed limestone for road use. Road sand was produced under contract for the State highway commission.

Montgomery.—The only producer of coal in the county in 1955 was the Freeman Coal Mining Corp. at the Crown underground mine near Farmersville. Output of over 1.5 million tons was reported;

84 percent was shipped by rail.

Litchfield Stone Co. quarried limestone for agricultural and road Nokomis Limestone Quarry produced crushed limestone

for road use.

Ogle.—Limestone for concrete aggregate, roadstone, and agricultural use was produced by Kutz Bros. Co., Clarence Lenstrom, Macklin Bros., Norris & Ludewig, and Oregon Stone Quarries. Crushed limestone for road use was produced by Rockford Blacktop Construction Co. and the county highway department. Sand for miscellaneous use was produced by Byron Sand & Stone Co. E. C. Kalpak operated a dredge and produced gravel for building use. Shilling's Gravel Pit produced gravel for building and road construction. Kutz Bros. Co. and Floyd Weigle produced road gravel. Sand and gravel for building and road construction was produced by Rockford Blacktop Construction Co. McGrath Sand & Gravel Co. produced sand for engine use, gravel for railroad ballast and sand and gravel for building and road purposes. National Silica Co. produced ground sand for filler, foundry use, and other purposes. Leaf River Township Highway Department produced road gravel. Sand and gravel for road use was produced under contract for the county highway department and the State highway commission.

Peoria.—Bituminous coal was produced at 12 mines in the county in 1955. Ninety-one percent of the output was mined from 5 strip mines; the remaining 9 percent came from 7 underground mines. These mines were operated by the following companies: O. W. Lightbody Coal Co., Charter Oak Coal Co., Big Bear Coal Co., Superior Mining Co., Lee Coal Co., Collins Bros. Coal Co., Zaborac Coal Co., Howard Scott Coal Co., Pioneer Collieries Co., Morgan Coal Co.,

J. & J. Coal Co., Inc., and Albrecht Coal Co.

Sand and gravel was produced in the county for building and road construction, railroad ballast, and other purposes. Commercial operators included: Chillicothe Gravel Co., Construction Materials Co., Coogan Gravel Co., McGrath Sand & Gravel Co., Stevers, Inc., and C. L. Swords & Son. Sand and gravel for road use was produced under contract for the city of Peoria.

Chipman Stone Quarry crushed limestone for agricultural use. LaMar Stone Co. and Princeville Stone Co. quarried limestone for Trivoli Stone Co. crushed limestone agricultural and road purposes.

for agricultural use and other purposes.

Perry.—Coal, the only mineral product in the county in 1955, came from 4 underground mines and 4 strip mines. The companies Service Coal Co., Big 5 Coal Co., and Truaxwere as follows: Traer Coal Co. (Pyramid mine and mine No. 2), near Pinckneyville; Cutler Coal Co., Inc., Cutler; United Electric Coal Cos. (No. 11 mine), Union Collieries Co. (New Kathleen), near DuQuoin; and Southern Illinois Coal Corp., Percy. The latter mine extends into Randolph County; in 1955, approximately 76 percent of the production was

mined in the Perry County part.

Pike.—Lacey & Bauer produced dimension, crushed, and broken limestone for rough construction, riprap, agricultural, and road purposes. Narvin O. Lumley and Pearl Stone Co. produced crushed limestone for agricultural use. Missouri Gravel Co. produced sand and gravel for road use and gravel for railroad ballast. Road gravel was produced by Victor Callender and also, under contract, for the county highway department and the State highway commission.

Pope.—Gravel for road use was produced under contract for the county highway department and the State highway commission.

Crude fluorspar produced in Pope County was processed at mills in Hardin County, Ill., and in Kentucky by Egyptian Mining Co., Hicks Creek Mining Co., and P. M. T. Mining Co.

Pulaski.—Columbia Quarry Co. produced crushed and broken

limestone for riprap, railroad ballast, agricultural, and road purposes. Clay for absorbent uses was produced near Olmstead by American

Charcoal Co.

Randolph.—Coal output was reported from four mines in the county. The 2 underground mines of Moffat Coal Co. and Midwest Utilities Coal Corp. furnished over 71 percent of production. The remaining 29 percent was mined by Southwestern Illinois Coal Corp. and Ritter Coal Co. Only about 24 percent of the production from the Streamline mine, which extended into Perry County and was operated by Southwestern Illinois Coal Corp., came from Randolph County.

Allied Chemical & Dye Corp. produced crushed limestone, chiefly for chemical uses. Al Stotz produced limestone from an underground mine for use as riprap and roadstone and for agricultural purposes. Chester Quarry Co. crushed limestone for agricultural and road use. The county highway department and the Illinois State Penitentiary crushed limestone for road purposes. Southern Illinois Sand Co. produced sand for engine, filter, building, and road use at its fixed

plant near Chester.

Rock Island.—Collinson Stone Co. and Cordova Quarry, Inc., crushed limestone for railroad ballast and agricultural and road pur-Midway Stone Co. produced crushed limestone for filter beds and agricultural and road use. Gravel for building purposes was produced by Builders Sand & Gravel Co. Sand and gravel for road use was produced by Blackhawk Aggregates, Inc., and under contract for the State highway commission. Blackhawk Clay Products Co. produced clay near Carbon Cliff for use in manufacturing heavy clay products.

St. Clair.—Mineral products included clay, coal, lime, limestone, and sand and gravel. Production of bituminous coal was reported by 10 companies operating 3 strip and 7 underground mines in the county during 1955. Seminole Coal Corp., Morgan Mines, Inc., and Midwest-Radiant Corp. operated strip mines. Underground mines were operated by the following companies: Perry Coal Co., New West Side Coal Co., Inc., Mid-Continent Coal Corp., Schubert Coal Co., East Side Coal Co., Inc., Belle Valley Coal Co., and Shiloh Valley Coal Co.

Columbia Quarry Co. produced dimension limestone for rough architectural use and flagging and crushed and broken limestone for riprap, railroad ballast, roadstone, and agricultural purposes. East St. Louis Stone Co. and Casper Stolle Quarry & Construction Co. produced both dimension and crushed and broken limestone for use as rubble, flagging, riprap, roadstone, and stone sand and for agri-

cultural purposes.

Hecker Quarry, Inc., quarried limestone for agricultural and road Missouri-Illinois Material Co. produced sand for building and road construction, engine use, and sand blasting. Aluminum Co. of America produced quicklime at East St. Louis for building, chemical, and industrial uses. Hydraulic-Press Brick Co. produced clay at French Village for use as lighweight aggregate. Hill Brick Co. produced clay used for manufacturing heavy clay products from a

pit near Belleville.

Saline.—Nearly 2.5 million tons of coal was produced from 10 mines in the county in 1955. The six strip mine producers included: Sahara Coal Co., Inc. (No. 6 mine), Beecher Williams Coal Co. (No. 1 and No. 2 mines), near Harrisburg; Saxton Coal Corp. (No. 2 mine), and Houston Coal Co. near Carrier Mills; and Vinyard Coal Co. (No. 1 mine), Equality. The four underground mines were operated by Sahara Coal Co., Inc. (No. 5 and No. 16 mines), Peabody Coal Co. (No. 43 mine), both of Harrisburg; and Pioneer Mining Co., Equality.

Sangamon.—Coal was obtained underground at three mines in the county. Eddy Coal Co. and Cantrall Coal Co. mined near Cantrall. Farrand Coal Co. abandoned its mine near Riverton in March.

entire coal output in the county was for local consumption.

Buckhart Sand & Gravel Co. produced sand and gravel for building and road construction and other uses. Springfield Sand & Gravel Co. produced gravel for building use. Clear Lake Sand & Gravel Co. produced sand and gravel for building purposes and sand for road use at a fixed plant near Clear Lake.

Poston Brick & Concrete Products Co. and Springfield Clay Products Co. near Springfield produced clays used in manufacturing heavy

clay products and lightweight aggregate.

Schuyler.—Coal was produced from 5 mines; 2 were strip mined near Camden by Green Coal Co., and 3 were mined underground at Rushville by Wheelhouse Coal Co., A. H. McCormick & Sons, and D. & D. Coal Co.

The State highway Lyle B. Moushon produced sand for road use.

commission contracted for road gravel.

Scott.—Thomas Quarry crushed limestone for agricultural and road Krueger Quarry produced limestone for agricultural use.

Homer E. Grady produced gravel for miscellaneous uses.

Shelby.—Sand and gravel for building and road construction was produced by Hanfland Sand & Gravel Co. Road gravel was produced under contract for the county highway department. Quality Lime Co. quarried limestone for road use.

Stark.—The county highway department produced and contracted

for road gravel. Stephenson.-Limestone was crushed for concrete aggregate, roadstone, and agricultural purposes in 1955. Commercial quarry opera-

tors included: Ray Askey, Ed. Finkbeiner, Fortner Limestone Co., Gund Graham, and Scofield & Co. The county highway department produced crushed limestone for road use. Road gravel was produced by Scofield & Co. and West Point Township. Sand and gravel for road use was produced under contract for the State highway commission.

Tazewell.—Hoffer Construction Co., Inc., produced sand and gravel for building and road construction at a fixed plant near East Peoria. Output from the McGrath Sand & Gravel Co. fixed plants at Mackinaw and Pekin was used as sand and gravel for building and road purposes, sand for engine use, and gravel for railroad ballast. C. A. Powley produced sand and gravel for building and road construction, filter sand, and railroad ballast. Sand for road use was produced by Spring Lake Sand & Gravel. Road gravel was produced under contract for the State highway commission and for the Mason County Highway Department.

Peoria Brick & Tile Co. produced clay for manufacturing heavy clay

products.

Peat was produced by Manito Filler Co. from a bog near Manito. Output was used as a conditioner in mixed fertilizers.

Lakeside Coal Co., at its underground mine near Pekin, was the sole producer of coal. Production decreased considerably below 1954.

Union.—Anna Quarries, Inc., produced crushed and broken limestone for riprap, concrete aggregate, and roadstone, and asphalt filler and agricultural and other purposes. Jonesboro Stone Co. quarried limestone for agricultural use. Bittle & Emrick produced sand for road use.

Vermilion.—Coal output was reported from nine mines in the county Fairview Collieries Corp., United Electric Coal Cos., Two Rivers Coal Co., Kedas Coal Co., and Georgetown Coal Co. did strip mining; underground mines were operated by V-Day Coal Co., B-10 Coal Co., Deep Valley Coal Co., and Blue Lake Coal Co., all in the vicinity of Danville.

Material Service Corp. and the county highway department crushed

limestone for road use.

Western Brick Co. produced clay near Danville for use as lightweight aggregate and for manufacturing heavy clay products. General Refractories produced clay for use in manufacturing firebrick and block.

Producers of sand and gravel included: Blakeney Gravel Co., Lawrence Clifton, Lewis & Co., Jesse Speranze, and Elton Wagner. Output was used for building and road use and other purposes.

Wabash.—Mt. Carmel Sand & Gravel Co. dredged sand and gravel for building and road construction and railroad ballast. Sand and gravel for road use was produced by Dunbar Sand & Gravel Co. Sand and gravel for building and road use and other purposes was produced by Allendale Gravel Co.

Washington.—Bois Coal Co. near DuBois and Venedy Coal Co.

near Venedy, produced coal from underground mines.

Pitts Quarry and Radom Quarry, crushed limestone for agricultural and road use.

Wayne.—Road gravel was produced under contract for the county highway department.

White.—Eastwood Sand & Gravel Works produced sand and gravel for building and road construction at a fixed plant. Frashier Bros. produced road gravel and building sand. Road gravel was also produced by Miller Sand & Gravel Co. and under contract for the State highway commission.

Whiteside.—Limestone was crushed and broken for riprap, concrete aggregate and roadstone, railroad ballast, and agricultural purposes. Quarry operators included Alldritt Bros., Cordova Quarry, Inc., Johnson Coal Co., Fred R. McKenzie & Co., and the Clyde

Township Highway Department.

Anderson Ready Mix produced sand and gravel for building use. William L. Taber produced gravel for building purposes from dredging near Prophetstown. Ernest Johnson and Weldon W. Lawrence produced gravel for miscellaneous uses. Road gravel was produced by Max Lawrence, Midwest Sand & Gravel Co., Vernon Schrader Gravel, and the Jordan and Prophetstown Townships. The State

highway commission contracted for road gravel.

Will.—Material Service Corp. produced sand and gravel for building purposes at a fixed plant at Lockport and also produced crushed limestone for use as concrete aggregate and roadstone from its Romeo quarry. Chicago Gravel Co. produced sand and gravel near Plainfield and Rockdale for building and road construction, railroad ballast, and fill. Avery Gravel Co. and C. N. Monk produced road gravel. Lincoln Stone Co. crushed limestone for concrete aggregate and roadstone, railroad ballast, flux, and agricultural use. Crushed limestone for concrete aggregate and roadstone, railroad ballast, agricultural, and other purposes was produced by National Stone Co. The Illinois State Penitentiary produced limestone for agricultural and road use. The sole producer of coal in Will County in 1955 was the Wilmington

Coal Mining Corp. at its strip mine near Braidwood. F. E. Schundler & Co., Inc., exfoliated vermiculite and expanded

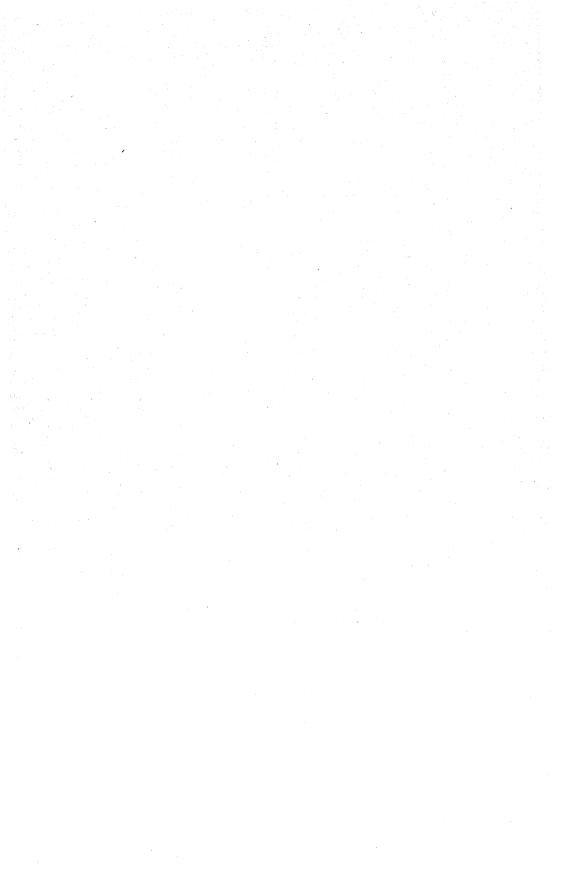
perlite at Joliet. The crude materials were mined in Western States. Williamson.—Williamson County led in bituminous-coal production A total of 32 mines—23 underground and 9 in the State in 1955. strip—was operated by the following companies: Barbara Kay Coal Co., Bell & Zoller Coal Co., Black Crystal Coal Co., Black Dot Coal Co., Blue Bell Coal Co., Blue Bird Coal Co., C. & C. Coal Co., Carmac Coal Co., Carterville Blue Blaze Coal Co., Cherry Hill Coal Co., Delta Collieries Corp., Forsythe-Carterville Coal Co., Freeman Coal Mining Corp., Harrisburg Coal Co., Hilliard Coal Co., Houston Bros. Coal Co., McHorn Coal Co., McLaren Equipment Co., Montgomery Enterprise, Inc., Moore & Son Coal Co., Morgan Mines, Inc., New Black Diamond Coal Co., New Walnut Valley Coal Co., Parton Coal Co., Prewitt Coal Co., Pure Coal Co., Stilley Coal Co., Stonefort Corp., Tregoning Coal Co., and Wilkins Coal Co. Montgomery Enterprise, Inc., acquired the Hilliard Coal Co. producing underground mine near Marion in July and continued mining the rest of the year. Ninety-five percent of county production was shipped to consumers by rail; the remainder was for local consumption. The county highway department crushed limestone for road use.

Winnebago.—Sand and gravel was produced in the county for building and road construction, railroad ballast, engine use, and other purposes. Producers during 1955 included: Anderson Sand & Gravel Co., Consumers Co., Illinois-Wisconsin Sand & Gravel Co., Kelly Sand & Gravel Co., Larson Bros. Sand & Gravel, Northwest Gravel Co., Porter Bros., Sahlestrom & Sons, and South Beloit Sand Co.

Charles Ind. Co., at the Byrne and Mulford quarries, Gregory Excav. Co., Art Zimmerman, and the county highway department crushed limestone for concrete aggregate and roadstone. William Nordhop and Porter Bros. produced crushed limestone for agricultural

and road use.

Woodford. - Wood-Mar Construction Co. produced gravel for road use.



# The Mineral Industry of Indiana

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

By Donald F. Klyce <sup>1</sup> and John B. Patton <sup>2</sup>



RODUCTION of minerals in Indiana in 1955 reached a record high; value was about 11 percent greater than in the previous year. Minerals used in the construction industries, notably cement, sand and gravel, and stone, gained substantially over 1954. To this group gypsum was added, as production from deposits in Martin County was begun during 1955.

Coal production rose 20 percent, but petroleum output remained near that in 1954. Production was reported for the following 13 minerals: Cement, clays, coal, gypsum, lime, marl, natural gas, peat,

petroleum, sand and gravel, stone, sulfur, and whetstones.

About 11 percent of the Nation's pig iron was produced in Lake County, which forms part of the Chicago industrial complex. alloys and coke were also produced in this area.

TABLE 1.—Mineral production in Indiana, 1954–55 1

	1	954	1:	955
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays Coal. Marl, calcareous Natural gas Petroleum (crude) Sand and gravel Stone Value of items that cannot be disclosed: Abrasives (whetstones), cement, gypsum, lime, peat, and recovered sulfur.	1, 946, 069 13, 400, 188 28, 536 735 11, 204 14, 405, 098 11, 181, 838	\$2, 990, 716 48, 913, 455 18, 515 44, 000 33, 160, 000 11, 879, 316 27, 460, 119	1, 729, 299 2 16, 149, 310 17, 080 1, 226 10, 988 17, 081, 982 14, 124, 406	\$2, 938, 010 258, 000, 085 10, 543 152, 000 31, 980, 000 14, 306, 348 34, 679, 589 43, 887, 787
Total Indiana 3		165, 369, 000		183, 479, 000

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption

\* Frontiers a microscope problem of the producers of the

<sup>1</sup> Commodity industry analyst, Region V, Bureau of Mines, Minneapolis, Minn.
2 Principal geologist, Geological Survey, Indiana Department of Conservation, Bloomington, Ind.

## REVIEW BY MINERAL COMMODITIES

### MINERAL FUELS

Coal.—The most valuable mineral produced was coal, valued at \$58 million compared with \$49 million in 1954. Bituminous-coal mining was concentrated in southwestern Indiana, chiefly in Warrick, Vigo, Pike, Greene, Sullivan, and Knox Counties. Warrick County production was expanded to supply the Clifty Creek powerplant near Madison and furnished most of the increase in State production. The powerplant was completed in 1955 to supply the Atomic Energy Commission plant at Portsmouth, Ohio, and ultimately will burn over 4 million tons of coal annually from Indiana and Kentucky mines. Two Warrick County mines—the Wright and the Victoria—have been developed primarily for this facility. In 1955 (their first year of full operation) over 2,300,000 tons was shipped from these mines.

During 1955 mining equipment comprising 1 mobile loading machine, 1 "mother" conveyor, and 3 shuttle cars was sold to companies in the State for use in further mechanizing coal mines. At

year end, 109 mobile loading machines were in use.3

The Bureau of Mines continued to analyze Indiana coal in 1955. A report includes analytical data showing the composition and quality of tipple and delivered samples of coal from 19 mines in 8 counties.

Peat.—Peat was produced from bogs in five counties during 1955. The output, which was sold for soil-conditioning purposes, consisted mostly of moss peat. Reed peat and humus peat were also dug. The bogs, of late Pleistocene origin, are in Blackford, De Kalb, Grant, Hamilton, and Wells Counties.

Petroleum and Natural Gas.—Petroleum production in 1955 totaled nearly 11 million barrels—about 2 percent less than in 1954. Natural-gas production increased to 1,226 million cubic feet from

735 million cubic feet in the preceding year. In 1955, 439 field wells and 229 wildcat (exploratory) wells were completed. Of these, 409 were dry, 236 produced oil, and 23 produced Drilling activity was concentrated in the southwestern section of the State. Exploratory drilling resulted in 18 producing wells and 7 new oilfields, including the Velpen pool in Pike County, the Johnsburg pool in Dubois County, and the South Piroque pool in Posey County.5

The reserves situation deteriorated during the year. At year end proved reserves of crude petroleum were estimated to be 57 million barrels, compared with 61 million barrels as of January 1, 1955. On January 1, 1956, natural-gas reserves were estimated at 33 billion cubic feet, a decrease of almost 3 billion cubic feet during 1955.6

During 1955 the Indiana Geological Survey studied underground storage conditions suitable for petroleum and liquid fuels.7

<sup>3</sup> Young, W. H., and Anderson, R. L., 1955 Sales of Mining Equipment: Coal Age, February 1956,

<sup>§</sup> Yong, W. H., and Anderson, R. E., Faso Sately and Apple of Coal;
§ Aresco, S. J., Haller, C. P., and Abernethy, R. F., Analyses of Tipple and Delivered Samples of Coal;
§ Bureau of Mines Rept. of Investigations 5221, 1956, 77 pp.
§ Data from Indiana Department Conservation, Geological Survey, Bloomington, Ind.
§ Data on reserves from American Gas Association and American Petroleum Institute, Proved Reserves of Crude Oil, Natural Gas. Liquids and Natural Gas.
§ Patton, J. B., Underground Storage of Liquid Hydrocarbons in Indiana: Indiana Geol. Survey Rept. of Progress 9, 1955, 19 pp.

TABLE 2.—Production of crude oil, 1955, by major fields 1

	The state of the s					
Field	County	Year dis-	Area	1955 production	Numb wells,	
		cov- ered	(acres)	(barrels)	Produc- ing	Com- pleted
Erskine Fairbanks. Ford South Griffin Consolidated. Heusler Consolidated.  Lamott Consolidated. Martin.  Marts. Monroe City Consolidated. Mount Carmel Consolidated. Mount Vernon Consolidated. Munford Hills Owensville East Consolidated. Owensville North. Patoka East. Rochester Rock Hill (New) Spencer. Springfield Consolidated. Terre Haute East. Union-Bowman Consolidated	do Vanderburgh Sullivan Posey Gibson and Posey Posey and Vanderburgh. Posey and Vanderburgh. Sullivan Knox Gibson and Knox Gibson and Knox Posey Gibson and Posey Gibson and Posey Gibson and Posey Gibson and Posey Gibson and Posey Gibson and Posey Gibson and Posey Gibson and Fosey Gibson and Fosey Gibson and Fosey Gibson and Fosey Gibson, Knox, and	1941 1930 1950 1950 1938 1938 1941 1947 1949 1950 1941 1940 1948 1948 1948 1948	1, 350 500 480 420 450 5, 990 1, 400 610 620 340 1, 710 620 700 420 420 420 420 420 1, 830 11, 500	342, 513 374, 284 133, 530 251, 048 101, 401 2, 372, 365 143, 400 108, 959 101, 503 103, 485 206, 808 413, 339 532, 767 140, 061 101, 416 151, 941 222, 790 436, 025 165, 434 123, 645 343, 261 143, 613 1658, 694	106 42 65 19 49 579 85 44 59 20 111 161 167 48 77 61 42 30 43 216 18	3 15 1 0 0 18 18 1 3 0 0 0 0 16 6 7 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(New). Welborn Consolidated West Hovey Undistributed	ldo	1941 1944	1, 300 190	440, 417 100, 944 2, 698, 357	112 12 1, 386	2 0 326
Total				10, 912, 000	4, 049	439

<sup>1</sup> Adapted from Dawson, T. A., and Carpenter, G. L., Oil Development and Production in Indiana During 1955: Indiana Department of Conservation, Geol. Survey Min. Econ. Ser. 2; Table 1.

#### NONMETALS

Abrasive Materials.—Indiana Sandstone Co., Inc., Bedford, produced natural whetstones at the Hindostan quarry near Orleans in Orange County.

Cement.—Portland and masonry cements were produced in Indiana by Louisville Cement Co., Speed (Clark County); Universal Atlas Cement Co., Buffington (Lake County); Lehigh Portland Cement Co. Mitchell (Lawrence County); and Lone Star Cement Corp., Limedale (Putnam County). Louisville Cement Co. also produced natural cement at its Speed plant. Universal Atlas used blast-furnace slag obtained locally as the chief raw material and obtained high-calcium limestone from Michigan quarries via Great Lakes shipping to supplement the calcium oxide requirement. The other three companies used limestone as the chief raw material and produced shale to furnish alumina and silica.

Portland-cement production in 1955 was about 7 percent larger than in 1954. This total includes portland cement used in the manufacture of other types of cements. Shipments data for the two years are not comparable. Shipment figures for 1955 exclude portland cement used in the manufacture of other cements, whereas 1954 data include it.

Clays.—Clay was produced in 26 counties; fire clay was mined in 8 counties; and miscellaneous clay was obtained in 22 counties. The

principal producing areas were in Clay, Greene, Morgan, and Park Counties. Miscellaneous clay was used in manufacturing heavy clay products (building brick, paving brick, draintile, sewer tile, and related products) and cement. Fire clay, produced from the underclays, beneath Lower Pennsylvanian coals, was used for firebrick, high-grade tile, refractories, stoneware, art pottery, and heavy clay products.

Overall, clay production was 11 percent lower than in 1954. The output of fire clay was 41 percent higher than in the preceding year; production of miscellaneous clays declined 24 percent from 1954 levels.

The Indiana Geological Survey report on the status of clay and shale industries briefly described types of materials, their geologic age, distribution, production, and uses.8

TABLE 3.—Clays sold or used by producers, 1946-50 (average) and 1951-55

Year	Fire	Fire clay Miscellaneous clay Total			tal	
	Short tons	Value	Short tons	Value	Short tons	Value
1946-50 (average)	389, 813 499, 723 397, 336 582, 639 374, 081 529, 310	\$662, 689 821, 672 732, 025 1, 163, 687 700, 044 1, 020, 703	826, 996 1, 025, 008 933, 962 1, 071, 473 1, 571, 988 1, 199, 989	\$667, 921 1, 092, 785 968, 184 1, 350, 540 2, 290, 672 1, 917, 307	1, 216, 809 1, 524, 731 1, 331, 298 1, 654, 112 1, 946, 069 1, 729, 299	\$1, 330, 610 1, 914, 457 1, 700, 209 2, 514, 227 2, 990, 716 2, 938, 010

Gypsum.—Production from the gypsum deposits near Shoals, in Martin County, which had been in a development stage, began during 1955. National Gypsum Co. and United States Gypsum Co. began processing crude ore at its mines and mills about July 1955.

Lime.—The Indiana State Farm in Putnam County produced a

small quantity of quicklime for its own use.

Marl, Calcareous.—Marl, for agricultural purposes, was produced in three counties—Fulton, Marshall, and Noble.

TABLE 4.—Production of calcareous marl, 1950-55

Year	Number of producers reporting	Short tons	Value	Year	Number of producers reporting	Short tons	Value
1950	6	20, 380	\$13, 977	1953	4	13, 540	\$6, 398
1951	4	12, 960	18, 129	1954	6	28, 536	18, 515
1952	5	16, 414	9, 021	1955	5	17, 080	10, 543

Perlite.—Airlite Processing Corp. expanded crude perlite, mined in Western States, at its plant in Scott County. Output was used as a

lightweight aggregate for plaster and concrete.

Sand and Gravel.—About three-quarters of the counties in Indiana produced sand and gravel. Production in 1955 was nearly one-fifth greater than in the preceding year. Notable increases were registered in the output of molding and engine sands and sand and gravel for building and paving purposes.

 $<sup>^{8}</sup>$  Murray, H. H., Directory of Producers and Consumers of Clay and Shale in Indiana: Ind. Geol. Survey Directory 3, 1955, 42 p.

The 10 largest producers, in alphabetical order, were:

American Aggregates Corp., Greenville, Ohio. Bedford-Nugent Co., Inc., Evansville. Irving Bros. Gravel Co., Marion. Kickapoo Sand & Gravel Corp., Peru. Koch Sand & Gravel Co., Evansville. Material Service Corp., Chicago, Ill. Portage-Manley Sand Co., Rockton, Ill. Spickelmier Co., Indianapolis. Standard Materials Corp., Indianapolis. Western Indiana Gravel Co., Lafayette.

TABLE 5.—Sand and gravel, sold or used by producers in Indiana, 1954-55, by classes of operations and uses

		1954			1955	
		Value	,		Value	)
	Short tons	Total	Average per ton	Short tons	Total	A ver- age per ton
COMMERCIAL OPERATIONS						
Sand: Molding Building Paying Grinding and polishing Engine Other Undistributed 1	468, 708 2, 789, 461 2, 463, 947 76, 905 98, 808 88, 329	\$571, 795 2, 030, 637 1, 549, 310 57, 480 61, 774 54, 731	\$1. 22 . 73 . 63 . 75 . 63 . 62	891, 641 4, 005, 960 2, 448, 005 16, 381 109, 801 107, 803 69, 644	\$1, 129, 676 2, 667, 631 1, 876, 079 7, 977 80, 454 81, 807 61, 841	\$1. 27 . 67 . 77 . 49 . 73 . 76 . 89
Total commercial sand	5, 986, 158	4, 325, 727	. 72	7, 649, 235	5, 905, 465	.77
Gravel: Building Paving Railroad Other		3, 139, 370 3, 458, 007 328, 692 373, 850	. 99 . 92 . 79 . 79	3, 300, 897 4, 716, 481 485, 416 372, 607	3, 231, 593 4, 321, 254 392, 777 227, 712	. 98 . 92 . 81 . 61
Total commercial gravel	7, 827, 088	7, 299, 919	. 93	8, 875, 401	8, 173, 336	.92
Total commercial sand and gravel	13, 813, 246	11, 625, 646	.84	16, 524, 636	14, 078, 801	. 85
GOVERNMENT-AND-CONTRACTOR					,	
Sand: Paving Gravel: Paving	95, 685 496, 167	74, 706 178, 964	.78 .36	557, 346	227, 547	.41
Total Government-and-contractor sand and gravel	591, 852	253, 670	. 43	557, 346	227, 547	. 41
ALL OPERATIONS						
SandGravel	6, 081, 843 8, 323, 255	4, 400, 433 7, 478, 883	.72 .90	7, 649, 235 9, 432, 747	5, 905, 465 8, 400, 883	.77 .89
Grand total	14, 405, 098	11, 879, 316	.82	17, 081, 982	14, 306, 348	. 84

<sup>&</sup>lt;sup>1</sup> Includes filter sand (1954) and railroad ballast (1955) to avoid disclosing individual company confidential data.

Slag.—Steel companies in the Lake County industrial area produced slag for use as aggregate and insulating material, for expansion as a lightweight aggregate, and for raw material in the cement and mineral-wool industries. The slag was a byproduct of blast-furnace operations.

Stone.—The tonnage and value of stone quarried in Indiana increased 26 percent over 1954 and was valued at nearly \$35 million. Dimension limestone furnished 53 percent of the value; crushed limestone, 45 percent; and dimension sandstone, 2 percent.

Indiana has for many years been a principal source of finished building stone; the Salem limestone formation has yielded most of this material. Quarries and mills were principally in Lawrence and

Monroe Counties in and near Bedford and Bloomington.

Leading producers of dimension limestone were Indiana Limestone Co., Ingalls Stone Co., and Heltonville Limestone Co., Bedford; and Bloomington Limestone Corp., Empire Stone Co., B. G. Hoadley

Quarries, Inc., and Victor Oolitic Stone Co., Bloomington.

Crushed limestone, used for concrete aggregate, agriculture, road construction, and in manufacturing cement, was produced in 39 counties. The leading counties, in order of crushed-stone production value were Putnam, Lawrence, Clark, Grant, and Monroe. Major producers of crushed stone include Erie Stone Co., France Stone Co., Louisville Cement Co., Newton County Stone Co., and Pipe Creek Stone Co.

Indiana Sandstone Co., Inc., near Huron in Lawrence County, and French Lick Sandstone Co., Inc., near French Lick, Orange County, quarried dimension sandston; which was sawed, split, and sold as

building stone.

TABLE 6.—Limestone sold or used by producers, 1954-55, by uses

		1954		1955			
Use		Value	)		Value		
	Quantity	Total	Aver- age per ton	Quantity	Total	Aver- age per ton	
Dimension: Building: Rubbleshort tons. Rough constructiondo Rough architecturalcubic feet Dressed (cut and sawed)do Flagging and rubbledo	49, 556 16, 222 2, 498, 519 5, 054, 282	\$128, 984 96, 918 3, 154, 864 11, 427, 362	\$2.60 5.97 1.26 2.26	(1) 3, 725, 392 5, 547, 378 1 276, 676	(1) \$4, 204, 560 14, 289, 137 1 35, 568	\$1. 15 2. 58 . 15	
Total (short tons approximate) 2	613, 356	14, 808, 128	24, 14	692, 335	18, 529, 265	26. 76	
Crushed and broken:  Riprapshort tons. Fluxing stonedo Refractory (dolomite)do	87, 105 98, 576	82, 687 122, 936	. 95 1. 25	455, 815 118, 930 3, 000	487, 673 147, 296 4, 350	1.07 1.24 1.48	
Concrete aggregate, roadstone, etc: Commercial do. Noncommercial do. Railroad ballast do. Agriculture do. Other 3 do.	6, 401, 833 3, 668 320, 720 1, 945, 673 1, 698, 831	7, 786, 927 4, 966 391, 296 2, 646, 616 1, 301, 816	1. 22 1. 35 1. 22 1. 36 . 77	8, 302, 582 270, 255 2, 078, 669 2, 178, 694	308, 536 2, 575, 569 1, 989, 068	1. 2: 1. 14 1. 24 . 9:	
Total commercialdo Total noncommercialdo	10, 552, 738 3, 668	12, 332, 278 4, 966	1. 17 1. 35	13, 407, 945	15, 572, 546	1. 10	
Total crushed and broken do	10, 556, 406	12, 337, 244	1.17	13, 407, 945	15, 572, 546	1. 1	
Total limestonedo	11, 169, 762	27, 145, 372	2. 43	14, 100, 280	34, 101, 811	2. 4	

<sup>1</sup> Included with "Flagging".

<sup>2 145</sup> pounds per cubic foot.
3 Includes limestone for cement and lime.

Sulfur.—Standard Oil Co. of Indiana recovered liquid sulfur from crude petroleum by the Mathieson Fluor process at the Whiting refinery.

### REVIEW BY COUNTIES

Adams.—Clay from the Krick Tyndall Co., Findlay, Ohio, pit at

Decatur was used in manufacturing brick and tile.

John W. Karch Stone Co. quarried at Bryant and Meshberger Bros. Stone Corp. at Linn Grove and Pleasant Mills. The stone was crushed and used for agricultural stone, roadstone, and concrete aggregate. Lybarger Gravel Co., Geneva, produced building sand and gravel and gravel for fill.

Allen.-Miscellaneous clay for use in manufacturing draintile was

mined by Walter A. Bolyard Tile Co., Monroeville.

May Sand & Gravel Corp., Fort Wayne, produced crushed limestone for concrete aggregate and road use, as well as paving sand and gravel. Paul C. Brudi Stone & Gravel Co., Inc., Fort Wayne, and W. & W. Gravel Co., Roanoke, produced sand and gravel for building and road

Bartholomew.-Meshberger Stone Co., Inc., quarried limestone at Columbus for refractories, filter beds, concrete aggregate, and agricultural stone.

Driftwood Gravel Co. and Charles Tobias, Columbus, produced sand and gravel to be used for building and road purposes. county highway department contracted for paving gravel.

TABLE 7.—Value of mineral production in Indiana, 1954-55, by counties 12

County	1954 8	1955	Minerals produced in 1955 in order of value 2
Adams Allen Bartholomew	656, 180	\$576, 479 841, 629	
Sartholomew	(4)	291, 673	
BentonBlackford	(1)	5, 738	Sand and gravel
Rooma	(2)	144,000	Stone, clays, nest
Boone arroll	(4) 330, 113	36, 511	Sand and gravel.
Parroll Pass Plark	330, 113	(4)	Stone sand and grown!
llark	(4)	494, 136	1 Do.
llay	(1)	(4)	Cement, stone, sand and gravel.
linton	4, 133, 621	3, 719, 541	Coal, Clays, Sand and pravel
rawford	29, 250	9, 475	Band and gravel.
aviess	(4)	(4)	Stone.
Dearborn Decatur Dec Kalb	370, 196	338, 522	Coal, sand and gravel, clays.
ecatur	(4) (4)	194, 780	Dang and gravel
e Kalh	8	231, 029	Stone.
velaware vubois lkhart	724, 585	223, 145	Sand and gravel, peat.
ubois	150, 479	574, 192	Stone, Sand and gravel
lkhart	226, 139	154, 894	Uoal, clavs, sand and gravel
avette	63, 645	287, 422	Sand and gravel.
ountain	492, 755	93, 565	Do.
ayette ountain ranklin	(4)	668, 108	Coal, sand and gravel, clays.
шил 1	(4) 48, 500	900 46, 066	I Clavs.
IDSOIL	(1)		Sand and gravel, marl.
rant	(1)	2,881,093 1,224,426	UUMI, Sand and graval
reene	3, 376, 814	5,014,027	Divile, Sand and gravel neet
amuton	357, 802	483, 543	Cual, clavs, sand and grown
aucock.	(A) 1	72, 136	Stolle, Sand and gravel neat
arrison	/A\	89, 727	Dang and gravel.
endricks	(4)	79, 006	Stone.
		32, 930	Sand and gravel.
oward	(4)	400, 900	
obward intington ckson sper	319, 124	(4)	Stone, sand and gravel.
ckson	208, 671	348, 699	Stone, sand and gravel, clays.
sper	148, 520	275, 240	Sand and gravel, clays. Stone, sand and gravel,
	(4)		DIVILLE, NAIRI ATIN OTOTOI

TABLE 7.—Value of mineral production in Indiana, 1954-55, by counties 12-Continued

County	1954 3	1955	Minerals produced in 1955 in order of value 2
	(4)	\$249, 397	Stone, sand and gravel.
ennings	3 .		
ohnson		4, 822, 178	Coal, sand and gravel.
Cnox.	\$5, 466, 843	293, 722	Sand and gravel.
Cosciusko	156, 015	70.7	Do.
agrange	195, 267.	$\mathbb{R}^{2}$	Cement, sulfur, clays, sand and gravel.
ake	(4)	(4)	Sand and gravel.
a Porte	383, 135		Stone, cement, sand and gravel.
Lawrence	13, 056, 820		Stone, cement, sand and staven
Madison	659, 372		Stone, sand and gravel.
Viadison	2, 522, 447	2, 589, 898	Sand and gravel.
Marion	73, 741	86, 296	Sand and gravel, clays, marl.
Marshall		(4)	Gypsum, clays, coal.
Martin	200 967	509, 183	Sand and gravel.
Miami	320, 867	9, 279, 291	Stone.
Monroe	7,069,004	102, 140	Clave cand and gravel.
Montgomery	151, 114	102, 140	Clays, sand and gravel, stone.
Morgan	384, 829	389, 180	Stone.
Mowton	646,000	579,000	Sand and gravel, marl.
Noble	28, 473	28, 825	Dalla and Staver, morr.
Unongo	(4)	698, 810	Stone, abrasives.
Orange	871, 953	1, 386, 160	Coal, stone, clays, sand and gravel.
Owen	233, 674	493, 195	Clays, sand and gravel, coal.
Parke		(4)	Stone, clays.
Porry	400, 101	7, 272, 793	Coal.
Pile	7, 300, 210	377, 102	Sand and gravel, clays.
Porter	180,014		Sand and gravel.
Posev	30, 121	116, 923	Ctone alove sand and gravel.
Pulacki	1 (7 1	579, 225	Cement, stone, sand and gravel, clays, lime.
Putnam	(4)	(4)	Cement, Stone, Sand and Staver, Clays, Manual
Randolph	ì74,026	212, 348	Stone, sand and gravel.
Randorph		169, 310	Stone.
Ripley		185, 951	Stone, sand and gravel.
Rush		621, 542	Sand and gravel.
St. Joseph	(4)	265, 951	Stone.
Scott		569, 853	Stone, sand and gravel.
Shelby	4(8,800	(4)	Coal, sand and gravel.
Spencer	1 (2 1	8 .	Sand and gravel.
Starke	1 (7, )		Do.
Steuben	209, 204	244, 788	Coal, sand and gravel.
Sullivan	1 0.401.000	4, 883, 367	
Switzerland		60, 450	Stone.
Tippecanoe		703, 189	Sand and gravel.
Tippecanoe	• 1 3.2	(4)	Sand and gravel, clays.
Vanderburgh	-1 \/	1, 487, 716	Coal, sand and gravel, clays.
Vermillion	10, 419, 456	11, 045, 094	Do.
Vigo		49, 857	Sand and gravel, stone.
Wahash	-1,001	1,000	Sand and gravel.
Warren	- (1)	17 000 000	Coal, stone, sand and gravel.
Warrick	9,871,630	17, 902, 693	Coal, Stolie, built and Branch
Washington	_ (4)		Sand and gravel, stone.
Wayne	_   500, 144	567, 914	Sand and graver, stone.
Wells		345, 329	Stone, sand and gravel, peat.
wens		418, 400	Stone.
White		(4)	Sand and gravel.
Whitley		77, 264, 728	
Undistributed	83, 034, 490	11, 201, 120	_
	107 000 000	109 470 000	
Total	\ 165, 369, 000	183, 479, 000	· 1

The following counties are not listed because no production was reported: Brown, Floyd, Jefferson,

Ohio, Tipton, and Union.

Except for natural gas and petroleum, which was not available by counties. Value of these commodities is included with "Undistributed".

Revised figures.

3 Revised figures.
4 Figure withheld to avoid disclosure of individual company confidential data; included with "Undistributed".

Benton.—Material from the Mount Gilboa Gravel Co. gravel pit

at Remington was used for road maintenance.

Blackford.—Inman Tile Co., Hartford City, produced clays for use in draintile. Montpelier Stone Co., Inc., quarried limestone at Montpelier for roadstone and concrete aggregate. Hartford Peat & Gravel Co. produced peat for soil conditioning from a bog near Hartford City.

Boone.—Road gravel was produced by Harold Blacker, Colfax; W. K. Murray, Frankfort; Glen Reagan, Lebanon; and for the Clinton County Highway Department. Routh Gravel Plant, Zionsville,

produced sand and gravel for building purposes.

Carroll.—Stuntz-Yeoman Co. limestone quarry and crusher at Delphi produced agricultural stone, roadstone, and concrete aggregate. Brim Gravel Transit Mix Co., Inc., Flora, at its pit in Monroe Township; Chester Brovont (Camden), and Lloyd Gangwer (Cutler) produced gravel.

Cass.—The Cass County Stone Co. quarry and crusher in Logansport produced limestone. Output from France Stone Co., Toledo, Ohio, quarry at Keeport was used for agricultural stone, concrete

aggregate, railroad ballast, and metallurgical purposes.

Great Lakes Foundry Sand Co., Detroit, Mich., produced foundry sand at Lake Cicott. Greenville Gravel Co., Logansport, produced sand and gravel for building, and the county highway department contracted for paving gravel.

Clark.—The Louisville Cement Co., Inc., plant at Speed manufactured portland, masonry, and natural cements and limestone and clay

used in cement manufacture.

T. J. Atkins & Co. of Jeffersonville at Claysburg and Sellersburg Stone Co. at Speed quarried limestone, producing crushed stone for agricultural stone, roadstone, and concrete aggregate.

Sand and gravel was produced by Yoder Same, Jeffersonville, and Walter J. Hieb Sand & Gravel, Inc., Louisville, Ky., to be used for

building purposes and railroad ballast.

Clay.—Fire clay and miscellaneous clay for use in manufacturing heavy clay products, firebrick, stoneware, and tile were produced from underclay and shale. Companies in the Brazil area were: American Vitrified Products Co., Big Bend Collieries, Inc., G. & F. Corp., Log Cabin Coal Co., Quality Coal Co., and Ren Coal Co. Brown Coal Co. produced clay for stoneware at Centerpoint.

Coal was mined in nine strip mines. In addition to the coal companies listed above, production was reported by Ayrshire Collieries Corp., Gillespie Coal Co. and Turner, Thompson & Albin Coal &

Clay Co.

Clyde Bullerdick Gravel Co., Poland, and H. & H. Sand & Gravel,

Brazil, produced sand and gravel for building and paving.

Clinton.-Joe Conrad, Frankfort, produced road gravel for the

county highway department.

Crawford.—Hy-Rock Products Co., Marengo, and Mulzer Bros., near Eckerty, quarried limestone for agricultural use, roadstone, and concrete aggregate. Riprap and railroad ballast were also produced by Hy-Rock Products Co.

Daviess.—The Kretz Brick Co. pit near Montgomery produced

clay for use in brick and tile.

Hicks Coal Co. and Loogootee Block Coal Co., Inc., operated strip mines.

John E. Mize, Elnora, and Western Sand & Gravel Co., Plainville, produced sand and gravel for building and paving.

Dearborn.—Dearborn Gravel Co., Lawrenceburg, and Laughery

Gravel Co., Inc., Aurora, produced sand and gravel.

Decatur.—Limestone quarries producing agricultural stone, roadstone, and concrete aggregate were: Harris City Stone Corp., Greensburg; Layton Stone Co., Westport; and New Point Stone Co., Batesville.

De Kalb.—Humus Peat Moss Co. produced moss and humus peat

at Corunna.

The Burtzner Bros. & Wilhelm pits at Garrett and Waterloo produced sand and gravel. Other producers were Tom Day, and Flegal & Faber, Inc., Hamilton; Irving Ready Mix, Inc., Harlan; and Harold J. Krafft, Spencerville. Material was used principally for building and paving.

Delaware.—J. & K. Stone & Gravel, Inc., Muncie, quarried limestone for concrete aggregate and roadstone. In the Muncie area, Fullhart Sand & Gravel, Muncie Excavating Co., and Park Sand &

Gravel, Inc. produced sand and gravel.

Dubois.—Fire clay and miscellaneous clay were produced by Hugo Bartlet, Huntingburg Brick Co., and Louisville Pottery Co. at Huntingburg for use in firebrick, art pottery, stoneware, and heavy clay products.

Simon Ackerman, Mehringer & Frick, Victor Stenftenagel, and Tedrow Coal Co., produced bituminous coal at four underground mines.

Hoffman Sand-Gravel produced sand from a pit at Portersville. Elkhart.—Sand and gravel, mostly for building and paving use, was produced by Christner Gravel Co., Inc., Goshen Sand & Gravel Co., and Donald Mikel Roher, at Goshen; and by Yoder Ready Mixed Concrete Co., Inc., at Elkhart; and Elkhart Gravel Co.

Fayette.—Grubbs Bros. and Connersville Gravel Co., Inc., Connersville, produced sand and gravel to be used for building and paving.

Fountain.—Hydraulic-Press Brick Co. (Crawfordsville), Poston-Herron Brick Co. (Attica), and Rostone Corp. (Lafayette) mined clays for heavy clay products and chemical purposes.

Economy Coal Co. and Morgan Coal Co. operated strip mines. Neal Gravel Co., Inc., Covington, and Towell & Towell, Kingman,

produced sand and gravel for building and paving.

Franklin.—Herman H. Wessel Co., Batesville, produced clay at its pit at Huntersville for use in making draintile.

Fulton.—M. E. Zellers produced marl for agricultural use at

Rochester.

George E. Metzger and Van Duyne Block & Gravel Co. (Rochester), S. S. & B. Gravel Co. (Leiters Ford), and C. G. Smith (Akron) pro-

duced sand and gravel.

Gibson.—Saxton Coal Corp. produced from a strip mine near Oakland City. Princeton Mining Co. and Somerville Coal Co. mined underground. Charles A. Griffin, Princeton, and Johnson Gravel Co., Owensville, operated sand and gravel pits.

Grant.—Glacier Peat Moss Co. produced moss peat from a bog at

Jonesboro.

Pipe Creek Stone Co. limestone quarry and crusher at Mier produced flagging, crushed stone for flux, agricultural stone, railroad ballast, concrete aggregate, and roadstone.

Irving Bros. Gravel Co., Inc., pit at Marion produced sand and

gravel for building and paving.

Greene.—Bloomfield Brick Co. operated a clay pit at Bloomfield and produced building brick and other heavy clay products from the material.

Coal was produced from three underground mines by Monarch Coal Co., Inc., Richardson Coal Co., and South Linton Coal Co. Strip mines were operated by Ax Coal Corp., Comet Collieries Corp., Lambright Coal Co., Al Lohr Coal Co., and Maumee Collieries Co.

Concrete Silo Co., Inc., and Nocus & Schofield, Bloomfield, pro-

duced sand and gravel.

Hamilton.—Fox Prairie Products, Inc., produced moss peat from a bog near Noblesville.

Stoney Creek Stone Co. limestone quarry and crusher at Nobles-

ville produced concrete aggregate and roadstone.

Sand and gravel was produced by Curt Ayers, Lebanon; Carmel Gravel Corp., Carmel; and F. Beaver & Sons, Inc., Clark Materials, Chauncey Craig, and Newton Gravel Co., Noblesville. The county highway department contracted for paving gravel.

Hancock.—The sand and gravel produced at Greenfield by Irving Materials, Inc., Delbert L. Reeves and Ed. Strubbe & Son was used

mostly for building and road construction.

Harrison.—Corydon Crushed Stone & Lime Co., Corydon, produced crushed stone for concrete aggregate, roadstone, and agricultural use.

Hendricks.—Standard Materials Corp., Indianapolis, sand and

gravel pit produced material for building purposes.

Henry.—Gravel was produced by Cooper & Priest, Paul Craig, and Henry I. McNew & Sons (Knightstown), J. L. McDonald (Honey Creek), Alpha Riley (Middletown), and the county highway department for use mainly in road construction.

Howard.—Yeoman Stone Co., Kokomo, quarry and crusher produced agricultural stone, roadstone, concrete aggregate, and flagging.

Sand and gravel pits were operated by Ted McKinney & Son, Tipton, and F. E. Thomas, Greentown. The Clinton County Highway Department contracted for paving gravel.

Huntington.—Majenica Tile Co. produced clay for draintile at

Erie Stone Co., Toledo, Ohio, quarried limestone at Huntington for use as agricultural stone, concrete aggregate, railroad ballast, and mineral-wool filler and for metallurgical purposes.

The county highway department contracted for paving gravel.

Jackson.—Jackson Brick & Hollow Ware Co. (Ewing), and Medora Brick Co. (Medora) produced clay for use in manufacturing heavy clay products. Lehigh Portland Cement Co. produced shale near Brownstown for use in the cement plant at Mitchell.

Medora Concrete Block Plant (Brownstown) and Spray Gravel Co., and Seymour Gravel Co., Inc. (Seymour) produced sand and

gravel.

Jasper.—W. C. Babcock Construction Co., Inc., Rensselaer, produced crushed limestone for agriculture, roadstone, and concrete aggregate.

Peter Dziabis and Rensselaer Gravel Co., Rensselaer, produced

sand and gravel.

Jay.—Martin Tile Co., Dunkirk, produced clay for use in heavy

clay products.

Rockledge Products Co., Portland, produced limestone for use as agricultural stone and roadstone.

Jennings.—The Paul Frank quarry and crusher at North Vernon produced concrete aggregate, roadstone, and agricultural stone.

The county highway department produced gravel at its pit for road

construction.

Knox.—Shasta Coal Corp. operated a strip mine. Enoco Collieries,

Inc., and Wolfe-Koenig Corp. mined underground.

Sand and gravel production was reported by Knox County Sand Co., Lenahans & Konen, Inc., John Schlomer & Sons, and White River Materials Co., all at Vincennes. The material was mostly used for

building and paving.

Kosciusko.—Sand and gravel was produced by Fuller's General Hauling, Estate of Roy R. Ruse, and Seth Yeiter, Warsaw; Donald Hiner, Pierceton; Sturm & Dillard Gravel Co., Syracuse; Charles R. Teeple, Leesburg; Western Indiana Gravel Co., Leesburg; and Zimmerman & Sons Sand & Gravel, Milford. The county highway department operated a gravel pit. Most of the material produced was used for building and paving. Some engine sand and railroad ballast were reported.

Lagrange.—Sand and gravel production was reported by Northrup Gravel Co. and Vern A. Pant (Lagrange), Wolcottville Sand & Gravel Corp. (Wolcottville), and the county highway department for use in

building and paving.

Lake. Universal Atlas Cement Co. produced portland, masonry,

and alumina cements at its plant in Buffington.

The National Brick Co., Chicago, Ill., operated a clay pit near

Munster. Heavy clay products were produced.

Molding, engine, building, and paving sands were produced by John N. Bos Sand Co., Chicago, Ill., from a pit at Miller. Construction Aggregates Corp., Chicago, Ill., produced sand at a pit at Aetna. J. K. Hall & Sons, Lowell, and Samocki Construction Co., East Chicago, also produced sand for building and paving.

Standard Oil Co. of Indiana recovered sulfur at its Whiting refinery.

La Porte.—Portage-Manley Sand Co. and Producers Core Sand

Corp. produced molding and engine sand at Michigan City.

Sand and gravel for building and paving was produced at Rolling Prairie by Clyde A. Bean, at La Porte by Frank Chlupacek, and at

Walkerton by J. & A. Gravel Co.

Lawrence.—Minerals valued at over \$15 million were produced in Lawrence County in 1955. Production of cement, dimension and crushed limestone, sandstone, and sand and gravel was reported. The quarries and mills of the Bedford area have made the name synonymous with fine building stone. Indiana Limestone Co., Ingalls Stone Co., and Heltonville Limestone Co. quarried and milled dimension limestone. Several other fabricators processed purchased stone. The Indiana Sandstone Co., Inc., produced dimension sandstone. Limestone was quarried and crushed for use as blast-furnance flux, concrete aggregate, roadstone, agricultural stone, and as filler. Bedford Ground Limestone Co. crushed spalls from the building-stone mills, and Oolitic Ground Limestone Co., (Bedford), Mitchell Crushed Stone Co., Inc. (Georgia), and Ralph Rogers & Co. (Springville), operated quarries and crushing plants.

The Lehigh Portland Cement Co. plant at Mitchell produced

portland and masonry cements and limestone used in manufacturing

C. E. Flynn produced fill sand from a pit near Bedford.

Madison.—Standard Materials Corp., Indianapolis, quarried limestone at Lapel and produced agricultural stone, concrete aggregate, and riprap.

Sand and gravel operations were reported by Myers Gravel & Sand Co., Inc., Riggs Equipment Co., Stiner Gravel Co., and Western Indiana Gravel Co., Anderson; and by Norman Stanley, Chesterfield.

Most of the material was used for building and paving.

Marion.—Large quantities of sand and gravel for building and road construction were produced in the Indianapolis area by American Aggregates Corp., John Jones & Sons, Inc., F. J. Schuster Coal Co., George Spees, Spickelmier Co., Standard Materials Corp., and F. B. Wicker & Sons.

Marshall.—Bremen Clay Products Co. mined clay at Bremen for use in heavy clay products. Sylvester Harnass, Knox, produced marl

for agricultural purposes.

Sand and gravel pits were operated by: Fred Appleman, Leroy Balsley, Floyd Bottorff, Sr., O. S. Goss & Sons, and Wood & Sons at Plymouth; Burns Gravel Co., Burr Oak Sand & Gravel Co., and R. & B. Gravel Co. at Culver; Broda Starnes at Tippecanoe; and David Stayton at Argos. Material was produced mostly for building and paving.

Martin.—Loogootee Clay Products Corp. mined clay at Loogootee for use in heavy clay products. National Gypsum Co. and United States Gypsum Co. mined and processed crude gypsum near Shoals.

Loogootee Block Coal Co., Inc., operated a strip mine.

Miami.—Sand and gravel for railroad ballast and building and paving was produced by Kickapoo Sand & Gravel Corp. and Jess Richardson, Peru; D. R. Keim, Roann; and J. C. O'Connor & Sons,

Inc., Fort Wayne, at a pit in Peru.

Monroe.—Building stone from quarries and mills in the Bloomington area was the most important mineral commodity produced. Dimension limestone was quarried by: Bloomington Limestone Corp., Empire Stone Co., Carl Furst Co., B. G. Hoadley Quarries, Inc., Independent Limestone Co., Indiana Limestone Co., Ingalls Stone Co., Midwest Quarries, Inc., Victor Oolitic Stone Co., Texas Quarries, Inc., and Wollery Stone Co., Inc. Stone quarried by the same company or purchased from other quarries was cut and dressed by 13 mills. Several other companies sawed stone and split it for veneer, and some split stone purchased in sawed form.

Indiana Calcium Corp. purchased mill spalls and produced a highcalcium limestone in its fine-grinding plant. This limestone was sold for a variety of uses, including filler, coal-mine dust, mineral food, and

agriculture.

Bloomington Crushed Stone Corp. produced agricultural stone, roadstone, and concrete aggregate at a quarry and crusher near

Bloomington.

Montgomery.—American Vitrified Products Co. and Hydraulic Press Brick Co. produced clay from pits at Crawfordsville for heavy clay products.

Also at Crawfordsville, James A. Kitts, Alex Le Jeune, Harry Petro,

Jr., and Lloyd E. Smith produced gravel mostly for road use.

Morgan.—Heavy clay products were produced from clays mined by Adams Clay Products Co., Martinsville; and Brooklyn Brick Co., Inc., and Indiana Drain Tile Co., Inc., both at Brooklyn.

Porter Cave Stone Co. and Clayton Winders & Sons quarried lime-

stone near Paragon.

Sand and gravel was produced mostly for building and paving by Edwards Sand & Gravel, Monrovia; and by Perle F. Hill and Bobby Hill, Jessup Sand & Gravel Co., Kivett Gravel Co., and Waverly Sand & Gravel Co., Martinsville.

Newton.—Newton County Stone Co., Inc., produced concrete aggregate, roadstone, and agricultural stone from a quarry at Kent-

land.

Noble.—Luther & Haney at Albion, Clint Ott at Kimmell, and Sylvan O. Shull at Rome City produced marl for agricultural purposes. Walter Barr (Rome City), Campbell & Sons and Ed Tipton (Albion), and Forest Geiger (Churubusco) produced sand and gravel for use in

building and paving. Orange.—Indiana Sandstone Co. produced whetstone at the

Hindostan quarry.

Limestone was quarried by Calcar Quarries, Inc., at Paoli, William M. Cave near French Lick, and Radcliff & Berry, Inc., at Orleans and west of Paoli.

Dimension sandstone was produced by French Lick Sandstone Co.,

Inc., French Lick.

Owen.—Fire clay was mined by Maumee Collieries Co. at Coal City for use as firebrick, refractories, art pottery, and other heavy clay

products.

Limestone was quarried by Dunn Limestone Co., Inc., and France Stone Products, Inc., at Spencer for use in agricultural stone, concrete aggregate, riprap, and metallurgical purposes. Ingalls Stone Co. produced architectural stone and riprap from a limestone quarry at

Burcham Bros., Inc., and Maumee Collieries Co. produced coal

from strip mines.

Gosport Gravel Co., Inc., Gosport, produced building and paving

sand and gravel.

Parke.—Fire clay and miscellaneous clay for use in making heavy clay products were mined. Pits were operated by Cayuga Brick & Tile Co., Bloomingdale; Clay City Pipe Co., Montezuma; and S. L. Turner Coal & Clay Co., Brazil.

Gerrard & Presley Coal Co., Maple Grove Coal Co., and S. L.

Turner Coal & Clay Co. produced coal from strip mines.

Western Indiana Gravel Co. produced building and paving sand and gravel at its two pits at Montezuma.

Perry.—Cannelton Sewer Pipe Co., Cannelton, and U. S. Brick Co.,

Tell City, mined clays for use in heavy clay products.

The Mulzer Bros. limestone quarry at Derby produced agricultural

stone and concrete aggregate.

Pike.—Coal was mined underground by: Arnold & Willes, Meyers Coal Co., Miley Coal Co., and Min-Win Coal Corp. Stripping operations were reported by Ayrshire Collieries Corp., Blackfoot Coal & Land Corp., Conder Coal Co., Davis Excavating Co., and Enos Coal Mining Co.

Porter.—Charles H. Schrock, Chesterton, mined fire clay for use

in pottery and refractories.

Molding and engine sands and sand and gravel for building and paving were produced by: John N. Bos Sand Co., Consumers Co., and Portage-Manley Sand Co. near Ogden Dunes; Crisman Sand Co.,

Inc., Gary; and K. Wyckoff, Valparaiso.

Posey.—Sand and gravel production was reported by Hagemann Sand & Gravel Co., Stoy Hughes Gravel Co., McDonald Gravel Co., Koch Sand & Gravel Co., William A. Williams, and New Harmony Sand & Gravel. Output was for railroad ballast and building and The county highway department contracted for paving gravel.

Pulaski.—At Francesville, Francesville Tile Co. mined fire clay for use in draintile; Francesville Stone Co., Inc., quarried and crushed lime-Riprap, concrete aggregate, agricultural stone, and material

for filter beds were produced.

Whipple Bros., Star City, operated a gravel pit.

Putnam.—Lone Star Cement Corp. produced portland and masonry cements in its plant at Limedale. Limestone for use in cement was also produced.

Indiana State Farm at Putnamville mined clays for use in heavy clay products, quarried limestone for agricultural use and concrete

aggregate and produced a small quantity of quicklime.

Near Greencastle, Ohio & Indiana Stone Co. quarried limestone, and France Stone Products, Inc. prepared finely ground limestone. Manhattan Crushed Stone Co. and Russelville Stone Co. produced limestone near Manhattan and at Russelville, respectively. Sons produced sand and gravel at Pleasant Garden.

Randolph.-H. & R. Stone Co., Ridgeville, and Hiatt Stone Co., Fairview, produced limestone for agricultural use and concrete aggre-Ernest L. Habben and Pugh Gravel Co. (Modoc), Harter Gravel Pit (Union City), Hutchens Gravel Co. (Lynn), and Marshall Retz (Winchester) produced sand and gravel, mostly for building purposes.

Ripley.—Limestone for roadstone, agricultural stone, concrete aggregate, and rubble was produced by Cord Stone Co. and Paul Frank, Inc., both near Versailles, and Ripley County Construction Co.,

Osgood.

Rush.—Limestone for agricultural use, concrete aggregate, and rubble was quarried by McCorkle Stone Co. near Milroy and by Rush County Stone Co., Inc., near Moscow.

Frank Alexander, Carthage, and W. P. Wolfal Co., Rushville,

produced sand and gravel.

St. Joseph.—Sand and gravel production was reported by Concrete Products Corp. and Dry Island Sand & Gravel Co., Mishawaka; George Lambert, La Porte; C. D. Smelser Co., Inc., South Bend Sand & Gravel Corp., George Toth, and Western Indiana Gravel Co., South Bend; and John G. Yerington, Benton Harbor, Mich., at The county highway department also operated a South Bend. gravel pit.

Scott.—Scott County Stone Co., Inc., Scottsburg, quarried limestone for agricultural stone and concrete aggregate.

Airlite Processing Co., Vienna, expanded perlite for use as a light-

weight aggregate for plaster and concrete.

Shelby.—Cave Stone Co., Inc., at Norristown, and St. Paul Quarries, Inc., at St. Paul quarried limestone for agricultural use, concrete

aggregate, railroad ballast, filler, and metallurgical use.

Sand and gravel was produced by Blue River Packing Co. and Elmer Caldwell at Morristown, and by E. T. Burnside, Inc., and Shelby Gravel, Inc., at Shelbyville. Sand and gravel for building and paving and some grinding and polishing sands were produced.

Spencer.—An underground coal mine was operated by St. Meinrad's

Abbey and a strip mine, by Mulzer Bros.

Hardy Sand Co., Evansville, produced molding sand at Richland. Starke.—Al Amidei at Bass Lake and Bruce Fletcher at Knox

operated gravel pits.

Steuben.—Sand and gravel for building and paving was produced by: Conway Garnes, Stonestreet Gravel Co., Inc., and the county highway department at Angola; Herbert Alleshouse at Pleasant Lake; George B. Foulk and Michigan Turnpike Gravel Co. at Fremont; Emery Spade at Orland; and Orville Stroh near Greenfield Mills.

Sullivan.—Buck Creek Coal Co., Inc., Fairview Collieries Corp., North Wilford Coal Co., Pandora Coal Corp., and West End Coal Co. mined coal underground. Strip mines were operated by Hale Coal Co., Maumee Collieries Co., S. A. Coal Corp., Sherwood-Templeton Co., and Tri-State Mining Corp.

Sand and gravel was produced by Burton Gravel Co., Graysville; the Merom Gravel Co., at Riverton, and West Carlisle Sand & Gravel, Sand and gravel for building, paving, railroad ballast, and

some engine sand were produced.

Switzerland.—Tri County Stone Co. of Osgood quarried limestone south of Cross Plains, producing agricultural stone and concrete aggre-

gate.

Tippecanoe.—Sand and gravel was produced by: Acme Materials, Inc., and Western Indiana Gravel Co. at Lafayette; H. A. Feldt at Most of the output Dayton; and E. H. Smith at Battle Ground.

was used for building, paving, and railroad ballast.

Vanderburgh.—Standard Brick & Tile Corp., Evansville, produced clay for heavy clay products. Bedford-Nugent Co., Inc., dredged in the Ohio River at Evansville and processed sand and gravel at plants in Vanderburgh and Spencer Counties, Ind., and Henderson County, Ky. Molding sand and sand and gravel for building, paving, railroad ballast, and other purposes were produced. Koch Sand & Gravel Co., Evansville, produced sand and gravel for building, paving, and railroad ballast.

Vermillion.—Fire clay was mined by Arketex Ceramic Corp. at Dana and by Clay City Pipe Co. at Montezuma. High-grade tile

and firebrick were produced.

Big Oak Coal Co., Blanford Coal Co., and K. M. & F. Coal Co.,

Inc., mined coal underground.

Ayrshire Collieries Corp. and Reed Coal Co. produced from strip mines.

Sand and gravel for building, paving, and railroad ballast was produced by Material Service Corp. at Cayuga, Samuel Ramsey at Perrysville, and Standard Materials Corp. at Clinton.

Vigo.—Terre Haute Vitrified Brick Works, Inc., mined clays for

use in heavy clay products.

Coal was produced from underground mines by M. B. & H. Coal Corp., Mt. Pleasant Mining Corp., Oak Grove Coal Co., Snow Hill Coal Corp., Tri-K Mining Co., and Viking Coal Corp. Strip mines were operated by Frazier Coal Co., Lone Star Coal Co., Inc., and Maumee Collieries Co.

In the Terre Haute area, G. A. Monninger, Quinn Gravel Co., Standard Materials Corp., and Wabash Sand & Gravel Co., Inc., produced sand and gravel for use in building, paving, and railroad ballast.

Wabash.—National Rock Wool Sales, Inc., quarried and crushed

limestone for mineral-wool filler at Lagro.

Hubert Baker (Wabash), Frank & Miller Gravel & Ready Mix Co. (Somerset), Eva K. Hart (Urbana), E. Lines (La Fontaine), and the county highway department produced sand and gravel for building and paving.

Warren.—Roderick Gravel Co., produced sand from a pit at West

Lebanon.

Warrick.—Lemmons & Co., Inc., quarried limestone for concrete

aggregate at Lynnville.

Coal production in Warrick County nearly doubled over the preceding year. Much of the output was shipped upriver to Madison, Jefferson County, to furnish fuel for the new steam-generating plant.

Production from underground mines was reported by Decker Coal Co., Houston Mining Co., Huffman Mining Co., Ingle Coal Corp., Polk Patch Mining Co., Quality Mining Co., Reed Mining Co., Inc., Rose Hill Mining Co., Inc., Rudolph Coal & Oil Co., Shaw Mining Co., and Three Coal Co.

Strip mines were operated by A. B. C. Coal Corp., Boonville Collieries Corp., Kennedy Coal Co., Lynnville Coal Co., Nixon Coal Co., Scales Coal Corp., Sunlight Coal Corp., Tecumseh Coal Corp., Victoria Coal Corp. and L. G. Wasson Mining Corp.

Road gravel was produced by Newburgh Sand & Gravel, Inc., at

Newburgh.

Wayne.—DeBolt Concrete Co., Richmond, produced limestone for agricultural stone, riprap, concrete aggregate, and railroad ballast and

sand and gravel for building and paving.

Sand and gravel was produced by American Aggregates Corp. (Richmond), Fisher Gravel Co. (Hagerstown), and Kirkpatrick Gravel Co., Inc. (Cambridge City). Paving gravel was produced for the city of Richmond and the county highway department.

Wells.—Erie Stone Co. and Heller Stone Co. produced limestone at Bluffton. Output was used for flagging, riprap, railroad ballast, agricultural stone, and concrete aggregate and for metallurgical purposes.

Irvin Gravel & Supply, Bluffton, produced gravel for building and paving.

William Graves produced peat humus at Warren. Ballards Peat-

Moss produced moss peat at Jackson.

White.—Monon Crushed Stone Co., Inc., quarried limestone for railroad ballast, concrete aggregate, and agricultural stone at Monon.

Whitley.—Allen-Whitley County Gravel Co., Inc., operated a sand and gravel pit at Columbus City. Output was used for building and paving.

# The Mineral Industry of Iowa

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 Iowa.

By Donald F. Klyce 1



INERAL production in Iowa in 1955 exceeded the previous record, established in 1954, by 8 percent, reaching a total value of \$63.5 million. Gains were registered in the production of cement, clays, gypsum, and stone. The value of coal and sand and gravel produced was less than in 1954.

Nonmetallic minerals and mineral fuels were produced in the State in 1955. Ranked according to value, they were: Cement, stone, sand and gravel, bituminous coal, gypsum, clays, peat, and lime.

TABLE 1.—Mineral production in Iowa, 1954-55 1

	1	954	1955		
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	
Cement: Portland	9, 858, 889 882, 849 1, 196, 698 1, 106, 626 4 12, 199, 65 13, 240, 087	\$27, 044, 464 920, 859 4, 502, 561 1, 096 9, 276, 530 16, 388, 141 251, 173 58, 798, 000	9, 914, 977 514, 966 (2) 1, 258, 357 1, 337, 160 11, 770, 836 15, 705, 412	\$27, 837, 418 1, 701, 574 (2) 4, 401, 857 4, 176, 710 8, 344, 832 18, 555, 176 1, 252, 282 63, 555, 000	

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption Production as measured by mine amplication, the producers).

Figure withheld to avoid disclosure of individual company confidential data.

Relates only to mines with a production of 1,000 tons or more.

The total has been adjusted to avoid duplication in the value of clays and stone.

<sup>1</sup> Commodity industry analyst, Region V, Bureau of Mines, Minneapolis, Minn.

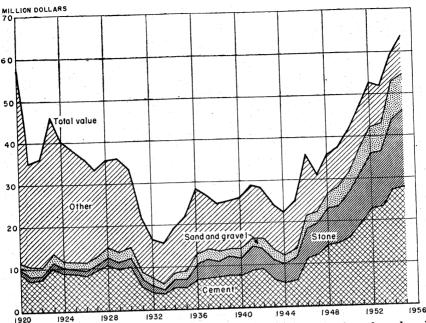


FIGURE 1.—Total value of mineral production in Iowa and value of sand and gravel, stone, and cement, 1920-55.

# REVIEW BY MINERAL COMMODITIES METALS

Metals were not produced in Iowa in 1955. The most recently recorded metal production was lead ore mined in Dubuque County in 1951-53 and marketed in 1954.

#### **NONMETALS**

Cement.—Portland and masonry cements were produced at 5 plants: 2 were in Cerro Gordo County, 2 in Polk County, and 1 in Scott County. Types I and II, general use and moderate heat, were produced at all 5 plants; type III, high-early-strength, was produced at 3 plants; air-entrained cement was produced at 4 plants; and masonry cements from portland cement at 4 plants. Cement shipments were greater in 1955 than in 1954. Direct comparison between the 2 years is not feasible because portland cement used in manufacturing masonry cement is included in 1954 data but not in 1955 data. The average value of portland cement was \$2.81 per barrel in 1955 and \$2.74 in 1954. Masonry cement was valued at \$3.30 per barrel in 1955; misons was a superior of the produced at \$3.44 in 1954.

Clays.—Clays were produced from pits in 14 counties in 1955; miscellaneous clay and fire clay were produced in two counties. With the exception of the clays used in manufacturing cement (about 40 percent of the total), output was used in manufacturing heavy clay products, including building brick, paving brick, draintile, sewer pipe, and re-

lated commodities.

Gypsum.—In Webster County four companies mined crude gypsum, processed the material at nearby mills and plants, and manufactured wallboard, lath, and prepared plasters.

Production of crude gypsum in 1955 totaled 1,337,000 tons, a 20-

percent increase over 1954 output.

Lime.—Quicklime and hydrated lime were produced in Scott County. Most of the quicklime was sold for metallurgical use; hydrated lime was used principally for building and water purification. Small amounts were sold to the paper industry and for manufacturing calcium carbide.

Perlite.—Crude perlite, mined in Colorado, was expanded by 1 company in Polk County and 2 in Webster County for use as an aggre-

gate, principally in plaster.

Sand and Gravel.—Sand and gravel tonnage, reported from 67 counties in Iowa, was 4 percent less than in 1954, reflecting declining use in paving and road construction. A very large proportion of the

TABLE 2.—Sand and gravel sold or used by producers in Iowa, 1954–55, by classes of operations and uses

		1954		1955		
		Value			Value	
	Short tons	Total	Average	Short tons	Total	Aver-
COMMERCIAL OPERATIONS						
Sand: Building. Engine Paying 1 Railroad ballast. Other. Undistributed 2  Total sand.  Gravel: Building. Paying 1 Railroad ballast. Other. Total gravel.  Total gravel.  GOVERNMENT-AND-CONTRACTOR OPER- ATIONS	21, 898 1, 507, 739 59, 821 59, 869 296, 756 4, 202, 221	\$1, 826, 013 29, 247 1, 170, 166 24, 122 47, 373 504, 777 3, 601, 698 1, 807, 443 2, 530, 925 81, 104 169, 614 4, 589, 122 8, 190, 820	\$0.81 1.34 .78 .40 .79 .86 1.33 .75 .68 1.26 .92	2, 428, 972 12, 800 1, 087, 379 26, 434 147, 688 210, 778 3, 914, 051  1, 190, 092 3, 171, 202 70, 492 40, 135 4, 471, 921 8, 385, 972	\$1, 915, 831 11, 760 829, 948 10, 682 85, 844 355, 418 3, 209, 483 1, 652, 695 2, 246, 724 39, 642 24, 159 3, 963, 220 7, 172, 703	\$0. 79 . 99 . 76 . 44 . 58 . 82 . 1. 39 . 71 . 56 . 60 . 89
Sand: Paving !	277,831	89, 837	. 32	598, 077	217, 924	.36
Gravel: BuildingPaving i	20, 284 2, 727, 248	6, 085 989, 788	.30	2, 786, 787	954, 205	.34
Total	2, 747, 532	995, 873	. 36	2, 786, 787	954, 205	.34
Total sand and gravel	-,,	1, 085, 710	. 36	3, 384, 864	1, 172, 129	.35
and	4, 480, 052 7, 719, 604	3, 691, 535 5, 584, 995	. 82 . 72	4, 512, 128 7, 258, 708	3, 427, 407 4, 917, 425	.76
Grand total	12, 199, 656	9, 276, 530	. 76	11, 770, 836	8, 344, 832	.71

<sup>&</sup>lt;sup>1</sup> Includes materials used in bridges, culverts, etc.
<sup>2</sup> Includes glass (1954), molding, blast, and filter sand (1954–55) to avoid disclosure of individual company confidential data.

output was used in the building industry and for road construction; relatively small tonnage was sold for industrial uses and railroad ballast.

In 1955, 108 commercial producers reported output. The 10 leading companies furnishing 48 percent of the State output value were:

Acme Fuel & Material Co., Muscatine.
Beu & Sons Co., Grundy Center.
Ervin Clark Construction Co., Logan.
Concrete Materials Co., Waterloo.
Concrete Materials & Construction Co., Cedar Rapids.
Coon Valley Gravel Co., Des Moines.
L. G. Everist, Inc., Sioux Falls, S. Dak.
Hallett Construction Co., Crosby, Minn.
Keefner Sand & Gravel Co., Des Moines.
Maudlin Construction Co., Webster City.

TABLE 3.—Limestone sold and used by producers, 1954-55, by uses

		1954		1955		
	Val		•		Value	
<b>Use</b>	Short tons	Total	Aver- age per ton	Short tons	Total	Aver- age per ton
Commercial: Agriculture	1, 296, 868 (1) (1) 192, 984 8, 170, 001	\$1, 839, 798 (1) (1) 239, 013 10, 450, 996 3, 062, 684	1.28	1, 399, 844 903 (1) (1) 588, 371 9, 841, 582 2, 861, 205	\$1, 988, 306 1, 255 (1) 707, 739 11, 773, 423 3, 093, 754	\$1.42 1.39 
Other 2  Total Noncommercial, all uses (concrete aggregate, roadstone, riprap)	12, 557, 161	15, 592, 491 795, 650	1. 24	14, 691, 905	17, 564, 477 990, 699	
Total commercial and noncommercial	13, 240, 087	16, 388, 141	1. 24	15, 705, 412	18, 555, 176	1.1

Figure withheld to avoid disclosure of individual company confidential data; included with "Other."
 Includes limestone for cement and lime and data indicated by footnote 1.

Stone.—Nearly 80 percent of limestone production, reported from 57 counties, was crushed for concrete aggregate, roadstone, and agricultural use; the rest was chiefly for manufacturing cement and lime and for various chemical and industrial uses.

The tonnage of limestone produced in 1955 was nearly 20 percent larger than in 1954. Unit value was slightly less, averaging \$1.18 a ton in 1955 compared with \$1.24 in 1954. The 10 leading commercial producers, supplying half the limestone reported in 1955, were:

Beu & Sons Co., Grundy Center.
Concrete Materials & Construction Co., Cedar Rapids.
Dewey Portland Cement Co., Kansas City, Mo.
Kaser Construction Co., Des Moines.
Linwood Stone Products Co., Inc., Buffalo.
Marquette Cement Mfg. Co., Chicago, Ill.
Missouri Valley Limestone Co., Oakland.
Penn-Dixie Cement Corp., Nazareth, Pa.
E. I. Sargent Quarries, Inc., Des Moines.
Weaver Construction Co., Iowa Falls.

### MINERAL FUELS

Coal.—Preliminary data indicated that 1955 bituminous-coal production from 9 counties aggregated about 11/4 million tons and was 5 percent greater than in 1954. More than 75 percent of the coal was produced from strip mines, reflecting a trend accelerated in recent years by rising costs of underground mining.

### TABLE 4.—Ten largest coal producers in Iowa, 1955

Company:		
Company.	Type of operation	County
Wilkinson Coal Co	Stain	3.7
Beard Coal Co	Durp	Marion.
Weldon Coal Co	ao	$\mathbf{Do.}$
Weldon Coal Co	do	Do.
Duning Coal Co. No. a At No. 4	indomorphism d	Appanoose.
SOULII TOWA COSI CO	O4i	
Lovilia Coal Co	Durp	Davis.
Angua Cool Co		Marion.
Angus Coal Co	Strin	Mahaska.
ver Steeg Coal Co	J.	3.6
Husted Bros		Marion.
	ao	D∩

Peat.—Peat humus and peat moss produced from peat bogs in Worth County were used for agricultural and horticultural purposes.

### **REVIEW BY COUNTIES**

Adair.—Crushed limestone for agricultural use, road construction, and concrete aggregate was produced by E. F. Schildberg, Greenfield, and the county highway department.

Adams.—Missouri Valley Limestone Co., Oakland, quarried lime-

stone for concrete aggregate and agricultural use.

Allamakee.—Limestone and sand and gravel for road construction

and limestone for agricultural use were produced in the county.

Andrew Bresnahan and R. J. Cooney, both of Waukon, and H. L. Leas, Monona, produced limestone. Carlson Materials Co., Inc., Decorah, and Francis Schwartzhoff, Dorchester, produced sand and gravel.

Appanoose.—Clays, bituminous coal, and limestone were produced

in the county.

Iowa Clay Products Co., Centerville, produced miscellaneous clay for manufacturing heavy clay products. Limestone for agricultural use, railroad ballast, and concrete aggregate was quarried by L & W Construction Co., Inc., and Porter & Magnall, Centerville; and W. P.

Farnsworth, Cincinnati.

Thirteen companies mining bituminous coal underground were: Appanoose Coal Co., Clarke Coal Co., D. C. Coal Co., K & K Coal Co., Long Branch Coal Co., Monitor Coal Co., New Block Coal Co., New Gladstone Coal Co., Old King Coal Co., Riverside Coal Co., Square Deal Coal Co. and Sunshine Coal Co. (2 mines). Dennis Coal Co. mined bituminous coal from the one strip mine in the county.

Audubon.—The county highway department contracted for paving

gravel.

Benton.—Garrison Brick and Tile Works worked a clay pit at Garrison. W. E. Dake, Garrison, and Vinton Lime & Rock Co., Vinton, produced limestone for concrete aggregate, riprap, and agricultural use.

TABLE 5.—Value of mineral production in Iowa, 1954-55, by counties 1

County	1954 2	1955	Minerals produced in 1955 in order of value
	(3)	(3)	Stone.
lairlams	(3)	\$207, 909	Do.
lams. lamskeeppanoose	\$46, 805	\$207, 909 149, 952	Stone, sand and gravel.
DOMONSA.	1,000,526	892, 313 25, 279 112, 075 1, 050, 445	Coal, stone, clays. Sand and gravel.
idubon	200 1	25, 279	Sand and graver.
entonack Hawk	141, 599 854, 651 156, 263	112, 075	Stone, clays. Stone, sand and gravel.
ack Hawk	854, 651	1, 050, 445	Sand and gravel.
oone	156, 263	210, 100	Stone, sand and gravel.
remer	354, 198 265, 482	164, 741 196, 379 95, 327 31, 190 92, 573	Stone.
uchanan uchanan vista utler alhoun	(3)	196 379	Sand and gravel.
uena Vista	195, 303	95, 327	Stone, sand and gravel. Sand and gravel.
utler	35, 463	31, 190	Sand and gravel.
arroll	110, 298	92, 573	Do.
MITOU	(3)	312, 447 318, 147 13, 627, 113 92, 914	Stone, sand and gravel.
edar	(3)	318, 147	Stone.
orro Cordo	11, 980, 224	13, 627, 113	Cement, stone, sand and gravel, clays.
	(3)	92, 914	Sand and gravel. Stone, sand and gravel.
hikasaw	(3)	141, 364 105, 364	Stone, sand and graver.
lav	(8)	105, 364	Sand and gravel. Sand and gravel, stone.
herokee hikasaw lay lay lay lay lay linton linton rawford allas lay lay lay lay lay lay lay lay lay lay	525, 804	(3)	Sand and gravel, stone.
linton	496, 241 80, 151	109, 320	Do.
rawford	80, 151	05, 190	Sand and gravel, clays.
allas	171, 704 290, 892	83, 196 255, 348 285, 475	Coal.
avis	290, 892	285, 475	Stone
ecatur elaware es Moines	(3) (3) (3)	177, 634	Stone, sand and gravel.
elaware	SX I	249, 420	Do.
es Moines	8	(3)	Sand and gravel.
lckinson	495 690 l	(3)	Stone, sand and gravel.
lockinsonubuqueayetteayette	161, 484 351, 935 166, 684 214, 494	163, 419 258, 376 287, 541	Sand and gravel.
mmet	351 935	258, 376	Stone, sand and gravel.
ayette loydranklin remont	166, 684	287, 541	Stone, clays. Sand and gravel, stone, clays.
loyu	214, 494	150, 512	Sand and gravel, stone, clays.
Tallkilli		(3)	Stone.
remone	397, 673	254, 380	Sand and gravel.
leundy	397, 673 117, 052 34, 577	(3) 254, 380 75, 794	Sand and gravl, stone.
Inthria	34, 577	(8)	Sand and gravel.
rrene Frundy Juthrie Hamilton	306, 639 139, 123 831, 979	23, 690 112, 562 826, 992	Stone.
Iancock	139, 123	112, 562	Sand and gravel.
Tardin	831, 979	826, 992	Stone, sand and gravel.
Iancock Hardin Harrison Henry	(3)	268, 677 180, 666 47, 270	Stone, sand and gravel, clays.
Henry	(3)	180,000	Stone, sand and gravel.
Howard	90, 354	259, 406	Do.
Howard Humboldt Jowa Jackson	(3)	200, 200	1 20.
owa	109, 531	144 607	Stone, sand and gravel.
ackson	(3)	144, 607 117, 263 36, 840	Sand and gravel.
acksonssper [efferson	109, 922	36, 840	Stone.
enerson	616, 030	(3)	Stone, sand and gravel. Sand and gravel, stone.
Onnson	114, 959 190, 104 143, 865	1 57 024	Sand and gravel, stone.
/ O1168	190, 104	(3)	I Stone, clavs.
Comuth	143, 865	221, 228	Sand and gravel.
Keokuk Kossuth	303, 500	247, 002	Sand and gravel. Stone, sand and gravel.
Linn	303, 500 687, 451	(3) 221, 228 247, 002 733, 337	D0.
Louisa	(3)	(3)	Do.
Lucas	_(3)		Gond and gravel
Lyon	(9)	81, 756 308, 964 767, 179	Sand and gravel. Stone.
Madison	833, 165	308, 964	Coal stone sand and gravel, clavs.
Mahaska	1, 018, 829 2, 562, 008	0 797 000	Coal, stone, sand and gravel.
Linn Louisa Lucas Lucas Lyon Madison Mahaska Marion Marshall Mitchall	- 2, 562, 008	2, 737, 960 483, 914 240, 412	Coal, stone, sand and gravel, clays. Coal, stone, sand and gravel. Stone, sand and gravel.
Marshall	624, 375 212, 225	200, 814	Do.
Mitchell	- 212, 220	1 3 033	i sand and graver.
Monona	- (3) 391, 210	322, 659	Coal.
Monona	391, 210	322, 659 328, 608 407, 579	Stone.
Montgomery	595, 933	407. 579	Sand and gravel, stone.
Muscaulle	1 787 00	(3)	Sand and graver.
O'Brien	- M	98, 914	Do.
Page	(9)		. <b>.</b>
Page	<u> </u>	37, 899	Sand and gravel.
Page Palo Alto Plymouth Pocohontas	221, 249	1 93·97(	11 120.
Poohontas	(3)	(8)	Stone, sand and gravel.
		3   10, 368, 71	Stone, sand and gravel, stone clays, co.
Pottawattamie		645, 19	5 Stone.
Pottawattamie Ringgold	(8)		1
Sec	254, 13	7 251, 17 6 8, 751, 24	Sand and gravel. Cement, stone, lime, sand and gravel.
		2 1 Q 751 9 <i>4</i> 4	n i Cement, Stone, iiiie, Sand and graver.
Section Story Story	7, 911, 68 755, 14	343, 41	8 Sand and gravel.

See footnotes at end of table.

TABLE 5.—Value of mineral production in Iowa, 1954-55, by counties 1—Con.

County	1954 2	1955	Minerals produced in 1955 in order of value
Tama. Taylor Van Buren Wapello. Warren Washington Webster Winnebago Winneshiek Woodbury Worth Wright.	\$378, 732 (3) 713, 352 432, 569 (256, 198 3, 481, 565 20, 227 67, 925 319, 463 244, 129 116, 407	(3) \$72, 203 364, 844 652, 639 32, 370 331, 790 4, 594, 405 79, 516 207, 317 (3) 453, 049 85, 614	Stone, sand and gravel. Stone, coal, sand and gravel. Coal, stone, clays. Coal, clays. Stone. Gypsum, clays, sand and gravel, stone. Sand and gravel. Stone, sand and gravel. Stone, peat, sand and gravel. Stone, peat, sand and gravel. Sand and gravel.
Undistributed  Total	5, 296, 850 58, 798, 000	6, 732, 257	

The following counties are not listed because no production was reported: Clarke, Ida, Mills, Powesheik,
 Revised figures.

3 Figure withheld to avoid disclosure of individual company confidential data; included with "Undistributed."

Black Hawk.—Limestone and sand and gravel, valued at over \$1 million, were produced in the county. Beu Limestone Co. and Beu & Sons Co., Grundy Center, quarried at Newton, La Porte City, and Yokom. Concrete Materials & Construction Co., Cedar Rapids, and Pint Soft Lime Products Co., Raymond, also quarried in the county. Limestone output was crushed for use as concrete aggregate, blast-furnace flux, and agricultural stone.

Sand and gravel for building and paving and a small quantity of engine sand were produced by Assink Bros. and B. L. Larsen & Son, Cedar Falls; Jay B. Bagenstos & Son, La Porte City; Concrete Materials & Construction Co., Cedar Rapids; and Hanson & Son Sand & Gravel Co., C. W. Shirey Co., and Waterloo Dredging Co., Waterloo.

Boone.—Companies producing sand and gravel for building and paving were: Hallett Construction Co., Crosby, Minn.; Dan Leininger, Boone; and Place Bros., Scranton. The county highway department contracted for paving gravel.

Bremer.—Limestone and gravel were produced, principally for road

construction and agricultural uses.

Beu & Sons Co., Grundy Center, quarried at Denver and Frederika. Paul Niemann Construction Co., Sumner, and Schield Soft Lime Quarry, Waverly, also produced limestone. The county highway department ran a gravel pit.

Buchanan.—Limestone for use as soil conditioning and concrete aggregate was produced by Aurora Limestone Products, Aurora; E. F. Patton Co., Independence; Beu & Sons Co., Grundy Center; and

the county highway department.

Buena Vista.—Beu & Sons Co., Grundy Center, and Hallett Construction Co., Crosby, Minn., produced sand and gravel for building and paving use. The highway departments of Buena Vista and

Pocahontas Counties contracted for paving gravel.

Butler.—Crushed limestone for concrete aggregate and agricultural use was produced by Greene Limestone Co., Greene; Neymeyer Lime Co., Aplington; and Shell Rock Lime Co., Inc., Shell Rock. Sand and gravel for building use was produced by Meyer & Muller and

Charles Willeke & Sons, Aplington; and Waverly Gravel & Tile Co., Shell Rock.

Calhoun.-The county highway department produced and con-

tracted for paving gravel.

Carroll.—Sand and gravel was produced by Carroll Sand & Gravel Co., Carroll; and McClue Gravel Co., Lanesboro. The county highway department contracted for paving sand and gravel.

Čass.-Missouri Valley Limestone Co., Oakland, produced concrete aggregate, and Place Bros., Scranton, operated a gravel pit.

Cedar.—Limestone for concrete aggregate, agricultural stone, and riprap were produced from the quarries of C. B. Dewees Construction Co., Marion; Kenneth Robinson, Tipton; Weaver Construction Co., Iowa Falls; and the county highway department.

Cerro Gordo.—Cement, clays, sand and gravel, and stone were produced in the county. The Lehigh Portland Cement Co. and Northwestern States Portland Cement Co. plants at Mason City produced portland and masonry cements, clay, and limestone used in manufacturing cement.

Mason City Brick & Tile Co. mined clay for use in making heavy

clay products.

Sand and gravel for building and paving was produced by Clear Lake Sand & Gravel Co., Inc., Clear Lake; Greene Limestone Co., Greene; Ideal Sand & Gravel Co., Mason City; and the county high-

way department.

Limestone quarried for use in cement and crushed stone for concrete aggregate and agricultural use were produced by Greene Limestone Co., Greene; Ideal Sand & Gravel Co. and Grupp Construction Co., Mason City; Weaver Construction Co., Iowa Falls; and the county highway department.

Cherokee.—Sand for use in building was produced by Shea Sand & Gravel Co., Cherokee. The county highway department contracted

for paving gravel.

Chickasaw.—Greene Limestone Co., Greene, produced paving sand, and Hewitt Bros., Fredericksburg, crushed limestone for concrete aggregate. Beu & Sons Co., Grundy Center, produced agricultural stone and concrete aggregate from four quarries.

Clay.—Stolley Construction Co. and Stolley Sand & Gravel Co., Spencer, produced sand and gravel for building and paving use. The

county highway department contracted for road gravel.

Clayton.—H. L. Leas, Monona, quarried limestone for soil conditioning and concrete aggregate. Concrete Materials Co., Waterloo, produced building and molding sand.

Clinton.—Fred R. McKenzie & Co. and Hass Gravel Pit, Clinton, produced blast and engine sand and building and paving sand and

Crawford.—Sand and gravel for building use and road construction was produced by L. J. Adams, Denison; James Ballantine, Arion Mauer Construction Co., Sac City; and the county highway department.

Dallas.—The output of the clay pits of Adel Clay Products Co., West Des Moines, Redfield Brick & Tile Co., Redfield, and United Brick & Tile Co., Kansas City, Mo., was used for manufacturing heavy clay products.

Building and paving sand and gravel was produced by Breeden Sand & Gravel Co., Des Moines; Hallett Construction Co., Crosby,

Minn.; Perry Sand & Gravel Co., Perry; and I. B. Welder, Madrid.

Davis.—Davis County Coal Co. and South Iowa Coal Co. produced bituminous coal from strip mines; Shute & Lewis Coal Co., from an underground mine.

Decatur.—Grand River Limestone Co., Grand River, produced

limestone for soil conditioner and concrete aggregate.

Delaware.—Dyersville Sand & Gravel Co., Dyersville, produced paving sand. Limestone for concrete aggregate and agricultural purposes was quarried by Beu & Sons Co., Grundy Center; Weber Dehn, Manchester; Dyersville Sand & Gravel Co.; and the county highway department.

Des Moines.—Building, paving, and filter sand was produced by Spring Sand & Gravel Co., Davenport. Raid Bros., Burlington, and J. T. Leonard Construction Co., Columbus Junction, quarried limestone for concrete aggregate, riprap, lime, and agricultural use.

Dickinson.—Concrete Sand & Materials Co., Milford, produced

sand and gravel for building and paving.

Dubuque.—Dubuque Sand & Gravel Co. and Molo Sand & Gravel Co., Dubuque, produced sand and gravel for building and paving and blast sand. Limestone was quarried by Dubuque Stone Products Co., Dubuque, and the county highway department and crushed for use as blast-furnace flux, riprap, concrete aggregate, and agricultural stone.

Emmet.—Don Billings Sand & Gravel Co. and Estherville Sand & Gravel Co., Estherville, and Hoien Gravel Pit, Armstrong, produced building and paving sand and gravel. Chicago, Rock Island & Pacific Railroad and the Minneapolis & St. Louis Railway Co. produced gravel for railroad ballast. The county highway department produced paving gravel.

Fayette.—Limestone was quarried by Fayette Stone Co., Fayette; Hewitt Bros., Fredericksburg; and the county highway department. Sand and gravel for building and paving was produced by Paul Niemann Construction Co. and Reisner Sand & Gravel Co., Sumner; Oelwein Sand & Gravel Co., Oelwein; and Carl Zupke & Son Sand &

Gravel, Randalia.

Floyd.—Rockford Brick & Tile Co., Rockford, produced miscellaneous clay for use in tile and brick from its clay pit. Limestone for use in agriculture and concrete aggregate were quarried by Walter Beine, Charles City; Greene Limestone Co., Greene; Heckman-Reynolds, Inc., Floyd; Weaver Construction Co., Iowa Falls; and the county highway department.

Franklin.—Sheffield Brick & Tile Co., Sheffield, produced clay for use in heavy clay products. Reiken Limestone Co., Ackley, and Weaver Construction Co., Iowa Falls, produced limestone for agri-

cultural purposes and concrete aggregate.

Sand and gravel pits were worked by Beu & Sons Co., Grundy Center; Hallett Construction Co., Crosby, Minn.; and Louis C. Toft, The county highway department contracted for paving Dows. gravel.

Fremont.—Jack Stanley and Fred Wenke, Thurman, produced

limestone for concrete aggregate and agricultural use.

Greene.—Sand and gravel production was reported by Beu & Sons Co., Grundy Center; Hallett Construction Co., Crosby, Minn.; Ferguson-Diehl Construction Co., Jefferson; Pound Construction Co., Scranton; and the Minneapolis & St. Louis Railway Co.

Grundy.—The Beu & Sons Co. Rieken quarry, Grundy Center,

produced agricultural stone and concrete aggregate.

Ben Ankes, Wellsburg, produced gravel for building purposes. The

county highway department contracted for paving gravel.

Guthrie.—K. H. Buttler, Guthrie Center, produced sand and gravel for paving.

Hamilton.—Weaver Construction Co., Iowa Falls, quarried lime-

stone, to be crushed for use as concrete aggregate.

Hancock.—Sankey Sand & Gravel, Britt, operated a sand and gravel pit. The county highway department produced and contracted for paving gravel.

Hardin.—Limestone was quarried for concrete aggregate, poultry grit, and agricultural stone by Beu & Sons Co., Grundy Center; Iowa Limestone Co., Des Moines; and Weaver Construction Co., Iowa

Falls. The Beu & Sons Co. and Weaver Construction Co. operated sand and gravel pits. Sand and gravel were also produced by Clary Concrete Materials, Eldora; and Iowa Falls Sand & Gravel Co. and George Janssen, Iowa Falls.

Harrison.-W. A. Schemmer Limestone Quarry, Logan, produced rubble, riprap, agricultural stone, and concrete aggregate. Ira E.

Gorham, Pisgah, produced building gravel.

Henry.—Winfield Brick & Tile Co., Winfield, produced miscellaneous clay for heavy clay products. Weaver Construction Co., Iowa Falls, produced paving gravel. Kaser Construction Co., Des Moines, and the county highway department quarried limestone for agricultural stone, riprap, and concrete aggregate.

Howard.—The county highway department produced limestone for concrete aggregate and gravel for paving. Ed Kubik and Zobeck

Limestone & Gravel Co., Elma, also produced paving gravel.

Humboldt.—Limestone for riprap and concrete aggregate was produced by Place Bros., Scranton; and Fort Dodge Limestone Co., Fort Dodge. Sand and gravel was produced by Iowa Sand & Gravel Co., Humboldt; by Place Bros.; and for the county highway department.

Jackson.—F. J. Trenkamp quarries, Preston, and Weaver Construction Co., Iowa Falls, quarried limestone for concrete aggregate and agricultural stone. Bellevue Sand & Gravel Co., Bellevue, produced sand and gravel.

Jasper.—Building and paving sand and gravel was produced by Newton Rock & Gravel Co., Newton; Eben Van Dusseldorp, Colfax;

and Earl Wagner, Monroe.

Jefferson. The county highway department crushed limestone for concrete aggregate.

Johnson.—Central Sand & Gravel Co., Inc., Iowa City, produced

sand and gravel. Limestone for riprap, agricultural uses and concrete aggregate, was quarried by River Products Co., Iowa City; Schroeder Co., McGregor; and Twin State Quarries, Inc., Allerton.

Jones.—Sand and gravel for building and paving was produced by Jensen Sand & Gravel, Anamosa; and Reichart Sand & Gravel Co.. Monticello. Weaver Construction Co., Iowa Falls, operated the Cascade limestone quarry.

Keokuk.—John Nelson & Sons, What Cheer, produced clay for use in heavy clay products. Kaser Construction Co., Des Moines, quar-

Kossuth.—Output of Place Bros., Scranton, and the county highway department sand and gravel pits was used for road construction.

Lee. Raid Bros. Construction Co., Burlington, and the county highway department produced limestone for riprap, concrete aggregate, and agricultural stone. Horn's Sand Pit, Fort Madison, produced engine sand and paving sand and gravel.

Linn.—Limestone for concrete aggregate and agricultural use was

produced by Concrete Materials & Construction Co. and L. Crawford Lime & Quarry Co., Cedar Rapids. Building and paving sand and gravel were produced by Concrete Materials & Construction Co. and King's Crown Plaster Co., Cedar Rapids; and Frank J. Meyer, Mount

Louisa.—Limestone was quarried by Camanche Stone Co., Davenport; Dillon Stone Co., Columbus Junction; and Louisa County Lime Products, Wapello. Concrete Materials Co., Waterloo, produced building and paving sand and gravel.

Lyon.—The county highway department produced and contracted

for paving gravel.

Madison.—Limestone for concrete aggregate was produced by Concrete Materials & Construction Co., Cedar Rapids; Gendler Stone Products, Des Moines; and the county highway department.

Mahaska.—The What Cheer Clay Products Co., What Cheer, and Mrs. Bernice McLandsborough, New Sharon, clay pits produced fire and miscellaneous clays for use in making heavy clay products.

Edwards Bros. Coal Co. mined bituminous coal from one underground mine. Strip mining from eight mines was reported by Angus Coal Co., Carbon Hill Coal Co., Hart & Mitch, Lost Creek Coal Co., Patik Coal Co., Prothero Coal Co., Spring Creek Coal Co., and Star Coal Co.

Limestone was produced by the county highway department and Kaser Construction Co., Des Moines. Concrete Materials Co., Water-

loo, produced building and paving sand and gravel.

Marion.—Marion was the leading coal-producing county in Iowa in 1955. Nine strip mines and seven underground mines were pro-Strip mining was reported by Beard Coal Co., Husted Bros., Ver Steeg Coal Co., Wilkinson Coal Co., Jude Coal Co., Inc., Kirkville Coal Co., Weldon Coal Co., Newton Coal Co., and Ruby Coal Co.

Coal was mined underground by Big Ben Coal Co., Last Chance Coal Co., Liberty Coal & Mining Co., Liter Coal Co., Inc., Cedar Creek Coal Co., Lovilia Coal Co., and Twin City Coal Co.

Limestone was quarried by C. D. Hess & Son Rock Material Co.. Lacona; Kibbey Limestone Co., Carlisle; and Pella Limestone Co., Agricultural stone, riprap, and concrete aggregate were produced. Sand and gravel for building and paving was produced by E. Groenendyk Sand & Gravel, Bussey; Russell Kintz, Colfax; and Pella Construction Co., Pella.

Marshall.—Concrete Materials & Construction Co., Cedar Rapids, quarried limestone and worked a sand and gravel pit. Empire Sand & Material Co., Marshalltown, and Minneapolis & St. Louis Railway

Co. also produced sand and gravel.

Mitchell.—L. R. Falk, St. Ansgar, and Edd Kollman, Osage, produced limestone. Sand and gravel were produced by L. R. Falk, St. Ansgar; and Lawrence H. Decklever and Seeber & Wetter, both of Osage.

Monona.—The county highway department contracted for paving

Monroe.—H. Halverson and C. N. Knox Coal Co. produced from strip mines. Coal was obtained from underground mines by Acme Coal Co., Avery Coal Co. (No. 3 mine), Karpan Coal Co., Maple Coal Co., White Oak Coal Co., and O'Brien Coal Co.

Montgomery.—Limestone for concrete aggregate and agricultural stone was quarried by Drexel Lundquist, Corning; Kaser Construction Co., Des Moines; and Missouri Valley Limestone Co., Oakland.

Muscatine.—Otto Wendling, Muscatine, quarried limestone for riprap and concrete aggregate. Sand and gravel was produced for building and paving by Acme Fuel & Material Co., Hahn Bros. Sand & Gravel Co., and Northern Gravel Co., Muscatine.

O'Brien.—Gilbert Bruegman, Hartley, produced sand and gravel

for building use.

Osceola.—Sand and gravel operations were reported by Beu & Sons Co., Grundy Center; Hallett Construction Co., Crosby, Minn.; and Van Drie Construction Co., Ocheyedan. The county highway department contracted for paving gravel.

Palo Alto.—Sand and gravel for paving was produced by Bauck Construction Co., Emmetsburg; John Durweiler Sand & Gravel Co., West Bend; and Place Bros., Scranton.

Plymouth.—Sand and gravel was produced by Higman Sand & Gravel Co., Akron; Wiltgen Ready Mixed Concrete Co., Le Mars;

and the county highway department.

Pocahontas.—Midwest Limestone Co., Inc., Gilmore City, quarried limestone for use as riprap, agricultural stone, and concrete aggre-Place Bros., Scranton, and the county highway department produced gravel for paving.

Polk.—Folk County yielded mineral products valued at more than 10 million dollars. Cement, clays, coal, limestone, and sand and

gravel were produced in the county.

Both fire clay and miscellaneous clay for manufacturing heavy clay products were produced at the clay pits of Des Moines Clay Co., Goodwin Tile & Brick Co., and Iowa Pipe & Tile Co., Des Moines; Hopkins Coal Co., Colfax; and United Brick & Tile Co., Kansas City, Mo.

Hopkins Coal Co. worked a strip mine at Colfax.

Portland and masonry cement and clays and limestone for use in manufacturing cement were produced by Hawkeye Portland Cement

Co. of Iowa and Penn-Dixie Cement Corp.

Sand and gravel was produced by Coon Valley Gravel Co., and Keefner Sand & Gravel Co., Des Moines; West Des Moines Sand Co., West Des Moines; I. J. Bishop, Mitchellville; and Concrete Materials Co., Waterloo, mostly for building and paving use. Some filter sand and sand for miscellaneous uses were also produced.

Pottawattamie.—Missouri Valley Limestone Co., Oakland, quarried

limestone for use as agricultural stone and concrete aggregate.

Sac.—Hallett Construction Co., Crosby, Minn., gravel pit produced building and paving sand and gravel. The highway departents of Carroll and Sac Counties contracted for paving gravel.

Scott.—Dewey Portland Cement Co., Davenport, produced portland and masonry cements. Linwood Stone Products Co., Buffalo, produced quicklime and hydrated lime for building, chemical, and industrial uses and limestone. Limestone quarries were also operated by Le Claire Quarries, Le Claire; Weaver Construction Co., Iowa Falls; and the county highway department. The output was used for concrete aggregate, roadstone, and agricultural stone. Builders Sand & Gravel Co., Davenport, produced building sand.

Sioux.—Sand and gravel production was reported by Beu & Sons

Sioux.—Sand and gravel production was reported by Beu & Sons Co., Grundy Center; L. G. Everist, Inc., Sioux Falls, So. Dak.; Floyd Gravel Co., Orange City; Hawarden Gravel Co., Hawarden; Rock Valley Cement Block & Tile Co., Rock Valley; and Roos Sand & Gravel, Boyden. The output was used for building and paving

purposes and railroad ballast.

Story.—Nevada Brick & Tile Co. produced clays for use in manufacturing heavy clay products. Cook Construction Co., Ames, limestone quarry and gravel pit produced material for road construction, concrete aggregate, and agricultural purposes.

Tama.—Joseph Wenke, Toledo, quarried limestone for riprap and soil conditioner. Material from Flint Crushed Gravel Co., Des Moines, sand and gravel pit was used for building and paving.

Taylor.—Missouri Valley Limestone Co., Oakland, produced lime-

stone for concrete aggregate and agricultural uses.

Van Buren.—Hamlin Bros. Coal Co., Bonaparte, and Laddsdale Coal Co., Inc., Eldon, operated strip mines. Camanche Stone Co., Davenport, and the county highway department quarried limestone. Douds Stone, Inc., Douds, quarried limestone underground (1 of the 2 underground quarries in the State) for agricultural stone, roadstone, and concrete aggregate.

Valley Limestone & Gravel Co., Inc., Farmington, produced sand

and gravel for building and paving use.

Wapello.—Ottumwa Brick & Tile Co., Ottumwa, mined clays for use in manufacturing brick and other heavy clay products. Bituminous coal was produced from 1 underground mine by New Globe Coal Co., Ottumwa, and from 5 strip mines by Engness Coal Co., Homer Haines Coal Co., Lanning Coal Co., Munterville Coal Co., Inc., and Star Coal Co. Kaser Construction Co., Des Moines, and Wapello Stone Quarries, Ottumwa, produced limestone for concrete aggregate and agricultural use.

Warren.—Carlisle Brick & Tile Co., Carlisle, mined clays for use in manufacturing brick and heavy clay products. S & R Coal Co.,

Carlisle, mined coal underground.

Washington.—Hayes Quarry, Washington, and Kaser Construction Co., Des Moines, quarried limestone for concrete aggregate and agricultural stone.

Webster.-Clays, gypsum, sand and gravel, and limestone were produced in the county.

Clays, for use in heavy clay products, were produced by Johnston Clay Works, Inc., Kalo Brick & Tile Co., Lehigh Sewer Pipe & Tile Co. and Vincent Clay Products Co., all at Fort Dodge.

Crude gypsum was mined and processed into building materials in the Fort Dodge area by Celotex Corp., Certain-Teed Products Corp., National Gypsum Co., and United States Gypsum Co. Perlite was expanded for manufacturing lightweight plaster mixes by National Gypsum Co. and United States Gypsum Co. An underground limestone deposit was quarried and gravel was obtained from its pit by Fort Dodge Limestone Co. Other sand and gravel producers included Casey Sand & Gravel and Wayne Goodrich, Lehigh; and the county highway departments of Calhoun, Pocahontas, and Webster Counties.

Winnebago.—The county highway department obtained gravel

from its pit and contracted for paving gravel.

Winneshiek.—Limestone was quarried for use as rubble, concrete aggregate, and agricultural stone by Bouska Construction Co., Protivin; Bruening Rock Products and Seegmiller Construction Co., Decorah; R. J. Cooney Construction Co., Waukon; and J. F. Paulavec, Calmar. Carlson Materials Co., Inc., Decorah, produced building and paving sand and gravel.

Woodbury.—Concrete Materials Co., Waterloo, and West Fork Sand & Gravel Co., Sioux City, produced sand and gravel for building,

paving, and railroad ballast.

Worth.—Grand River Limestone Co., Grand River, and Limestone Products Co., Fertile, produced agricultural stone and concrete aggregate. Peat was dug from bogs near Hanlontown by Eli Colby Co. and Colby Pioneer Peat Co. L. R. Falk, St. Ansgar, and Hallett Construction Co., Crosby, Minn., produced sand and gravel for building and paving use.

Wright.—Output from Oscar Nelson, Belmond, and the county highway department sand and gravel pits was used mostly for

building and paving.

# The Mineral Industry of Kansas

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

By Harvard Eng <sup>1</sup> and Walter H. Schoewe <sup>2</sup>



ANSAS attained another record year in 1955 for mineral production, as the value rose to \$471 million—\$21 million more than in 1954. The value of petroleum (\$341 million) in Kansas, commonly known as the "Wheat State," exceeded the value of that

farm crop by \$90 million.

Crude petroleum represented 72 percent of the State's total mineral value, and all mineral fuels composed 85 percent of this value in 1955. Secondary recovery of oil, an important method of producing oil in the State, accounted for an estimated 12.4 percent of the total crude petroleum produced. The Kansas section of the Hugoton gas area provided 85 percent of the 471 billion cubic feet of natural-gas pro-

TABLE 1.—Mineral production in Kansas, 1954-55 1

			1954		955
	Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Coal. Hellum Lead (recoverable cont Natural gas. Natural gasoline and c LP-gases. Petroleum (crude) Pumice. Salt. Sand and gravel. Stone. Zinc (recoverable conte Value of items that c gypsum (crude), ma ment, stone (dimensi cated by footnote 4.		(4) 1,372,294 37,530,000 4,033 412,369 (4) 119,317 23,433 876,667 10,421,554 610,377,008 19,110	(4) 5, 602, 808 593, 163 1, 105, 042 43, 711, 000 (4) (4) (4) 335, 280, 000 92, 899 7, 778, 406	382, 523 5 767, 662 742, 282 42, 750, 000 5, 498	\$24, 520, 53; 1, 333, 50; \$ 873, 01; 3, 165, 86; 662, 61; 1, 638, 40; 52, 286, 00; 6, 318, 00; 2, 643, 00; 340, 670, 00; 59, 710; 8, 432, 325; 6, 999, 666; 1, 615, 934; 470, 830, 000

<sup>&</sup>lt;sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

<sup>2</sup> Excludes natural cement, value for which is included with items that cannot be disclosed.

<sup>2</sup> Excludes masonry cement.

3 Includes masonry cement.

4 Figure withheld to avoid disclosing individual company confidential data.

5 Excludes fire clays, value for which is included with items that cannot be disclosed.

5 Excludes certain stone; value for which is included with "thems that cannot be disclosed."

6 Excludes certain stone; value for which is included with "thems that cannot be disclosed."

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 Geologist, State Geological Survey of Kansas, University of Kansas, Lawrence, Kans.

Natural gas was the second-ranking mineral duction in the State. commodity produced in 1955. Other leading minerals following petroleum and natural gas in order of value were cement, stone, and natural-gas liquids.

Construction was extensive during the year and resulted in increased outputs of cement, stone, sand and gravel, and other construction

materials.

Only 5 counties of the 105 in Kansas reported no mineral production in 1955; and 16 had mineral production exceeding \$10 million. counties, in order of rank, were: Barton, Ellis, Russell, Butler, Rice, Rooks, Stafford, Greenwood, Cowley, Graham, Grant, McPherson, Stevens, Cherokee, Allen, and Reno. Coal and pumice declined in tonnage during 1955.

TABLE 2.—Average unit value of mineral commodities produced in Kansas, 1950-55

Commodity	1950	1951	1952	1953	1954	1955
ement 376-pound barrel do do do do do do do do do do do do do	\$2. 21	\$2.38	\$2.38	\$2. 51	\$2.63	\$2. 70 3. 49
Masonrydo	2, 69	2. 69	3, 01	2.98	2.96	2. 95
	. 83	1.00	1. 19	1.12	1. 20	1.26
		2.09	2. 18	2, 00	2,00	2. 34
	2.80	. 96	1, 30	1.06	1. 22	1. 2
		. 20	1.00	1.00	1.00	1.0
For cement manufacture do	3, 87	3, 94	3. 90	3.92	4.02	4. 2
For cement manufacture do do do do do do do do do do do do do	1. 95	1.66	1.62	1. 67	1.55	2.0
lypsum (crude)	. 76	. 55	. 54	. 54	. 69	. 6
traveldo	. 10	12.44	12.75	13. 18	15. 81	15. 5
Fravelper thousand cubic feet	270 00	346.00	322.00	262, 00	274.00	298. 4
eadsnort ton	210.00	010.00	022.00		3. 25	3. 2
Helium per thousand cubic feet- ead short ton darl (distomaceous) do  Natural gas per thousand cubic feet-	07	. 08	. 08	. 09	. 11	. 1
Natural gasper thousand cubic lest	. 01					
		. 06	.06	.06	. 05	. (
Natural gasoline and cycle productsper gallon_	.03	.04	.04	. 03	. 03	
Natural gasoline and cycle products—per ganon— LP-gases———————————————————————————————————	2, 57	2, 57	2.56	2.69	2.81	2.
Petroleumper 42-ganon barren		3. 20	7, 86	11.42	3.96	25.
Pumiceshort ton	6. 99	7. 37	7, 51	8. 26	8. 87	9.
Pumicedodo	11.79	12.91	13.31	14. 26	15. 37	16.
Evaporateddo	3.68	3, 67	3.75	4.10	4. 43	4.
Rockdo	. 60	. 65	. 63	.70	. 69	
Sanddo				l		
Stone:	1, 26	1.31	1.38	1.35	1.23	1.
Limestone (crushed)dodo	15, 49	18. 28	16, 22	15. 65	18.95	17.
Limestone (dimension)dodo	. 32	. 30	. 37	.40	. 35	
Miscellaneous do	1.30	1.60	1.65	1.35	1.87	1.
Miscellaneous	1.02	. 80	1. 25		7.89	19.
Sandstone (dimension)	1		1		89	1.
Limestone for cement manufacturedodo	284.00	364.00	332, 00	230.00	216.00	246.

# EMPLOYMENT IN MINERAL INDUSTRIES

Employment.—Average annual employment of the mining industries in Kansas gained slightly from 1954. Increases of 1 percent were recorded in the average mining employment in petroleum and naturalgas extraction and of 6 percent in nonmetal mining and quarrying.

Accelerated construction and road-building programs increased the demand for sand and gravel and rock products; the larger outputs of these localized industries necessitated overall enlargement of work-

Continued activity in exploration and production of petroleum and natural gas in Kansas caused the average employment for this industry to gain gradually since 1945. A sharp drop in number of producers of bituminous coal during 1955 was reflected by an 80-percent reduction in average working forces from the previous year.

TABLE 3.—Average employment in mining industries and products of petroleum and coal by months, 1955 1

Industry group	Jan.	Feb.	March	April	May	June
Mining (total)  Metal  Nonmetal  Coal.  Petroleum and natural-gas extraction  Products of petroleum and coal.	18, 300 400 1, 500 400 16, 000 4, 800	18, 400 400 1, 500 400 16, 100 4, 800	18, 800 400 1, 650 350 16, 400 4, 800	18, 700 400 1, 650 350 16, 300 4, 900	18, 700 400 1, 650 350 16, 300 4, 800	18, 800 400 1, 700 300 16, 400 4, 900
Industry group	July	Aug.	Sept.	Oct.	Nov.	Dec.
Mining (total)  Metal  Nonmetal Coal  Petroleum and natural-gas extraction.  Products of petroleum and coal	18, 900 400 1, 750 350 16, 400 4, 900	19, 100 400 1, 750 350 16, 600 5, 000	18, 700 400 1, 750 350 16, 200 4, 900	18, 500 350 1, 700 350 16, 100 4, 900	18, 500 400 1, 800 400 15, 900 4, 800	18, 700 400 1, 800 400 16, 100 4, 800

<sup>&</sup>lt;sup>1</sup> Employment Security Division, Department of Labor, State of Kansas.

TABLE 4.—Average annual employment, mining industries and products of petroleum and coal, 1946–50 (average) and 1951–55  $^{\rm 1}$ 

Industry group	1946-50	1951	1952	1953	1954	1955
Mining (total)  Metal.  Nonmetal.  Coal.  Petroleum and natural-gas extraction  Products of petroleum and coal	16, 660 1, 000 1, 440 1, 060 13, 180 5, 020	18, 500 800 1, 700 800 15, 200 5, 300	18, 900 600 1, 700 700 15, 900 5, 200	18, 500 400 1, 700 500 15, 900 5, 400	18, 400 300 1, 600 500 16, 000 5, 000	18, 700 400 1, 700 400 16, 200 4, 900

<sup>&</sup>lt;sup>1</sup> Employment Security Division, Department of Labor, State of Kansas.

Injuries.—Mineral industries in Kansas reported 5 fatal accidents, 1 permanent disability accident, and 672 nonfatal injuries. The petroleum industry had the highest fatality rate (4) of the mining groups. The quarry industry, with a total of 1,746 employees during the year, reported 2 permanent injuries and 30 temporary injuries.

Safety Competition.—National Safety Competition programs for sand and gravel and crushed stone were poorly received in Kansas. During 1955, only one sand-and-gravel plant and no crushed-stone plants were enrolled.

Wages.—Average weekly earnings in all the mining industry advanced 63 cents to \$87.77, and the average weekly hours dropped 0.1 hour to 42.4 hours. The petroleum industry had the largest gain (49 cents), boosting its average weekly earnings to \$88.19. A reduction of 0.3 hour to 41.6 hours per average work week also was recorded, according to the Employment Security Division of the Department of Labor, State of Kansas.

Transportation.—Kansas ranked fifth in the Nation for railroad mileage, according to the Kansas Industrial Development Commission. Rail lines in the State were operated by 16 companies; during 1953, 4 major railroads carried 13.5 billion ton-miles of revenue

freight. Kansas also had a total of 133,019 miles of highway, of which 97 percent was surfaced. The Missouri River gained in importance as a transportation route. These facilities contributed considerably to expansion of manufacturing and mineral production in the State.

TABLE 5.—Accident experience of the petroleum industry, by types of activity and products, in Kansas and the United States, 1955

					Inj	ury exp	erienc	е	÷ .
Petroleum-industry group	Men em- ployed	Man-hours	Days disa- bility (non-	To-4-1	Non-	Seve		Freque	
	ployed		fatal)	Fatal	fatal	Fatal	Non- fatal	Fatal	Non- fatal
Exploration Drilling Production Natural gasoline	257 1, 156 3, 325 143	432, 292 2, 363, 257 7, 067, 024 283, 724	5, 325 7, 527 76	1 2	1 111 130 3	2. 54 1. 70	2. 25 1. 07 . 27	0.42	2. 31 46. 97 18. 40 10. 57
Pipelines: Products	705 1, 807 1, 579 1, 029	1, 476, 375 3, 749, 861 3, 193, 634 2, 379, 031	95 1, 383 1, 296 732	1	8 44 43 19	2. 52	.06 .37 .41 .31	.04	5. 42 11. 73 13. 46 7. 92
Total oil and gas industry in Kansas Total United States oil and gas industry	10, 001 617, 274	20, 945, 198 1, 303, 013, 846	16, 435 598, 414	4 135	359 13, 038	1.15 .62	. 78 . 46	.19	17. 13 10. 01

TABLE 6.—Injury experience in metal quarries and coal mines in 1955

Industry group	Number	Number	Days	Inj	uries
industry group	of mines	of men	worked	Fatal	Nonfatal 1
Coal Lead-zhe mines. Quarries.	42 19 54	512 402 1,746	4, 471 4, 300	1	56 225 32

<sup>&</sup>lt;sup>1</sup> Includes permanent, partial permanent, and temporary injuries.

TABLE 7.—Pipeline construction, by types, 1955 1

Company	Origin	Terminal	Kansas length (miles)	Diameter (inches)
Product: Okan Pipe Line	Sec. 5-26S-38W, Stanton County	Sec. 14-35S-25W, Clark County	103	6
Gas: Northern Natural Gas. Do	Various sections, Seward County		10. 25 1. 50 2. 75	4 6 4
Do Do Do Colorado Interstate Gas	Finney County Haskell County Morton County Various sections, Morton County_		. 50 3. 0 4. 75 55. 0	4 4 4 4
Oil: Socony Vacuum Do Skelly Oil Co	Sec. 34-9S-23W	Sec. 28-8S-25W Morel pool Sec. 11-26S-5E	19. 0 11. 0 45. 0	4 8 13

<sup>&</sup>lt;sup>1</sup> National Oil Scouts and Landmen's Association, Oil and Gas Field Development in the United States and Canada: 1956 Yearbook, vol. 26, pp. 280-342.

Pipelines moved vast quantities of oil, natural gas, and petroleum products through the State. A total of 256 pipeline miles was completed during 1955.3 Transmission lines for natural gas recorded the largest number of new lines in 1955.

## REVIEW BY MINERAL COMMODITIES

### MINERAL FUELS

The production of mineral fuels in Kansas continued to grow. Petroleum, natural gas, natural-gas liquids, coal, and helium were produced, in order of value. Wide application of secondary-recovery methods for petroleum production had boosted Kansas reserves. Mined output of coal, on the other hand, recorded a decline.

A total of 149 new fields was discovered in Kansas during 1955; of these, 118 produced oil, 25 gas, and 6 both oil and gas. Graham County led in the State, with 17 new oilfields, followed by Barber County, with 7 oil, 3 gas, and 1 oil and gas; Barton County, third with 11 oil and 1 gas; and Kingman County fourth, with 7 oil, 3 gas, and 3 oil and gas.4

Carbon Black.—Carbon-black production in Kansas increased 70 percent from 1954. Natural-gas liquids were used to supplement natural gas in manufacturing carbon black.5

Coal.—Mine production of coal in Kansas dropped a sharp 46 percent in quantity and 43 percent in value from the previous year. Only 24 coal mines were operated in 1955 compared with 40 in 1954, despite an advance in average price from \$4.08 to \$4.27 per ton. Many Kansas mines had been depleted of minable reserves, and the number of "strippers" (salvage operations at abandoned mines) declined in spite of the rise in coal price. Nearly all of the coal was produced by open-pit methods. Hazards of abandoned mine shafts were reduced by filling 50 mine shafts in Crawford County and 60 deep entries in Cherokee County.

TABLE 8.—Coal production, 1946-50 (average) and 1951-55

	Number of mines				Value	
Year	Under- ground	Strips	Total	Short tons	Total	Average per ton
1946-50 (average)	57 222 15 28 10 5	33 46 32 21 30 19	90 68 47 49 40 24	2, 386, 411 1, 961, 101 2, 028, 601 1, 715, 004 1, 372, 294 742, 282	\$8, 390, 319 7, 734, 478 7, 902, 590 7, 101, 386 5, 602, 808 3, 165, 868	\$3. 52 3. 94 3. 90 4. 14 4. 08 4. 27

Helium.—Shipments of helium extracted from natural gas increased 14 percent in quantity at the Otis Helium Plant, as the Federal Government stepped up production to meet increasing demands from industry and research agencies. Many industrial applications have been developed for helium since its first use as a "lighter-than-air" gas.

<sup>3</sup> National Oil Scouts and Landmen's Association, Oil and Gas Field Development in United States and Canada: 1956 Yearbook, vol. 26, pp. 280-342.
4 Goebel, E. D., Hornbaker, A. L., Atkinson, W. R., Jewell, J. M., Oil and Gas Developments in Kansas During 1955: State Geol. Survey of Kansas, Univ. of Kansas Pub., Bull. 122, 1956, p. 15.
5 Work cited in footnote 4.
6 Mine Inspection Section and Mine Rescue Section, Report: Dept. of Labor, State of Kansas, 1956, p. 51.

Natural Gas.—The vast Hugoton gas area of Kansas, Oklahoma, and Texas has been estimated to have the world's largest single gas The Kansas section of this gas area in southwest Kansas reserve. produced over 85 percent of the State output of natural gas in 1955. The eastern Kansas gas fields, which reached their peak output 50 years ago, produced only 1 percent of the total 7 in 1955. Gas marketed from 48 counties amounted to 471 billion cubic feet and was valued at \$52.3 million.

Estimated recoverable reserves of natural gas for Kansas were 16,293 billion cubic feet, compared with 15,758 billion in 1954.8

TABLE 9.—Marketed production of natural gas, 1946-50 (average) and 1951-55

1110112 0	· •				
Year	Million cubic feet	Value	Year	Million cubic feet	Value
1946–50 (average)	255, 667 417, 538 412, 544	\$14, 211, 000 33, 821, 000 34, 241, 000	1954	420, 607 412, 369 471, 041	\$36, 172, 000 43, 711, 000 52, 286, 000

TABLE 10.—Marketed production of natural gas from the Kansas part of Hugoton gas area, 1940-55 1

Year	Quantity (thousand cubic feet)	Year	Quantity (thousand cubic feet)
1940	37, 083, 797 40, 759, 482 46, 365, 484 70, 921, 532 92, 922, 822, 921 90, 345, 203 119, 637, 983 157, 663, 036	1948. 1949. 1950. 1951. 1952. 1953. 1954. 1955.	185, 872, 594 247, 868, 876 320, 545, 480 371, 002, 475 375, 081, 748 387, 635, 243 346, 732, 192 394, 257, 153

<sup>&</sup>lt;sup>1</sup> Goebel, E. D., Hornbaker, A. L., Atkinson, W. R., and Jewett, J. M., Oil and Gas Developments in Kansas During 1955: State Geol. Survey of Kansas, Univ. of Kansas Pub., Bull, 122, 1956, p. 33.

TABLE 11.—Gross withdrawals and disposition of natural gas, 1951-55, in million cubic feet

		Outsid I -				
	, V	Vithdrawals <sup>1</sup>	ı	•	Disposition	
Year	From gas wells	From oil wells	Total	Marketed production <sup>2</sup>	Repressur- ing	Vented and wasted 3
1951	379, 500 382, 000 415, 000 390, 000 461, 000	80, 700 80, 300 60, 000 72, 000 64, 000	460, 200 462, 300 475, 000 462, 000 525, 000	412, 369	1, 401 1, 197 1, 079 2, 203 2, 174	41, 261 48, 559 53, 314 47, 428 51, 785

Marketed production plus quantities used in repressuring, vented, and wasted.
 Comprises gas sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas in pipelines.
 Includes direct waste on producing properties and residue blown to air. (Partly estimated.)

Work cited in footnote 4, pp. 30-32.
 Am. Petrol. Inst. and Am. Gas Assoc., Proved Reserves of Crude Oil, Natural Gas Liquids, Lignite, and Natural Gas: Vol. 10, 1955, p. 19.

Important new gasfields discovered in 1955 were:<sup>9</sup>

		Initial pro- duction (thou-
County:	Field name	sand cubic
Barber		feet per day)
Clark	Moffett	12, 400
Kiowa	Morrison Northeast	14,000
Meade	Nicholas	7, 300
Monton	Singley	<b></b> 9, <b>200</b>
Morton	Taloga	82,000

Kansas consumption of natural gas reached a high of 309 billion cubic feet, almost two-thirds of the State production; 383 billion cubic feet was shipped to other States, and Kansas received 240 billion cubic feet from other States.

Major uses of natural gas in Kansas for 1955 were industrial, domestic, and for the manufacture of carbon black.

TABLE 12.—Gas wells drilled in Hugoton gas area, cumulative to 1947 and 1948-55, by counties  $^{\rm 1}$ 

	1947 cumu-	1948 drilled	1949 drilled	1950 drilled	1951	1952	1953	1954	19	955
	lative	dimed	armed	drined	drilled	drilled	drilled	drilled	Drilled	Cumu- lative
Finney. Grant. Hamilton Haskell Kearny Morton Seward Stanton	66 269 2 127 155 61 26 94 470	20 65 2 44 49 25 22 31 75	76 89 2 42 71 6 41 9	47 36 1 39 51 52 91 17 63	19 68 8 33 56 62 51 25	49 29 8 30 75 27 10 7	73 6 10 27 72 31 19 27 4	72 5 4 39 44 14 42 24 20	49 3 0 40 27 9 21 0 5	471 570 37 421 600 287 323 234 747
Total	1, 270	333	413	397	338	252	269	264	154	3, 69

<sup>&</sup>lt;sup>1</sup> Goebel, E. D., Hornbaker, A. L., Atkinson, W. R., and Jewett, J. M., Oil and Gas Developments in Kansas During 1955: State Geological Survey of Kansas, University of Kansas Publications, Bulletin 122, 1956; p. 33.

TABLE 13.—Statistical summary of natural gas supply and disposition, 1952-55, in billion cubic feet

	1952	1953	1954	1955	Change from 1954 (percent)
Marketed production	412. 5	420. 6	412. 4	471. 0	+14. 2
	162. 7	174. 5	229. 8	239. 9	+4. 4
Total supply Shipped from State. Transmission loss and unaccounted Change in storage Consumed in State. Field use and carbon black Residential Commercial Petroleum refining Other industrial	575. 2	595. 1	642. 2	710. 9	+10.7
	286. 6	297. 1	326. 9	382. 9	+17.1
	8. 3	7. 4	12. 7	15. 7	+23.6
	. 7	7. 0	8. 8	3. 3	-62.5
	279. 6	283. 6	293. 8	309. 0	+1.8
	22. 4	20. 6	21. 6	34. 4	+59.3
	50. 1	50. 5	51. 4	54. 6	+6.2
	28. 4	28. 9	30. 4	34. 1	+12.2
	11. 8	11. 6	13. 2	12. 2	-7.6
	166. 9	172. 0	177. 2	173. 7	-2.0

Work cited in footnote 4.

Natural-Gas Liquids.—Recovery of natural-gas liquids, reported from 15 Kansas plants, increased over the previous year to 211 million gallons valued at \$8.9 million. The State daily plant capacity for natural gasoline and cycle products at the end of the year was 466,996 gallons and for LP-gases 384,304 gallons. This was a loss in daily capacity of 10 percent for natural gasoline and a gain of 26 percent for LP-gases from the beginning of 1954. Estimated proved recoverable reserves of natural-gas liquids declined 82,362 thousand gallons to 7,275,912 thousand gallons at the end of 1955.

Petroleum.—The 1955 yield of 122 million barrels of crude petroleum valued at \$340.7 million topped the record set in 1954 and continued to hold the State in fifth position among the oil-producing States. Secondary recovery of oil, an important method of recovering oil in Kansas, accounted for an estimated 15 million barrels in 1955. Footage drilled for exploration and production of oil totaled 8 million feet for the year. Although average costs for drilling a well rose generally,

TABLE 14.—Natural-gas liquids produced, 1946-50 (average) and 1951-55

	Natural	gasoline	LP-g	gases	Total		
Year	Thousand gallons	Value	Thousand gallons	Value	Thousand gallons	Value	
1946-50 (average)	80, 480 111, 090 115, 206 (1) 118, 599	\$4,766,200 6,931,000 7,286,000 (1) 6,318,000	31, 147 68, 082 77, 406 (1) 92, 596	\$1, 164, 000 2, 445, 000 3, 116, 000 (1) 2, 643, 000	111, 627 179, 172 192, 612 (1) 211, 195	\$5, 930, 200 9, 376, 000 10, 402, 000 (¹) 8, 961, 000	

<sup>1</sup> Figure withheld to avoid disclosing individual company confidential data.

TABLE 15.—Natural-gasoline plants, December 31, 1955

	Location	n	Ca	pacity (	allons pe	er day)		
Company	Nearest town	County	Natural gasoline	Pro- pane	Butane	Iso- butane	LP-gas mixture	Total
Cities Service Oil Co	Burrton	}Reno	15, 000	7,000	8,000			30, 000
Do Do Colorado Interstate	Haven Wichita Lakin	Sedgwick - Kearny	77,000 40,000	26,000	32,000			135, 000 40, 000
Gas Co., Inc. Dunn-Mar Oil & Gas	Otis	Rush	12, 000		3,000			15,000
Co. Hugoton Production Co.	Ulysses	Grant	25,000	22, 000 2, 500	18, 000		7,000	72,000 34,000
Kansas-Nebraska Natural Gas. Kansas Power & Light	Deerfield Medicine Lodge_	Kearny	24,000	2,500				15,000
Co. Magnolia Petroleum	Ulysses	Grant	39, 400	15, 700	11, 500			66,600
Co. Northern Natural Gas	Holcomb	Finney	1				-	10,000
Do Panhandle Eastern	Sublette Liberal	Sewarddo	45, 000 75, 000	20,000	15, 000			110,000
Pipe Line Co. Skelly Oil CoStanolind Oil & Gas	Cunningham Ulysses		10,000 75,096	74, 004	72, 030	24, 570	15, 000	25, 000 245, 700
Co. The Texas Company		Cowley	4, 500			-	3, 500	-
Total			466, 996	167, 204	159, 530	24, 570	33, 000	851, 30

Kansas with \$8.99 per foot, was below the United States average of \$12.43 per foot in 1953.

Average price of crude oil remained unchanged, but indicated demand increased from the previous year. Sales of gasoline and fuel oils increased through expanding economy.

TABLE 16.—Sales of LP-gases, 1954-55, by uses, in thousand gallons 1

Uses	Bu	tane	Pro	pane	Mi	kture	Total 1	LP-gases	Per-
	1954	1955	1954	1955	1954	1955	1954	1955	change
Domestic uses	7, 430	6, 683	86, 471 19	94, 188	16, 492	16, 270	110, 393	117, 141	+6.1
Industrial Synthetic rubber	4, 935	24, 792	2, 960	4,848	129	52	8, 024	29, 692	+270.0
Chemical plants Internal combustion Ali other	2, 371 62	4, 131	9, 306 263	11, 243 323	5,079 197	9, 865 200	16, 756 522	25, 239 523	+50.6 +0.2
Total	14, 798	35, 606	99, 019	110, 602	21, 949	26, 387	135, 766	172, 595	+27. 1

<sup>&</sup>lt;sup>1</sup> Data include liquid residual gases (LR-gases).

Drilling and exploration.—Drilling activity, measured by the number of rigs in use during the year, was high, with a monthly average of 480 rigs used during the year. Discovery of oil became more difficult in Kansas; however, redevelopment of old fields for secondary recovery has helped maintain reserves.

Average footage of new wells drilled mounted steadily during the period 1951-55. The total footage drilled in Kansas rose 7 percent from 1954, yet the average depth of wells drilled in the State was 3,771 feet compared with the national average (4,101 feet). Kansas was below the average cost per foot for drilling in the United States by approximately 8 percent in 1953.

The average exploratory drilling was less successful than in 1954. Only 18-percent success was reported for 1955, though the number of exploratory wells drilled was greater than in 1954.

TABLE 17.—Oil- and gas-well drilling in 1955, by counties 1

County	Prov	red field	wells	Exp	loratory	wells		Total		Grand
	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	total
Barber Barton Brown	69 150	36 1	31 90	9 20	6	52 26	78 170	42 1	83 116	203 287
Butler Chase	56		43	1		26 4	57		69	126
Cheyenne Clark Clay	16	2	5	2	2	5	18	4	10	2 32
Coffey_ Comanche Cowley_	1 175			1	1	1 7	1 1	1	1 7	1 2 9
Decatur Dickinson Doniphan	11 13		73 2 9	18 2 3	1 	56 12 18	193 13 16	1	129 14 27	323 27 43 2
Edwards	3 135		2 96	16	2	2 13 46	3 151	2	2 15 142	20 20 293
Ellsworth	25		24	3		17	28		41	69

See footnote at end of table.

TABLE 17.—Oil- and gas-well drilling in 1955, by counties 1—Continued

	County	Prov	ed field v	vells	Expl	oratory v	vells		Total		Grand
	County	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	total
_		1	49	5	1	2	1	2	51	6	59
d	еу		1	1			2 2		1	3 5	4 5
1	am	185		3 78	22		59	207	3	137	344 3
	nt	97	2	48	i	1	13	98		61	159
1	ilton	65	3	3 9	1 4	i	5 21	1 69	4	8 30	9 103
r	oer	1	1	1 3		1	7	1 5	2 44	8	11 52
	cellgeman	4	43	3	1	1	6	a		6	6
u	my	56	25 5	19	7	2 2	21	63	27 7	40	27 110
7	gmanva.	5	4	8	8	3	20 1	13	7	28 1	48 1
	n	27	i	9	1		12	28	1	21	50
1	herson	87 64		33 32	11		32 16	87 75		65 48	152 123
a	ion de	4		4	3	4	4	7 12	4	8	19 17
	ris ton	. 12 17	107	10	1	1 8	4	18	115	14	147
S	ston	16 12		4	3		17 24	19 12		21 28	40 40
b	orne				6	4	5 54	157	14	5 84	5 255
ij	nee lips	151 5	10	30 2			4	5		6	11 83
1	tt vlins	27	1	23	8	2	22 2	35	3	45 2	2
n	0	9	1	7 39	4 5	<u>-</u> -	29 24	13 78	<u>-</u> -	36 63	49 143
	ks	73 98	1	72	9		23	107	1	95	202 56
	hsell	17 82	i	12 44	2 4	1	24 16	19 86	1	36 60	147
i	ne	7	<del>-</del> -	6	1		8	7 2		14 1	$\begin{array}{c c} 21 \\ 3 \end{array}$
1	tt gwick	1 195		77	8		59	203	25	136 11	339 36
	ard ridan	4	22	8 9	3	3	3 21	7		30	37
8	rman fford	53		67	15		40	68		107	175
ij	nton	00	3	2			6		3 4	8	11
'n	vens nner	125	1	51	6		53	131	i	104	236
t	masgo	20		21	3		2 25	23		2 46	69
a	baunsee						2			2	2
	llaceodson	5		3	2		3	7		6	18
	Total: 1955	2, 179	323	1, 122	215	49	988	2, 394	372	2, 110	4, 876
0	Total: 1955 1954	2, 179 2, 197	323 325			-	49 45	49 988	49 988 2,394	49 988 2,394 372	49 988 2.394 372 2,110

<sup>&</sup>lt;sup>1</sup> National Oil Scouts and Landmen's Association, Oil and Gas Field Development in the United States and Canada: 1956 Yearbook, vol. 26, pp. 280-342.

Average footage of n	ew wells drilled: 10 11	
19503, 224	1952 3, 468	1954 3, 552
1951 3, 437	1953 3, 478	1955 3, 771

Production.—Barton, Ellis, Russell, Butler, Rooks, and Rice Counties, respectively, had the State's largest outputs. Important new fields or pools discovered during the year that had initial production over 300 barrels per day were: 12

<sup>10</sup> Includes oil wells, gas and distillate wells, and dry holes only. Excludes water-input wells, gas-input wells, salt-water-disposal wells, and wells drilled deeper.

11 American Petroleum Institute, Petroleum Facts and Figures: 12th ed., 1956, p. 132.

12 Work cited in footnote 4, pp. 262-344.

Field name	County	Initial pro- duction (barrels per day)	Field name	County	Initial pro- duction (barrels per day)
Irvin East	Ellis Ellsworth do Graham do	775 3,000 1,520 1,155 389	Holley North Holley Northwest Law Southeast Prairie Glenn Southeast Miller	Grahamdodo Harper	301 306 375 373 427

## TABLE 18.—Production of crude petroleum, 1946-50 (average) and 1951-55

	Value			1	Value		
Year	Thou- sand barrels	Total (thou- sand dollars)	Average per barrel	Year	Thou- sand barrels	Total (thou- sand dollars)	Average per barrel
1946-50 (average) 1951 1952	104, 542 114, 522 114, 807	\$233, 726 294, 320 293, 910	\$2. 24 2. 57 2. 56	1953	114, 566 119, 317 121, 669	\$308, 180 335, 280 340, 670	\$2.69 2.81 2.80

TABLE 19.—Production and indicated demand of crude petroleum, by months, 1955, in thousand barrels

Month	Produc- tion	Indicated demand	Month	Produc- tion	Indicated demand
January Pebruary March April May June	10, 559 9, 569 10, 670 10, 092 9, 510 9, 620 10, 531	10, 448 9, 559 10, 492 9, 721 10, 824 9, 747 10, 509	August_September_October_November_December_	10, 366 9, 880 10, 442 9, 993 10, 437	10, 442 10, 467 8, 722 10, 276 10, 602

TABLE 20.—Production of crude petroleum, 1951-55, by fields, in thousand barrels [Oil and Gas Journal]

Field	1951	1952	1953	1954	1955
Bemis-Shutts	4, 287	3, 741	3, 526	3, 549	3, 263
Bloomer	2, 782	2, 344	2,067	1, 589	1, 456
Burnett	3,044	2,709	2, 303	2, 170	2,464
Burrton-Haury	1,026	909	781	809	732
Chase	2, 786	1 7, 152	1 6, 007	1 5, 339	1 4, 897
El Dorado	3, 202	3, 454	3, 939		
Fairnort	1 195	879	834	3, 864	4, 242
Geneseo-Edwards	3,001	3, 304		823	903
Gladys.	9,001		3,061	2,869	2,941
Gorham	(2)	(2)	(2)	(2)	1,024
Holl Comes	2, 452	1,990	1,793	1,692	1, 589
Hall-Gurney	3, 637	3, 954	4,640	4,528	4,064
Iuka-Carmi	1, 104	1, 244	1, 314	1, 421	1, 464
Kraft-Prusa	6, 326	5, 449	4, 721	4, 357	3,826
Marcotte	399	1, 964	1,831	1,681	1,712
Morel	2, 301	2,092	1, 798	1,654	1, 470
Ray	1,822	1,624	1, 393	1, 280	1, 312
Seeley-Wick	760	1, 292	1,753	1, 798	1, 479
Suca-Raymond	4.950	(í)	(1)	(1)	(1)
Stoltenberg	1.760	ì. 471	1, 270	1.119	1,043
Thrall-Aagard	1. 324	1, 650	1, 121	1,002	775
'l'rann	7 696	6, 469	6, 081	5, 461	4, 943
Welch-Bornholdt	(2)	740	1, 259	1, 361	1, 254
Other fields	58, 334	60, 414	³ 63, 767		
	00,001	00, 414	- 00, 707	<sup>3</sup> 70, 951	* 74, 816
Total	114, 118	114, 845	3 115, 259	* 119, 317	<sup>3</sup> 121, 669

Silica included with Chase.
 Included with "Other fields,"
 Bureau of Mines data.

Secondary recovery.—Application of secondary recovery by water flooding to recover oil from partly depleted fields in Kansas was conducted rather haphazardly until 1935, when legislation was passed defining and recognizing water flooding as a method for producing oil. York State Oil Co. organized the first legalized project in the Seeley pool, in northern Greenwood County.<sup>13</sup>

Repressuring of oil-bearing formations by injection of water has boosted Kansas recovery of crude oil in the "stripper fields" as much as 60 percent of the residual oil that would not have been recovered by primary production methods. Important formations being water-flooded in Kansas were the Bartlesville, Peru, and Wayside sands—

all of Pennsylvanian age.

Annual output by secondary practices climbed from 5 million barrels in 1942 to approximately 15 million barrels in 1955, when it represented 12.4 percent of the oil recovered during 1955. Twelve

TABLE 21.—Secondary recovery of oil from eight counties during 1955 1

County	Number of projects	Total oil production (barrels)	Estimated secondary recovery oil production (barrels)	Secondary as a percent of total production
Allen	12 7 26 4 48 8 15	806, 836 732, 416 8, 469, 378 376, 674 6, 485, 392 676, 726 833, 449 634, 699	709, 201 417, 130 3, 526, 419 310, 525 5, 401, 273 552, 731 658, 249 474, 592	87. 9 57. 0 41. 6 82. 4 83. 3 81. 7 60. 0 74. 8
Total	131	19, 015, 570	12, 050, 120	59. 9

<sup>&</sup>lt;sup>1</sup> Goebel, E. D., Hornbaker, A. L., Atkinson, W. R., and Jewett, J. M., Oil and Gas Developments in Kansas During 1955: State Geol. Survey of Kansas, Univ. of Kansas Pub., Bull. 122, 1956, p. 29.

TABLE 22.—Crude runs to stills and refinery receipts of crude oil by method of transportation by months during 1955
(Thousands barrels)

			•					
					Tot	al receipts, transpo		đ of
Months	Crude runs to stills	Fuels and losses	Origin of domestic crude	Daily average	Intra	state	Inter	state
	Sullo		receipts		Pipe- lines	Tank cars and trucks	Pipe- lines	Tank cars and trucks
January. February. March April May June July August. September October. November	7, 600 6, 413 7, 595 7, 848 8, 114 7, 992 8, 260	5 4 3 2 -3 4 -1 1 3 -4	12,007 10,141 10,053 10,742 10,053 9,545 10,522 11,186 9,934 10,280 10,357 11,407	387 362 324 258 324 318 339 361 331 332 345 368	5, 598 5, 012 5, 270 4, 799 4, 707 5, 194 5, 224 5, 583 5, 595 5, 032 4, 883 5, 295	80 77 95 102 92 112 112 119 133 125 101	2, 034 1, 791 2, 074 1, 711 2, 534 2, 524 2, 499 2, 429 2, 441 2, 745 2, 561 2, 918	4 3 4 3 2 4 4 4 4 4 4 4
Total	91, 739	15	126, 227	4, 049	62, 192	1, 280	28, 261	41

<sup>&</sup>lt;sup>13</sup> Grandone, Peter, Water Flooding of Oil Sands in Kansas: Bureau of Mines Rept. of Investigations 3761, 1944, p. 1.

million barrels of this total was credited to 8 counties.<sup>14</sup> In 1955, 131 secondary recovery projects, containing 6,414 wells, were reported.

TABLE 23.—Sales of petroleum products, 1951-55, in thousand barrels

Product	1951	1952	1953	1954	1955
Gasoline <sup>1</sup> Kerosine Range oil Distillate fuel oil Residual fuel oil	18, 723	19, 798	21, 004	23, 259	24, 474
	1, 344	1, 290	1, 100	1, 068	977
	906	916	880	893	828
	5, 552	5, 695	5, 938	5, 897	6, 493
	7, 068	6, 062	5, 247	4, 020	4, 179

<sup>&</sup>lt;sup>1</sup> Consumption rather than sales of gasoline. Data obtained from American Petroleum Institute, Petroleum Facts and Figures.

TABLE 24.—Barrels of oil produced, shipped in, used, and shipped out, 1954-55 1

	1954	1955
Produced	118, 309, 260 24, 966, 516	121, 161, 234 29, 505, 340
Total	143, 275, 776	150, 666, 574
Shipped out	54, 968, 489 88, 307, 287	57, 527, 501 93, 139, 073
Total	143, 275, 776	150, 666, 574

<sup>&</sup>lt;sup>1</sup> Figures provided by Conservation Division, Kansas Corporation Commission.

Average price of crude petroleum in Kansas was \$2.80 per barrel, a reduction of 1 cent from 1954.

Sales of kerosine and range oil diminished during the year but

increased for gasoline and fuel oils.

Reserves.—According to the American Petroleum Institute, reserves of petroleum hydrocarbons, including natural-gas equivalent, in Kansas rose 18 million barrels during 1955. A slight decrease in natural-gas-liquid reserves was more than offset by the increase for crude oil. Proved recoverable reserves of petroleum gained 19 million barrels, which made the reserves at the end of 1955 an estimated 998 million barrels.

#### **METALS**

The Tri-State lead-zinc district of southwestern Missouri, Kansas, and Oklahoma reported mine production of 4 million tons of crude ore and 486,000 tons of old tailing, yielding 27,000 tons of lead concentrate containing 20,000 tons of recoverable lead and 131,000 tons of zinc concentrate containing 70,000 tons of recoverable zinc. Production of lead-zinc ores in Kansas was entirely from that part of the Tri-State district in Cherokee County. District mine and mill operations of the Eagle Picher Co. were halted during a 4-day strike early in July. Improved zinc prices, resulting in part from the General Services Administration stockpile program during the year, allowed increases in marginal production from the Tri-State district. (See the Oklahoma chapter of volume III for further details on Tri-State district activity.)

Workicitedlinifootnote[4, pp. 28, 29.

Kansas supplied 28 percent of the lead and 40 percent of the zinc recovered metal in the Tri-State district. This recovery in Kansas amounted to 5,498 short tons of lead valued at \$1.6 million and 27,611 short tons of zinc valued at \$6.8 million.

TABLE 25.—Mine production of lead and zinc, 1946-50 (average), 1951-55, and total 1876-1955, in terms of concentrates and recoverable metals <sup>1</sup>

# 1# A		Tando	oncentrate	Zine co	ncentrate	F	Recoverable metal content <sup>2</sup>			
Year	Mines pro- duc-		lena)	(sphal		Lead		Zine		
in internet of the Season of the	ing	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	
1946-50 (average) - 1951 - 1952 - 1953 - 1954 - 1955 - 1876-1955 -	75 78 84 58 26 36	10, 870 11, 920 7, 747 4, 399 5, 390 7, 362 820, 919	\$2, 017, 714 2, 582, 335 1, 582, 699 665, 189 916, 161 1, 352, 876 69, 589, 945	67, 310 53, 281 47, 077 28, 668 3 38, 896 51, 252 5, 385, 174	\$6, 444, 455 6, 651, 855 5, 685, 236 2, 064, 783 2, 638, 102 3, 980, 849 256, 080, 583	8, 275 8, 947 5, 916 3, 347 4, 033 5, 498 626, 238	\$2, 430, 944 3, 095, 662 1, 904, 952 876, 914 1, 105, 042 1, 638, 404 84, 007, 473	36, 277 28, 904 25, 482 15, 515 4 19, 110 27, 611 2, 797, 769	\$9, 232, 531 10, 521, 056 8, 460, 024 3, 568, 450 4, 127, 760 6, 792, 306 401, 405, 628	

TABLE 26,-Mine production of lead and zinc in the Tri-State district, 1946-50 (average) and 1951-55, in terms of concentrates and recoverable metals

	Lead concentrate (galena)		Zine co	ncentrate	Recoverable metal content			
Year				lerite)•	1	-ead	Zinc	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946–50 (average)	36, 140 36, 300 36, 333 17, 403 24, 497 7, 362 3 75 \$19, 555 26, 992	\$6, 700, 330 7, 720, 550 7, 388, 754 2, 715, 987 4, 127, 232 1, 352, 876 12, 750 3, 368, 713 4, 734, 339	183, 916 170, 263 167, 474 102, 821 127, 053 51, 252 41, 048 678, 726	\$18, 236, 352 21, 023, 818 19, 537, 949 7, 455, 540 8, 483, 611 3, 980, 849 74, 528 5, 997, 071	27, 309 26, 906 27, 356 13, 273 18, 314 5, 498 4 55 6 14, 126 19, 679	\$7, 975, 188 9, 309, 476 8, 808, 632 3, 477, 526 5, 018, 036 1, 638, 404 16, 390 4, 209, 548 5, 864, 342	98, 480 91, 553 90, 512 55, 729 264, 322 27, 611 3 542 641, 543 69, 696	\$25, 066, 092 33, 325, 292 30, 049, 984 12, 817, 670 13, 893, 552 6, 792, 306 133, 332 10, 219, 578

Includes 360 tons from old tailings remilled.
 Includes 194 tons from old tailings remilled.
 Includes 217 tons from old tailings remilled.

### **NONMETALS**

Cement.—Shipments of portland cement during 1955 valued at \$24.5 million declined very slightly, although the production of portland cement increased 5 percent from the previous year. Masonry cement, reported separately for the first time in Kansas, accounted for the slight recession rather than a slight increase (4 percent) in

<sup>&</sup>lt;sup>1</sup> Based on Kansas ore and old tailings treated at mills during calendar year indicated.
<sup>2</sup> 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 lead and zinc is calculated from the average price for all grades.
<sup>3</sup> Includes 360 tons from old tailings remilled.
<sup>4</sup> Includes 194 tons from old tailings remilled.

<sup>4</sup> Includes 5 tons from old tailings remilled.
5 Includes 2,519 tons from old tailings remilled.
6 Includes 39 tons from old tailings remilled.

quantity of cement shipped. Nevertheless, Kansas cement manufacturers attempted to replenish their badly depleted stocks. Demand for cement by construction programs remained firm. Growth and demand for cement from 1951 through 1955 and the promise of continued high consumption prompted expansions of plant-processing equipment for the several cement companies. Modernizations and expansions completed during 1955 increased the State capacity of cement 2 million barrels annually. Lone Star Cement Corp. and Consolidated Cement Corp. each enlarged its processing facilities. Revamping of Ash Grove Portland Cement Co. plant neared completion.

Natural Cement.—Desirable properties of natural cement, such as low coefficient of expansion, low shrinkage, and slow setting time, are some of the advantages for using this product in mortars and cement. Shipments of natural cement in Kansas more than doubled the 1954 output. The general demand for cement also has benefited natural

cement production from Ft. Scott Hydraulic Cement Co.

TABLE 27.—Production and shipments of portland cement, 1946-50 (average) and 1951-55, in 376-pound barrels

			Shipments	
Year	Production (barrels)		Va	lue
	(500.15)	Barrels	Total	Average per barrel
1946-50 (average) 1951 1952 1953 1954 1955	7, 582, 265 8, 514, 521 8, 672, 883 8, 766, 206 8, 803, 007 9, 219, 533	7, 686, 622 8, 163, 916 8, 811, 762 8, 546, 250 9, 076, 328 9, 071, 747	\$15, 412, 158 19, 413, 144 20, 956, 886 21, 428, 536 23, 874, 179 24, 520, 533	\$2.01 2.38 2.38 2.51 2.63 2.70

Clays.—Kansas clays have attracted attention for structural products and ceramic artware since the turn of the century. Increased use of clays used for art pottery has been greatly encouraged by the ceramic laboratory of the Kansas Geological Survey and the Art Department of the University of Kansas.

Pidgeon Vitrified China Co., one of the most modernly equipped dinnerware plants and the first dinnerware industry to locate in

Kansas, began operations in 1955.

The clay industry in Kansas was marked with expansions throughout the year. Production of miscellaneous clay increased 10 percent in tonnage, and value increased 12 percent from 1954. Fireclay production increased during the year.

The bulk of the Kansas clay production was used for structural products. Thirteen brick plants, 1 lightweight-aggregate plant, and

1 pottery plant operated during the year.

Gypsum.—Keeping pace with residential building in the Kansas area, National Gypsum Co. installed an 18-ton calcining kettle to meet the growing demand.<sup>15</sup>

<sup>15</sup> Pit and Quarry, vol. 47, No. 12, June 1955, p. 96.

Tonnage and value increased 17 and 58 percent respectively from the previous year. The sharp rise in value was attributable mainly

to demand and rising operating costs.

Marl (Diatomaceous).—Pulverized diatomaceous marl was used as flatting pigments in oil-and-water emulsion paints. Production of marl increased substantially from 1954, partly reflecting growing demand for paint caused by the extensive residential construction.

Perlite.—Pancalite Perlite Co. of Kansas City, Wyandotte County, produced bloated perlite for lightweight aggregate, used for insulating

plasters and non-load-bearing lightweight concrete.

Pumice (Volcanic Ash).—Pumice, mined and crushed only for use as in cleansing powders, dropped 90 percent in output and 36 percent in value. Specialized use of pumice boosted the unit price from \$3.96 to \$25.74 per ton and prevented a very sharp decline in value when related with production. Only three counties reported pumice production. Twenty-three volcanic ash glazes have been developed by the Kansas Geological Survey for ceramic ware, but no utilization

of these glazes was reported.

Salt.—Five companies operated shaft mines and brine wells for producing salt. Approximately half of the total rock salt produced in Kansas was consumed by agricultural industries. Meat packers, block salt for livestock, and leather tanners were among the major agricultural consumers. Because of its processing, evaporated salt had about twice the value of the rock-salt production; tonnage was only two-thirds of the amount of rock salt produced. Again the huge agricultural industry of Kansas used the largest part of evaporated

TABLE 28.—Salt sold or used by producers, 1946-50 (average) and 1951-55

Year	Evapora	ted salt	Rock	c salt	То	tal
1 ear	Short tons	Value	Short tons	Value	Short tons	Value
1946-50 (average)	336, 977 360, 785 358, 887 370, 569 356, 045 361, 612	\$3, 345, 595 4, 659, 036 4, 775, 741 5, 285, 805 5, 474, 151 5, 819, 536	509, 021 540, 132 552, 857 534, 658 520, 622 549, 254	\$1, 582, 907 1, 980, 307 2, 074, 286 2, 194, 751 2, 304, 255 2, 612, 789	845, 998 900, 917 911, 744 905, 227 876, 667 910, 866	\$4, 928, 502 6, 639, 343 6, 850, 327 7, 480, 556 7, 778, 406 8, 432, 325

Sand and Gravel.—The 4-percent decline (\$6.9 million) in value of sand and gravel compared with the 2-percent increase in total output (10.7 million tons) may be explained in part by the excessive supply

that resulted from a larger number of producers.

Kansas reported 199 sand-and-gravel operations in 1955 compared with 172 operations in 1954. Of this total, 71 Government-andcontractor operators quarried sand and gravel compared with only 55 in 1954. This gain in the number of Government-and-contractor operators indicates the magnitude of the road and construction programs in Kansas.

Stone.—Stone output, paralleling the rise in Kansas construction activity, rose 20 percent in tonnage (12.5 million tons) and 23 percent in value (\$15.9 million) from 1954. This gain represents a twofold increase in (1) stone used in roads and construction and (2) produc-

TABLE 29.—Sand and gravel sold or used by producers, 1946-50 (average) and 1951-55

Year	Commercial		Governm contra		Total	sand and gr	avel
	Short tons	Value	Short tons	Value	Short tons	Value`	Average value per ton
1946-50 (average) 1951 1952 1953 1954 1955	4, 191, 785 6, 167, 690 6, 797, 975 6, 678, 241 8, 340, 949 9, 000, 242	\$2, 578, 270 4, 234, 173 4, 675, 216 4, 946, 934 6, 365, 665 6, 342, 242	1, 777, 401 1, 509, 198 1, 582, 090 2, 050, 050 2, 080, 605 1, 664, 744	\$960, 775 513, 371 348, 377 721, 374 828, 506 567, 424	5, 969, 186 7, 676, 888 8, 380, 065 8, 728, 291 10, 421, 554 10, 664, 986	\$3, 539, 045 4, 747, 544 5, 023, 593 5, 668, 308 7, 194, 171 6, 909, 666	\$0. 5 . 6 . 6 . 6 . 6

tion of cement, of which limestone used for the cement is reported with stone production. Dimension limestone and dimension sandstone were cut for building and facing. Crushed limestone was 87 percent of the total stone produced.

Crushed limestone was used for concrete, road metal, agricultural

limestone, riprap, cement, and railroad ballast.

The Jayhawk Crushed Stone Corp., Lawrence, Douglas County, a new stone producer, had a plant with crushing capacity of about 300 tons per hour.

TABLE 30.—Stone sold or used by producers, 1951-55, by kinds

37	Lime	estone	San	Sandstone Miscellaneous stone		Total stone		
Year	Short tons	Value	Short tons	Value	Short tons	Value	Short	Value
1951 1952 1953 1954 1955	5, 824, 103 7, 551, 061 7, 026, 871 1 9, 161, 085 1 10, 848, 030	\$8, 284, 559 11, 204, 877 10, 045, 111 111, 956, 778 14, 302, 875	277, 446 295, 246 591, 424 355, 430 2 745, 349	\$444, 108 485, 871 800, 008 687, 180 2 1, 221, 726	1, 089, 934 984, 564 1, 150, 857 860, 493 877, 237	\$329, 845 360, 992 458, 831 297, 864 362, 668	7, 191, 483 8, 830, 871 8, 769, 152 10, 377, 008 12, 470, 616	\$9, 058, 512 12, 051, 740 11, 303, 950 1 12, 941, 822 15, 887, 269

<sup>1</sup> Includes limestone for cement but excludes limestone for certain other uses to avoid disclosure of individual company data.

<sup>2</sup> Excludes dimension sandstone.

Vermiculite.—Vermiculite was expanded for insulation and plaster aggregate by Dobson Manufacturing Co. of Wichita, Sedgwick County. Production declined in 1955 from the previous year.

## **REVIEW BY COUNTIES 16**

Mineral output was reported in 100 of the 105 counties in Kansas in 1955, with 53 counties reporting production of \$1 million or more. Barton County was foremost, with \$40.6 million in minerals produced during the year. No minerals were reported produced in Greeley, Lane, Mitchell, Rawlins, and Wichita Counties. Decline in coal production hampered the economy of some counties, while building and highway construction boosted the mineral economy of others. Growing production of crude petroleum was responsible for considerable gains in county mineral value.

<sup>16</sup> Oil and gas data taken from State published reports: Goebel, E. D., Hornbaker, A. L., and Jewett, J. M., Oil and Gas Developments in Kansas During 1955; State Geological Survey of Kansas, Bull. 122, September 1956; Schoewe, Walter H., The Mineral Industry in Kansas, 1955; State Geological Survey of Kansas, Bull. 119, part 8, 1956.

TABLE 31.—Value of mineral production in Kansas, 1954–55, by counties 1

IMPER 01.			
County	1954	1955	Minerals produced in 1955 in order of value
AllenAnderson	\$9, 955, 078 2, 239, 436	\$10, 733, 745 2, 224, 905 384, 927 7, 099, 826	Cement, crude petroleum, stone, clays, natural gas. Crude petroleum, stone, sand and gravel.
AtchisonBarber	(2) 5, 261, 159	384, 927 7, 099, 826	Stone. Crude petroleum, natural gas, gypsum, natural-gas liquids,
2	46, 634, 226 917, 703 9, 193 25, 143, 892 127, 676 2, 774, 924 7, 964, 041		sand and gravel. Crude petroleum, sand and gravel, natural gas, clays. Natural cement, stone, crude petroleum, coal. Sand and gravel, crude petroleum.
BartonBourbon	917, 703	40, 565, 367 1, 124, 214	Natural cement, stone, crude petroleum, coal.
BrownButler	9, 193	25 059 1	Crude petroleum, stone, sand and gravel.
Butler	25, 143, 892	101, 118	Crude petroleum, natural gas, sand and gravel.
ChaseChautauqua	2.774.924	24, 056, 370 101, 118 2, 700, 610	Crude petroleum, natural gas, sand and gravel. Crude petroleum, stone, natural gas, sand and gravel. Zinc, coal, lead, stone, clays. Sand and gravel. Crude petroleum, natural gas, sand and gravel.
Charutauqua	7, 964, 041	1 11 035,808 1	Zinc, coal, lead, stone, clays.
Cheyenne	(2) 475, 501	1, 227, 626 70, 863	Cititie Delitieum, natural gab, barra alla g
Clark	224, 037	70, 863	Sand and graver, stone.
Cloud	224, 037 359, 006	1 341, 250 1	Sand and gravel, clays.  Crude petroleum, coal, stone, sand and gravel, natural gas.
Coffey	654, 396	570, 061 28, 570	Natural gas, crude petroleum, sand and gravel.
ComancheCowley	7, 875 13, 072, 083	28, 570 14, 392, 514	
Cowley	20,000	1	gravel, natural gas. Coal, crude petroleum, clays, stone, natural gas. Crude petroleum, sand and gravel. Crude petroleum, sand and gravel.
Crawford Decatur	2, 268, 356	1, 192, 358	Crude petroleum, sand and gravel.
Decatur	983, 144 483, 273 192, 371 267, 201	1, 192, 358 978, 386 894, 956 420, 570	Stone, crude petroleum, sand and graver.
Decatur Dickinson Doniphan Douglas Edwards Elk	192, 371	420, 570	Stone.
Douglas	267, 201	420, 570 194, 174 300, 845 2, 506, 361 31, 239, 502 9, 399, 382 4, 896, 237	Crude petroleum, natural gas, sand and gravel.
Edwards		2, 506, 361	Crude petroleum, natural gas, sand and gravel.  Crude petroleum, stone, sand and gravel.  Crude petroleum, stone, sand and gravel.
Elk	2,340,814 32,060,240 9,722,867 3,847,400	31, 239, 502	Crude petroleum, stone, sand and gravel.
Ellis Ellsworth Finney	9,722,867	9, 399, 382	Crude petroleum, stone, sand and gravel. Crude petroleum, salt, sand and gravel. Natural gas, crude petroleum, natural-gas liquids, sand and
Finney	3,847,400	4, 890, 237	
Ford	121, 346	140, 661 1, 346, 568	Cand and gravel natural cas, critice Detroiteum.
Franklin	121, 346 1, 543, 174 393, 943	1, 346, 568	Crude petroleum, stone, clays, coal. Stone, sand and gravel.
Geary	393, 943	363, 674	
Gove	83, 838 10, 930, 633 12, 304, 390	90, 082 13, 975, 460 12, 583, 273	Orude petroleum, stone. Orude petroleum, stone. Natural gas, natural-gas liquids.
Grant	12, 304, 390	12, 583, 273	
Ford	- 17 276 042	(2)	Sand and gravel. Crude petroleum, stone, sand and gravel.
Greenwood	17, 376, 043 482, 577	633, 466	Natural gas, crude petroleum, sand and gravel.
Hamner	482, 577 462, 321 563, 926	633, 466 1, 682, 349 720, 009	Crude petroleum, natural gas, sand and gravel
Harvey	563, 926	720,009	Orude petroleum, sand and gravet, natural gas. Natural gas, crude petroleum, sand and gravel. Crude petroleum.
Haskell	2,760,468	3, 862, 738 292, 562	Crude petroleum.
Jackson	394, 929 113, 362	2 (2)	Stone.
Jefferson	341, 558 2, 384	(2)	Do. Stone, sand and gravel.
Jewell	359, 838	379,095	Stone, crude petroleum.
Hodgeman Jackson Jefferson Jemes Jemes Johnson Kearny	7, 375, 13		Natural gas, natural-gas inquitas, crude personal,
Kingman		1 4,990,367	and gravel. Crude petroleum, natural-gas liquids, natural gas, san
	20.00	1	and gravel.
Kiowa	29, 09: 440, 39	2 185, 393 5 582, 461	Stone, crude petroleum, natural gas.
Labette Lane	6,06	3	
Logranworth			
		$ \begin{array}{c c} 9 & (2) \\ 6 & 405,071 \end{array} $	Crude petroleum, stone, sand and graver, natural sas.
Lincolin	1, 373, 35 (2)		Cond and grave
Lyon	1, 195, 86	3 1,320,96	4 Crude petroleum, sand and gravel, stone. 4 Crude petroleum, stone, natural gas. 5 Crude petroleum, stone, natural gas.
Marion	1, 195, 86 2, 185, 46 455, 01 11, 421, 81 1, 970, 45 2, 055, 81, 19, 71 209, 97 5, 219, 12 105, 96 6, 345, 77	9 2, 935, 554 5 619, 766 5 12, 470, 35	Gypsum, sand and gravel, stone.
Marshall MaPherson	11. 421, 81	5 12, 470, 35	Grude petroleum, sand and gravel, natural gas.
Meade	1, 970, 45	8 1,660,73	4   Crime Delivieum, natural Sas, Parisione
Miami Montgomery	2,055,83	33 2,048,12 14 9,263,88 17 220,73 25 7,101,89	Orude petroleum, stoller, natural gas, stone, natural gas. Cement, crude petroleum, clays, stone, natural gas.
Montgomery Morris	209. 97	77 220, 73	Crude petroleum, sand and gravel, stone, natural gas.
Morton	5, 219, 12	25 7, 101, 89	Natural gas, crude petroleum. Crude petroleum, stone.
Nemaha	105, 95	52 90,29	Cement, crude petroleum, stone, natural gas.
Morris	6, 345, 76	52 90, 29 35 6, 866, 77 38 998, 30 70 2, 910, 57	9 Crude petroleum, sand and gravel.
Ness Norton	2, 151, 6	70 2, 910, 57	6 Crude petroleum, pumice.
Osage	751, 43 751, 43 2, 151, 63 327, 20 265, 3	66 (2)	
Osborne	265, 3	49 241, 95 50 (2)	
Ottawa	19, 6 4, 775, 8	03 7, 261, 47	78   Crude petroleum, natural gas, sand and graver.
Phillips	4, 775, 8 6, 451, 1	10 5, 903, 81	Crude petroleum, stone, sand and graver.
Pottawatomie	117, 6	98   136, 71	12 Stone, sand and gravel. 56 Crude petroleum, natural gas, sand and gravel.
Pratt	8, 339, 4	10 8, 232, 25	JU + Orado portologia, marana gar,

See footnotes at end of table.

TABLE 31.—Value of mineral production in Kansas, 1954-55, by counties 1—Con.

			, -,
County	1954	1955	Minerals produced in 1955 in order of value
Reno	\$10, 087, 988	\$10, 075, 846	
Republic	(2)	(2)	
Rice	22 074 469	20, 903, 506	Sand and gravel.
Киеу	269 654	132,900	
B.OOKS	1 20 308 540	19, 888, 555	vand and graver, stone.
Kusn	1 679 994	9 174 790	Crude petroleum.
Russell Saline	31, 597, 601	30, 126, 873	Crude petroleum, helium, natural gas, natural-gas liquids.
Saline	4, 400, 249	3, 591, 176	
Scott Sedgwick	182, 350	282, 894	Crude petroleum, sand and gravel.
Sedgwick	5, 206, 911	9, 043, 225	Cwide netwel
eward	4, 338, 534	5, 171, 118	
snawnee	1 709 602	1,004,964	Natural gas, natural-gas liquids, crude petroleum. Stone, sand and gravel.
heridan	1 133 9/3	1,066,801	Cride petroleum cond and and
herman	12 075	30, 314	Crude petroleum, sand and gravel. Sand and gravel.
mith	(2)	(2)	Do.
tafford	20, 305, 621	18, 464, 346	Criide netroloum notural and need
tanton	1 1 483 750	1, 738, 380	Crude petroleum, natural gas, sand and gravel. Natural gas, sand and gravel.
tevens	I 10 040 836	12, 214, 872	Natural gas, sand and graver.
umner	5, 463, 746	8,064,466	Crude petroleum, natural gas, sand and gravel.
Homas	1 64 057	36, 568	Sand and gravel, crude petroleum.
rego	2, 917, 495	3, 032, 586	Crude petroleum, sand and gravel.
Vabaunsee Vallace	599, 505	441, 837	Crude petroleum, stone.
Vallace	(2)	(2) (2)	Distomaceous marl, sand and gravel
Vashington	(2)	(2)	Salid and gravel, stone
Vilson	3, 708, 598	3, 754, 058	Cement, criide netroleum stone clara material
Voodson	2, 135, 869	2, 414, 934	Crude Detroienin, namrai gas
Vyandotte Indistributed	7, 112, 678 793, 896	7, 392, 610	Cement, stone, sand and gravel, natural gas.
manananaga	793, 896	2, 551, 901	Search Property Prop.
Total	440 507 000	470 000 000	
T 0001	449, 587, 000	470, 830, 000	

The following counties are not listed because no production was reported: Greeley, Lane, Mitchell,
 Rawlins, and Wichita.
 Value included with "Undistributed."

Allen.—Production and shipments of both masonry and portland cements by Lehigh Portland Cement Co. at Iola and Monarch Cement Co. at Humboldt in Allen County were the largest in the State during 1955. Approximately 800,000 barrels of crude petroleum was recovered from 10 fields in Allen County. Twelve secondary-recovery projects accounted for 88 percent of the county total oil production. An estimated 230 wells were drilled for primary, secondary, and natural-gas recovery. Limestone was crushed by Monarch Cement Co., Nelson Bros. Quarries, and Allen County Highway Department for concrete, road metal, and screening purposes. A new shale planer was placed in operation by Humboldt Brick & Tile Co. near Humboldt. United Brick & Tile Co. mined clay at Iola for the manufacture of brick and tile. Natural gas was recovered from the Humboldt-Chanute field.

Anderson.—Application of secondary recovery for producing oil yielded over 50 percent of the total petroleum for Anderson County and was responsible for most of the drilling activity during 1955. Over 700,000 barrels of crude oil was produced from 17 areas in 8 fields. Drilling of 110 wells was reported. At Garnett crushed limestone was produced for concrete and road metal by the Garnett Rock Co. Paving gravel was quarried by the Anderson County Highway Department for road construction. Two limestone-crushing plants were operated by George W. Kerford Quarry Co. and 1 limestone-crushing plant by Ralph Bromley. These plants in Anderson County crushed limestone for concrete and road metal.

Barber.—Approximately 2 million barrels of crude petroleum was produced from 40 fields in Barber County. Most of the production was by primary methods, as only 2 secondary-recovery projects were reported. Drilling activity increased over 80 percent from the previous year, with 203 wells drilled in 1955. Exploration and development centered in Rhodes and Hardtner fields. Ten new oil and gas fields were discovered, the more important of which were Landis and Forsyth oil-fields. The Moffett field, which was discovered in 1951 but not brought into production was revived, and initial daily potential from the Pennsylvanian basal conglomerate was over 12 million cubic feet of gas. Goemann and Boggs Southwest gasfields were important discoveries. Output of natural gas from Barber County was over 12 billion cubic feet during 1955. Rhodes, the largest oilfield in Barber County, produced over 1 million barrels in 1955. National Gypsum Co. installed an 18-ton calcining kettle at its Medicine Lodge plant.<sup>17</sup> Mined tonnage of crude gypsum rose sharply from 1954. Natural gasoline was recovered by Kansas Power & Light Co. at its plant near Medicine Lodge. Paving gravel was quarried by Barber County Highway Department.

Barton.—The value of mineral production from Barton County in 1955, composed mostly of petroleum, was the largest in the State. Over 14 million barrels of crude oil was recovered from 145 fields, yet production decreased approximately 12 percent from 1954. Drilling activity remained high and was about the same as in the previous year, with 287 wells drilled in 1955. Kimpler and Heizer West, each producing from the Arbuckle Limestone, were important new oilfield

discoveries.

Arkansas Sand & Gravel Co., Dubois Sand Co., Gruber Sand Plant, Charles Hardesty, Moos Bros. Sand Co., Savely Sand Co., and Barton County Highway Department quarried sand and gravel for paving and construction purposes. Most of this tonnage was sand. 900 million cubic feet of natural gas was recovered from the Heizer Southwest, Krier, Pawnee Rock, and Unruh fields. Production of

natural gas was only half of that reported in 1954.

Kansas Brick & Tile Co., a new brick manufacturer, completed construction of its plant near Hoisington. Plant capacity was rated at 1 million brick per month with possibilities of producing 2 million brick per month in the future. One tunnel kiln and drier and four 30-foot-diameter downdraft kilns constituted part of the equipment at this new plant. Great Bend Brick & Tile Co. expected to increase its total capacity 20 percent by installing its eighth kiln at its plant

near Great Bend.

Bourbon.—Natural cement was the leading commodity produced in Bourbon County, and this county was the only natural-cement producer in Kansas. Fort Scott Hydraulic Cement Co. at Fort Scott more than doubled its shipments of natural cement from 1954. Bandera Stone Quarry cut dimension sandstone at its plant near Fort Cullor Limestone Co., Fort Scott Hydraulic Cement Co., and Bourbon County Highway Department quarried and crushed limestone for road construction and agricultural purposes. Output of coal in Bourbon County, from only 3 coal companies, decreased 21 percent from 1954.

<sup>17</sup> Pit and Quarry, vol. 47, No. 12, June 1956, p. 96.

Butler.—Butler County ranked fourth in the total value of mineral production and fourth in the value of petroleum in Kansas for 1955. The value of the 8 million barrels of crude petroleum produced from 65 fields in the county was 98 percent of its total mineral value. Secondary recovery operations composed nearly half of the petroleum produced. Wells drilled in the county during the year totaled 140. A new oilfield (Degraff) was discovered in the Burgess sandstone formation. Limestone for road construction and building purposes was crushed by Amis Construction Co. of Augusta, Concrete Materials Construction Co. at Wilson, and George M. Myers, Inc., of El Dorado. Miscellaneous stone was crushed by the city of El Dorado for concrete and road building. Paving gravel was produced by Butler County Highway Department.

Chautauqua.—Petroleum production in Chautauqua County was slightly less than in 1954, with nearly 1 million barrels reported. Nearly 75 percent of the total production of crude oil was recovered by water flooding. Most of the 449 wells drilled during the year were for secondary recovery projects. Sedan Limestone Co. of Sedan crushed limestone for building and paving. Natural gas was produced from several fields. Gravel for paving was quarried by

Chautauqua County Highway Department.

Cherokee.—The State's entire production of lead and zinc originated in Cherokee County. Twenty-one mining companies operated 36 mines in the county. The two largest producers were The National Lead Co., St. Louis Smelting & Refining Division (7 mines), and Eagle-Picher Co. (7 mines). Eagle-Picher Co. operated its lead smelter and pigment plant and produced sulfuric acid by the contact process at its Galena plant. The county remained first in coal mined in Kansas, though production declined from 1954. The 6 strip mines operated during the year provided employment for 125 men. Important coal producers in the county were: C. Y. Simple Mining Co. at McCune, Pittsburgh-Midway Coal Co. at Hallowell, and Wilkinson Coal Co. at Weir.

Limestone for building and road construction was crushed by Francis-Reeves Limestone. Chats were produced by the Baxter Chat Co. and Eagle-Picher Co. for railroad ballast, concrete, road metal, and riprap. Heavy clay products were manufactured from miscellaneous clay mined by United Brick & Tile Co. at Weir.

Clark.—Development of Harper Ranch field in Clark County tripled the county production of petroleum in 1955 by approximating 400,000 barrels. Crude petroleum and natural gas were produced from seven fields. Ashland and McKinney were important gasfields. Clark County Highway Department produced gravel for

Cloud.—Earl Beaver Sand Co. at Glasco and Ross Sand Co., Inc., and Walker Sand Co. near Concordia quarried sand and gravel for building and paving purposes. Plastic fire clays were mined at Concordia for use in heavy clay products by Cloud Ceramics.

Coffey.—Petroleum produced in Coffey County (190,000 barrels)

remained the leading mineral produced in the county. Mined tonnage of coal (3,481 tons) was slightly less than in 1954. Coal was produced by S. L. Rogers Coal Co. at Arvonia and Thorne Coal Co. at Lebo. Neosho Valley Rock Co. crushed limestone for concrete

and road metal near Burlington. Paving gravel was produced by Coffey County Highway Department. Natural gas was recovered in Coffey County.

Cowley.—Cowley County ranked ninth in the State for value of

mineral production in 1955. Crude petroleum, the leading mineral commodity produced, amounted to nearly 5 million barrels reported from 95 fields. Six new fields were discovered in 1955, and the drilling activity remained approximately the same as in the previous year. Anderson-Prichard Oil Corp. operated its refinery and cracking plant near Arkansas City. The Texas Co. recovered natural gasoline and LP-gases at its plant near Burden. Approximately one-half billion cubic feet of natural gas was produced in the county in 1955.

Crushed limestone was produced by Anderson-Oxandale at Udall and C. L. Daniels and John V. Elam at Winfield for riprap, concrete, and road metal. Sand and gravel was quarried for structural and paving uses by Cowley County Highway Department, Phillips & Son Construction, and Winfield Sand & Gravel Co., all of Winfield; Arkansas City Sand & Gravel Co., McFarland Gravel Co., George M. Myers, Inc., West Madison Sand Co., and Wilson Bros., all of Arkansas City; and Oxford Sand & Gravel Co. at Oxford. A small

quantity of blast and engine sands also was produced.

Crawford.—The combined output of coal from Crawford County was second only to that produced in Cherokee County. Coal was mined by two methods: Shaft and open pit. Important companies mining underground were True Cherokee Coal Co. of Arma and Lucky Star Coal Co. at Pittsburg. Important strip producers were Apex-Compton Coal Co. at McCune and Clemens Coal Co. near Pittsburg. A total of 27 persons was employed by the underground coal-mining operators and of 97 persons by open-pit operators.

A small quantity of crude petroleum was produced from seven fields in Crawford County, and most of the petroleum was produced by secondary recovery methods. W. S. Dickey Clay Manufacturing Co. installed a new tunnel kiln and drier at its Pittsburg plant. The cost of the new facilities was estimated at \$700,000 and will be used in manufacturing heavy clay products. Limestone was produced for agricultural, concrete, and building purposes by John J. Stark at Farlington. Natural gas also was produced in Crawford County.

Decatur.—Petroleum recovered from 8 fields in Decatur County, 348,000 barrels, approximated the 1954 production. Two new fields Jorn and Jorn East—were discovered during the year. Paving gravel was produced by the Decatur County Highway Department at

Oberlin.

Dickinson.—Limestone was quarried from 2 pits by Anderson-Oxandale and from 1 pit by Riddle Quarries, Inc., for building, paving, agricultural, and riprap. Recovery of crude petroleum from 6 fields in Dickinson County increased approximately 40,000 barrels from Sand and gravel was produced for paving and building by Shoffner Sand & Gravel Co. near Solomon and by C. Smith Sand & Gravel Co. near Abilene.

Doniphan.—Limestone was crushed by Everett Quarries, Inc., at Wathena, George W. Kerford Quarry, Inc., at Sparks, Wolf River Limestone, Inc., at Troy, and by the United States Corps of Engineers.

The material was used mainly for concrete, road metal, agricultural

limestone, and riprap.

Edwards.—Petroleum and natural gas were recovered from nine fields in Edwards County. Production of natural gas more than doubled the 1954 quantity. Sand and gravel was produced by the Mekeh Sand & Gravel Co. and Dave Showalter, both of Kinsley.

Elk.—Limestone was quarried and crushed by Concrete Materials Construction Co. near Moline and by Elk County Highway Department near Howard, for concrete, road metal, railroad ballast, agricultural limestone, and riprap. Most of the limestone produced was used in constructing the Kansas Turnpike. Recovery of oil from Elk County increased sharply from 1954. Four new fields were discovered, and 121 wells were drilled during 1955. Some oilfields in Elk County are among the oldest in the State. Natural gas was produced from some of 31 fields in the county. Paving gravel was quarried by the Elk County Highway Department.

Ellis.—Ellis County ranked second in the State for value of mineral production and second among the oil-producing counties, with over \$31 million for petroleum in 1955. Approximately 11 million barrels of petroleum was produced from 96 fields in the county. Five new fields were discovered, of which the Kraus West and Irvin East were important. One new field, Combs, was revived, and 293 wells were drilled in Ellis County during 1955. Ellis County moved ahead of

Russell for second place among oil producers.

Limestone was produced for concrete and road metal by the Ellis County Highway Department, and glass sand was produced near

Victoria by Lewis C. Schmidtberger.

Ellsworth.—The 1955 production of oil (3 million barrels from 18 fields in the county) declined slightly from the previous year. Two new oilfields (Progress and Progress Northwest) were discovered by drilling 69 wells.

Rock salt was produced near Kanopolis by Independent Salt Co. Most of the salt was used by the agricultural industries. Paving sand was quarried by the Ellsworth County Highway Department and paving sand and gravel by Lowell Johannes near Marquette and

by Henry Millberger near Wilson.

Finney.—The Finney County section of the Hugoton gasfield produced a new high of over 34 billion cubic feet of natural gas in 1955. The 49 new gas wells drilled in Finney County brought the county total of gas wells to 398. Northern Natural Gas Co. completed the largest initial potential gas well of the year. No wildcat tests were attempted in Finney County during 1955, and oil and gas production originated from nine fields. Northern Natural Gas Co. recovered natural gasoline at its plant near Holcomb.

Sam Alsop Construction Co., Smith Sand Co., and Finney County Highway Department, all of Garden City, produced sand and gravel

for building and paving purposes.

Franklin.—Secondary-recovery projects furnished most of the petroleum produced in 1955 in Franklin County. The quantity of oil recovered from the three fields in the county was considerably less than in 1954.

Crushed limestone was produced by the Franklin County Highway Department, Killough Construction Co., Dan Fogle, and Bert Ross for concrete and road aggregate, railroad ballast, and agricultural purposes at their plants near Ottawa, Kans. Lightweight aggregate was bloated by Buildex, Inc., by applying the Haydite process. Miscellaneous clay, mined near Ottawa, was the raw material used for making lightweight aggregate. Red Star Coal Co. operated a strip mine near Williamsburg.

Geary.—Crushed and dimension limestone was quarried by the Walker Cut Stone Co. near Junction City. W. O. Homer Construction Co. crushed limestone at its plant near Junction City. The stone was used for building and agricultural purposes and for concrete and read aggregate. Building and paving sand was produced by Junction City Sand & Gravel Co. and by More Sand Co. near Junction City, Kans.

Graham.—Graham County ranked 10th in the State for the value of mineral production, and most of this value resulted from the production of crude petroleum. Fifty-three fields in Graham County produced nearly 5 million barrels of oil. Exploration and drilling activity was high and accounted for 344 wells completed during the Seventeen new oil fields and 6 new producing zones in old fields were discovered. Each of the following 6 fields reported over 300 barrels initial daily production: Brush Creek, Elrick, Holley North, Holley Northwest, Law Southeast, and Prairie Glen Southeast. The Brush Creek field reported an initial daily potential of 1,155 barrels of oil.

Government-and-contractor operators crushed sandstone for riprap,

road metal, and concrete aggregate.

Grant.—Grant County ranked second in the production of natural gas, with a total of 84 billion cubic feet from 570 wells, all in the Hugoton gasfield. Only three new wells were drilled during the year, and all produced gas in 1955. Natural gasoline and liquefied petroleum were produced and accounted for \$3.1 million. output of natural gas and natural-gas liquids, the only mineral commodities produced, placed Grant County closely behind Graham

County in total mineral value.

Greenwood.—Secondary-recovery projects yielded 83 percent of the 6.5 million barrels of oil produced from 58 fields in the county. A total of 159 wells, including oil wells, dry holes, input wells, and saltwater disposal wells, was drilled during the year. Most of the drilling activity in Greenwood County was for development of secondary recovery projects. Only one new field—Salt Springs—was discovered. Forty-eight water-flooding and other secondary-recovery operations were reported. Greenwood County Highway Department crushed limestone for paving purposes.

Hamilton.—Natural gas was the leading commodity produced in Hamilton County. Two fields in the county produced over 5 billion cubic feet of natural gas in all and a small quantity of petroleum.

The Helfrich field was discovered during the year.

Building sand and paving sand and gravel were produced near Syracuse by Smith Sand & Gravel Co., Syracuse Sand & Gravel Co.,

and Hamilton County Highway Department.

Harper.—The total mineral value in 1955 jumped 264 percent to \$1.7 million, compared with the previous year. This large gain is attributable mainly to recovery of 558,000 barrels of petroleum in

Three new fields resulted from drilling 103 new wells during 1955. The Miller oilfield had an initial daily potential of 427 barrels The Grabs Northwest field had an initial daily potential of 4.2 million cubic feet of gas, and the Spivey Southeast had a combined initial daily potential of 31 barrels of oil and 1.3 million cubic feet of natural gas. The output of natural gas from Harper County passed the 1-billion-cubic-foot mark during the year. Paving sand was quarried by the Harper County Highway Department.

Harvey.—Production of petroleum in Harvey County increased approximately 35 percent from 1954. Oil and natural gas were produced from eight fields in the county. Building and paving sand and

gravel were quarried near Burrton by Howard R. Thach.

Haskell.—The Haskell County section of the Hugoton gas area reported nearly 33 billion cubic feet of natural gas during 1955. Forty new gas wells were drilled in developing the Hugoton area. Pleasant Prairie field, the only oilfield in Haskell County, produced 64,000 barrels from 7 wells in the Mississippian stratum. Howard Mitchell produced building sand near Hugoton, and the Haskell County High-

way Department contracted for paving gravel at Sublette.

Kearney.—The gas-producing area in Kearny County was extended several miles west and northwest, as 27 new gas wells were drilled in the county section of the Hugoton gas area. Approximately 60 billion cubic feet of natural gas valued at approximately \$7 million was reported in 1955. Kansas-Nebraska Natural Gas Co., with its plant near Deerfield, and Colorado Interstate Gas Co., Inc., with its plant near Lakin, recovered natural gasoline and liquefied petroleum gases. Paving gravel was quarried by the Kearney County Highway Depart-

Kingman.—Crude petroleum produced from 30 fields in Kingman County amounted to 1.5 million barrels and represented an 83-percent increase from production in 1954. Drilling activity accounted for 110 wells and 13 new fields in 1955. Gilchrest, the county's most important new field discovered in 1955, had an initial daily potential of 444 barrels. Natural-gas liquids were produced by Skelly Oil Co. at its plant near Cunningham. Recovery of natural gas increased 50 percent and was sparked by 3 important gasfield discoveries: Bertholf, Rochester, and Zenda South. Natural-gas production in Kingman County approached the 2-billion-cubic-foot mark in 1955. Building and paving sands were produced by Ray Wells from his quarry near Kingman.

Labette.—Limestone was produced by Anderson-Oxandale at Parsons, John J. Stark at Mound Valley, the city of Parsons Street Department, and the Labette County Highway Department at Oswego for concrete, road metal, screening, agricultural purposes, and building rubble. About 98,000 barrels of petroleum was produced from 12 fields in Labette County. Water flooding and gas repressuring supplied two-thirds of this total production. Sixty-one wells were drilled in Labette County, of which 36 were oil productive, 15 dry, and 10 for repressuring old fields. Over 100 million cubic feet of natural gas

was produced in 1955.

Leavenworth.—Limestone was crushed for riprap, concrete, roadmetal aggregate, railroad ballast, and agricultural limestone by J. C. Haigwood near Tonganoxie, Loring Quarries, Inc., near Coldspur,

Kansas State Penitentiary at Leavenworth, and the city of Leaven-Building and paving sands were produced by the Missouri Valley Sand, Inc., from its pits near Leavenworth. Natural gas was

produced in Leavenworth County during 1955.

Linn.—The total value of mineral production in Linn County decreased 74 percent from 1954. Closing of Hume Sinclair Coal Co. near Prescott, Snow Coal Co. near Pleasanton, and LaCygne Coal Co. near LaCygne caused the sharp decline in the county's total mineral value. These shutdown mines also caused a work-force reduction of 51 men.

Water-flood projects in Linn County were the source of nearly all of the crude petroleum produced from the county's five fields, and the recovery was slightly larger than in the previous year. A total of 43 wells drilled in 1955 was slightly less than in the previous year.

Concrete and road aggregate, agricultural limestone, and riprap were crushed by Lee Giles near Greeley and by Murray Limestone Products Co. near Centerville. Paving gravel was quarried by the

Linn County Highway Department.

Lyon.—The 1955 production of petroleum in Lyon County originated from 9 fields and amounted to 400,000 barrels. Secondary recovery by waterflooding accounted for over 100,000 barrels of the total production. Drilling activity in the county increased sharply to 50 wells drilled in 1955, the greatest activity being in Fankhauser field, where 24 wells were drilled.

Sand and gravel was produced from quarries near Hartford by Wesley Parks and near Emporia by Harry Waterman, for building and paving purposes. Limestone for concrete aggregate and road metal was produced by the city of Emporia, Anderson-Oxandale near Bushong, and Lyon County Highway Department near Emporia and

by Greenwood County Highway Department.

Marion.—Nearly 1 million barrels of crude petroleum was recovered from 29 fields in the county. New wells drilled in Marion County totaled 123; of the 2 new fields discovered, Unger was an important discovery for Marion County. The largest drilling activity took place in the Lost Springs field, where 47 wells were drilled during the year. Riddle Quarries, Inc., operated 2 crushing plants (1 at Lost Springs and 1 at Marion) to produce crushed limestone used for riprap, concrete, road metal, screenings, and agricultural limestone. Recovery of natural gas in Marion County increased slightly from the previous vear.

Marshall.—Crude and calcined gypsum was produced from deposits near Blue Rapids by Certain-Teed Products Corp. Building and paving sand and gravel were produced by Blue River Sand & Gravel Co. and C. V. Garrett at Blue Rapids, Kenneth Griffee at Oketo, Hall Bros. and The Heinzelman Construction Co. at Marysville, and Hugo P. Vogler at Waterville. Dimension limestone was quarried by the

Marshall County engineer at Marysville for building rubble.

McPherson.—The value of crude petroleum accounted for nearly all of the mineral production in McPherson County. million barrels of crude petroleum was recovered from 38 fields in the county. Total wells drilled in McPherson County declined to 152 from the previous year. This drilling activity resulted in the discovery of two new fields—the Lindsborg South and the Harmac.

Cooperative Refinery Association operated its petroleum refinery near McPherson. Paving sand was produced at A. N. Colburn

quarry near McPherson.

Meade.—Novinger, the largest field in Meade County, declined in petroleum production from 1954 and reflected a total decline in county petroleum production. Less than one-half million barrels of crude oil was produced from 12 fields. Most important of the three fields discovered in 1955 was the Leslie. The discovery well, with an initial daily potential of 1,073 barrels, produced from the Morrow sand. The recovery of natural gas, nearly 3 billion cubic feet, declined from the previous year. However, discovery of the Novinger Northwest and Singley fields, with 15 and 8 million cubic feet initial daily potentials, respectively, will boost future production of natural gas from Meade County.

Cudahy Packing Co. and Purex Corp. Ltd., mined and processed pumicite near Meade. The "Silica Mine" in Meade County, owned by Cudahy Packing Co., was sold to Purex Corp. for pumice pro-

duction in May.

Miami.—Crude petroleum was the leading mineral commodity reported in Miami County for 1955, and all production was from 27 areas in 4 fields. Eight water-flooding projects supplied 82 percent of the 677,000 barrels recovered. Wells drilled during the year totaled 255, of which 136 were oil productive, 50 were for repressuring, 1 was for salt-water disposal, 68 were dry holes, and 1 was a dry wildcat. Limestone for riprap, concrete, road metal, and agricultural purposes was produced by L. W. Hayes, Inc., and the Miami County Highway Department near Paola. A small quantity of natural gas was reported in the county. Paving sand was produced

by Miami County Highway Department.

Montgomery.—Montgomery County ranked second in the State for the output of cement. The entire production of portland and masonry cement was produced at the Independence plant of Universal Atlas Cement Co. Over 0.8 million barrels of crude petroleum was produced from 11 fields in Montgomery County, and over half of this production originated from 15 secondary-recovery projects. Most of the 497 wells drilled were for development of water-flooding projects. Structural clay products were manufactured from miscellaneous clay at Coffeyville by United Brick & Tile Co. and Ludowici-Celadon Concrete aggregate and road metal was produced by Anderson-Oxandale at the James quarry and Severs quarry near Sycamore. Montgomery County engineer and the city of Coffeyville also produced concrete and road-metal aggregate from limestone. Natural gas was produced in the county. Ozark Smelting & Mining Co. processed zinc ores into zinc pigment at its Coffeyville plant.

Morton.—Only two mineral commodities were reported produced in Morton County-natural gas and petroleum. The recovery of natural gas increased approximately 26 percent to over 60 billion cubic feet in 1955. The discovery of two large gasfields in the county will boost its future production. The first well of the Elkhart gasfield, discovered by Musgrove Petroleum Corp., had an initial potential of 2.5 million cubic feet per day. The Taloga field was discovered by Colorado Oil & Gas Corp., and the discovery well had an initial daily potential of 82 million cubic feet of gas. Both fields produce

from the Morrow sand. The recovery of natural gas originated from two areas, Greenwood and Hugoton. Although the production of petroleum increased about sixfold, the quantity remains rather

small. A total of 147 wells was drilled in 1955.

Neosho.—Cement, the county's leading mineral commodity in 1955, also made the county the third largest producer of cement in the State. At Ash Grove Portland Cement Co. plant near Chanute modernization was nearly completed, as one 10 by 325-foot kiln and extra grinding equipment were being installed. Although the new equipment will not increase the plant's output, a more efficient flow of materials is expected. The quantity of crude petroleum produced from eight fields in Neosho County increased slightly from the previous year. Secondary-recovery operations accounted for nearly 75 percent of the county total oil production. An estimated 376 wells were drilled in 1955. Chanute Refining Co. and N. F. A. Oil Co. operated petroleum refineries near Chanute. Harry Byers and Joe O'Brien crushed limestone for concrete, road metal, and agricultural limestone. Neosho County engineer quarried limestone for concrete and road metal near Urbana. Natural gas was recovered in the county.

Ness.—The 355,000 barrels of crude petroleum produced from 7 fields in Ness County represented a 35-percent increase from 1954. Two new fields (Davenport and Vermilion) were discovered Paving sand was quarried at the Cecil Knoy pit near Ness. in 1955.

Norton.—The 1955 production of crude petroleum from Norton County was over 1 million barrels, an increase from 1954 due mainly to development of the Norton field. Forty wells were drilled in 1955 compared with 130 drilled in 1954. The pay zones in the Norton field are the Arbuckle limestone and Reagan sand. Pumicite was

prepared by the Wyandotte Chemical Corp. at Calvert.

Pawnee.—Approximately 2.4 million barrels of crude petroleum was produced from 35 fields in Pawnee County, representing a gain of about 57 percent over 1954. Wells drilled in 1955 totaled 255 and resulted in the discoveries of 7 new fields. The Garfield oilfield furnished nearly half of the total oil produced in the county. gas recovery approached nearly 5 billion cubic feet and gained 22 percent over the previous year. Two new gasfields (Hearn North and Shady North) were reported. Near Larned, paving sand was produced by the Pawnee County Highway Department; sand and gravel for other purposes was produced by Willis Eakin and Larned Sand & Gravel Co.

Phillips.—The value of petroleum produced in Phillips County (\$5.5 million), declined approximately 4 percent from the previous year. Only 11 wells were drilled, of which 5 were oil productive and The petroleum refinery of the Cooperative Refinery Association was operated at Phillipsburg. Sandstone was crushed for riprap by E. C. Schroeder Construction Co. and Texas Construction Co. near Phillipsburg. Paving gravel was quarried by D. G. Hanson near Logan, and Phillips County Highway Department contracted

for paving gravel near Phillipsburg.

Pratt.—Crude petroleum, produced from 37 fields, including 1 secondary-recovery project, was nearly 3 million barrels. Two new

<sup>18</sup> Pit and Quarry, vol. 48, No. 7, January 1956, p. 154.

oilfields (Earl North and Randle) and 2 new gasfields (Carver-Robbins and Coats West) were discovered in the county by drilling 83 wells in 1955. Natural gas produced in the county amounted to over 1.3 billion cubic feet. Near Pratt, C. D. Hogard and the Pratt County Highway Department produced paving sand; Miller Sand & Gravel

Co. quarried building sand.

Reno.—The value of salt from Reno County was the largest of the three counties reporting salt production in 1955. Salt was evaporated by Barton Salt Co., Carey Salt Co., and Morton Salt Co.; rock salt was mined by Carey Salt Co. All salt was produced near Hutchinson. The production of crude petroleum from 21 fields in the county exceeded 1 million barrels. This output declined 19 percent from the previous year, partly because of unitization of the Zenith-Peace Creek field; as a consequence, Reno County lost credit for part of the production from this field. Three new oilfields—Beck, Castleton, and Hilger Southwest—resulted from the 49 wells drilled in the county during 1955. Two secondary recovery projects were reported in the county, although no production was assigned to them. Natural-gas liquids were recovered near Burrton by Cities Service Oil Co. J. N. Shears' Sons, Inc., produced paving sand from its quarry near Hutchinson. Building sand was quarried by J. E. Steele Sand & Gravel Co. near Hutchinson, and Henderson Sand & Gravel Co. operated a sand and gravel pit in Hutchinson. A small amount of sand and gravel was produced by Fountain sand pit near Arlington, Haven Sand Co. near Haven, and J. A. Mummy near Nickerson for building and paving purposes and glass sand. Slightly more natural gas (454 million cubic feet in all) was recovered in Reno County than in the previous year.

Rice.—Rice County ranked fifth in the State for the total value of mineral production and was the sixth ranking producer of petroleum, with 6.8 million barrels from 59 fields. The recovery of oil diminished about 11 percent from 1954. Drilling activity, which declined to 143 wells in 1955, resulted in the discovery of four new fields—Crawford Northwest, Dymond, Guldner, and Lyons Southwest. Both evaporated and rock salt were produced near Lyons by American Salt Corp. Approximately 659 million cubic feet of natural gas was produced in

the county.

Sand and gravel for building, paving, and other purposes was quarried by Arensman Sand & Gravel Co. near Raymond, The Rock Hill Stone & Gravel Co. and Sterling Sand & Gravel Co. near Sterling, A. L. Stapleton near Alden, and A. Wright & D. Birchenough near Lyons. Riddle Quarries, Inc., crushed limestone near Little River

for riprap, concrete, road metal, and agricultural purposes.

Rooks.—Crude petroleum, the only mineral commodity reported in Rooks County, ranked fifth among oil-producing counties in the State. The 1955 production (7.1 million barrels) came from 90 fields. Exploratory drilling resulted in discovery of four new fields—Amboy Southwest, Carmichael, Flagler, and Nettie Southeast. The discovery well of the Carmichael field, with an initial daily potential of 474 barrels of oil, produced from 2 zones. Drilling during 1955 accounted for 107 new oil wells out of a total 202 wells drilled. Important producing fields included Marcotte, Barry Southeast, Jelinek, Northampton, and Palco Southeast.

Rush.—Development of the Webs field (Pennsylvanian basal conglomerate) was mainly responsible for a 34-percent increase in county production of petroleum. All oil output was from 12 fields. A total of 56 wells was drilled in Rush County during the year, and 2 new fields were discovered—Webs Northwest oilfield and Rothe gasfield. Helium, recovered from natural gas by the Federal Bureau of Mines plant at Otis, increased from the previous year. Production of natural gas—approximately 2.7 billion cubic feet—increased considerably from 1954. Discovery of the Rothe gasfield, which had an initial daily potential of 4 million cubic feet, will greatly add to the total yield of natural gas from Rush County. Natural-gas liquids were recovered at Otis by Flynn Oil Co.

Russell.—The total mineral value in Russell County declined over \$1 million from 1954, but the county maintained its position as the third largest mineral producer in Kansas. A decrease of almost 4 percent in oil production forced Russell County down to third position among oil-producing counties in the State. Almost 10.8 million barrels was recovered from the county's 33 fields. Drilling programs in the county failed to discover any new fields, although 147 wells were drilled. Eighty-six new oil wells were drilled in existing fields.

Paving and structural gravel were produced near Russell by the Russell County Highway Department. A small quantity of natural gas was produced in conjunction with petroleum production.

Saline.—Only two mineral commodities were reported produced in Saline County in 1955—crude petroleum and sand and gravel. Over 1.1 million barrels of petroleum was produced from 11 active fields in the county. Important fields were: Smolan, Salemsborg, Gypsum Creek, and Hunter. Putnam Sand & Building Co. and Salina Sand Co., Inc., quarried sand and gravel near Salina for building,

paving, and other sand-and-gravel purposes.

Sedgwick.—The value of mineral production in Sedgwick County increased almost 74 percent from 1954. This gain was caused mainly by a twofold increase in the production of crude petroleum. This petroleum yield (over 2.1 million barrels) was from 38 fields in Sedgwick County. Of 339 wells drilled, 203 found oil. The Brumley, Gladys South, Gladys Southeast, and Schulte South fields all producing from the Mississippian stratum, were discovered during the year. The Gladys field accounted for nearly half of the total oil produced in the county. Petroleum was refined by Derby Oil Co. at Wichita. Cities Service Oil Co. operated its natural-gasoline plant at Wichita. Natural gas was also produced in the county.

Construction and paving activities in Sedgwick County added 5 new sand-and-gravel operators during 1955, bringing the total to 17. Important producers were Inland Construction Co., Miles Sand Service, Dolese Bros., Wichita Big River Sand Co., and Superior Sand Co., Inc. The city of Wichita Highway Department produced concrete aggregate, road metal, and miscellaneous stone. Molding sand was produced near Bentley by the Bentley Sand Co. Most of the

construction took place in the city of Wichita.

Seward.—The total production of natural gas in Seward County
—30.3 billion cubic feet—originated from 5 fields. The most important
producing field was the Seward County section of the Hugoton gas

area. The Massoni and Shuck gasfields were discovered in 1955. The discovery well of the Massoni field had an initial potential of 8 million cubic feet of gas per day, and the discovery well of the Shuck field recorded 5 million cubic feet per day. Development of gasfields in Seward County resulted in 21 productive gas wells of the total 36 wells drilled. Much of the natural gas was processed by natural-gasoline plants operated by the Panhandle-Eastern Pipeline Co. and Northern Natural Gas Co. A small quantity of crude petroleum was

produced from six fields.

Shawnee.—Crushed limestone was produced by Henry C. Luttjohann and Netherland Stone Co. from quarries near Topeka. Pattons Crushed Stone Co. also produced crushed limestone near Pauline. Most of the limestone was used for concrete, road metal, and screening purposes, but a small quantity was produced for agricultural purposes. Sand and gravel, principally used for building and paving, was quarried at Topeka by the Kansas Sand Co., Inc., River Sand Co., Inc., Shoffner Sand, Inc., and Victory Sand & Stone, Inc. Small quantities of blast, engine, filter, and other sands were produced. Road building, industrial construction, and residential construction in the city of Topeka were responsible for the increased stone output.

Sheridan.—The total output of crude petroleum, 354,000 barrels, declined approximately 9 percent from the previous year. Wells drilled, however, rose from 20 to 37 and resulted in the discovery of 3 new fields—Chicago, Custer, and Studley Southeast. No production was reported from Chicago field during 1955. The Custer-field discovery well had an initial potential of 320 barrels per day, and the Studley Southeast discovery well was rated at 255 barrels per day. Building sand was produced by the Sheridan County Highway Department at Hoxie. Paving gravel was quarried by Harry Henery, Inc., near Hoxie, and paving sand was produced near Grainfield by Carl Kaiser.

Stafford.—Stafford County was seventh in total mineral value in Kansas for 1955 and also ranked seventh in the production of petroleum in the State. The recovery of petroleum during 1955 from 152 fields was 6.6 million barrels. A total of 175 wells was drilled in the county during the year, and 4 new fields were discovered—Farmington Northeast, Happy Valley Northeast, Max North, and Pleasant Grove South. The rated output of the discovery wells was 166, 147, and 52 barrels per day, respectively, with no production from Pleasant Grove South. The Clarksburg field, discovered in 1950, was revived during the year, and the revival well had an initial potential of 237 barrels per day. About 854 million cubic feet of natural gas was produced during the year.

Sand for molding and other uses was quarried by the Partin Sand & Gravel Co. near Stafford. Paving sand was quarried by the county

near Saint John.

Stanton.—Natural gas recovered (15.4 billion cubic feet) in Stanton County came from the Hugoton gas area. This quantity of natural gas represents a 12-percent increase from the previous year and was reported from a total of 234 producing wells. Only 11 development and exploration wells were drilled. Harry Henery, Inc., operated a quarry near Manter to produce paving gravel.

Stevens.—Stevens County was the leading producer of natural gas in Kansas, with over 109 billion cubic feet recovered from 720 active wells in the Hugoton gas area. No other minerals were produced.

Sumner.—The 1955 production of crude petroleum, natural gas, and sand and gravel increased the total mineral value for Sumner County 48 percent from 1954. The 2.8 million barrels of petroleum reported from 41 fields gained almost the same amount. The number of wells drilled in Sumner County was 236, of which 131 were oil productive. Four new fields were discovered—Kerschen, Norris, O'Hara, and Wellington Northeast. Discovery wells in the O'Hara and Wellington recorded initial potentials of 423 and 258 barrels of oil per day, respectively. The yield of natural gas in the county increased to over 1.5 billion cubic feet.

Paving gravel was produced by the Sumner County Highway Department near Wellington. Mulvane Sand Co., Inc., produced

structural, paving, and other sands near Mulvane.

Trego.—Over I million barrels of crude petroleum was produced from 25 fields in Trego County, and output was slightly more than in the previous year. Two new fields—Groff Southeast and Homburg—were discovered in 1955. Sand and gravel for paving purposes was produced by the Siebert Sand Co. at its quarries near Ransom. Trego County Highway Department quarried paving gravel near Wakeenev.

Wilson.—Consolidated Cement Co. enlarged its plant at Fredonia by the addition of a new 425-foot kiln and grinding equipment. The expansion, completed late in the year, increased the plant's capacity 1.3 million barrels to a total annual output of 2.3 million. The recovery of crude petroleum from 15 fields increased slightly from the previous year. Coyville West field was discovered, with the "pay zone" in the Squirrel sand. Natural gas was also reported in the county.

Limestone was crushed by Carr Rock Products Co. at Neodesha, Benedict Rock Lime Co. at Benedict, and Wilson County Highway Department at Fredonia for concrete, road metal, and screening and agricultural purposes. Acme Brick Co. at Buffalo and Excelsior Brick Co. at Fredonia mined miscellaneous clay for structural clay

products.

Woodson.—The output of crude petroleum recovered from 26 fields in Woodson County was nearly 862,000 barrels and included production by secondary-recovery methods. McWherter field was discovered during the year. A small quantity of natural gas was

produced in the county.

Wyandotte.—Construction and road-building programs in Kansas City and nearby areas was slightly higher in 1955 than in the previous year. Pacing the growing demand for portland cement, Lone Star Cement Corp. increased its annual capacity 660,000 barrels to a total of 2,260,000 barrels. One 10 by 240-foot new kiln and other processing equipment were added to the Bonner Springs plant of Lone Star Cement Corp. Limestone was quarried and crushed near Turner

<sup>19</sup> Pit and Quarry, vol. 48, No. 7, January 1956, p. 156.

and Kansas City by American Rock Crusher Co., Peerless Quarries, Inc., Thompson Strauss Quarries, Inc., and the Wyandotte County engineer for riprap, concrete and road metal, and asphalt filler.

Nine operators produced sand in Wyandotte County during 1955, which was used as structural, paving, filter, engine, railroad ballast, molding, and other sand uses. A small quantity of building gravel was also produced. Important producers included Stewart Sand Material Co., Peck-Woolf Sand & Material Co., Holliday Sand & Gravel Co. Builders Sand Co. opened a new-type sand plant near Bonner Springs. Sand was to be mined by open-pit methods and also graded. The deposit, 56 feet in thickness, is composed of fine-grained sand. Natural gas was produced from Roberts-Maywood field in Wyandotte and Leavenworth Counties. Wyandotte was one of the great centers of activity for the production of crushed limestone in Kansas and had a total of 4 producers. Crushed stone was used principally in Kansas City for construction and road building.

<sup>20</sup> Rock Products, vol. 58, No. 11, November 1955, p. 59.



# The Mineral Industry of Kentucky

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

By Avery H. Reed, Jr. 1 and A. C. McFarland 2



OAL MINING dominated the Kentucky mineral industry in 1955, supplying 74 percent of the total value of production. Other fuels, including oil and gas, furnished 18 percent. Among

the States, Kentucky ranked third in coal output.

Leading producers, exclusive of oil and gas companies, were Nashville Coal Co. mines in Hopkins, Muhlenberg, and Union Counties; West Kentucky Coal Co. mines in Hopkins County; United States Steel Corp. mines in Harlan and Letcher Counties; Blue Diamond Coal Co. mines in Perry County; and the Homestead Coal Co. mine in Hopkins County.

The 1955 increase of 19 percent in value of State mineral production over 1954 was 23 percent below 1948, the record year. The increased

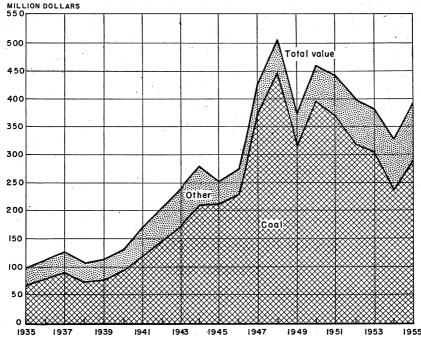


FIGURE 1.—Value of coal and total value of all minerals produced in Kentucky, 1935-55.

<sup>&</sup>lt;sup>1</sup> Chief, Field Office, Division of Mineral Industries, Region V, Bureau of Mines, Knoxville, Tenn.
<sup>2</sup> Director, Kentucky Geological Survey, Lexington, Ky.

production in 1955 was due mainly to rising coal production. Fluor-spar output was the lowest since 1910.

TABLE 1.—Mineral production in Kentucky, 1954-55 1

	19	054	1955		
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	
Clays. Coal Fluorspar. Lead (recoverable content of ores, etc.)	35, 831 80 72, 713 28, 224 189, 966 13, 791 4, 729, 606 10, 129, 725 458	21, 920 16, 579, 000	875, 699 69, 019, 910 8, 899 73, 214 34, 991 189, 25 15, 518 4, 898, 705 11, 933, 899	\$4, 416, 131 288, 665, 344 308, 140 17, 352, 000 2, 492, 000 6, 451, 000 44, 850, 000 5, 298, 102 15, 579, 312	
Total Kentucky 2		327, 503, 000		391, 068, 000	

<sup>&</sup>lt;sup>1</sup> Production as measured by shipments, sales, or marketable production (including consumption by producers.)

<sup>2</sup> The total has been adjusted to eliminate duplication in the value of clays and stone.

TABLE 2.—Average unit values of mineral commodities produced in Kentucky, 1951-55

Commodity	1951	1952	1953	1954	1955
Clays:	\$12.69 6.28 1.09 4.89 34.01 346.00 .22	\$12. 80 6. 56 1. 13 4. 80 38. 57 322. 00 . 22	\$9. 70 5. 20 1. 40 4. 66 44. 46 262. 00 . 22	\$13. 10 6. 67 1. 50 4. 16 42. 15 274. 00 . 23	\$13. 4 6. 7 1. 4 4. 1: 34. 6
LP-gases	.03 2.77 .87 1.22 364.00	. 03 2. 76 . 80 1. 23 332. 00	. 03 2. 91 . 95 1. 25 230. 00	. 03 2. 92 . 93 1. 31 216. 00	2. 8 1. 0 1. 3

<sup>&</sup>lt;sup>1</sup> For greater detail on prices by grades and markets, see vol. I, Minerals Yearbook, 1955.

## REVIEW BY MINERAL COMMODITIES

### MINERAL FUELS

Asphalt (Native).—Bituminous-sandstone production was less than in 1954.

Coal.—Kentucky continued to be third among the States in bituminous-coal output. For the first year since 1950, Kentucky production increased over the previous year. Output was still below that of 1951 and 18 percent below the peak year 1947. Coal was produced at 1,871 mines in 30 counties in Eastern Kentucky, with Harlan, Pike, Floyd, Letcher, Perry, and Leslie Counties leading.

In Western Kentucky coal was mined at 133 mines in 9 counties, principally Hopkins and Muhlenberg Counties. Eastern Kentucky produced 42.7 million tons and Western Kentucky 26.3 million tons.

TABLE 3.—Coal production, 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	74, 791, 372 74, 972, 335 66, 114, 341 65, 060, 478	\$350, 550, 090 366, 686, 901 317, 386, 725 302, 871, 877	1954 1955 Earliest record to date	69, 019, 910	\$236, 736, 940 288, 665, 344 (1)

1 Data not available.

Natural Gas.—Production of natural gas in 1955 exceeded that in 1954 by 501,000 cubic feet. The average value per thousand cubic feet was the same as in 1954.

Natural Gasoline.—Production of natural gasoline reached an all-

time high in 1955, exceeding 1954 by 24 percent.

LP-Gases.—Production of LP-gases was about the same as in 1954. Petroleum.—Crude-petroleum production in 1955 again established an alltime high of 15.5 million barrels, exceeding the previous 1954 high by 1.7 million. The average value of 1 barrel of crude oil at the well was \$2.89, compared with \$2.92 in 1954.

## **NONMETALS**

Cement.—As in previous years Kosmos Portland Cement Co. was the only manufacturer of portland and masonry cement in the State. Production in 1955 paralleled that in 1954 in both quantity and value.

TABLE 4.—Clays sold or used by producers 1946-50 (average) and 1951-55

	Ba	ll clay	Fire clay		Miscella	neous clay	Total	
Year	Short tons	Value	Short tons	Value	Short	Value	Short tons	Value
1946-50 (average) - 1951 - 1952 - 1953 - 1954 - 1955 -	99, 453 111, 215 107, 211 100, 482 96, 483 111, 600	\$1, 123, 945 1, 411, 175 1, 372, 695 974, 637 1, 263, 526 1, 498, 950	447, 863 583, 291 526, 238 348, 359 197, 400 341, 862	\$1, 942, 741 3, 660, 626 3, 450, 046 1, 809, 988 1, 316, 364 2, 315, 715	186, 248 185, 734 247, 425 262, 368 277, 598 422, 237	\$150, 855 202, 484 278, 525 333, 727 415, 036 601, 466	733, 564 880, 240 880, 874 711, 209 571, 481 875, 699	\$3, 217, 541 5, 274, 285 5, 101, 266 3, 118, 352 2, 994, 926 4, 416, 131

Clays.—The previous 2-year decline in clay production was reversed, and output of all types of clay exceeded that of 1954 by 53 percent in tonnage and 47 percent in value. Production was less than 1 percent below the alltime high of 1952.

Miscellaneous clay production increased 52 percent over 1954 in tonnage and 45 percent in total value, reflecting a small drop in unit value. However, miscellaneous clay, lowest in value, was only 40

percent of the next higher ranking ball clay.

Production of fire clay, ranking between ball clay and miscellaneous clay in tonnage, was highest in total value of the three types. Production was 73 percent above 1954 in quantity and 76 percent above in total value, representing an average increase of 10 cents per ton.

Ball-clay production, at an alltime high in both tonnage and value, exceeded the previous high of 1951 by 400 tons and \$88,000 in value. Average unit value was 33 cents above 1954 and 74 cents above 1951.

Fluorspar.—Production of fluorspar was the lowest in many years. This downward trend was emphasized by the continuing reduction in the number of active properties from 39 in 1954 to 20 in 1955. Owing to the inactivity of the fluorspar mills in Illinois, the ore mined in Kentucky was prepared for market in local mills, and no recovery of lead and zinc was made. Kentucky production came mostly from small operations; roughly one-third came from old mine dumps. The average value of marketed fluorspar declined from \$42.15 per ton in 1954 to \$34.63 in 1955. Total production was only about one-quarter of that in 1954.

TABLE 5.—Fluorspar shipped from mines, 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	76, 373	\$2, 367, 843	1953	47, 244	\$2, 100, 493
1951	68, 635	2, 334, 485	1954	35, 831	1, 510, 344
1952	48, 308	1, 863, 262	1955	8, 899	308, 140

Sand and Gravel.—The State production of sand and gravel, at an alltime high of 4.9 million tons, exceeded the previous high of 1954 by 4 percent in tonnage and 20 percent in total value, reflecting an

increase in average value per ton of 15 cents.

Government-and-contractor output for paving was produced by the county highway departments of Hardin and Trimble Counties and the Kentucky State Highway Department from Ballard, Calloway, Carlisle, Graves, Hancock, Henderson, Livingston, Lyon, Marshall, Trigg, and Union Counties. Paving-sand production was 2,500 tons valued at \$1,750, all from Hardin County. Gravel output was 134,000 tons valued at \$48,000 distributed among the counties named above. Unit values were 70 cents for sand and 36 cents for gravel, compared with 23 cents for sand and 37 cents for gravel in 1954.

TABLE 6.—Sand and gravel sold or used by producers, 1954-55, by uses

TT	19	54	1955		
Use	Quantity Value		Quantity	Value	
Sand: Structural	1, 631, 347 891, 003 103, 974 26, 750 2, 653, 074	\$1, 579, 339 697, 881 107, 706 39, 481 2, 424, 407	1, 973, 564 772, 974 (¹) 53, 481	\$2, 223, 253 743, 042 (1) 68, 756	
Gravel: Structural	1, 213, 335 590, 673 (²) 272, 524	1, 255, 568 505, 552 (²) 216, 266	1, 450, 416 507, 565 81, 578 (¹)	1, 676, 416 484, 699 42, 276	
Total gravel	2, 076, 532	1, 977, 386	(1)	(1)	
Total sand and gravel	4, 729, 606	4, 401, 793	4, 898, 705	5, 298, 10	

<sup>1</sup> Figure withheld to avoid disclosure of individual company confidential data. Included with "Total

<sup>2</sup> Figure withheld to avoid disclosure of individual company confidential data. Included with "Other gravel."

Stone.—Stone production exceeded that in 1954 by 18 percent in tonnage and 17 percent in value and set an alltime high in both tonnage and value. Output of dimension sandstone for rough construction and rubble was increased. Production of rough architectural stone, curbing, and flagging increased over 1954; no dressed stone was reported in 1955; a net loss in these materials resulted. However, dimension-sandstone output was 70 percent greater in tonnage and 37 percent more in value than in 1954.

Production of crushed stone exceeded that in 1954 by 18 percent in tonnage and 17 percent in total value, reflecting a very small drop in average unit value. Concrete and road metal increased 19 percent in tonnage and 17 percent in total value. Production of stone for railroad ballast decreased 13 percent in tonnage and 7 percent in total value, reflecting an average increase of 7 cents per ton. Agricultural-limestone production increased 13 percent in tonnage and 14 percent in total value.

TABLE 7.—Crushed limestone sold or used by producers, 1954-55, by uses

	1	954	1955		
Use	Short tons	Value	Short tons	Value	
Concrete and roads. Agriculture Riprap Rallroad ballast. luxing stone. Rock dust for coal mines. Other uses.	7, 771, 869 1, 113, 663 (¹) 421, 471 21, 078 3, 073 789, 499	\$10, 419, 965 1, 391, 024 (1) 419, 840 29, 763 23, 775 953, 359	9, 217, 156 1, 255, 305 418, 282 367, 404 (1) (1) (1) 663, 723	\$12, 221, 629 1, 584, 348 423, 384 391, 637 (1) (1) 899, 974	
Total	10, 120, 653	13, 237, 726	11, 921, 870	15, 520, 972	

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosure of individual company confidential data; included with "Other uses."

## **REVIEW BY COUNTIES**

Of 120 counties in the State, 96 reported mineral production, compared with 85 in 1954. As in previous years, the leading counties were the large coal producers, listed in order of total value, Harlan, Pike, Floyd, Hopkins, Letcher, Perry, Muhlenberg, and Leslie; each produced more than \$10 million.

TABLE 8.—Value of mineral production in Kentucky, 1954-55, by counties <sup>1</sup>

County	1954	1955	Minerals produced in 1955 in order of value <sup>2</sup>
Adair	\$144, 250	\$153, 910 25, 171 (³)	Limestone.
Allen		25, 171	Do.
Anderson	(3)	458	Do. Sand and gravel.
BallardBarren		191, 520	Limestone.
BarrenBell	5. 782. 468	(3)	Coal, limestone, sandstone. Sand and gravel.
Boone		(3)	Sand and gravel.
Rourhon	58, 634	(§)	Limestone. Coal, fire clay.
Bovd	964, 479	(3)	Limestone.
Boyle	58, 634 964, 479 220, 251 3, 888, 671	2, 818, 722	Coal.
BreathittBreckinridge	3, 300, 011	321, 298 I	Limestone, miscellaneous clay. Miscellaneous clay.
Bullitt		(3)	Miscellaneous clay.
Butler	3/5, 19/	(3) (3) (3)	Coal.
Caldwell	(°)	(3)	Limestone, fluorspar. Sand and gravel.
Collower		2, 216 788	Do.
Carlisle	(3)	(3)	Do.
Carroll Carter	1	2, 744, 454	Fire clay, coal, limestone.
Casey	(3)	151, 300	Limestone.
Christian		(3) (3)	Limestone, coal.
Clark	126,082	3 330 000	Limestone. Coal.
Cler	2, 179, 965	3, 338, 092	Coal, limestone.
Clinton	1,872,475	313, 824 489, 900	Limestone, fluorspar, sandstone.
CrittendenCumberland	(3)	(3)	Limestone.
Doviess	1 1.745.129	(8) 668, 465	Coal, sand and gravel.
DaviessEdmonson	(3)	(3) 73, 434	Limestone.
Elliott	(*)	73, 434	Coal. Limestone.
Estill		(3) <sup>'</sup> (3)	Do.
Fayette	295, 168	352, 086	Do.
Fleming Floyd	25, 248, 573	352, 086 29, 445, 372	Coal.
		(3)	Limestone.
Fulton	(3)	(3)	Sand and gravel.
(fallatin		109,570	Do. Ball clay, fire clay, sand and gravel.
Graves	1, 362, 654 119, 370	1, 623, 457	Limostono
Grayson	(3)	(8)	Sand and gravel, fire clay, coal.  Fire clay, sand and gravel.  Limestone, miscellaneous clay, sand
GreenupHançock	40,600	80, 855	Fire clay, sand and gravel.
Hardin	452, 940	693, 835	Limestone, miscellaneous clay, sand
•		47, 493, 157	and gravel.
Harlan	49, 703, 074	47, 493, 137	Limestone.
Harrison	(3)	(3)	l Do.
Hondorson	870.181	(3)	Sand and gravel, coal.
Hopkins	38, 613, 679	26, 973, 207	Coal, miscellaneous clay.
HopkinsJackson	531, 389	995, 104 9, 477, 453	
Jefferson	4, 590, 880	9, 477, 453	Coar, innestone.  Cement, limestone, sand and gravel, miscellaneous clay, sandstone.
-	(2)	(3)	Limestone.
JessamineJohnson	1, 177, 385	2, 032, 098	Coal.
Kenton		(3)	Limestone.
Knott	2, 209, 520	3, 551, 033	Coal.
Knox	477, 999	(3) 223, 751 38, 040	Coal, fire clay. Coal, limestone.
Tournal	373,749	38 040	Coal.
Lawrence		1 (3)	Coal, limestone.
LesLatcherLivingston	673, 457 8, 571, 148	10, 388, 589	Coal. Coal, limestone.
Lesite	1 18, 882, 251	(3)	Coal, limestone.
Livingston	237, 075	(3)	Limestone, fluorspar, sand and gravel.
		932	Limestone, sandstone. Sand and gravel.
Lyon	113, 869	(3) 932	Limestone, miscellaneous clay.
MadisonMagoffin	110,000	330, 597	Coal.
Marion	(3)	(3)	Limestone.
Marshall		3, 901	Sand and gravel.
Montin	1 (*)	279, 498	Coal.
Mason	(%)	(3) 311, 032	Sand and gravel, miscellaneous clay. Sand and gravel.
McCracken	(*)	2, 913, 537	Coal, sandstone.
McCreary	(3)	2, 913, 337	Limestone.
Manda	12	(3)	Do.
Medical y	117.988		
Menifee	(3)	(3)	Do.
Menifee	(3)	(3)	Do.
Menifee	(3)	(3)	Do. Do. Do. Coal, limestone.

See footnotes at end of table.

TABLE 8.—Value of mineral production in Kentucky, 1954-55, by counties 1-Continued

* · · · · · · · · · · · · · · · · · · ·	County	1954	1955	Minerals produced in 1955 in order of value 2
Olidham Pendleton Perry- Perry- Pike Powell Pulaski Rockeastle Rowan Simpson Todd Trigg Trimble Union Warren Wayne Webster Whiley Wolfe Undistributed		16, 305, 361 -27, 456, 164 161, 281 661, 358 -754, 304 (r) 120, 934 109, 313 (r) 6, 910, 618 (r) 91, 727 (r)	(3)	Limestone. Coal, limestone. Sand and gravel. Limestone. Coal. Do. Limestone, miscellaneous clay. Coal, limestone. Do. Limestone, miscellaneous clay. Limestone, miscellaneous clay. Limestone, sand and gravel. Sand and gravel. Coal, sand and gravel, fire clay. Limestone. Coal, limestone. Coal, limestone. Coal, fire clay. Coal, fire clay. Coal.

¹ County figures exclude native asphalt, natural gas, natural-gas liquids, and petroleum; included with "Undistributed." The following counties are not listed because no production was reported: Bath, Bracken, Campbell, Garrard, Grant, Green, Henry, Hickman, Larue, Lewis, Lincoln, McLean, Montgomery, Nicholas, Owen, Owsley, Robertson, Russell, Scott, Shelby, Spencer, Taylor, Washington, and Woodford. <sup>2</sup> Other than native asphalt, natural gas, natural-gas liquids, and petroleum. <sup>3</sup> Figure withheld to avoid disclosure of individual company confidential data; included with "Undistributed."

Adair.—Shamrock Stone Co., Inc. (Butler quarry), crushed 95,000 tons of limestone for concrete aggregate and road metal and 14,000 tons for agricultural purposes. This compares with 91,000 and 12,500, respectively, in 1954. Total value was \$154,000, compared with \$144,000 in 1954.

Anderson.—Kentucky Stone Co., Inc., at its Tyrone quarry, prepared crushed limestone for marketing as railroad ballast, concrete aggregate, road metal, and agricultural use. Production was somewhat below that in 1954.

Ballard.—The Kentucky State Highway Department produced 2,139 tons of paving gravel valued at \$458.

Barren.-J. F. Pace Construction Co. at its Pace quarry crushed limestone, which was marketed for riprap, concrete aggregate, road metal, and agricultural use. Production was below that in 1954.

Bell.—Kentucky-Virginia Stone Co. crushed limestone from its Pineville quarry for riprap, concrete aggregate, and road metal at the same rate as in 1954. Levi Polly quarried more crushed sandstone for concrete aggregate and road metal than in 1954. Output in 1954 was crushed to sand sizes and sold as such, but size reduction was not reported in 1955. Bituminous-coal production from 59 mines was 1,184,000 tons, compared with 1,222,000 tons in 1954.

Boone.—Belleview Gravel Co. began producing sand and gravel for

building, paving, and other uses.

Bourbon.—Bourbon Limestone Co., Inc., quarried limestone for concrete aggregate, road metal, and agricultural purposes at virtually double the 1954 production rate. Unit value increased 14 percent above 1954.

Boyd.—Big Run Coal & Clay Co. mined clay for heavy clay products at a slightly higher rate than in 1954 but at lower unit value. Coal production from 14 mines was 397,000 tons, compared with

228,000 tons in 1954.

Boyle.—Caldwell Stone Co. (Danville quarry) quarried limestone for concrete aggregate, road metal, and agricultural use, producing somewhat more than in 1954 and at a 25-percent higher value per ton. Boyle County Highway Department quarried 10,000 tons of crushed limestone valued at \$16,000.

Breathitt.—Bituminous coal was the only mineral produced in the county. Production from 23 mines was 524,000 tons compared with

791,000 tons in 1954.

Breckinridge.—Murray Tile Co. mined clay for its own use in manufacturing heavy clay products, at the same rate as in 1954. Kentucky Stone Co. (Webster quarry) and Hardinsburg Stone Co. (Hardinsburg quarry) produced for concrete aggregate, road metal, and agricultural use. The former also marketed some railroad ballast. Combined production exceeded that in 1954 by 36 percent, and average value per ton was 5 cents higher.

Bullitt.—Kentucky Light Aggregates, Inc., began producing an appreciable tonnage of clay for its own use in manufacturing light-

weight aggregates.

Butler.—Bituminous-coal output of 119,000 tons from 7 mines was

the only mineral production in the county.

Caldwell.—P. L. Perkins continued leasing the Williamson mine, and J. Willis Crider Fluorspar Co. produced at the Beavers mine. Michigan & Kentucky Fluorspar Co. took a small tonnage of fluorspar from the Tyree mine. An additional small tonnage was reported without identification of source. Fredonia Valley Quarries, Inc., and Cedar Bluff Stone Co. produced crushed limestone. Combined production rose 19 percent, compared with 1954; but total value exceeded that in 1954 by only 4 percent, reflecting a substantial drop in value per ton.

Calloway.—The only mineral production from the county was 10,000 tons of paving gravel valued at \$2,200 by the Kentucky State Highway

Department.

Carlisle.—Kentucky State Highway Department produced 3,700

tons of paving gravel valued at \$800.

Carroll.—Carrollton Gravel-Sand Co. and Standard Materials Co. produced building sand and gravel; the former marketed some gravel for railroad ballast. Combined production was less than in 1954, with

no change in value per ton.

Carter.—Carter County continued as the principal source of fire clay. The leading producers, as in 1954, were General Refractories Co. (Olive Hill mine), North American Refractories Co. (Bailey, Hayward, and Lowe mines), and Harbison Walker Refractories Co. (Brinegar, Riggs, and Stenson mines), who together supplied 82 percent of the county total, compared with 86 percent in 1954. The county total was considerably above that in 1954. Coal production from 8 mines was 110,000 tons, compared with 85,000 tons in 1954. Standard Slag & Stone Co. quarried limestone for concrete aggregate and road metal but did not quite reach its 1954 tonnage. Value per ton also decreased somewhat.

Casey.—Casey Stone Co. continued quarrying at Bethel Ridge for riprap, concrete aggregate, road metal, and agricultural stone, marketing a total of 96,000 tons, compared with 79,000 tons in 1954. The average value per ton increased 37 percent compared with 1954.

Christian.—Christian Quarries, Inc., and Hopkinsville Stone Co., Inc., quarried limestone for concrete aggregate, road metal, and agriculture use. Harry Berry, Inc., began substantial production of limestone for concrete aggregate and road metal. Total county production of limestone was 50 percent above 1954 in tonnage and 44 percent in total value, reflecting a small reduction in average unit value. Coal production from 1 mine was 1,400 tons.

Clark.—Allen Co., Inc., Boonesboro quarry increased its production of limestone appreciably and marketed its stone for concrete aggregate,

road metal, and agricultural stone.

Clay.—Bituminous coal was the only mineral produced in the county. Total production from 47 mines was 849,000 tons, compared

with 549,000 tons in 1954.

Clinton.—Shamrock Stone Co. increased its production of limestone for concrete aggregate, road metal, and agricultural stone from 25,000 tons in 1954 to 40,000 tons in 1955, but average unit value was slightly lower. Bituminous-coal production from 3 mines was 58,400 tons, compared with 14,000 tons in 1954.

Crittenden.—Owing to cessation of operations at the fluorspar mills, lead or zinc was not recovered from fluorspar ores mined in Kentucky.

Fluorspar production from Crittenden County was about 10 percent of that in 1954. Crude fluorspar shipments were made from mine dumps and a few small mines, compared with 36 mines and 2 dumps in 1954. Roughly half of the 1955 shipments came from the mine dumps at the Pigmy and Tabb No. 1 mines.

Alexander Stone Co. quarried limestone for riprap, railroad ballast, concrete aggregate, and road metal, with an appreciable increase over 1954 and at a small increase in value per ton. Marion Silica Co., Inc., mined sandstone for foundry and glass sands; production was only about half that of 1954, in spite of a slight increase in average unit

value.

Cumberland.—Cumberland Construction Co. Wells quarry was taken over by the Shamrock Stone Co. in July 1955. Combined production for concrete aggregate, road metal, and agricultural use exceeded that of 1954 by 29 percent in tonnage but only 16 percent in value, reflecting a decrease of 20 percent per ton in average value.

Daviess.—Owensboro River Sand & Gravel Co. was the only producer of any mineral other than coal. The company increased its production of building and paving sands and gravels and engine sand by 60 percent in tonnage and 53 percent in value compared with 1954, reflecting an average reduction of 6 cents per ton. Coal production from 9 mines was 592,000 tons compared with 618,000 in 1954.

Edmonson.—McLellan Stone Co. quarried limestone for concrete aggregate, road metal, and agricultural use, increasing tonnage by 40 percent and value per ton slightly. Kentucky Rock Asphalt Co. quarried bituminous sandstone for road-surfacing material. Production was below that in 1954, but average value per ton improved considerably.

Elliott.—Bituminous coal was the only mineral produced in Elliott County. Production from 2 mines was 17,600 tons.

Estill.—Estill County Stone Co. began producing crushed limestone

for agricultural use and fertilizer filler.

Fayette.—Blue Grass Stone Co. and Central Rock Co. both quarried limestone for concrete aggregate, road metal, and agricultural use. Combined production increased 26 percent in both tonnage and value, compared with 1954.

Fleming.—Gorman Construction Co. quarried 236,000 tons of limestone for riprap, concrete aggregate, road metal, and agricultural use, compared with 212,000 tons in 1954. Average value per ton was

10 cents above 1954.

Floyd.—Coal production from 299 mines was 5.6 million tons compared with 4.6 million tons in 1954. Some building- and engine-sand production was reported in 1954, but none was recorded in 1955.

Franklin.—Blanton Stone Co. and Frankfort Builders Supply Co., Inc., quarried limestone for concrete aggregate, road metal, and agricultural use. The former also marketed some railroad ballast. Combined production was 22 percent higher in tonnage and 26 percent higher in total value than in 1954, reflecting a small increase in value per ton.

Fulton.-Hickman Sand & Gravel Co. mined paving sand and

gravel; tonnage and value were slightly below those in 1954.

Gallatin.—Gallatin Sand & Gravel Co. increased its production of building and paving sands and gravels approximately 50 percent over 1954 owing primarily to a substantial increase in average value per

Graves.—Graves County continued to be the sole source of ball clay in the State and also supplied a substantial part of plastic-fire-clay production. Ball clay was mined and marketed by Cooley Clay Co., Inc., Kentucky Clay Mining Co., Kentucky-Tennessee Clay Co., and Old Hickory Clay Co. Combined production was appreciably greater than in 1954, and there was also a small increase in value per ton. Kentucky-Tennessee Clay Co. increased its production of plastic fire clay, in spite of a small drop in value per ton. The Kentucky State Highway Department produced 38,000 tons of paving gravel valued at \$8,200.

Grayson.—Rogers & Brunnhoeffer and Ragland Bros. continued to quarry limestone for concrete aggregate, road metal, and agricultural markets. Combined production was approximately 50 percent above 1954, and total value increased 37 percent, reflecting a 10-percent

average decrease in value per ton.

Greenup.—Fire clay was again produced by M. A. McCoy, following no output in 1954. Worthington Sand & Gravel Co. nearly doubled its production of paving sand and more than doubled the total value compared with 1954, indicating a substantial increase in average value per ton. Coal production from 4 mines was 9,500 tons, compared with no production in 1954.

Hancock.—Booneville Brick & Tile Co. produced both plastic fire clay and miscellaneous clay for its own use. Owensboro Sewer Pipe Co. increased production of clay for its own use. Murray Tile Co. and Owensboro Brick & Tile Co. began producing clay for local use. Total clay production more than doubled that in 1954. The Ken-

tucky State Highway Department produced 5,300 tons of paving

gravel valued at \$6,800.

Hardin.—West Point Brick Co. mined clay for its own use at little change in rate from 1954. Kentucky Stone Co. (Lilmay and Upton quarries), Waters Construction Co. (Elizabethton quarry), and Osborne Bros. quarried limestone for concrete aggregate and road metal. Kentucky Stone Co. and Osborne Bros. also marketed some agricultural stone. Geoghegan & Mathis (Fort Knox quarry) began producing a substantial quantity of limestone for concrete aggregate and road metal. Total county production was 57 percent above 1954 in tonnage and 55 percent above in total value, reflecting a small decrease in average value per ton. The Hardin County Highway Department produced 5,000 tons of paving sand and gravel valued at \$3,500.

Harlan.—The county ranked first in total value of mineral production, but its only mineral output was bituminous coal. Production from 170 mines was 8.4 million tons compared with 8.6 million tons

in 1954.

Harrison.—Genet Stone Co. again substantially increased its production of crushed limestone for concrete aggregate, road metal, and agricultural limestone.

Hart.—McLellan Stone Co. production at its Horse Cave quarry

was considerably below that in 1954.

Henderson.—The Kentucky State Highway Department produced 8,000 tons of paving gravel valued at \$7,700. Production of riverbed sand and gravel by Bedford-Nugent Co., Inc., was six times that in 1954. Coat production from 11 mines was 229,000 tons, compared with 247,000 tons in 1954.

Hopkins.—Clark's Clay Products Co. mined a small tonnage of clay for its own use. Bituminous coal from 57 mines totaled 14.5

million tons, compared with 12.5 million tons in 1954.

Jackson.—M. A. Walker & Co. produced an initial 61,000 tons of limestone marketed for concrete aggregate, road metal, and agricultural use. This was slightly more than was reported from the county by Roy Clark in 1954.

The output from 28 mines was 185,000 tons of coal, compared with

111,000 tons in 1954.

Jefferson.—Kosmos Portland Cement Co. produced portland and masonry cements at Kosmosdale. The tonnage and value were substantially the same as in 1954. Louisville Pottery Co. mined a small tonnage of clay for its own use in manufacturing flowerpots and art pottery. Kosmos Portland Cement Co. mined clay for its kilns in burning cement clinker, and Southern Brick & Tile Co. mined clay for its own use. County crushed-limestone production was 1.5 million tons valued at \$2.1 million, compared with 1.8 million tons valued at \$2.7 million in 1954. The same six crushed-limestone producers in 1955 were Louisville & Nashville Railroad Co., W. T. Liter, Jefferson County Stone Co., Falls City Stone Co., Okalona Stone quarry, and Louisville Crushed Stone Co.

Like Henderson County, Jefferson County is credited with sand and gravel production dredged from river bottoms. In 1955 Nugent Sand Co., Ohio River Sand Co., E. T. Slider Co., Inc., and H. B. Hammond Co. were active. R. W. Green Sand & Gravel Co. and

Humpich Sand Co. did not report from Jefferson County. Combined production was 1.4 million tons valued at \$1.6 million, compared with 1.8 million tons valued at \$1.9 million in 1954. This indicates a slight increase in value per ton over 1954. Kosmos Portland Cement Co. quarried a small tonnage of crushed sandstone for its kiln mix and also quarried its own limestone.

Jessamine.—Kentucky Stone Co. increased output substantially at its High Bridge quarry. Crushed limestone was marketed for railroad

ballast, concrete aggregate, road metal, and agricultural stone.

Johnson.—Production of bituminous coal from 111 mines totaled

538,000 tons, compared with 310,000 tons in 1954.

Kenton.—Franxman Bros. crushed limestone at its Covington quarry for concrete aggregate and road metal but did not quite reach the tonnage quarried in 1954.

Knott.—The only mineral produced in Knott County was bituminous coal. Output from 92 mines totaled 978,000 tons, compared

with 610,000 tons in 1954.

Knox.—Barbourville Brick & Tile Co. mined clay for its own use and appreciably increased its tonnage, compared with 1954. Twenty-nine coal mines produced 257,000 tons, compared with 126,000 tons in 1954

Laurel.—Bituminous coal was the only mineral produced in Laurel County. Production at 8 mines totaled 48,600 tons, compared with

105.000 tons in 1954.

Lawrence.—The only mineral produced in Lawrence County was bituminous coal. Two coal mines reported a total of 7,100 tons,

compared with 16,000 tons in 1954.

Lee.—Kentucky Stone Co. Yellow Rock quarry increased its production of limestone appreciably over the 1954 tonnage. The material was marketed for railroad ballast, concrete aggregate, road metal, and agricultural limestone. The average value per ton was slightly above 1954. Output from 5 bituminous-coal mines was 108,000 tons, compared with 91,000 tons in 1954.

Leslie.—Bituminous coal, the only mineral output from Leslie County, was produced from 52 mines, reporting 2,323,000 tons, com-

pared with 2,251,000 tons in 1954.

Letcher.—Levisa Stone Corp. Jenkins Limestone quarry and Hurricane Gap quarries began producing limestone. Both quarries marketed material for concrete aggregate and road metal. County production was somewhat above that in 1954. Output from 280 coal mines was 5.7 million tons, compared with 3.9 million tons in 1954.

Livingston.—Fluorspar production in Livingston County was limited to 2 mines and 2 mine dumps. Roberts & Frazer produced from the Karr mine and Tracy Harris from the Harris mine. Tinsley & Loyd worked the Nancy Hanks dump and Moody & Butler the Klondike dump. Ward & Montgomery Garrett's limestone quarry and Reed Crushed Stone Co. Grand Rivers quarry, produced 33 percent above 1954 in tonnage and 36 percent higher in total value, representing an average increase of 3 cents per ton. The Kentucky State Highway Department produced 22,400 tons of paving gravel valued at \$4,800.

Logan.—Kentucky Stone Co. Russellville quarry produced limestone for railroad ballast, concrete aggregate, road metal, and agricultural limestone. Production increased appreciably in value per ton and 14 percent in tonnage above 1954. Kolar Stone Quarries and Kentucky Flagstone Co. produced dimension sandstone for dressed building stone and for architectural material and flagging, respectively. Combined production exceeded that in 1954 by 61 percent in tonnage and 33 percent in total value.

Lyon.—The only mineral production from Lyon County was 4,300 tons of paving gravel valued at \$900 reported by the Kentucky

State Highway Department.

Madison.—Etta Grinstead mined a small quantity of clay for high-grade tile manufacture. At the Kentucky Stone Co. Boonesboro limestone quarry production was below that of 1954, but unit value was up slightly.

Magoffin.—Bituminous coal was the only mineral produced in Magoffin County. Four coal mines reported a total of 103,900 tons.

Marion.—Ward & Montgomery and Lebanon Stone Co. produced

Marion.—Ward & Montgomery and Lebanon Stone Co. produced crushed limestone. Production decreased slightly from 1954, and there was a slight decline in unit value.

Marshall.—Kentucky State Highway Department produced 18,000 tons of paving gravel valued at \$3,900, the only mineral output reported for Marshall County.

Martin.—Coal, the only mineral production from Martin County,

came from 9 mines and totaled 83,200 tons.

Mason.—Sphar Brick Co. mined clay for its own use in manufacturing heavy clay products. Production increased slightly. J. F. Hardyman appreciably increased the tonnage of building and paving sand and gravel; average value per ton was substantially increased.

McCracken.—Federal Materials Co., Inc., mined building and paving sands and gravels, engine sand, and railroad-ballast gravel. Keeling Bros. confined production to paving gravel, and Smiley Sand & Gravel Co. produced only paving sand. Combined production was roughly 28 percent below that of 1954 in tonnage, and value per ton dropped slightly.

McCreary.—Thos. C. Mayne produced a small tonnage of dimension sandstone marketed as facing stone, rough architectural stone, curbing, and flagging; the resulting spalls were sold as crushed sandstone for concrete aggregate. Production from 18 coal mines totaled

781,000 tons, compared with 314,000 tons in 1954.

Meade.—Kosmos Portland Cement Co. quarried limestone to manufacture its portland cement, and Kentucky Stone Co. Gaston quarry produced limestone for concrete aggregate, road metal, and agricultural stone.

Menifee.—A. W. Walker & Son Frenchburg quarry produced limestone for concrete aggregate, road metal, and agricultural lime-

stone. Output was appreciably greater than in 1954.

Mercer.—The Mercer County Highway Department produced 24,000 tons of crushed limestone valued at \$35,000 for concrete aggregate and road metal. Mercer Stone Co. crushed limestone for concrete aggregate, road metal, and agricultural limestone. Production exceeded that of 1954.

Metcalfe.—Montgomery & Co. increased crushed-limestone output from its Chapman and Word quarries considerably. Unit value

remained constant compared with 1954.

Monroe.—Monroe-Cumberland Stone Co. Tomkinsville quarry produced less than in 1954; unit value was appreciably below that

in 1954.

Morgan.—Licking River Limestone Co. Zag limestone quarry and Kentucky Road Oiling Co. began crushing limestone. Both companies marketed material for concrete aggregate, road metal, and agricultural use. County production of limestone roughly doubled that in 1954, and value per ton increased appreciably.

Production from 12 coal mines totaled 92,400 tons, compared with

19,000 tons in 1954.

Muhlenberg.—Greenville Quarries, Inc., and Luzerne Limestone Quarry crushed limestone for concrete aggregate, road metal, and agricultural stone. The latter company also marketed some railroad ballast. Combined production was 31 percent above that in 1954 in tonnage, but total value exceeded that in 1954 by only 1 percent, reflecting a substantial drop in unit value.

Coal was the principal mineral produced in the county, and 25 mines reported a total of 5.7 million tons, compared with 5.1 million

in 1954

Nelson.—Geoghegan & Mathis produced a substantial quantity

of crushed limestone for concrete aggregate and road metal.

Ohio.—State Contracting & Stone Co. and Fort Hartford Stone Quarry crushed limestone for concrete aggregate, road metal, and agricultural use. The latter company also marketed some riprap and railroad ballast. Combined production was 33 percent above that of 1954 in tonnage and 44 percent above in total value, reflecting a substantial increase in value per ton. Coal was a major mineral product in the county. Twelve coal mines reported a total of 2.2 million tons, compared with 1.7 million tons in 1954.

Oldham.—R. W. Greene Sand & Gravel Co. produced a substantial

quantity of building and fill sands and building gravel.

Pendleton.—Geoghegan & Mathis produced a substantial quantity of crushed limestone from two quarries—Butler and Falmouth. The material was marketed as concrete aggregate and road metal.

Perry.—Bituminous coal was the only mineral produced in Perry County; 107 mines reported 4.9 million tons, compared with 4,018,000 tons in 1954.

Pike.—Coal from 396 mines totaled 8.5 million tons, compared

with 5.9 million in 1954.

Powell.—H. B. Sipple Brick Co. mined clay for its own use in manufacturing heavy clay products, but tonnage was somewhat below that in 1954. A. W. Walker & Son again increased production from its quarry, but total value did not increase, reflecting a small

drop in unit value.

Pulaski.—Strunk Construction Co. (Tatesville quarry) and Somerset Stone Co. (Somerset quarry) crushed limestone for concrete aggregate, road metal, and agricultural use. Combined production increased 31 percent above 1954, but total value rose 10 percent, reflecting a substantial reduction in value per ton. Production from 32 bituminous-coal mines was 453,000 tons, compared with 59,000 tons in 1954.

Rockcastle.—Kentucky Stone Co., Inc., crushed limestone from its Mount Vernon and Mullins quarries for railroad ballast, concrete

aggregate, road metal, and agricultural use. Combined production was below that of 1954 in both tonnage and value.

Bituminous coal from 17 mines totaled 87,700 tons, compared

with 61,000 tons in 1954.

Rowan.—Lee Clay Products Co. mined a somewhat larger tonnage of clay for its own use than in 1954. Moorehead Limestone Co. and Kentucky Road Oiling Co. crushed limestone for concrete aggregate, road metal, and agricultural limestone. The former company also produced fluxing stone. Combined production was 189,000 tons valued at \$244,000, compared with an output of 45,000 tons valued at \$55,000 in 1954, reflecting an average increase of 7 cents per ton.

Simpson.—Southern Stone Co. Franklin quarry produced concrete aggregate, road metal, and agricultural stone but at somewhat reduced

rate compared with 1954.

Todd.—D. W. Dickenson (Gallatin quarry), Kentucky Stone Co. (Elkton quarry), and Todd County Stone Co. quarried crushed limestone for concrete aggregate, road metal, and agricultural use. Todd County Stone Co. also quarried some riprap. Combined production was greater than in 1954, and total value indicated an increased value per ton.

Trigg.—Cedar Bluff Stone Co. increased somewhat its production of crushed limestone from its Cerulean quarry. Material was marketed for riprap, concrete aggregate, road metal, and agricultural use. The Kentucky State Highway Department reported production of

12,000 tons of paving gravel valued at \$2,600.

Trimble.—The Trimble County Highway Department produced 1,600 tons of paving gravel valued at \$1 per ton. R. W. Greene Sand & Gravel Co. produced a substantial quantity of building and fill sands

and building gravel.

Union.—Clark's Clay Products Co. (Uniontown mine) produced from its clay mine for part of the year only. The Kentucky State Highway Department produced 5,200 tons of paving gravel valued at \$6,700. Union Sand & Gravel Co. mined building sand and gravel and paving gravel. Production was 30,000 tons valued at \$37,000, compared with 34,000 tons valued at \$42,600 in 1954. Five coal mines reported production of 2.2 million tons, compared with 1.7 million tons in 1954.

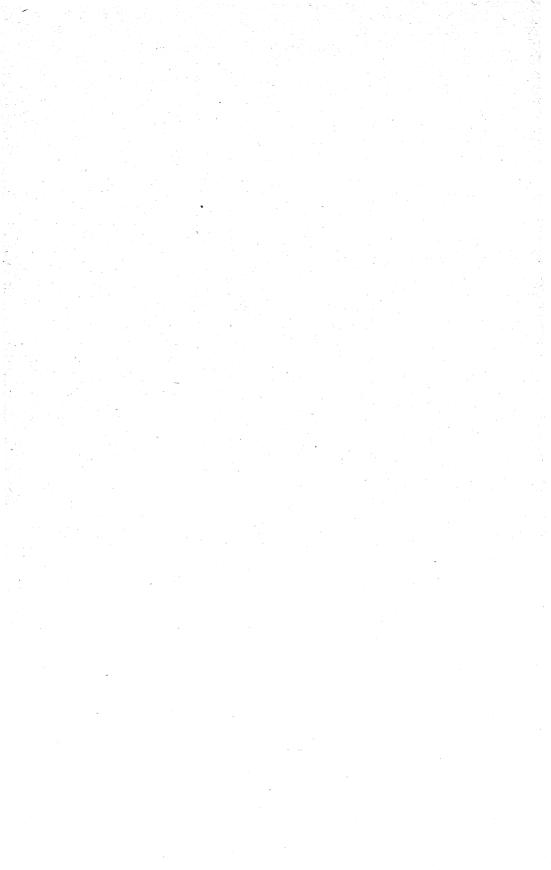
Warren.—McLellan Stone Co. and Gary Bros. Crushed Stone Co. crushed limestone for concrete aggregate, road metal, and agricultural use. Their combined production was somewhat below that of 1954.

Wayne.—Bassett Products Co. produced crushed limestone for concrete aggregate, road metal, and agricultural use and increased production somewhat above that in 1954. Nine mines reported production of 88,300 tons of coal.

Webster.—Bituminous coal was produced at 6 mines.

Whitley.—Corbin Brick Co. mined clay for its own use at the same rate as in 1954. Output from 29 coal mines totaled 256,000 tons, compared with 275,000 tons in 1954.

Wolfe.—Bituminous coal, only mineral output from Wolfe County, was produced from 2 mines and totaled 11,000 tons, compared with 9,000 tons in 1954.



# The Mineral Industry of Louisiana

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

By Howard E. Rollman<sup>1</sup> and Leo Hough<sup>2</sup>



brought a new range of mineral-productive potentialities. Offshore activities appeared likely to extend the horizon of mineral development so that the mineral economy may continue its steep upward trend for many more years, and growth means not only more mineral products but also expanded reserves. The rate of development of reserves of petroleum and natural gas exceeded the ability of national and state economies to utilize fully available supplies of these fuels. Opening the offshore area favored the possibility of growth of the mineral industry in Louisiana so that in 1955 the State ranked as second largest liquid-fuel producer in the Nation.

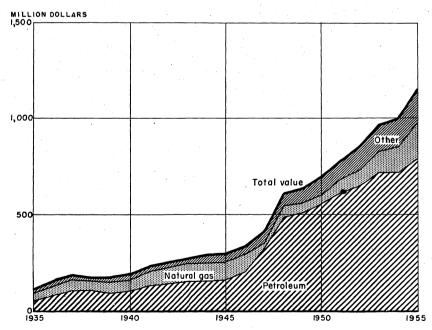


FIGURE 1.—Value of petroleum and natural gas and total value of mineral production, 1935-55.

<sup>&</sup>lt;sup>1</sup>Commodity-industry economist, Region IV, Bureau of Mines, Bartlesville, Okla. <sup>2</sup> State geologist, Louisiana Geological Survey, Baton Rouge, La.

TABLE 1.—Mineral production in Louisiana, 1954-55 1

	19	54	1955		
Mineral	Short tons (unless other- wise stated)	Value	Short tons (unless other- wise stated)	Value	
Clays	<sup>2</sup> 713, 940 ( <sup>3</sup> ) 1, 399, 222	<sup>2</sup> \$940, 940 ( <sup>3</sup> ) 124, 531, 000	<sup>2</sup> 651, 268 335, 371 1, 680, 032	<sup>2</sup> \$659, 099 586, 900 189, 844, 000	
Natural gasoline and cycle products thousand gallons. LP-gases. do. Petroleum (crude) thousand 42-gallon barrels. Salt (common) Sand and gravel. Stone. Sulfur (Frasch process). long tons. Value of items that cannot be disclosed:	665, 070 292, 226 246, 558 3, 088, 686 7, 910, 152 4 5 2, 043, 872 1, 853, 563	54, 330, 000 11, 620, 000 722, 370, 000 11, 101, 456 9, 686, 635 4 5 3, 127, 124 49, 222, 394	782, 328 291, 138 271, 010 3, 562, 636 8, 574, 020 4 5 3, 252, 585 2, 072, 418	59, 158, 000 10, 323, 000 793, 280, 000 15, 406, 993 10, 941, 860 4 8 4, 961, 657 58, 027, 704	
Bentonite (1954), cement, gypsum (1954), lime, sulfur, recovered elemental 3		13, 334, 241		<b>15, 308,</b> 896	
Total Louisiana 6		998, 057, 000		1, 156, 637, 000	

Production as measured by mine shipments, sales, or marketable production (including consumption

During 1955, \$1,157 million worth of minerals was produced; mineral fuels constituted over 90 percent. Although other minerals composed a relatively small part of the State production, the value of nonfuel commodities was quite sizable. Louisiana was the source of one-third of the Nation's sulfur, ranked fourth in salt output, and supplied over 3.2 million tons of shell and 8.6 million tons of sand and gravel, as well as sizable tonnages of clays, cement, and lime. of these minerals were consumed or processed within the State.

The abundant supplies of energy, construction, and chemical raw materials and the plentiful quantity of industrial water favored continued industrial development within the State. The Gulf Coast region of Louisiana is one of the fastest growing industrial areas in The chemical industry, a dominant segment of the the Nation. economic growth factors, continued to develop in 1955 on the basis of bountiful supplies of liquid and gaseous hydrocarbons. Many of these chemical plants operate in conjunction with State petroleum refineries and utilize refinery gases to comprise a refinery-petrochemical industrial complex.

In 1955 production of all minerals, except clays and LP-gases, increased.

Employment.—Employment in the oilfields and gasfields, in the quarries, pits, and mines, and on dredges increased 15 percent in 1955, compared with 1954. Nine-tenths of the labor force in the mineral industry was engaged in producing petroleum, natural gas, and natural-gas liquids. The number of workers in this activity increased 17 percent; in nonmetallic production, only 4 percent. Oilfield and gasfield contract services were responsible for nearly all of the gain in employment during the year.

The average annual wage for the oil and gas activity advanced 0.4 percent, to \$5,032; for nonmetals the increase was 4 percent, to an average of \$4,148.

In all phases of petroleum production, refining, and the related industries employment was 5,900 more than in 1954.

Froducers).

Excludes bentonite, value included with items that cannot be disclosed.

Excludes bentonite, value included with items that cannot be disclosed.

Figure withheld to avoid disclosing individual company confidential data

Final figure. Supersedes figure given in commodity chapter.

All oystershell in 1954 and 3,220,928 short tons of oystershell valued at \$4,930,000 in 1955

The total has been adjusted to avoid duplication in the value of clays and stone.

Injuries.—The injury rate for the oil and gas industry in 1955 was 1 fatal injury for every 5 million man-hours and 15 nonfatal injuries per million man-hours. There were 11 fatal or permanently disabling injuries, 33 partial permanent injuries, and 786 temporary The nonfatal injuries resulted in the loss of 37,626 working days.

TABLE 2.—Employment and wages in the mineral industries, 1954-55 1

	Average number of workers		Total wages and salaries	
	1954	1955	1954	1955
Crude-petroleum production (including associated natural-gas production)  Natural gas and natural-gas liquids.  Oilfield and gasfield contract services.  Sand and gravel quarries, pits, and dredges.  Salt mines.  Nonmetallic minerals <sup>2</sup>	17, 848 1, 222 11, 941 1, 220 1, 030 1, 655	18, 694 1, 352 16, 199 1, 319 1, 014 1, 710	\$92, 371, 269 5, 571, 566 57, 491, 260 3, 599, 528 3, 625, 208 8, 334, 964	\$101, 831, 895 6, 475, 229 74, 093, 801 4, 101, 402 3, 710, 595 8, 958, 155
Total	34, 916	40, 288	170, 993, 795	199, 171, 07

TABLE 2a.—Total wage and salaried workers in petroleum production, refining, and related industries, 1946-50 (average) and 1951-55 1

Year	Crude- petrole- um and natural- gas pro- duction	Petro- leum refining	Pipeline transpor- tation (except natural gas)	Gas utili- ties	Petrole- um bulk tank stations	Retail filling stations	Chemicals manufac- tured as byprod- ucts of petroleum or used in refining petroleum	Total
1946–50 (average) 1951	20, 816 24, 574 26, 442 28, 450 31, 900 35, 900	15, 004 15, 407 16, 039 15, 900 15, 850 15, 800	1, 419 1, 421 1, 544 1, 500 1, 450 1, 450	3, 546 4, 440 4, 660 4, 900 4, 950 5, 100	2, 845 3, 157 3, 157 3, 500 3, 650 3, 900	4, 487 5, 138 5, 572 6, 250 6, 600 7, 400	7, 996 9, 392 9, 688 10, 350 10, 600 11, 350	56, 113 63, 529 67, 102 70, 850 75, 000 80, 900

Louisiana State Department of Labor.

# **REVIEW OF MINERAL COMMODITIES**

#### MINERAL FUELS

Just as Louisiana fuels have provided energy for factories, powergenerating stations, and transportation facilities, they have supplied the motivating force for economic development of the State. fluence was expressed, first, in greater employment in the production, processing, and distribution of oil and gas and, second, in the attraction of energy-oriented industries. In employment, income, and investment the oil, gas, and related industries were a prevailing element in the growing industrial economy. These industries are accelerators in an evolving industrial growth.

Offshore Development.—Spectacular developments in the Louisiana offshore area has led to creation of a new oil frontier. Production in the area ultimately may exceed that of the inland area of the State.

Most leases were in the relatively shallow water offshore; but the

Louisiana Department of Labor.
 Mainly sulfur- and shell-production workers.

<sup>&</sup>lt;sup>2</sup> Preliminary figures.

future should bring more leasing at greater depths, with accompanying greater complexities, problems, and expense. The equipment for drilling on these areas ranges from submersible barges to self-contained platforms. The deeper the water the more complicated and expensive the equipment becomes.

According to the Louisiana Department of Conservation, 25 million barrels of crude petroleum and 115 billion cubic feet of natural gas were produced in 1955 in the offshore areas. To date, 66 million barrels of petroleum and 285 billion cubic feet of natural gas have been

produced.

The State of Louisiana approved leases on 25,000 acres of its submerged land and received bonuses totaling \$2,049,626 at the State lease sale on July 12, 1955.<sup>3</sup> By the end of 1955 the State of Louisiana had collected over \$166 million from rentals, bonuses, and royalties from leases on submerged lands. According to the Federal Geological Survey, New Orleans, a sale of leases by the Federal Government in 1955 for 252,807 acres in lands adjacent to Louisiana brought a total of \$100,091,263 in bonuses and \$758,442 in rentals.

TABLE 3.—Louisiana offshore production of crude petroleum, natural gas, and condensate, 1955 and cumulative total <sup>1</sup>

		1955	10 8 4	Cumulative total				
Area	Oil (thousand barrels)	Gas (million cubic feet)	Conden- sate (thousand barrels)	Oil (thousand barrels)	Gas (million cubic feet)	Conden- sate (thousand barrels)		
Breton Island Breton Sound Eugene Island Grand Island Main Pass Ship Shoal South Pass South Peltot South Peltot South Timbalier Vermilion West Cameron West Delta	2, 283 2, 651 1, 391 6, 305 238 10, 180 48 2	5, 797 261 60, 277 851 8, 267 393 9, 569 47 1 28, 064 285 772	706	10, 032 6, 545 3, 939 21, 745 1, 709 17, 977 48 209	8, 919 899 146, 312 2, 285 21, 857 1, 589 15, 195 47 132 85, 595 1, 209 1, 138	1, 798 		
Total	24, 217	114, 584	854	64, 232	285, 177	2, 23		

<sup>&</sup>lt;sup>1</sup> Department of Conservation, Louisiana Geological Survey, Statistics of Oil and Gas Development, 1955. October 1956, pp. 27–44.

TABLE 4.—Revenue from oil and gas mineral leases on Louisiana State submerged lands  $^1$ 

Year	Rentals	Bonuses	Royalty
1945	\$229, 381 2, 275, 599 5, 573, 631 7, 663, 728 3, 941, 764 867, 455 1, 026, 869 1, 300, 176 2, 091, 481 1, 553, 069	\$634, 998 4, 854, 613 8, 676, 522 11, 866, 375 1, 340, 590 4, 087, 286 8, 933, 573 3, 766, 110 36, 302, 875 44, 212, 535	\$32, 524 273, 814 941, 800 319, 959 136, 890 3, 576, 812 3, 983, 146 5, 839, 623

<sup>&</sup>lt;sup>1</sup> Louisiana State Land Office.

<sup>&</sup>lt;sup>3</sup> Petroleum Engineer, vol. 27, No. 10, September 1955, p. A-10.

Exploration and Reserves.—Again in 1955, when the drill penetrated Louisiana's inland and offshore territory to measure the vast wealth of mineral fuels, abundant reserves of oil and gas were revealed. Over 9 million feet of exploratory tests were made by drilling crews at an estimated cost of nearly \$170 million. In the 3 years from 1953 through 1955, the aggregate footage of exploratory drilling could have reached the center of the earth.

Of the total increases in reserves in the United States in 1955, 65 percent of the crude petroleum, 47 percent of the natural gas, and 27 percent of the natural-gas liquids reserves were developed in

Louisiana as a result of the vast exploratory program.

TABLE 5.—Reserves of crude petroleum, natural gas, and natural-gas liquids, 1954-55 1

Fuel	Proved res	•		
	1954	1955	Change in reserves	Increase, percent
Crude petroleum <sup>2</sup>	2, 962 884 36, 800	3, 255 936 42, 436	293 52 5, 636	10 6 15

American Gas Association, American Petroleum Institute, Proved Reserves of Crude Oil, Natural-Gas Liquids, and Natural Gas: Vol. 10, Dec. 31, 1955, pp. 9, 10, and 19.
 Million barrels.
 Billion cubic feet.

TABLE 6.—Average footage of oil, gas, and condensate wells, and dry holes drilled as exploratory tests 1

Year	Averag	e depth	Year	Average depth		
1949 1950 1951 1952	9, 337 9, 060 6, 864 8, 762	7, 374 7, 443 7, 268 7, 773	1953 1954 1955	10, 043 10, 424 10, 324	Bry hole 8, 629 8, 701 9, 701	

<sup>&</sup>lt;sup>1</sup> American Petroleum Institute, Petroleum Facts and Figures, 12th ed., 1956, pp. 105-110; 9th ed., 1950, p. 124.

Because of deeper drilling in southern Louisiana and the greater problems of offshore drilling, the average cost of drilling per foot (\$17.88) was the third highest in the Nation. The figures below show drilling costs in Louisiana in 1953:4

Number of wells drilled	2, 828
Total cost	\$342, 026, 000
Average cost per well	\$120, 900
Total footage	19, 252, 000
Average cost per foot	<b>\$17.88</b>
Average depth per well	6, 800

The average cost per foot for offshore drilling was \$31.29, compared with the United States average of \$12.43. About one-third of the successful oil and gas exploratory wells were drilled in offshore areas.

Seventy-seven new oilfield and gasfield discoveries resulted from exploratory activity. A total of 712 exploratory wells were drilled in 1955, which resulted in 104 oil producers, 74 gas producers, and 534 dry holes.

<sup>4</sup> American Petroleum Institute, Petroleum Facts and Figures; 12th ed., 1956, p. 134.

TABLE 7.—Oil and gas well drilling in 1955, by parishes 1

	Prove	d field	wells	Explo	ratory	wells		Total	
Parish	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry
Acadia	16	29	27	3 2		10	19 32	29	37
Allen	- 30	4	6	2	2 1	8 9	32	6 2	37 14 10
AscensionAssumption	16	1 1	1 4	2	4	8	18	5	12
Assumption	1		î			8 3 8 10	. 1		4 17
Beauregard	36	2 2	9	2 1	2	8	38	4	17
Bienville	95	2 8	8		1	10 9	99	3 8	18 32
Bossier	1, 014	36	8 23 84	4 5	3	16	1, 019	39	100
Daddo	68	4	19			8	68	4	27
DalcasieuDaldwell						8			27 8 35 26 24 81
Cameron	36 10	14	26 10	1	3	9 16	36 11	17	35
Catahoula Claiborne	31	6	14	6	3	10	37	9	24
Joncordia	41		41	Š		40	46		. 81
De Clota	16	20	36	5 2 1	4	12	18	24	48
East Baton Rouge East Carroll	5			1		5 1	6		1
East Feliciana						1			1
Evangeline	5		3			4	5		1
Franklin	17	3	19	1		2	18	3	2
Grant	8 30		8		<u>1</u>	3	8 31	7	12 28 21
[beria   berville	26	6	8 22 8	1 3	2	13	29	6	21
Jackson	l					1 16			1
Tofforgon	19	4	7	2	2	16	21	6	23
efferson Davis	3	18	16	1		9	4	18 4	2
Lafayette Lafourche	117	28	3 27 17	1 7	7	32	5 124	35	59
La Salle	32	28 1	17	li		18	33	1	3
Lincoln		6	5		1	1		7	
Madison		2	. 1		<b></b>	4 2		2	
Morehouse Natchitoches	5		3			10	5		13
Ouachita	ĭ	1 3	3 2 23	1		4	2	1 7	- (
Plaquemines	104	3	23	5	4	25	109	7	49
Pointe Coupee	i		1	1		6	1		'
Rapides Red River	2		3			3 2 5 4	2		
Richland	13	12	20			5	13	12	2
Sabine	11	2	7			4	11	2	1
St. BernardSt. Charles	1 8	4	1 3	1	3	1 7	9	7	10
St. Helena.	1				i	7 1 4	l		1
St. James	3			1	1	4	4	1	
St. John the Baptist					;-	3 9		10	١
St. Landry	29 31	9 8	23 25 19		1	10	29 31	10	3
St. MartinSt. Mary	43	14	19			16	43	14	1 2222 222 222 222 222 222 222 222 222
St. Tammany						1 7 23			
l'ensas	27 68	1	10 23	7	8	7	28 75	1 40	1 1
TerrebonneUnion	08	32 56	1	'	•	5	15	56	*
Vermilion	14	20	16	1	3	11	15	23	2
Webster	41	7	14			1	41	7	1
West Baton Rouge		15	3			6		15	
West Carroll Winn.	22	15	8			1 32	22	13	4
Gulf of Mexico:			1						Į.
Bay Marchand	19	1	1	2		4	21	1	١.
Belle Isle	1	1				3	1	1	
Breton SoundChandeleur Sound	1		2			0	1		
East Cameron		1			4	6		5	
Eugene Island	18	3	9	7 4	4		25	4	
Grand Isle	8	3	3	4	i	1	12	3	ļ
Main PassRabbit Island	31	2 2	5	1	1 1	l .	32	5 4 3 3 2	
Ship Shoal	4	1	4	6	1	7	10	i	1
South Pass	117	1	5	4	1	6	121	2	1 1
South Pelto	1		5 1	2 3			3		
South Timbalier	1	4	1	3	1 5	1 3	3 1	1 9	l
West Cameron West Delta	11	1 1	7	6	4	3	17	5	1
Total Gulf of Mexico	212	19	42	35	17	35	247	5 36	7
Total: 1955	2, 317	406	692	104	74	534	2, 421	480	1. 22
1954	2, 292	363	480	81	96	470	2, 373	459	95

<sup>&</sup>lt;sup>1</sup> National Oil Scouts & Landmen's Association, Oil- and Gas-Field Development in United States: Austin, Tex., vol. 26, 1956.

TABLE 8.—New oil and gas discoveries, 1955, by parish 1

Parish	Field	Sec- tion	Town- ship	Range	Date of dis- covery	Produ
	NORTH LO	UISIAN	IA.			<u></u>
				T	T	Ī
Bienville	Topy Creek	25	14 N. 23 N.	8 W. 13 W.	Aug. 6, 1955 Feb. 15, 1955	Oil.
Bossier	Arkana Harrisonburg	2	9 N.	7 E.	Cont 00 1055	Do.
Datahoula	Darlow	32	10 N	7 W.	Sept. 29, 1955	Do.
DoDoDoncordia	Darley Mount Sinai West Lisbon	5	19 N. 22 N. 21 N.	7 W. 5 W. 5 W.	Oct. 11, 1955 May 18, 1955 Sept. 7, 1955 Aug. 17, 1955	Oil.
Do	West Lishon	20	21 N	5 W	Sent 7 1055	Gas.
longordia	Bougere	20	4 N.	9 E.	A 110 17 1055	Oil.
Do	Braheton	25	4 N.	8 E.	Tune 10 1055	Do.
Do Do	Brabston Quinn Bayou East Trenton	16	5 N.	8 E. 13 W. 7 E.	June 19, 1955 Sept. 29, 1955	Do.
e Soto	East Trenton	ĭ	11 N.	13 W.	20000	Gas.
ranklin	wisner	3	11 N. 11 N.	7 E.	Dec. 3, 1955	Oil.
e Soto ranklin a Salle	French Fork	10	6 N.	4 E. 4 W.	Aug. 25, 1955	Do.
incoln	West Simsboro	19	18 N.	4 W.	Oct. 24, 1955	Gas.
uachita tichland	Codeville	19	17 N.	2 E.	Jinly 20 1955	Oil.
cichland	Rayville	5	17 N.	7 E.	June 6, 1955 Sept. 11, 1955 Dec. 28, 1954	Gas.
ensasVest Carroll	Newlight	9	13 N.	10 E.	Sept. 11, 1955	Qil.
Vest Carroll	Rayville Newlight South Epps	15	19 N.	10 E.	Dec. 28, 1954	Gas.
	SOUTH LO	UISIAN	A			
cadia	Bayou Wikoff	15	9 S.	1 E.	Sept. 26, 1955	Oil.
Do		13	8 S.	1 1 W.	May 18, 1955	Do.
Do	Grand Coulee South Boseo Bunchy Creek Harmony Church Le Blanc Oakley Cowards Gully Dry Creek Merryville West Jugatte	9	98.	3 E. 6 W. 5 W. 6 W.	Mar. 8, 1955	Gas.
llen	Bunchy Creek	22	6 S.	6 W.	Mar. 8, 1955 Dec. 21, 1955	Do.
Do	Harmony Church	32	58.	5 W.	OCt. 11. 1900	Oil.
Do	Le Blanc	11	6 S.	6 W.	Dec. 2, 1955 Mar. 9, 1955	Do.
Dossumption	Oakley	79	14 8.	14 E.	Mar. 9, 1955	Gas.
leauregard	Cowards Gully	9.	7 S.	11 W.	Oct. 10, 1955	Do.
Do	Dry Creek	24	6 S.	11 W.	Apr. 22, 1955	Do.
Do	Merryville	14	3 S.	12 W. 11 W.	Dec. 5, 1955	Oil.
_ Do	V 050 5 GGHIOG	16	5 S.	11 W.	Apr. 4, 1955 Dec. 28, 1955	Do.
ameron	Cheniere Perdue	36 Offshar	20 8.	12 E.	Dec. 28, 1955	Gas.
Do	East Cameron Block 4 East Cameron Block 17	Oushor	e		Aug. 31, 1955	Do.
Do Do	East Cameron Block 49	do_			Mar. 12, 1955	Do. Do.
Do	Go Around Bayou	32	14 8	4 W.	Sept. 5, 1955	Do.
Do	Second Revou	25	14 S. 14 S.	12 W.	Dec. 4, 1955 Sept. 13, 1955	Do.
Do	Second Bayou Second Lake West Cameron Block 40 Nesser	16	15 S.	5 W.	Oct. 1, 1955	Do.
Do	West Cameron Block 40	Offshor	Α		Mar. 20, 1955	Do.
East Baton Rouge	Nesser	48		2 E.	June 18, 1955	oil.
beria	Nesser Eugene Island Block 47	Offshor	e	, = =.	Mar. 15, 1955	Gas.
Do	Little Bayou Pigeon	11	12 S.	10 E.	Jan. 30, 1955	Oil.
Do	Loisel		12 S.	8 E.	Jan. 30, 1955 July 30, 1955	Gas.
efferson	Bayou Villars		15 S.	23 E.	I NAV 90 1055	Oil.
Do	Loisel	Offshor	e		Dec. 15, 1955	Do.
efferson Davis	Topsy	28 20	7 S.	7 W. 3 E.	June 26, 1955	Do.
afayette	Ridge		10 8.	3 E.	Oct. 29, 1955	Gas.
Afayetteafourche	Kings RidgeLake Enfermer	16	19 S.	23 E.	May 8, 1955	Oil.
Ďo	Lake Enfermer	34	19 8.	23 E.	Mar. 18, 1955	Gas.
D0	South Timbalier Block 54	Offshor	e	1 20 T	May 25, 1955 Sept. 9, 1955	Oil.
Plaquemines	Burrwood	3	25 S. 20 S.	30 E.	Sept. 9, 1955	Do.
Do	Fort Jackson	Officher	20 8.	1 30 E.	Apr. 4, 1955 Mar. 22, 1955 July 7, 1955	Gas.
Do	Main Pass Area Block 25 Main Pass Area Block 47	Oushor	e		Mar. 22, 1900	Oil.
Do Do	Courth Dogg Area Dlock 4/	do-			May 9, 1955	Do. Do.
D0	South Pass Area Diock 5	ao-	95 Q	20 F	May 9, 1955 Mar. 29, 1955	Do.
Do	South Page Rlook &	Offehor		1 90 12.	Jan. 20, 1955	Do.
Do	South Pass Block 0	QTOTO!	·		June 17, 1955	Gas.
Do	West Delta Block 55	do-			Sept. 14, 1955	Do.
Do	West Delta Block 56	do			May 11, 1955	Do.
Do	West Delta Block 58	do			May 11, 1955 Jan. 30, 1955	Do.
Do	West Delta Block 59	do			Aug. 6, 1955	Oil.
Do	West Delta Block 84	do			June 25, 1955	Do.
Point Counce	Ravenswood	11	58	8 E.	Apr. 28, 1955	Do.
Point Coupee st. Bernard	Breton Sound Block 1	Offshor	e		May 2, 1955	Gas.
t. Charles	Lake Des Allemands	27	13 S.	19 E.	May 2, 1955 Oct. 21, 1955	Oil.
t. Charles	Main Pass Area Block 47. South Pass Area Block 45. South Pass Area Block 5. South Pass Area Block 5. South Pass Block 30. West Delta Block 30. West Delta Block 55. West Delta Block 55. West Delta Block 58. West Delta Block 58. West Delta Block 58. Lower Delta Block 59. Lower Delta Block 54.  Ravenswood. Breton Sound Block 1. Lake Des Allemands. Lower Vacherie. Grand Cotean	23	13 S.	17 E.	Sept. 12, 1955	Gas.
4 Y 3	Grand Coteau	87	7 S.	4 E.	Aug. 3, 1955	Do.
t. Landry						
t. Landry t. Martin t. Mary			13 S.	11 E.	Apr. 3, 1955	Do.

See footnote at end of table.

TABLE 8.—New oil and gas discoveries, 1955, by parish 1—Continued

Parish	Field	Sec-	Town-	Range	Date of dis-	Product
	SOUTH LOUISIA					
Terrebonne	Mosquito Bay	Offshoredodo. Vermil	ion Bay.		Dec. 28, 1955 Dec. 20, 1955 Nov. 24, 1955 July 28, 1955 July 28, 1955 July 28, 1955 Nov. 17, 1955 Dec. 10, 1955 Feb. 10, 1955	Gas. Oil. Gas. Oil. Do. Do. Do. Cas. Do. Do. Do. Do.

<sup>&</sup>lt;sup>1</sup> Louisiana Department of Conservation, Annual Oil and Gas Report: 1955, pp. 8-9.

Parishes in which exploratory drilling for oil and gas was most extensive included Lafourche, Concordia, Terrebonne, Plaquemines, Winn, Caddo, and Jefferson. In the offshore area the largest number of wells were drilled in the Ship Shoal, West Delta, South Pass, and East Cameron areas. Inland, three or more new oilfields or gasfields were discovered in each of Claiborne and Concordia Parishes in North Louisiana; and in Acadia, Allen, Beauregard, Cameron, Plaquemines, Terrebonne, and Vermilion Parishes in South Louisiana. Three gasfields and 2 oilfields were discovered in the West Delta offshore area, and 3 new oilfields were discovered in the Ship Shoal area. In Winn Parish 32 dry holes were drilled without a discovery.

TABLE 9.—Crew-weeks spent in geophysical and core-drill oil and gas prospecting, by methods 1

	Met	hod		Me	ethod
Parish	Reflection seismo- graph	Gravity meter	Parish	Reflection seismo- graph	Gravity meter
South Louisiana:  Bienville  Bossier Caddo Caldwell Cataboula Claiborne Concordia De Soto East Carroll Franklin Jackson La Salle Madison Morehouse Natchitoches Ouachita Richland Sabine Tensas Union Webster West Carroll Winn  Total North Louisiana: Acadia Allen Ascension	19. 0 5. 0 113. 75 3. 0 19. 0 5. 5 16. 0 48. 25 20. 0 4. 5 6. 0 4. 0 172. 0 44. 0 172. 0 44. 0 3. 0 29. 0 578. 75	13. 0 5. 5 2. 0 4. 5 37. 0 1. 0 5. 0 20. 0	North Louisiana (Con.): Beauregard Calcasieu Cameron East Baton Rouge East Feliciana Evangeline Iberia Iberville Jefferson St. Landry St. James St. John the Baptist St. Landry St. Martin St. Mary Tangipahoa Terrebonne Vermillon West Baton Rouge West Feliciana	27 17 68 198 214 150 110 175 250 13 2 2227 50 13 36 45 187 101 265 14 329 346 17	3 1 7
AssumptionAvoyelles	9		Total	3, 994	34

See footnote at end of table.

TABLE 9.—Crew-weeks spent in geophysical and core-drill oil and gas prospecting, by methods 1—Continued

Parish	Reflection seismograph	Gravity meter	Seismograph	Resistivity survey	
Offshore area:					
Bay Marchand	. 5				
Breton Sound	. 40				
Chandeleur Sound					
East Cameron		22	16	1	
Eugene Island	170	33			
Grand Isle	- 18	4	16		
Main Pass		21			
Ship Shoal	178	74	12	1	
South Marsh	25.5	1	8		
South Pass		12	20		
South Pelto		16			
South Timbalier	38.5	18	16	1.	
Vermilion area	. 115	44			
West Cameron	. 148.5	19		100	
West Delta	. 29		4		
Total	1, 025, 5	264	92		

<sup>&</sup>lt;sup>1</sup> National Oil Scouts and Landmen's Association, Oil- and Gas-Field Development in United States and Canada Year Book 1956 (Review of 1955): Vol. 26, 1956, pp. 397, 407, 423, 436.

Exploration in terms of geophysical and core-drill prospecting was active during the year in Union and Claiborne Parishes in North Louisiana; Vermilion, Terrebonne, St. Mary, Acadia, Lafourche, and Cameron Parishes in South Louisiana; and in the Ship Shoal, Eugene Island, West Cameron, and Vermilion offshore areas.

South Louisiana established another deep-drilling record in 1955. The world's deepest hole (Richardson & Bass 1 L. L. & E.-Humble "L", 35–19S–27E, Plaquemines Parish) was drilled to a depth of 22,570 feet. The former record of 21,482 feet was held by California at Ohio Oil Co., 72–4 Kern County land, Paloma field, Kern County.<sup>5</sup>

The average number of drilling rigs used in the State for the past

5 years was as follows:

							Average number
Year			- "				of drilling rigs used
1951							225
1952							227
1953							246
1954							275
1955							373

A deterrent to extensive future exploration will be removed when mineral rights on the Continental Shelf are clarified by the Supreme Court.

The United States Department of the Interior reopened wildlife refuges that had been closed to oil and gas leasing since 1953. Frankfort Oil Co., Bartlesville, Okla., obtained the first lease on 13,140 acres in Lacassine Waterfowl Refuge in Cameron Parish. The greater part of the refuge was under development by 9 oil companies, which by the end of 1955 had brought in 9 producing wells. Steps had been taken previously to demonstrate that wells could be drilled without polluting the refuge.

Oil and Gas Journal, vol. 54, No. 39, Jan. 30, 1956, pp. 147-149.
 American Petroleum Institute: World Oil, Petroleum Facts and Figurse: 12th ed., 1956, pp. 124-129.
 Oil and Gas Journal, vol. 54, No. 32, Dec. 21, 1955, p. 69.

Pipelines.—The world's longest undersea pipeline was placed in operation in the offshore area of Louisiana during the year. The 48-mile system, owned by the Continental Oil Co., Magnolia Petroleum Co., and Newmont Oil Co., is superior to barge transportation because it can deliver oil to shore continuously regardless of unfavorable weather. This new line, connecting with several wells 25 miles offshore, is expected to deliver 60,000 barrels of oil per day and is reported to be the first of its size and complexity capable of carrying both petroleum and natural gas.<sup>8</sup>

TABLE 10.—Crude-petroleum and product pipeline mileage and capacity in Louisiana, 1952 and 1955

	Mileage		Capacity (thousand barrels)	
	1952	1955	1952	1955
Crude petroleum: GatheringTrunk	1, 998 2, 872	2, 128 2, 732	248 1, 908	342 2, 249
Total	4, 870 616	4, 860 799	2, 156 318	2, 591 538
Total	5, 486	5, 659	2, 474	3, 129

TABLE 11.—Miles of utility gas mains for Louisiana by type of main, 1954-55 1

					1954	1955
Field and gar Transmission	thering	 	 	 	 1, 880 8, 330	1, 960 8, 850 7, 010
Distribution		 	 	 	 6, 450	7,010
Total_		 	 	 	 16, 660	17,820

<sup>&</sup>lt;sup>1</sup> American Gas Association, Gas Facts: 1955, p. 56; 1956, p. 59.

The H. C. Price Co., Bartlesville, Okla., began constructing the American Louisiana Transmission pipeline, which was to extend from producing wells in Louisiana to consumers in the area of Detroit, Mich. A plea by the Panhandle Eastern Pipeline Co. for an injunction to prevent construction of this natural-gas line was rejected by the Supreme Court of the United States. The line was expected to cost approximately \$130 million.

Carbon Black.—Production of carbon black in the State increased 37 percent, compared with the 22-percent increase in the Nation as a whole. One of the eight plants that shut down, following the 1954 decline in production of carbon black, was in Louisiana.

The major factor that boosted sales was a sharp increase in the use of carbon black by the rubber industries, a result of greatly increased automobile production. The rubber industry usually consumes over 90 percent of carbon-black production. Louisiana produced 503 million pounds of carbon black of a national total of 1,744 million

Oil and Gas Journal, vol. 53, No. 45, Mar. 14, 1955, p. 118.

pounds and was the second-ranking State in the Nation. Virtually all carbon black in the State was manufactured by the furnace-black process, which utilizes natural gas and liquid hydrocarbons as raw materials. Furnace black largely had replaced contact black as a major type of black for industrial purposes. A second major development in this industry was substitution of liquid hydrocarbons for natural gas as the raw material. Thus, most of the increased production of carbon black in the State from 1951 to 1955 was from liquid hydrocarbons. The following table shows the trend in production:

Year							:	4.		F	roduction million pounds
1951 1952	 	 	 	 		 		 		 	. 259 . 256
1953	 	 	 	 	·	 		 	- <i></i>	 	. 250 . 377
1954 1955	 	 	 	 		 		 		 	. 368 . 503

Two more carbon-black units were ready to go on stream at the end of the year at Columbia Carbon Co. plant in St. Mary Parish. The total installation, estimated to cost \$3 million, will have a total

capacity of 6 million pounds of carbon black a year.

Natural Gas.—A notable development among the mineral industries of Louisiana was the large increase in natural-gas production. About 40 percent of the increase in value of production of all minerals during the year was due to the increased output of natural gas. Natural-gas production in the United States increased an average of 8 percent; in Louisiana the increase was 20 percent. The ranking parishes producing natural gas were: Terrebonne, Cameron, Vermilion, Acadia, and St. Mary.

Louisiana, the third largest consumer of natural gas in the Nation, exported to other States a net of 899 billion cubic feet of this fuel during 1955. Although one-third of the natural gas consumed in the State was for field use in producing oil and gas (drilling, pumping, etc.) and as a refinery fuel, the greatest quantity was used for other industrial purposes. These other industries were attracted to the State because of the large available supplies of cheap natural gas. The price of natural gas for industrial fuel (14.5 cents per thousand cubic feet) was nearly the lowest in the Nation. Plentiful reserves of available natural gas in Louisiana should continue to be a strong, attractive force for further industrialization in the State.

TABLE 12.—Marketed production of natural gas, 1946-50 (average) and 1951-55 1

Year	Million cubic feet	Value at wells	Cents per thousand cubic feet
1946-50 (average)	671, 451	\$28, 480, 600	4. 2
	1, 054, 199	61, 143, 000	5. 8
	1, 237, 143	82, 889, 000	6. 7
	1, 293, 644	106, 079, 000	8. 2
	1, 399, 222	124, 531, 000	8. 9
	1, 680, 032	189, 844, 000	11. 3

<sup>&</sup>lt;sup>1</sup> Comprises gas either sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas pipelines.

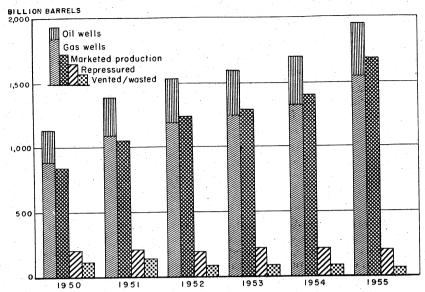


FIGURE 2.—Gross withdrawals and disposition of natural gas in Louisiana, 1950-55

TABLE 13.—Consumption of natural gas, 1955, by uses

Use	Volume	Percent of	A verage	A verage
	(million	total con-	Louisiana	United States
	cubic feet)	sumption	value <sup>1</sup>	value <sup>1</sup>
Residential	37, 862	4.9	62. 9	88. 7
	15, 660	2.0	34. 9	62. 7
	153, 311	19.8	8. 6	10. 1
	28, 674	3.7	7. 3	7. 9
plants) Refinery fuel All other	538, 813 98, 260 440, 553	12. 7 56. 9	14.5	25.7
Total	774, 320	100. 0		

<sup>1</sup> Cents per thousand cubic feet at point of consumption.

In December 1955 the Louisiana Department of Conservation placed natural gas on the same system of proration as petroleum. The order applied to all wells producing gas from "nonassociated" gas pools. Casing-head gas from oil wells and pools with special cycling and pressure-maintenance operations were exempted from the order. To obtain an equitable allocation for every landowner and producer concerned, allowables were to be determined by demand for gas from each pool, the capacity of the individual well to produce gas, and the productive acreage of each well. The order was reported to be one of the most comprehensive ever issued by any State to control natural-gas production. Before the proration order became effective, production was regulated by pipeline demand.

Oil and Gas Journal, vol. 54, No. 30, Nov. 28, 1955, p. 51.

The characteristic of natural gas that prevents ready storage after it is produced necessitates careful control of the relationship of market demand for gas to the capacity to produce. This capacity to produce has been growing steadily. For the 10-year period ended in 1955 the number of natural-gas wells in Louisiana increased from

2,000 to 3,600.

Natural-Gas Liquids.—The 12-percent increase in the quantity of natural-gas liquids produced during the year was due entirely to increased production of natural gasoline and cycle products. Production of liquefied petroleum gases declined during the year. With the exception of the LP-gases consumed by the chemical industry and for the production of synthetic rubber, most of the uses remained stable. During the year the use of LP-gases for synthetic rubber declined in Louisiana but increased for the Nation as a whole. The State chemical industry used about 25 million gallons more in 1955 than in 1954. In the United States the principal use of LP-gases is for domestic and commercial uses. In Louisiana the chemical industry consumed about 58 percent of the LP-gases, compared with the national figure of 23 percent. Ranking parishes yielding natural-gas liquids were: Caddo, St. Landry, Vermilion, Lincoln, and Webster.

TABLE 14.—Natural-gas liquids produced, 1946-50 (average) and 1951-55

Year		asoline and products	LP-	gases	To	otal
1946-50 (average)	Thousand gallons  531, 278 657, 006 672, 042 665, 532 665, 070	Value \$35, 954, 600 49, 202, 000 48, 579, 000 55, 421, 000 54, 330, 000	Thousand gallons  186, 004 287, 238 297, 444 287, 280 292, 226	\$8, 048, 600 15, 374, 000 14, 890, 000 12, 654, 000 11, 620, 000	Thousand gallons 717, 282 944, 244 969, 486 952, 812 957, 296	Value \$44, 003, 200 64, 576, 000 63, 469, 000 68, 075, 000 65, 950, 000

TABLE 15.—Sales of LP-gases, 1954-55, by uses

(Thousand gallons)

Uses	Bu	tane	Pro	pane	Mi	ture	т	otal
	1954	1955	1954	1955	1954	1955	1954	1955
Domestic. Gas manufacturing Industrial Synthetic rubber. Chemical plants Internal combustion All other	4, 955 77 464 33, 861 158, 968 64 2	3, 964 500 12, 677 10, 715 513	17, 017 5, 182 3, 809 5, 526 12	17, 504 5, 336 45, 934 5, 682 5	51, 890 103 5, 276 3, 345 19, 521 120	52, 145 110 5, 059 14, 233 131, 434 20, 313 69	73, 862 180 10, 922 37, 206 162, 777 25, 111 134	73, 613 110 10, 895 26, 910 188, 083 26, 508 74
Total	198, 391	28, 369	31, 546	74, 461	80, 255	223, 363	310, 192	326, 193

A "platforming" unit was placed in operation at the Southwest-Feazel gasoline plant at Dubach, by the Universal Oil Products Co. as part of a plant-expansion program begun in March. The program, estimated to cost \$750,000, was to increase the daily gas capacity of the plant to 190 million cubic feet.

Construction was begun on a natural-gasoline plant by the Gulf Natural Gas Corp. near Shreveport, to process gas from 2,200 wells in the Pine Island field, Caddo Parish. The plant, estimated to cost \$2,350,000, was reported to service more wells than any other plant

of this type in the United States.10

The Sunray Oil Co. awarded a contract to the Tuloma Builders, Inc., for a natural-gasoline plant with a capacity of 27 million cubic feet per day in Acadia Parish.

With the development of new reserves and the increased plant capacity for processing natural-gas liquids, production of natural-gas

liquids was expected to continue increasing.

Petroleum.—An alltime-record production of 271 million barrels of crude petroleum was established during the year, continuing the longtime trend for greater output of petroleum in Louisiana, temporarily interrupted in 1954. Although recovery each month, with one exception, was greater than in the previous year, the largest gains were made in the last quarter. This increased production reflected the greater demand for petroleum products in 1955. Plaquemines Parish ranked first in production, followed by Lafourche, Terrebonne, Iberia, and St. Mary. Refinery runs in Louisiana were up about 14 percent, and gains were particularly noticeable in the coastal area.

In 1955, 8,600 wells in the Gulf Coast area of the State averaged 78.2 barrels per day, compared with 12.7 barrels for the 10,200 wells in the northern part of the State. The number of producing wells increased 2,820 during the year—1,550 in the northern district and 1,270 in the Gulf Coast district. The capacity of the State to produce has been increasing at a rate greater than the ability of the market to absorb the products of Louisiana. With the extensive drilling program and increased reserves, the output of petroleum per well, adjusted to the estimated demand for Louisiana crude, has been declining steadily since 1951 to an average of 42.7 barrels per well per day.

TABLE 16.—Production of crude petroleum, 1946-50 (average) and 1951-55

	Thou-	Valu	10		Thou-	Valu	е -
Year	sand 42-gallon barrels	Total (thousand dollars)	Average per barrel	Year	sand 42-gallon barrels	Total (thousand dollars)	Average per barrel
1946–50 (average) 1951 1952	177, 009 232, 281 243, 929	415, 410 614, 680 645, 090	\$2. 35 2. 65 2. 64	1953 1954 1955	256, 632 246, 558 271, 010	721, 150 722, 370 793, 280	\$2.81 2.93 2.93

<sup>10</sup> Oil and Gas Journal, vol. 54, No. 20, Sept. 19, 1955, p. 94.

TABLE 17.—Indicated demand, production, and stocks of crude petroleum by months, 1954-55

(Thousand barrels)

		1954			1955	
Month	Indicated demand	Production	Stocks 1	Indicated demand	Production	Stocks 1
January February March April May June July August September October November	20, 388 22, 322 19, 708 21, 966 21, 133 20, 515 20, 649 19, 190	21, 671 19, 295 21, 721 21, 670 22, 325 21, 276 20, 532 19, 767 18, 643 19, 525 19, 421 20, 712	16, 035 14, 942 14, 341 16, 303 16, 662 16, 805 16, 822 15, 940 15, 393 14, 917 14, 974 15, 069	21, 534 20, 923 21, 469 21, 908 22, 126 22, 935 21, 840 23, 791 21, 425 24, 172 23, 018 24, 472	21, 909 20, 182 22, 626 22, 169 23, 121 21, 267 22, 474 22, 792 22, 677 23, 651 23, 516 24, 626	15, 444 14, 703 15, 860 16, 121 17, 116 15, 448 16, 082 15, 083 16, 332 15, 814 16, 312
Total	248, 967	246, 558		269, 613	271, 010	

<sup>1</sup> End of month.

TABLE 18.—Number of producing oil wells and average production per well, 1945-55

Year	Number of producing wells as of Dec. 31	A verage pro- duction per well per day (42-gallon barrels)	Year	Number of producing wells as of Dec. 31	A verage production per well per day (42-gallon barrels)
1945	7, 650 8, 060 8, 700 9, 770 10, 890 11, 860	47. 5 50. 1 52. 4 53. 7 50. 6 50. 4	1951 1952 1953 1954 1955	12, 490 13, 290 14, 220 15, 980 18, 800	52. 3 51. 7 49. 4 44. 6 42. 7

TABLE 19.—Production of crude petroleum in Louisiana, 1951-55, by districts and fields

(Thousand barrels)

District and field	1951	1952	1953	1954	1955 1
Aulf Coast: Anse la Butte Avery Island Barateria Bay de Chene Bay Marchand Bay St. Elaine Bayou Blue Bayou Uncetaw Bayou Mallett Bayou Sale Bully Camp Caillou Island	2, 442 3, 018 3, 294 1, 259 2, 428 2, 672 1, 122 393 1, 253 5, 139 867 6, 499 1, 136	2, 373 3, 090 2, 876 1, 288 2, 004 2, 733 1, 156 600 1, 604 5, 199 1, 250 7, 136 1, 176	2, 165 3, 111 2, 351 1, 302 1, 560 3, 194 1, 158 893 1, 796 4, 710 1, 640 8, 540 1, 278	1, 699 2, 724 1, 628 1, 208 2, 430 3, 130 1, 060 1, 171 1, 413 3, 589 1, 353 8, 398 1, 223	1, 719 3, 499 1, 358 1, 456 2, 933 3, 315 1, 293 1, 140 3, 090 1, 767 9, 017

See footnotes at end of table.

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TABLE 19.—Production of crude petroleum in Louisiana, 1951-55, by districts and fields—Continued

District and field	1951	1952	1953	1954	1955 1
df Coast—Continued					
Delta Farms	7, 190	6, 751	6, 480	5, 456	4, 8
Dog Lake	1, 320	1,276	1.530	1, 270	1, 07
Duck Lake	1, 123	2, 269	2, 935	3, 199	3, 32
East White Lake	1, 443	1, 427	1, 479	1, 179	1, 39
Egan	2,083	2,041	2,017	2, 117	2, 22
Erath	1, 178	1, 179	1, 370	1, 152	9€
Garden Island	1, 583	1, 590	1,590	1, 419	1, 34
Gibson	1, 460	1, 498	1,410	1, 140	1, 02
Golden Meadows	4, 864	4, 546	3, 918	3, 974	3, 78
Good Hope	2, 434	2, 288	2,045	1, 446	1, 20
Grand Bay	3, 853	3, 638	3, 768	3, 519	3, 40
Gueydan	2, 325	1,970	1, 570	1, 298	1, 0
Hackberry	3, 621	3, 780	4, 512	4, 215	4, 4,
Horseshoe Bayou	1, 346	1, 303	1, 394	1,097	8
Iowa	2, 282	2, 513	2,842	2, 701	2, 40
Jeanerette	1,067	1,084	1, 137	1, 228	1, 1
Lafitte	4, 489	4,467	4, 650	3, 686	3, 32
Lake Barre	233	417	599	1,056	1, 3
Lake Chicot.	1, 105	1, 104	1,072	1,021	1,0
Lake Fausse Point	317	468	576	823	1, 3
Lake Pelto	2, 173	2, 456	2, 697	2, 324	2, 4
Lake SalvadorLake Washington	2,086	1,843	1,831	1, 415	1, 3
	352	380 2, 417	951	1,947	4, 6
LeevilleLittle Lake	2, 205	192	3, 251	3, 556 1, 582	4, 0
Main Pass	2,057	2, 445	823 4, 287	4, 981	2, 1
North Crowley	1, 669	1, 390	1, 504	1, 273	6, 3 1, 2
Paradis	3, 626	3, 411	3, 445	3, 379	3, 1
Phoenix Lake	614	1, 507	1, 781	1,778	1, 5
Pine Prairie	1,048	984	955	864	1, 3
Point-a-La Hache	2, 464	2,746	2, 689	2, 451	2, 1
Port Barre	1, 438	1, 285	1, 327	1, 056	2, 1
Quarantine Bay	3, 960	3, 480	3, 151	2, 649	3, 1
Romre Pass	2, 315	3, 641	4, 570	4, 719	3, 9
St. Gabriel	1, 793	2,095	1, 778	1, 278	1,0
Section 28	1, 117	1, 343	1, 244	1, 335	1, 3
Tepstate	3, 321	2, 647	2, 149	1,722	1,6
Timbalier Bay	368	1, 731	2, 514	2, 289	3, 9
University	2, 203	1, 811	1, 534	1, 391	1,0
Valentine	651	902	1, 252	1, 379	1, 6
Venice	5, 742	5, 965	5, 728	5, 364	4,9
Ville Platte	1,462	1, 424	1, 333	1,402	1, 2
Vinton	3, 960	3, 786	3, 618	2, 712	2, 3
Weeks Island	8, 190	10,680	11, 258	9,029	8, 2
West Bay	2, 936	3, 123	3, 132	2, 525	2, 4
West Cote Blanche	2, 392	2, 830	2,865	2,380	2,0
West Lake Verrett	1, 782	1, 966	1, 757	1, 517	1, 3
White Castle	1, 672	1, 563	1, 343	941	7
Other Gulf Coast 2	47, 211	49, 780	56, 071	58, 048	77, 6
Total Gulf Coast	188, 768	200, 019	214, 130	204, 721	227, 4
rthern:					
Big Creek	1, 468	1, 432	1, 279	900	7
Caddo	4, 995	5, 111	5, 438	8, 251	9, 1
Delhi	6, 679	6, 436	5, 916	4, 880	5, 3
Haynesville	5, 480	5,008	4, 445	3, 694	3, 2
Lake St. John	5, 871	4,870	4, 015	3, 162	2, 7
Nebo 3	2, 302	2, 272	2, 268	2, 270	2, 1
Qlla 4	2, 294	2, 203	2, 106	1, 934	1, 7
Rodessa	1,043	934	868	784	7
Sligo	538	859	879	966	1, 0
Other Northern 2	12, 843	14, 785	15, 288	14, 996	16, 6
Total Northern	43, 513	43, 910	42, 502	41, 837	43, 6
Total Louisiana	232, 281	243, 929	256, 632	246, 558	271, 0

Preliminary figures.
 Includes crude oil consumed on leases and net change in stocks held on leases for entire district.
 Includes Hemphill, Trout Creek, and Jena.
 Includes Little Creek and Summerville.

About one-third of the oil wells producing during 1955 were flowing

wells; two-thirds produced with artificial lift.11

The world's deepest producing area was at Weeks Island field in Iberia Parish. Several wells in this field were producing in the Miocene formation below 17,500 feet. A well in the Coles Levee field of Kern County, Calif., previously producing at 17,892 feet, was the deepest producing well but was inactive during the year.

The crude-petroleum refining capacity of Louisiana at the end of 1955 was 704,650 barrels per calendar day, an increase of 61,150

barrels per day over the previous year.

The Nation's largest refinery, at Baton Rouge, was operated by Esso Standard Oil Co. Completion of the \$20-million modernization program of Cities Service Oil Co. at the Lake Charles refinery made the plant one of the most modern in the Nation. A new construction project approved for a rapid tax writeoff, included the 8,000-barrel-per-day thermal cracking unit of Shell Oil Co. at Norco.

In 1955 over one-third of the United States refinery runs to stills were made in the Gulf Coast area of Louisiana and Texas. In Louisiana runs to stills were 239,377,000 barrels, of which 237,983,000 was domestic crude and 1,394,000 imported crude. The output of refined products at Louisiana Gulf Coast refineries was as follows:

			Thous
lasoline			
erosine			20, 0
stillate fuel o	oil		59, (
t fuel		 	6, 7
ibricants		 	5,
ax		 	
ako			2. (
sphalt		 	5, 0
oad oil		 	
ill gas		 	9,
quefied gases		 	9, 8
liscellaneous		 	1, 1

TABLE 20.—Sales of petroleum products, 1951-55

(Thousand 42-gallon barrels)

Product	1951	1952	1953	1954	1955
Gasoline <sup>1</sup>	14, 303	15, 510	16, 742	17, 572	19, 961
Kerosine	1, 550	1, 572	1, 425	1, 348	1, 228
Range oil	1, 050	1, 051	664	675	648
Distillate fuel oil	5, 224	5, 840	6, 212	6, 242	7, 385
Residual fuel oil	10, 917	10, 407	9, 929	9, 710	10, 601

<sup>&</sup>lt;sup>1</sup> Gasoline consumption from American Petroleum Institute.

<sup>11</sup> American Petroleum Institute, World Oil, Petroleum Facts and Figures: 12th ed., 1956, p. 123.

TABLE 21.—Sales of distillate and residual fuel oils, 1954-55, by uses

(Thousand barrels)

Use	Distillate fuels		Residual fuels	
	1954	1955	1954	1955
To railroads. To vessels (including tankers). To gas and electric power plants. Industrial (excluding oil company use). Oil-company fuel. Light heating oils. Heavy heating oils. To military. Miscellaneous uses.	1, 125 1, 965 1, 965 1, 82 633 185 628	1, 223 2, 088 63 656 195 659 465 1, 959	76 7, 671 41 573 538 580 100 131	57 8, 592 32 647 470 571 140 92
Range oil No. 1	6, 242	7, 385	9, 710	10, 601

Petrochemicals.—One of the most dynamic forces in the developing economy of Louisiana was the rapidly expanding petrochemical industry. The Gulf Coast region of Texas and Louisiana was rapidly becoming one of the most important chemical-producing areas in the world. Petrochemicals constituted an estimated 25 percent of all chemicals manufactured in the United States in 1955, and 80 percent of the production was from the Texas-Louisiana Gulf Coast area. The two States produced 75 percent of the polyethylene manufactured in the Nation and 70 percent of the synthetic rubber. Substantial quantities of ammonia, chlorine, and soda ash also originated in the area. Forecasts indicated that by 1965 petrochemicals will constitute half of all the chemical output of the United States. Because of the position of the Gulf Coast region in regard to raw materials, its role in rapid expansion was expected to be a dominant one.

Among expansions in the petrochemical industry in the State in 1955 were the world's first full-scale nitroparaffin-producing facilities, placed in operation by Commercial Solvents Corp. at its Sterlington plant north of Monroe. The product of the plant, not previously available to industry in large quantities, was to be used by many industries—textile, surface coatings, petroleum, photographic, and chemical specialties. Other prospective industrial uses of the nitroparaffins were in plastics, cosmetics, and pharmaceuticals and in processing aluminum and light metals. Agriculture was expected to utilize nitro-

paraffin in the form of pesticides.

Firestone Tire & Rubber Co. expanded production of synthetic rubber at its Lake Charles plant 50 percent since the plant was

purchased in April 1955.

In October Shell Chemical Co. dedicated a multimillion dollar chemical plant at Norco. The first unit, scheduled to make allyl chloride and chlorohydrins, was part of a larger chemical facility. The next unit for production of hydrogen peroxide was scheduled for construction.<sup>13</sup>

At Lake Charles, Petroleum Chemicals, Inc., owned jointly by Continental Oil Co. and Cities Service Co., announced a \$4,350,000 expan-

 <sup>12</sup> Chemical and Engineering News, vol. 33, No. 28, July 11, 1955, p. 2886.
 13 Oil and Gas Journal, vol. 54, No. 32, Dec. 12, 1955.

sion program at its butadiene plant. The expansion program increased its annual capacity from 63,000 to 79,000 tons of butadiene.<sup>14</sup>

### **NONMETALS**

Barite.—Barite, for use as a weighting material for drilling muds in the extensive drilling program of the oil and gas industry, was ground from imported materials by the Magnet Cove Barium Corp. in Orleans Parish.

Cement.—Consumption of cement, as indicated by shipments, continued upward during the year. This rising demand for cement and other construction materials reflected the unfolding industrial complex of the Louisiana Gulf Coast area. The rate of increase in consumption of cement in the past 10 years in the State has been twice that of the United States. The expected economic growth in Louisiana indicates that construction activity in this area would increase rapidly for several years.

In preparing for the increased demand the two cement companies operating in New Orleans and Baton Rouge engaged in expansion

programs that were to extend over several years.

In March 1955 the Ideal Cement Co. began a \$3,750,000 expansion program, designed to raise annual plant capacity to 2,750,000 barrels of cement at the Baton Rouge plant—a 25-percent increase over the

previous capacity.

Included in the expansion program were increased capacities for the raw and finished mill departments, construction of kiln-feed tanks, 4 clinker-storage tanks, 2 storage silos for additives, a conveying system necessary for handling the materials to be processed, a new 10- by 250-foot kiln, and 15 new cement-storage silos. The plant, originally designed for bauxite sintering, was purchased in 1950 from RFC. Oystershell for the plant was supplied by a dredging operator, who delivered the material in barges at the company dock. Clay was obtained at the company pit on the river. The expansion program was scheduled to be completed in the spring of 1956.

FABLE 22.—Shipments of finished portland cement into Louisiana from mills

Year	Quantity (thousand barrels)	Change in Louisiana (percent)	Change in United States (percent)	Year	Quantity (thousand barrels)	Change in Louisiana (percent)	Change in United States (percent)
1946–50 (average)	3, 612	+12.5	+6.5	1953	5, 759	-1.9	+4.1
1951	5, 282	+16.0	+5.6	1954	6, 292	+9.3	+5.4
1952	5, 869	+11.1	+4.3	1955	7, 340	+16.7	+6.5

Late in the year Lone Star Cement Co. announced plans to build a cement plant with a capacity of 2 million barrels a year on a 350-acre site on the Calcasieu River ship channel, 5 miles southwest of Lake Charles, at an estimated cost of \$14 million. The plant was scheduled for completion in late 1956. Oystershell was to be delivered to the plant by barge and clay made available on or near the

 <sup>14</sup> Oil and Gas Journal, vol. 54, No. 32, Dec. 12, 1955, p. 67.
 15 Pit and Quarry, vol. 49, No. 2, August\_1956, pp. 70-71.

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plant site. This company was reported to be the pioneer user of oystershell as raw material for the production of quality portland cement. The Lone Star plant was to be equipped to ship cement both by rail and water to this rapidly growing section of the State.

Cement production was roughly 10-percent greater than in 1954. The price per barrel of cement shipped averaged somewhat higher

during the year, following the national price trend.

Clays.—Most clays produced in Louisiana were used for making structural brick and tile in 12 brickworks in 11 parishes. Although production statistics indicate a decline in the output of miscellaneous clay for making structural-clay products and expanded clay (light-weight aggregate), generally, most producers were increasing their output in line with rising trends in the construction-activity area. The decline in production was attributed to 1 or 2 producers who reorganized their operations. The five ranking parishes in clay production were: East Baton Rouge, Pointe Coupee, Orleans, St. Tammany, and Rapides.

Operations continued at the two expanded clay and shale light-weight-aggregate plants in the State. The plant at Erwinville near Baton Rouge was reorganized under the name of Big River Industry, Inc. In Lincoln Parish a major producer of industrial clays mined bentonite. Plans were announced for a new ceramic industry near

Bossier City for production of pottery from local clays.

TABLE 23.—Miscellaneous clay sold or used by producers, 1946–50 (average) and 1951-55  $^{1}$ 

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	243, 876	\$191, 267	1953	614, 427	\$901, 612
1951	306, 542	306, 542	1954	713, 940	940, 940
1952	390, 136	433, 808	1955	651, 268	659, 099

<sup>1</sup> Excludes bentonite.

Gypsum.—A new mineral industry to be located at Westwego was to use gypsum imported from Nova Scotia. The plant was to make sheet rock, gypsum wallboard, plaster base, and sheeting, and the output was expected to be 20 carloads daily. The plant was to employ 200 to 300 workers and provide an annual payroll of about \$1 million. The plant was to be part of a nationwide expansion program of the National Gypsum Co.<sup>17</sup>

The Anderson-Dunham Co. produced gypsum at its pit and mill near Winnfield in Winn Parish for use as a cement retarder and as an aggregate for roads and asphalt. A sizeable increase in production

occurred over the previous year.

Lime.—Mathieson Chemical Corp. produced lime from oystershell

for chemical uses at its plant in Calcasieu Parish.

Salt.—The virtually inexhaustible supplies of salt in Louisiana played an important part in meeting the needs of the State inorganic chemical plants. In the United States about 70 percent of the salt output is consumed as raw material by the major chemical companies.

Pit and Quarry, vol. 48, No. 4, October 1955, p. 727.
 Pit and Quarry, vol. 47, No. 12, June 1955, p. 16.

In Louisiana about three-fourths of the salt produced in 1955 was used in chemicals such as chlorine and soda ash, and in other chemical

materials.

Despite an increase in the production of salt from 3.1 million tons in 1954 to 3.6 million in 1955, the State dropped in rank from third to fourth place in the United States. Resourcewise, it is significant that an estimated 70 percent of the salt produced in Louisiana was consumed in the State by the chemical industries or by other innumerable industries that used salt as a raw material or as a processed material for curing fish, feeding livestock, etc. In value of output salt ranked fifth among the various mineral commodities produced in the State. Compared with 1954, the increase of salt production was 15 percent in Louisiana and an average of 10 percent in the United States. The leading parishes producing salt were: Iberia, Calcasieu, Iberville, Winn, and Cameron.

TABLE 24.—Salt sold or used by producers, 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	2, 066, 808	\$5, 939, 231	1953	3, 061, 234	\$9, 189, 526
1951	2, 737, 149	7, 662, 179	1954	3, 088, 686	11, 101, 456
1952	2, 553, 448	7, 807, 693	1955	3, 562, 636	15, 406, 993

TABLE 25.—Production of salt, 1954-55, by types

Type	1	1954		1955	
	Short tons	Value	Short tons	Value	
Evaporated salt	124, 558 989, 224 1, 974, 904	\$1, 831, 480 6, 307, 626 2, 962, 350	110, 218 1, 198, 299 2, 254, 119	\$1, 743, 445 7, 602, 698 6, 060, 850	

Sand and Gravel.—Of the nearly 3 million tons of sand produced during 1955, 32 percent was consumed within the State in mixing concrete, and the remaining 64 percent was used in paving roads. Of the nearly 5.5 million tons of gravel produced, 25 percent was used in concrete and 73 percent for paving.

The Ace Sand & Gravel Co. began operating a gravel pit near De Ridder with a daily production of approximately 800 yards of gravel. Approximately 12 men worked in the plant and 65 in the entire

operation.18

Most sand and gravel deposits in Louisiana lie north of an east-west line across the State from Baton Rouge. The largest production was in a group of parishes in the vicinity of and north and west of Baton Rouge. Other deposits were found in the counties surrounding Shreveport—a total of 51 sand and gravel operations in 20 parishes. The parishes leading in production were: Jefferson Davis, Webster, Tangipahoa, Ouachita, and Rapides.

<sup>18</sup> Pit and Quarry, vol. 48, No. 3, September 1955, p. 44.

TABLE 26.—Sand and gravel sold or used by producers, 1951-55

	Commercial		Governmen trac		Total			
Year		ons Value	Short tons			Value		
	Short tons			Value	Short tons	Total	Average per ton	
1951 1952 1953 1954 1955	6, 098, 898 5, 788, 098 4, 305, 597 7, 641, 229 8, 338, 015	\$7, 262, 749 6, 660, 994 5, 090, 598 9, 592, 566 10, 758, 658	285, 430 217, 021 232, 790 268, 923 236, 005	\$156, 821 75, 530 71, 650 94, 069 183, 202	6, 384, 328 6, 005, 119 4, 538, 387 7, 910, 152 8, 574, 020	\$7, 419, 570 6, 736, 524 5, 162, 248 9, 686, 635 10, 941, 860	\$1. 16 1. 12 1. 14 1. 22 1. 28	

Stone.—The paucity of available limestone in Louisiana for making aggregate, cement, and lime might have been a serious detriment to the present and future development of the State industrial economy were it not for the supplies of oystershell and clamshell readily available in the coastal waters. Although the Bureau of Mines has not compiled statistics on the production of oystershell over a period of time, it is evident from Louisiana records that growth has been rapid in utilization of these shells for many purposes. An estimated one-third of all shell produced in 1955 in Louisiana was used in the State cement and lime plants. Large quantities of shell also were used for concrete, aggregate, and road material, and an expanded road program would impose a greater demand for shell. The parishes leading in the production of stone were: Cameron, St. Mary, St. Tammany, Jefferson, and St. Charles.

Artificially colored roofing granules also were produced in New

Orleans from materials brought into the State.

Sulfur.—The most noteworthy development in the Louisiana sulfur industry in 1955 was the beginning of operations at the new mine of Freeport Sulphur Co., 50 miles west of New Orleans. The mine (known as the Chacahoula) opened March 10, 1955, at Thibodaux and is part of a \$25-million expansion program. This program involved 4 new mines with a combined annual capacity of 750,000 long tons. The new mine, in a swamp site, required considerable clearing and draining before facilities could be constructed. Other Frasch mines in Louisiana were: The Stark Dome in Calcasieu Parish, Grand Ecaille and Garden Island Bay in Plaquemines Parish, and Bay Ste. Elaine in Terrebonne Parish. The Boling Dome mine of Texas and Grand Ecaille were the largest individual mines in the country. In 1955 Grand Ecaille furnished a major portion of Louisiana sulfur. Plans were announced to develop a new salt-dome sulfur deposit, to be known as Lake Pelto, in the tideland. The deposit is near Bay Ste. Elaine about 60 miles southwest of New Orleans. Prospecting encouraged the decision to install mining facilities 6 to 8 feet under water. As this was the first company operation entirely under water, the project involved many new and difficult engineering and development problems. The coastal offshore discoveries during the year were estimated to have very large reserves of sulfur.

TABLE 27.—Sulfur produced and shipped from Frasch mines, 1946-50 (average) and 1951-55

			Shipments	
Year	Production (long tons)		Val	ue
		Long tons	Total	Average per ton
1946-50 (average)	1, 028, 608 1, 311, 293 1, 508, 550 1, 640, 571 2, 009, 553 2, 081, 261	1, 035, 051 1, 152, 821 1, 449, 668 1, 609, 364 1, 853, 563 2, 072, 418	\$18, 300, 148 25, 400, 000 32, 015, 000 43, 453, 000 49, 222, 394 58, 027, 704	\$17. 6 22. 0 22. 0 27. 0 26. 5 28. 0

A new method of shipping sulfur in the liquid state over long water routes by maintaining heat in insulated barges, was inaugurated by Freeport Sulphur Co. at Port Sulphur in 1955. Thus loss of dust is prevented, moisture is avoided, contamination is reduced, and the need for remelting at the point of delivery is eliminated. On May 4, 2 new insulated barges each carried a 2,500-ton cargo of melted sulfur at a temperature above the boiling point of water to newly developed docks of The National Lead Co. in St. Louis.

During 1955 the demand for sulfur in the form of a sulfuric acid was estimated to be larger because of growing consumption by the fertilizer (superphosphate and ammonium sulfate), chemicals, and

steel industries.

The four parishes leading in sulfur production were: Plaquemines. Lafourche, Calcasieu, and East Baton Rouge. Increased production of sulfur in Louisiana approximated the 5-percent increase of the Nation as a whole. Shipments, however, increased at a larger rate.

Vermiculite.—Vermiculite was exfoliated in New Orleans from

materials shipped into the State from other areas.

#### **METALS**

Aluminum.—The Kaiser Aluminum & Chemical Corp. plant at Chalmette, St. Bernard Parish, the largest in the Nation, produced about one-seventh of the primary aluminum metal of the Nation during the year. The State ranked third after Washington and Texas in production of aluminum. The Chalmette plant received alumina from the Kaiser plant at Baton Rouge, where Jamaica bauxite was processed. The Baton Rouge plant also supplied alumina to Kaiser plants at Tacoma and Mead, Wash.

Installation of a multi-million-dollar fume-control system was begun at the beginning of the year at the Chalmette plant and was expected to be completed within a year. Plans also were announced for constructing a cryolite-recovery plant and facilities for direct chill casting of billet at the reduction plant.

Late in 1955 the Kaiser Co. announced plans for constructing a \$60-million alumina plant on the Mississippi River near Gramercy, as part of a large expansion program. The new plant will be midway

between Baton Rouge and New Orleans and will have an initial annual capacity of 500,000 tons. Bauxite from the Caribbean area will be transported by ocean-going vessels up the Mississippi River

directly to the plant site.

Nickel and Cobalt.—Freeport Sulphur Co. completed a pilot plant near New Orleans late in 1955 to test a new process for producing nickel and cobalt from deposits at Moa Bay, Cuba. The plant, using a sulfuric-acid leaching process, began tests on a 10,000-ton shipment of ore. Upon successful completion of the pilot-plant program the company expected to build a commercial plant with an annual capacity of 30 million pounds of nickel and 3 million pounds of cobalt.<sup>19</sup>

## **REVIEW BY PARISHES 20**

Geographically, mineral production was fairly well divided among the parishes. Of the 64 parishes in the State, 60 produced 1 or more of the minerals recovered. Gaseous and liquid hydrocarbons were produced in 59 and other minerals in 36 parishes. In value of production Plaquemine, with \$215 million, was the ranking parish, followed by Lafourche, Terrebonne, Iberia, and St. Mary.

TABLE 28.—Value of mineral production in Louisiana, 1954-55, by parishes 12

Acadia					
Allen         2,593,447         4,937,427         90         Crude petroleum, natural gas.         Crude petroleum, natural gas.           Assumption         2,263,720         4,066,515         80         Do.         Do.           Beauregard         10,772,918         11,724,869         9         Crude petroleum, natural-gas linatural gas.           Bienville         3,650,667         4,188,064         15           Bossier         18,108,923         23,403,541         29           Caddo         42,779,245         46,138,322         8           Calcasieu         38,228,011         41,770,020         9           Caldwell         317,307         289,971         -9           Cameron         31,202,930         43,325,279         39           Catabolla         2,329,490         2,541,187         9           Claiborne         25,992,979         26,117,086         1           Claiborne         25,992,979         26,117,086         1           Concordia         14,911,321         14,827,095         -1           Concordia         14,911,321         14,824,050         15           Natural gas, crude petroleum, natural gas, sand and gravel.         Crude petroleum, natural gas, sand; natural gas, crude petroleum, natura	Parish	1954	1955		Minerals produced in 1955 in order of value
Allen         2,593,447         4,937,427         90         Icquids.         Crude petroleum, natural gas.         Do.           Assumption         2,263,720         4,066,515         80         Do.					
Allen         2, 593, 447         4, 937, 427         90         Crude petroleum, natural gas.           Assemption         2, 263, 720         4, 066, 515         80         Do.         Do.           Avoyelles         4, 328, 228         3, 521, 279         -19         Crude petroleum, natural gas.         Crude petroleum, natural gas.           Beauregard         10, 772, 918         11, 724, 869         9         Crude petroleum, natural gas, and and gravel.           Bienville         3, 650, 667         4, 188, 064         15         Natural gas, crude petroleum, natural gas, crude petroleum, natural gas, crude petroleum, natural gas, sand and gravel.           Caddo         42, 779, 245         46, 138, 322         8         Natural gas, crude petroleum, natural gas, sand and gravel.           Calcasieu         38, 228, 011         41, 770, 020         9         Crude petroleum, natural gas, salt, natural-gas, sulfur, clays.           Caldwell         317, 307         289, 971         -9         Natural gas, crude petroleum, natural gas, salt, natural-gas liquids, sulfur, clays.           Catahoula         2, 329, 490         2, 541, 187         9         Crude petroleum, natural gas, shell natural gas, crude petroleum, natural gas, shell natural gas, crude petroleum, natural gas, shell natural gas, shell natural gas, shell natural gas, crude petroleum, natural gas, shell natural gas, shell natural gas, crude petroleum, natural gas, crude petr	Acadia	\$37, 326, 551	\$42, 725, 285	14	
Ascension 622, 280 695, 274 12 Do. Assumption 2, 263, 720 4, 066, 515 80 Do. Crude petroleum, natural-gas lie natural gas.  Beauregard 10, 772, 918 11, 724, 869 9 Crude petroleum, natural-gas lie natural gas, and and gravel.  Bienville 3, 650, 667 4, 188, 064 15 Natural gas, crude petroleum, natural-gas lie natural gas, and and gravel.  Bossier 18, 108, 923 23, 403, 541 29 Natural gas, crude petroleum, natural-gas lie natural gas, crude petroleum, natural gas, sand and gravel.  Caddo 42, 779, 245 46, 138, 322 8 Crude petroleum, natural-gas lie natural gas, sand and gravel.  Calcasieu 38, 228, 011 41, 770, 020 9 Crude petroleum, natural-gas lie natural gas, sand and gravel.  Caldwell 317, 307 289, 971 9 Cameron 31, 202, 930 43, 325, 279 39 Crude petroleum, natural gas, salt, natural-gas liquids, sulfur, clays.  Natural gas, crude petroleum, natural gas, salt, natural-gas liquids, sulfur, clays.  Natural gas, crude petroleum, natural gas, salt, natural-gas liquids, sand and gravel.  Crude petroleum, natural-gas lie natural-gas, crude petroleum, natural-gas lie natural-gas, crude petroleum, natural-gas, salt, natural-gas, sand and gravel.  Crude petroleum, natural-gas, crude petroleum, natural-gas, salt, natural-gas lie natural-gas, crude petroleum, natural-gas, salt, natural-gas lie natural-gas, crude petroleum, natural-gas lie natural-gas, crude petroleum, natural-gas, salt, natural-gas lie natural-gas, crude petroleum, natural-gas lie natural-gas, salt, natural-gas, sand and gravel.  Crude petroleum, natural-gas, crude petroleum, natural-gas, salt, natural-gas, sa	A llen	2, 593, 447	4, 937, 427	90	
Assumption 2, 263, 720 4, 666, 515 80 To. Crude petroleum, natural-gas list natural gas, sand and gravel.  Beauregard 10, 772, 918 11, 724, 869 91 15 Natural gas, sand and gravel.  Bienville 3, 650, 667 4, 183, 064 15 Natural gas, sand and gravel.  Caddo 42, 779, 245 46, 138, 322 81		622, 280			
Avoyelles 4, 328, 228 3, 521, 279 —19 Crude petroleum, natural-gas linatural gas, and and gravel.  Bienville 3, 650, 667 4, 188, 064 15 Natural gas, crude petroleum, natural gas, and and gravel.  Bossier 18, 108, 923 23, 403, 541 29 Natural gas, crude petroleum, natural gas, crude petroleum, natural gas, crude petroleum, natural gas, crude petroleum, natural gas, sand and gravel.  Caddo 42, 779, 245 46, 138, 322 8 Crude petroleum, natural gas, sand and gravel.  Calcasieu 38, 228, 011 41, 770, 020 9 Calcasieu 317, 307 289, 971 9 Cameron 31, 202, 930 43, 325, 279 39 Crude petroleum, natural gas, salt, natural gas, crude petroleum, natural gas, salt, natural gas, crude petroleum, natural gas, shelt, natural gas, sand and gravel, clays.  Caldwell 317, 307 289, 971 9 Crude petroleum, natural gas, shelt, natural gas, crude petroleum, natural gas, shelt, natural gas, sand and gravel, clays.  Catahoula 2, 329, 490 2, 541, 187 9 Crude petroleum, natural gas, shelt, natural gas, shelt, natural gas, crude petroleum, natural gas, shelt, natural gas, shelt, natural gas, shelt, natural gas, crude petroleum, natural gas, shelt, natural gas, sand and gravel.  Corude petroleum, natural gas, crude petroleum, natural gas, shelt, natural gas, shelt, natural gas, shelt, natural gas, shelt, natural gas, shelt, natural gas, sand and gravel.  Corude petroleum, natural gas, shelt, natural gas, shel		2, 263, 720		80	Do.
Beauregard   10, 772, 918   11, 724, 869   9   Crude petroleum, natural-gas linatural gas, sand and gravel.	Avoyelles				Crude petroleum, natural-gas liquids natural gas.
Bienville	Beauregard	10, 772, 918	11, 724, 869	9	Crude petroleum, natural-gas liquids
18, 108, 923   23, 403, 541   29   Natural gas, crude petroleum, natural gas liquids, sand and gravel.	Bienville	3, 650, 667	4, 188, 064	15	Natural gas, crude petroleum, natural-gas
Caddo         42, 779, 245         46, 138, 322         8         Crude petroleum, natural-gas linatural gas, sand and gravel, clays.           Calcasieu         38, 228, 011         41, 770, 020         9         Crude petroleum, natural gas, sand and gravel, clays.           Caldwell         317, 307         289, 971         -9         Natural gas, crude petroleum.           Cameren         31, 202, 930         43, 325, 279         39         Crude petroleum, natural gas, shell           Catahoula         2, 329, 490         2, 541, 187         9         Crude petroleum, natural gas, shell           Claiborne         25, 992, 979         26, 117, 086         1         gas.           Concordia         14, 911, 321         14, 827, 095         -1         Iquids, sulfura, clays.           Cob Soto         3, 831, 385         4, 424, 050         15         15         Natural gas, crude petroleum, natural gas, shell           Crude petroleum, natural gas, natural gas, crude petroleum, natural gas, natural gas, natural gas, crude petroleum, natural gas, natu	Bossier	18, 108, 923	23, 403, 541	29	Natural gas, crude petroleum, natural-gas
Calcasieu       38, 228, 011       41, 770, 020       9       Crude petroleum, natural gas, salt, natural-gas liquids, sulfur, clays.         Caldwell       317, 307       289, 971       -9       Natural gas, crude petroleum.         Catahoula       2, 329, 490       2, 541, 187       9       Crude petroleum, natural gas, shell Crude petroleum, natural gas, satural gas, s	Caddo	42, 779, 245	46, 138, 322	8	Crude petroleum, natural-gas liquids
Caldwell       317, 307       289, 971       -9       Natural gas, crude petroleum.         Cameron       31, 202, 390       43, 325, 279       39       Crude petroleum, natural gas, shell         Catahoula       2, 329, 490       2, 541, 187       9       Crude petroleum, sand and gravel, natural gas.         Claiborne       25, 992, 979       26, 117, 086       1       Crude petroleum, natural gas, natural gas.         Concordia       14, 911, 321       14, 827, 095       -1       Orude petroleum, natural gas, natural gas, natural gas, natural gas, natural gas, natural gas, natural gas.         De Soto       3, 831, 385       4, 424, 050       15       Natural gas, crude petroleum.	Calcasieu	38, 228, 011	41, 770, 020	9	Crude petroleum, natural gas, salt, lime
Cameron       31, 202, 930       43, 325, 279       39       Crude petroleum, natural gas, shell Crude petroleum, sand and gravel, n         Claiborne       25, 992, 979       26, 117, 086       1       Crude petroleum, natural gas, natural	Caldwell	317, 307	289, 971	-9	Natural gas, crude petroleum.
Claiborne 25, 992, 979   26, 117, 086   1   Crude petroleum, natural gas, nat				39	Crude petroleum, natural gas, shell, salt
Claiborne			2, 541, 187		
Concordia       14, 911, 321       14, 827, 095       -1       Crude petroleum, nătural gas.         De Soto       3, 831, 385       4, 424, 050       15       Natural gas, crude petroleum.	Claiborne	25, 992, 979	26, 117, 086	1	Crude petroleum, natural gas, natural-gas
De Soto 3, 831, 385   4, 424, 050   15   Natural gas, crude petroleum.	Concordia	14 011 321	14 897 005	_1	
Do botto:	De Soto	3 831 385			
sand and gravel, sulfur, clays, mi	East Baton Rouge	12, 770, 931	12, 855, 612	1	Cement, crude petroleum, natural gas sand and gravel, sulfur, clays, miscella
	East Carroll	(3)	1 350		
East Carroll (3) 1,359 Natural gas.  East Feliciana (3) (3) Sand and gravel.		(3)	(3)		Sand and gravel
Evangeline 13, 722, 988 13, 286, 533 -3 Crude petroleum, natural gas, natural liquids, sand and gravel.		13, 722, 988	13, 286, 533	-3	Crude petroleum, natural gas, natural-ga
Franklin 1, 912, 773   2, 245, 409   17   Crude petroleum, natural gas.					Crude petroleum, natural gas.
Grant 273, 412 457, 354 67 Sand and gravel, crude petroleum, n	Grant	273, 412	457, 354	67	Sand and gravel, crude petroleum, natura

See footnotes at end of table.

Engineering and Mining Journal, vol. 157, No. 2, February 1956, p. 98.
 Data on number of producing wells and cumulative production estimated from Statistics of Oil and Gas Development and Production: Trans., AIME, vol. 10, 1956, pp. 204-256.

TABLE 28.—Value of mineral production in Louisiana, 1954-55, by parishes 12. Continued

Parish	s, sand natural- shell,
Therville	shell,
Therville	shell, nd and
Jackson         56, 869         71, 531         26         Natural gas.         Crude petroleum, natural gas, natural-gas liquids.           Jefferson Davis         16, 297, 514         23, 635, 089         45         Crude petroleum, natural gas, sar gravel, natural-gas liquids.         Crude petroleum, natural gas, sar gravel, natural-gas liquids.         Crude petroleum, natural gas, clays         Crude petroleum, natural gas, clays         Crude petroleum, natural gas, clays         Crude petroleum, natural gas, sar gravel.         Crude petroleum, natural gas, clays         Crude petroleum, natural gas, sar gravel.         Crude petroleum, natural gas, sar gravel.         Natural-gas liquids, natural gas, sar gravel.         Crude petroleum, natural gas,	nd and
16, 297, 514   23, 635, 089   45   Crude petroleum, natural gas, sar gravel, natural-gas liquids.   Crude petroleum, natural gas, clays   Crude petroleum, natural gas, sar gravel.   Natural-gas liquids, natural gas, sar gravel.   Natural-gas liquids, natural gas, petroleum, clays.   Crude petroleum, natural gas, petroleum, clays.   Crude petroleum, natural gas, petroleum, clays.   Crude petroleum, natural gas, petroleum, clays.   Crude petroleum, natural gas, clays   Crude petroleum, natural gas, crude petroleum, natural gas, crude petroleum, natural gas, crude petroleum, natural gas, crude petroleum, natural gas, crude petroleum, natural gas, crude petroleum, natural gas, crude petroleum, natural gas, crude petroleum, natural gas, crude petroleum, natural gas, crude petroleum, natural gas, crude petroleum, natural g	nd and
Lafayette	
Lafourche	)•
Lincoln	r. shell.
Livingston	id and
Livingston	crude
Natural gas, sand and gravel, crude leum.   Natural gas, sand and gravel, crude leum.   Crude petroleum, natural gas, clays	
Natchitoches	
Natural gas, clays   Crude petroleum, natural gas, clays	petro-
Ouachita         2,714,498         3, 129,725         15         crude petroleum, natural gas.         Natural gas, sand and gravel, natural gas, sand and gravel, natural gas, sand and gravel, natural gas, sand and gravel, natural gas, crude petroleum, sulfur, natural gas, clays         Crude petroleum, sulfur, natural gas, clays         Crude petroleum, sand and gravel, natural gas, clays         Crude petroleum, sand and gravel, natural gas, clays         Crude petroleum, sand and gravel, natural gas, clays         Crude petroleum, santural gas, clays         Crude petroleum, natural gas.         St. James         4, 899, 955         5, 030, 377         32, 909         To deptroleum, natural gas, crude petroleum.         Natural gas, crude petroleum.         Natural gas, crude petroleum.         Natural gas, crude petroleum.         Natural gas, crude petroleum.         Natural gas, crude petroleum.         Natural gas, crude petroleum.         Natural gas, crude petroleum.         Natural gas, crude petroleum.         Natural gas, crude petroleum.         Natural gas, crude petroleum.         Natural gas, crude petroleum.         Natural gas, crude petroleum.         Natural g	
Ouachita         2,714,498         3,129,725         15         Natural gas, sand and gravel, natural gas, clays.         Ilquids, crude petroleum, clays.         Crude petroleum, sulfur, natural gas, clays.         Crude petroleum, sulfur, natural gas, clays.         Crude petroleum, sulfur, natural gas, clays.         Crude petroleum, sulfur, natural gas, clays.         Crude petroleum, sulfur, natural gas, clays.         Crude petroleum, sulfur, natural gas, clays.         Crude petroleum, natural gas, clays.         Crude petroleum, natural gas, clays.         Crude petroleum, natural gas.         Natural gas.         Crude petroleum, natural gas.         Natural gas, clays.         Natural gas, clays.         Natural gas, crude petroleum.         Natural gas, crude petroleum.<	clays,
Red River	ıral-gas
Red River	s.
Red River	
Red River	aturai-
Sabine         316,039         386,505         22         Instrural gas.         Crude petroleum.           St. Bernard         124,320         202,906         63         Crude petroleum, natural gas.           St. Charles         24,429,741         23,923,298         -2         Crude petroleum, natural gas, natu liquids, shell.           St. James         4,899,955         5,030,377         3         Crude petroleum, natural gas.           St. John the Baptist         288,274         32,909         15         Natural gas, crude petroleum.	
Sabine	iquids,
St. Charles	
St. Charles	
St. James 4, 899, 955 5, 030, 377 3 Crude petroleum, natural gas. St. John the Baptist_ 288, 274 332, 909 15 Natural gas, crude petroleum.	ıral-gas
St. John the Baptist 288, 274 332, 909 15 Natural gas, crude petroleum.	
Ct T and 10000 000 1 00 410 141 1 70   Charles	
	iquids,
St. Martin 35, 372, 650 40, 039, 812 natural gas. Crude petroleum, natural gas, salt natural-gas liquids.	
St. Mary 46, 571, 126 56, 113, 795 20 Crude petroleum, natural gas, natu	ıral-gas
St. Mary 46, 571, 126 56, 113, 795 20 Crude petroleum, natural gas, na	, crude
Tangipanoa 597. 100   1. 303. 081   118   Sand and gravel, days.	
Tensas 6 Crude petroleum, natural gas.	_
Terrebonne 72, 142, 257 4 86, 461, 459 20 Crude petroleum, natural gas, natur	ıral-gas
Union	crude
Vermilion	ıral-gas
Washington 1, 100, 306   830, 805   -24   Sand and gravel, natural gas, crude	petro-
Webster 24, 512, 861 27, 894, 266 14 Crude petroleum, natural-gas 1 natural gas, sand and gravel.	iquids,
West Baton Rouge	
West Feliciana (8) Winn 1, 659, 370 2, 235, 447 35 Salt. gypsum, crude petroleum, 1	noture
gas.	TOPHIS
Undistributed 5, 539, 136 1, 749, 113	
Total 5	

<sup>1</sup> St. Helena and Vernon Parishes not listed because no production was reported.

\* 2 Value of crude petroleum, natural gas, and natural-gas liquids, by parishes, based on data from Louisiana Department of Conservation, Annual Oil and Gas Report, 1955.

\$ Figure withheld to avoid disclosing individual-company confidential data; value included with "Undistributed."

4 Sulfur value not included.

\$ Adjusted to avoid duplicating value of clays and stone.

Acadia.—Since discovery, through 1955, over 238 million barrels of petroleum and 850 billion cubic feet of natural gas have been recovered in Acadia Parish. At the end of 1955 about 383 oil wells and 210 gas and condensate wells were producing. From these wells 9.6 million barrels of crude petroleum and 109 billion cubic feet of natural gas were recovered in 1955. Compared with 1954, recovery of petroleum was 4 percent higher and natural gas 38 percent higher. At 2 natural-gasoline and cycle plants at Church Point and 1 at Egan, over \$2 million of natural-gas liquids was extracted from natural gas. The Canal Refining Co. plant at Church Point had a daily crude-oil capacity of 1,000 barrels and a daily cracking capacity of 750 barrels of gasoline.

Beauregard.—In order of value, crude petroleum, natural-gas liquids, natural gas, and sand and gravel were produced during the year. Two natural-gasoline and cycle plants recovered natural gasoline and liquefied petroleum products in Beauregard Parish—1 at Merryville, using the absorption process, and 1 at Longville, using the compression process. Compared with the value in 1954, the output at these plants was 11 percent lower. The 10 billion cubic feet of natural gas and 3.2 million barrels of crude petroleum recovered represented gains of 41 and 9 percent, respectively. Accumulated production of fuels in the parish at the end of 1955 was 44.6 million barrels of crude petroleum and 121 billion cubic feet of natural gas. This production was yielded by 97 flowing oil wells, 84 oil wells operated with artificial lift, and 18 gas and condensate wells.

Bossier.—The Bossier Parish Highway Department produced sand for public-highway construction during 1955. At Bossier City expanded perlite was manufactured by Southwestern Perlite, Inc. Natural gasoline and cycle products were processed at 2 plants at Haughton and 1 at Benton. The output declined 25 percent in value. Crude-petroleum recovery increased 36 percent to 3.2 million barrels. The output of 99 billion cubic feet of natural gas was 52 percent higher than in the previous year. An accumulated total of 41 million barrels of petroleum and 953 billion cubic feet of natural gas had been recovered by the end of 1955. On December 31, 381 oil wells and 197 gas and condensate wells were active. Calumet Refining Corp. operated a lube-asphalt refinery at Princeton that had a daily capacity

of 900 barrels of crude oil.

Caddo.—Building brick was manufactured by the Arklatex Face Brick Co. near Mooringsport from clays produced locally. In the vicinity of Shreveport the Meriwether Sand Co., Inc., operated a dredge for producing washed and screened sand and gravel, which was used in building and highway construction. The 10.8 million barrels of crude petroleum recovered in 1955 was about three-fourths of the total mineral value of the parish. This represented a 12-percent increase over 1954. The output of natural gasoline and cycle products from the 9 plants in the parish declined 8 percent from 1954 levels. Caddo Parish ranked first in the production of natural-gas liquids in Since discovery of oil in the parish, 321 million barrels of petroleum and 1,073 billion cubic feet of natural gas had been produced. Less than 1 percent of the active oil wells in the parish were flowing wells; 5,524 wells produced oil by artificial lift. At the end of the year, 173 natural-gas wells were producing. Natural-gas recovery of 28 billion cubic feet in 1955 represented a 52-percent increase.

Three refineries (at Hosston, Ida, and Superior) operated during the year with a combined daily capacity of 8,000 barrels of crude oil and a

daily cracking capacity of 2,680 barrels of gasoline.

Calcasieu.—Quicklime used for manufacturing alkalies was produced from oystershell by the Olin Mathieson Chemical Corp. rotary kilns at its plant near Lake Charles. Clay was mined from a pit at Lake Charles by Price Dunham Fenet Brick Co. for manufacturing heavy clay products. Frasch sulfur was produced by Freeport Sulphur Co. from wells in Starks Dome, 6 miles south of Starks. Sulfur also was recovered by the contact method by Cities Service Refining Co., both in the form of sludge sulfur from refining operations and from hydrogen sulfide in the liquid purification of gas. Salt brines for manufacturing chlorine were produced from wells in salt domes in the parish by Columbia-Southern Chemical Corp.

The value of natural gasoline and cycle products recovered at plants in Lake Charles and Iowa tripled that of 1954. Natural-gas recovery increased 36 percent, but the output of crude petroleum declined 4 percent. Since the first well was brought in, about 234 million barrels of petroleum and 346 billion cubic feet of natural gas had been recovered in Calcasieu Parish. At the end of the year 434 oil wells and 63 gas and condensate wells were in production. Half of the oil wells

producing in 1955 were flowing oil wells.

Cameron.—Natural gas from Cameron Parish in 1955 more than doubled that marketed the previous year for a total of 120 billion cubic feet. Recovery of crude petroleum was 15 percent higher. The accumulated production of petroleum by the end of 1955 was 175 million barrels; natural gas totaled 476 billion cubic feet. On December 31, 332 oil wells and 124 gas and condensate wells were producing. Two refineries at Lake Charles operated during the year, with a combined daily crude-petroleum capacity of 222,500 barrels and cracking capacity of 56,645 barrels of gasoline.

At Hackberry, Olin Mathieson Chemical Corp. produced salt from wells for making soda ash. Reef shell from coastal waters was re-

covered in the parish.

Claiborne.—Petroleum, natural gas, natural-gas liquids, and sand and gravel were produced in Claiborne Parish in 1955. The total value of the output of 5 natural-gasoline and cycle plants was \$2,750,000, a 24-percent decrease from 1954. The value of crude petroleum gained 2 percent, with an output of 5.7 million barrels; production of 55 billion cubic feet of natural gas represented a 14-percent increase. Cumulative production to the end of 1955 was 172 million barrels of petroleum and 506 billion cubic feet of natural gas. Only 64 of 654 producing oil wells at the end of the year were flowing wells. There were 154 active gas wells.

Concordia.—Nearly 4.9 million barrels of crude petroleum and 4 billion cubic feet of natural gas were obtained in 1955, and values were increased 14 and 29 percent, respectively. Cumulative recovery to the end of 1955 was 38 million barrels of petroleum and 40 billion cubic feet of natural gas. At the end of the year 189 oil wells and 1 gas well

were producing.

East Baton Rouge.—Clay for manufacturing brick was mined by the Acme Brick Co. at Baton Rouge. Ideal Cement Co. produced clay as a raw material for manufacturing cement at its Baton Rouge plant. Reef shell was used as the basic material for producing general-use, high-early-strength, and masonry cements at the Ideal Cement plant. Consolidated Chemical Industries, Inc., recovered sulfur as a byproduct in the liquid purification of gas by the Claus process at its Baton Rouge plant. Sand and gravel was produced by three operators near Baton Rouge for use in construction and paving.

By the end of 1955, 41 million barrels of petroleum and 76 billion cubic feet of natural gas had been recovered in the parish. During the year 1.9 million barrels of crude petroleum and 4 billion cubic feet of natural gas were obtained from 76 producing oil wells and 3 gas wells. The largest refinery in the State was operated at Baton Rouge

by Esso Standard Oil Co.

Evangeline.—In order of value, crude petroleum, natural gas, natural-gas liquids, and sand and gravel were produced in Evangeline Parish in 1955. The total value of mineral production declined 3 percent from the previous year. Recovery of natural-gas liquids at plants at Easton, Basile, Ville Platte, and Mamou was one-fifth lower than in 1954. The 2.6 million barrels of crude petroleum and 24 billion cubic feet of natural gas recovered during the year represented a decrease of 6 percent and an increase of 38 percent, respectively. Since petroleum has been produced in the parish, 74 million barrels of petroleum and 243 billion cubic feet of natural gas have been recovered. At the end of 1955 there were 154 producing oil wells and 75 producing gas wells.

Gifford-Hill Co., Inc., dredged sand and gravel for paving and road

construction at Turkey Creek.

Iberia.—In total value of mineral production, Iberia Parish ranked fourth in the State. Nearly half of the salt yielded in Louisiana came from three operations in this parish. Evaporated salt, rock salt, and pressed-salt blocks were produced at the underground mine and refinery operated by International Salt Co., Inc., near Avery Island. Evaporated salt was produced by the vacuum-pan method. Similar operations were conducted by the Morton Salt Co. at Weeks Island and by Jefferson Island Salt Co., Inc., at New Iberia. At Jefferson Island, Iberia Sand & Gravel Co. dredged sand for paving purposes.

Fifteen million barrels of crude petroleum and 42 billion cubic feet of natural gas were recovered in 1955. Cumulative totals to the end of that year were 151 million barrels of petroleum and 162 billion cubic feet of natural gas. At the end of the year the parish had 77 oil wells operating with artificial lift, 262 flowing oil wells, and 14

wells producing natural gas and condensate.

Iberville.—Solvay Process Division of Allied Chemical & Dye Corp. produced salt brines from wells near Plaquemine for use mainly in manufacturing soda ash. Amerada Petroleum Corp. obtained natural gasoline from natural gas at its plant at Plaquemine by the absorption process. Petroleum and natural-gas output in 1955 amounted to 5.7 million barrels and 15 billion cubic feet, respectively; total output to the end of 1955 were 78 million barrels of petroleum and 102 billion cubic feet of natural gas. Twenty-four gas wells and 220 oil wells were producing at the end of the year.

Jefferson.—Crude petroleum, natural gas, shell, and natural-gas liquids were produced during 1955. Production of natural-gas liquids

at the plant at Lafitte declined 9 percent in value, compared with 1954. The 10.9 million barrels of crude petroleum was one-fifth greater, and natural-gas production gained sharply to a total of 20 billion cubic feet. At the end of the year 267 oil wells and 13 gas wells were producing. Cumulative recovery by the end of the year was 172 million barrels of petroleum and 238 billion cubic feet of natural gas. The Clark Oil & Refining Corp. operated a petroleum refinery at Marrero.

Jefferson Davis.—Gifford-Hill Co., Inc., and Witte Gravel Co., operating near Kinder, produced sand and gravel for road paving and construction. The value of the output of natural gasoline and other liquefied petroleum gases from 4 plants—1 at Jennings, 1 at Welsh, and 2 at Elton—was 45 percent higher than in 1954. The value of natural gas produced more than doubled that in the previous year, and the 4 million barrels of crude petroleum recovered was 13 percent higher. Cumulative recoveries to the end of 1955 were 103 million barrels of petroleum and 580 billion cubic feet of natural gas. At the end of the year 104 oil and 98 gas wells were producing in the parish. Evangeline Refining Co., Inc., operated a small skimming refinery at Jennings.

Lafourche.—Lafourche Parish was the leading producer of the principal minerals in the State—crude petroleum, natural gas, and sulfur. The total value of these minerals and shell was 17 percent higher than in 1954. At Thibodaux, Freeport Sulphur Co. began producing sulfur at its newly completed mine. Petroleum production, 10 percent higher, totaled 27.9 million barrels in 1955; the natural-gas yield was up 69 percent. At the end of the year cumulative petroleum production was 248 million barrels and natural-gas recovery, 608 billion cubic feet. On December 31, oil wells numbered

923 and gas wells, 69.

La Salle.—Near Jena, Quality Sand & Gravel Co. produced sand and gravel for paving and road construction. Petroleum recovery in 1955 was 5.8 million barrels; natural-gas yield, up 37 percent, totaled 3 billion cubic feet. Cumulative production in the parish was 110 million barrels of crude petroleum and 101 billion cubic feet of natural gas. At the end of the year 523 oil wells and 7 gas wells were

producing.

Lincoln.—Building and face brick were manufactured by Ruston Brick Works from clays produced at its pit near Ruston. Bentonite also was mined in the parish by a leading processor of industrial clays. Yields of natural-gas liquids at plants in Ruston, Hilly, and Dubach rose 12 percent in value during the year. The 64 billion cubic feet of natural gas produced during the year was 23 percent higher than in 1954. Cumulative production to the end of 1955 was 16 million barrels of petroleum and 733 billion cubic feet of natural gas.

Orleans.—Portland cements were produced at the New Orleans plant of Lone Star Cement Corp. to supply material for building and industrial construction to the largest metropolitan area in the State. Limestone was the raw material used as feed for the plant's four rotary kilns. Expanded perlite was manufactured by Alatex Construction Service, Inc., at its plant at New Orleans from crude perlite from Western States. Also at New Orleans, artificially colored roofing granules were produced by the Flintkote Co. Vermiculite was ex-

foliated by the Zonolite Co. at its Bergundy plant near New Orleans, using crude vermiculite imported from other States. Barite was crushed and ground by Magnet Cove Barium Corp. at its mill and grinding plant at New Orleans for well-drilling and other uses. Sand

was produced at Rigolets by The Jahncke Service Co., Inc.

Plaquemines.—In terms of value of mineral production, Plaquemines Parish was far ahead of the next most important parish. Petroleum production during the year, 51.8 million barrels, resulted in an accumulated total of 311 million barrels over the years. Most sulfur recovered in the State originated in the parish. This was one of the Nation's most important sulfur-producing areas from mines near Venice and Port Sulphur. Production of 77 billion cubic feet of natural gas gave the parish an alltime total of 377 billion cubic feet. Producing at the end of the year were 964 oil wells and 26 gas wells.

Rapides.—Sand and gravel for building, paving, and road construction was produced at Oden, Vortex, Paradise, Forest Hill, Valde Rouge, Kisatchie National Forest, and Ruston during 1955. Structural-clay products were manufactured from local clays at the Acme Brick Co. plant, Alexandria. Natural-gas liquids were recovered at Cheneyville in a plant using the absorption process. Nearly 575,000 barrels of crude petroleum and small quantities of natural gas also

were produced.

Richland.—Although in 1955 the value of natural-gas liquids from the plant at Delhi declined 22 percent, increases of 10 and 33 percent in petroleum and natural gas resulted in an overall gain of 8 percent in the value of the parish mineral production. With the recovery of 5.1 million barrels of petroleum and 5 billion cubic feet of natural gas, cumulative parish totals were 28 million barrels of crude petroleum and 478 billion cubic feet of natural gas at the end of 1955. Twelve gas wells and 119 oil wells were producing at the end of the year.

St. Charles.—Crude petroleum, natural gas, natural-gas liquids, and shells were produced in St. Charles Parish in 1955. The total value of this output was 2 percent less than that in the previous year. Although natural-gas production rose, declines in the value of the output of natural-gas liquids and petroleum resulted in the total decrease. By the end of 1955 a cumulative total of 105 million barrels of petroleum and 135 billion cubic feet of natural gas had been recovered. At the end of the year 205 oil wells and 9 gas wells were producing. Two refineries with straight-run and cracking stills were

operated at Norco and Destrehan.

St. Landry.—Although the value of crude petroleum and natural gas recovered increased 30 to 40 percent, the output of a larger number of natural-gasoline plants was largely responsible for the 78-percent increase in the total value of minerals produced. The natural-gas liquids were processed from natural gas at Eunice (2), Krotz Springs, and Opelousas (2). About 5.9 million barrels of petroleum and 49 billion cubic feet of natural gas were recovered in 1955. The cumulative total at the end of 1955 was 63 million barrels of petroleum and 315 billion cubic feet of natural gas. At the end of the year, 130 oil and 99 gas wells were producing.

St. Martin.—Salt, shell, crude petroleum, natural gas and natural-gas liquids were produced in St. Martin Parish in 1955. The Gordy Salt Co., Inc., produced evaporated salt for many chemical and industrial uses from wells and a mill at Breaux Bridge. Shell was

dredged from coastal waters in the parish for construction and industrial activities. Eighty-seven billion cubic feet of natural gas and 10.2 million barrels of petroleum were estimated to have been produced in the parish during 1955. Natural gasoline and cycle products were recovered from gas at a plant in Breaux Bridge. Cumulative totals at the end of 1955 were 86 million barrels of petroleum and 299 billion cubic feet of natural gas. Also at the end of the year 302 oil and 49 gas wells were producing. At Anse LaButte, Breaux Bridge Refining Co. processed petroleum products.

St. Mary.—În order of value, crude petroleum, natural gas, natural-gas liquids, and shells were produced in 1955. Over 14 million barrels of petroleum and 104 billion cubic feet of natural gas were produced from 419 oil and 41 gas wells. Cumulative production over the years was 153 million barrels of petroleum and 296 billion cubic feet of gas. Natural gasoline and cycle products were recovered from natural gas

at The California Co. natural-gasoline plant at Waterproof.

Terrebonne.—Large quantities of petroleum, natural gas, and natural-gas liquids were recovered in Terrebonne Parish during 1955. The total value of minerals produced was 20-percent higher than in 1954. Petroleum gained 9 percent, and natural-gas yields were up 56 percent. The 22 million barrels of petroleum produced in 1955 brought the parish cumulative total to 231 million barrels; the 171 billion cubic feet of natural gas recovered increased the cumulative total to the end of 1955 to 1,008 billion. In 1955 production and in the alltime total, Terrebonne Parish has been the leading producer of natural gas. At the end of the year 525 oil wells and 137 gas wells were producing.

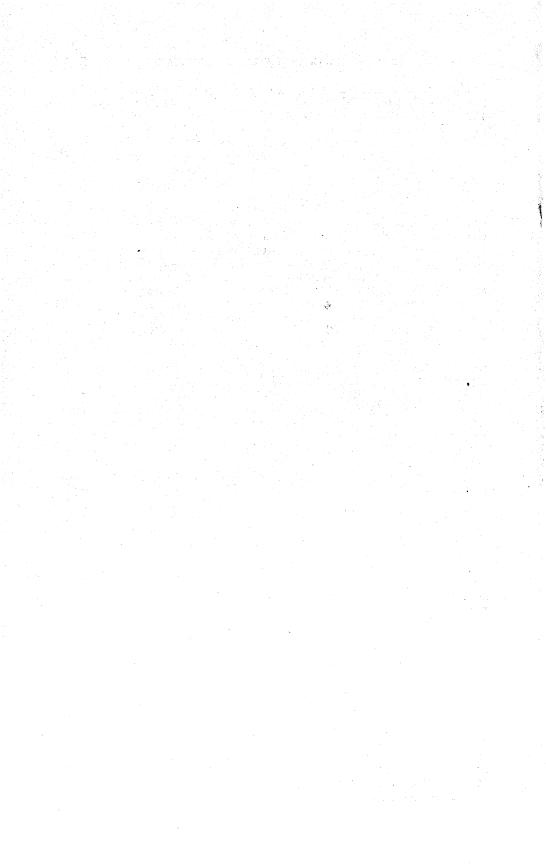
Sulfur was recovered from wells in the Bay Ste. Elaine dome

near Houma.

Vermilion.—By the end of 1955 cumulative production of mineral fuels in Vermilion Parish totaled 100 million barrels of petroleum and 440 billion cubic feet of natural gas. In 1955, 110 billion cubic feet of natural gas and 5.6 million barrels of crude petroleum were produced. On December 31, 149 oil and 100 gas wells were producing. The natural-gasoline plant at Erath had the largest capacity of any such plant in the State.

Webster.—About 1.6 million short tons of sand and gravel was produced in Webster Parish in 1955. Gifford-Hill Co., Inc., produced sand and gravel at a portable plant near Minden for building and paving purposes. Another portable plant belonging to the International Paper Co. recovered sand and gravel for paving near Springfield. Also at Minden, Braswell Sand & Gravel Co., Inc., and Minden Materials Co. produced sand and gravel for building and paving.

The value of natural-gas liquids produced at plants at Heflin, Cotton Valley, and Sarepta declined slightly during the year. Petroleum production gained 17 percent in value; natural gas gained 38 percent. A yearly total of 4.3 million barrels of petroleum and 52 billion cubic feet of natural gas was achieved. Cumulative production in the parish totaled 152 million barrels of petroleum and 745 billion cubic feet of natural gas. At the end of the year 345 oil wells and 149 gas wells were producing. At Cotton Valley, Cotton Valley Solvents, Inc., operated a skimming plant that had a daily crude capacity of 4,000 barrels.



# The Mineral Industry of Maine

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

By Robert W. Metcalf 1



HE VALUE of mineral production in Maine in 1955 was \$13 million, a 22-percent increase over 1954. Sizable increases in value of sand and gravel (13 percent) and stone (8 percent) were partly responsible for rise in total valuation, but the 27-percent increase in value of cement was the chief factor. Value of output increased for most commodities, including: Clay, feldspar, lime, peat, sheet mica, and slate. Only scrap mica and beryllium concentrate declined in value.

The combined output of cement, sand and gravel, and stone comprised 91 percent of the value of Maine's mineral industries. principal counties, in terms of value of products, were Knox, Hancock, and Cumberland. Knox County alone supplied 58 percent of the entire mineral value of the State.

TABLE 1.—Mineral production in Maine, 1954-55 1

	19	954	1955		
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	
Beryllium concentrate.  Cement:     Masonry	(*) 1, 973, 249 26, 872 (*)	(2) (3) \$5, 425, 184 26, 872 (2) (2)	83, 839 2, 264, 678 32, 598 26, 282 (*)	\$12, 672 304, 996 6, 570, 449 32, 598 188, 961 5, 000	
Scrap. Sheet	(3) 10, 320 7, 460, 620 1, 023, 709	36, 894 2, 538, 143 2, 355, 385	71 21, 121 7, 528, 903 1, 192, 361	1, 922 128, 721 2, 855, 585 2, 542, 228	
Total Maine 6		865, 077 10, 716, 000		857, 353 12, 991, 000	

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Figure withheld to avoid disclosing individual company confidential data.

<sup>3</sup> Included with portland cement.

Weight not recorded. Data not available for 1955.

<sup>6</sup> Total has been adjusted to eliminate duplication in the value of stone.

<sup>&</sup>lt;sup>1</sup> Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.

## REVIEW BY MINERAL COMMODITIES

#### METALS

Beryllium.—Of five companies in Maine, Beryllium Development, Inc., near Bethel and William Pechnik at North Norway were the principal producers of beryl. The entire production of this commodity in Oxford County was sold to the Franklin, N. H. Government Purchase Depot under the GSA beryl-purchase program.

Columbium-Tantalum.—Whitehall Co., Inc., at its Newry mine near Newry, recovered columbium-tantalum concentrate as a byproduct of feldspar and mica mining. This commodity was sold to

the GSA at Franklin, N. H.

Manganese.—The Federal Bureau of Mines continued investigating low-grade manganese deposits in Maine. A published report concerned results of surface trenching and diamond drilling in the Littleton Ridge area in southern Aroostook County.<sup>2</sup>

### **NONMETALS**

Cement.—Cement was Maine's chief mineral product in value, furnishing over half the total of the entire State mineral output. Dragon Cement Co., Inc., Thomaston, Knox County, the sole producer, ran a 2-million-barrel-per-year wet-process plant. Output comprised largely general-use and moderate-heat cements; sizable quantities of high-early-strength were burned. Masonry cement was included in the total cement figure in 1954 and earlier years but was reported separately in 1955, amounting to 83,839 376-pound barrels valued at \$304,996.

Clays.—Clay output in Maine in 1955 increased 21 percent compared with 1954. Production comprised entirely miscellaneous or so-called common or surface clay for use in manufacturing heavy clay products, mostly building brick. Clay was mined from 7 open-pit mines: 2 in Androscoggin County, 4 in Cumberland County, and 1 in Penobscot County. Cumberland County led in clay production. Androscoggin County ranked second; Penobscot County was third in quantity of output. Morin Brick Co., Androscoggin County, and Lachance Bros. Brick Co., Cumberland County, again were the chief producers.

TABLE 2.—Clays sold or used by producers, 1946-50 (average) and 1951-55

Year	Short	Va	lue		Short		Value		
	tons	tons Total A	Average per ton	Year	tons	Total	Average per ton		
1946-50 (average) 1951 1952	25, 347 21, 885 26, 050	\$21, 585 21, 885 26, 050	\$0.85 1.00 1.00	1953 1954 1955	29, 661 26, 872 32, 598	\$27, 476 26, 872 32, 598	\$0. 93 1. 00 1. 00		

<sup>&</sup>lt;sup>2</sup> Eilertson, N. A., Investigation of the Littleton Bidge Manganese Deposit and Vicinity, Southern District, Arostook County, Maine: Bureau of Mines Rept. of Investigations 5104, 1955, 39 pp.

Feldspar.—The output of crude feldspar rose substantially in 1955 compared with 1954 and totaled 26,282 long tons valued at \$188,961. The average value per ton, however, declined 2 percent to \$7.19. Active mines included 2 in Androscoggin County, 7 in Oxford, and 4 in Sagadahoc. The Bureau of Mines was unable to obtain direct reports from several other producers, known to be mining feldspar in Oxford and Sagadahoc Counties. Most of the mines produced potash feldspar. The largest producing mines in the State were the LaFlamme and Perham mines of Bell Minerals Co. in Androscoggin and Oxford Counties, respectively, and the Newry mine of Whitehall Co., Inc., in Oxford County. Most of the feldspar mined is ground in the three mills in Oxford and Sagadahoc Counties. In 1955, the Bell Minerals Co. plant at West Paris, Oxford County, processed both company-mined and purchased feldspar; Topsham Feldspar Co. at Topsham, company ore (taken from stockpile); and Consolidated Feldspar Division, International Minerals & Chemical Corp., also at Topsham, Sagadahoc County, purchased feldspar only. The manufacture of pottery, including tile, sanitary ware, and electrical porcelain, comprised the chief market for Maine ground feldspar, followed by soaps, abrasives, and miscellaneous uses.

Lime.—Output from Rockland-Rockport Lime Co., Inc., Rockland, Knox County, sole producer in Maine, consisted of quicklime for chemical uses and hydrated lime for agricultural purposes. Produc-

tion was somewhat larger than in 1954.

Lithium Mineral (Spodumene).—Spodumene, recovered at the Newry mine of Whitehall Co., Inc., Newry, Oxford County, was the only such material reported in Maine in 1955. It was sold to a

chemical concern.

Mica.—The quantity of sheet mica produced in Maine in 1955 more than doubled compared with 1954, and the value more than tripled. In comparisons of total sheet mica, hand-cobbed material has been converted to full-trim basis. Virtually the entire production was sold to the GSA at Franklin, N. H. Production of scrap mica increased in quantity but declined somewhat in value. Output from 18 companies at 19 mines, chiefly in Oxford and also in Sagadahoc Counties was sold as sheet and scrap mica. In addition, other producers not reported by county, sold punch, sheet, and scrap mica to GSA, including some mica mined in Maine and sold to the Spruce Pine, N. C., Government Purchase Depot. Several miners obtained mica from more than one mine, and several also from the same mine. The chief producers were Maine Mining Co. at Norway; Pechnik Bros., also near Norway; and Wheeler Bros. at Gilead. The first two produced both sheet and scrap mica.

Sand and Gravel.—Total value of sand and gravel production rose 13 percent compared with 1954. Tonnage increased slightly—about 1 percent. Output of commercial sand and gravel rose 15 percent, and was 30 percent greater in value than in 1954. Government-and-contractor production remained almost the same as in 1954—84 percent of the total. Over 95 percent was used for building and paving purposes. By far the largest producer was the Maine State Highway Commission, Augusta, which mined sand and gravel, either with its

own crews or under contract in every county in the State. The chief producing counties in Maine were Kennebec, Androscoggin, Penobscot, Cumberland, and Aroostook.

TABLE 3.—Sand and gravel sold or used by producers, 1954-55, by classes of operations and uses

	19	54	1955		
	Short tons	Value	Short tons	Value	
COMMERCIAL OPERATIONS					
Sand: Structural Paving	144, 766 71, 268	\$121, 261 48, 913	193, 093 (¹)	\$178, 663 (¹)	
Gravel: Structural Paving Railroad ballast	254, 380 415, 033	196, 032 287, 623	215, 153 489, 476 52, 485	200, 024 340, 763 24, 575	
OtherUndistributed <sup>2</sup>	62, 615 93, 097	15, 794 24, 671	113, 586 129, 753	72, 975 86, 476	
Total commercial sand and gravel	1, 041, 159	694, 294	1, 193, 546	903, 476	
GOVERNMENT-AND-CONTRACTOR OPERATIONS					
Sand: StructuralPaving	16, 200 238, 380	520 72, 609	270 367, 828	110, 26	
Gravel: Structural	4, 050 6, 160, 831	180 1, 770, 540	20, 148 5, 947, 111	1, 864 1, 839, 95	
Total Government-and-contractor sand and gravel.	6, 419, 461	1, 843, 849	6, 335, 357	1, 952, 10	
Grand total	7, 460, 620	2, 538, 143	7, 528, 903	2, 855, 58	

<sup>&</sup>lt;sup>1</sup> Included with "Undistributed." <sup>2</sup> Includes paying (1955), engine, filter (1954), other sand (1954), and railroad-ballast gravel (1954).

Slate.—Electrical slate and flagging slate were produced by Portland-Monson Slate Co. at its Monson mine and mill in Piscataquis County in 1955. Switchboard panels were one of this firm's chief

products.

Stone.—Stone quarrying continued to be the third-ranking mineral industry. Output increased 16 percent in tonnage and 8 percent in value, compared with 1954. Dimension and crushed granite, crushed limestone, and crushed sandstone were the principal types of stone produced. In 1955, 14 commercial quarries were active: 3 in sandstone, 3 in limestone, and 8 in granite. Seven granite quarries produced dimension stone; 1 also produced crushed or broken stone; and 1 quarried crushed or broken granite only. The crushed or broken sandstone and granite were used largely for riprap, concrete aggregate, and roadstone. The crushed or broken limestone was utilized in agriculture, in manufacturing lime and cement, and a small quantity for riprap. As in 1954, the principal counties in order of both tonnage and value were Hancock, Knox, and Cumberland.

## MINERAL FUELS

Peat.—Nearly double the 1954 quantity of peat moss was produced in Maine in 1955. The moss was obtained from bogs in Hancock and Washington Counties and was utilized locally for agricultural purposes.

## **REVIEW BY COUNTIES**

Androscoggin.—Mineral production in 1955 in Androscoggin County consisted of clay, feldspar, and sand and gravel. The county led in value of sand and gravel output, ranked second in value of clay and feldspar, and was fifth in value of total mineral production. Miscellaneous or common clay for manufacturing building brick was mined from open pits by Joseph F. Dennis & Sons and Morin Brick Co., both of Auburn. Bell Minerals Co. produced potash feldspar from its LaFlamme and Sturtevant open-pit mines near Center Minot. Buck & Baker, West Paris, subleased the latter mine and sold the product to Bell Minerals.

TABLE 4.—Value of mineral production in Maine, 1954-55, by counties

County	1954	1955	Minerals produced in 1955 in order of value
Androscoggin Aroostook Cumberland Franklin Hancock Kennebee Knox Lincoin Oxford  Penobscot Piscataquis Sagadahoc Somerset Waldo Washington York Total	17, 046 (1) 2, 069, 983 5, 980, 241 110, 678 229, 676 (1)	\$511, 612 294, 554 721, 554 (1) (1) 7, 568, 453 72, 903 384, 195 475, 192 (1) 91, 144 172, 457 (1) 2, 699, 320 12, 991, 000	Sand and gravel, feldspar, clays. Sand and gravel. Stone, sand and gravel, clays. Sand and gravel, clays. Sand and gravel, clays. Stone, sand and gravel, peat. Stone, sand and gravel, Cement, stone, lime, sand and gravel. Sand and gravel, mica, feldspar, beryllium concentrate, gem stones, columbium tantalum concentrate. Sand and gravel, stone, clays. Slate, sand and gravel, feldspar, mica. Sand and gravel, feldspar, mica. Sand and gravel, stone. Sand and gravel, stone. Sand and gravel, stone. Stone, sand and gravel, stone. Stone, sand and gravel.

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

<sup>2</sup> Includes gem stones and some mica for which no breakdown by counties is available and values indicated by footnote 1.

Sand and gravel was mined by 9 commercial producers and 6 municipal agencies. Uses for this output were principally for building and paving, traction (engine sand), and miscellaneous purposes. Commercial producers were W. E. Cloutier Co., Inc., Lewiston; R. F. Dobbins, Webster; Philip E. Dunn, Poland; Alice L. Knox, Livermore Falls; Kramartz & Dingley, Lisbon; Leeds Sand & Gravel Co., Winthrop (formerly W. H. Hinman, Inc.); Lewiston Crushed Stone Co., Inc., Lisbon; C. W. Meserve & Sons, Mechanic Falls; and G. A. Peterson Co., Auburn. The cities of Auburn and Lewiston and the towns of Lisbon, Mechanic Falls, Turner, and Webster produced sand and gravel for their own use. The Maine State Highway Commission also produced sand and gravel for use in road construction.

Aroostook.—Sand and gravel, the only mineral production reported, was used for building, paving, railroad ballast, and miscellaneous purposes. Operators were Bull Bros., Washburn; Lawrence Burleigh and Quint Bros., both of Houlton; and Bangor & Aroostook Railroad, Wallagrass. The Maine State Highway Commission also produced sand and gravel for roads and highway construction.

Cumberland. Cumberland County led in value of clay output, ranked third in value of mineral products, and was third in value of stone and sand and gravel. Blue Rock Quarry, Cumberland Mills, vielded quartzite for use as riprap, concrete aggregate, and roadstone. Cesare Trusiani crushed and marketed quartz, obtained from dumps in the area, for abrasive purposes. Sand and gravel for building and paving was mined from open pits by Cumberland Sand & Gravel Co., Cumberland Center; Hartley Gravel Co., Brunswick; Fred H. Jordan, South Portland; and Charles W. Qualey, Gray. Sand and gravel was mined by the State Highway Commission for its own use.

Common clays were mined for use in heavy clay products, largely building brick, by Joseph A. Blais, Jr., Portland; Lachance Bros. Brick Co., Gorham; Fred S. Liberty & Son, North Yarmouth; and Royal River Brick Co., Cumberland Center.

Franklin.—Sand and gravel and clay were produced in Franklin County in 1955. Commercial sand and gravel producers were E. N. Barry, Farmington; Omar Beisaw, Jay; and Thomas A. Skolfield, Weld. The Maine State Highway Commission also mined sand and gravel for road building. Farmington Brick Co. (formerly Farmington Brick Yards) produced miscellaneous clay for heavy clay products.

Hancock.—Deer Island Granite Corp. quarried dimension granite from its Deer Island site in 1955. The stone was utilized for architectural construction and monumental purposes. Grenci & Sons, Inc., at Hall quarry and Joseph Musetti, at Joe's quarry, produced granite for irregular-shaped dimension stone, curbing, and riprap. John L. Goss Corp., near Stonington, again was idle. Paving sand and gravel was produced by T. W. Carlisle from the Fiske pit near Blue Hill; Alvin R. Whitten, Winter Harbor; Messrs. Grindle and Hamar, of Lamoine and Bar Harbor, respectively; the town of Blue Hill; and the Maine State Highway Commission. A small tonnage of peat was produced by The Richland Peat Mines, Inc., near Penobscot.

Kennebec.—Stone and sand and gravel were produced in 1955 in Kennebec County. Sand and gravel for use in road construction and maintenance by the Maine State Highway Commission was reported for each county separately rather than as a State total as in recent years. This gives a more accurate distribution of the sand and gravel tonnage by counties in 1955 than in 1954. Producers of sand and gravel were Rundstrom Bros., Gardiner, and the Maine State Highway Commission. Crushed granite for concrete aggregate and roadstone was produced by H. E. Sargent, Inc., near Farmingdale, and by the city of Augusta. Miscellaneous stone produced by the State Highway Commission has been credited to this county although quarried for concrete and road metal at various locations in the State.

Knox.—The aggregate tonnage of Knox County, by far the leading mineral-producing county, was nearly 3 times greater and the value was 10 times higher than any other county. Cement, lime, sand and gravel, and stone were produced in 1955. The Dragon Cement Co., Inc., plant at Thomaston, sole producer in Maine, prepared both portland and masonry cement. This firm operated two 11 by 356foot kilns. During 1955, its clinker-storage building was enlarged, and a filter feed was installed on the second kiln. Finished-cement shipments were made mostly to Maine, Massachusetts, and New Hampshire. The cement company also quarried limestone at Thomaston. Rockland-Rockport Lime Co., Inc., produced limestone for riprap, agricultural uses, and making paper and lime. Limestone, used in manufacturing paper, was quarried by Knox Lime Co., Union. Rockland-Rockport Lime Co., Inc., also burned lime for chemical use (paper manufacture) and agricultural purposes. The Clark Island quarry of Hocking Granite Industries, Inc., produced granite for riprap, irregular-shaped stone for construction use, architectural and monumental stone, and curbing. The Maine State Highway Commission mined sand and gravel for road paving and maintenance.

Lincoln.—Sand and gravel recovered by the Maine State Highway Commission was used in maintaining and constructing State roads. Oxford.—The chief products were feldspar, beryl, and mica, all obtained from pegmatitic deposits. The columbium-tantalum concentrate and spodumene recovered also were derived from pegmatites. Bell Minerals Co. produced feldspar from four mines in Oxford County: The Perham mine near West Paris, and the Foster, Twitchell, and Tamminen mines, all near South Paris. R. C. Benson, West Paris, subleased the latter mine and sold the output to Bell Minerals. Pechnik Bros. Dunn mine at Norway, and Whitehall Co., Inc., Newry mine at Newry reported output of feldspar. In addition, feldspar, mined by a number of small producers, was sold to Bell Minerals Co., which ground both purchased and company-mined feldspar at its mill at West Paris. The ground product was marketed for abrasive manufacture but chiefly for ceramic use, including tile, sanitary ware, and electrical porcelain. Beryl was produced by Richard I. Baker from the Tiger Bill mine near Greenwood; the Scotty mine of Beryllium Development, Inc., near Bethel; Howard M. Irish at the Mount Mica mine near Paris; the Dunn mine of William Pechnik near North Norway; and the Newry mine of Whitehall Co., Inc., at Newry. latter company also recovered columbium-tantalum concentrate and spodumene at its Newry mine. Columbium-tantalum concentrate and the beryl mined in the county were sold to the GSA depot at Franklin, N. H.

Thirteen operators in Oxford County producing mica were: Lawrence Anderson, Beryllium Development, Inc., Elmer Daggett, W. Phillips Cole, Gerald Harrington & Elgen Tibbetts, Harry E. Leach, Maine Mining Co., Sabon P. Milligan, Donald M. Rich, Pechnik Bros., Sparks & Buchanan, Roger W. Wheeler, and Wheeler Bros. The mines were mostly in or near the following places: Albany, Bethel, Gilead, Newry, Norway, and Stoneham. Beryllium Development, Inc., Elmer Daggett, Maine Mining Co., Pechnik Bros., and Sparks & Buchanan produced scrap mica. Hand-cobbed mica and half- and full-trimmed sheet were produced. One operator recovered only scrap; four miners of hand-cobbed and sheet mica also produced some scrap. Commercial producers of sand and gravel for building and paving were: Homer A. Roberts, Mexico; Cloyd Swett, Ridlonville; and Donald E. Wood, Norway. The Maine State Highway Commission mined sand and gravel for its own use in road construction.

Penobscot.—The mineral output of Penobscot County consisted of sand and gravel, stone, and clay. Producers of sand and gravel used for building and paving purposes were: D. T. Curran, Bangor;

Foley & Clements, Veazie; G. E. Goding & Son, Lincoln; Owen R. Folsom, Stillwater; C. M. Page Co., Inc., Orono; Allen Rooks, Bangor; Benjamin J. Striar Estate, Orrington; the city of Brewer; and the Maine State Highway Commission. Bridge Construction Corp., at its Read quarry near Orono, mined and crushed quartzite for sale as concrete aggregate and road material. Brooks Brick Co., Brewer, produced miscellaneous clay for making building brick.

Piscataquis.—Slate was the chief mineral product of Piscataquis County in 1955. Only Portland-Monson Slate Co. at Monson, produced this commodity at an underground mine and marketed its output as electrical slate and flagging. The Maine State Highway Commission produced sand and gravel for road maintenance and

construction.

Sagadahoo.—Feldspar, mica, and sand and gravel were mined in Sagadahoc County. The principal producers were Consolidated Feldspar Division, International Minerals & Chemical Corp., Topsham and Mount Ararat mines; Frank DiBiasio and David Ponziani, each of whom worked the Purington mine during the year; Ray C. Leavitt, Diamond Match mine; and Joseph Paulin, McIver mine. Consolidated Feldspar Division, International Minerals & Chemical Corp. ground purchased feldspar at its mill at Topsham. Topsham Feldspar Co., Topsham, produced and ground feldspar for sale as poultry and pet grits and for soaps and abrasives.

Earl Williams of Brunswick sold a small quantity of full-trimmed sheet mica from two mines near Topsham to the GSA at Franklin, Producers of sand and gravel in Sagadahoc County in 1955 were: Guy Allen, Phippsburg; Almon R. Mitchell, Sr., Bath; Mrs. Helen G. Morton, formerly G. H. Morton, Brunswick; and the Maine State Highway Commission. Output was used for building and

paving purposes.

Somerset.—Sand and gravel was the only mineral commodity produced in Somerset County and came from the Donald J. Gurney pit and plant at Smithfield, a pit at Fairfield, and the Maine State Highway Commission. Uses included building and paving purposes.

Waldo.—Sand and gravel for paving, railroad ballast, and miscellaneous uses was produced by A. P. Wyman, Inc., the Bangor & Aroostook Railroad, and the Maine State Highway Commission. Grenci & Ellis, Inc., produced architectural granite from the Mount Waldo quarry. Material from this quarry was used in the Socony-Vacuum

Building, New York, N. Y., and other structures.

Washington.—Peat, sand and gravel, and stone were produced in Washington County in 1955. Maine Peat Moss, Inc., and Daniel McGraw produced peat moss from bogs near Jonesport and Centerville, respectively. Sand and gravel for paving, railroad ballast, and miscellaneous purposes was produced by D. T. Moffett, Whitneyville; the Maine Central Railroad; and the Maine State Highway Com-Grenci & Sons, Inc., reopened its Jonesboro quarry, producing dressed architectural stone. This stone was utilized in the exterior walls of the Worcester Telegram and Gazette Building, Worcester, Mass., and in exterior construction of other buildings.

York.—Pink granite for riprap, irregular-shaped construction stone, rubble, and architectural stone was quarried by John Swenson Granite Co. at its High Pine operation near North Berwick. Concrete aggregate and roadstone also was prepared. The architectural stone was placed in exterior construction of buildings in Baltimore, Md., Detroit, Mich., and other locations. Sand and gravel was mined for use on State roads by the Maine State Highway Commission.



# The Mineral Industry of Maryland

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, Department of the Interior, and the Maryland Department of Geology, Mines and Water Resources.

By James R. Kerr 1 and Jean A. Pendleton 2



THE VALUE of mineral production in Maryland in 1955 increased 15 percent, compared with 1954. Increased output of fuels played a part in the upswing of State value, as value of coal and natural gas produced increased 7 and 122 percent, respectively. Other commodities showing increased value of production were clays (9 percent) and stone (21 percent). Also accounting in part for the increase in total State value was the fact that 1955 marked the first year in the collection of data on oystershell production, and new collection procedures initiated in the cement canvass brought wider coverage than formerly. Although output of lime increased 11 percent, value of output decreased 2 percent owing to a drop in unit price. Production of slate ceased in 1955, as the one slate producer, Central Commercial Co., reported discontinuing operations and dismantling its plant. Value of output of sand and gravel increased only slightly over 1954.

Mineral production was reported in 22 counties in 1955. Major producing counties, in order of decreasing value of output, were Baltimore, Washington, Prince Georges, Carroll, and Frederick.

TABLE 1.—Mineral production in Maryland, 1954-55 1

	19	954	1955		
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	
Clays. Coal. Lime (open-market). Natural gas. Sand and gravel. Stone. Value of items that cannot be disclosed: Beryllium (1954), portland cement, masonry cement (1955), greensand marl, mica (1954), potassium salts, slate, stone (oystershell 1955),	627, 311 421, 616 67, 081 1, 394 10, 097, 800 5, 064, 526	\$1, 165, 747 1, 879, 018 685, 427 282, 000 12, 171, 613 8, 265, 521	698, 257 512, 469 74, 497 3, 116 9, 694, 928 2 5, 342, 968	\$1, 264, 948 2, 001, 743 669, 228 628, 000 12, 210, 658 2 8, 800, 044	
tale and soapstone		7, 288, 888		11, 027, 986	
Total Maryland 3		30, 743, 000		35, 491, 000	

<sup>&</sup>lt;sup>1</sup> Production as measured by mine shipments, sales or marketable production (including consumption by producers).

Excludes certain stone, included with items that cannot be disclosed.
 The total has been adjusted to eliminate duplication in the value of clays and stone.

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# REVIEW BY MINERAL COMMODITIES

#### **METALS**

Iron and Steel.—Bethlehem Steel Corp. continued to operate at Sparrows Point, the second largest iron and steel plant in the United States. This huge operation features 687 coke ovens, 9 blast-furnace stacks, 28 basic open-hearth furnaces, 3 Bessemer converters, and a wide variety of steel-fabricating equipment. Annual blast-furnace capacity was 4,272,000 tons; steel-furnace capacity was 6,040,000 tons. The bulk of the iron ore consumed at Sparrows Point was imported. The company also produced sinter for use primarily as blast-furnace feed.

**NONMETALS** 

Cement.—The production of portland cement in Maryland in 1955 was characterized by an increase in average price per barrel from \$2.42 to \$2.85. New collection procedures initiated during 1955, when data on masonry cement were collected for the first time, made comparisons between 1954 and 1955 production and value invalid. The two cement producers in 1955 were Lehigh Portland Cement Co., at Union Bridge, Carroll County, and the North American Cement Corp., at Hagerstown, Washington County. The raw material for these operations, except gypsum, was produced at company-owned

mines and quarries.

Clays.—Production of clays in Maryland in 1955 increased 11 percent, compared with 1954. The ball-clay and fire-clay industries showed large increases in production (32 and 41 percent, respectively), but the production of miscellaneous clay, which constituted the bulk of the State clay total, increased only 8 percent. Predominant fireclay uses were in the production of refractories, as 82 percent was used in manufacturing of firebrick and block and 15 percent was consumed at foundries and for steel work. The primary use for miscellaneous clay was in the manufacture of heavy clay products (85 percent), which included building and paving brick and drain tile. all, clays were produced from 21 pits in 11 counties in 1955, with Baltimore, Prince Georges, and Washington Counties leading in total output. Leading producers were Baltimore Brick Co. and Champion Brick Co., in Baltimore County; West Bros. Brick Co. and Washington Brick Co., in Prince Georges County; and Victor Cushwa & Sons, Inc., Washington County.

Gypsum.—The National Gypsum Co. calcined a large tonnage of imported gypsum at a plant in Baltimore. The bulk of the production was consumed in manufacturing plasters (40 percent) and lath

and wallboard (49 percent).

Iron Oxide Pigments.—The Mineral Pigments Corp. at Laurel processed crude red iron oxide material and copperas, producing a

wide variety of colors in iron oxide pigments.

Lime.—Although the production of lime in Maryland in 1955 increased 11 percent, compared with the preceding year, the value of production decreased 2 percent. This can be explained by the fact that agricultural lime, which constituted 91 percent of the total lime production in Maryland, dropped in value from \$10.15 per ton to \$8.83. Frederick County was the center of lime production again in 1955.

Production consisted of quicklime (76 percent) and hydrated lime (24 Major producers were S. W. Barrick & Sons, Inc., Le Gore Lime Co., and M. J. Grove Lime Co., all of Frederick County.

Marl, Greensand.—The Kaylorite Corp. at Dunkirk, Calvert County, produced refined greensand marl from an open pit for use as

soil conditioner.

Perlite.—The Atlantic Perlite Co., Prince Georges County, and the Perma Rock Products, Inc., Baltimore County, produced expanded perlite from crude material mined in southwestern United States for use primarily as light-weight aggregate and soil conditioner.

Potassium Salts.—Potassium salts were produced by the North American Cement Corp. at the Security plant in Washington County. Potash at this plant was obtained in the form of cement clinker, as a

byproduct of cement-mill operations.

Sand and Gravel.—The production of sand and gravel continued in 1955 to be the major mineral industry in Maryland in terms of both tonnage and value, but total State production dropped 4 percent, compared with 1954. This drop, however, was caused by a 57-percent decrease in production by Government and contractor crews. Because of the low unit value assigned to Government-and-contractor production, this large drop did not cause a corresponding decrease in total value of sand and gravel production for the State. there was a slight increase in total value of sand and gravel produc-

tion, as commercial output increased 1 percent over 1954.

Production consisted of paving sand (29 percent), structural sand (23 percent), paving gravel (27 percent), and structural gravel (20 Other uses of sand included glassmaking, grinding, and percent). polishing, and for filter-, fire- and furnace-, and engine-sand purposes. Larger producing counties included Prince Georges, Baltimore, Har-

ford, and Anne Arundel.

TABLE 2.—Sand and gravel sold or used by producers, 1954-55, by uses

		1954		1955			
Use		Value			Value		
	Short tons	Total	Average per ton	Short tons	Total	Average per ton	
Sand: Structural	2, 491, 035 1, 880, 521 2, 288, 800 3, 120, 873 11, 110 305, 461	\$2, 960, 638 2, 380, 477 3, 873, 105 2, 623, 474 25, 399 308, 520	\$1. 19 1. 27 1. 69 . 84 2. 29 1. 01	2, 221, 341 2, 817, 906 1, 919, 447 2, 612, 575 (1) 123, 659	\$2, 399, 638 3, 642, 952 3, 349, 848 2, 517, 507 (1) 300, 713	\$1. 08 1. 28 1. 75 . 96 (1) 2. 43	
Total	10, 097, 800	12, 171, 613	1. 21	9, 694, 928	12, 210, 658	1. 2	

Slate.—The Central Commercial Co. produced roofing granules from slate mined at an open pit and crushed at a plant near Whiteford, Harford County. Production decreased 33 percent below 1954, as the company reported the plant shut down and dismantled during the year.

Included with "Undistributed."
 Includes glass sand, grinding and polishing sands, fire or furnace sand, engine sand, filter sand, and other sands, railroad ballast (1955), and other gravel, which cannot be shown separately and are concealed to avoid disclosure of individual company confidential data.

Stone.—The production of stone in Maryland in 1955 increased 5 percent, compared with 1954. Although limestone was by far the leading type of stone quarried; basalt, granite, marble, sandstone, and miscellaneous stone also were produced. Crushed and broken stone, mostly limestone, made up 99 percent of the total stone output. Dimension stone, produced primarily for use in rough construction work, was also quarried in Maryland in 1954. Baltimore County was the leading stone producer, followed by Frederick and Washington Counties.

TABLE 3.—Stone sold or used by producers, 1954-55, by kinds and uses

Use	195	i4	195	5
Use	Quantity	Value	Quantity	Value
Dimension stone:				
Granite: Building stone: Rough constructionshort tons Rough architecturalcubic feet Rhbleshort tons	(1) (1)	(1) (1)	27, 043	\$205, 727
Total (approximate short tons)	(1)	(1)	27, 043	205, 727
Miscellaneous: Building:  Rough and dressedshort tons  Rubble and flaggingdo	8, 499 1, 484	\$46, 828 13, 631	12, 074 1, 902	71, 124 14, 181
Totaldo	9, 983	60, 459	13, 976	85, 305
Crushed and broken stone: Granite: Riprapdo Crushed stonedo	10, 500 60, 344	36, 750 138, 838	22, 963 55, 357	52, 815 158, 924
Totaldo	70, 844	175, 588	78, 320	211, 739
Basalt and related rocksdodo		(1)	692, 908	1, 040, 34
Totaldo	(1)	(1)	692, 908	1, 040, 34
Limestone:   do	1, 016, 197	113, 668 4, 604, 119 244, 135 1, 332, 601 6, 294, 523	(2) 3, 258, 241 29, 502 1, 231, 230 4, 518, 973	5, 001, 43; 125, 41; 1, 899, 60- 7, 026, 45
Undistributed 8	872,866	1, 734, 951	11,748	230, 47
Grand total	5, 064, 526	8, 265, 521	4 5, 342, 968	4 8, 800, 04

<sup>1</sup> Figure withheld to avoid disclosure of individual company data, included with "Undistributed."

4 Excludes certain stone; Bureau of Mines not at liberty to publish.

Oystershell.—The Oyster Shell Corp. of Baltimore in Baltimore County, and J. M. Clayton Co. of Cambridge, Dorchester County, produced oystershell for use as poultry grit and as a source of byproduct lime.

Sulfur.—The Baltimore Gas & Electric Co. at the Spring Gardens Gas Manufacturing plant in Baltimore produced a small quantity of sulfur paste as a byproduct of the liquid-purification plant, using the

Thylox, Koppers, sulfur recovery process.

Talc and Soapstone.—The production of talc and soapstone increased slightly over the previous year. Producers were Clinchfield Sand & Feldspar Corp. at Marriottsville and the Liberty Stone Co.

<sup>2</sup> Included with miscellaneous limestone.
3 Includes dimension limestone, dimension sandstone (1955), marble, dimension granite (1954), and miscellaneous stone (1955).

at Sykesville, both in Carroll County, and Harford Tale & Quartz Co., Inc., at Dublin, Harford County. Primary uses of the output of these plants included asphalt filler, roofing material, and foundry

facings.

Vermiculite, Exfoliated.—The Zonolite Co., after taking over the operations of the Carolina Vermiculite Co. September 1, 1955, produced exfoliated vermiculite at a plant near Beaver Heights, Prince Georges County. Crude material for this plant was obtained primarily from Spartanburg County, S. C.

### MINERAL FUELS

Coal.—The production of bituminous coal in Maryland has been characterized by a steady decline since 1948, but in 1955 it increased over the previous year. The peak coal-production year in Maryland was 1907, when more than 5½ million tons was mined. Production in 1955 was ½ million tons. Allegany and Garrett Counties were the only producing areas.

**************************************		Value				Value	
Year Short ton	Short tons	Total	Average per ton 1	Year	Short tons	Total	Average per ton 1
1946–50 (average) 1951 1952	1, 406, 249 588, 639 587, 903	\$6, 700, 217 2, 781, 343 2, 694, 842	\$4. 76 4. 73 4. 59	1953 1954 1955	530, 590 421, 616 512, 469	\$2, 441, 605 1, 879, 018 2, 001, 743	\$4.60 4.46 3.91

TABLE 4.—Production of coal, 1946-50 (average) and 1951-55

Coke and Coal Chemicals.—The Sparrows Point plant of Bethlehem Steel Corp. received 3,060,435 tons of high-volatile bituminous coal and 1,533,006 tons of low-volatile bituminous coal at its 11 batteries of 687 coke ovens. Of this amount 4,478,535 net tons (97 percent of the coal received) was carbonized to produce 3,235,527 tons of coke. Of the coal consumed, 86 percent was produced in West Virginia, 13 percent in Pennsylvania, and 1 percent in Virginia. The bulk of coke produced was consumed in blast furnaces. Small quantities were also used in foundries and other industrial plants. In the process of coking the coal the following quantities of other products were obtained: 241,960 tons of coke breeze; 49,113,160 thousand cubic feet of coke gas, of which 22 percent was used in heating coke ovens and 77 percent in steel or allied plants: 95,071,291 pounds of ammonium sulfate; 38,331,895 gallons of coke-oven tar, of which 93 percent was burned as fuel in open-hearth furnaces and 15,433,822 gallons of crude light oil was absorbed from coke-oven gas. Light-oil derivatives include 10,044,765 gallons of benzene, 2,302,637 gallons of toluene, and 806,118 gallons of xylene.

Natural Gas.—The natural-gas industry in Maryland in 1955 was marked by large increases in production and value of production—124 and 122 percent, respectively. Production was from the Mountain Lake Park field and the Accident field, both in Garrett County.

<sup>&</sup>lt;sup>1</sup> Value received or charged for coal f. o. b. mine, 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.)

### **REVIEW BY COUNTIES**

Allegany.—Coal production increased in Allegany County in 1955. The 25 underground and 12 strip pits, all producing over 1,000 tons, contributed 38 percent to the total coal value of the State. Although more underground mines were active in the county, strip output was slightly larger. The larger producing companies were Moran Coal Co., Consolidated Fuel Co., Cross Fuel Co., M. K. Coal Co., Allegany Engineering Co., Gary Coal Co., Georges Creek Coal Co., Inc., Central Sand & Gravel Co., Edna Fuel Co., and Phoenix Big Vein Coal Co. Two-thirds of the tonnage represented by these companies was taken from strip pits.

Other commodities mined in the county were sand and gravel, clay, Sand and gravel production increased over 1954. Output was reported by Cumberland Cement & Supply Co., Cumberland, and Lewis & Hunter, Frostburg—a small producer operating during the summer months only. The bulk of the county output was consumed

for building and paving purposes.

TABLE 5.—Value of mineral production in Maryland, 1954-55, by counties 1

County	1954	1955	Minerals produced in 1955, in order of value		
Allegany	\$1, 709, 915	\$1, 622, 867	Coal, sand and gravel, clays, stone.		
Anne Arundel	(2)	(2)	Sand and gravel, clays.		
Baltimore		8, 783, 773	Stone, sand and gravel, oystershell, clays.		
Calvert	(2)	(2) (2)	Greensand marl, sand and gravel.		
Carroll		(2)	Cement, soapstone.		
Cecil		598, 983	Sand and gravel, clays.		
Charles	(2)	11, 558	Sand and gravel.		
Dorchester	(2)	(2)	Sand and gravel, oystershell.		
Frederick	2, 571, 816		Stone, lime, clays.		
Garrett		1, 997, 132	Coal, natural gas, stone, sand and gravel.		
Harford		1, 478, 390	Sand and gravel, stone, slate, talc.		
Howard		(2) (2) (2)	Sand and gravel, stone.		
Kent	337, 121	(2)	Sand and gravel, clays.		
Montgomery	414, 424	(2)	Sand and gravel, stone.		
Prince Georges	5, 101, 605	5, <b>3</b> 38, 506	Sand and gravel, clays, stone.		
Queen Annes		(2)	Sand and gravel.		
St. Marys		(2)	Do. Do.		
Somerset		1,600			
Talbot		10, 759	Sand and gravel, clays.		
Washington	5, 312, 583		Cement, stone, clays, potassium salts, lime. Sand and gravel, clays.		
Wicomico					
Worcester		12,886	Sand and gravel.		
Undistributed	• 4, 459, 615	3 13, 088, 990			
(D-4-1	20 742 000	25 401 000			
Total	30, 743, 000	35, 491, 000			

<sup>&</sup>lt;sup>1</sup> The following counties were not listed, because no production was reported: Caroline (1954-55) and Somerset (1954).

Included with "Undistributed."

Excludes value of clay used for cement and stone used for lime and cement.

Allegany was the second largest clay-producing county in the State. This position was due largely to the output of Mount Savage Refractories Co., Mount Savage, leading producer of fire clay in the Output of fire clay and miscellaneous clay was also reported by Big Savage Refractories Corp., Frostburg; and Pen-Mar Brick & Supply Co., Cumberland. Fire clay was utilized primarily for manufacturing heavy clay products, such as building brick and sewer pipes.

Stone was quarried by Cumberland Cement & Supply Co. at

Corrigans ville for use primarily as concrete aggregate.

Anne Arundel.—Anne Arundel was the third leading county in the State in the production of sand and gravel. Producers, in order of descending value of production, were Arundel Corp., with operations near Annapolis, Brooklyn, and Baltimore; Frederick Link Sons, Hanover; The Brooklyn Corp., Baltimore; and Maryland Street and Roads Commission, Alan E. Barton, R. L. Martin, and John I. Rogers. The bulk of sand output was used for building (21 percent) and paving (74 percent) purposes. Fire and furnace sands and paving gravel covered the balance of the county output.

The Severn Clay Co., operators of an open pit near Glen Burnie, was the one producer of clay in the county. The entire output was

used for sanitary ware and floor and wall tile.

Baltimore and Baltimore City.—Again in 1955, Baltimore County ranked first among the mineral-producing counties of Maryland. The county led in the production of stone, clay, and ovstershell and

was second in output of sand and gravel.

Limestone, basalt, granite, and sandstone were quarried in the county. Major producers of crushed limestone were the Arundel Corp., Pikesville; A. A. Dyer Co., Glyndon; and Harry T. Campbell Sons' Corp., Texas. The greater portion of the output was used in making concrete and as roadstone. Other uses were for asphalt, riprap, blast-furnace flux, and chemical and agricultural purposes. Basalt for use primarily in making concrete and as railroad ballast was produced by J. E. Baker Co., White Hall, and Arundel Corp., Baltimore. Granite was quarried by Carl B. Temple, Reckord, and by Harry T. Campbell Sons' Corp. from properties near Baltimore, Towson, and Butler. Hernwood Quarries, Randallstown, was the only producer of sandstone. Output was used for flagging.

Seven producers were responsible for Baltimore County's sand and gravel output. They were Harry T. Campbell Sons Corp., Cowenton; Nottingham Farms, Inc., Harry A. Smuck & Sons, and George W. Schwarz, Baltimore; Caton Corp., Halethorpe; Louis H. Richter, Overlea; and Charles B. Polesne, Fullerton. Clark Certified Concrete Co., a former producer, went out of business. Louis H. Richter sold out to Nottingham Farms. Fifty-four percent of sand and gravel output was used for building purposes, and 46 percent was

used as a paving base.

Oystershell, ground for use as poultry grit and byproduct lime, was

produced by the Oyster Shell Corp. near Baltimore.

Clay was mined at 5 open-pit operations in 1955. Baltimore Brick Co., with 2 plants near Baltimore and Champion Brick Co. and Excelsior Brick Co., Baltimore, produced miscellaneous clay for use in manufacturing heavy clay products, such as building brick and tile and drain tile. The United Clay Mines Corp. of White Marsh produced ball clay for use for pottery and stoneware, refractories, floor and wall tile, and pastes.

Calcined gypsum was produced by the National Gypsum Co., Baltimore, the only producer in the State. Output was used mainly for building purposes, although a small amount was utilized for agri-

cultural purposes and as portland-cement retarder.

Perma Rock Products, Inc., Baltimore, produced expanded perlite for plaster, concrete, soil conditioning, and filtering.

A small tonnage of sulfur paste was produced by the Baltimore Gas & Electric Co. near Baltimore City.

Calvert.—The Kaylorite Corp. mined a small quantity of greensand

marl from an open pit near Dunkirk for use as a soil conditioner.

Sand and gravel was mined by Oscar S. Bowen, Barstow, and the Maryland Street and Roads Commission. Output was used entirely for paving roads.

Carroll.—Cement, stone, and soapstone were produced in Carroll County in 1955. Lehigh Portland Cement Co., at the Union Bridge plant, Union Bridge, quarried limestone for its own use in making

cement.

Clinchfield Sand & Feldspar Corp., Marriottsville, the larger of the county's two soapstone producers, utilized its product predominantly for roofing material and as an asphalt filler. The Liberty Stone Co., Sykesville, produced ground soapstone for use in manufacturing

foundry facings.

Cecil.—Sand and gravel and clay were the two commodities produced in Cecil County in 1955. Sand and gravel was mined by the Mason-Dixon Sand & Gravel Co., Perryville; Arthur D. Johnston, Port Deposit; McDaniel Sand & Gravel Co., Inc., North East; C. Ray Ott, Elkton; Maryland Sand & Gravel Co., Aberdeen; Fred S. Russell, North East; and Vernon Kincaid, Elkton. The complete county tonnage was used for building and paving purposes. The Paramount Sand & Gravel Co. was idle during the entire year.

A small quantity of clay was yielded by the open-pit mines of Fred S. Russell and North East Fire Brick Co., both near North East. Production was utilized in the manufacture of firebrick and block and

for lining heating and cooking equipment.

Charles.—The Maryland Street and Roads Commission mined sand

and gravel for its own use in paving roads.

Dorchester.—Sand and gravel and oystershell constituted the mineral value of Dorchester County in 1955. Producers contributing to the sand and gravel output were J. Edwin Rosser, Inc., the larger producer, operator of a fixed plant near Federalsburg, and A. D. Gamble & Sons. Output was used mainly for building and paving, and a small portion was employed for drainage systems. The Maryland Street and Roads Commission produced gravel for its own use in paving roads.

Ground ovstershell for use as poultry grit and byproduct lime was

produced by J. M. Clayton Co. near Cambridge.

Frederick.—Stone, lime, and clay constituted the entire mineral production of Frederick County in 1955. Limestone, the only stone produced, was quarried by M. J. Grove Lime Co., Frederick; Le Gore Lime Co., Le Gore; S. W. Barrick & Sons, Inc., Woodsboro; Farmers Cooperative Association, Inc., New London; and Everett V. Moser, Middletown. The major part of the county output was utilized in making concrete and as roadstone, although sizable quantities were used for lime, railroad ballast, and agricultural purposes.

Frederick County was by far the leading producer of lime in the State. Output was used almost exclusively for agricultural purposes, although a small quantity went for masonry lime and for use in prepared masonry mortars. Producers were S. W. Barrick & Sons

Inc., Woodsboro; Le Gore Lime Co., Le Gore; Everett V. Moser, Middletown; and M. J. Grove Lime Co., Lime Kiln.

Hudson Supply & Equipment Co., the only clay producer in the county, mined miscellaneous clay from an open pit near Buckeystown. The entire output was used in the manufacture of heavy clay products.

Garrett.—Garrett, the leading producer of the two coal-producing counties, contributed over 60 percent to the coal value of the State. Coal, the leading commodity of the county in 1955, was reported mined from 45 properties. There were also scattered small pits with production less than 1,000 tons. The major producers were W. & W. Coal Co., Schell Coal Corp., Garrett Coal Corp., Carr & Glotfelty Construction Co., J. R. Thrasher Contracting Co., Old Hampshire Coal Co., Salisbury Construction Co., Myers Coal Co., Inc., Stanley Coal Co., and C. A. Liller Coal Co. Half of the tonnage represented by these companies was mined from strip pits.

Vetter Bros., Inc., produced crushed limestone at Fry & Browning quarry near Oakland. Output was used exclusively for roadstone

and cement manufacture.

Sand and gravel for building and paving purposes was taken from the mines of the Silver Knob Sand Co. and the Eagle Rock Sand Co., both of Oakland.

Harford.—In order of decreasing value, sand and gravel, stone, slate and talc were produced in Harford County in 1955. The county ranked fourth in both sand and gravel and stone production and was

the only slate producer in the State.

Ten sand and gravel plants were active in the county; the largest production came from the four properties of Stancill's, Inc., near Aberdeen, Edgewood, Joppa, and Mountain Road. Other large producers were Abingdon Sand & Gravel Co., Inc., Abingdon; and Charlestown Sand & Gravel Co., Aberdeen. Smaller producers were W. Noble Hamilton, Havre de Grace; Victor Mullin Sand & Gravel Co., Aberdeen; and Belcamp Sand & Gravel Co., Inc., and N. G. Spencer & Son, both of Abingdon. Studlick Bros., a former producer, went out of business. Paving sand and gravel made up 59 percent of the output, and building sand and gravel comprised the balance.

The Maryland Green Marble Co., Inc., produced in 1955, as in former years, Maryland verde antique from an open quarry near Cardiff, for use in building interiors and for terrazzo. Basalt was obtained from the Churchville quarry of Thomas B. Gatch & Sons, Inc., near Churchville and was utilized for concrete, roadstone, and screenings.

One producer is credited with the entire slate output for Maryland. The central Commercial Co. operated an open quarry and crusher near Whiteford for the production of roofing granules. The company shut down during the year and reported dismantling its plant.

Harford Tale & Quartz Co., Inc., mined tale from an open pit near Dublin for use primarily as foundry facings and ceramics, plus a

small tonnage as an asphalt filler constituent.

Howard.—Sand and gravel, the more important of the two commodities produced in Howard County in 1955, was obtained from the pits of the Arundel Corp., Laurel, and Cosca Sand & Gravel, Jessups. Sand output from the Arundel Corp., the larger producer, and gravel

output from Cosca Sand & Gravel was used as a paving and road material.

Dimension limestone was quarried by T. D. Nichols near Clarksville for use in rough construction work. The Ivory Pearl Quarries, Marriottsville, produced miscellaneous dimension stone for flagging.

Kent.—Sand and gravel and clay were the commodities mined in Kent County in 1955. Kent Concrete Co., Chestertown, and Kaiss Bros. Sand Co., Baltimore, operated plants and produced sand and gravel for building purposes.

Chestertown Brick Co., Chestertown, mined miscellaneous clay from an open pit for use in manufacturing heavy clay products.

Montgomery.—Montgomery County contributed sand and gravel and stone to the mineral value of Maryland in 1955. The entire production of sand and gravel was mined from the property of William H. McCeney, Jr., Inc., Silver Spring, and was used for building purposes.

Stone was quarried by Stoneyhurst Quarries, the leading producer, Bethesda; Alberta D. Battista, Rockville; and Segreti Bros., Bethesda. The bulk of the output was mica schist, used primarily

as building stone.

Prince Georges.—Sand and gravel, clay, and stone were the principal commodities produced in Prince Georges County in 1955. The county (third ranking in the State in value of mineral output) was the leading producer of sand and gravel. The 10 sand and gravel producers of the county were The Smoot Sand & Gravel Corp., Alexandria, Va.; Contee Sand & Gravel Co., Inc., Laurel; Silver Hill Sand & Gravel Co.. Washington, D. C.; Forestville Sand & Gravel Co., District Heights; Joseph Smith & Son, Camp Springs; District Sand & Gravel Co., Silver Hill; Washington Sand & Gravel Co., near Washington, D. C.; Landover Sand Co., Bowie; M & M Union Sand & Gravel Co., Inc., Glenn Dale; and Davis Sand & Gravel Co., Clinton. Output was utilized for building and paving purposes.

Clay, the second commodity of value in the county, was obtained from three open-pit mines. The Washington Brick Co., Muirkirk, the largest producer, mined alluvial clay for use in manufacturing building and paving brick, flue linings, and flowerpots. Miscellaneous clay for heavy clay products was mined by West Bros. Brick Co. near Washington, D. C. The pit of William L. Allen, Laurel, yielded

plastic fire clay for use in foundries and steelworks.

A small quantity of stone was quarried by Frank Pennini, Mount

Rainier, for building purposes.

Atlantic Perlite Co. produced expanded perlite in a plant near

Washington, D. C.

The Carolina Vermiculite Co. sold its property, near Beaver Heights to the Zonolite Co., which continued to process exfoliated vermiculite from crude material obtained primarily from South Carolina.

The Mineral Pigments Corp., Laurel, processed crude iron oxide material and copperas, producing a wide variety of colors in iron

oxide pigments.

Queen Annes.—The only commodity produced in Queen Annes County was sand and gravel obtained from the fixed plant of R. B. Baker & Sons, Inc., Queenstown. Output was used as a building and paving ingredient and for filter sand.

St. Marys.—Sand and gravel was the only mineral produced in St. Marys County in 1955. The Leonardtown Sand & Gravel Co., the principal producer, and Dean B. Beaver, both of Leonardtown, produced sand and gravel for building and paving purposes. Maryland Street and Roads Commission utilized their production for paving and road purposes.

Somerset.—Sand and gravel, the only commodity of Somerset County in 1955, was produced by the Maryland Street and Roads

Commission for road paving purposes.

Talbot.—Sand and gravel and clay were the mineral commodities of Talbot County in 1955. The Talbot County Highway Department produced gravel for building purposes.

The New Brick & Tile Co., Easton, mined miscellaneous clay,

which was used in manufacturing heavy clay products.

Washington. —Washington County was the second-ranking county in Maryland in the value of mineral production in 1955. stone, clay, potassium salts, and lime constituted over one-fifth of the State's mineral output. Cement, the county's major commodity, was manufactured by North American Cement Corp., Hagerstown. Sulfate of potash was recovered by this company as a byproduct from its cement-mill operations. The company also quarried limestone near Security, primarily for its own use in manufacturing cement, but it also sold a sizable quantity for use as roadstone. Rubble was produced for use in construction work by Schetrompf Lime Co., Clear Spring. This company also produced quicklime for agricultural purposes at a plant near Hagerstown.

Victor Cushwa & Sons, Inc., Williamsport, continued to mine

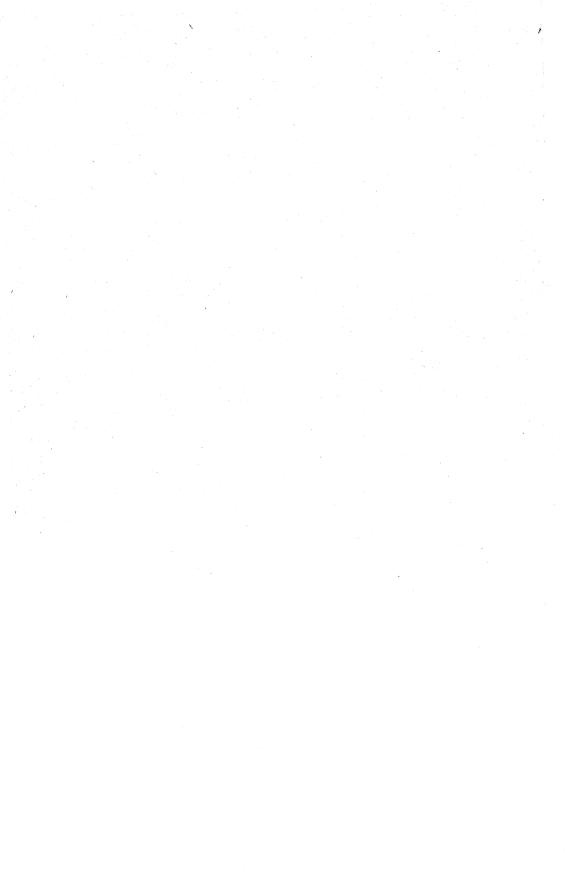
miscellaneous clay for heavy clay products.

Wicomico.—Sand and gravel and clay were the mineral commodities of Wicomico County in 1955. Richard H. Howard and Basic Materials, both of Hebron, produced sand and gravel for paving purposes. Some also was produced by the Maryland Street and Roads Commission for its own use.

Miscellaneous clay for heavy clay products was mined by the

Salisbury Brick Co., Inc., from an open pit near Salisbury.

Worcester.—Sand and gravel was the only mineral commodity produced in Worcester County in 1955. Blades Sand & Gravel Co. operated a plant near Pocomoke for 6 months during the year, output being utilized for building purposes. Steward's Sand & Gravel Co., active in 1954, discontinued operations and sold its plant to Richard Howard. Gravel for paving purposes was produced by the Maryland Street and Roads Commission.



# The Mineral Industry of Massachusetts

By Robert W. Metcalf 1



NEW RECORD value of \$22 million was established by Massachusetts mineral production in 1955. This was 17 percent higher than in 1954, the previous peak year. Although most of the increase was due to a 26-percent gain in value of stone

production, all principal minerals rose in value.

Stone, sand and gravel, and open-market lime, in that order, were the principal minerals produced in Massachusetts in 1955 and comprised over 99 percent of the value of mineral output in the State. Other mineral commodities were clay for brick and other heavy products, a small tonnage of peat, and ground quartz sand. In order of value of products, Middlesex again ranked first among the State's counties, followed by Berkshire, Norfolk, and Hampden. As in 1954, stone was the chief commodity produced in Middlesex County; lime, in Berkshire County; and sand and gravel, in Norfolk County. put from Hampden County was principally stone.

TABLE 1.—Mineral production in Massachusetts, 1954-551

Mineral	19	954	1955		
.vv mets97	Short tons (unless other- wise stated)	Value	Short tons (unless other- wise stated)	Value	
Clays Lime (open market) Sand and gravel Stone Value of items that cannot be disclosed: Mineral fuels and nonmetals	128, 998 127, 836 9, 640, 274 2, 942, 435	\$121, 049 1, 709, 341 8, 366, 409 9, 039, 590 12, 077	124, 832 134, 952 9, 580, 943 4, 128, 004	\$141, 65- 1, 957, 34- 8, 926, 32- 11, 381, 16- 5, 933	
Total Massachusetts 2		18, 851, 000		22, 109, 00	

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

The total has been adjusted to eliminate duplication in value of stone.

# REVIEW BY MINERAL COMMODITIES **NONMETALS**

Clays.—Although the output of clay in Massachusetts was 3 percent less than in 1954, the value rose 17 percent. The production was used for making structural brick and other heavy clay products. Five companies mined clay from 6 pits in 4 counties in 1955. Plymouth

<sup>&</sup>lt;sup>1</sup> Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.

County, the leading producing county, was followed in order by

Hampden, Middlesex, and Bristol Counties.

Lime.—Output of lime, including both quick and hydrated material, rose 6 percent in tonnage and 15 percent in value in 1955 compared with 1954. The average value per ton increased 8 percent to \$14.50, somewhat less than in 1953 and 1952. The average value for building and chemical-and-industrial lime increased in 1955.

Little change occurred in the percentages of the various uses of lime to total tonnage, chemical-and-industrial, 69 percent of the total in 1955 (67 percent in 1954); building lime, 22 percent in 1955 (23 percent in 1954); and agricultural uses, 9 percent in 1955 (10 percent

in 1954).

TABLE 2.—Lime (quick and hydrated) sold by producers, 1946-50 (average) and 1951-55

Year Short tons	Value			Short	Value		
	Total	Average per ton	Year	tons	Total	Average per ton	
1946-50 (average) - 1951	118, 138 143, 316 132, 135	\$1, 381, 265 1, 930, 225 1, 999, 545	\$11. 69 13. 47 15. 13	1953 1954 1955	135, 383 127, 836 134, 952	\$2, 156, 205 1, 709, 341 1, 957, 346	\$15. 93 13. 37 14. 50

Perlite.—The Permalite Division, Whittemore Co., continued to produce expanded perlite at its Roslindale plant in Suffolk County from raw material shipped from Colorado and New Mexico. About 62 percent of the total output was marketed as a lightweight aggregate for use in plaster; 37 percent was sold for concrete aggregate and the remainder (1 percent) for miscellaneous uses.

Roofing Granules.—Roofing granules were prepared by Bird & Son

at a plant in East Walpole and by William J. Barry Co. at Roslindale.

Sand and Gravel.—The output of sand and gravel in 1955 decreased slightly, although the value of production rose 7 percent compared with 1954. Owing largely to improved coverage of sand and gravel plants in 1955, production was reported from 147 commercial pits compared with 119 in 1954. Building and paving sand and gravel represented the greater part of the total produced, structural sand and gravel totaling 57 percent of all sand and gravel and paving sand and gravel amounting to 35 percent of the total. Other types of sand and gravel produced in Massachusetts in 1955 were molding, engine, filter, and miscellaneous sands and railroad-ballast gravel. The average value of all sand and gravel in 1955 increased to \$0.93, or 7 percent higher than in 1954, although the average value of commercial output decreased slightly.

The leading counties, in order of tonnage, were Middlesex, Norfolk, Hampden, Bristol, and Worcester, which produced over 72 percent of the total output of the State. N. Wilbraham Sand & Gravel & Concrete Co. (Hampden County), Highland Sand & Gravel Co., Inc. (Middlesex and Norfolk Counties), Acme Sand & Gravel Co., Inc. (Middlesex County), and Boston Sand & Gravel Co. and Glacier Sand & Stone Co. (both in Norfolk County) were among the State's

larger producers.

TABLE 3.—Sand and gravel sold or used by producers, 1954-55, by classes of operations and uses

		1954		1955		
Uses		Val	ue	Short tons	Value	
	Short tons	Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS			# .			
Sand:  Molding	75, 659 2, 358, 350 1, 272, 819 105, 588	\$220, 133 2, 089, 256 1, 039, 583 66, 996	\$2.91 .89 .82 .63	2, 875, 484 1, 358, 366 (1)	\$2, 508, 822 1, 074, 808	(1) \$0. 87 . 79
Structural. Paving. Railroad ballast. Other Undistributed <sup>3</sup>	2, 136, 630 1, 461, 241 (1) 919, 055 55, 963	2, 520, 786 1, 310, 807 (1) 492, 060 60, 054	1. 18 . 90 (¹) . 54 1. 07	2, 433, 690 1, 643, 426 15, 025 491, 372 257, 396	2, 870, 499 1, 168, 074 5, 259 359, 696 420, 812	1. 18 . 71 . 35 . 73 1. 63
Total commercial sand and gravel	8, 385, 305	7, 799, 675	. 93	9, 074, 759	8, 407, 970	. 93
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand: Structural Paving Gravel:	19, 437 97, 357	46, 080 86, 361	2. 37 . 89	43, 565 71, 735	100, 157 130, 461	2. 30 1. 82
StructuralPaving	22, 300 1, 115, 875	38, 980 395, 313	1.75 .35	152, 594 238, 290	124, 819 162, 922	. 82 . 68
Total Government-and-con- tractor sand and gravel	1, 254, 969	566, 734	. 45	506, 184	518, 359	1. 02
Grand total	9, 640, 274	8, 366, 409	. 87	9, 580, 943	8, 926, 329	. 93

<sup>&</sup>lt;sup>1</sup> Included with "Undistributed" to avoid disclosure of individual company confidential data.

<sup>2</sup> Includes molding sand (1955), blast sand (1954), engine sand, filter sand, other sand (1955), ground sand (1955), and railroad-ballast gravel (1954).

Stone.—Stone produced in Massachusetts in 1955 totaled 4.1 million short tons valued at \$11.4 million, increasing 40 percent in quantity and 26 percent in value compared with 1954. Both dimension and crushed or broken stone were quarried. Although some dimension sandstone was produced, most of the dimension stone was granite. Output of dimension stone increased 4 percent in quantity and 21 percent in value in 1955 compared with 1954 and comprised 3 percent of the total tonnage and 43 percent of the value of the Massachusetts stone total. Dressed construction stone (with 18 percent of the quantity and 24 percent of the value of dimension stone) and curbing and flagging (with 63 percent of the quantity and 52 percent of the value) were the chief types of dimension stone marketed in 1955.

Output of crushed and broken stone, largely for use as concrete aggregate and roadstone, rose sharply in 1955 to over 4 million tons valued at nearly \$6.5 million, and increased 42 percent in tonnage and 30 percent in value over 1954. Sizable quantities of crushed and broken stone were used for riprap, railroad ballast, agriculture (limestone), furnace flux, and lime manufacture. Of this crushed and broken stone sold, basalt had the largest tonnage, followed by granite. Other kinds of stone quarried in Massachusetts and marketed in

crushed or broken form were limestone and miscellaneous stone

(granitic gneiss).

Commercial stone quarries active in Massachusetts in 1955 totaled 30; they were operated by 26 firms or individuals. Thirteen quarries produced basalt, 12 granite, 3 limestone, and 1 each sandstone and miscellaneous stone. Dimension stone was obtained chiefly from Middlesex and Worcester Counties and crushed and broken stone largely from Hampden, Essex, Norfolk, and Suffolk Counties.

TABLE 4.—Stone sold or used by producers, 1954-55, by uses

	19	<b>54</b>	1955	
	Quantity	Value	Quantity	Value
Dimension stone:  Building stone:  Rough construction	16, 907 (1) (1) (1) (1) (2) 2 10, 845	\$223, 061 (1) (1) (1) (1) (2) (3) (4) (4)	10, 238 6, 415 22, 240 1, 035 (1) (1) 76, 417	\$174, 614 11, 647 1, 157, 918 32, 678 (1) (1) 2, 541, 561
Undistributed *  Total dimension stone (quantities approximate, in short tons)  Crushed and broken stone:	98, 943	3, 734, 887 4, 025, 696	121, 935	4, 884, 988
Riprap	441, 380 2, 210, 387 73, 363 100, 701 153, 054 246, 805	4 59, 136 3, 537, 821 87, 683 370, 327 489, 227 469, 700	122, 438 3, 336, 645 (1) (1) 141, 569 405, 417	199, 463 4, 867, 622 (1) (1) 754, 852 674, 239
Total crushed and broken stonedo	2, 825, 690	5, 013, 894	4, 006, 069	6, 496, 176
Grand total (quantities approximate, in short tons)	2, 942, 435	9, 039, 590	4, 128, 004	11, 381, 164

<sup>1</sup> Included with "Undistributed."

<sup>4</sup> Excludes granite. <sup>5</sup> Includes crushed granite (1954), railroad ballast (1955), agricultural limestone (1955), furnace flux, and limestone for lime.

Vermiculite.—Two firms in Middlesex County exfoliated vermiculite for use in plaster and concrete aggregate, home insulation, and various other purposes. Part of the raw vermiculite was imported from South Africa, and part was from South Carolina and Montana.

#### MINERAL FUELS

Peat.—Peat humus was recovered in 1955 by one producer each from bogs in Berkshire and Essex Counties. The peat was used for local agricultural purposes as a soil conditioner or sweetener.

### **REVIEW BY COUNTIES**

Barnstable.—Sand and gravel and crushed or broken granite were produced in Barnstable County in 1955. Six producers were active in 1955, compared with 8 in 1954. Sand and gravel was mined from open pits by Concrete Products Co. and Frederick V. Lawrence, Inc., both

<sup>&</sup>lt;sup>2</sup> Excludes dressed monumental stone.
<sup>3</sup> Includes rubble (1954), rough architectural (1954), dressed architectural, dressed construction (1954), monumental (1955), paving blocks and curbing and flagging (1954).

in Falmouth; Sorenti Bros., Cedarville; Whitehead Bros. Co., Provincetown; and the Boston & Maine Railroad. Although molding sand, railroad ballast, and sand and gravel for use in ice control and other miscellaneous purposes were produced, output was used mostly for building and paving. Turner and Breivogel, Inc., near Falmouth reported larger sales of granite for use as riprap in repairing hurricane damages.

TABLE 5.—Value of mineral production in Massachusetts, 1954–55, by counties <sup>1</sup>

County	1954	1955	Minerals produced in 1955 in order of value
Barnstable Berkshire Bristol Dukes Essex Franklin Hampden Hampshire Middlesex Norfolk Plymouth Suffolk Worcester Undistributed Total	\$216, 139 2, 848, 586 1, 173, 616 (2) 1, 501, 802 174, 860 725, 630 (2) 6, 359, 624 688, 587 1, 121, 812 1, 549, 101 131, 750	\$261, 289 3, 080, 863 1, 393, 924 (2) 1, 499, 512 (3) (2) 6, 782, 365 2, 489, 849 707, 302 1, 401, 839 1, 602, 916 2, 889, 593	Lime, stone, sand and gravel, ground sand, peat. Sand and gravel, stone, clays. Sand and gravel

Nantucket County was not listed because no production was reported.
Figure withheld to avoid disclosure of individual company confidential data; included with "Undistributed."

Berkshire.—Lime, peat, sand and gravel, ground sand, and stone were produced in Berkshire County in 1955. Quicklime and hydrated lime, produced from limestone quarried by Lee Lime Corp. (Lee), New England Lime Co. (Adams), and U. S. Gypsum Co. (Farnams) was marketed for building, agricultural, chemical, and industrial uses. These firms also produced crushed or broken limestone for riprap, blast-furnace flux, agricultural stone, whiting, asphalt, fertilizer, and

rubber filler, poultry grit, and miscellaneous other uses.

Sand and gravel for structural and paving use was produced by 15 commercial and 1 Government-and-contractor operator. The principal producers were Abby & Sons, Lee; Berkshire Gravel, Inc., with pits at Lee and Pittsfield; Frank Bushika, Cheshire; General Sand & Stone Corp., Dalton; Hutchinson Sand & Gravel Co., Inc., mines at Dalton and Pittsfield; Maxymillian, Inc., Adams; Mountain Sand & Gravel Co., Inc., Great Barrington; State Lime Sand & Gravel Co., Sheffield; and Twentieth Century Concrete Works, Stockbridge. In addition, six other small pits near Great Barrington, Otis, Sandisfield, and Becket produced paving gravel. Paving sand and gravel was mined by the city of North Adams Highway Department for road and street construction. Ground sand prepared from quartz deposits near Cheshire was sold by Pettinos New England, Inc., for foundry and other uses, including handsoap.

Otis Chester Granite Co., Inc., quarried dimension granite for rough monumental stone from its Whiting quarry near Otis, and George E. Emerson, Inc., obtained quartz from a quarry near Pittsfield for use

in rough construction.

Peat humus was recovered from bogs near Hinsdale by Hinsdale

Leaf Mold Co., Inc.

Bristol.—Sand and gravel, granite dimension stone, and clay, in order of size of output, were produced in Bristol County in 1955. 13 active companies selling commercial sand and gravel for building and paving purposes, the 10 largest were: Joseph Borge & Sons, Inc., Swansea; Brockton Sand & Gravel Co., Inc., South Easton; McCabe Sand & Gravel Co., Taunton; Montaup Sand & Gravel Co., Swansea; Morse Sand & Gravel Co., Attleboro; Pine Hill Sand & Gravel Co., Westport; River Sand & Gravel Co., Seekonk; J. J. Stevens Co., Dartmouth; Swansea Sand & Gravel Co., Swansea; and Thomas Bros. Corp., Raynham (operated under lease to Tri-City Concrete Co., Inc., Taunton). The Taunton City Street Department produced paving gravel for its own use. The town of Dartmouth also dug sand and gravel for street and road construction.

Riprap, concrete aggregate, and roadstone were prepared by Blue Stone Quarry Division, Warren Bros. Roads Co., from its granite quarry near Acushnet. Common clay, utilized in manufacturing brick and other heavy clay products, was mined from the Stiles & Hart Brick Co. clay pit at Taunton.

Dukes.—Sand and gravel, the only minerals reported from Dukes

County, were produced solely by Colby Construction Co. at Oak

Bluffs and sold for paving sand and structural gravel.

Essex.—Stone, sand and gravel, and peat were produced in 1955 in Essex County. Essex Sand & Gravel Co., West Peabody, and Trimount Bituminous Products Co., Saugus, quarried basalt for concrete and road metal. Lynn Sand & Stone Co., Swampscott, also quarried basalt for concrete aggregate, riprap, and railroad ballast. Karl A. Persson, Rockport, produced dimension granite from the Johnson

quarries.

Nineteen commercial producers and one Government-and-contractor producer reported output of sand and gravel in 1955. largest were: Andover Associates, Inc., Andover; Essex Sand & Gravel Co., Andover; Georgetown Sand & Gravel Co., Salem; William Heinrich's Sons, Inc., Lawrence; Miles River Sand & Gravel, Inc., Ipswich; Henry Ouellette & Sons Co., Inc., Mathuen; Topsfield Sand & Gravel Co., Topsfield; Videtta Construction Co., West Peabody; Stephen Vitale Construction Co., Beverly; Wright Contracting Co., Department of Vermes Brog. Inc., Graveland. Sand and gravel week. Danvers; and Yemma Bros. Inc., Groveland. Sand and gravel was used mostly for building and paving purposes and for fill. Massachusetts Peat Humus Co. recovered peat in 1955 for soil-enrichment purposes from bogs near Lawrence.

Franklin.—Basalt for riprap, concrete aggregate and roadstone, and railroad ballast was quarried near Deerfield by Greenfield Massachusetts Broken Stone Co. Mackin Sand & Concrete Products Co. produced building sand near Greenfield. R. E. Pray Co., former producer of common clay for making heavy products, liquidated its

operations and dismantled its plant.

Hampden.—Sand and gravel, stone, including sandstone and basalt, and clay were obtained from mines and quarries of Hampden County. Sand and gravel was utilized largely for building and paving, although some engine sand was marketed. The principal producers of sand and gravel in 1955 were: Banas Sand & Gravel Co., Inc., Ludlow; Baxter Sand & Gravel Co., Springfield; Edward N. Christianson, Inc., Monson; E. A. Jenson & Sons, Inc., Granville Center; R. Lavoie Trucking Co., Granby; John Lizak, Palmer; North Wilbraham Sand & Gravel & Concrete Co., Springfield; John F. Porter Sons, Westfield; D. D. Ruxton Co., Inc., Ludlow; and Western Massachu-

setts Sand & Gravel, Inc., Westfield.

A dimension sandstone marketed as dressed architectural stone was quarried at East Longmeadow by McCormick Longmeadow Stone Co., Inc. Buildings in which this product was utilized included an Episcopal church in Norwich, Conn.; dormitories at Wesleyan University, Middletown, Conn.; and the Cathedral of Sts. Peter and Paul, in Philadelphia, Pa. John S. Lane & Son, Inc., produced basalt for concrete and road metal from three quarries in Hampden County near Southwick. Common surface clays were mined by Hampshire Brick Co. at Chicopee and Westfield Clay Products Co. at Westfield for use in manufacturing brick.

Hampshire.—Sand and gravel and stone were the only minerals produced in Hampshire County in 1955. The sand and gravel was sold for building and paving purposes. Producers in 1955 were: A. Giard & Sons, Inc., Ware; Hampshire Sand & Gravel, Inc., Westhampton; Omasta Bros., Northampton; Eli Quenneville, South Hadley; Strickland's Pit, Huntington; and Bill Willard, Inc., Northampton. Basalt for concrete and road metal was quarried by John S.

Land & Son, Inc., near Amherst.

Middlesex. Middlesex County was the leading county, in value of mineral production, in Massachusetts in 1955. Stone, sand and gravel, and clay were produced. Output of elemental sulfur was discontinued. Middlesex County also ranked as the leading stone- and sand-and-gravel-producing area in the State. H. E. Fletcher Co. and Morris Bros Granite Co., Inc., quarried dimension granite at their respective Westford quarries. Fletcher Co. produced building and monumental stone, paving blocks, and curbing; this output included rubble, rough and dressed construction, rough and dressed architectural, and rough and dressed monumental stone. Morris Bros. Granite Co., Inc., quarried only flagging and curbing. Crushed granite was produced for concrete aggregate and roadstone by H. E. Fletcher Co., Westford, and B. & M. Crushed Stone Corp., Ashland. Winchester Crushed Stone Co. produced basalt from its Winchester quarry for use as concrete aggregate, roadstone, and railroad ballast. John P. Condon Corp., Dracut, quarried granitic gneiss for roadstone. Output of sand and gravel in Massachusetts in 1955 came from 38

producers at 39 pits. Sand and gravel was used principally for building and paving. Some material also was produced for molding sand, fill, and miscellaneous uses. The 10 principal companies producing 88 percent of the county sand and gravel output were: Acme Sand & Gravel Co. and Akeson Sand & Gravel Co., both with pits near Woburn; Ashland Sand & Gravel Co., Inc., Ashland; Assabet Sand & Gravel Co., Inc., South Acton; William P. Cogger, Chelmsford; Highland Sand & Gravel Co., West Roxbury; Kennedy Bros., South Lincoln; Lexington Sand & Gravel Co., Framingham and South Acton; Riverside Sand & Gravel Co., Newton Lower Falls;

and San-Vel Contracting Co., Littleton.

Miscellaneous clay used in manufacturing flowerpots was obtained from a pit near Cambridge by A. D. Hews & Co., Inc. Boston Consolidated Gas Co. discontinued recovery of byproduct sulfur paste at its Boston plant. California Stucco Products Co., Inc., at Cambridge and Zonolite Co. at North Billerica produced exfoliated vermiculite, used largely for plaster concrete and insulation. Output was prepared both from crude material from South Africa and from deposits

in South Carolina and Montana.

Norfolk.—Norfolk County ranked second in order of value of output of sand and gravel in 1955. The 9 firms or individuals active at 10 pits during the year were: Boston Sand & Gravel Co., Canton; Joseph Columbo & Sons, Dedham; Edward T. Dwyer Sand & Gravel Corp., Quincy; Glacier Sand & Stone Co., Inc., Norwood; Highland Sand & Gravel Co., Inc., Walpole and Dedham; Varney Bros. Sand & Gravel, Inc., Milford; Frank W. Weaver, East Weymouth; Charles E. Wilkinson Estate, Wrentham; and A. A. Will Sand & Gravel Corp., Milton. The town of Needham produced paving sand for its own use in road construction. Although some filter sand and sand for miscellaneous uses was mined, production was largely of building and paving sand and gravel.

Dimension granite for building and monumental purposes was quarried by J. S. Swingle, Inc. (monumental), and Bates Bros. Seam Face Granite Co. (rough architectural stone). Old Colony Crushed Stone Co. produced crushed granite for concrete, roadstone, and railroad ballast. Quarries of the above three firms are all near Quincy. Stoughton Crushed Stone Co., Stoughton, produced concrete aggregate and road metal from its basalt quarry. Roofing granules were

prepared by Bird & Son, Inc., East Walpole.

Plymouth.—Sand and gravel, stone, and clays were produced in Plymouth County in 1955; sand and gravel, measured by value of output, was the most important mineral produced. The nine commercial producers of building and paving sand and gravel, molding sand, gravel for fills, and sand for ice control were: Henry Andracle, Cedarville; Boston Sand & Gravel Co., Greenbush; Bradford Weston, Inc., Hingham; Bridgewater Sand & Gravel, Bridgewater; A. K. Finney Co., Plymouth; Marshfield Sand & Gravel Co., Marshfield; Petrino Co., Whitman; Whitehead Bros. Co., Onset and Marion (dredge); and Albert W. Winters, Marion. Bradford Weston, Inc., Hingham, also quarried granite for use as riprap and concrete aggregate. Stiles & Hart Brick Co., South Bridgwater, and Bridgwater Brick Co., East Bridgwater, mined clay for use in manufacturing building brick.

Suffolk.—West Roxbury Crushed Stone Co. quarried granite at West Roxbury for concrete and roadstone and roofing granules. William J. Barry Co., Roslindale, and Rowe Contracting Co., Suffolk, produced crushed and broken basalt for highway construction and riprap, and the former also prepared roofing granules. D. B. Raymond (Burlington) and S. Rotundi (Stoneham) produced gravel fill and paving gravel, respectively. Permalite Division, Whittemore Co., expanded perlite at its plant at Roslindale for use mostly as plaster and concrete aggregate. Raw material was obtained from

Western and Southwestern States.

Worcester.—Sand and gravel and stone were the only mineral commodities produced in Worcester County in 1955. Of the 14 sand and gravel producers in that year, the 10 largest were: B. N. T. Sand & Gravel Co., Inc., Millbury; R. T. Curtis, Inc., Barre; E. L. Dauphinais, Grafton; De Falco Concrete, Inc., Millbury; P. J. Keating Co., Lunenberg; Joseph Rosenfeld, Hopedale; Stony Brook Sand & Gravel Co., Inc., Auburn (leased to Scavone Construction Co., Worcester); Henry Trulson, Holden; Webster-Dudley Sand & Gravel, Inc., Webster; and Worcester Sand & Gravel Co., Inc., Shrewsbury. Production was largely for building and paving purposes, with the remainder for miscellaneous uses. H. E. Fletcher Co. and Uxbridge Granite Co. quarried granite building stone near Milford and Uxbridge, respectively. Holden Trap Rock Co., Holden, produced crushed and broken basalt for riprap, concrete aggregate, and road metal.



# The Mineral Industry of Michigan

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

By Samuel A. Gustavson 1 and D. F. Klyce 2



THE VALUE of all mineral production in Michigan in 1955 was \$363.8 million, nearly 30 percent greater than in 1954. Increases of more than 10 percent were recorded for production of calcium compounds, copper ore, iron ore, lime, magnesium compounds, marl, natural gas, sand and gravel, and stone. Gains of less than 10 percent were noted in output of all other minerals except crude pretoleum, natural gasoline, and potassium salts. No manganiferous ores and coal were produced during the year.

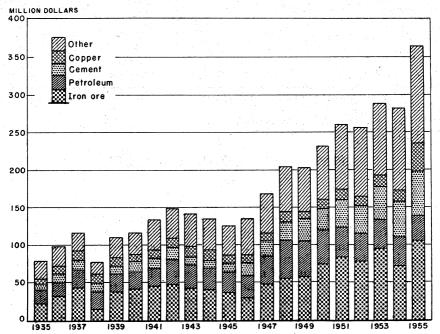


FIGURE 1.—Value of copper and iron ore, and total value of all minerals in Michigan, 1935-55.

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Iron ore continued to lead in value, followed by cement, copper, crude petroleum, salt, sand and gravel, and stone. Of the total value. nonmetals represented 52 percent, metals 39 percent, and fuels 9 percent.

TABLE 1.—Mineral production in Michigan, 1954-55 1

	19	954	19	955
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement: Portland	1, 870, 814 23, 593 1, 693, 279 9, 709, 167 37, 038 13, 715 106, 668 6, 962 12, 028 5, 063, 633 32, 040, 639 27, 758, 443	13, 919, 870  5, 035, 550 70, 004, 504 4, 103, 766  (3) 37, 724 1, 239, 236 35, 600, 000 29, 396, 812 25, 516, 169  21, 904, 517	14, 143, 509 46, 336 119, 313 8, 300 11, 266 4, 975, 442 37, 214, 459 478, 000 33, 635, 612	37, 349, 236 250 5, 660, 587 104, 258, 188 5, 063, 621 57, 176 955, 000 32, 900, 000 31, 668, 351 29, 490, 50 432, 614 28, 908, 784 31, 849, 463
Total Michigan 5		279, 940, 000		363, 787, 000

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption Frouttion as measure by many confidential data.

Weight not recorded.

Figure withheld to avoid disclosing individual company confidential data.

Includes friable sandstone.

## **REVIEW BY MINERAL COMMODITIES**

### **METALS**

Copper.—Production of copper in Michigan in 1955, in terms of recoverable metal more than doubled that in 1954, owing primarily to output from the White Pine mine, White Pine Copper Co., subsidiary of Copper Range Co. Production of copper concentrate from this mine in Ontonagon County began in October 1954. Calumet & Hecla, Inc., operated its group of mines, Ahmeek mill, and Tamarack reclamation plant in Houghton and Keewenaw Counties. During the labor strike from May 2 through August 21 at its mines and plants, unwatering of the company Osceola mine was reduced to maintaining that level attained May 2. The contract between the Defense Minerals Exploration Administration and Calumet & Hecla, Inc., for exploring copper properties in Houghton and Keweenaw Counties continued through 1955; work on a second contract involving exploration of copper properties in Ontonagon County was begun in March 1955. Quincy Mining Co. reclamation plant and Copper Range Co. Champion mine were operated throughout the year.

Total has been adjusted to eliminate duplication in value of clays and stone.

Production for the State totaled about 50,000 short tons, valued at \$37 million in 1955, and represented 5 percent of the Nation's output. Production was from 11 underground mines and 2 tailings-

reclamation plants.

Copper has been produced for many years from various deposits in the Keweenawan series of rock formations, which extend from the north peninsula of Michigan south and westward into Wisconsin. Records of production began in 1845, but before that time Indians had mined and used native copper found at and near the surface. Virtually all production from deposits in the Keweenawan series has come from mines in Houghton, Keweenaw, and Ontonagon Counties. Historically this area has produced slightly less than one-fifth of the Nation's total copper output.

The average annual weighted price used for calculating the value of copper produced in 1955 was 37.3 cents per pound delivered in the United States. In 1954 the annual weighted price used was 29.5 cents per pound. Quoted market prices for copper, per pound, delivered Connecticut Valley, opened 1955 at 30 cents, rose to 36 cents March 31, then to 40 cents August 18, reached a maximum of

45.35 cents on September 1, and closed 1955 at 43.275 cents.

TABLE 2.—Mine production of copper in 1955, by months, in terms of recoverable metal

Month	Short tons	Month	Short tons
January February March April May June July	3, 210 3, 835 4, 925 4, 150 3, 140 3, 730 3, 160	August	3, 420 5, 340 4, 890 4, 586 5, 686

TABLE 3.—Mine production of copper, 1946-50 (average) and 1951-55, in terms of recoverable metal

Year	Mines producing		Material treated		Copper	
	Lode	Tailings	Ore (short tons)	Tailings (short tons)	Short tons	Value
1946-50 (average)	10 8 8 9 13	3 3 3 2 2 2	1, 878, 245 2, 214, 369 1, 879, 131 2, 314, 420 2, 478, 085 5, 319, 699	2, 575, 624 2, 256, 965 1, 991, 051 1, 878, 297 1, 812, 695 1, 488, 854	23, 748 24, 979 21, 699 24, 097 23, 593 50, 066	\$9, 513, 920 12, 089, 836 10, 502, 316 13, 831, 678 13, 919, 870 37, 349, 230

Iron Ore.—Iron-ore mining in Michigan increased substantially in 1955. The tonnage of crude iron ore mined was 15 percent above

1954: ore shipments increased 45 percent.

In 1955 the value at the mine (\$104 million) of ore shipped from the Michigan iron ranges increased 49 percent above the 1954 total of \$70 million. The average mine value of ore without respect to grade was \$7.37 per long ton in 1955 and \$7.21 in 1954. The value applies more closely to the non-Bessemer grades, which constitute the greater part of the tonnage shipped.

Manganese.—No manganiferous iron ore or ferruginous manganese

ore was produced from Michigan mines during 1955.

Silver.—Michigan copper ores normally contain a small quantity of silver associated with the copper, and occasionally free native silver is found. Since virtually all the copper recovered from these ores is fire refined instead of electrolytically refined, silver is seldom recovered. Actually a few ounces of silver per ton of refined copper is desirable for certain uses, and occasionally silver must be added

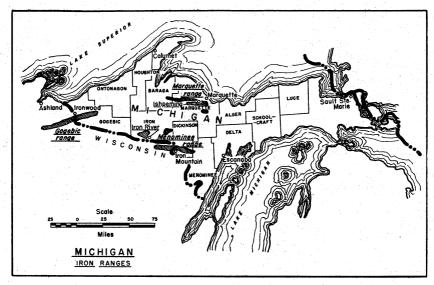


FIGURE 2.—Michigan iron ranges.

TABLE 4.—Production, shipments, and stocks of crude iron ore in 1955, by counties and ranges, in gross tons <sup>1</sup>

	Stocks of	Production	on in 1955	Shipmen	Stocks of	
County and range crude or	crude ore, Jan. 1, 1955	Under- ground	Open pit	Direct to consumers	To beneficiation plants	crude ore, Dec. 31, 1955
County:						
Baraga Dickinson			208, 404 87, 279	87, 279	208, 404	
Gogebic.	687, 420	2, 877, 441	1,916	3, 177, 731		389,046
Iron	718, 021	3, 710, 805	375, 509	4, 129, 088	245, 040	430, 207
Marquette	2, 065, 095	4, 714, 923	950, 735	6, 327, 258	587, 511	815, 984
Total	3, 470, 536	11, 303, 169	1, 623, 843	13, 721, 356	1,040,955	1, 635, 237
Range:						
Gogebic	687, 420	2, 877, 441	1,916	3, 177, 731		389, 046
Marquette	2,065,095	4,714,923	1, 159, 139	6, 327, 258	795, 915	815, 984
Menominee	718, 021	3, 710, 805	462, 788	4, 216, 367	245, 040	430, 207
Total	3, 470, 536	11, 303, 169	1, 623, 843	13, 721, 356	1, 040, 955	1, 635, 237

<sup>&</sup>lt;sup>1</sup> Exclusive of iron ore containing 5 percent or more manganese.

to the refined copper to meet specifications. During 1955 part of the copper concentrate and copper blister was electrolytically refined, resulting in the recovery of 478,000 fine ounces of silver, which at the Government price for newly mined silver was valued at \$432,600.

TABLE 5.—Usable iron ore shipped from mines 1942–55, by ranges, in gross tons  $^{1}$ 

Year	Marquette range	Menominee range (Michigan portion)	Gogebic range (Michigan portion)	Total
1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1951 1952 1953 1954 1955	6,540,228 5,602,904 4,790,179 4,585,340 3,270,384 5,543,124 4,896,754 4,249,707 4,958,674 5,647,423 4,516,509 5,571,501 3,675,429 6,639,992	4, 897, 305 4, 812, 731 4, 835, 317 4, 239, 045 2, 589, 433 3, 712, 501 4, 085, 089 3, 587, 068 4, 035, 347 4, 767, 139 4, 258, 996 4, 552, 915 3, 655, 995 4, 325, 786	4, 691, 941 4, 094, 722 4, 067, 881 3, 008, 670 2, 617, 608 3, 709, 857 3, 914, 635 3, 156, 464 3, 827, 323 3, 197, 059 3, 003, 861 3, 183, 350 2, 377, 743 3, 177, 731	16, 129, 474 14, 510, 357 13, 693, 377 11, 833, 055 8, 477, 425 12, 965, 482 12, 986, 478 10, 993, 239 12, 821, 344 13, 611, 779, 366 13, 312, 766 9, 709, 167 14, 143, 509
1942–55	70, 488, 148	58, 354, 667	48, 033, 845	176, 876, 660

<sup>&</sup>lt;sup>1</sup> Exclusive of iron ore containing 5 percent or more manganese, natural.

TABLE 6.—Usable iron ore produced, 1854-1951 total and 1952-55, by ranges, in gross tons <sup>1</sup>

Year	Marquette range	Menominee range (Michigan portion) 2	Gogebic range (Michigan portion) <sup>2</sup>	Total
1854–1951	262, 891, 831	220, 233, 364	221, 516, 257	704, 641, 452
1962	4, 668, 550	4, 163, 465	2, 972, 930	11, 809, 945
1963	5, 785, 118	4, 559, 638	3, 463, 583	13, 813, 341
1964	4, 670, 603	3, 640, 320	2, 439, 763	10, 750, 686
1964	5, 412, 956	4, 018, 298	2, 879, 357	12, 310, 611
1955	283, 429, 058	236, 620, 085	233, 276, 892	753, 326, 035

Exclusive of iron ore containing 5 percent or more manganese, natural.
 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, 1910-55

(Gross tons)

Year	Gross tons	Year	Gross tons
1910-40	3, 120, 797 30, 931 89, 368 40, 794 1, 500 1, 743	1949	105, 017 62, 166 19, 728 68, 081 13, 715

#### **NONMETALS**

Cement.—Producing plants shipped 18.1 million barrels of portland cement valued at \$52.4 million in 1955, an increase of 1.4 million barrels or 8 percent over 1954. Production was from 7 plants in 6 counties; 2 plants were in Wayne and 1 each in Alpena, Bay, Emmet, Lenawee, and St. Clair Counties. All plants were close to water transportation and received most of the limestone used in the manufacturing process by water. Most of the clay or shale used was mined locally. Gypsum and slag, iron sinter, and other iron-bearing materials were purchased from nearby sources. The average value of portland cement shipped from Michigan was \$2.89 per barrel in 1955 and \$2.73 in 1954.

Masonry cements manufactured from portland cement or cement clinker and other materials were produced at five plants. Four plants used cement clinker and one portland cement. Producing plants shipped 1.6 million barrels of masonry cement valued at \$5.7 million in 1955. The average value of masonry cements was \$3.54 per

barrel in 1955 and \$3.41 in 1954.

TABLE 8.—Finished portland cement produced, shipped and in stock, 1946-50 (average) and 1951-55

	Active plants		Ship			
		Produc-		Valu	1 <b>e</b>	Stocks at mills on Dec. 31
Year		tion (barrels)	Barrels	Total	Average per barrel	(barrels)
1946-50 (average)	8 7 7 7 7	11, 410, 053 14, 393, 599 14, 790, 587 15, 532, 853 16, 671, 383 18, 204, 826	11, 432, 917 14, 112, 639 14, 760, 783 15, 853, 096 16, 711, 710 18, 128, 068	\$23, 514, 231 35, 121, 324 36, 819, 042 41, 860, 464 45, 691, 867 52, 352, 794	\$2.06 2.49 2.49 2.64 2.73 2.89	1, 149, 699 1, 598, 105 1, 627, 909 1, 307, 666 1, 266, 340 1, 337, 530

<sup>1</sup> Revised figure.

Clays.—Clays produced in 1955 totaled 1.9 million tons valued at \$2 million, an increase of 66,800 tons and \$99,900 in value over 1954. The increased production in 1955 is largely the result of increased cement production. Of the total clay produced, 1,401,222 tons (72 percent) was used in manufacturing cement, and 536,371 tons for brick, tile, heavy clay products, refractories, and lightweight aggregates. In 1955 the plants of 12 companies were in the 9 following counties, in order of output: Wayne, Oakland, Eaton, Shiawassee, Saginaw, Monroe, Lenawee, Clinton, and Gratiot. The average value (partly estimated) of raw clay was \$1.04 per ton in 1955 and \$1.03 in 1954.

Gem Stones.—A small quantity of semiprecious gem stones, chiefly agates, was produced by the collection efforts of members of the Michigan Mineralogical Society. No commercial production was reported in the State.

Gypsum.—Michigan production of crude gypsum in 1955, 1.8 million tons valued at \$5.7 million, increased 68,826 tons (4 percent)

and \$625,037 (12 percent) in value over 1954. Four companies produced from mines in Iosco and Kent Counties. Calcining plants were operated in Grand Rapids in Kent County, National City in Iosco County, and River Rouge in Wayne County. The principal products were plasterboard, lath, exterior sheathing, and plaster. Gypsum was also used as a raw material in manufacturing cement. The average value of crude gypsum in 1955 was \$3.21 per ton compared with \$2.97 per ton in 1954.

Lime.—Three companies produced quicklime and hydrated lime in Bay, Mason, and Menominee Counties from high-calcium limestone quarried in northern Michigan. The lime was used for building, chemical, and industrial purposes. Production in 1955 was nearly 29

percent more than in 1954.

Marl.—Michigan led in calcareous marl production in the United States. Output in 1955—119,313 tons—increased 12 percent over 1954. Virtually all of the marl was sold for agricultural use in neutralizing acid soils. The use of limestone, with a higher neutralizing

value, replaced marl to some extent for this use.

Natural Salines.—Natural brines were produced from wells in Gratiot, LaPeer, Manistee, Mason, and Midland Counties. Bromine and bromine compounds, calcium chloride, calcium-magnesium chloride, magnesium compounds, and potassium salts were produced from the brines in one or more of these counties. Value of the products, other than salt (see section on Salt) was \$34,335,917, an increase of nearly 10 percent over 1954.

Perlite. Crude perlite, produced in Western States, was expanded at a plant in Grand Rapids for use as a lightweight aggregate in

plaster and concrete.

Salt.—Salt was produced from natural well brines in Gratiot, Manistee, Midland, Muskegon, St. Clair, and Wayne Counties and used mostly in manufacturing numerous chemicals and in industry. One underground mine in Wayne County produced rock salt in various sizes and grades. Table salt and stock feed also were important Ten companies ran 11 plants during 1955. Production in 1955 was 5 million tons, a 2-percent decrease compared with 1954. The total value increased sharply because a higher and more realistic value was applied to brines used in manufacturing chemicals. Salt in brines sold and used for manufacturing chemicals represented over

half of production.

Sand and Gravel.—Sand and gravel, produced in nearly every Michigan county (80 of 83) in 1955, increased 16 percent in quantity and nearly 16 percent in value over 1954. As a large part of the output was used in the building and road-construction industries, production tended to be concentrated near centers of population. surrounding the Detroit area, Grand Rapids, and Lansing reported substantial values. The 10 principal commercial producers of sand and gravel were: American Aggregates Corp., Greenville, Ohio; Construction Aggregates Corp., Chicago, Ill.; Grand Rapids Gravel Co., Grand Rapids; Great Lakes Foundry Sand Co. and Koenig Coal & Supply Co., Detroit; Michigan Silica Co., Rockwood; Nugent Sand Co., Inc., Muskegon; Harry Pickitt, Allegan; Lyle J. Walker Sand & Gravel, New Hudson; and Whittaker & Gooding Co., Ypsilanti.

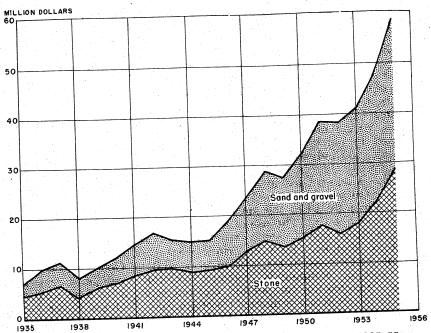


FIGURE 3.—Value of sand and gravel and stone in Michigan, 1935-55.

Stone.—Limestone and dolomite, sandstone, and miscellaneous stone were produced in 1955. Limestone and dolomite contributed the greatest tonnage and value. A small quantity of dimension limestone was produced, but the output was mostly crushed and broken stone. Principal uses of crushed limestone were: Fluxing, 47 percent; concrete aggregate and roadstone, 14 percent; and other chemical and industrial uses, including cement and lime manufacture, 39 per-Production of limestone and dolomite in 1955 was 33,521,638 tons valued at \$28,675,711, an increase of 21 percent in quantity and 32 percent in value over 1955. Principal producers of limestone, in order of value in 1955, were: Michigan Limestone Division, United States Steel Corp., Mackinac and Presque Isle Counties; Inland Lime and Stone Co., Division of Inland Steel Co., Schoolcraft County; Presque Isle Corp., Chemstone Division, Presque Isle County; Drummond Dolomite, Inc., Chippewa County; Wyandotte Chemicals Corp., Alpena County; Wallace Stone Co., Huron County; Michigan Stone Co. and France Stone Co., both of Monroe County; Penn-Dixie Cement Corp., Emmet County; and Michigan Foundation Quarry Co., Wayne County.

A considerably greater quantity of dimension sandstone for use in

construction was produced in Jackson County than in 1954.

TABLE 9.—Sand and gravel, sold or used by producers in Michigan, 1954-55, by classes of operations and uses

		1954		1955			
Class of operation and use		Valu	ıe		Value		
	Short tons	Total	Aver- age	Short tons	Total	Aver- age	
COMMERCIAL OPERATIONS							
Sand: 1		1					
Glass. Molding. Building. Paving. Grinding and polishing. Blast. Engine. Filter. Ground. Railroad ballast. Other. Undistributed 3	1, 117, 737 4, 710, 204 3, 002, 364 (2)	(2) \$1, 273, 601 3, 528, 755 2, 365, 766 (2) (2) (2) (2) (2) (2) (2) (2) (2) (2)	(2) \$1. 14 . 75 . 79 (2) (2) . 77 (2) (2) (2) (2) . 82 1. 72	348, 610 1, 895, 382 5, 237, 547 4, 599, 304 291, 472 4, 380 84, 895 63, 315 16, 233 78, 256 521, 855	\$919, 403 1, 795, 555 4, 102, 520 3, 670, 800 102, 015 25, 010 101, 191 14, 110 129, 155 21, 185 217, 119	\$2. 64 . 94 . 78 . 30 . 31 5. 71 1. 14 . 22 7. 96 . 27 . 42	
Total commercial sand	9, 947, 235	8, 590, 535	. 86	13, 141, 249	11, 098, 063	.84	
Gravel: Building Paying Railroad ballast Other	4, 131, 930 11, 231, 436 284, 306 374, 016	4, 357, 628 9, 072, 018 267, 750 213, 138	1. 05 . 81 . 94 . 57	4, 428, 446 12, 723, 987 283, 761 461, 070	4, 421, 163 10, 195, 155 222, 216 314, 475	1.00 .80 .78	
Total commercial gravel	16, 021, 688	13, 910, 534	. 87	17, 897, 264	15, 153, 009	. 85	
Total commercial sand and gravel	25, 968, 923	22, 501, 069	. 87	31, 038, 513	26, 251, 072	. 85	
GOVERNMENT-AND-CONTRACTOR OPERATIONS Sand:							
Building Paving	8, 284 523, 099	1, 355 196, 424	.16 .38	5, 539 406, 711	1, 662 129, 616	.30	
Total Government-and-contrac- tor sand	531, 383	197, 779	. 37	412, 250	131, 278	. 32	
Gravel: Building Paving	788, 115 <b>4</b> , 752, 218	373, 108 2, 444, 213	. 47 . 51	30, 954 5, 732, 742	9, 286 3, 099, 139	.30	
Total Government-and-contrac- tor gravel	5, 540, 333	2, 817, 321	. 51	5, 763, 696	3, 108, 425	. 54	
Total Government-and-contrac- tor sand and gravel	6, 071, 716	3, 015, 100	. 50	6, 175, 946	3, 239, 703	. 52	
ALL OPERATIONS							
Sand Jravel	10, 478, 618 21, 562, 021	8, 788, 314 16, 727, 855	. 84 . 78	13, 553, 499 23, 660, 960	11, 229, 341 18, 261, 434	. 83 . 77	
Grand total	32, 040, 639	25, 516, 169	. 80	37, 214, 459	29, 490, 775	. 79	

Includes friable sandstone.
 Included with "Undistributed" to avoid disclosing individual company confidential data.
 Includes glass, grinding and polishing, blast, filter, ground, and railroad ballast sand 1954.

TABLE 10.—Dimension stone sold or used by producers, 1951-55, by kinds

Year	Limestone		Sandstone		Total	
I GAI	Short tons	Value	Short tons	Value	Short tons	Value
1951	4, 627 5, 322 4, 849 8, 938 29, 907	\$43, 138 45, 925 53, 425 68, 984 113, 912	984 908 369 3, 524 9, 429	\$4,776 5,126 2,624 31,235 79,410	5, 611 6, 230 5, 218 12, 462 29, 336	\$47, 914 51, 051 56, 049 100, 219 193, 322

TABLE 11.—Crushed and broken limestone sold and used by producers, 1954-55, by uses

		1954			1955	4
Use		Value			Value	
	Short tons	Total	Average per ton	Short tons	Total	Average per ton
Riprap: CommercialNoncommercial	38, 134	\$22, 549	\$0. 59	20, 142 64, 616	\$15, 747 77, 539 13, 657, 112	\$0.78 1.20 .87
Fluxing Concrete aggregate, roadstone, etc.:	10, 815, 128	9, 032, 464	.84	15, 717, 028		1.07
Commercial Noncommercial Railroad ballast	4, 050, 770 227, 725 114, 916	4, 318, 101 249, 502 143, 618	1. 07 1. 10 1. 25	4, 527, 389 191, 135 231, 439	4, 839, 244 155, 850 249, 506	. 82 1. 08
Agriculture Other uses	534, 306 11, 883, 295	485, 252 7, 444, 694	. 63	633, 483 12, 106, 499	8, 954, 300	.97
Total commercial	27, 436, 549	21, 446, 678 249, 502	1.10	33, 235, 980 255, 751	28, 328, 410	.85
Total noncommercial  Grand total	227, 725	21, 696, 180	.78	33, 491, 731	28, 561, 799	.80

### MINERAL FUELS

Natural Gas and Natural-Gas Products.—Natural-gas output (8,300 million cubic feet) increased 19 percent over 1954.

Production was reported from 55 fields,<sup>3</sup> principally in Clare, Craw-

ford, and Isabella Counties. Natural-gas products were produced at about the same rate as in 1954.

Peat.—Although classed as a fuel, peat produced from bogs in Kalamazoo and St. Clair Counties in 1955 was sold as a soil conditioner. Production and sales were about the same as in previous years.

Petroleum.—Petroleum production, 11.3 million barrels in 1955,

decreased 6 percent from the preceding year.

According to the Michigan Department of Conservation, 4 510 wells were completed in 1955; 204 were oil wells, 13 were gas wells, 1 was for a service well, and 292 were dry holes. About half of the production from fields in 39 counties came from wells in 5 counties—Arenac, Bay, Clare, Isabella, and Ogemaw. Fifteen refineries, rated at a capacity of about 150,000 barrels daily, were operated in the State during the year.

Michigan Department of Conservation, Geological Survey Division, Summary of Operations, Oil and Gas Fields, 1955. Lansing, 1956, 38 pp.
 Work cited in footnote 3.

# **REVIEW BY COUNTIES**

Alcona.—E. P. Brady & Co. (Flint), the Federal Forest Service, and the county road commission produced sand and gravel for road construction.

Alger.—Mrs. Hilma Samuelson (Chatham), Duluth, South Shore & Atlantic Railroad Co., and the county road commission produced sand and gravel for use as engine sand, and for building and road construction. The Michigan State Highway Department contracted for road gravel.

Allegan.—L. Z. Arndt (Fennville) and Gerald Arnsman and Emil Pavlak (Hopkins) produced marl for agricultural use. Sand and gravel for building and road construction was produced by Cleo L. Arndt and H. R. Vernon (Fennville), Ralph W. Bodine (Otsego), Huitt & Son, Harry Pickitt, and Ben Waanders (Allegan), West Shore Construction Co. (Zeeland) from pits near Dunningville and Grand Junction, John G. Yerington (Benton Harbor), and the county road commission. Petroleum and natural gas were produced.

TABLE 12.—Value of minerals produced in Michigan, 1954-55, by counties, and principal minerals produced in 1955

County	1954 2	1955	Minerals produced in 1955 in order of value			
Alcona	\$38, 437	\$05 440	G			
Alger	60,000					
Allegan	001 000					
Albena	01 000 700					
Antrim	21, 680, 563	28, 022, 365	Cement, stone, sand and gravel			
Arenac	59, 915		l band and gravel			
Raraga	5, 695, 058	4, 637, 062	Petroleum, stone, sand and gravel.			
Baraga	618, 149	1, 071, 130	I If Off Ore, Sand and orayol			
Barry	287, 256	322, 884	Sand and gravel, petroleum, marl.			
Bay	6, 813, 760	7, 997, 665	Cement, petroleum, lime.			
Benzie	15 000	17, 930	Sand and gravel.			
perrien i	450 100	271, 306	Sand and gravel.			
		126, 022	Sand and gravel, petroleum.			
zamonu i	004 004	228, 274	Sand and gravel, marl.			
		188, 329	Do.			
			Do.			
		33, 564	Sand and gravel.			
		33, 006	Sand and gravel, stone.			
lare	2, 922, 200	(3)	Stone, sand and gravel.			
linton	3, 167, 458	3, 344, 139	Petroleum, sand and gravel			
rawford	260, 604	323, 374	Sand and gravel, clays.			
rawford	852, 599	732,090	Petroleum, sand and gravel.			
Pelta	115, 377	149, 371	Sand and gravel.			
Dickinson	435, 540	342, 256	Iron ore, sand and gravel, stone.			
	369, 410	435, 024	Sand and gravel, stone, clays.			
шшес	(3)	(3)	Cement, stone, sand and gravel.			
redesee	773, 648	678, 219	Sand and gravel, petroleum.			
uadwin i	1, 399, 928	1, 263, 853	Petroleum, sand and gravel.			
ogebic	16, 454, 125	23, 291, 941	Trop ore gord and gravel.			
ogebic rand Traverse	(3)	67, 998	Iron ore, sand and gravel, stone.			
ratiot	(3)	(3)	Sand and gravel.			
		(9)	Salines, salt, petroleum, sand and gravel,			
illsdale	537, 228	F10 000	Clays.			
Oughton :	13, 949, 082	510, 809	Sand and gravel.			
uron.	10, 949, 002	38, 051, 896	Copper, silver, sand and gravel, stone.			
gham	657, 404	(3)	Stolle, Sand and gravel, netroleum			
nia	582, 539	646, 306	Sand and gravel			
SCO	141, 051	130, 777	Sand and gravel, petroleum			
00	4, 065, 776	(3)	Gypsum, stone, sand and gravel.			
on	25, 626, 888	31, 247, 129	Iron ore, sand and gravel, stone.			
abella	4, 230, 054	4, 038, 519	Petroleum, sand and gravel.			
CKSOII	387, 721	472, 400	Sand and gravel stone metal			
alamazoo i	553, 865	584, 567	Sand and gravel, stone, petroleum, marl.			
alkaska	231, 180	174, 072	Sand and gravel, marl, peat, petroleum.			
BU6	2, 978, 385	3, 370, 505				
Ke	79. 045	95, 061	Sand and gravel, gypsum, petroleum, marl. Sand and gravel, petroleum.			
loeer i	375, 315	90, UOI	Sand and gravel, petroleum.			
elanau	27, 634	333, 527				
	21,034	50, 327	Sand and gravel.			

See footnotes at end of table.

TABLE 12.—Value of minerals produced in Michigan, 1954-55, by counties, and principal minerals produced in 1955—Continued

County	1954 2	1955	Mineral produced in 1955 in order of value			
Lenawee	(3)	(3)	Cement, sand and gravel, clays, petroleum.			
Livingston	\$2, 644, 363	\$3, 370, 581	Sand and gravel.			
Luce		36, 685	Do.			
Mackinac		(3)	Stone, sand and gravel.			
Macomb	1, 131, 612	1, 274, 801	Sand and gravel.			
Manistee		8, 549, 216	Salt, salines, sand and gravel.			
Marquette		49, 435, 661	Iron ore, sand and gravel, stone.			
Mason		5, 321, 007	Salines, petroleum, lime, sand and gravel.			
Mecosta	593, 914	478, 100	Petroleum, sand and gravel, marl.			
Menominee		841, 499	Lime, sand and gravel.			
Midland	(3)	(8)	Salines, salt, petroleum, sand and gravel.			
Missaukee	1, 792, 101	1, 613, 162	Petroleum, marl.			
Monroe	1, 141, 128	1, 415, 547	Stone, petroleum, clays.			
Montcalm		1, 107, 773	Petroleum, sand and gravel.			
Montmorency		(8)	Sand and gravel.			
Muskegon	862, 605	1, 650, 251	Sand and gravel, salt, petroleum.			
Newaygo	728, 109	679, 359	Petroleum, sand and gravel.			
Oakland		5, 975, 531	Sand and gravel, clays, petroleum.			
Oceana	2, 655, 812	1, 985, 460	Petroleum, sand and gravel.			
Oromaw		2, 702, 964	Petroleum, sand and gravel, marl.			
Ögemaw Osceola	2, 337, 077	2, 055, 454	Do.			
Oscoda	15, 445	15, 012	Sand and gravel, petroleum.			
Otsego	33, 485	55, 691	Sand and gravel.			
Ottawa	649, 784	1, 588, 103	Sand and gravel, petroleum, marl.			
Presque Isle	(*)	(3)	Stone, sand and gravel.			
Roscommon	1, 210, 450	1, 294, 588	Petroleum, sand and gravel. Petroleum, clays, sand and gravel.			
Saginaw	89, 847	137, 435	Salt, cement, peat, sand and gravel.			
St Clair	10, 376, 032	13, 104, 478	Sand and gravel, marl.			
St Joseph	192, 000	172, 099	Sand and gravel, mari.			
Sanilac	110, 012	98, 774	Stone, sand and gravel.			
Schoolcraft	3, 0/4, 444	4, 081, 756	Sand and gravel, clays.			
Shiawassee	160, 959	201, 097				
Tuscola	1, 021, 205	1, 306, 500				
Van Buren	303, 044	313, 736				
Washtenaw	1, 840, 497	1, 583, 985				
Wayne	28, 939, 571	29, 470, 153	petroleun.			
		40.070				
Wexford	(3)	42, 079				
Undistributed 5	50, 692, 034	67, 530, 624				
		363, 786, 570				
Total	279, 940, 444	303, 780, 970				

 <sup>1</sup> Gem stones, natural gas, and natural-gas liquids not listed by counties as data are not available, value included with "Undistributed."
 2 Revised figures.

<sup>3</sup> Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

Includes value of mineral production in Keweenaw and Ontonagon counties.
 Includes gem stones, natural gas, natural-gas liquids and values indicated by footnote 3.

Alpena.—Alpena County led in cement production. Huron Portland Cement Co. at Alpena produced portland and masonry cements and limestone for manufacturing cement. Wyandotte Chemicals Corp., Wyandotte, produced crushed limestone for manufacturing alkali and cement. E. P. Brady & Co., Flint, and Gilliland Gravel Co., Alpena, The Michigan State Highway produced gravel for road construction. Department contracted for road gravel.

Antrim.—A. L. Dyer & Sons, McBrides, and the county road commission produced gravel for road construction. Michigan State Highway Department and the county road commission contracted for

Arenac.—The county road commission produced limestone for use as riprap. Sand and gravel for building and road construction was produced by Eastman Gravel Pit and Shirley Van Deusen, Standish. The county led in petroleum production.

Baraga.—Cleveland-Cliffs Iron Co. produced iron ore and operated the concentrator at the Ohio Mine. I. L. Whitehead Co., Sault Ste. Marie, and the county road commission produced sand and gravel for building and road construction. The Michigan State Highway Department contracted for road gravel.

Barry.—H. A. Carlton Schau, Kalamazoo, produced marl for agri-

Bender Gravel Co. (Hastings), Cole Gravel Co. (Dorr), A. L. Dyer & Sons (McBrides), Nashville Gravel Co. and A. D. Pennock (Nashville), Harry Pickitt (Allegan), John G. Yerington (Benton Harbor), and the county road commission produced sand and gravel for building, road construction, and miscellaneous purposes. The Michigan State Highway Department contracted for road gravel. Petroleum was produced.

Bay.—Aetna Portland Cement Co. at Bay City produced portland and masonry cements, and limestone for manufacturing cement. Limestone for manufacturing lime and quicklime for industrial use, was produced by Monitor Sugar Division, Robert Gage Coal Co., at The county ranked fifth in petroleum production.

Benzie.—The county road commission produced road gravel. Berrien.—Ireland & Lester Co. (St. Joseph), Harold Kiell (Niels), Fred M. Ott (Bridgman), Producers Core Sand Corp. of Michigan City (Indiana, at Sawyer), Wakeman & Neva Ryno (Coloma), and John G. Yerington (Benton Harbor), produced molding sand and sand and gravel for building and road construction. Petroleum was produced.

Branch.—Harry Pickitt (Allegan), H. Stukey (Coldwater), Union City Gravel Co. (Union City), and the county road commission produced sand and gravel for building, road construction, and miscellaneous purposes. The county road commission also contracted for Case Bros., Sherwood, worked the Dunn, Himebaugh, and

Lepird marl pits.

Calhoun.—Producers of marl for agricultural use were: Carl Avery, Athens, Pullman pit; Case Bros., Sherwood, Arthur Casey and Edward Casey pits; and Arnie Delebaugh and Clyde M. Reed, Union City. John Alexander, Sr. (Marshall), Battle Creek Gravel Co. (Battle Creek), Emil Combs (Tekonsha), Harry Pickitt (Allegan), and the city engineer (Battle Creek) produced sand and gravel for building and road construction. Contracts for sand and gravel were placed by the county road commission and the city engineer, Battle Creek.

Cass.—Marl for agricultural use was produced by Grant Brizendine, Edwardsburg, at the Thulin pit and Frank R. Hixon, Marcellus. Nieb Concrete Products Co. (Niles), Harry Pickitt (Allegan), John G. Yerington (Benton Harbor in Lagrange Township), and the county road commission produced sand and gravel for building and road The Michigan State Highway Department contracted construction.

for paving sand.

Charlevoix.—The county road commission produced sand and gravel

for road construction.

Chebovgan.—Afton Stone & Lime Co., Afton, crushed limestone for concrete aggregates. A. L. Dyer & Sons, McBrides, and Hugh H. Mason & Sons, Gaylord, produced sand and gravel for building and road construction. The Michigan State Highway Department contracted for road gravel.

Chippewa.—Limestone produced by Drummond Dolomite, Inc., Sheboygan, Wis., was sold for flux, concrete aggregate, agricultural, chemical, and other uses. Gilliland Gravel Co. (Alpena), I. L. Whitehead Co. (Sault Ste. Marie), and the county road commission produced gravel for road construction. The Michigan State Highway Department contracted for paving sand and gravel.

Clare.—Clare County ranked third in petroleum production (10 percent) and also produced natural gas. The Michigan State High-

way Department contracted for road gravel.

Clinton.—C. M. McKee, Grand Ledge, produced clay for heavy clay products. Boichot Concrete Products Corp. (Lansing), E. P. Brady & Co. (Flint), H. L. Martin Gravel Co. (Westphalia), Harry Pickitt (Allegan), Tabor Co. (Grand Rapids), Walling Gravel Co. (St. Johns), and the county road commission produced sand and gravel for building, road construction, and miscellaneous purposes. The Michigan State Highway Department contracted for road gravel.

Crawford.—Crawford County produced natural gasoline, natural gas, and petroleum. A. L. Dyer & Sons, McBrides, and the county road commission produced sand and gravel for road construction.

Delta.—Bichler Bros. (Escanaba), Cloverland Milling & Supply Co. and Days River Sand & Gravel Co. (Gladstone), United States Forest Service, and the county road commission produced sand and gravel for building and road construction. The Michigan State Highway Department and United States Forest Service contracted for

road gravel.

Dickinson.—Globe Iron Co. at the Globe-Cornell mine and Jackson Iron & Steel Co. at the Bradley mine worked open pits. Champion, Inc. (Iron Mountain, with plants in Loretto, Menominee, and Iron Mountain), Fox Valley Construction Co. (Appleton), and the county road commission produced sand and gravel for railroad ballast, building, and road construction. The Michigan State Highway Department contracted for gravel. Metro-Nite Co., Milwaukee, and Superior Rock Products Co., Sagola, produced limestone for use as concrete aggregate, whiting, and other purposes.

Eaton.—Clay for manufacturing heavy clay products, vitrified pipe, and tile, was produced by American Vitrified Products Co., Cleveland, Ohio, and Grand Ledge Clay Products Co., Grand Ledge. Cheney Limestone Co., Bellevue, produced limestone for use as rubble, concrete aggregate, and for agricultural purposes. Sand and gravel was produced by Pryor Bros. (Charlotte), Vermontville Gravel Co. (Vermontville), and West Shore Construction Co. (Zeeland), for building, filter, road construction, and misclaneous uses. The Michigan State

Highway Department contracted for road gravel.

Emmet.—Penn-Dixie Cement Corp., plant 10, produced portland and masonry cement and limestone for manufacturing cement. The Michigan State Highway Department contracted for road gravel.

Genesee.—Filter sand and sand and gravel for building and road construction were produced by Ferguson Excavating Co. and A. S. Leffler Gravel Co., Davison; Hansen Gravel Co., Flushing; Kurtz Gravel Co., Flint; Mathews Gravel Co., Mount Morris; Otisville Stone Co. of Mount Morris, Otisville; John Post & Sons, Swartz Creek; Saginaw Core Sand Co., Saginaw; and Justus Snelenberger, Burt. Petroleum was produced.

Gladwin.—Gladwin County ranked tenth in petroleum production. The county highway department produced gravel for road construc-The county highway department and the Michigan State

Highway Department contracted for road gravel.

Gogebic.—About 22 percent of the State 1955 iron-ore output came from mines in Gogebic County. Iron ore was produced and shipped by North Range Mining Co. (at the Penokee mine); Oliver Iron Mining Division (at the Geneva mine); Pickands Mather & Co., (at the Anvil-Palms-Keweenaw, Geneva-Newport, Loomis, Newport, Peterson, and Sunday Lake Mines); and Republic Steel Corp. (at the Penokee stockpile). The county road commission produced crushed limestone for concrete aggregates. Ironwood Concrete Products Co. and Lake Superior Gravel Co., Ironwood, and the county road commission produced sand and gravel for building and road construction. The Michigan State Highway Department and United States Forest Service contracted for road gravel.

Grand Traverse.—Paul C. Miller, Sparta, and Peninsula Asphalt & Construction Co., Traverse City, produced gravel for road con-The Michigan State Highway Department contracted for struction.

road gravel.

Gratiot.—Michigan Chemical Corp. produced bromine and bromine compounds, calcium-magnesium chloride, magnesium compounds, and salt from natural wellbrines from the Marshall and Dundee formations at St. Louis. Salt, recovered from the brines by evaporation, was used for table salt, various chemical and industrial purposes, and stock feed. Clay Products Co., St. Louis, produced clay for manufacturing heavy clay products. Roy Dayringer and North Star Washed Sand & Gravel Co. (Ithaca), A. L. Dyer & Sons (Mc-Brides), Taber Co. (Grand Rapids) and the county road commission produced sand and gravel for building and road construction. Michigan State Highway Department contracted for road gravel. Petroleum and natural gas were also produced.

Hillsdale.—Elliott Ice & Coal Co. and Art Russell's Concrete Products (Hillsdale); Hoover Bros. (Waldron); Northwest Materials, Inc. and Southern Michigan Materials, Inc. (Bryon, Ohio, at Ransom); Bundy Hill Gravel Co. (Somerset Center), and the county road commission produced sand and gravel for building and road construction. The county road commission also contracted for road gravel.

Houghton.—Houghton County ranked third in copper production. Calumet & Hecla, Inc., operated the Centennial and North Kearsarge

Unwatering of the Calumet & Hecla Osceola lode continued during the year. Mining through No. 13 shaft was begun, and production through No. 6 shaft was expected by late 1956. The company continued work at the Tamarack reclamation plant, treating sands from the Ahmeek mill tailing banks. The quantity of copper produced per ton of sand treated increased over the previous year.

Exploration in the Centennial mine revealed a hitherto unknown

The economic value of the ore was being assessed.

A crosscut was driven from the Allouez No. 3 mine to the Allouez conglomerate lode, and areas of good mineralization were reported. The test stoping program in the Mass, Mich., area in adjoining Ontonagon County, continued to show ore of better than the average

grade now being mined in the Calumet district.

Quincy Mining Co. reclamation plant on Torch Lake, on a 24-hourday schedule, handled nearly 900,000 tons of stamp sands, slightly less than in 1954. The smelter at Hancock was operated continuously throughout the year.

Copper Range Co. operated the Champion mine and shipped over 400,000 tons of ore to the Freda concentrator. Shipments were 20 percent higher than in 1954. Copper content of the ore was lower than in previous years, due to dilution in stope rock and use of low-

grade ore from development.

A program for rehabilitating equipment at the Freda concentrator

neared completion at the end of 1955.

Miscellaneous stone was produced by the county road commission for use in road construction. Copper Range Railroad Co. produced engine sand; Duluth, South Shore & Atlantic Railroad mined sand for railroad ballast; and United States Forest Service produced gravel for road construction. The Michigan State Highway Department contracted for sand and gravel.

Huron.—Limestone for use as rough and cut stone and crushed limestone for flux, concrete aggregate, railroad ballast, and agricultural use was produced by Wallace Stone Co., Bayport. E. P. Brady & Co. (Flint), Wagner Sand & Gravel (Harbor Beach), and the county road commission produced sand and gravel for building, road construction,

and miscellaneous purposes. Petroleum was produced.

Ingham.—Sand and gravel for building, railroad ballast, road construction, and miscellaneous purposes was produced by Angell Construction Co., East Lansing; Cheney Gravel Co. and Delhi Gravel Co., both of Holt; Ferris Co., Inc., S. E. Ketchum & Sons, and Mason Gravel Co., Mason; West Lansing Gravel Co., Lansing; and the county road commission. The county road commission contracted for sand and gravel.

Ionia.—Harry Pickitt (Allegan), Taber Co. (Grand Rapids), and the county road commission produced sand and gravel for road con-

struction. Petroleum was produced.

Iosco.—Mineral commodities produced in the county were gypsum, limestone, and sand, and gravel. Crude gypsum was produced by National Gypsum Co., Buffalo, N. Y., at National City and the United States Gypsum Co., of Chicago, Ill., at Alabaster. National Gypsum Co. calcining and board plant produced wallboard, lath, exterior sheathing, and various prepared plasters. Limestone was produced by the county highway department for road construction. United States Forest Service produced gravel for road use.

Iron.—Iron County ranked second in iron-ore production in Michigan The following companies mined in the county: M. A. Hanna Co.-Cannon, Hiawatha No. 1 and 2, Homer-Minckler-Cardiff, and Wauseca mines; Pickands Mather & Co.—Buck Unit, Lawrence mines, and the Fortune Lake open pit; Republic Steel Corp.— Mononga Hela and Tobin-Columbia mines; Inland Steel Co.-Bristol and Sherwood mines; North Range Mining Co.—Book and Warner mines; and Cleveland-Cliffs Iron Co.—Spies mine. Limestone for rubble, concrete aggregate, and miscellaneous purposes was produced by Caspian Lumber & Coal Co., Caspian. Champion, Inc.

(Iron Mountain), United States Forest Service, and the county road commission produced sand and gravel for building, railroad ballast and road contruction. The Michigan State Highway Department and United States Forest Service contracted for road gravel.

Isabella.—Isabella County ranked second in the State in petroleum production. Natural gasoline and natural gas were also produced. Sand and gravel for building, road construction, and miscellaneous purposes were produced by Denslow & Denslow, Weidman; A. L. Dyer & Sons, McBrides; George Hubscher & Son of Mount Pleasant, in Deerfield and West Township; and C. Utterback, Mount Pleasant.

Jackson.—Marl for agricultural use was produced by Barnes & Van Antwerp, Horton. John C. Jeffrey, Parma, produced crushed limestone for concrete aggregate and agricultural use. Original Sandstone Quarry and Ray's Stone Quarry of Napoleon produced sandstone for use in rubble, rough construction and flagging. Star Sandstone Co., Napoleon, produced sandstone for use as rough and dressed architectural stone and flagging and ground sandstone for foundry use. Klumpp Bros. (Chelsea), Edward Palmer & Son and Gordon D. Stevick (Jackson), and the county road commission produced sand and gravel for building and road construction. The Michigan State Highway Department contracted for road gravel. Petroleum was produced.

Kalamazoo.—Marl for agricultural use was produced by Lawrence Hayward, Scotts; Claude Mastin, Climax; and Dan Slack, Kalamazoo. Cravens Peat Moss, Kalamazoo, produced peat, which was used for agricultural purposes. American Aggregates Corp., of Greenville, Ohio, Gravel Producers, Inc., and Casper Haas Co. (all of Kalamazoo), Paul C. Miller (Sparta), and Harry Pickitt (Allegan) produced sand and gravel for building, railroad ballast, and road construction. The city engineer of Kalamazoo and Michigan State Highway Department

contracted for road gravel. Petroleum was produced.

Kalkaska.—The county road commission produced sand and gravel for road construction. Petroleum and natural gas were produced.

Kent.—Certain-teed Products Corp., of Ardmore, Pa., and Grand Rapids Plaster Co., Grand Rapids, produced crude gypsum in Kent County and manufactured wallboard, lath, exterior sheathing, and prepared plasters at calcining and board plants. Marl for agricultural use was produced by Mathew J. Brown, Byron Center. The county ranked fourth in sand and gravel production; more than 11/2 million tons was produced in 1955. Principal producers were: Chesapeake & Ohio Railway Co., Detroit; Coit Avenue Gravel Co., Edward De Vries & Sons, Grand Rapids Gravel Co., (three plants in operation), Grande Brick Co., Pekaar & Van Doorn, Riverside Sand & Gravel Co., and Harry Zeeff Sons Gravel Co., all of Grand Rapids; Lowell Gravel Co., Lowell; Harry Pickitt, Allegan; H. F. Postma Gravel Co., Grandville; West Shore Construction Co., Zeeland; and the county road commission. Some ground sand for filter and foundry use was produced, although most production was used for building and road construction. The Michigan State Highway Department contracted for road gravel. Gregg Froducts Co. expanded crude perlite, obtained in Western States, for use as lightweight aggregate and as a plaster admixture. Petroleum and natural gas were produced.

Keweenaw.—Keweenaw County ranked second in copper production in 1955. Calumet & Hecla, Inc., operated the Ahmeek and Allouez, Douglas, Iroquois, and Seneca No. 2 mines and the Ahmeek mill. Fox Valley Construction Co., Appleton, and the county road commission produced gravel for road building.

Lake.—Petroleum and sand and gravel were produced. Tabor Co., Grand Rapids produced road gravel from the Latin pit near Chase; United States Forest Service and the county road commission

produced paving sand and gravel. Petroleum was produced.

Lapeer.—Wilkinson Chemical Co., Mayville, produced calcium-magnesium chloride. Gilliland Gravel Co. (Alpena), Pine Sand & Gravel Co. (Lapeer), and the county road commission produced sand and gravel for glass sand and road building.

Leelanau.—The county road commission produced paving gravel and the Michigan State Highway Department contracted for road

gravel.

Lenawee.—Consolidated Cement Corp. produced limestone for cement manufacture and portland and masonry cement at Cement City. Comfort Brick & Tile Co., Tecumseh, produced clay for manufacturing heavy clay products. Sand and gravel for building, road construction, and miscellaneous purposes was produced by the following: Don Bills, Hudson; Donald F. Clark, Morenci, at the Stetton and Woerner pits; Cy Page, Manitou Beach; Harry Pickett, Allegan; Porter Sand & Gravel Co. and Tecumseh Gravel Co., Tecumseh; Stamm Bros. Gravel Co. and John Woerner, Adrian; and the county road commission. The county road commission and Michigan State Highway Department contracted for road gravel. Petroleum was produced.

Livingston.—Livingston ranked second in sand and gravel production in 1955. American Aggregates Corp., of Greenville, Ohio (from a pit near Brighton), D. & J. Gravel Co. (Fowlerville), Van E. Dailey (Howell), and Harry Pickitt (Allegan) produced sand and gravel for building and road construction. The Michigan State

Highway Department contracted for road gravel.

Luce.—Gravel for road construction was produced by I. L. Whitehead Co., Sault Ste. Marie, and the county highway commission. The Michigan State Highway Department contracted for road sand.

Mackinac.—Michigan Limestone Division and U. S. Steel Corp. (Detroit), and the Michigan State Highway Department produced limestone for flux, concrete aggregate, and agricultural use. Gilliland Gravel Co. (Alpena), Mike Mangene (Cedarville), Lawrence Tamlyn (St. Ignace), and the Duluth, South Shore & Atlantic Railroad Co. produced sand and gravel for building, railroad ballast, and road construction. The Michigan State Highway Department contracted for road gravel.

Macomb.—Over 1½ million tons of sand and gravel was produced in Macomb County. Nearly two-thirds of the output was used in building construction and the remainder for highway use. Producers were: Advance Building Materials Co., Inc., Great Lakes Gravel Co., Macomb Sand & Gravel, Michigan Sand & Gravel, and Morgan Sand & Gravel Co., all of Utica; Daniel J. Bollig, Mount Clemens; Hygrade

Sand & Gravel and Smith Sand & Gravel Co., Romeo; Fred Kaatz, Richmond; Maertens Sand & Gravel Co., Grosse Pointe; Louis Marsack & Sons, St. Clair Shores; Ray Industries, Inc., Oxford; Bernie Rief, Rosteck Contractors, Fraser; S. K. Rogers, New Baltimore; Underwood Sand & Gravel Co., Detroit; and the county road commission. The county road commission and the Michigan State

Highway Department contracted for road gravel.

Manistee. Elemental bromine, bromine compounds, magnesium compounds, salt, and sand and gravel were the mineral products of Manistee County. The Morton Salt Co. plant at Manistee produced bromine compounds, magnesium compounds, and evaporated salt. Great Lakes Chemical Corp. and the Michigan Chemical Corp. of St. Louis produced elemental bromine from well brines at Filer City and Eastlake, respectively. Standard Lime & Stone Co. produced refractory magnesia at Manistee. Salt from well brines was produced by the Manistee Salt Works, Manistee. Frank L. Gauthier (Onekama), Taber Co. (Grand Rapids), Sand Products Corp. of Detroit (Manistee), United States Forest Service, and the county road commission produced building, paving, molding, grinding, and polishing sand and gravel for building and road construction. Michigan State Highway Department contracted for road gravel.

Marquette.—Marquette County led the State in iron-ore production. The following companies mined in the county in 1955: Cleveland-Cliffs Iron Co., Athens & Bunker Hill, Cambria-Jackson, Cliffs Shaft, Humboldt, Lloyd, Maas, Mather and Tilden open pits; M. A. Hanna Co. (Richmond Iron Co.); Richmond open pit; Inland Steel Co., Greenwood and Morris mines; Jones & Laughlin Steel Corp., Tracy mine; North Range Mining Co., Blueberry and Champion mines; and Pickands Mather Co., Volunteer-Maitland mine. A. Lindberg & Sons. Inc., Ishpeming, produced miscellaneous stone for concrete aggregate. Champion, Inc. (Iron Mountain), A. Lindberg & Sons, Inc. (Ishpeming), Lake Superior & Ishpeming Railway Co., Michigan State Highway Department, and the county road commission produced sand and gravel. Sand was produced for engine, building, and paving use and gravel for railroad ballast, building, and road construction.

Mason.—The minerals produced were: Bromine, calcium chloride,

magnesium chloride, magnesium compounds, lime, peat, petroleum, and sand and gravel. Dow Chemical Co. produced bromine, calcium chloride, lime, magnesium chloride, and magnesium compounds at Ludington and processed limestone for lime manufacture. Peat was produced by Irving L. Pratt & Son, Scottville. The Michigan State Highway Department and county road commission produced sand and gravel for road purposes. The county ranked eighth in petroleum

production.

Mecosta.—Minerals produced were marl, petroleum, natural gas, and sand and gravel. Marl was produced by Wilson Frost, Blanchard, A.L. Dyer & Sons (McBrides), Steve Lyle Sand & Gravel (Big Rapids), Paul C. Miller (Sparta), and the county road commission produced gravel for road construction.

Menominee.—Limestone Products Co., Menominee, produced quicklime and hydrated lime for chemical and industrial use, and limestone for lime manufacture. Champion, Inc. (Iron Mountain),

Walsh Sand & Gravel Co. (Menominee), and the county road commission produced sand and gravel for building and road construction. The Michigan State Highway Department contracted for road gravel.

Midland.—Dow Chemical Co. at Ludington and Midland produced elemental bromine, bromine compounds, calcium chloride, calciummagnesium chloride, magnesium compounds, potassium salts, salt brine for manufacturing chemicals, and sand and gravel from brine obtained at wells near the plant. Fisher Sand & Gravel Co. (Midland), Saginaw Core Sand Co. (Saginaw), and the county road commission produced molding sand and gravel for road construction. Petroleum, natural gas, and natural gasoline were produced.

Missaukee.—C. Stanley Hooker, Cadillac, produced marl for The county ranked ninth in the production of agricultural use. petroleum. Natural gasoline and natural gas were also produced.

Monroe.—Clay for pottery and stoneware was produced by F. W. Ritter & Sons Co., Inc., South Rockwood. France Stone Co. of Toledo, Ohio, and Michigan Stone Co., Ottawa Lake, produced limestone for use as riprap, concrete aggregate, railroad ballast, and agricultural purposes. Limestone for road construction was produced by and for the county highway commission. Petroleum was produced.

Montcalm.—Frank H. Stoerk, Pierson, and the county highway commission produced sand and gravel for building and road construction. The Michigan State Highway Department contracted for road

gravel. Petroleum was produced.

Montmorency.—Gilliland Gravel Co., Alpena, and the county road

commission produced road gravel.

Muskegon.—Hooker Electrochemical Co., Niagara Falls, N. Y., produced salt for chemical use at its plant in Montague utilizing artificial brines from wells in the Salina formation. Molding and engine sand and road gravel were produced by Nugent Sand Co., Inc. (Muskegon), Harry Pickitt (Allegan), and Sand Products Corp. of Detroit (Manistee). Petroleum and natural gas were produced.

Newaygo.—Petroleum, natural gas, and sand and gravel were the mineral products of Newaygo County. Sand and gravel for building and road construction were produced by A. L. Dyer & Sons (Mc-Brides), K. & V. Gravel Co. (Fremont), Paul C. Miller (Sparta), Harry Pickitt of Allegan (from a pit near Hesperia), West Shore Construction Co. (Zeeland), and United States Forest Service. The Michigan State Highway Department contracted for road gravel.

Oakland.—Natco Corp. of Pittsburgh, Pa., produced clay for manufacturing heavy clay products at its Birmingham plant. Over 6 million tons of sand and gravel was produced in the county. About 30 percent was used in building construction and the remainder for highway use, railroad ballast, and miscellaneous purposes. ducers were: American Aggregates Corp. of Greenville, Ohio; Avon Asphalt & Gravel Co., Kemler Bros., Rochester; Floyd Beardslee, and Slaters Bald Mountain Gravel Pit, Pontiac; Benjamin Pit, Farmington; Dachille Trucking Co. of Detroit, Farmington and Sterling pits; Foley & Beardslee and F. S. Ward, Clarkston; Holly Sand & Gravel Co. and Koan Gravel Co., Holly; John R. Sand & Gravel Co., Lake Orion; Koenig Coal & Supply Co., of Detroit at Oxford; Mickelson Bros., Oxford; Paul C. Miller, Sparta; Oakland Sand & Gravel Co., Walled Lake; Underwood Sand & Gravel Co., Detroit; Lyle J. Walker

Sand & Gravel, New Hudson; White Lake Gravel, Inc., Clauson; and the county road commission. The Michigan State Highway Department and Pontiac City Engineer contracted for sand and gravel. Petroleum was produced.

Oceana. Oceana County ranked sixth in petroleum production. West Shore Construction Co., Zeeland, produced road gravel from a pit near Hesperia. The Michigan State Highway Department

contracted for road gravel.

Ogemaw.—Ogemaw County was fourth in petroleum production. Sand and gravel were produced for road purposes by E. P. Brady & Co., of Flint, and Walter Rosevear Pit at West Branch, and the county road commission. Marl for agricultural use was produced by Ehinger Bros., West Branch.

Ontonagon.—Ontonagon County led the State in copper production. White Pine Copper Co., a wholly owned subsidiary of Copper Range

Co., produced copper and silver.

Mine development continued during the year, and in October fullscale work was begun with approximately 500 personnel on a 6-dayweek schedule.

The mill was in operation continuously during the year, treating over 3.5 million tons of ore and producing 109 thousand tons of concentrate.

Work at the smelter was begun in January. Many obstacles and problems inherent to bringing a new smelter into full production were overcome. Continuing investigations and experiments in metallurgical problems resulted in increased smelting rates and longer furnace campaigns.

Fox Valley Construction Co., Appleton, and the county road commission produced sand and gravel for road use. The Michigan State

Highway Department contracted for road gravel.

Osceola.—Osceola County ranked sixth in petroleum production. Natural gas was also produced. C. Stanley Hooker, Cadillac, produced marl for agricultural use at the Evert, McBain, and Tustin Wallace Stone Co., Bay Port, produced sand and gravel for road construction.

Oscoda.—Gilliland Gravel Co., Alpena, and United States Forest rvice produced paving gravel. The Michigan State Highway Service produced paving gravel. Department contracted for road gravel. Petroleum was produced.

Otsego.—Hutckins Sand & Gravel Co. (Gaylord), Harry Pickitt (Allegan), and the county road commission produced sand and gravel for building and road construction. Some natural gas was also produced.

Ottawa.—Marl for agricultural use was produced by Ralph Meyers, West Olive, and Wierenga Bros., Spring Lake. Molding sand, engine sand, and sand and gravel for building, road construction, and miscellaneous purposes was produced by Construction Aggregates Corp. of Chicago at Grand Haven; Thomas F. Johnston, Standard Sand Co., Grand Haven; Henry De Went, Hudsonville; William Huizenga and West Shore Construction Co., at the Diendorf and Vereeke pits, both of Zeeland; and Harry Pickitt, Allegan. Petroleum and natural gas were produced.

Presque Isle.—Michigan Limestone Division of United States Steel Corp., Detroit, produced crushed limestone for flux, concrete aggregate, agricultural use, cement and lime manufacture, and various chemical and industrial uses at Rogers City—one of the largest operations of its kind in the United States. Onaway Stone Co. of Onaway quarried limestone for use as rubble, flagging, house veneer, and rough construction stone. Presque Isle Corp., operated by Chemstone Corp., Cleveland, produced crushed limestone for flux, concrete aggregate, and cement and lime manufacture. Straits Aggregate & Equipment Corp. of East Tawas produced sand and gravel for building, paving, railroad ballast, and miscellaneous purposes at Millersburg. Road gravel was produced by E. P. Brady & Co., Flint, and Gilliland Gravel Co., Alpena. The Michigan State Highway Department contracted for road gravel.

Roscommon.—Sand and gravel for road construction was produced by Harry Pickitt, Allegan. The Michigan State Highway Department contracted for road gravel. Petroleum, natural gas, and

natural gasoline were produced.

Saginaw.—Minco Products Corp., Saginaw, produced clay for foundry use, insecticides, fertilizer, drilling mud, and miscellaneous purposes. Saginaw Core Sand Co., Saginaw, produced molding sand. The Michigan State Highway Department contracted for road gravel.

Petroleum was produced.

St. Clair.—Limestone for manufacturing cement and portland and masonry cement was produced by Peerless Cement Corp. at Port Huron. Diamond Crystal Salt Co., St. Clair, and Morton Salt Co., Chicago, Ill., at the Marysville plant, produced evaporated salt from well brines. Green Thumb Peat Humus Co., of Sandusky, and Michigan Peat, Inc., produced peat from bogs near Capac. William Click, Sr. (Goodells) and Harry G. Hall and Lakeport Sand & Gravel Co. (Port Huron) produced sand and gravel for building and road construction. The Michigan State Highway Department contracted for road gravel.

St. Joseph.—Marl for agricultural use was produced by Leslie Knox and Kenneth L. Wood, Colon. Sand and gravel for building and road construction was produced by Aggregates Processors, Inc., White Pigeon; Harry Pickitt of Allegan, Howardsville; John G. Yerington, Benton Harbor; and the county road commission. The

county road commission also contracted for road gravel.

Sanilac.—Harold Peters, Decker, produced sand and gravel for building and road construction. Orville J. Fair (Deckerville), Robert Van Camp (Croswell), and the county road commission produced road gravel. The Michigan State Highway Department

and county road commission contracted for road gravel.

Schoolcraft.—Inland Lime & Stone Co., Division of Inland Steel Co., produced limestone for flux, riprap, concrete aggregate, railroad ballast, agricultural use, cement and lime manufacture, and various chemical and industrial uses. E. P. Brady & Co. (Flint), I. L. Whitehead Co. (Sault Ste. Marie), and the county road commission produced road gravel. The Michigan State Highway Department contracted for road gravel.

Shiawassee.—Clays for manufacturing heavy clay products were produced by Michigan Vitrified Tile Co., Findlay, Ohio. Harry Fuoss and Shenk Gravel Co., Durand, and John A. Parks Sand & Gravel, Perry, produced sand and gravel for building, road construction, and miscellaneous purposes. The Michigan State Highway Department contracted for road gravel.

Tuscola.—Anderson Sand & Gravel Co. (Saginaw), Bernthel Sand & Gravel Co. (Reese), Great Lakes Foundry Sand Co. (Detroit), Hile Bros., Peterhans Bros., and Chuck Vaughan (all of Caro), C. R. Hunt and E. L. Schwaderer (Cass City), and the county road commission produced molding sand and sand and gravel for building, road construction, and miscellaneous purposes. The Michigan State Highway Department contracted for road gravel. Some petroleum was also produced.

Van Buren.—Clifford Ellis, Grand Junction, produced marl for agricultural use. Garrett Sand Co. and South Haven Sand Co. (South Haven), Harry Pickitt (Allegan), and John G. Yerington (Benton Harbor) produced sand and gravel for glass and molding sand, railroad ballast, building, road construction, and miscellaneous The Michigan State Highway Department contracted for purposes. road gravel. Petroleum was produced.

Washtenaw. Washtenaw County ranked fifth in sand and gravel production; output was nearly 2 million tons in the county. Producers were: Dexter Gravel Co., Killins Gravel Co., Scio Gravel Co., and Zahns Sand & Gravel, all of Ann Arbor; Kruse Gravel Pit, Lawrence B. Skinner, Lamar Thumm, Whittaker & Gooding Co., and Youngs Sand & Gravel, all of Ypsilanti; Harry Pickitt, Allegan; and the county road commission. The material was used for building, road construction, and miscellaneous purposes. The county road commission also contracted for road gravel. Petroleum and natural

gas were also produced.

Wayne. - Minerals and mineral products produced in Wayne County in 1955 were: Cement, clay, limestone, petroleum, salt, and sand and gravel. Companies producing cement were: Wyandotte Chemicals Corp., operated by Huron Portland Cement Co., Wyandotte, and Peerless Cement Corp., Detroit. Limestone for manufacturing cement was also produced. Michigan Foundation Quarry Co., Trenton, produced crushed limestone for riprap and concrete aggregate. Producers of clays were Clippert Brick Co. (Detroit), Flat Rock Clay Products Co. (Flat Rock), and Light Weight Aggregate Corp. (Livonia) for manufacturing heavy clay products and lighweight aggregates. Salt was evaporated from well brines by Solvay Process Division, Allied Chemical & Dye Corp. at Detroit and by Pennsylvania Salt Manufacturing Co. and Wyandotte Chemicals Corp., both The International Salt Co. underground mine at at Wyandotte. Detroit was the only producer of rock salt in the State. Wayne County led in clay and salt production and ranked second in cement production and third in sand and gravel production. W. L. Emery

Co., and Wolverine Contractors, Inc. (Detroit), Manning & Locklin,

Northville Sand & Gravel Co. and Thompson Sand & Gravel (Northville), Michigan Silica Co. (Rockwood), Moore Bros. Sand & Gravel and Wayne Sand & Gravel Co., (Wayne), and Harry Pickitt (Allegan) produced sand and gravel for glass, molding, blast sand, building, road construction, and miscellaneous purposes. The Michigan State Highway Department contracted for road gravel. Petroleum was also produced.

Wexford.—Sand and gravel was produced by Harry Pickitt (Allegan), Wexford Gravel Co. (Cadillac) and United States Forest Service for building and road construction. The Michigan State Highway

Department contracted for road gravel.

# The Mineral Industry of Minnesota

by Matthew G. Sikich 1



INNESOTA mineral production totaled \$501 million in value for 1955, an increase of 43 percent over 1954 and second to the record high of \$543 million established for the State in 1953. Greater shipments of iron ore in 1955, with slightly higher unit value, accounted for most of the increase. In value the shipments of iron ore represented approximately 93 percent of the total State mineral output for the year. Other increases in value of production over 1954 were reported for portland cement, lime, manganiferous ore, marl, sand and gravel, and tube-mill liners. New records were established in the values of portland cement and sand and gravel, surpassing the previous highs for these commodities set in 1954. Values of clays, grinding pebbles, peat, and stone produced in 1955 were less than in 1954. Values for synthetic manganese ore, masonry cement, and gem stones were included in the State total for the first time.

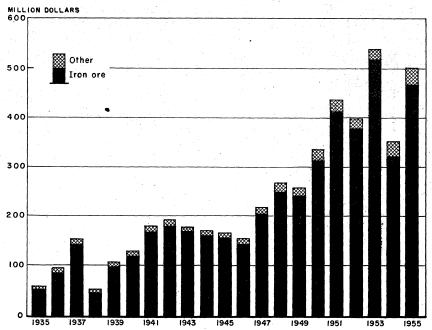


FIGURE 1.—Value of iron-ore shipments and total value of all minerals produced in Minnesota, 1935-55.

<sup>&</sup>lt;sup>1</sup> Commodity-industry analyst, Region V, Bureau of Mines, Minneapolis, Minn.

TABLE 1.—Mineral production in Minnesota, 1954-55 1

	1	954	1955	
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Gem stones	48, 613, 338 504, 057 23, 848, 856 4 2, 629, 456	\$319, 632, 491 (3) 16, 318, 520 4 7, 485, 291 5 8, 204, 448	(2) 69, 419, 334 864, 627 25, 896, 426 4 3, 004, 521	\$175 465, 169, 412 (3) 17, 429, 334 4 7, 042, 840 11, 739, 266 501, 151, 000

<sup>&</sup>lt;sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

<sup>2</sup> Weight not recorded.

weight not recorded.
 Figure withheld to avoid disclosing individual company confidential data.
 Excludes certain stone, included with items that cannot be disclosed.

Revised figure.

Total has been adjusted to eliminate duplicating the value of stone.

# REVIEW BY MINERAL COMMODITIES METALS

Iron Ore.—Shipments of usable iron ore from mines in Minnesota in 1955 totaled 69 million long tons, a substantial increase over the quantity shipped in 1954, chiefly because of the increased demand for ore by the steel industry. The 1955 operating rate of the industry was 93 percent of average rated ingot capacity compared with 71 percent in 1954. During the year blast-furnace capacity increased 1.5 million tons in the United States to a new high of 85.5 million net tons. Production of pig iron in the United States in 1955 reached an alltime high of 76.8 million net tons. Minnesota continued its lead among the iron-ore-producing States and in 1955 supplied 67 percent of the total usable iron produced in the United States.

Iron ore was shipped by 28 companies operating mines in Crow Wing, Fillmore, Itasca, and St. Louis Counties. During the 1955 season, the 2-billionth ton of iron ore was shipped from the famous Mesabi range (in Itasca and St. Louis Counties). Mines in this range accounted for approximately 93 percent of the total usable iron ore shipped from the State in 1955. Shipments from the Cuyuna range in Crow Wing County, 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.

Direct-shipping grades constituted 63 percent of the total usable iron ore (direct-shipping ore plus beneficiated ore) shipped from the State in 1955. Average iron content of usable iron ore produced during the year was 50.65 percent, natural analysis, compared with 50.94 in 1954.

Virtually all iron ore shipped from the State in 1955 was used in making pig iron and steel. A small quantity of crude ore was sold for use in manufacturing iron oxide pigments.

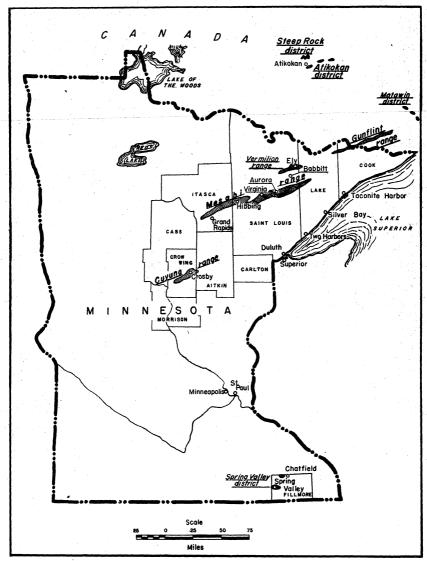


FIGURE 2.—Location of iron-ore ranges in Minnesota, showing State and county boundaries.

Development work was continued on the new taconite industry on the eastern end of the Mesabi range. In October 1955 the Reserve Mining Co., owned jointly by Armco Steel Corp. and Republic Steel Corp., began first operation of the concentrating and pelletizing units at its new taconite plant, the E. W. Davis Works, at Silver Bay, Lake County. Initial annual capacity of this plant was to be 3.75 million long tons of finished pellets, containing an average of approximately 62 percent iron. Design of the plant includes provision for an ultimate

capacity of 10 million tons of pellets yearly. Reserve Mining Co. has operated its smaller taconite plant, with an annual capacity of about 300,000 tons of finished product, at Babbitt since 1952. Crude taconite for both plants is supplied from the open-pit mine near Babbitt, 47 miles inland by company-owned railroad from Silver Bay. The cost of Reserve's entire project was estimated at \$190 million.

Erie Mining Co. continued constructing its large-scale taconite plant near Aurora. The plant was to have an initial rated annual capacity of 7.5 million tons of finished agglomerated-iron concentrate averaging 62 percent iron content. The agglomerated product will be in pellets. Pellets will be hauled from the plant over the company-owned 73-mile railroad to Taconite Harbor, the shipping port on the north shore of Lake Superior in Cook County. Two open pits, which will furnish crude material for the plant, were also under development near the plant site. The plant was expected to be ready for production in 1957. The Erie Mining Co. operated its preliminary taconite plant near Aurora, which started in 1948. The plant had an annual capacity of 200,000 tons of finished product. The company is owned by Bethlehem Steel Corp. (45 percent), Youngstown Sheet & Tube Co. (35 percent), Interlake Iron Corp. (10 percent), and the Steel Co. of Canada (10 percent). Pickands Mather & Co. is the operating agent.

Oliver Iron Mining Division of United States Steel Corp. operated its taconite "pilot" plant and mine, the Pilotac, near Mountain Iron, which was started in 1953. Annual rated capacity of the plant was 500,000 tons. Concentrate produced at the Pilotac plant was hauled approximately 6 miles by rail to the Oliver Extaca plant at Virginia for agglomeration. The Extaca plant had equipment for both sintering and nodulizing. Both products were made. The plant also agglomerated iron-ore fines and concentrate from other company operations.

Average weighted value at the mine of usable iron ore shipped, as reported by producing companies in the State in 1955, was \$6.70 per long ton compared with \$6.57 in 1954. Throughout 1955 Lake Erie base prices were: High Phosphorus, \$10.00 per long ton; Mesabi non-Bessemer, \$10.10; Mesabi Bessemer and Old Range non-Bessemer, \$10.25; and Old Range Bessemer, \$10.40. These prices are for ore delivered at lower Lake ports and are based on the following

TABLE 2.—Dates of first and final cargoes of iron ore shipped from United States upper Lake ports, 1953-55 <sup>1</sup>

Port and dock	19	53	19	54	1955	
	First	Final	First	Final	First	Final
Ashland, Wis.:  C&NW  Soo Line  Duluth, Minn.: DM&IR  Escanaba, Mich.: C&NW  Marquette, Mich.:  DS&A  LS&I  Superior, Wis.:  G. N  N. PSoo Line  Two Harbors, Minn.: DM&IR	Apr. 3 Apr. 7 Mar. 29 Mar. 30 Apr. 3 Apr. 3 Apr. 2 Apr. 1 Mar. 29	Nov. 12 Nov. 13 Nov. 21 Nov. 27 Nov. 7 Nov. 21 Nov. 27 Nov. 21 Nov. 28	May 2 Apr. 24 Apr. 21 Apr. 19 Apr. 30 Apr. 28 Apr. 22 Apr. 20 Apr. 19	Nov. 16 Nov. 10 Oct. 26 Dec. 2 Oct. 30 Nov. 28 Nov. 29 Nov. 26 Nov. 18	Apr. 24 Apr. 24 Apr. 13 Apr. 7 Apr. 22 Apr. 18 Apr. 14 Apr. 21 Apr. 13	Nov. 20 Nov. 28 Nov. 26 Dec. 8 Nov. 13 Dec. 3 Nov. 26 Nov. 26

<sup>1</sup> Source: Skillings' Mining Review.

guaranteed-base analyses; non-Bessemer grades, 51.50 percent iron (natural); Bessemer grades, 51.50 percent iron (natural) and 0.045 percent phosphorus (dry). Premiums and penalties were applied for variations in analyses and physical structure. Non-Bessemer grades constituted the bulk of the tonnage shipped from mines in the State.

Over 97 percent of the iron ore shipped from mines in the State was hauled by rail to ore docks at Duluth and Two Harbors, Minn., and Superior, Wis., for lake shipment to lower Lake ports. remainder was shipped all-rail to consumers. During 1955 Duluth blast furnaces consumed 1,346,738 tons of Minnesota iron ore. 1955 ore-shipping season for both the Duluth and Two Harbors ports opened April 13 and closed November 26. Opening and closing dates for the Superior, Wis., harbor were April 14 and December 3, respectively. Extremely cold weather during the latter part of the 1955 season hampered the movement of ore. Tonnage still on order at

TABLE 3.—Total usable iron ore produced (direct-shipping, concentrate, and sinter), 1884-1955, by ranges, in long tons

Year	Cuyuna	Mesabi	Vermilion	Spring Valley district	Total
1884-1942 1943 1944 1944 1946 1946 1947 1948 1949 1950 1951 1952 1953 1954 1954 1955 Total	29, 642, 750 1, 747, 304 1, 417, 256 1, 784, 010 1, 380, 120 2, 100, 846 2, 380, 571 1, 286, 711 2, 480, 843 2, 651, 724 2, 369, 180 2, 900, 579 1, 497, 296 1, 770, 738	1, 248, 701, 856 65, 334, 939 61, 994, 023 58, 355, 320 46, 678, 679 58, 772, 404 64, 071, 983 52, 551, 346 60, 838, 025 73, 574, 908 59, 370, 538 75, 324, 236 45, 724, 827 64, 860, 493	72, 455, 525 1, 782, 237 1, 481, 007 1, 232, 008 1, 471, 879 1, 381, 327 1, 580, 217 1, 506, 818 1, 573, 741, 967 1, 444, 365	59, 218 220, 427 147, 787 352, 979 102, 158 335, 470 452, 405 476, 242 217, 760 157, 681 270, 670	1, 350, 859, 349 69, 084, 907 64, 878, 095 61, 620, 337 49, 290, 807 62, 492, 916 63, 035, 740 55, 861, 542 565, 234, 555 78, 485, 855 63, 789, 708 80, 085, 614 44, 751, 771 69, 356, 266 2, 187, 827, 462

<sup>&</sup>lt;sup>1</sup>Exclusive after 1905 of iron ore containing 5 percent or more manganese.

TABLE 4.—Production, shipments, and stocks of usable iron ore in 1955, by counties and ranges, in long tons 1

County or range	Stocks Jan. 1, 1955	Production	Shipments	Stocks Dec. 31, 1955	Iron con- tent of pro- duction (in long tons)
County: Crow Wing Fillmore Itasea. St. Louis	215, 946 869, 113 968, 521	2, 770, 738 270, 670 15, 776, 435 50, 538, 423	2, 871, 667 270, 670 15, 934, 749 50, 342, 248	115, 017 710, 799 1, 164, 696	1, 399, 976 130, 046 8, 285, 430 25, 314, 168
Total	2 2, 053, 580	69, 356, 266	69, 419, 334	1, 990, 512	35, 129, 620
Cuyuna Mesabi Vermilion Spring Valley district (Fillmore County)	215, 946 1, 613, 954 223, 680	2, 770, 738 64, 860, 493 1, 454, 365 270, 670	2, 871, 667 64, 807, 125 1, 469, 872 270, 670	115, 017 1, 667, 322 208, 173	1, 399, 976 32, 793, 853 805, 745 130, 046
Total	2 2, 053, 580	69, 356, 266	69, 419, 334	1, 990, 512	35, 129, 620

<sup>&</sup>lt;sup>1</sup> Exclusive of ore containing 5 percent or more manganese.
<sup>2</sup> Revised figure.

TABLE 5.—Production, shipments, and stocks of crude iron ore, in 1955, by counties and ranges, in long tons 1

County or range	Stocks.	Produ	action	Ship	Stocks,	
	Jan. 1, 1955	Under- ground	Open pit	Direct to consumers	To beneficiation plants	Dec. 31, 1955
County: Crow Wing	51, 502	296, 255	3, 285, 946 415, 002	1, 495, 140	2, 106, 751 415, 002	31, 812
ItascaSt. Louis	672, 817	2, 204, 545	32, 007, 411 56, 393, 130	1, 208, 533 40, 934, 597	30, 760, 790 17, 451, 296	38, 088 884, 599
Total	724, 319	2, 500, 800	92, 101, 489	43, 638, 270	50, 733, 839	954, 499
Range: Cuyuna Mesabi Vermilion Spring Valley district	51, 502 449, 137 223, 680	296, 255 750, 180 1, 454, 365	3, 285, 946 88, 400, 541	1, 495, 140 40, 673, 258 1, 469, 872	2, 106, 751 48, 212, 086	31, 812 714, 514 208, 173
(Fillmore County)			415, 002		415, 002	
Total	724, 319	2, 500, 800	92, 101, 489	43, 638, 270	50, 733, 839	954, 499

<sup>1</sup> Exclusive of ore containing 5 percent or more manganese.

TABLE 6.—Salient statistics of iron ore shipped from mines in Minnesota, 1946-55, in long tons 1

	Crude ore		Total	Proportion of beneficiated		
Year	to concen- trators	Sinter	Other	Total	usable ore <sup>2</sup>	to total usable ore (percent)
1946	19, 808, 661	96, 350	11, 421, 034	11, 517, 384	49, 055, 340	23. 48
1947	26, 841, 902	295, 045	14, 972, 344	15, 267, 389	62, 436, 102	24. 45
1948	28, 176, 320	256, 000	15, 997, 641	16, 253, 641	67, 923, 237	23. 93
1949	24, 941, 064	260, 403	14, 091, 248	14, 351, 651	55, 943, 714	25. 65
1950	36, 334, 262	253, 452	18, 525, 065	18, 778, 517	64, 538, 759	29. 10
1951	43, 972, 058	194, 971	21, 575, 427	21, 770, 398	78, 164, 527	27. 85
1952	36, 812, 301	781, 459	18, 326, 238	19, 107, 697	63, 906, 069	29. 90
1953	49, 924, 037	1, 080, 413	25, 097, 519	26, 177, 932	80, 533, 670	32. 51
1954	38, 469, 805	1, 335, 379	17, 859, 191	19, 194, 570	48. 613, 338	39. 48
1955	50, 733, 839	1, 793, 125	23, 987, 939	25, 781, 064	69, 419, 334	37. 14

Exclusive of ore containing 5 percent or more manganese.
 Direct-shipping and beneficiated ore.

the end of the season could have been shipped had weather conditions been more favorable.

Detailed Minnesota iron-ore-mining industry information was pub-

lished in The State Mining Directory.<sup>2</sup>

Manganese Ore.—Manganese Chemicals Corp. continued to manufacture manganese products from Cuyuna-range ores during 1955 at its plant near Riverton. In addition to manganese carbonate, nodulized concentrate containing about 65 percent manganese and manganese dioxide were produced. Total value of sales of these products was included in the State total for the first time in 1955. Construction of the plant was completed in 1953, with assistance of a loan from the Defense Materials Procurement Agency.

<sup>&</sup>lt;sup>2</sup> Wade, Henry H., and Alm, Mildred R., Bulletin of the University of Minnesota, Mining Directory Issue, Minnesota, 1955.

Manganiferous Ore.—Shipments of manganiferous iron ore (containing 5 to 10 percent manganese, natural) and ferruginous manganese ore (containing 10 to 35 percent manganese, natural) totaled 864,627 short tons, an increase of 72 percent over that recorded in 1954. Shipments during the year consisted of 463,945 short tons of direct-shipping ore and 400,682 short tons of concentrate. The 1955 tables of this chapter do not include 213 short tons of concentrate shipped to Government stockpile.

TABLE 7.—Shipments, with average iron and manganese contents, of usable <sup>1</sup> manganiferous iron ore (containing 5 to 10 percent Mn, natural) and ferruginous manganese ore (containing 10 to 35 percent Mn, natural) from mines in the Cuyuna range, 1913–55, in long tons

	Manga	niferous iro	on ore	Ferruginous mai		anese ore	
Year		Contents	(natural)	Ship-	Contents	(natural)	Total ship- ments
	Shipments	Fe, percent	Mn, percent	ments	Fe, percent	Mn, percent	
13				26, 200	46, 00	(2)	26, 2
14				55, 192	(2)	(2) (2)	55.1
15		1		42, 973	33.84	16.42	42, 9
16	45, 712	(2) 48. 58	(2) 7. 65	193, 257	* 32. 18	13.83	238, 9
17	91, 590	48. 58	7.65	359, 542	33. 29	14. 85	451, 1
18	227, 202	46. 61	5.87	625, 009	3 33. 76	<sup>3</sup> 14. 53	852, 2
19	98, 220	40.80	7. 31	138, 952	3 38. 23	\$ 12.61	237, 1
20	248, 913	37. 57	6.82	293, 524	44. 76	12.46	542, 4
2122	56, 530 248, 560	36. 67 3 44. 57	8. 82 6. 41	305, 093	41. 50	10. 32	56, 5 553, 6
23	499, 181	36.63	7. 42	253, 634	39. 25	10. 32	752, 8
24	361, 527	36.01	7. 51	159, 915	34. 27	11.21	521, 4
25	741, 409	35. 58	7. 79	77, 665	34. 15	11.04	819.0
26	799, 458	36. 56	7. 35	158, 759	34.06	10. 39	958, 2
27	934, 599	37. 98	7. 73	6, 276	34. 15	13. 57	940, 8
28	1, 025, 014	37. 38	7.77	3.487	(2)	11. 53	1,028, 5
29	1,004,420	36. 63	7. 52	5, 421	(2) 30. 64	17.11	1,009,8
30	693, 546	37. 61	7. 39	4, 235	34. 26	15.37	697, 7
31	217, 352	38. 12	7. 54	26, 567	36.50	15.81	243, 9
32				1, 399	(2)	12.44	1, 3
33	171, 722	36. 10	7.83				171, 7
34 35	197, 622 419, 373	37. 35	7. 70 7. 37	77, 931	37. 82	10.85	197, 6 497, 3
36	840, 725	(2) 35. 98	7. 87	47, 796	33. 88	10. 85	888.
37	1, 173, 637	36. 44	7. 62	84, 263	31. 33	17. 30	1, 257, 9
38	259, 183	35. 84	7. 52	17, 424	31. 53	17. 37	276.6
39	469, 703	36. 67	7. 21	182, 260	35, 93	11.69	651. 9
40	797, 642	38, 28	7. 34	248, 732	34. 76	13.02	1.046.3
41	819, 226	36. 71	6. 90	365, 942	3 35. 02	12.64	1, 185, 1
42	1, 299, 826	38.04	8.02	79,026	34. 67	15.14	1, 378, 8
43	1,070,596	43.06	7.74	226, 588	31. 81	15. 61	1, 297,
44	977, 583	36. 90	7. 65	109, 612	33. 15	13. 98	1,087,1
45	1, 246, 294	38.04	6. 77				1, 246, 2
46	955, 977	37. 84	6. 31				955, 9
4748	930, 144 1, 070, 110	36. 92 36. 48	6.00 6.03				930, 1 1, 070, 1
49	881,000	36. 93	5. 81	3, 109	36. 10	11.11	884. 1
50	762, 071	37. 59	6. 17	14, 470	31. 92	11.04	776, 5
51	885, 824	36. 93	6.05	13, 150	33. 33	12.17	898. 9
52	773, 260	38. 40	5. 77	28, 127	32. 38	10. 61	801. 3
53	795, 001	37. 79	5. 69	179, 545	33. 73	11.62	974, 5
54	443, 308	40.65	5. 65	6, 743	4 30, 22	4 10. 96	450.0
55	669, 056	39. 63	5. 90	102, 933	33. 47	13. 15	771, 9
Total	25, 202, 116			4, 524, 751			29, 726, 8

Direct-shipping and beneficiated ore.
 Figure not available.

Partly estimated.
Revised figure.

Companies that produced manganiferous ore in Minnesota in 1955 where Hanna Coal & Ore Corp., Pickands Mather & Co., and Zontelli Bros., Inc. All production was from 7 open-pit mines in Crow Wing County in the Cuyuna range, the district that has produced over 99 percent of the total manganiferous ore shipped to date from mines in the State.

Ores containing over 5 percent manganese, natural, were usually priced as Old Range non-Bessemer on the combined natural iron and manganese content, plus a premium for the natural manganese in excess of 5 percent. Premiums varied and were determined by

negotiation between buyer and seller.

#### **NONMETALS**

Abrasives.—Grinding pebbles and tube-mill liners were produced in 1955 by the Jasper Stone Co. from a quartzite deposit in Rock County. Total sales of these abrasive stones decreased slightly from 1954. Scrap material from this operation was sold for use as riprap.

Cement.—The Universal Atlas Cement Co. operated the only cement plant in the State at Duluth, in St. Louis County. Total shipments and value thereof in 1955 increased over the previous year. Production of types I and II (general use and moderate heat), airentrained, and masonry cement was reported in 1955. Average mill value per barrel of portland cement increased in 1955 to \$2.83 compared with \$2.78 in 1954.

Clays.—Production of clays for manufacturing building brick, pottery, high-grade tile, and heavy clay products was reported by 8 companies operating in 7 counties in 1955. Fire clay was produced in Carlton and Goodhue Counties and miscellaneous clay in Beltrami, Brown, Carlton, Polk, Ramsey, and Winona Counties. Total value of clays sold or used by producers in Minnesota in 1955 decreased

slightly below the previous year.

Gem Stones.—A small quantity of gem materials, consisting chiefly of agate and thomsonite, was collected by hobbyists. The sources were principally along the north shore of Lake Superior or in Cook, Lake, and St. Louis Counties. Much of the material was used for

trading purposes among rock collectors.

Lime.—Quicklime and hydrated lime were produced by the Cutler-Magner Co. in 1955 at its plant in Duluth, the only lime plant in the State. Quantity shipped in 1955 was 32 percent over that in 1954. Total value of sales increased 37 percent over the previous year. Products were sold for building, agricultural, industrial, and chemical uses.

Marl.—Calcareous marl was produced in Chisago and Crow Wing Counties for agricultural use. Quantity sold in 1955 increased 15

percent over that in 1954.

Perlite.—Crude perlite produced in Western States was expanded at two plants in Minneapolis. The expanded product was sold chiefly

for use as lightweight aggregate in plaster and concrete.

Sand and Gravel.—A new record high was established in the production of sand and gravel in the State in 1955. Output was approximately 26 million short tons, a 9-percent increase over 1954, the previous record year. Chief reason for the increase was expansion

of road-construction activity in the State. Production was reported from 79 of the State's 87 counties. Major producing counties were Hennepin, St. Louis, and Washington. Approximately 46 percent of the total was produced at commercial operations and the remainder at Government-and-contractor operations.

Over 95 percent of the sand and gravel produced in Minnesota in 1955 was for building and paving use. A substantial quantity was used for railroad ballast. Smaller quantities of special types of sands were consumed for railroad-engine use, for the manufacture of glass, and in foundries.

TABLE 8.—Sand and gravel sold or used by producers, 1954-55, by classes of operations and uses

		1954			1955	
Class of operation and use		Val	ue		Val	ue
	Short tons	Total	Average per ton	Short tons	Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						1.0
Glass	(1)	(1)	(1)	5, 795	\$39, 822	\$6.87
Building	2, 993, 532	\$2, 424, 008	\$0.81	3, 387, 806	2, 802, 358	.83
Paving	887, 763 1, 917	638, 583	.72	806, 919	632, 736	. 78
Railroad ballast Other	1,917	568	.30	(1)	(1)	(1)
Undistributed 2		63, 820	. 68	89,004	245, 013	2.75
Olidistributed -	53, 290	139, 076	2. 61	76, 019	152, 778	2.01
Total commercial sand	4, 030, 791	3, 266, 055	. 81	4, 365, 543	3, 872, 707	. 89
Gravel:						
Building	2, 318, 437	3, 249, 287	1.40	2, 226, 484	3, 258, 073	1.46
Paving Railroad ballast Railroad ballast	3, 677, 918	3, 053, 817	. 83	4, 300, 762	3, 223, 247	. 75
Railroad ballast		550, 305	. 59	890, 572	362, 475	.41
Other	353, 960	161, 349	. 46	178, 260	35, 714	. 20
Total commercial gravel	7, 282, 933	7, 014, 758	. 96	7, 596, 078	6, 879, 509	. 91
Total commercial sand and						
gravel	11, 313, 724	10, 280, 813	. 91	11, 961, 621	10, 752, 216	.90
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building Paving		2, 700	. 25	4,050	1, 215	. 30
Pavmg	92, 205	49, 247	. 53	110, 172	40, 913	. 37
Total Government-and-con-						
tractor sand	103, 005	51, 947	. 50	114, 222	42, 128	. 37
				111, 222	12, 126	.01
Gravel:				,		
Building	102, 942	41, 177	. 40	3, 517	1,055	. 30
Paving	12, 329, 185	5, 944, 583	. 48	13, 817, 066	6, 633, 935	. 48
Total Government-and-con-						<del></del>
tractor gravel	12, 432, 127	5, 985, 760	. 48	13, 820, 583	6, 634, 990	40
and Branching	=======================================	0,000,700	. 10	10, 620, 060	0, 034, 990	. 48
Total Government-and-con-						
tractor sand and gravel	12, 535, 132	6, 037, 707	.48	13, 934, 805	6, 677, 118	. 48
ALL OPERATIONS Sand	4 100 700	2 210 000		4 400 000		
Gravel	4, 133, 796 19, 715, 060	3, 318, 002 13, 000, 518	.80	4, 479, 765	3, 914, 835	. 87
G14701	19, /13, 000	10, 000, 518	. 66	21, 416, 661	13, 514, 499	. 63
Grand total	23, 848, 856	16, 318, 520	. 68	25, 896, 426	17, 429, 334	. 67

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosing individual company confidential data included with "Undistributed." <sup>2</sup> Includes blast, glass, and filter sand (1954), engine and foundry sand (1954-55), and railroad-ballast sand (1955 only) to avoid disclosing individual company confidential data.

Of the quantity produced in 1955, over 93 percent was hauled by Rail transportation and a small amount for which the method

of transportation was unspecified accounted for the remainder.

The 10 leading commercial producers in 1955 were: Anderson Aggregates, Barton Contracting Co., Chas. M. Freidheim & Co., Industrial Aggregates Co., and Landers-Norblom-Christenson Co., all of Minneapolis; Becker County Sand & Gravel Co. and Hallett Construction Co., Crosby; Cemstone Products Co. and J. L. Shiely Co., St. Paul; and Silica Sand Corp., Le Sueur.

Stone.—Combined sales of granite, limestone, and quartzite in 1955 were slightly over 3 million short tons, establishing a new alltime high for production of stone in the State. Total tonnage was 14 percent over that in 1954, the previous record year; however, total value of sales decreased 6 percent below 1954, chiefly because of the marked

decrease in production and value of dimension granite.

Granite was produced in the following counties in 1955: Big Stone, Chippewa, Kanabec, Lac qui Parle, Mille Lacs, Redwood, Renville, St. Louis, Stearns, and Yellow Medicine. Chief uses of dimension granite were for building and monumental purposes. Crushed and broken granite was used principally as railroad ballast and concrete aggregate.

Limestone was produced in 15 counties in the south-central and southeastern portion of the State. Dimension limestone for struc-

TABLE 9.—Granite sold or used by producers in 1954-55, by uses

		1954		1955		
Use		Value			Value	
	Quantity	Total	A verage per unit of measure	Quantity	Total	A verage per unit of measure
Dimension: Rough construction: Commercial	1 62, 973 4, 000 (1) 73, 742 162, 608	1 \$82, 081 10, 000 (1) 985, 345 2, 373, 917	1 \$1. 30 2. 50 (1) 13. 36 14. 60	581 249 46, 838 2 117, 281 41, 924 (2) 109, 411	\$6,000 6,000 27,279 21,110,110 191,708 (2) 1,184,195	\$10. 33 24. 09 . 58 2 9. 47 4. 57 (2) 10. 82
Total dimension equivalent short tons 3	82, 922	3, 451, 343	41.62	69, 963	2, 525, 292	36.09
Crushed and broken:  Riprapshort tons  Concrete aggregate and roadstonedo Railroad ballastdo Otherdo	122, 773 4 397, 483 (4)	186, 103 4 507, 344 (4)	1. 52 4 1. 28 (4)	(4) (4) 432, 962 4 143, 605	(4) (4) 475, 474 347, 650	(4) (4) 1.10 2.42
Total crushed and broken_do	520, 256	693, 447	1. 33	576, 567	823, 124	1. 43
Grand totaldodo	603, 178	4, 144, 790	6. 87	646, 530	3, 348, 416	5. 18

<sup>&</sup>lt;sup>1</sup> Figures for rubble and rough monumental use are combined to avoid disclosing individual company confidential data.

<sup>2</sup> Figures for dressed and rough architectural use are combined to avoid disclosing individual company confidential data.

<sup>3</sup> Average weight of 166 pounds per cubic foot used to convert cubic feet to short tons.
4 Figures for railroad ballast and "Other" for 1954 and riprap, concrete aggregate and roadstone, and "Other" for 1955 are combined to avoid disclosing individual company confidential data.

tural and architectural use was quarried in Dakota, Hennepin, Le Sueur, Steel, and Winona Counties. Crushed limestone was used chiefly as concrete aggregate and roadstone and for agricultural purposes.

TABLE 10.—Limestone sold or used by producers in 1954-55, by uses

		1954			1955	
Use		Va	lue		Val	ue
	Quantity	Total	Average per unit of measure	Quantity	Total	A verage per unit of measure
Dimension: Rough construction and rubbleshort tons Architecturalcubic feet Dressed (cut and sawed)do	3, 060 89, 300 153, 275	\$3, 535 62, 050 689, 200	\$1. 16 . 69 4. 50	12, 148 18, 164 135, 041	\$148, 242 45, 410 636, 402	\$12. 20 2. 50 4. 71
Flaggingdo  Total dimension equivalent short tons 1  Crushed and broken:	23, 488	8, 680 763, 465	32, 50	26, 950	903, 473	33. 5
Riprap short tons Flux do Concrete aggregate and roadstone:	26, 937 350	37, 621 1, 050	1.40 3.00	60, 468 425 1, 823, 786	97, 160 1, 500	1. 6 3. 5
Commercial short tons Noncommercial do Railroad ballast do Agriculture do Other uses do	47, 300 1, 000	1, 910, 750 47, 300 1, 950 402, 297 176, 068	1. 18 1. 00 1. 95 1. 47 4. 48	1, 823, 786 166, 132 2, 381 235, 014 42, 835	1, 984, 493 169, 972 4, 919 335, 674 197, 233	1. 00 1. 00 2. 07 1. 43 4. 60
Total crushed and broken_do Grand totaldo	2, 002, 790	2, 577, 036 3, 340, 501	1. 29	2, 331, 041 2, 357, 991	2, 790, 951	1. 2

<sup>1</sup> Average weight of 160 pounds per cubic foot used to convert cubic feet to short tons.

#### MINERAL FUELS

Peat.—A small quantity of moss peat was produced in Aitkin County by the Colby Pioneer Peat Co. of Hanlontown, Iowa. This was the only commercial production of peat reported in the State in 1955. Output was used for horticultural purposes. Minnesota reserves of peat totaled approximately 6.8 billion tons in 1919,<sup>3</sup> estimated on an air-dried basis and in deposits more than 5 feet thick. About half of the estimated reserves of peat in the United States lie in Minnesota, and, with the exception of Russia, the State has the largest known deposits of peat in the world.

Although peat is classed by the Bureau of Mines as a mineral fuel, its principal use in the United States was for soil improvement. The Minnesota Iron Range Resources and Rehabilitation Commission sponsored research to develop the economic utilization of the peat resources in the State, with emphasis on chemical applications.

#### REVIEW BY COUNTIES

Aitkin.—The Colby Pioneer Peat Co. of Hanlontown, Iowa, produced moss peat from a bog near Floodwood. The product was sold for horticultural use.

<sup>3</sup> Soper, E. K., The Peat Deposits of Minnesota: Minnesota Geol. Survey Bull. 16, 1919

Anoka.—Charles Weaver Sons, Inc., produced pit-run road gravel.

The county highway department produced sand for road use.

Becker.—The Becker County Sand & Gravel Co. produced sand and gravel near Detroit Lakes for building and road construction, engine use, railroad ballast, and other purposes. Road gravel was produced by Ernest C. Anderson and by and for the county highway department.

Beltrami.—Sand and gravel for building and road use was produced by Ritchie & Tell, who operated a fixed plant near Bemidji. Melvin Samuelson produced building sand near Kelliher. Road gravel was produced by and for the county highway department and for the Bureau of Public Roads. The Bemidji Brick Co. produced clay for the manufacture of heavy clay products.

Benton.—The county highway department produced gravel for building and road use. Road gravel was produced by Ahles & Lush,

who operated a portable plant near Foley.

TABLE 11.—Value of mineral production in Minnesota, 1954-55, by counties 1

itkin noka ecker eltrami enton ig Stone line Earth rown	(2) \$3, 750 402, 609 52, 425 10, 877 (2) 401, 349 96, 649 141, 217	(2) (2) (2) \$68, 763 12, 523 (2) 465, 708 104, 324	Peat. Sand and gravel. Do. Sand and gravel, clays. Sand and gravel. Stone, sand and gravel. Sand and gravel. Sand and gravel.
eckereltramii entonig Stonelue Eartharltonarltonarlton	402, 609 52, 425 10, 877 (2) 401, 349 96, 649	\$68, 763 12, 523 (2) 465, 708	Do. Sand and gravel, clays. Sand and gravel. Stone, sand and gravel.
eltrami enton ig Stone lue Earth rown arlton	402, 609 52, 425 10, 877 (2) 401, 349 96, 649	\$68, 763 12, 523 (2) 465, 708	Sand and gravel, clays. Sand and gravel. Stone, sand and gravel.
enton ig Stone lue Earth rown arlton	10, 877 (2) 401, 349 96, 649	12, 523 (2) 465, 708	Sand and gravel. Stone, sand and gravel.
ig Stonelue Earth rownarlton	(2) 401, 349 96, 649	(2) 465, 708	Sand and gravel. Stone, sand and gravel.
lue Earth rownarlton	401, 349 96, 649	465, 708	Stone, sand and gravel.
rownarlton	96, 649		Sand and gravel stone
arlton		104, 324	
	141, 217		Sand and gravel, clays.
		159, 264	Do.
arver		(2)	Sand and gravel.
ass	14, 604	84, 151	Do.
hippewa	110, 494	113, 950	Sand and gravel, stone.
hisago	157, 871	44, 754	Sand and gravel, marl.
lay	236, 490	244, 273	Sand and gravel.
00k	24, 976	10, 602	Sand and gravel, gem stones.
ottonwood	50, 970	110, 982	Sand and gravel.
row Wing	12, 678, 592	23, 906, 927	Iron ore, manganiferous ore, manganese ore sand and gravel, marl.
akota	521, 364	455, 197	Stone, sand and gravel.
odge	37, 081	(2)	Stone.
ouglas	25, 002	57, 783	Sand and gravel.
aribault	147, 310	268, 319	Do.
illmore	1, 030, 809	2, 110, 190	Iron ore, stone, sand and gravel.
reeborn	125, 190	138, 297	Sand and gravel.
oodhue	358, 630	172, 803	Clays, stone, sand and gravel.
rant	43, 793	45, 386	Sand and gravel.
ennepin	2, 654, 628	3, 256, 245	Sand and gravel, stone.
ouston	263, 859	146,688	Stone, sand and gravel.
anti	23, 120	7, 036	Sand and gravel.
asca	74, 461, 837	114, 092, 412	Iron ore, sand and gravel.
ackson	81, 261	92, 114	Sand and gravel.
anabec	30, 976	(2)	Stone, sand and gravel.
andiyohi	335, 988	292, 025	Sand and gravel.
ittson	(2)	176, 685	Do.
loochiching		1,094	Do.
ac qui Parle	330, 965	250, 994	Stone, sand and gravel.
ake	16, 523	19, 218	Sand and gravel, gem stones.
ake of the Woods	13, 674	14, 300	Sand and gravel.
e Sueur	724, 459	1,009,322	Stone, sand and gravel.
incoln	34, 044	63, 899	Sand and gravel.
yon	(2)	115, 052	Do.
lahnomen	5, 720	12, 407	Do.
[arshall		12, 226	Do.
Iartin	69, 791	22, 635	Do.
IcLeod	37, 611	72, 397	Do.
feeker		(2)	Do. ,
fille Lacs	256, 169	426, 278	Stone, sand and gravel.
Iorrison	(2) 149, 561	31, 496 131, 615	Sand and gravel. Sand and gravel, stone.

See footnotes at end of table, p. 13.

TABLE 11.—Value of mineral production in Minnesota, 1954-55, by counties —Continued

County	1954	1955	Minerals produced in	1 1955 in order of value
Murray	\$19, 369	(2)	Sand and gravel.	
Nicollet	63 213		Do.	
Nobles	67 407	\$108, 596		
Ulmsted	100 100			
Otter Tail	EO 054			er in a second control of the second control
PenningtonPine	23, 361			
Pine	28, 403	8, 035		
		234, 865		
POIR	ו ווֹסְיוֹת וּיַר	404, 800		
robe	(2)			
		59, 169	i band and oroval	
K.ea wood	40.000		Sand and gravel, clays.	
Renville	40, 229		Danu and gravel, stone	
Rice	457, 233		Stone, sand and grown	
Rock	61, 769		Sand and gravel stone	
Roseau	297, 604		Sand and gravel, abracives	stone
Saint Louis	(2)	52, 056	I DAMU AMU STAVAI	
Dame Louis	240, 519, 989	337, 483, 687	Iron ore, cement, lime, sa	nd and gravel, stone, gem
Scott				and graver, stone, gem
Shorburna			Stone, sand and gravel.	
Sherburne	17, 632	17, 500	Sand and gravel.	
Sibley.	(3)	1,667	Do.	
Stearns	1, 981, 911	1, 274, 603	Stone, sand and gravel.	
Steele	549, 638	201, 751	Sand and gravel, stone.	
Stevens	29, 751	l	g-u. o., boole.	
Swift	91, 982	(2)	Sand and gravel.	
1000.	06 049	(2)	Do.	
Traverse	. 1	24,912	Do.	
w anasna	0.00*	(2)	Do.	
Wadena Washington Watonwon	24, 332	(2)	Do.	
Washington	1, 192, 361	1, 449, 324	Do.	
Watonwan	110, 722	62,680	Do.	
Watonwan Wilkin	42, 349	24,114	Do.	The state of the state of the state of
Winona	487, 494	541,726	Stone, sand and gravel, clay	
Winona Wright	897, 442	104,756	Sand and gravel, clay	S.
Yellow Medicine	(2)	(2)	Stone cond and man '	
Yellow Medicine Undistributed	7, 088, 454	8, 118, 145	Stone, sand and gravel.	
		0, 110, 110		
Total	351, 474, 000	501, 151,000		
		-0-, 101,000		

¹ The following counties are not listed because no production was reported: Clearwater, Hubbard, Nor man, Red Lake, and Waseca.
²Figure withheld to avoid disclosing individual company confidential data.

Big Stone.—Granite for architectural and monumental purposes was produced by the Cold Spring Granite Co. from the Agate quarry near Ortonville and by the Delano Granite Works, Inc., from its quarry near Odessa. The rough granite produced in this county was processed at plants operated by both companies, one at Cold Spring in Stearns County and the other at Delano in Wright County. Sand for building use and gravel for paving and road use was produced by the Hallett Construction Co. from a pit near Odessa.

Blue Earth.—Guaranteed Gravel & Sand Co. and Hiniker Sand & Gravel Co. produced sand and gravel for building use. The North Star Concrete Co. reported sales of sand and gravel for building and road use. Hallett Construction Co. produced sand for building purposes and gravel for paving and road use. Ed Swartout produced gravel and crushed limestone for road construction. Lundin Construction Co. quarried limestone for use as riprap and roadstone. T. R. Coughlen produced broken limestone for riprap.

Brown.—A. C. Ochs Brick & Tile Co. of Springfield produced miscellaneous clay for use in the manufacture of building brick and other heavy clay products. Roberts Bros. operated a portable sand and gravel plant near New Ulm and reported sales for building and road purposes. Math N. Schumacher produced road gravel.

Wallner Construction Co. produced sand and gravel for building use at its fixed plant near New Ulm. Production of gravel for building purposes was reported by M. M. Youngman, who operated a fixed plant near New Ulm. Road gravel was produced under contract

for the county highway department.

Carlton.—Gravel for railroad ballast and other uses was produced by the Great Northern Railway Co. and Minneapolis, St. Paul & Sault Ste. Marie Railroad Co. Sand and gravel for building purposes was produced by White & Almer, who operated a fixed plant near Cloquet, and Albert Obraske. The Zenith Dredge Co. operated a fixed plant near Carlton and produced gravel for building and road use and railroad ballast. Road gravel was produced by and for the county highway department. The Nemadji Tile & Pottery Co. of Moose Lake produced clay for use in pottery and high-grade tile. The Wrenshall Brick Co. of Duluth permanently stopped manufacturing brick. In 1955 the company sold a small quantity of miscellaneous clay.

Carver.—Hallett Construction Co. produced sand for building purposes and gravel for paving and road use from a pit near Chaska. Sand and gravel for building use and road gravel was produced by William Mueller & Sons, who operated a fixed plant near Carver.

Cass.—Sand and gravel for road purposes was produced by and for the county highway department. The Forest Service of the United States Department of Agriculture produced road sand. Gravel for use on roads was produced under contract for the Bureau

of Public Roads.

Chippewa.—Sand for building use and gravel for road use and other purposes were produced by the Hallett Construction Co. near Montevideo. Jay Volden produced sand for building and road purposes. Dimension granite for monumental use was quarried near Montevideo by the Melrose Granite Co. The stone was dressed at the company plant in St. Cloud.

Chisago.—The county highway department produced and contracted for sand and gravel for use on roads. Hallett Construction Co. produced building sand and road gravel from pits near Center City and Shafer. Marl for agricultural use was produced by William

Danner.

Clay.—Sand and gravel for building and road construction was produced by Ames Sand & Gravel, Inc., and Kost Bros., Inc., who operated fixed plants near Glyndon. Road gravel was also produced by Rollo Lewis, who operated a portable plant near Glyndon; Twin City Sand & Gravel Co.; and Thomson Bros., who operated a portable plant near Moorhead. Ulven Gravel Co. operated a portable plant near Hawley and reported sales of building sand and gravel for building and road construction. Road gravel was produced under contract for the county highway department.

Cook.—Road gravel was produced under contract for the Bureau

of Public Roads and the county highway department.

A small quantity of thomsonite, a semiprecious gem material, was recovered by Maynard Green near Grand Marais. Most of the material was used for trading with other rock collectors.

Erie Mining Co. made substantial progress in developing Taconite Harbor, the new shipping port on Lake Superior. At this point taconite pellets produced at the large-scale company taconite plant under construction at Aurora will be loaded into ore freighters, utilizing traveling-belt conveyors, instead of the conventional chute arrangement. The ore dock, which will be approximately 1,800 feet long, was planned to have a storage capacity of 100,000 tons of pellets. Shipments from Taconite Harbor were expected to begin in 1957. A powerplant, which will supply power for the entire taconite project, and unloading facilities for coal and petroleum products will also be located at Taconite Harbor.

Cottonwood.—Sand and gravel for building use and sand for fill were produced by the Windom Sand & Gravel Co., who operated a fixed plant near Windom. Road gravel was produced by and for the Cottonwood County Highway Department and under contract

for the Jackson County Highway Department.

Crow Wing.—Mineral products in the county in 1955 included iron ore, manganese ore, manganiferous ore, sand and gravel, and marl. Shipments of iron ore totaled 2,871,667 long tons, compared with 1,708,893 long tons in 1954. Operating companies and mines from which iron ore and/or manganiferous ores were shipped in 1955 include:

Cor	npany:	Mines operated
	Dates Mining Co	Pennington
	M. A. Hanna Co	North Yawkey, Portsmouth group, and
	Hanna Coal & Ore Corp	South Yawkey.
	Training Coar & Ore Corp	Alstead group, Feigh, Huntington, Louise stockpile, Maroco, Section 6 mine, and
		South Hillcrest.
	Inland Steel Co	Armour No. 1 and No. 2.
	Pickands Mather & Co	
	Zontelli Bros., Inc	Mangan-Joan, Manuel, Merritt stockpile,
		Virginia, and West Airport.

Except for the Armour No. 1 and No. 2, all mines were open-pit operations. Ore from the Armour No. 2 mine was hoisted through the No. 1 shaft.

Rhude & Fryberger completed stripping operations at the new Carlson-Nelson mine near Riverton. Shipments from this property were expected to begin in 1956.

The Portsmouth group, operated by M. A. Hanna Co., ranked first in shipments of iron ore in the county in 1955. Ore was sintered at

Portsmouth sintering plant.

Shipments of manganiferous iron ore in 1955 were reported by Hanna Coal & Ore Corp., from the Alstead group and Section 6 mine; Pickands Mather & Co., from the Mahnomen and Sagamore mines; and Zontelli Bros., Inc., from the Mangan-Joan, Merritt stockpile, and Virginia mines. The latter company also shipped ferruginous manganese ore from these properties; however, shipments from the Virginia mine went to the Government stockpile and are not included as production in 1955.

Manganese Chemicals Corp. continued production of manganese carbonate from Cuyuna-range ores during 1955 at its plant near Riverton. In addition, the firm produced manganese nodules, containing about 65 percent manganese, and manganese dioxide, which was used in manufacturing dry-cell batteries. The recovery

method utilized was the Leute-Dean ammonia-leaching system. Construction of the plant was completed in 1953, with assistance of a loan from the Defense Materials Procurement Agency. Daily capacity of the plant was approximately 200 long tons of crude-ore input.

Road gravel was produced under contract for the county highway

department.

Tweed Bros. produced marl in Pelican Township for agricultural

Dakota.—J. L. Shiely Co. produced both dimension and crushed limestone from the Mendota quarry for use as rubble, veneer, flagging, riprap, road material, and railroad ballast and for agricultural purposes. Virtually all the material sold was transported by river barges. The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. produced limestone for use as riprap.

Sand and gravel for building purposes was produced by Standard Building Materials Co. in South St. Paul and Edw. M. Husting near Hastings. Bituminous Surface Treating Co. produced gravel for asphalt mix near Inver Grove. Emil Hanson reported output of

gravel for building use from a pit near Farmington.

Dodge.—Crushed limestone for road use was produced by the

Stussy Construction Co. and the county highway department.

Douglas.—Sand and gravel for building use was produced by Alexandria Sand & Gravel Co., which operated a fixed plant near Carlos. The county highway department produced road gravel.

Faribault.—Road gravel was produced by Clarence Zufall near Elmore, H. R. Loveall near Winnebago, and under contract for the

county highway department.

Fillmore.—Two companies produced iron ore in Fillmore County in 1955. Hanna Coal & Ore Corp. shipped 240,418 long tons of concentrate from its group of open-pit operations near Spring Valley. First shipments of iron ore were recorded from the Krueger mine, operated by Schroeder Mining Co. about 7 miles west of Chatfield. The company shipped 30,252 long tons of concentrate during 1955. All shipments of iron ore in the county were by rail to consuming furnaces at Granite City, Illinois.

Crushed limestone for road surfacing and agricultural purposes was produced near Spring Valley by Hadland & Vreeman and Edwin C. Kappers and near Harmony by Pederson Bros. Limestone for road base and surfacing was produced under contract for the county high-

way department.

Allen Thompson produced building sand from a pit near Peterson.

Freeborn.—Sand and gravel for building and road use was produced by Emil Olson & Sons, who operated a fixed plant near Albert Lea. The county highway department produced and contracted for road

Goodhue.—The Red Wing Sewer Pipe Corp. produced clay near Goodhue for use in manufacturing heavy clay products. Mann Construction Co. operated the Spring Garden quarry near White Rock and produced crushed limestone for agricultural purposes. Output

of crushed limestone for roadstone and agricultural use was reported by Valley Limestone Co., which operated a quarry near Zumbrota.

Hallett Construction Co. produced sand and gravel for building and road use and other purposes from a pit near Frontenac. Sand and gravel for building use was produced by Arthur Mickow near Lake City. The city of Red Wing produced road gravel. Sand and gravel for use on roads was produced under contract for the county highway department.

Grant.—Sam Olson operated a fixed sand and gravel plant near Elbow Lake and reported output for building purposes. The Great Northern Railway Co. and the Minneapolis, St. Paul & Sault Ste. Marie Railroad produced gravel for railroad ballast and other pur-

poses.

Hennepin.—Sand and gravel was produced in the county for a variety of purposes, but chiefly for building and road use. Commercial operators who reported output in 1955 were as follows: Anderson Aggregates; Barton Contracting Co.; Concrete Service, Inc.; Consolidated Builders Supply Co.; J. W. Craig Co.; Chas. M. Freidheim & Co.; Howard Ganley; Glacier Sand & Gravel Co.; J. V. Gleason; the Great Northern Railway Co.; F. W. Hedberg & Sons; Industrial Aggregate Co.; Keller Bros. Gravel Co.; Landers-Norblom-Christenson Co.; Mapco Sand & Gravel Co.; Oscar Roberts Co., Inc.; Earl A. Sewall Co., Inc.; and Woodrich Construction Co. Road gravel was also produced by and for the county highway department. All operations were in the vicinity of the Minneapolis area. Six of the above companies operated portable plants in 1955. Landers-Norblom-Christenson Co. also produced limestone for use on parking lots and driveways, as railroad ballast, filler for asphalt and fertilizers, and rubble. Crude perlite produced in Colorado and Nevada was expanded in Minneapolis by Western Mineral Products Co. and Minnesota Perlite Corp. The product was used chiefly as a lightweight aggregate in plaster and concrete.

Lithium minerals produced in South Dakota were processed into lithium compounds and metal by Lithium Corp. of America at its

plant in St. Louis Park.

Houston.—Hector Construction Co., Inc., produced crushed limestone from the Anderson quarry near Houston and the Kruger quarry near Caledonia. Output was used for roadstone and agricultural purposes. Botcher Bros. & Son operated the Sprague quarry and produced crushed and broken limestone for use as riprap and roadstone. Heintz & Smith produced limestone for riprap, road surfacing, and agricultural use. Paving and road sand was produced by Roverud Construction Co. Road gravel was produced under contract for the county highway department.

Isanti.—Road gravel was produced by two companies under con-

tract for the county highway department.

Itasca.—Shipments of usable iron ore in 1955 from mines in the county totaled 15,934,749 long tons compared with 10,715,333 tons in 1954. Over 92 percent of the shipments consisted of beneficiated ore.

Operating companies and mines from which iron ore was shipped in 1955 were:

Company:	Mines operated
Butler Bros	Aromac, Galbraith, Harrison group, Mac-
Duvior Drobert error	Killican, Patrick "A" group, Patrick "C,"
	Snyder, and Wyman.
Cleveland-Cliffs Iron Co	Canisteo, Hawkins, Hawkins Tailing plant,
Olo y Oldana Olima ====	Hill-Trumbull, Holman-Cliffs, and
	Sargent.
M. A. Hanna Co	Buckeye and Mississippi group.
Hanna Coal & Ore Corp	Argonne stockpile, Carlz No. 2, and Perry.
Jessie H. Mining Co	Jessie.
Jones & Laughlin Steel Corp	Hill Annex.
Oliver Iron Mining Division	Arcturus group, King group, and Plummer.
U. S. Steel Corp.	
Pacific Isle Mining Co	Mississippi and Missouri L. O. S. P.
Pickands Mather & Co	Bennett, Danube, Tioga No. 2, and West
	Hill.

The Tioga No. 2, the most westerly mine in the Mesabi range and the first mine in the Lake Superior district west of the Mississippi River, joined the ranks of shipping mines in June 1955. Pickands Mather & Co., agent for Western Mining Co., has had the mine under development since 1953. An interesting phase of the development was driving of a tunnel for transporting ore from the pit to the beneficiation plant. The tunnel passed through a loose sand formation in which chemicals were used to solidify the sand. All ore produced at the mine in 1955 was beneficiated at the Tioga No. 2 plant by washing, heavy-medium separation, and cyclone treatment.

Shipments from the Buckeye mine, operated by M. A. Hanna Co., were from stockpile. Actual mining at this property was suspended

indefinitely in the latter part of 1954.

New mines under development during 1955 included the Parcel No. 3 near Coleraine, operated by M. A. Hanna Co., and the O'Brien near Nashwauk, operated by W. S. Moore Co. Ore from both of these mines will be treated at heavy-medium beneficiation plants at their respective locations.

Republic Steel Corp. sold its interests in the St. Paul mine near Keewatin to Pacific Isle Mining Co. in the latter part of 1955.

No underground mining has been done in the county since 1953. Road gravel was produced by the Forest Service of the United States Department of Agriculture and by and for the county highway department.

Jackson.—Sand and gravel for building purposes was produced by the Willett Gravel Co. The county highway department produced

and contracted for road gravel.

Kanabec.—Dimension granite for architectural and monumental use was produced by the Cold Spring Granite Co. from the Mora Grey quarry. The rough stone was processed at the company plant in Cold Spring. Road gravel was produced under contract for the Isanti County Highway Department.

Kandiyohi.—Ed Beske (Atwater Sand & Gravel) produced sand for building use and gravel for building and road purposes near Atwater. Sand and gravel for building purposes and railroad ballast was produced by New London Materials & Construction Co., which operated a fixed plant near New London. The Great Northern Railway Co.

produced gravel for railroad ballast and other uses. The county highway department produced and contracted for road gravel.

Kittson.—The Hallett Construction Co. produced sand for building use and gravel for paving and road purposes from a pit near Halma.

Koochiching.—Road gravel was produced under contract for the

Beltrami County Highway Department.

Lac qui Parle.—Cold Spring Granite Co. produced dimension granite for architectural and monumental use from its Cold Spring Red quarry near Odessa. The rough material was finished at the company plant in Cold Spring. The North Star Granite Corp. operated its No. 9 quarry near Odessa and produced granite for monumental use. Output was processed at the company finishing plant in St. Cloud. The Dakota Granite Co. of Milbank, S. Dak., acquired the quarry formerly operated by Unique Granite Co. near Bellingham and reported output of rough granite for architectural use and dressed granite for monumental purposes. Road gravel was produced by

and for the county highway department.

Lake.—The first unit of the É. W. Davis Works, the large taconite plant operated by Reserve Mining Co. at Silver Bay, went into operation in October 1955. All units were expected to be ready for production early in 1956. Taconite pellets produced at this plant in 1955 were stockpiled for shipment to lower Lake ports the following spring. The crude taconite for the plant was supplied from the vast deposit of magnetic taconite on the eastern tip of the Mesabi range near Babbitt, St. Louis County. Primary crushing of the crude taconite was performed at Babbitt. A 47-mile, company-owned railroad was used to haul the crude taconite to the E. W. Davis Works, where it was further crushed, ground, magnetically separated, and formed into pellets. Operation of the plant will be year round, with pellets stockpiled during the winter months when navigation on the Great Lakes is closed. Silver Bay, built by Reserve Mining Co. in a sparsely populated region, is approximately 50 miles northeast of Duluth on Lake Superior.

A report on a Federal Bureau of Mines drilling program of coppernickel mineralization in northern Minnesota, in an area about 12 miles southeast of Ely, Lake County, was published in 1955.<sup>4</sup> This report describes the procedures and results of the drilling program, as

well as the metallurgical work and laboratory studies.

The county highway department produced road gravel.

A small quantity of agate material was recovered by Rocky Quinn from glacier drift on the north shore of Lake Superior near Silver Bay.

Lake of the Woods.—The county highway department produced

gravel for road use.

Le Sueur.—The Babcock Co. at Kasota produced dimension limestone for rough construction, rubble, architectural use and flagging, and broken limestone for riprap. Most of the stone is a fine-grained, dolomitic, yellow and yellowish-pink limestone. Part of the production was marketed as "marble," actually a highly polished limestone, for interior trim and facings. The Silica Sand Corp. produced silica sand from the Jordan Sandstone formation near Ottawa. A greater

Grosh, W. A., Pennington, J. W., Wasson, P. A., and Cooke, S. R. B., Investigation of Copper-Nickel Mineralization in Kawishiwi River Area, Lake County, Minn.: Bureau of Mines Rept. of Investigations 5177, 1955, 18 pp.

portion of the output was used as oilfield fracturing sand, with small quantities for molding, building, and engine use. C. C. Cram produced road sand. Glander Washed Sand & Gravel Co. operated a fixed plant near Le Sueur and reported output of sand and gravel for building and road purposes. Hallett Construction Co. produced sand and gravel for building use and road gravel from a pit near St. Peter. Gene Sutter produced gravel for building use near Waterville. Ed Swartout and Zarnott Construction Co. produced road gravel.

Lincoln.—Gravel for building use was produced by the Tyler Cement Tile & Silo Works, which operated a fixed plant near Lake Benton. Road gravel was produced by and for the county highway department.

Lyon.—Deutz & Crow Co. produced sand and gravel for building purposes near Marshall. Sand and gravel for road purposes was produced by the Marshall Sand & Gravel Co. near Lynd. McLaughlin & Shultz operated a portable plant near Marshall and produced road gravel.

Mahnomen.—The county highway department produced and con-

tracted for gravel for road purposes.

Marshall.—Ben Bjorgaard operated a portable plant near Argyle and produced gravel for road use. Gravel for road surfacing was also produced under contract for the highway departments of Beltrami and Marshall Counties.

Martin.—Daniel F. Winter produced sand for road use near Ceylon. Road gravel was produced by and for the county highway department.

McLeod.—Bullert Construction Co. operated a fixed plant near Biscay and reported output of sand and gravel for building and road use. Gravel for railroad ballast was produced by the Minneapolis, Northfield & Southern Ry. A small quantity of sand for miscellaneous uses was sold by D. Rolf from a pit on his farm near Brownton. Road gravel was produced under contract for the county highway department.

Meeker.—Sand and gravel for building and road purposes was produced by Wolters Washed Sand, which operated a fixed plant near Litchfield. Hallett Construction Co. produced building sand

and road gravel from a pit near Litchfield.

Mille Lacs.—Dimension granite for architectural and monumental purposes was produced from the Diamond Grey quarry, operated by Cold Spring Granite Co. near Isle. The company processed the rough stone at its sawing and finishing plant in Cold Spring, Stearns County. Hallett Construction Co. produced sand for building use and gravel for road surfacing and other purposes. Ahles & Lush operated a portable plant near Milaca and reported output of gravel for road use. Mille Lacs Sand & Gravel Co. operated a fixed plant near Milaca and produced sand and gravel for building, road surfacing, and other uses.

Morrison.—The county highway department produced and contracted for road gravel. No shipments of iron ore have been recorded for Morrison County since 1953, when Zontelli Bros., Inc., shipped 5,754 long tons from stockpile at the Gorman mine near Randall.

Mower.—Sand and gravel for building and road purposes was produced by the Austin Ready-Mix Concrete Co., which operated a portable plant approximately 7 miles south of Austin. Road gravel and crushed limestone were produced under contract for the county

highway department. Osmundson Bros. operated several quarries and produced crushed limestone for roadstone and agricultural use. Hickok Calcium White Rock Co. produced crushed limestone near Le Roy. Output was for mineral food, poultry grit, and metallurgical, and agricultural purposes.

Murray.—Muecke Bros. produced sand and gravel for building and

other purposes.

Nicollet.—Delphin Anderson produced washed sand and gravel for building use at a fixed plant near Courtland. A. H. & J. H. Massopust produced road gravel near New Ulm. The county highway department contracted for road gravel.

Nobles.—Sand and gravel for building purposes and road gravel was produced by the Worthington Sand Co. near Rushmore. Road gravel was produced by and for the county highway department. Broken limestone for riprap was produced by L. G. Everist, Inc.

Olmsted.—Crushed limestone for roadstone and agricultural purposes was produced by Patterson Quarries near Eyota and also by Clarence Paulson. Sand and gravel for building and road use and other purposes was produced by Rochester Sand & Gravel Co. near Rochester. Sand and gravel for road surfacing was produced under

contract for the county highway department.

Otter Tail.—Mark Sand & Gravel Co. operated a fixed sand and gravel plant near Underwood and reported output for building and road purposes. Gravel for railroad ballast and other uses was produced by the Minneapolis, St. Paul & Sault Ste. Marie Railroad. Orville R. Edner produced sand and gravel for building use and road sand near Campbell. The city of Fergus Falls produced building sand and road gravel. The county highway department produced and contracted for gravel for road purposes.

Pennington.—Sand and gravel for building purposes was produced by the Walker Sand & Gravel Co., which operated a fixed plant near

Thief River Falls.

Pine.—Louis Hultgren & Sons produced sand for molding use.

The entire output was shipped by rail.

Pipestone.—Hallett Construction Co. operated two sand and gravel pits near Edgerton and Woodstock and produced sand for building use and gravel for road purposes and other uses. Pronk Bros. produced building sand near Edgerton. The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. produced gravel for railroad ballast and miscellaneous uses.

Polk.—Spring Gravel Co. operated a fixed sand and gravel plant near Fertile and reported output for building and road purposes Gravel for road use and railroad ballast was produced by Thorson Gravel Co. near Melvin. The Great Northern Railway Co. produced gravel for building use, railroad ballast, and other purposes. Common clay used in manufacturing heavy clay products was produced near Fertile by the Red River Valley Brick Corp. of Grand Forks, N. Dak. Pope.—Schmidgall Sand & Ready Mix Co. produced sand and

Pope.—Schmidgall Sand & Ready Mix Co. produced sand and gravel for building and road use near Starbuck. Sand and gravel for building purposes was produced by Starbuck Cement Products Co. at a fixed plant near Starbuck. Hallett Construction Co. produced sand and gravel for building and road uses from a pit near Villard. The county highway department produced road gravel.

Ramsey.—The Ford Motor Co. mined silica sand from the St. Peter sandstone formation beneath its glass plant in St. Paul. The entire output was used in the plant for the manufacture of glass. Ed Heaton Foundry Sand Co. produced silica sand for foundry use in St. Paul. The city of St. Paul produced gravel for road use. Miscellaneous clay for the manufacture of building brick and other heavy clay products was produced by the Twin City Brick Co.

Redwood.—Sand and gravel for road purposes was produced by Chapman Gravel Co. near Belview. Buterbaugh Sand Co. produced sand and gravel for building use near Walnut Grove. Johnson Bros. Quarry Co. produced dimension granite, chiefly for monumental use.

Renville.—Cold Spring Granite Co. produced dimension granite for architectural and monumental purposes at the Rainbow quarry near Morton. Dimension granite for monumental purposes and broken granite for riprap were produced at the Melrose Tapestry quarry near Morton by the Melrose Granite Co. Both companies operated finishing plants in the State. Road gravel was produced by the Fairway Construction Co. near Hector and also under contract for the highway departments of Kandiyohi and Renville Counties. Danube Sand & Gravel Co. produced sand and gravel for building use and

other purposes near Danube.

Rice.—The county highway department purchased crushed limestone for road use from the following operators: Craig J. Alexander; Bryan Rock Products, Inc.; Ben Erwin & Son; H. J. Frederickson; Melvin Kielmeyer; and Paul F. Kolling. Bryan Rock Products, Inc., also produced crushed limestone for agricultural purposes. Sand and gravel for building purposes was produced by Melvin Kielmeyer near Nerstrand. Cleland Construction Co. produced sand for building use and gravel for building, road use, and fill from a pit near Northfield. Concrete Materials, Inc., produced sand and gravel for building purposes near Faribault. James Condon Sand & Gravel operated a portable plant near Northfield and reported output of gravel for building use and fill. Faribault Washed Sand & Gravel produced gravel for building and road purposes.

Rock.—The Jasper Stone Co. produced grinding pebbles and tube-mill liners from a quartzite deposit near Jasper. Some waste material from the operation was sold for use as riprap. Hallett Construction Co. produced sand and gravel for building and road use and other purposes near Luverne. C. H. Hatting Gravel Co. produced sand and gravel for building and road construction. Gravel for railroad ballast was produced by the Chicago, St. Paul, Minneapolis & Omaha

Railway Co.

Roseau.—Herbert Reese & Sons produced sand and gravel for road use. Road gravel was produced by and for the county highway

department.

St. Louis.—Mineral output in St. Louis County in 1955 included cement, gem stones, iron ore, lime, sand and gravel, and stone. Shipments of usable iron ore from mines in the county increased 40 percent over 1954 and accounted for 73 percent of the total usable ore shipped from the State in 1955. Operating companies and mines or lean ore stockpiles (LOSP) from which shipments of iron ore were reported in 1955 were as follows:

Company:	Mines operated
Butler Bros	- Agnew No. 2, South Agnew South Long
Charleson Iron Mining Co	year, and weggum.
Cleveland-Cliffs Iron Co	- Various LUSP.
E. W. Coons Co	- Various LOSP Agnew and Alworth Bradford, Bradford Annex, Chataco, Com-
	modore, Bradioid Annex, Chataco, Com- modore, Genoa-Sparta, Sidney, South
Holom V. Art. 1 G	
Haley-Young Mining Co	
W. A. Hanna Co	Enterprise, Morton, Impro "B," Norpac, and Section 18
	and Section 18.
Johnson & Moore, Inc.	and Section 18.  Pacific.  Columbia, Longyear, Missabe Mountain, Pettit, Schley, and Wentworth.  Gilbert Sliver, Hanna, Judson, Knox, Margaret, Norman, Pilot, Pilot, Appey Prindle
Jones & Laughlin Steel Corp.	Columbia, Longvear Missaha Mountain
W C M C	Pettit, Schley, and Wentworth
W. S. Moore Co	Gilbert Sliver, Hanna, Judson, Knox, Mar-
	garet, Norman, Pilot, Pilot Annex, Prindle,
North Range Mining Co	
Oliver Iron Mining Division.	Bradford-Pillsbury Canton group Down
U. S. Steel Corp.	St. James.  Bradford-Pillsbury, Canton group, Dormer, Gilbert, Godfrey, Hull-Rust group, Impro A No. 61 stockpile, Impro A No. 88 stockpile, Kosmerl-Midwey, Impro A No. 88
	A No. 61 stockpile, Impro A No. 88
	stockpile, Kosmerl-Midway, Leonard.
	stockpile, Kosmerl-Midway, Leonard, Leonidas stockpile, McKinley, Monroe
	group, Mountain from group, Nilos Dilla
	bury Brown, Penobscot stockpile No. 62, Pillsbury, Pilotac, Pioneer, Rouchleau
	group, Rust stockpile No. 27, St. James
	Canton, Sauntry, Sherman group, Soudan,
Posific Tale Mining	
Pacific Isle Mining Co	Cyprus-Rust, Emmett, Graham No. 2, Graham LOSP, Holland LOSP, Kerr, Lamberton Langdon & W.
	Graham LOSP, Holland LOSP, Kerr,
	Lamberton, Langdon & Warren, Midget, Missabe Mountain, Missabe Mountain LOSP, North Shiras, Pacific Fee, Sheridan,
	LOSP North Shires Pacific For Sharid
	and wacoman
Pickands Mather & Co	Albany, Bennett Annex, Biwahik Carmi-
	Carson Lake, Fillingrings Eric Proliminary
	Taconite plant, Mahoning groups 1, 2, 3, 4, and 6, Scranton, Wade, and Zenith.
Pioneer Mining Co	3, 4, and 6, Scranton, Wade, and Zenith.
republic Steel Corp	Stevenson and Sugarahama
Tillude & Fryberger	Roging and Tross
rendde-Gilbert Corp.	Alworth () P
Skubic Bros. Co	Forsyth LOSP, Virginia LOSP, Wheeling
	Shenango, South Tener, Webb, and White- side.
E. A. Young, Inc.	Minnowas
Zontelli Bros., Inc	Graham No. 1

Expansion of the Mesabi-range taconite projects continued throughout 1955. Reserve Mining Co., which had operated its preliminary taconite plant near Babbitt since 1952, began producing taconite pellets at the E. W. Davis Works, its large-scale plant at Silver Bay in Lake County. Crude taconite for both plants was supplied from the company taconite mine near Babbitt. The ore body at Babbitt is a vast deposit of magnetic taconite approximately 9 miles long, averaging 2,800 feet in width, and 175 feet deep at its thickest point. It is known to contain at least 1.5 billion tons of iron-bearing material.

When processed, this will yield 500 million tons of high-grade concentrate, averaging approximately 62 percent iron. Mining was done by the open-pit method. Utilizing jet-piercing machines at the mine for sinking blastholes, the taconite was broken, then loaded by electric shovels into 45-ton side-dump trucks. The crude taconite was reduced to 8-inch size in the large primary crusher, capable of crushing 3,500 tons per hour. The rock was reduced further at Babbitt to minus 3 inches by 3 gyratory crushers. At this stage the taconite destined for the E. W. Davis Works was stored in bins at Babbitt to await shipment to that plant over the 47-mile interdepartmental railroad built by Reserve Mining Co. The taconite was processed further at Silver Bay. Reserve Mining Co. mined approximately 1.8 million tons of crude taconite at Babbitt in 1955. During the year the company shipped a substantial quantity of taconite

pellets, which were produced at the Babbitt plant.

Work progressed steadily at Erie Mining Co. taconite development on the eastern end of the Mesabi range near Aurora. The project was about 50 percent complete as of the end of 1955. Initial yearly capacity of the new plant will be 7.5 million tons of pellets. Eventually the project may be expanded to produce 10.5 million tons of finished product annually. Approximately 22.5 million tons of crude taconite will be required to operate the plant at its initial rated capacity. Crude material will be supplied from two open pits near The large concentrator building was erected during 1955 and enclosed by the end of the year, making it possible for many men to work inside during the extremely cold winter months. Approximately 3,000 men were employed at the plant site. Also under construction during the year was the 73-mile railroad over which the finished pellets will be hauled to Taconite Harbor, where the company had been constructing dock and harbor facilities. Another phase of the vast project was the construction by Erie Mining Co. of the new town of Hoyt Lakes, several miles from Aurora. The company continued operating the Erie Preliminary Taconite plant near Aurora. This plant, which has an annual capacity of 200,000 tons of pellets, has been in operation since 1948.

Another producer of taconite concentrate in 1955 was the Oliver Iron Mining Division of United States Steel Corp., which operated its Pilotac plant and mine near Mountain Iron. Shipments from this operation were first recorded in 1953. Concentrate produced at the Pilotac plant were agglomerated at the company Extaca plant at Virginia.

Jones & Laughlin Steel Corp. resumed mining at the Schley and Pettit open-pit iron mines near Gilbert. Both mines had been closed down since the spring of 1954. The company also performed diamond drilling at the Section 30 mine near Ely in the Vermilion Work has been concluded pending a study of the exploration range.

The Commodore mine, operated by E. W. Coons Co., reentered the

ranks of shipping mines in 1955.

Pacific Isle Mining Co. acquired the Stevenson mine near Hibbing

from the Republic Steel Corp. in the latter part of 1955.

Last shipments of iron ore were recorded from the Biwabik mine, operated by Pickands Mather & Co. near Biwabik. The mine was the second oldest open-pit mine on the Mesabi range. Since the date of the first shipments in 1893, approximately 25 million tons has

been produced from the mine.

Oliver Iron Mining Division of United States Steel Corp. suspended operations at the Godfrey underground mine near Chisholm in the spring of 1955. At the end of the year only seven mines in St. Louis County were being worked by underground methods.

W. S. Moore Co. concluded operations at the Prindle and Yawkey

open-pit mines near Virginia. The company planned to move the concentrator at the Prindle property and the crushing plant at the

Yawkey mine to the Mariska mine near Gilbert.

Blast furnaces were operated at Duluth by the American Steel & Wire Division of United States Steel Corp. and the Interlake Iron The former company operated 2 furnaces and the latter 1 during 1955.

Portland and masonry cements were produced by the Universal Atlas Cement Co. at Duluth. The company was the sole producer of cement in the State. Total shipments of cement and the value

thereof increased slightly in 1955 over 1954.

Cutler-Magner Co. produced quicklime and hydrated lime at the State's only lime plant at Duluth. Both quantity and value of shipments in 1955 increased substantially over the previous year. The Mesaba Granite Co. operated a quarry near Mountain Iron

and produced granite for monumental use.

Sand and gravel for building use was produced by the Arrowhead Sand & Gravel Co. at Twig and by Enrico Ghilardi from deposits along the Sturgeon Lake road in the vicinity of Hibbing. Coons Co. operated a portable sand and gravel plant near Saginaw and reported output for building and road purposes and railroad ballast. Biwabik Gravel Co. produced sand for engine use and sand and gravel for railroad ballast and building purposes. Gravel for road use and railroad ballast along with building sand was produced by the Hallett Construction Co. near Brimson. The Mesaba Construction Co. produced sand and gravel for building and road use near Northwest Gravel & Excavating Co., Virginia, produced road gravel. Pioneer Mining Co. reported output of gravel for railroad ballast and fill as a byproduct of iron-ore mining and concentrating operations near Biwabik. Gravel for railroad ballast and other uses was produced by the Duluth, Missabe & Iron Range Railway Co. and the Great Northern Railway Co. Paving gravel was produced under contract for the city of Duluth. The county highway department contracted for sand and gravel for road use.

A small quantity of agate material was collected by hobbyists in

the area near Duluth along the north shore of Lake Superior.

Scott.—Bryan Rock Products, Inc., produced crushed or broken limestone for riprap, road construction, and agricultural use. Concrete Service, Inc., produced crushed limestone for road use and sand and gravel for building purposes. Shakopee Sand & Gravel Co. produced sand and gravel for building use near Shakopee. Plaine Sand & Gravel Co. produced sand and gravel for road use. Lubansky & Kranz reported output of road gravel from a pit near Chaska. Sand and gravel for building and road purposes was produced by Haferman & Stark near Prior Lake. The Minneapolis &

St. Louis Railway Co. produced gravel for railroad ballast. Road gravel was produced by and for the county highway department.

Sherburne.—Big Lake Gravel Co., Inc. reported output of gravel for building and road purposes. The company operated a fixed plant near Big Lake.

Sibley.—Hallett Construction Co. produced sand for building use and paving gravel near Henderson. Dahlke Excavating Co. produced

gravel for miscellaneous uses.

Stearns.—Cold Spring Granite Co. operated the Crystal Gray, Diamond Pink, Opalescent, and the Rockville quarries and produced dimension granite for architectural and monumental purposes. In addition, the company reclaimed waste granite by crushing it to small size for use chiefly as poultry and traction grit. Granite for monumental use was also produced by the Melrose Granite Co. from the Melrose Red and Melrose Gray quarries and by the North Star Granite Corp. from its No. 4 and No. 5 quarries. Sawing and finishing plants were operated in St. Cloud by the Melrose Granite Co. and North Star Granite Corp., and at Cold Spring by the Cold Spring Granite Co. Shiely-Petters Crushed Stone Co. reported output of crushed granite for railroad ballast and highway surfacing. The Minnesota State Reformatory produced dimension granite for building A. C. Petters Co. produced granite for use as riprap and sand and gravel for building purposes near St. Cloud. Hallett Construction Co. produced sand for use as concrete aggregate near St. Cloud. Megarry Bros. produced sand and gravel for building use.

Steele.—Klemmer Construction Co. produced crushed or broken limestone for riprap, roadstone, and agricultural use at a quarry near Owatonna. Faribault Quarries produced limestone for use as roadstone and rubble. Owatonna Aggregates Corp. produced sand and gravel for building purposes near Medford. George Kohlmier, Inc., produced road gravel near Owatonna. The Medford Washed Sand & Gravel Co. reported output of glass sand and sand and gravel for

building and road use from a fixed plant near Medford.

Swift.—The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. produced sand and gravel for railroad ballast and other purposes. Gravel for railroad ballast and other uses was produced by the Great Northern Railway Co. Road gravel was produced by and for the county highway department.

Todd.—The county highway department produced and contracted The Great Northern Railway Co. produced gravel for road gravel.

for railroad ballast.

Traverse.—Gravel for paving and road use was produced by Ray Werner, who operated a portable plant in the county during the year. Wabasha.—The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. produced gravel for railroad ballast and other uses. Harry M. Berktold produced building sand and road gravel near Lake City. Gravel for road use was produced under contract for the county highway department.

Wadena.—Sand and gravel was produced by the Becker County Sand & Gravel Co. at a fixed plant near Wadena. Output was for building and road purposes, engine use, railroad ballast, and other

applications.

Washington.—J. L. Shiely Co. produced sand and gravel for building and road construction and sand for engine use at its Grey Cloud plant near St. Paul Park. Sand and gravel for building use and road sand was produced near Lakeland by Cemstone Products Co. Sand and gravel for building purposes was produced by Certified Aggregates, Inc., near Hudson, Wis. Moelter Construction Co. produced sand and gravel for road use near Stillwater. Shalander & Shaleen produced road gravel near Scandia. Gravel for road surfacing was produced under contract for the county highway department.

Watonwan.—George Allen produced gravel near Madelia chiefly for road repair. The county highway department produced sand and

gravel for road use and also contracted for road gravel.

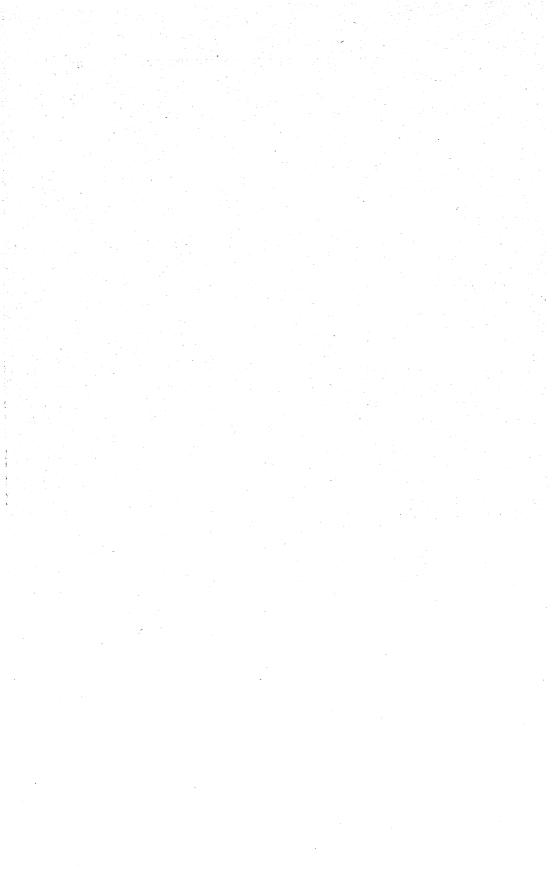
Wilkin.—Behrens Construction Co. produced gravel near Wolverton

for use in road construction.

Winona.—The Biesanz Stone Co. produced dimension limestone for use as house-stone veneer and cut stone for architectural purposes. Ben Erwin & Son produced crushed limestone for road use. Fred Fakler reported output of crushed limestone for road maintenance and agricultural use. All the above-mentioned operations were in the vicinity of Winona. Crushed limestone for road use was produced under contract for the county highway department. Sand and gravel for building and road construction was produced by the Winona Sand & Gravel Co. The Biesanz Brick Yards produced clay for manufacturing of common building brick.

Wright.—Ed. Schram produced gravel near South Haven for building and road purposes and railroad ballast. Road gravel was produced by Charles & Anna Frank and Oliver Ordorff. The county highway department produced and contracted for road gravel. The Delano Granite Works, Inc., operated a sawing and finishing plant at Delano.

Yellow Medicine.—The Great Northern Railway Co. produced granite for railroad ballast and rubble. Sand and gravel for building purposes were produced near Canby by Deutz & Crow Co. Burdett C. Long reported output of gravel for building use from a pit near Hazel Run. Gravel for road surfacing was produced under contract for the county highway department.



# The Mineral Industry of Mississippi

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, Department of the Interior, and the Mississippi Geological Survey, William C. Morse, Director.

By Robert S. Sanford 1 and William C. Morse 2



THE RAPID industrialization of the Gulf Coast States was evidenced in Mississippi, where mineral production reached a record \$122.6 million in 1955, an increase of over \$12 million over the previous year. In the 10-year period beginning in 1946, the value of mineral production more than tripled, and the rate of increase doubled that in the United States as a whole. Petroleum represented 75 percent and natural gas 13 percent of the State's total mineral production. Other minerals, in the order of importance, were sand and gravel, clays, natural-gas liquids, and stone. According to the 1954 Census of Manufactures, in the period from 1949 to 1954, manufacturing employment increased 35 percent and the value added by manufacture 111 percent. This industrial expansion explains, in part, the added market for Mississippi's mineral output.

TABLE 1.—Mineral production in Mississippi, 1954-55 1

	1	954	1955	
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	559, 401 140, 448	\$3, 103, 132 11, 657, 000	700, 615 163, 167	\$3, 913, 113 15, 664, 000
LP-gases thousand gallons.  LP-gases do.  Petroleum (crude) thousand 42-gallon barrels Sand and gravel.  Stone.	15, 288	1, 944, 000 528, 000 85, 600, 000 4, 286, 871	22, 382 12, 242 37, 741 5, 624, 878	1, 573, 000 396, 000 92, 840, 000 4, 603, 032
Value of items that cannot be disclosed: Certain non- metals.	101, 418	181, 418 3, 352, 481	572, 816	572, 816 3, 589, 504
Total Mississippi 3		110, 563, 000		122, 620, 000

Production as measured by mine shipments, mine sales, or marketable production (including consumption by producers).
 The total has been adjusted to eliminate duplicating the value of clays and stone.

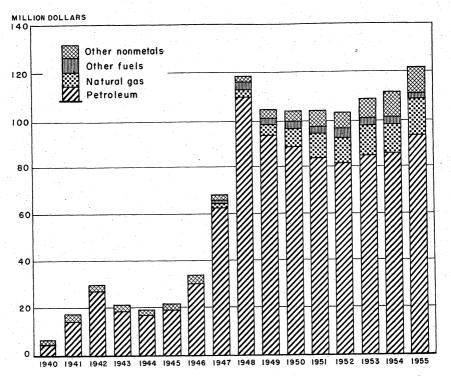


Figure 1.—Value of petroleum, natural gas, and total value of mineral production in Mississippi, 1940-55.

#### CONSUMPTION AND MARKETS

In 1955 Mississippi had 2 petroleum refineries processing crude petroleum and 3 natural-gasoline and cycle plants processing gas for condensates. One cement plant was in operation, and a second was under construction. Fifteen brick and heavy clay products plants utilized clays; fuller's earth was processed for absorbent uses. Bentonite was shipped to other States and countries for use as a binder in refractories, for filtering and clarifying oils, and for fillers, drilling muds, and other uses. Sand and gravel was employed for building and highway construction, railroad ballast, engine sand, molding sand, and other uses. Mississippi limestone was used in manufacturing cement and by farmers as a soil conditioner.

## EMPLOYMENT AND INJURIES

Employment in the mineral industries remained relatively stable, and there were no fatal accidents. The oil and gas industry employed 2,400 men for a total of 4.9 million man-hours. There were 56 non-fatal accidents; the frequency rate was 11.34 and the severity rate 0.21.

TABLE 2.—Average unit value of mineral commodities produced in Mississippi, 1951-55

Commodity	1951	1952	1953	1954	1955
Cement	9. 73 1. 83 41. 04 1. 02 1. 00 . 06	\$2. 53 14. 90 7. 89 1. 61 43. 65 1. 08 1. 00 . 06 . 077 . 04	\$2.71 14.57 10.72 1.69 41.94 1.06 1.00 .08	\$2.69 15.13 10.77 1.61 36.80 1.06	\$2.76 16.19 11.28 1.61 36.80 1.00 1.00 .10
Sand and gravel	2. 24 . 76 1. 15 . 40	2. 23 . 80 1. 15	2. 36 . 82 1. 15	2. 50 . 79 1. 00	2.46 .82 1.00

# REVIEW BY MINERAL COMMODITIES MINERAL FUELS

The production of liquid and gaseous fuels increased for the third successive year to \$110.5 million. In 1955 the State had 2,339 producing oil and gas wells, an increase of 166 wells over 1954. completions totaled 488, or 43 more than in 1954. Of the 488 current year completions, 295 were in proved fields, and 193 were exploratory tests; of the 295 proved field wells, 158 were oil, 23 were gas, and 114 were dry. Of the 193 exploratory drill holes, 16 were oil, none were gas, and 177 were dry. Exploratory tests totaled 193 and accounted for 1,387,966 feet of drilled hole, or an average depth per well of 7,192 feet-402 feet deeper than the average for 1954. As a result, 11 oilfields were discovered, all in the Wilcox formation, in the 4-county area of Adams, Wilkinson, Jefferson, and Franklin Counties. gasfields were discovered. Even though drilling increased from 445 wells in 1954 to 488 in 1955, the proved reserves decreased 6 percent for petroleum and natural gas and 4 percent for natural-gas liquids during the year.

Natural Gas.—The value of marketed production of natural gas attained the alltime high of \$15.7 million, increasing 34 percent from 1954. Mississippi was the eighth largest natural-gas producer in the Nation. Gross withdrawal of natural gas was 266,000 million cubic feet, of which gas wells supplied 193,000 million cubic feet and oil wells the remaining 73,000 million cubic feet. Marketed production totaled 163,167 million cubic feet and repressuring 62,598 million cubic feet; 40,235 million cubic feet was wasted or vented. Counties leading in natural-gas production in 1955 were Jefferson Davis, Adams, Lincoln, Forrest, and Marion. The California Co. operated 2 natural-gasoline plants, 1 at Brookhaven in Lincoln County and the other at Washington in Adams County. Southern Natural Gas Co. operated a natural-gasoline and cycling plant, using the absorption process, at Prentiss in Jefferson Davis County.

TABLE 3.—Total well completions by counties in 1955 1

County	Prov	red fiel pment	d or wells	Explo	ratory	wells		Total		Grand total
County	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	
	-						- 00		62	9
dams	_ 28		36	4		26	32		1	
mite	-					1			i	
olivar						i			î	
alhoun						1			i	
laiborne									2	
larke						2			ĩ	
ovington						1		16	6	2
orrest	_ 5	16	3			3	5	16		2
ranklin	_ 5		11	1		9	6		20	٠ '
leorge						4			2	
reene						2			1	
renada						1			3	
Iancock.						3				2
Inds	_ 10		2	1		- 8	11		10	- 4
ttawamba						5			5	1
ackson		l				1			1	
	40	3	6			2	40	3	8	
asperefferson			16	3		30	15		46	•
		1						1		١.
efferson Davis	19	`l	11	1		6	20		17	
ones						2			2	1
Lamar			1			. 1			1	
[incoln	3		2			. 4	3		6	
Madison Marion			1			1			1	
						. 1			1	1
Marshall		1	1		.	. 2		1	3	
Monroe		1 -	1 .			. 1			1	
Panola	3	2	3	3			. 6	2	3	
Pearl River			i	l		. 1			2	1
Perry						. 2			2	l
Pontotoc						. 1		.	1	l
Prentiss		-	-			. 1	1		. 1	1
Rankin		-				1			. 1	1
50000						1			. 1	1
Sharkey			-			ī			. 1	1
Simpson					-	-1 -	12			_1
Smith	12					2			. 2	
Stone		-				ī			. 1	
Sunffower		-	-		-	î			. 1	1 .
Tallahatchie		-	-	1	-	1 2			2	. 1
Tippah		-	-	-	-	ī			1	
Tishomingo		-	-	-	-1	il î		1	1	
Union			-	-	-	- i			1	. 1
Warren		-	9	-	-	_ 13			_ 22	: 1
Wayne	3		1 12			25			37	1
Wilkinson	6		- 12			_ 3			1 4	
Yazoo	12	s	-  -			-ا_	_			_
	1 200		114	16	1	177	174	23	291	
Total: 1955	158					163				
1954	127	7   31	. 1 100	, 10	, , ,	,			1	1

<sup>&</sup>lt;sup>1</sup> National Oil Scouts & Landmen's Association, Oil- and Gas-Field Development in United States, Yearbook 1956 (Review 195b): Vol. 26, Austin, Tex., p. 482.

TABLE 4.—Estimated proved reserves of crude oil, natural-gas liquids, and natural gas, 1954-55 1

	Proved reserves, Dec. 31,	Changes in proved reserves, due to exten- sions and new discoveries in 1955	Proved re- serves, Dec. 31, 1955 (produc- tion was de- ducted)	Change from 1954, percent
Crude oil barrels Natural-gas liquids <sup>2 3</sup> million cubic feet.	412, 276, 000 60, 420, 000 2, 772, 683	11, 259, 000 699, 000 46, 285	387, 702, 000 57, 876, 000 2, 608, 340	-6 -4 -6

American Petroleum Institute, Petroleum Facts and Figures: 12th Edition, 1956, pp. 158, 159, 161.
 Includes condensate, natural gasoline, and LP-gases.
 Proved recoverable reserves.

Natural-Gas Liquids.—The production of natural-gas liquids decreased in value and quantity for the third consecutive year. production of natural-gas liquids, as shown on county table 12 for 1955 and 1954, is not comparable between the years. In 1954 all of the natural-gas liquids were credited to the county in which the natural-gasoline and cycle plant was located; in 1955 the production of natural-gas liquids was credited to the county where the gas was produced.

TABLE 5.—Marketed production of natural gas, 1946-50 (average) and 1951-55

Year	Million cubic feet	Value (thousand dollars)	Year	Million cubic feet	Value (thousand dollars)
1946–50 (average)	57, 875	1 3, 410	1953	154, 254	12, 340
	158, 845	10, 007	1954	140, 448	11, 657
	174, 100	10, 620	1955	163, 167	15, 664

<sup>&</sup>lt;sup>1</sup> Production of natural gas did not become significant until 1947.

TABLE 6.—Gross withdrawals and disposition of natural gas, 1951-55, in million cubic feet

	1	Withdrawals	1		Disposition		
Year	From gas wells	From oil wells	Total	Marketed produc- tion 2	Repressuring	Vented and wasted *	
1951 1952 1953 1954 1954 1955	175, 500 184, 200 180, 000 167, 000 193, 000	83, 400 81, 500 75, 000 70, 000 73, 000	258, 900 265, 700 255, 000 237, 000 266, 000	158, 845 174, 100 154, 254 140, 448 163, 167	41, 718 47, 605 53, 223 58, 645 62, 598	58, 33 43, 99 47, 52 37, 90 40, 23	

Marketed production plus quantities used in repressuring, vented, and wasted.
 Comprises gas sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas in pipelines.
 Includes direct waste on producing properties and residue blown to air (partly estimated).

TABLE 7.—Natural-gas liquids produced, 1947-50 (average) and 1951-55

Year	Natural	gasoline	LP-	gases	Total		
	Thousand gallons	Value (thousand dollars)	Thousand gallons	Value (thousand dollars)	Thousand gallons	Total (thousand dollars)	
1947-50 (average) 1951 1962 1963 1964 1955	27, 780 30, 618 33, 726 32, 214 27, 804 22, 382	1, 817 2, 503 2, 606 2, 295 1, 944 1, 573	16, 121 19, 866 19, 614 17, 724 15, 288 12, 242	629 852 777 713 528 396	43, 901 50, 484 53, 340 49, 938 43, 092 34, 624	2, 446 3, 355 3, 383 3, 008 2, 472 1, 969	

Petroleum.—The value of petroleum production continued to increase for the fourth consecutive year. The 1955 production value (\$92.8 million) was surpassed only during the 2 peak years 1948 (\$110.3 million) and 1949 (\$93.4 million). Petroleum was produced in 22 of the State's 82 counties; Adams was first, followed by Jasper, Lincoln, Yazoo, and Lamar Counties, in order of their importance.

In 1955 Mississippi had 2,339 producing wells that had an average

daily production of 44.2 barrels each.

Paluxy Asphalt Co. operated a skimming and cracking refinery at Crupp in Yazoo County. Southland Co. operated a skimming

refinery at Sandersville, Jones County.

Pipelines.—Gaylord Container Corp. completed 9.9 miles of 8-inch gasline from Lamar County (sec. 21, T. 1 N., R. 16 W.) to Pearl River County (sec. 3, T. 1 S., R. 14 W.). Texas Eastern completed 5.0 miles of 4-inch gasline from 30" Junction to Trebloc field and 210.0 miles of 30-inch gasline from St. Francisville to Kosciusko; 9.5 miles of 8-inch gasline from Egypt Station to Muldon field was under construction.3

TABLE 8.—Production of crude petroleum, 1946-50 (average) and 1951-55

		Val	ne			Valu	10
Year	Thousand barrels	Total (thousand dollars)	Average per barrel	Year	Thousand barrels	Total (thousand dollars)	Average per barrel
1946–50 (average) 1951	36, 237 37, 039 36, 310	\$76, 722 82, 970 80, 970	\$2. 12 2. 24 2. 23	1953 1954 1955	35, 620 34, 240 37, 741	\$84, 060 85, 600 92, 840	\$2. 36 2. 50 2. 46

TABLE 9.—Production of crude petroleum, 1951-55, by fields

Fie	eld	1951	1952	1953	1954	1955
La Grange Mallalieu Soso		6, 487 4, 237 3, 334 1, 746 3, 452 3, 666 2, 520 245 5, 071 1, 650 4, 631	6, 212 3, 905 2, 792 1, 670 3, 437 3, 277 1, 944 288 4, 934 1, 633 6, 218	5, 940 4, 211 2, 398 1, 542 3, 336 2, 701 1, 484 316 4, 545 1, 652 7, 495	5, 137 3, 724 1, 776 1, 352 3, 098 2, 269 1, 252 748 4, 326 1, 526 9, 032	5, 301 3, 511 1, 497 1, 355 3, 255 2, 128 1, 117 3, 110 4, 477 1, 433 10, 56
Total		37, 039	36, 310	35, 620	34, 240	37, 74

TABLE 10.—Sales of petroleum products, 1954-55

	Declaret	Quantity (thou- sand barrels)		Change from 1954,
	Product	1954	1955	percent
Gasoline 1 Kerosine Range oil Distillate fuel oil Residual fuel oil		12, 955 1, 187 530 1, 619 160	13, 806 1, 093 465 1, 808 178	+7 -8 -12 +12 +11

<sup>&</sup>lt;sup>1</sup> Consumption of gasoline from American Petroleum Institute.

<sup>&</sup>lt;sup>3</sup> National Oil Scouts & Landmen's Association, Oil- and Gas-Field Development in United States and Canada: Yearbook 1956 (Review 1955), vol. 26, p. 493.

### **NONMETALS**

Clays.—During the year 700,600 short tons of clay valued at \$3. million was produced, an increase of 25 percent in quantity and 26 percent in value over 1954. Significant quantities of bentonite, fuller's earth, fire clay, and miscellaneous clay were produced.

Mississippi ball clay, consumed mainly by the refractories industry, advanced in price from \$15.13 to \$16.19 per ton from the previous year.

Bentonite production, reported from 4 counties, increased in average price from \$10.77 to \$11.28 per ton during 1955. Uses of bentonite were for refractories, decoloration and filtration of oils, detergents and emulsions, drilling muds and filtering.

Production of fuller's earth, used for absorbents, increased in quantity and value during the year. The average price remained stable at

Production of fire clay increased over 1954; the average price remained stable at \$1.61 per ton. Fire clay was used for heavy clay products.

Production of miscellaneous clay increased both in tonnage and total value from 1954. The average price decreased from \$1.06 to

Southern Brick & Tile Co., Byhalis, Miss., completed its plant and started operations. A 250-foot tunnel kiln and a 145-foot twin-tunnel drier were installed. The kiln has a capacity of 50,000 units per day and was fired with natural gas. The face-brick plant will produce 5 shades of red, 1 pink, and 1 gunmetal, in 4 textures.

Sand and Gravel.—Production of sand and gravel in Mississippi reached an alltime high of 5.6 million short tons valued at \$4.6 million, representing increases of 3 percent in quantity and 7 percent in value over 1954. In the order of importance, sand was used for paving, building, molding, miscellaneous uses, engine sand, railroad ballast, and blast sand. Gravel was used for paving, building, railroad ballast, and other purposes. Sand and gravel was produced in 23 of the State's counties; the most important, in order of output, were Copiah, Adams, De Soto, Washington, and Forrest.

Stone.—The production of stone, all of which was crushed limestone, amounted to 572,800 short tons valued at \$572,800, an increase of 216percent over 1954. Part of the increase is attributable to 360,705 short tons of marl used in manufacturing cement, which was not reported in 1954. All limestone was used in manufacturing cement

and as agricultural lime.

TABLE 11.—Sand and gravel sold or used by producers, 1946-50 (average) and 1951-55

Year	Comr	nercial	Governm		Т	Average	
	Short tons	Value	Short tons	Value	Short tons	Value	per ton
1946-50 (average) 1951 1952 1953 1954 1955	2, 095, 153 2, 404, 583 1, 845, 864 2, 070, 123 5, 208, 459 5, 027, 196	\$1, 408, 833 1, 890, 584 1, 482, 581 1, 713, 362 4, 179, 421 4, 335, 799	610, 551 607, 569 450, 713 583, 523 233, 378 597, 682	\$299, 206 388, 450 350, 725 460, 509 107, 450 267, 233	2, 705, 704 3, 012, 152 2, 296, 577 2, 653, 646 5, 441, 837 5, 624, 878	\$1, 708, 039 2, 279, 034 1, 833, 306 2, 173, 871 4, 286, 871 4, 603, 032	\$0. 63 . 76 . 80 . 82 . 79 . 82

# REVIEW BY COUNTIES

Mineral fuels and nonmetals were produced in 50 of the 82 counties in Mississippi. Petroleum was produced in 22 counties, natural gas in 21, natural-gas liquids in 13, clay in 19, and sand and gravel in 23. Counties producing natural-gas liquids in 1955 are not comparable with those reported in 1954 because in 1954 all output of natural-gas liquids was credited to the county location of the natural-gasoline plant, whereas in 1955 the natural-gas liquids were credited back to the county of origin.

Adams.—In 1955 Adams County, led in the value of minerals produced, ranking first in crude oil and second in natural gas and sand and gravel. Drilling of 30 exploratory holes resulted in 4 discoveries. Sixty-four development wells resulted in 28 oil producers and 36 dry holes. Natchez Gravel Co. and St. Catherine Gravel Co. produced

sand and gravel for building and paving.

Alcorn.—Corinth Brick & Tile Co. manufactured heavy clay products from miscellaneous clay mined near Corinth. Sand and gravel was mined by the Bureau of Public Roads.

Clay.—Agricultural limestone was produced by the Mississippi State West Point Gravel Co. mined structural sand, Lime Plant Board.

paving sand, and building gravel.

Copiah. Copiah County led in the production of sand and gravel in Mississippi during 1955. Gatesville Sand & Gravel Co., Green Bros. Gravel Co. (both at Jackson), and the Traxler Gravel Co., Inc., (near Utica) produced paving sand, railroad-ballast sand, structural gravel, paving gravel, and railroad-ballast gravel.

Forrest.—Exploratory drilling resulted in 3 dry wells; 24 development wells resulted in 5 oil wells, 16 gas wells, and 3 dry holes. Forrest County ranked first in the production of natural-gas liquids and fifth in the production of sand and gravel in the State during 1955. American Sand & Gravel Co. operated a quarry near Hattiesburg. Hattiesburg Brick Works manufactured heavy clay products.

Franklin.—Explanatory drilling accounted for 1 oil discovery and 9 dry holes; development drilling resulted in 5 oil producers and 11 Petroleum and natural gas were produced in Franklin dry holes.

Hinds.—Nine exploratory wells were drilled in 1955, and 1 was oil productive; of 12 development wells drilled, 10 were oil productive and 2 dry. Johnson-Cone Brick Co. and Tri-State Brick & Tile Co.

manufactured heavy clay products.

Jasper .- Jasper County was the second largest producer of petroleum in Mississippi. Forty-nine development wells were drilled; 40 were oil productive, 3 gas producers, and 6 holes dry. This remarkable record resulted in doubling crude-oil production and raising Jasper County's rank from fourth to second largest producer in the State.

Jefferson.—Exploratory drilling during the year resulted in 3 productive oil wells and 30 dry holes; development drilling resulted

in 12 oil-productive and 16 dry holes.

Jefferson Davis.—The county ranked first in the production of natural gas; appreciable quantities of natural-gas liquids were produced also.

TABLE 12.—Value of mineral production in Mississippi, 1954-55, by counties 1

County	1954	1955	Minerals produced in 1955 in order of value
Adams	\$20, 325, 581	\$22, 558, 177	Petroleum, natural gas, sand and gravel, natural gas liquids.
Alcorn	81, 741	59, 049	Clays, sand and gravel.
Amite	29, 442	51, 611	Petroleum, natural gas.
Attala		6,000	Clays, sand and gravel.
Carroll		18,000	Clays.
Chickasaw		86,001	Natural gas, natural-gas liquids.
Choctaw		11,000	Sand and gravel.
Clarke		422, 920	Petroleum, natural gas.
Clay	(2)	(2)	Limestone, sand and gravel.
Copiah	759, 125	704, 839	Sand and gravel.
De Soto	(2)	(3)	Do.
Forrest		2, 545, 566	Natural gas, natural-gas liquids, sand and gravel, petroleum, clays. Petroleum, natural gas.
Franklin		1, 834, 293	Cond and ground
George	(2)	(2)	Sand and gravel.
Greene	12, 554	10, 113 10, 800	Petroleum.
Grenada	(2)	78, 510	Sand and gravel. Do.
Hancock	93, 069	94,000	D0. D0.
Harrison Hinds	253, 838	1, 420, 817	Petroleum, clays, natural gas, natural-ga
mus	200,000	1, 120, 011	liquids.
Holmes	170, 459	170, 450	Sand and gravel.
Itawamba.		(2)	Clays.
Jasper	8, 728, 528	16, 537, 328	Petroleum, natural gas, natural gas liquids.
Jefferson	4, 888, 910	5, 373, 413	Do.
Jefferson Davis		5, 974, 981	Natural gas, natural-gas liquids, petroleum.
Jones	1, 270, 645	592, 634	Petroleum, natural gas, clays, natural-galliquids.
Lamar	7, 586, 293	11, 424, 779 19, 200	Petroleum, natural gas, natural gas liquids. Clays.
Lauderdale	15,000		Do.
Lee Leflore	(2) 100, 000	(2) 190, 000	Sand and gravel.
Lincoln	14, 210, 824	14, 374, 695	Petroleum, natural gas, clays.
Lowndes	401, 392	413, 951	Sand and gravel, clays.
Madison	923, 704	1, 237, 646	Petroleum natural gas natural-gas liquids
Marion	8, 972, 935	4, 679, 487	Petroleum, natural gas, natural-gas liquids. Petroleum, natural gas, natural-gas liquids
	0,012,000	1,010, 201	sand and gravel.
Marshall	(2)	(2)	Clays.
Monroe	1, 423, 758	1, 754, 152	Clays, natural gas, sand and gravel.
Noxubee		44,000	Limestone.
Panola	210, 984	266, 264	Clays, sand and gravel.
Pearl River	110, 482	1, 279, 037	Natural gas, natural gas liquids, petroleum sand and gravel, clays.
Perry	185, 818	78, 407	Petroleum, sand and gravel.
Pontotoc	(2)	(2)	Clays.
Prentiss	(2)		. A
Quitman	(2)		Coment stone send and sparel
Rankin	(2)	(2)	Cement, stone, sand and gravel. Petroleum.
Sharkey	16, 109	20, 449 410, 004	Natural gas, natural-gas liquids, petroleum.
Simpson	3, 794, 552 1, 157, 617	410,004	Clavs.
		(2) (2)	Do.
Sunflower Pippah	(2)		Montmorillonite.
Washington	586, 523	532, 000	Sand and gravel.
Wayne	7, 491, 770	7, 362, 750	Petroleum, natural gas.
Wilkinson	849, 552	1, 586, 940	Do.
Yazoo	11, 627, 192	12, 024, 415	Petroleum, sand and gravel, natural gas.
Undistributed	5, 090, 646	6, 360, 971	
	-,,		

<sup>&</sup>lt;sup>1</sup> The following counties are not listed because no production was reported: Benton, Bolivar, Calhoun, Claiborne, Coahoma, Covington, Humphreys, Issaquena, Jackson, Kemper, Lafayette, Lawrence, Leake, Montgomery, Neshoba, Newton, Oktibbeha, Pike, Scott, Stone, Tallahatchie, Tate, Tishomingo, Tunica, Union, Walthall, Warren, Webster, Winston, Yalobusha.

<sup>2</sup> Figure withheld to avoid disclosing individual company confidential data; included with "Undistrib uted."

Jones.—Oil was discovered in 1 exploratory well, and 6 holes were dry; of 30 development wells, 19 were oil productive and 11 dry. Laurel Brick Works produced face brick at its plant near Laurel.

Lamar.—Lamar County ranked fifth in the production of petroleum. Significant quantities of natural gas and natural-gas liquids also were produced.

Lincoln.—Lincoln County ranked third in the production of petroleum and natural gas during 1955. Brookhaven Pressed Brick & Mfg. Co. mined miscellaneous clay for manufacturing brick at Brookhaven.

Lowndes.—Sand and gravel was produced by Columbus Gravel Co., Fleming Gravel Co., Smith Gravel Co., and Williams Sand & Gravel Co. for structural, paving, blast and engine sand, and other miscellaneous uses. Columbus Brick Co. mined miscellaneous clay for manufacturing heavy clay products.

Madison.—Four exploratory wells were drilled and all proved dry.

Of 5 development wells drilled, 3 were oil productive and 2 dry.

Marion.—Marion County ranked fifth in the production of natural gas and sixth in crude oil during 1955. Natural-gas liquids and sand

and gravel were also produced.

Monroe.—Monroe County led in the production of bentonite, with one-third the value of the State's total clay production. International Minerals & Chemical Corp. and American Colloid Co. were the principal producers. Sand and gravel for structural and paving was produced by Amory Sand & Gravel Co., Francis Sand & Gravel Co., and Dee Nash. Natural gas was produced. Exploratory drilling resulted in 2 dry holes; of 2 development wells drilled, 1 was gas productive, the other dry.

Pearl River.—Three exploratory wells were completed and all were oil productive. Eight development wells were drilled; 3 were oil productive, 2 gas productive, and 3 dry. Pearl River Clay Co. produced montmorillonite for use as filler and drilling mud. Bean & Wilkins produced sand and gravel for paving. Natural gas, natural-

gas liquids, and petroleum also were produced.

Rankin.—Marquette Cement Co. continued to increase the production and shipments of cement from its Brandon mill to meet increased demands for building and road construction. Building and paving

sand was quarried by Worley Bros. near Jackson.

Washington. Washington County ranked fourth in the production of sand and gravel during 1955. Washed gravel for flood control was produced by Greenville Dredging Co.; building sand, structural gravel, and paving gravel were produced by the Greenville Gravel Co.

Wayne.—Wayne County was the sixth largest producer of petroleum in the State. Thirteen exploratory wells were drilled: all were

dry holes.

Wilkinson.—Petroleum was produced from existing fields in the county. The drilling of 28 exploratory wells resulted in 3 oil discoveries. Eighteen development wells were completed; 6 were oil pro-

ductive and 12 dry holes.

Yazoo.—Yazoo County was the fourth largest producer of petro-Three exploratory wells were drilled; all were dry. leum in 1955. Thirteen development wells were completed; 12 were oil productive, and 1 was a dry hole. Anderson Sand & Gravel Co. mined paving sand from its open pit near Yazoo City.

# The Mineral Industry of Missouri

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Division of Geological Survey and Water Resources, Department of Business Administration of Missouri.

By W. G. Diamond 1 and G. A. Muilenburg 2



NEW RECORD in total value of mineral production established in Missouri in 1955—\$152 million. It exceeds by \$11 million the previous record set in 1952. Missouri was the ranking lead-producing State in the Nation for the 48th consecutive year, the second largest producer of barite, and the third largest producer of fire clay. The principal minerals produced in 1955 were lead, cement, stone, lime, and coal. Output of crude iron oxide pigments was reported in 1955 for the first time in several years. Cobalt and nickel were produced in Missouri as the National Lead Co. began operations at its cobalt-nickel refinery. Mineral production was reported from 110 of the 114 counties; the leaders, in order of value, were: St. Francois, St. Louis, Ste. Genevieve, Jackson, and Ralls.

TABLE 1.—Mineral production in Missouri, 1954-55 1

	1	954	1	955
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Barite	1, 927, 285 2, 513, 593 1, 925 173, 394	\$3, 047, 436 31, 425, 190 5, 858, 756 10, 028, 293 1, 135, 750 (34, 318, 500 11, 165, 381 (2) 10, 203, 481 319, 457 24, 751, 610 1, 125, 360	363, 692 12, 255, 346 2, 402, 401 3, 232, 485 1, 722 260, 560 125, 412 1, 464, 828 72 2 988, 620 4 22, 368, 762 4, 476	\$4, 003, 842 34, 912, 186 6, 902, 323 12, 777, 570 1, 284, 612 20, 37, 372, 776 14, 408, 279 3, 000 190, 000 3, 9, 808, 878 243, 115 4, 29, 580, 414 1, 101, 096
Total Missouri 5		131, 280, 000		151, 626, 000

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2 Value included with "Undistributed."

<sup>Yanue included with "Ondistributed."
Final figure. Supersedes preliminary figure given in commodity chapter.
Excludes certain stone, value for which is included with "Items that cannot be disclosed."
Total has been adjusted to eliminate duplication in value of clays and stone.</sup> 

<sup>&</sup>lt;sup>1</sup> Commodity-industry economist, Region IV, Bureau of Mines, Bartlesville, Okla.
<sup>2</sup> Assistant State geologist, Geological Survey and Water Resources, Rolla, Mo.

TABLE 2.—Average unit values of certain mineral commodities, 1951-55 1

	Commodity	1951	1952	1953	1954	1955
Cement	short tons 376-pound barrel. short ton pound short ton pound short ton do troy ounce	\$9. 57 2. 52 4. 10 . 242 . 77 . 173 10. 06 . 98 . 905	\$9. 60 2. 53 4. 08 . 242 . 77 . 161 10. 02 1. 02 . 905	\$10.09 2.66 4.12 .287 .74 .131 9.97 1.02 .905	\$9. 74 2. 76 3. 99 2. 295 2. 93 137 9. 92 1. 13 2. 905	\$11. 01 2. 85 3. 95 .373 .85 .149 9. 84 1. 15 .905
Stone: Granite: Dimensio	nshort ton do	38. 15 1. 48	33. 17 1. 36	59. 04 1. 69	57. 40 2. 32	71. 20 3. 58
Marble:	ndo	(2) 20.00	(2) 6. 12	121. 50 9. 44	154.35 4.91	135.30 12.00
Limestone: Dimensio Crushed	ndo	7. 65 1. 48	4.47 1.48	5. 21 1. 47	2. 68 1. 29	6. 59 1. 34
Crushed.	ondo do s: Crusheddo pound	3.00 .81 .38 .182	4.00 1.32 .37 .166	2. 14 1. 48 . 61 . 115	17.31 .67 .108	19. 57 . 36 . 123

For greater detail on prices by grades and markets, see vol. I, Minerals Yearbook, 1955.
 Data not available.

# EMPLOYMENT IN THE MINERAL INDUSTRIES

Employment.—Average annual employment in Missouri mining industries decreased slightly in 1955, continuing a trend that started in 1953. Average employment in the nonmetals industries increased for the second consecutive year, coal mining industries increased slightly, and the metal-mining industries decreased for the third consecutive year, according to the Division of Employment Security, Department of Labor and Industrial Relations of Missouri.

Injuries.—Three fatal accidents occurred in the mineral industries of Missouri in 1955, 1 in the metals industry and 2 in the nonmetals industry. No fatal accidents were reported in the coal, oil, and gas

industries.

Wages.—Average hourly and weekly earnings in the mineral industries for 1955 were slightly higher than in 1954 to continue the upward trend in wages, according to the Division of Employment Security, Department of Labor and Industrial Relations of Missouri.

TABLE 3.—Average annual employment and earnings of mining industries, 1954-55 <sup>1</sup>

Industry	1954			1955				
	Average employ- ment	Average weekly earnings	Average weekly hours	Average hourly earnings	Average employ- ment	A verage weekly earnings	Average weekly hours	Average hourly earnings
Metal mining Nonmetal mining Coal mining	3, 527 3, 909 962	\$76. 09 67. 78 75. 34	40. 0 42. 9 37. 6	\$1.90 1.58 2.01	3, 371 3, 999 970	\$80. 65 72. 37 (2)	40.1 43.9 (2)	\$2. 01 1. 65 (²)

Letter from Henry J. St. Clair, Division of Employment Security, Department of Labor and Industrial Relations, State of Missouri. Annual averages not comparable due to change in sample structure.

Defense Minerals Exploration Administration Projects.—During 1955 the program of the Defense Minerals Exploration Administration (DMEA) continued to encourage systematic investigation of strategic and critical mineral occurrences. Projects active in 1955 include National Lead Co., in Bollinger and Madison Counties, which investigated source of lead, copper, cobalt, and nickel; Dale Mining Co., in Newton County, searching for zinc and lead occurrences; and Lucy A. McLaren, in St. Francois County, investigating lead and zinc deposits.

### **REVIEW BY MINERAL COMMODITIES**

#### METALS

Missouri reported production of seven metals in 1955—cobalt, copper, iron ore, lead, nickel, silver, and zinc. Lead remained the

principal mineral in value.

Mine Mills and Smelters.—St. Joseph Lead Co., Herculaneum, Mo., lead smelter and refinery operated at near capacity in 1955. National Lead Co. cobalt-nickel refinery began operations during the year. Eight mine mills were operating in Missouri in January, 1955—7 in Southeastern Missouri and 1 in Southwestern Missouri. Dale Mining Co. shut down its Dale mill in Newton County after operating in January and remained idle the rest of the year. National Lead Co. operated its Madison mill in Madison County all year except in August, when operations ceased because of a labor strike. Mine La Motte operated its mill in Madison County. St. Joseph Lead Co. operated its Indian Creek mill in Washington County and its Federal, Bonne Terre, Desloge, and Leadwood mills in St. Francois County.

Cadmium, Gallium, Germanium, and Indium.—These minor metals were recovered from the zinc-lead, lead, and lead-copper ores of Missouri. Since they occur only in minute quantities in the abovenamed ores and are recovered from the flue dusts of smelting opera-

tions, no assignment is possible to the state of origin.

Cobalt.—National Lead Co. reported recoveries of cobalt from

its cobalt-nickel refinery at Fredericktown, Mo., in 1955.

Copper.—Missouri produced a limited quantity of copper from lead-copper ore in Madison County and lead ore in St. Francois County. National Lead Co. was the State's largest producer. The copper concentrate was shipped to a Texas smelter for reduction.

Iron Ore.—Iron-ore production in Missouri turned upward in 1955 after a considerable drop in 1954. St. Francois County again ranked first in production, followed by Howell, Oregon, Shannon, and Ozark Counties. The ore occurs as hematite in St. Francois County and as

limonite in the remaining producing counties.

Lead.—Missouri continued as the Nation's largest lead-producing state in 1955, with St. Joseph Lead Co. the major producing company. Missouri supplied 37 percent of the Nation's total lead production. Most of the production came from St. Joseph Lead Co. operations in St. Francois County. All major producers operated steadily throughout the year and maintained exploration and development projects. St. Joseph Lead Co. completed three circular shafts at its southeastern Missouri properties in 1955. Almost all the lead was produced in the Southeastern Missouri region.

TABLE 4,—Mine production of silver, copper, lead, and zinc in 1955, by months, in terms of recoverable metals

Month	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)	Month	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January February March April	22, 373 22, 776 24, 455 22, 500	140 148 176 153	10, 724 10, 566 11, 555 10, 620	291 281 366 322	September October November December	22, 862 21, 854 22, 162 22, 383	104 156 148 151	10, 266 10, 240 10, 110 10, 455	426 272 560 449
May June July August	21, 853 21, 737 20, 237 23, 428	159 151 136 100	10, 310 10, 322 9, 549 10, 695	290 356 440 423	Total: 1955 1954	268, 620 352, 971		125, 412 125, 250	4, 476 5, 210

TABLE 5.—Mine production of silver, copper, lead, and zinc, 1946-50 (average), 1951-55, and total 1860-1955, in terms of recoverable metals

	Mines	Material sol	d or treated	Silve	er	Cop	per
Year	pro- ducing	Crude ore (short tons)	Old tailings (short tons)	Fine ounces	Value	Short tons	Value
1946-50 (average) 1951 1952 1953 1954 1955 1860-1955	54 67 28 16	6, 159, 596 6, 499, 122 7, 128, 550 6, 674, 300 6, 598, 647 6, 734, 346	905, 632 1, 574, 379 1, 750, 818 1, 483, 157 1, 579, 068 1, 546, 126	127, 375 184, 424 517, 432 359, 781 352, 971 268, 620 6, 412, 698	\$113, 933 166, 913 468, 302 325, 620 319, 457 243, 115 4, 943, 295	2, 528 2, 422 2, 576 2, 374 1, 925 1, 722 41, 474	\$1, 011, 188 1, 172, 248 1, 246, 784 1, 362, 676 1, 135, 750 1, 284, 612 16, 162, 424
	/ear		I	ead.	Zi	ne	Total
	-		Short tons	Value	Short tons	Value	value
1946-50 (average) 1951			123, 702 129, 245 125, 895 125, 250	\$36, 335, 668 42, 800, 892 41, 616, 890 32, 984, 490 34, 318, 500 37, 372, 776 1, 278, 029, 646	11, 974 11, 476 13, 986 9, 981 5, 210 4, 476 3, 700, 123	\$3, 013, 553 4, 177, 264 4, 643, 352 2, 295, 630 1, 125, 360 1, 101, 096 490, 695, 165	\$40, 474, 342 48, 317, 317 47, 975, 328 36, 968, 416 36, 899, 067 40, 001, 599 1,789,830,530

<sup>1</sup> Data not available.

TABLE 6.—Mine production of silver, copper, lead, and zinc in 1955, by classes of ore or other sources of material, in terms of recoverable metals

Source	Number mines	Material sold or treated (short tons)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lead ore <sup>1</sup>	12 7 3	8, 247, 336 30, 636 2, 500	268, 620	1,722	125, 360 29 23	4, 039 393 44
Total	22	8, 280, 472	268, 620	1,722	125, 412	4, 476

 $<sup>^{\</sup>rm 1}$  Includes lead-copper ore from 1 mine; also 1,546,126 tons of old tailings remilled, concentrates from which were mixed with those from crude ore.

Lead-metal price opened 1955 at 15.0 cents per pound, New York, and remained stable until September 26, when the price advanced to 15.5 cents and advanced further to 16.0 cents on December 29.

Manganese Ore.—No manganese-ore production was reported in Missouri in 1955. Industry (in large part with Government assistance) continued to work upon various processes for beneficiating

TABLE 7.—Mine production of lead and zinc in southeastern and central Missouri, 1946-50 (average) and 1951-55, in terms of concentrates and recoverable

	Lead concentrate (galena)		Zinc co	ncentrate 2	Re	Recoverable metal conten		
Year	(g:	alena)	(sphalerite)		1	ead	Zine	
	Short tons	Value 4	Short tons	Value	Short tons	Value	Short	Value
1946-50 (average) 1951 1952 1953 1954 1955	177, 803 176, 764 178, 746 182, 418 181, 790 180, 262	\$29, 004, 766 32, 484, 309 33, 325, 589 26, 622, 152 29, 680, 857 32, 428, 093	1, 335 4, 475 5, 703 5, 369 6, 069 7, 507	\$94, 464 509, 658 637, 709 347, 482 480, 412 700, 022	125, 222 122, 318 122, 942 125, 273 125, 173 125, 357	\$35, 797, 110 42, 322, 028 39, 587, 324 32, 821, 526 34, 297, 402 37, 356, 386	<sup>5</sup> 813 <sup>6</sup> 2, 277 <sup>6</sup> 3, 872 <sup>6</sup> 3, 180 <sup>6</sup> 3, 169 3, 934	\$215, 620 828, 828 1, 285, 504 731, 400 684, 504 967, 764

1 Based on southeastern and central Missouri ore "dirt" and old tailing treated at mills during calendar year indicated.

year indicated.

2 Includes zinc-lead carbonate concentrate.
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 inc is calculated from the average price for all grades.

4 Values given are to a certain extent arbitrary, as part of the lead concentrate is smelted by the producer.

5 Includes zinc recovered from lead-smelter slag.

3 Includes zinc recovered from byproduct matte from lead smelting as follows: 1951, 138 tons; 1952, 900 tons: 1953, 327 tons: 1954, 427 tons.

TABLE 8.—Mine production of lead and zinc in southwestern Missouri, 1946-50 (average) and 1951-55, in terms of concentrates and recoverable metal <sup>1</sup>

		Lead concentrate				Zine co	ncentrate	•
Year	G	alena	Car	Carbonate		halerite	Silicate	
	Short tons	Value	Short tons	Value	Short tons	Value	Short	Value
1946-50 (average)	2, 482 1, 767 8, 113 791 103 75	\$478, 650 423, 857 1, 701, 121 135, 603 16, 826 12, 750		\$12, 528	20, 936 17, 370 18, 671 12, 257 3, 713 1, 048	\$2, 233, 291 2, 074, 867 2, 138, 108 849, 141 378, 782 74, 528		\$16,001
					F	lecoverable r	netal con	tent 2
	Year					Lead		Zinc
-					Short tons	Value	Short tons	Value
1946-50 (average)					1, 936 1, 384 6, 303 622 77 55	\$538, 450 478, 864 2, 029, 566 162, 964 21, 098 16, 390	11, 151 9, 199 10, 114 6, 801 2, 041 542	\$2, 794, 979 3, 348, 436 3, 357, 848 1, 564, 230 440, 856 133, 332

Based on southwestern Missouri ore "dirt" and old tailing treated at mills during the calendar year indicated.

<sup>2</sup> 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.

A \$202,100, 15-month contract was signed between General Services Administration and Ores Benefication, Inc., for erecting a pilot plant at Joplin, Mo., and subsequent testing of a process developed by the Bruce Williams Laboratories.3

Nickel.—Nickel was recovered with cobalt at National Lead Co.

cobalt-nickel refinery.

Silver.—Silver was recovered from base bullion smelted from lead and lead-copper concentrates at the Herculaneum, Mo., lead smelter

of St. Joseph Lead Co.

Zinc.—The decline in mine production of recoverable zinc in Missouri continued in 1955 as the Quick Seven mine and mill of American Zinc, Lead & Smelting Co. in southwestern Missouri closed permanently in February because of depleted ore reserves. A slight increase in production was reported from southeastern Missouri. Southeastern Missouri produced 88 percent and southwestern Missouri 12 percent of total zinc output. Prime Western slab zinc opened the year at 11.5 cents per pound, East St. Louis, and climbed to 13.0 cents in September, at which price it closed the year.

TABLE 9.—Tenor of lead and zinc ore, old tailings, and slimes milled and concentrates produced in 1954-55, by districts

	Southeaster	n Missouri	Southwester	n Missouri
	1954 crude	1955 crude	1954 crude	1955 crude
	ore 1	ore 1	ore	ore <sup>2</sup>
Total are etc. milledshort tons	7, 958, 007	8, 204, 676	219, 708	75, 796
Total ore, etc., milledshort tons_ Total concentrate produced:do Leaddo	181, 790	180, 262	103	75
	6, 069	7, 507	3, 713	1, 048
Ratio of concentrate to ore, etc.:  Leadpercent	2. 28	2. 20	0.05	0. 10
	0. 08	0. 09	1.69	1. 38
Zinc	1. 57 0. 04 70. 26 58. 10		0. 04 0. 93 76. 70 61. 08	0. 07 0. 72 76. 00 57. 35
A verage value per ton: Galena concentrate	\$163. 27	\$179. 89	\$163. 36	\$170.00
	79. 16	93. 25	102. 02	71.11

TABLE 10.—Quoted prices of 60-percent zinc concentrate and 80-percent lead concentrate at Joplin, Mo., in 1955

[E&N	IJ Metal and	Mineral Markets]	
Zinc concentrate		Lead concentrate	
Period	Price per short ton	Period	Price per short ton
Jan. 4-Apr. 4	\$68. 00 72. 00 76. 00 80. 00	Jan. 4–Sept. 21. Sept. 27–Dec. 27.	\$187.85 195.05

²DeHuff, Jr., Gilbert L., Manganese, Eng. & Min. Jour., vol. 157, No. 2, February 1956, p. 100.

<sup>1</sup> Includes lead-copper ore and old tailing remilled: 1954, 1,579,068 tons; 1955, 1,503,466 tons.
2 Includes old tailing remilled: 1955, 42,660 tons.
3 Figures represent metal content of crude ore only insofar as it is recovered in the concentrates; data on tailing losses not available.

### TRI-STATE DISTRICT

The Tri-State lead-zinc district of southwestern Missouri, Kansas, and Oklahoma reported mine production of 4 million tons of crude ore and 486,000 tons of old tailing, yielding 27,000 tons of lead concentrate containing 20,000 tons of recoverable lead and 131,000 tons of zinc concentrate containing 70,000 tons of recoverable zinc. western Missouri production totaled less than 1 percent of the district lead concentrate and zinc concentrate. (See the Oklahoma chapter of volume III for further details on Tri-State district activity.)

TABLE 11.—Mine production of lead and zinc in the Tri-State district in 1955 in terms of material treated, concentrate, and recoverable metals

		(Short ton	ıs)					
State	Materia	l treated	Concen	trates	Recovered n	netal content		
	Crude ore	Old tailing	Lead	Zine	Lead	Zine		
KansasSouthwestern Missouri Oklahoma	1, 543, 530 33, 136 2, 563, 615	42, 660 443, 620	7, 362 1 75 4 19, 555	51, 252 2 1, 048 6 78, 726	5, 498 <sup>8</sup> 55 <sup>7</sup> 14, 126	27, 611 4 542 8 41, 543		
Total: 1955	4, 140, 281	486, 280	26, 992	131, 026	19, 679	69, 696		

1 Includes 5 tons from old tailing remilled.
2 Includes 217 tons from old tailing remilled.
3 Includes 217 tons from old tailing remilled.
4 Includes 305 tons from old tailing remilled.
5 Includes 39 tons from old tailing remilled.
5 Includes 2,519 tons from old tailing remilled.
6 Includes 2,519 tons from old tailing remilled.
7 Includes 24 tons from old tailing remilled.
8 Includes 1,281 tons from old tailing remilled.

#### NONMETALS

Barite.—The State barite output, second highest in the Nation for 12 consecutive years, totaled 363,700 short tons valued at \$4 million, a new record. All production was from Washington County. One producer installed a dry grinding unit to increase capacity. Several new washing plants were contemplated or under construction for recovering crude barite from a mixture of ore and soil mined from open pits. Both the chemical and oil industries consume Missouri barite.4 Washing and grinding plants operated in Washington and St. Louis Counties.

TABLE 12.—Barite sold or used by producers, 1946-50 (average) and 1951-55

	Value		ue			Value	
Year	Short tons	Total	Average per ton	Year	Short tons	Total	Average per ton
1946-50 (average) 1951 1952.	248, 033 281, 895 304, 080	\$2, 081, 925 2, 697, 200 2, 919, 795	\$8. 39 9. 57 9. 60	1953	\$330, 763 312, 791 363, 692	3, 338, 395 3, 047, 436 4, 003, 842	\$10.09 9.74 11.01

Cement.—Portland-cement production—12 million barrels—and shipments-12.3 million barrels-established new alltime records in 1955. Plants were in St. Louis, Ralls, Jackson, and Cape Girardeau Counties. The Missouri Portland Cement Co. announced a multi-

Engineering and Mining Journal ,vol. 157 ,No. 2, February 1956, p. 117.

million-dollar expansion program for its new 3,000-barrel-per-day cement plant at Sugar Creek (near Independence), which will increase its capacity from 1.2 million to 2.4 million barrels yearly. New equipment will include a second 360-foot kiln and grinding mills. In 1955 a third kiln was installed at the company Prospect Hill plant This 12- by 450-foot kiln, with its 6- by 100-foot (near St. Louis). air-quenching cooler, added 1,350,000 barrels per year to the capacity of this plant, which now totals 4.8 million barrels annually. new cement-storage silos were also added in 1955. Marquette Cement Manufacturing Co. announced plans to build a new plant alongside the present plant at Cape Girardeau, which will provide an additional capacity of 1,250,000 barrels annually. This will be a 1-kiln, 12-by-450-foot, wet-process operation and will cost about \$7 million.

TABLE 13.—Production and shipments of portland cement, 1946-50 (average) and 1951-55, in 376-pound barrels

		8	Shipments	
Year	Production (barrels)		Valu	е
	(barrens)	Barrels	Total	Average per barrel
1946-50 (average)	8, 319, 653 10, 230, 449 10, 007, 609 10, 281, 230 11, 201, 697 12, 001, 304	8, 329, 018 10, 217, 421 10, 086, 850 9, 860, 179 11, 379, 257 12, 255, 346	\$17, 443, 741 25, 760, 473 25, 523, 368 26, 238, 460 31, 425, 190 34, 912, 186	\$2. 09 2. 52 2. 53 2. 66 2. 76 2. 85

Clays.—Fire clay, diaspore, burley, and miscellaneous clay were produced in Missouri in 1955. Expansion at several of the State's 17 refractory manufacturing plants caused an increase in the production of fire, burley, and diaspore clays for refractories. The production of miscellaneous clay also increased to meet the demands of the heavy clay products and cement industries. Clays were produced in 21 counties at 98 separate operations. Fire clay was produced in 14 of the 21 counties and miscellaneous clay in 9. The five principal clay-producing counties, in order of value, were Gasconade, Audrain, Callaway, Montgomery, and Warren.

Iron Oxide Pigments.—Crude iron oxide pigments were mined in Missouri in 1955 for the first time in several years. Yellow and red iron oxide pigments were obtained in Crawford and Dent Counties.

Lime.—Missouri had 6 lime plants active in 1955—2 in Greene County and 1 each in Marion, Newton, St. Francois, and Ste. Genevieve Counties. Almost 82 percent of the lime was used for chemical and industrial purposes, with 9 percent used for building purposes and 9 percent for refractory material. Eighty-five percent of the output was quicklime and the remainder hydrated lime.

Perlite.—Crude perlite from deposits in Western States was expanded at a plant in St. Louis County. There are no known de-

posits of crude perlite in Missouri.

Sand and Gravel.—Sand and gravel for building and highway construction was obtained by 154 producers from 79 counties, primarily from stream deposits. High-purity silica sand, used in manufacturing

<sup>&</sup>lt;sup>5</sup> Pit and Quarry, vol. 48, No. 7, January 1956, pp. 156-157.

glass and for other special purposes, was obtained from the St. Peter formation in St. Charles, St. Louis, and Jefferson Counties by openpit and underground-mining methods. The five ranking counties, in order of value, were St. Louis, Jefferson, Franklin, St. Charles, and Jackson.

TABLE 14.—Clays sold or used by producers, 1946-50 (average) and 1951-55, by kinds

		by Kil	ius			
Year	Fire	clay	Dia	spore	Burley	
	Short tons	Value	Short tons	Value	Short tons	Value
1946-50 (average)	1, 174, 779 1, 453, 721 1, 734, 612 1, 392, 022 1, 170, 305 1, 486, 253	\$3, 188, 302 8, 249, 535 9, 089, 960 8, 562, 318 4, 460, 438 5, 692, 467	42, 660 45, 020 44, 757 50, 144 3, 322 11, 546	\$428, 277 704, 151 705, 269 962, 384 16, 610 134, 298	42, 239 73, 781 71, 433 53, 971 9, 265 31, 460	\$230, 059 745, 032 664, 358 563, 043 50, 835 208, 259
Year			Miscellan	eous clay	To	tal
			Short tons	Value	Short tons	Value
1946–50 (average)			607, 517 782, 335 1, 140, 217 735, 459 744, 393 873, 142	\$450, 927 859, 720 1, 638, 833 1, 094, 351 1, 330, 873 867, 299	1, 867, 195 2, 354, 857 2, 991, 019 2, 231, 596 1, 927, 285 2, 402, 401	\$4, 297, 565 10, 558, 438 12, 098, 420 11, 182, 096 5, 858, 756 6, 902, 323

TABLE 15.—Lime (quick and hydrated) sold by producers, 1946-50 (average) and 1951-55  $^{\rm 1}$ 

Year	Quicklime (short tons)  Hydrated lime (short tons)	lime	Total lime		
		Short tons	Value		
1946–50 (average)	727, 624 930, 132 949, 572 1, 006, 393 917, 684 1, 241, 051	194, 888 192, 167 181, 398 205, 714 208, 235 223, 777	922, 512 1, 122, 299 1, 130, 970 1, 212, 107 1, 125, 919 1, 464, 828	\$7, 883, 878 11, 285, 877 11, 326, 941 12, 084, 130 11, 165, 381 14, 408, 278	

<sup>&</sup>lt;sup>1</sup> Includes lime used by producers.

TABLE 16.—Sand and gravel sold or used by producers, 1946-50 (average) and 1951-55

			1001	00			
Year	Commercial operations		Government-and-con- tractor operations		Total		
	Short tons	Value	Short tons	Value	Short tons	Value	Average value per ton
1946-50 (average) 1951 1952 1953 1954 1955	4, 660, 925 6, 027, 503 5, 695, 296 4, 932, 617 8, 822, 467 8, 352, 467	\$4, 133, 945 5, 419, 034 5, 417, 628 4, 770, 451 9, 555, 223 8, 789, 439	1 685, 617 782, 354 1, 095, 126 859, 441 1, 068, 838 1, 631, 157	1 \$351, 685 550, 815 704, 567 463, 548 648, 258 1, 191, 439	1 5, 346, 542 6, 809, 857 6, 790, 422 5, 792, 058 9, 891, 305 2 9, 983, 624	1\$4, 485, 630 5, 969, 849 6, 122, 195 5, 233, 999 10, 203, 481 2 9, 980, 878	\$0. 84 . 87 . 90 . 90 I. 03 I. 00

Excludes Government-and-contractor production for 1947 to avoid disclosing individual company confidential data.
 Final figure. Supersedes figure shown in commodity chapter.

Stone.—Limestone, marble, granite, sandstone, and miscellaneous stone were produced in Missouri in 1955. Limestone production was reported in 83 of the State's 114 counties and supplied 92 percent of the total value of stone produced. Dimension marble was obtained in Jasper, Greene, and Ste. Genevieve Counties and crushed marble in Jefferson County. Iron County reported production of dimension and crushed granite. Iron Wayne Counties supplied dimension sandstone. Miscellaneous stone (chats) was produced in Jasper and St. Francois Counties. Crushed stone was used mainly for concrete, road metal, riprap, and railroad ballast and dimension stone for monumental and building purposes. Commercial producers furnished 94 percent of total stone production and noncommercial producers the remainder.

TABLE 17.—Stone sold or used by producers in 1951-55, by kinds

	Gran	ite	Marble		Lime	stone	
Year	Short tons	Value	Short tons	Value	Short tons	Value	
1951	11,618	\$168, 607 149, 196 164, 792 169, 935 179, 483	(2) (2) (2) (2) 22, 893 8 8, 500	(2) (2) (2) \$1, 067, 742 3 102, 000	8, 856, 795 12, 709, 705 12, 727, 029 17, 770, 749 21, 283, 587	\$13, 532, 757 18, 877, 717 18, 924, 418 22, 913, 657 28, 850, 387	
	Sands	Sandstone		Miscellaneous stone <sup>1</sup>		Total stone	
Year	Short tons	Value	Short tons	Value	Short tons	Value	
1951	10, 972	(2) (2) \$23, 413 10, 957 59, 407	2, 418, 207 2, 372, 812 1, 191, 819 874, 137 1, 070, 824	\$909, 222 889, 254 731, 423 589, 319 389, 137	11, 294, 227 15, 106, 544 13, 942, 531 18, 672, 239 22, 368, 768	\$15, 255, 427 20, 676, 958 19, 908, 540 24, 751, 610 3 29, 580, 414	

Chats; also includes small quantity of stone.
 Figure withheld to avoid disclosing individual company confidential data.
 Excludes dimension marble.

Tripoli.—The American Tripoli Co. processed tripoli at its plant at Seneca, Newton County. The company reported that the demand was better than normal due to high automobile production. The raw material was quarried in Ottawa County, Okla. The processed tripoli was used for abrasive polishing and buffing compounds in the metal-finishing trades, as a chemically inert filler, and for foundry facings.

Vermiculite.—Crude vermiculite was shipped from western states

and exfoliated in St. Louis and Jackson Counties.

### MINERAL FUELS

Asphalt (Native).—Native asphalt was produced from deposits in

Barton County by the Barton County Rock Asphalt Co.

Coal.—Production of bituminous coal in Missouri in 1955 continued to increase for the second year. Missouri had 47 operators in 19 counties that reported mining over 1,000 tons of coal during the year. The 28 strip mines produced 95 percent, and the 19 underground mines, 5 percent of the coal. Counties producing over \$1 million worth of coal, in order of their importance, are: Henry, Bates, Macon, Barton, and St. Clair.

TABLE 18.—Coal production, 1946-50 (average) and 1951-55

		,	(ozugo) uni	- 1001 00	
Year	Short tons	Value	Year	Short tons	Value
1946-50 (average) 1951 1952	3, 720, 453 3, 269, 283 2, 954, 450	\$13, 500, 597 13, 405, 436 12, 048, 141	1953 1954 1955	2, 393, 304 2, 513, 593 3, 232, 485	\$9, 848, 903 10, 028, 293 12, 771, 570

Natural Gas.—Several northwestern counties of Missouri reported production of natural gas in 1955. Production remained about the same as in the several previous years.

Petroleum.—A small quantity of crude petroleum was produced in Missouri in 1955 in the St. Louis area. Output and value declined from 1954.

### **REVIEW BY COUNTIES**

Mineral production was reported in 110 of the 114 counties in Missouri in 1955. The five leading producing counties, in order of value, were St. Francois, St. Louis, Ste. Genevieve, Jackson, and Ralls. No mineral production was reported in De Kalb, Mississippi, New Madrid, and Schuyler Counties.

Adair.—Coal was mined by the Billy Creek Coal Co., Inc., Blacksmith Coal Co., Inc., and Number Eight Coal Co. Bailey Limestone Quarry produced crushed limestone for concrete, road metal, and agricultural purposes.

Andrew.—Limestone was quarried and crushed by George W. Kerford quarry and United States Army Corps of Engineers for use as concrete, road metal, riprap, and flagstone.

Atchison.—Paving sand was produced under contract to Missouri

State Highway Department from deposits in Atchison County.

Audrain.—Audrain County ranked second in the State in clay production. Plastic and flint fire clay and fire-clay products were produced in the Mexico, Farber, and Vandalia areas. Producers included the A. P. Green Fire Brick Co., Mexico Refractories Co., Laclede-Christy Co., and Walsh Refractories Corp. Molino Lime Co. produced limestone for concrete, road metal, and agricultural purposes and sand and gravel for paving purposes.

Barry.—Troy Douthitt Lime Co. produced crushed limestone. Gene Haworth and the Missouri State Highway Department produced sand and gravel.

Barton.—The county ranked fourth in the State in coal production. Clemens Coal Co. and D. O. Short Coal Co. mined coal. Barton

County Rock Asphalt Co. produced native asphalt.

Bates.—The county ranked second in the State in coal production; coal was mined by the Hume-Sinclair Coal Mining Co., Mullies Coal Co., and Heckadon Coal Co. Crushed limestone was produced for concrete, road metal, and agricultural purposes by Alvis Limestone & Concrete Co., Missouri State Highway Department, Fuller Lime Co., and Frank Underwood. Clyde S. Miller and Fuller Lime Co. obtained gravel from deposits in the county.

Benton.-Junge Gravel Co. produced structural, paving, and other

gravel.

TABLE 19.—Value of mineral production in Missouri by counties, 1954-55 1

County	1954	1955	Minerals produced in 1955 in order of value
	\$441, 962	\$359, 122	Coal, stone.
dair		(2)	Stone.
tohicon	(2)	37, 549	Sand and gravel.
udrain	633, 893	1, 431, 046	Clay, stone, sand and gravel.
Rorry	21, 652	22, 210	Stoné, sand and gravel. Coal, native asphalt.
Panton	(2) (2)	2, 954, 108	Coal, stone, sand and gravel.
Potos	(2) (2)	2, 934, 100	Sand and gravel.
S 4	6, 750	(2) 37, 159 649, 607	Dο
Bollinger	486, 314		Stone, sand and gravel, coal, clays
Buchanan	486, 314 263, 924	275, 184	Sand and gravel, stolle, clay.
Butler	100, 169 120, 722 1, 645, 606	56, 740	Sand and gravel.
Toldwell	120, 722	120, 312	Stone. Clays, coal, stone, sand and gravel.
Colloway	1, 645, 606	2, 127, 155	Sand and gravel.
	6, 000 5, 703, 231	10, 700	Cement, stone, sand and gravel, clays.
Jone Girerdesil	5, 703, 231	6, 058, 735	Stone.
Torroll	(2)	(2) 33, 300 217, 728	Sand and gravel.
Carter	12, 675 351, 896	217, 728	Stone, clays.
7000	(2)	(2)	Stone.
Dedar	(2)	(2) (2)	Coal.
Chariton	(2)	(2)	Sand and gravel, stone.
Christian	(2) (2)	(2)	Stone.
Olay	1, 258, 087	1, 181, 781	Stone, coal.
Clinton	(2)	(2)	Stone.
Cole	155, 175	162, 520	Sand and gravel, stone.
Cooper	84, 484	110, 391	Do. Sand and gravel, crude iron oxide pigmen
Crawford	(2)	(2)	stone.
		(9)	Coal, sand and gravel.
Dade	(2)	(2) 10, 400	Sand and gravel.
Dollog	11, 625	(2)	Stone.
Doviess	(2)	(-)	
Do Kalh	<sup>(2)</sup> 7, 275	79, 018	Stone, sand and gravel, crude iron oxide p
Dent	1,210	, 020	ments.
_	5, 475	6, 200	Sand and gravel.
Douglas Dunklin	(2)	(2)	Stone, sand and gravel.
Franklin	927, 532	837, 967	Sand and gravel, stone, clays.
Gasconade	1, 988, 024	2, 200, 196	Clays, stone, sand and gravel.
Gentry	(2)	117, 887	Stone, sand and gravel.
Greene	2, 184, 998	2, 500, 230	Lime, stone, sand and gravel.
Grundy	(2)	(2) 208, 383	Stone. Stone, sand and gravel, coal.
Harrison	354, 208	3, 445, 858	Coal, stone.
Henry	(2) (2)	3, 440, 606 (2)	Stone, sand and gravel.
Hickory	202 500	(2)	Stone.
Holt Howard	88, 826 55, 788 219, 810 7, 187, 355 2, 665, 518	132,634	Stone, sand and gravel.
Howell	55, 788	214,060	Iron ore, stone, sand and gravel.
Iron	219, 810	214, 060 248, 728	Stone, sand and gravel.
Jackson	7, 187, 355	9, 066, 124 2, 102, 156	Cement, stone, sand and gravel, clays.
Jasper	2, 665, 518	2, 102, 156	Stone, sand and gravel, zinc, lead.
Tefferson	9/1,002	978, 513	Sand and gravel, stone.
Tohnson	(2) (2)	240, 382	Stone, coal.
Knox.	(2)	(2)	Stone. Stone, sand and gravel.
Laclede	(2)	(2) 29, 075 169, 166	Coal, sand and gravel, stone.
Lafavette	165, 013	6, 900	Sand and gravel, stone.
Lawrence	(2) 421, 589	666, 057	7   Stone, sand and gravel.
Lewis	394, 865	314, 203	
Lincoln		(2)	Stone.
LinnLivingston	208, 023 305, 716	246, 244	Stone, sand and gravel, clays.
Macon	(2)	(2)	Cool stone
Madison		5, 222, 60	Lead, copper, cobalt, nickel, silver
Maries	(2)	52, 57 617, 21	7 Sand and gravel, clays.
Marion	544, 980	617, 21	9 Lime, stone, sand and gravel.
McDonald	1,425	2, 90	0   Sand and gravel.
Mercer	.) (2)	57, 66 21, 24	1   Stone. 2   Sand and gravel, stone.
Miller	. 30,00*	21, 24	Land and Branch, Stories
Micciccinni	1 1,000	45, 30	o Stone, sand and gravel.
Moniteau	53, 439		Clays, stone, sand and gravel.
Monroe	. 110,004	626, 40	9   Do.
Montgomery	133 587	1 40.00	0 Sand and gravel, stone.
Morgan New Madrid	(2)	25,00	
Newton	(2) 497, 899	511, 95	Lime, zinc, stone, lead.
Nodaway			Stone, sand and gravel.
Oregon	63, 550	113, 97	79   Tron ore stone sand and gravel.
Osage	_  11,010	382, 42	6 Clays, stone, sand and graves.
Ozark.	_  64,403	12,10	in I Sand and gravel, iron ore.
V 101.		(2)	Sand and gravel.
Perry	- ( )	ìó1, 52	20 Sand and gravel, stone.

See footnotes at end of table.

TABLE 19.—Value of mineral production in Missouri by counties, 1954-55 1—Con.

County	1954	1955	Minerals produced in 1955 in order of value
Phelps	\$214, 424	\$172, 136	Clays, stone, sand and gravel.
Pike	187, 485	158, 133	Stone, sand and gravel.
Platte	939, 495	209, 324	Clays, stone.
Polk.	10, 875	13, 800	Sand and gravel.
Pulaski	(2)	67, 665	Do.
Putnam	(2) (2)	52, 805	Coal.
Ralle	5 150 256	6, 719, 384	Cement, stone, coal, sand and gravel.
Rendolph	(2)	502, 928	Coal, stone.
Randolph Ray Reynolds	(2) 177, 895	144, 864	Stone, coal.
Damolda	6. 225	4, 100	Sand and gravel.
Di-1	0, 220	(2)	Do.
Ripley St. Charles	25, 427 979, 057		
St. Charles	979, 057	1, 043, 939	Sand and gravel, stone, clays.
St. Clair	(2)	1, 335, 872	Coal, stone, sand and gravel.
St. Francois	34, 423, 010	39, 976, 287	Lead, stone, iron ore, lime, zinc, copper, sil-
~. <b>-</b> .			ver, sand and gravel.
St. Louis	24, 078, 931	24, 950, 751	Cement, sand and gravel, stone, clays, pe-
			_ troleum.
Ste. Genevieve	(2) 298, 899	11, 757, 545	Lime, stone, sand and gravel.
Saline Scotland	298, 899	475, 804	Stone.
Scotland	(2)	(2) (2)	Do.
Scott	10,000	(2)	Sand and gravel.
Shannon	63, 100	70, 388	Iron ore, stone, sand and gravel,
Shelby	(2)	(2)	Stone.
ShelbyStoddard	155, 088	174, 290	Sand and gravel.
Stone	3 300	45, 400	Do.
Sullivan	(2)	(2)	Stone.
Sullivan Taney Texas	12,000	352, 800	Sand and gravel.
Texas	(2)	39, 348	Stone, sand and gravel.
Vernon	130, 699	235, 191	Coal, stone, sand and gravel.
Warren		325, 396	Clays, sand and gravel, stone.
Washington	4, 184, 459	5, 782, 647	Barite, lead, zinc, sand and gravel.
Wayne	123, 246	143, 199	Sand and gravel, stone.
Wayne Webster	(2)	7, 100	Sand and gravel.
Worth	(2) (2)	(2)	Stone.
Worth Wright Undistributed	2	27, 850	Stone, sand and gravel.
Undigtributed	22, 524, 118	8, 709, 147	DOULD, DALIG ALIG STAVEL
Ondisminared	22, 024, 110	0, 109, 147	
Total	131, 280, 000	151, 626, 000	
10041	191, 480, 000	101, 020, 000	

<sup>&</sup>lt;sup>1</sup> The following county is not listed because no production was reported in 1954 or 1955: Schuyler.
<sup>2</sup> Value included with "Undistributed."

Bollinger.—Mayfield Gravel Co., Penzel Construction Co., and Missouri State Highway Department obtained paving gravel from local deposits.

Boone.—Adrian Materials Co., N. R. Garrett, Boone Quarries, Inc., and Central Stone Co. produced crushed limestone for riprap, concrete, road metal, agricultural, and other purposes; operations centered near Columbia and Jefferson City. Columbia Sand & Towing Co. and Columbia Special Road District produced structural, paving, and filter sands and structural and paving gravel. Hughes Coal Co., Earl S. Hussey mine, and William R. Carter mined coal. Columbia Brick & Tile Co. produced shale and fire clay for use in manufacturing heavy clay products.

Buchanan.—Pioneer Sand Co. produced structural, paving, and engine sand. Everett Quarries, Inc., and L. S. Stafford produced limestone for concrete, road metal, and agricultural purposes. Moorhead Brick & Tile Co. quarried shale and processed it locally into tile and

common building brick.

Butler.—Missouri State Highway Department, Eads Construction Co., Kittredge Gravel Co., and Grobe & Sons produced building sand

and paving gravel.

Caldwell.—Farmers Rock & Lime Co. and A. L. Houghton Stone Co. crushed limestone for concrete, road metal, and agricultural purposes, quarried near Kingston and Nettleton. The city of Braymer produced limestone for use as riprap.

Callaway.—Callaway County ranked third in the production of clays in Missouri. Flint and plastic fire clays were mined within the county and manufactured locally into refractories. Producers included Harbison-Walker Refractories Co., Walsh Refractories, Clayton & Crowson, Laclede-Christy Co., and A. P. Green Fire Brick Co. Mariott-Reed Coal Co. mined coal.

Camden.—Missouri State Highway Department contracted for

paving gravel in Camden County in 1955.

Cape Girardeau.—Cape Girardeau County ranked sixth in the value of mineral production in Missouri in 1955. The Cape Girardeau Sand Co. dredged sand from the Mississippi River for structural and paving purposes. Steinhoff-Kirkwood & Joiner operated a portable plant and obtained paving gravel along the Mississippi River. Farmers Limestone Co. and Federal Materials Co. quarried limestone and crushed it for concrete, road metal, railroad ballast, and agricultural purposes. Ceramo Co., Inc., and Kasten Bros. Brick Co. mined common red clay for use in manufacturing building brick. Marquette Cement Manufacturing Co. produced clay and limestone for the manufacture of cement.

Carroll.—M. M. Green Quarry Co. produced crushed limestone for

riprap, concrete, road metal, and agricultural purposes.

Carter.—Missouri State Highway Department produced and con-

tracted for gravel in Carter County for paving purposes.

Cass.—Deitz Hill Development Co., Peculiar Rock & Lime Co., Emmett Brasnahan, S & W Quarries, and Missouri State Highway Department quarried and crushed limestone near Peculiar and Harrisonville for concrete, road metal, and agricultural purposes. S & W Quarries near Garden City produced dimension limestone for use as rubble. United Brick & Tile Co. mined clay for manufacturing brick and tile.

Cedar.—Sac River Lime Co. produced crushed limestone from sources near Stockton for agricultural purposes.

Chariton.—W. O. Loumaster mined coal from deposits in Chariton

County.

Christian.—Bureau of Public Roads and Missouri State Highway Department obtained paving gravel from deposits in Christian County. Joe Howard quarried limestone near Billings for use as a soil conditioner.

Clark.—Myron Baker, near Kahoka, and Brooks Construction Co. quarried and crushed limestone for concrete, road metal, and agricul-

tural purposes.

Clay.—Clay County ranked sixth in the State in the production of stone. Mid-West Precote Co., Tobin Quarries, Inc., J. H. Oldham Stone Co., Everett Quarries, Inc., Clay County Highway Engineer, and Clay County quarries quarried and crushed limestone for use as riprap, concrete, road metal, and agricultural limestone. Mosby Coal Co. and Perry Rice Coal Co. mined coal.

Clinton.—Everett Quarries, Inc., produced crushed limestone for

riprap, concrete, road metal, and agricultural purposes.

Cole.—Jefferson City Sand Co., Adrian Materials Co., Inc., Thompson Sand Co., Cole County Highway Department, and Missouri State Highway Department obtained structural and paving sand and gravel along the Osage and Missouri Rivers. Franklin Groose

quarried limestone for agricultural purposes and other uses near

Eugene.

Cooper.—Missouri River Sand & Gravel Co. produced structural, paving, and blast sand. Missouri State Highway Department, H. A. Harms & Sons, and Ralph Reuter produced paving gravel. United States Army Corps of Engineers and Castle Bros. quarried and crushed limestone for use in bank stabilization along the Missouri River and for concrete and road metal.

Crawford.—The Missouri State Highway Department contracted for paving gravel in Crawford County in 1955. George B. Smith Chemical Works, Inc., produced crude iron oxide pigments. Charles

Waidman quarried limestone for agricultural purposes.

Dade.—Missouri State Highway Department contracted for paving Tyler Coal Co. mined coal from open-pit operations in Dade gravel. County.

Dallas.—The Missouri State Highway Department produced and

contracted for paving gravel in Dallas County in 1955.

Daviess.—Snyder Quarries, Inc., quarried and crushed limestone

for concrete, road metal, agricultural and riprap purposes.

Dent.—Ozark Stone Products, Inc., quarried dimension limestone. Ozark Contractors, Inc., produced limestone for agricultural pur-Missouri State Highway Department and United States Forest Service produced paving gravel. George B. Smith Chemical Works, Inc., produced crude iron oxide pigments.

Douglas.—Missouri State Highway Department produced and

contracted for paving gravel.

Dunklin.-Wilkey & Langford Gravel Co. produced paving gravel from local stream beds in Dunklin County in 1955. Everett Quarries,

Inc., produced limestone for concrete, road metal, and agstone.

Franklin.—The county ranked third in the State in sand-andgravel production. Glass, structural, paving, grinding and polishing, filter, and other sands, and structural, paving, and railroad ballast gravel were produced. The five leading producers were St. Louis Material & Supply Co., Pacific Pebbles, Inc., Meramec Sand & Gravel Co., O. E. Jessup, and Washington Sand Co. Oliver L. Taetz Co., Inc., Edwin Bebermeyer, Julius Grapethin, W. I. Bramel, Tourville Lime Co. L. E. McKoover, and United States Army Cornel Tourville Lime Co., J. E. McKeever, and United States Army Corps of Engineers quarried limestone and dolomite for concrete, road metal, and agricultural purposes. A. P. Green Fire Brick Co. and Rousset Bros. Clay Co. mined fire clay for use in manufacturing refractories.

Gasconade.—The county ranked first in the State in clay production. Burley, flint, and diaspore fire clays were produced in the vicinity of Swiss, Hermann, Bland, and Owensville and used mainly in manufacturing refractories. Producers included General Refractories Co., Harbison-Walker Refractories Co., A. P. Green Fire Brick Co., Walsh Refractories, and Laclede-Christy Co. General Chemical Division of Allied Chemical & Dye Corp. mined clay for chemical uses. Virgil Smith and United States Army Corps of Engineers produced crushed limestone for concrete, road metal, and agricultural purposes. Missouri State Highway Department con-

tracted for paving gravel in Gasconade County.

Gentry.—Structural sand and paving gravel were produced by the Albany Gravel Co. from deposits in Gentry County. Gentry County

Quarry and H. V. Windsor produced crushed limestone for concrete,

road metal, and agricultural purposes.

Greene.—Greene County ranked third in the State in the production of lime and seventh in the production of stone. Ash Grove Lime & Portland Cement Co. quarried limestone at Galloway and Springfield and converted it into quick and hydrated lime near the quarry sites. Garrett Construction Co., Joseph J. Griesemer, and G. B. Mason produced crushed limestone for concrete, road metal, and agricultural purposes. Carthage Marble Co. produced dimension marble. Missouri State Highway Department contracted for paving gravel.

Grundy.—E. E. Trenary and Jay Wilcox Limestone Quarry Co. produced crushed limestone for riprap, concrete, road metal, and

agricultural and other purposes.

Harrison.—L. W. Hayes, Inc., Mathes Quarries, and Sargent, Inc., quarried and crushed limestone near Bethany and Ridgeway for concrete, road metal, and agricultural purposes. Harrison County Highway Department produced paving sand. New Black Diamond

Coal Co. mined coal in Harrison County.

Henry.—This county ranked first in coal production in Missouri in 1955. Producers included the Crowe Coal Co., Power Coal Co., Windsor Coal Co., Crowder Coal Co., W. W. Coal Co., Inc., A. H. Manbeck Coal Co., A. G. Pence Coal Co., and Redding Coal Co. Williams Rock Co., Alvis Limestone & Concrete Co., Davis Rock Co. and O. A. Knisley produced crushed limestone for concrete, road metal, and agricultural purposes.

Hickory.—Roy Worthington obtained limestone for agricultural

purposes from deposits in Hickory County.

Holt.—Gordon Bros. Quarries, Inc., and United States Army Corps of Engineers quarried and crushed limestone for use as road metal and agstone and for bank stabilization along the Missouri River.

Howard.—Hall & Riley Quarries produced crushed limestone for concrete, road metal, and agricultural purposes. United States Army Corps of Engineers produced crushed limestone for riprap and road-building purposes. Sand for structural purposes was produced by Glasgow Sand Co.

Howell.—Kilkenny Limestone Co. quarried limestone near West Plains for concrete, road metal, and agricultural purposes. Missouri State Highway Department produced paving sand and gravel. Lee Johnson, Patillo Bros. Mines, E. E. Carroll, Dolan Dubineck, Hobart

Bowen, and Dan Huff mined iron ore.

Iron.—Heyward Granite Co. produced crushed granite for use as riprap and dimension granite for rough architectural purposes near Graniteville. Duncan Bros. quarried dolomite for use as a soil conditioner. United States Forest Service contracted for paving sand and

gravel.

Jackson.—Jackson County was the State's leading producer of stone, third largest cement producer, fifth largest sand and gravel producer, and fourth highest in total mineral production, Gerald Hodgins Building Rock Co., Dick Carson, Rowe & Son, Strongs Quarries, and Reese Quarries quarried dimension limestone for use mainly as rubble. Twelve companies crushed limestone for concrete, road metal, and agricultural purposes. The five leading producers included Stewart Sand & Material Co., Beyer Crushed Rock Co., Centropolis

Crusher Co., Union Construction Co., and McKee Quarries. Sand & Material Co. and Kansas City Quarries produced structural, Stewart paving, and engine sands and paving gravel. United Brick & Tile Co. mined miscellaneous clay and used it in manufacturing heavy clay products. Missouri Portland Cement Co. quarried limestone and shale near Independence for use in manufacturing cement.

Jasper.—Jasper County ranked fourth in the State in stone production. Carthage Marble Corp., Carthage Crushed Limestone Co., and Independent Gravel Co. produced crushed limestone, used mainly for concrete, road metal, and agricultural purposes. Carthage Marble Corp., quarried dimension limestone and marble. Calcium Products Co. and Jasper County Highway Department produced miscellaneous stone. Highway Stone Co. produced railroad-ballast gravel, and Independent Gravel Co. structural, glass, molding, grinding, blast, and engine sands. Zinc and lead were obtained from ores mined in the Duenweg and Webb-Carterville districts by small operators and from tailings by W. A. Hughes. Chats from zinc-lead mining operations were used as railroad ballast and paving gravel.

Jefferson.—Jefferson County was the second largest producer of sand and gravel in the State. High-purity silica sand, obtained from quarries in the St. Peter formation by Aubuchon Silica Mining Co. near Festus and Pittsburgh Plate Glass Co. near Crystal City, was used in manufacturing plate glass and for grinding and polishing purposes. Jefferson County Highway Department, Walter Ficken, Masters Bros. Silica Sand Co., and Lewis Miller also produced sand. Henry Trautman, Kitson Bros., quarry, and the Hess Bros. quarried limestone and dolomite for concrete, road metal, and agricultural purposes. Hess Bros. produced rough construction dimension limestone. Giudicy Marble Terrazzo & Tile Co. produced crushed marble.

Johnson.—Dietz Hill Development Co., Marr & Sons, and Marr

Bros. produced crushed limestone for concrete, road metal, and agricultural purposes. Herman Smith mined coal for open-pit

Knox.—McSorley Lime Co. obtained limestone from its quarry near Edina for concrete, road metal, and agricultural purposes.

Laclede.—Missouri State Highway Department and United States Forest Service contracted for paving gravel in Laclede County in 1955. Wissbaum Quarry, H. R. Lillard, and United States Forest Service

quarried and crushed limestone for agricultural purposes.

Lafayette.—Earl Ashford Coal Co., Hughes Coal Co., H. S. Peek Coal Co., Roscher Coal Co., and Winfrey Mining Co. mined coal underground. Lexington Sand & Gravel Co and Waverly Sand Co. operated dredges to obtain paving sand near Lexington and Waverly. Limestone for concrete and road metal was quarried near Higginsville by Dietz Hill Development Co. and for riprap by the United States Army Corps of Engineers.

Lawrence.—E. L. Britain quarried dimension limestone from deposits in the county. Missouri State Highway Department contracted

for paving gravel.

Lewis.—Missouri Gravel Co. obtained sand and gravel from deposits near LaGrange for paving purposes. Hamill Limestone Co., Louisa County Lime Products Co., and the Missouri State Highway Department quarried and crushed limestone used mainly for concrete, road metal, and agricultural purposes.

Lincoln.—Harbison-Walker Refractories Co. produced firebrick from clays obtained in Lincoln County. Columbia Quarry Co., Watson Quarry, and Gessman Lime Quarry produced limestone for riprap, concrete, road metal, and agricultural purposes. State Highway Department contracted for paving gravel.

Linn. Baily Limestone Co. quarried and crushed limestone for

concrete, road metal, and agricultural purposes.

Livingston,—Cooper Contracting Co. and Fred McVey produced limestone for riprap, concrete, road metal, railroad ballast, and agricultural purposes. Cooley Gravel Corp. obtained and washed paving sand and paving and structural gravel at its fixed preparation plant near Chillicothe. Midland Brick & Tile Co. mined clay for use in manufacturing brick and tile.

Macon. - Macon County ranked third in the State in the production of coal, which is mined by Bevier Coal Co. and Lewellyn Coal Co. L & O Quarry & Construction Co. quarried and crushed limestone for

concrete, road metal, and agricultural purposes.

Madison.-Mine La Motte Corp. mined ores containing lead, copper, and silver near Mine La Motte. National Lead Co. mined ores containing lead, copper, cobalt, nickel, iron, and silver at its Madison mine near Fredericktown. National Lead Co. recovered cobalt and nickel at its refinery near Fredericktown from iron rejects from the lead-copper circuit of its Madison mill.

Maries.—Wallace Bros., Paul R. Litton, A. P. Green Fire Brick Co., and Laclede-Christy Co. mined diaspore, burley, and fire clays in Maries County for use in manufacturing refractories. State Highway Department contracted for gravel for paving purposes.

Marion.-Marblehead Lime Co. produced quicklime and hydrated lime at its kiln near Hannibal from limestone quarried nearby. S. D. Fessenden & Sons produced limestone for agricultural purposes. Bolton Sand & Gravel Co. produced structural and blast sand.

McDonald.—Missouri State Highway Department contracted for

gravel for paving purposes in McDonald County in 1955.

Mercer.—Donald Wilcox quarried and crushed limestone used as

road metal and soil conditioner.

Miller.—Dimension limestone was quarried near Brumley by Al Elam, Inc., for use as rubble, dressed stone, curbing, and flagging. Missouri State Highway Department contracted for paving gravel.

Moniteau. - Moniteau County Agricultural Association quarried and crushed limestone for railroad ballast and agricultural purposes. Missouri State Highway Department contracted for paving gravel.

Monroe. - Monroe County Highway Department produced paving sand and Wilkerson Bros. and Missouri State Highway Department Walsh Refractories Corp., Bethlehem Co., Gilliam paving gravel. Mining Co., and Fleutsch Bros. mined fire clay, diaspore, and burley clays and used them mainly for manufacturing refractories. Limestone was quarried and crushed for agricultural purposes by Ullmer Wilkerson and for concrete and road metal by Monroe County Highway Department and C. E. Hamilton Lime Co.

Montgomery.—The county ranked fourth in value of clays produced. Fire clay was mined from local pits for use in the manufacture of refractories. Producers included Wellsville Fire Brick Co., F. B. Blansett, General Refractories Co., Staley & Zimmerman, A. P. Green Fire Brick Co., and Mary A. Dixon & Co. Two Rivers Sand

& Gravel Co., Montgomery County Highway Department, and the Missouri State Highway Department produced sand and gravel for structural and paving purposes. McClain Lime Quarry, Danville Stone Co., and Montgomery County Highway Department quarried and crushed limestone for concrete, road metal, and agricultural purposes.

Morgan.—Missouri State Highway Department produced paving gravel and Harold Campbell quarried and crushed limestone for

agricultural purposes.

Newton.—Big Four Mining Co. and Dale Mining Co. mined ores containing zinc and lead in the Stark City district. Southwest Lime Co. manufactured quick and hydrated lime near Neosho from limestone quarried locally. A portion of the limestone was sold for agricultural purposes. Tripoli for use in polishing and buffing compounds was processed at a plant near Seneca. The raw tripoli was obtained from Ottawa County, Okla.

Nodaway.—Gendler Stone Co. quarried and crushed limestone for concrete, road metal, and agricultural purposes. Earl Wilson Sand Co. obtained building sand and gravel through dredging operations

from deposits near the Platte River.

Oregon.—Miller & Reynolds, A. J. Curry, and M. Batesel mined brown iron ore. O. O. Mainprize produced crushed limestone for concrete, road metal, and agricultural purposes. Missouri State

Highway Department obtained paving gravel from local deposits.

Osage.—A. P. Green Fire Brick Co., Staley & Zimmerman, Rogers & Son, and Russell Phillips produced fire clay for use in manufacturing refractories. Missouri State Highway Department and Osage County Highway Department produced gravel for paving purposes. Hall & Riley Quarry Construction Co., V. W. Morris, and the Missouri State Highway Department quarried limestone from local deposits for concrete, road metal, and agricultural purposes.

Ozark.—Bowen, Holmes, & Batesel mined brown iron ore from deposits in Ozark County. Missouri State Highway Department

contracted for paving gravel.

Pemiscot.—Taylor Sand & Gravel Co. and Caruthersville Sand & Gravel Co. obtained sand and gravel for structural and building purposes from deposits near Caruthersville.

Perry.—Gibbar Bros. obtained limestone for concrete, road metal, and agricultural purposes, and building gravel from local deposits.

Missouri State Highway Department contracted for paving gravel.

Pettis.—W. J. Menefee Construction Co., T & O Rock Lime Co., and Howard Construction Co. produced crushed limestone for concrete, road metal, and agricultural purposes. J. C. Orender produced paving gravel.

Phelps.—Fire clay was mined for use in manufacturing refractories. Producers included Laclede-Christy Co., Floyd C. Dillon, Robinson Clay Products Co., A. P. Green Fire Brick Co., Dillon Bros., and E. E. Withouse. Bray Construction Co., Brown Construction Co., and Jessie Nivens produced crushed dolomite for use as a soil conditioner and in building and road construction. Missouri State Highway Department produced paving gravel.

Pike. Magnesium Mining Co., Ashley Quarries, Weaver Construction Co., and the Galloway Lime Co. quarried and crushed limestone for concrete, road metal, and agricultural purposes. Missouri State Highway Department contracted for gravel for paving purposes.

Platte.—Carter-Waters Corp. mined miscellaneous clay for use in producing lightweight aggregates. United States Army Corps of Engineers used crushed limestone for bank stabilization along the Missouri River. Everett Quarries, Inc., and Mid-West Precote Co. produced limestone for concrete and road metal.

Polk.—Missouri State Highway Department contracted for gravel for paving purposes. H. F. Butcher produced paving gravel near

Humansville.

Pulaski.—J. H. Walser Construction Co. produced sand and gravel near Waynesville for building and paving purposes. Missouri State Highway Department contracted for paving gravel. W. J. Menefree Construction Co. produced paving gravel.

Putnam.—Clark Coal Co. and Hays Coal Co. mined coal in Putnam

County.

Ralls.—This county ranked fifth in the value of total mineral production and second in cement, produced by Universal Atlas Cement Co. at its plant near Ilasco. Limestone and shale for use in cement manufacture were obtained near the plant. Central Stone Co. produced limestone for concrete and road metal. Edward B. Cooper and Missouri State Highway Department obtained paving gravel from local deposits. Maple Valley Coal Co. mined coal.

Randolph.—Moberly Fuel Co., Inc., D. L. Bradley Coal Co., Inc., Fately Coal Co., and Nejedly Coal Co. mined coal. N. J. Cooksey Co., Glasgow Quarries, Inc., Ralph Potter Quarry Co., and Alfred Vanskike Lime Quarry quarried and crushed limestone for concrete,

road metal, and agricultural purposes.

Ray.—Crushed limestone, produced by the Steva Stone Co. near Richmond and the Orrick Stone Co. near Orrick, was used for concrete, road metal, and agricultural purposes. United States Army Corps of Engineers produced crushed limestone for use as riprap. East Side Coal Co. mined coal.

Reynolds.—Paving gravel was produced and contracted for by the

Missouri State Highway Department.

Ripley.—Wright Gravel Co. produced structural and paving sand

and gravel and railroad-ballast gravel.

St. Charles.—St. Charles County ranked fourth in the State in the production of sand and gravel. Tavern Rock Sand Co. produced glass, molding, structural, fire, and other sands. Missouri State Highway Department and St. Charles County Highway Department produced paving gravel. St. Charles Quarry Co., O'Fallon Quarry, Hemsath Quarry, Joerling Bros., and Schiermeier Limestone Quarry quarried and crushed limestone for use as riprap and for concrete, road metal, and agricultural purposes. O'Fallon Quarry produced dimension limestone for use mainly in rough construction. Harbison-Walker Refractories Co. mined flint fire clay.

St. Clair.—The county ranked fifth in coal production; it was mined by Pioneer Mining Corp., Clary Coal Co., Stoneman Bros. Coal Co., and Osage Coal Co. Hunt Limestone Co. quarried and crushed limestone for agricultural, concrete, and road-metal purposes. Pickell Construction Co., Missouri State Highway Department, and Herman

Schneider produced paving and other gravels.

St. Francois.—St. Francois County ranked first in total value of minerals produced; it was also first in lead, iron ore, copper, silver, and zinc and second in stone and lime production. Hematite iron ore was mined at Iron Mountain by Ozark Ore Co. and shipped to steel furnaces. Lead ore (yielding zinc, copper, and silver as byproducts) was mined and milled by St. Joseph Lead Co. Chats from lead- and iron-mining operations were used for railroad ballast, road metal, and agricultural purposes. St. Joseph Lead Co. and Valley Dolomite Corp. produced dolomite and used it as flux and for concrete, road metal, and agricultural purposes. Valley Dolomite Corp. produced lime for use as refractory material and for manufacturing lime.

St. Louis.—St. Louis County ranked first in the production of cement and sand and gravel, second in total mineral production, and third in stone production. Limestone quarries near Lemay, Maplewood, and Clayton supplied material for road metal, riprap, and agricultural purposes. The leading crushed-limestone producers were Rock Hill Quarries Co., Vigus Quarries, Inc., West Lake Quarry & Materials Co., Riverview Stone & Materials Co., Bussen Quarries, Inc., and Des Peres Quarry. Rough dimension limestone, quarried by Riverview Stone & Material Co., West Lake Quarry & Materials Co., and F. Ruprecht & Sons, was used as foundation stone and flagging.

Alpha Portland Cement Co. produced cement near Lemay and Missouri Portland Cement Co. near Prospect Hill. Sand and gravel for glass, molding, grinding and polishing, building, and paving purposes were produced by 16 operators; the most important were: Missouri Aggregates, Inc., Winter Bros. Materials Co., Inc., Dennis Materials Co., St. Charles Sand Co., and the Pioneer Silica Products Co. Alton Brick Co., Thomas Mining Corp., Hydraulic-Press Brick Co., Evans & Howard Sewer Pipe Co., Laclede-Christy Co., and Guth & Sons mined plastic fire clay and shale for use in manufacturing refractory brick and heavy clay products. Petroleum was also produced in St. Louis County.

Ste. Genevieve.—This county was the largest lime producer, fifth largest stone producer, and third largest in the State in total mineral production. Mississippi Lime Co. of Missouri produced quick and hydrated lime for chemical, industrial, and building purposes at its plant near Ste. Genevieve. The company sold limestone for glass, whiting, asphalt filler, coal dust, poultry grit, concrete, riprap, and various purposes. Ste. Genevieve Building Stone Co., Inc., produced crushed and dimension limestone. Other crushed limestone producers were Cliffdale Quarry & Manufacturing Co. and Henry Trautman. Ste. Genevieve Marble Co. produced dimension marble. Bauman Bros. produced building sand and gravel.

Saline.—United States Army Corps of Engineers produced crushed limestone for use in riprapping the banks of the Missouri River from the Diggs and Morrison quarries near Waverly and Miami. Hall & Riley Quarry Co., the Duderstadt Construction Co., and Howard Construction Co. produced limestone for concrete, road metal, and agricultural purposes.

Scotland.—Charles E. Peck quarried and crushed limestone for railroad ballast and agricultural purposes.

Scott.—Sikeston Concrete Products Co., Inc., obtained sand from

deposits along the Mississippi River for building purposes.

Shannon.—Ozark Mining Corp. mined brown iron ore from its Fisher mine. Missouri State Highway Department produced gravel for paving purposes. Crider Bros. produced limestone for agricultural purposes.

Shelby.—Turner Lime & Rock quarry quarried and crushed limestone near Shelbina for concrete, road metal, riprap, and agricultural purposes. Central Stone Co. obtained limestone from deposits in Shelby County for roadbuilding purposes.

Stoddard.—Structural and paving sand and gravel were obtained from deposits near Dexter. Producers included Brown Sand & Gravel

Co., Hill & Stuart, Inc., and Lee R. Warren.

Stone.—The United States Army Corps of Engineers and Missouri

State Highway Department contracted for paving gravel.

Sullivan.—Partin Lime & Rock Co. and Bailey Limestone quarry produced limestone for concrete, road metal, and agricultural use.

Taney.—Missouri State Highway Department and United States Army Corps of Engineers contracted for paving sand and gravel.

Texas.—Long Bros. and Earl Duke quarried and crushed limestone for road building and agricultural purposes. Missouri State Highway

Department contracted for paving gravel.

Vernon.—Coal was mined in Vernon County in 1955. Producers included Ellis Coal Co., M. L. Schooley Coal & Construction Co., Thornhill Coal Co., and K & M Coal Co. Blue Mound Township clerk obtained paving sand and gravel from local deposits for road maintenance. R. E. Jones and Missouri State Highway Department

produced limestone for concrete and road metal.

Warren.—Warren County ranked fifth in the State in the value of clays produced. Fire clay was mined for use in the manufacture of refractories by Harbison-Walker Refractories Co., John Meyer, Wilcoxon & Long, Acme Mining Co., and Wesley Johnson. Sprick Bros. produced limestone for agricultural purposes. Missouri State Highway Department and Warren County Department of Roads

contracted for paving gravel.

Washington.—Over 99 percent of the State's barite production came from Washington County from mines near Mineral Point, Potosi, Richwoods, Fertile, Palmer, Cadet, and Old Mines. The largest of the 20 producers were as follows: J. E. Carter Mining Co., Baroid Division of National Lead Co., General Barite Co., Hornsey Bros., Wascot Mining Co., Mobar Corp., Superbar Co., J. R. Dellinger, and H & P Mining Co. Quantities of galena were recovered in barite mining and washing operations. A. M. Mount produced building sand and gravel. Missouri State Highway Department contracted for paving gravel. Lead ore, containing small quantities of zinc, was mined and milled by St. Joseph Lead Co. at its Indian Creek operations.

Wayne.—Keener Gravel Co., Inc., produced paving sand and gravel and railroad-ballast gravel. The Missouri State Highway Department contracted for paving gravel. Williamsville Stone Co. produced dimension sandstone for use as rubble and flagging. Wm. Harris & Son lime quarry obtained limestone from local deposits for use as

flagstone.

Webster.—Missouri State Highway Department produced paving

gravel.

Worth.—Grand River Limestone Co. quarried and crushed limestone

for concrete, road metal, and agricultural purposes.

Wright.—Thomson Lime Co. produced limestone for concrete, road metal, and agricultural purposes. Missouri State Highway Department obtained paving gravel from local deposits.

## The Mineral Industry of Montana

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Montana Bureau of Mines and Geology.

By Kenneth D. Baber, Frank B. Fulkerson, and Albert J. Kauffman, Jr. 2



ORK STOPPAGES that materially hampered mining operations in Montana in 1954 were at a minimum during 1955. Employees remained on the job during wage negotiations; consequently, a number of the major commodities showed a marked increase in production over 1954. Total valuation of all mining production for 1955 was \$167 million, nearly \$41 million more than in the preceding year and, according to records, the highest in the State's history. Metals comprised 63 percent of the State total, with copper (\$60.8 million) accounting for slightly over half of the metal

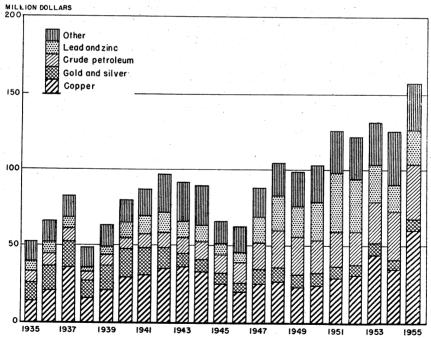


FIGURE 1.—Value of gold and silver, copper, lead and zinc, and crude petroleum, and total value of mineral production in Montana, 1935-55.

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portion; zinc ranked second in value (\$16.9 million). Petroleum ranked with copper as one of the State's principal products; the 2 supplied 58 percent of the total value of mineral production for the

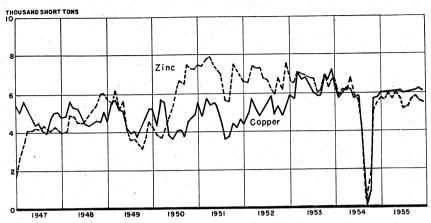


FIGURE 2.—Mine production of copper and zinc in Montana, 1947-55, by months, in terms of recoverable metals.

TABLE 1.—Mineral production in Montana, 1954-55 1

	19	54	198	55
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Chromite	1, 490, 846 (2) 59, 349 15, 102 23, 660 (2) 14, 820 4 5, 8661 4 5, 266 30, 252 14, 195 175 13, 340, 544 5, 177, 942 1, 319, 678 60, 952	\$4, 132, 475 4, 157, 325 35, 015, 910 (2) 828, 100 4, 080, 680 (2) 2, 057, 000 31, 230, 000 7, 460, 260 4, 686, 299 1, 385, 239 1, 31, 165, 632	6, 631 17, 028 4 106, 026 4 6, 341 28, 255 15, 654 (2) 13, 771, 609 6, 880, 390 1, 273, 600 1, 211 68, 588	\$3, 718, 882 3, 781, 879 (3) 60, 830, 332 (2) 984, 305 (2) 1, 724, 000 35, 380, 000 (5, 503, 060 1, 199, 619 (2) 16, 872, 648 25, 637, 201
Total 8		126, 412, 000		166, 993, 00

Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Some minerals that originated in Montana cannot be credited owing to lack of information (see par. 12 of introduction).
 Figure withheld to avoid disclosing individual company confidential data.
 Lignite production data included with bituminous coal.
 Production figures on manganiferous ores (less than 35 percent Mn) mined and shipped to Government stockpile depots not included in State totals (see text; section on manganese).
 Total has been adjusted to eliminate duplication in the value of stone.

The previous valuation of nearly all commodities increased, with manganese almost doubling its 1954 figure and copper, gypsum, and fluorspar making substantial gains. The increased valuation was due to a combination of greater production and some advance

Considerable activity occurred in exploration, development of mines, and renovation and construction of processing plants. The exploration program undertaken by The Anaconda Co. at its Greater Butte Project assured that potential development would exceed early expectations. The copper-ore reserve was estimated at 180 million tons, and prospects for increasing this figure were good. Three other important develops ent projects also were being undertaken by the company at Butte. Anaconda Aluminum Co., subsidiary of The Anaconda Co., opened its \$65 million aluminum-reduction plant in Columbia Falls, Flathead County. Planned capacity was 120 million pounds annually. The coal industry received a stimulus when Montana-Dakota Utilities started constructing an \$8 million electricalgenerating plant utilizing lignite as fuel. The powerplant, in Richland County, was scheduled for completion in 1958. Construction of a \$200,000 plant in Red Lodge was begun by Koal Krudes, Inc., which was to process 200 tons of coal daily to produce char, creosote, and other byproducts. Anticipation of future developments led to investigation by the Federal Geological Survey of the extent, accessibility, and rank of coal deposits in the western portion of the Fort Union-Powder River coal region. The findings of this investigation were summarized in four technical bulletins.3 Huge deposits of subbituminous coal and lignite were found to be readily accessible to strip mining in the eastern portion of the State.

Despite a decrease in large-scale projects, construction maintained a high level, as the building and remodeling of business establishments, schools, and highways took up the slack. Value of building permits in 10 cities totaled \$27.6 million-8.5 percent higher than in the same cities in 1954. Construction at the Tiber Dam on the Marias River south of Chester was completed in 1955. Land clearing and railroad relocation were begun late in the year at the site of the \$21 million Noxon Dam in the extreme northwestern corner of the State. thousand workers were to be employed when construction reached Morrison-Knudsen Co. was awarded the construction its peak.

contract.

Crude-petroleum production ranked second among mineral commodities in the State in 1955, with a total value of \$35.4 million. Production in 1955 was about 75 percent more than in 1951, when oil was first discovered in the Williston Basin. Transportation problems that hampered production in the past were alleviated materially by completion of the Butte pipeline. This line connected the fields of eastern Montana with midwestern refineries via Guernsey and Fort Laramie, Wyo. Anticipated expansion of crude-oil production

<sup>&</sup>lt;sup>3</sup> Brown, Andrew, Culbertson, W. C., Dunham, R. J., Kepferle, R. C., and May, P. R., Strippable Coal in Custer and Powder River Counties, Mont.: Geol. Survey Bull. 995–E, 1954, 48 pp. May, Paul R., Strippable Lignite Deposits, Wibaux Area, Montana and North Dakota: Geol. Survey Bull. 995–G, 1954, 37 pp. Culbertson, William C., Three Deposits of Strippable Lignite West of Yellowstone River, Mont.: Geol. Survey Bull. 995–H, 1954, 39 pp. Kepferle, Roy C., Selected Deposits of Strippable Coal in Central Rosebud County, Mont.: Geol. Survey Bull. 995–I, 1954, 48 pp.

prompted refinery expansion in Billings and construction of a new refinery at Kevin. The Carter Oil Co. and the Continental Oil Co. completed refinery improvements to raise the quality of diesel fuels and increase output of high-grade gasoline. Hydrogen sulfide gas from the Carter and Continental oil refineries was to be utilized by the Montana Sulphur & Chemical Co. as raw material for producing high-grade elemental sulfur in a new plant under construction at Billings, which was scheduled for completion in the summer of 1956.

New uranium lease forms were made available to Montana prospectors on State lands. The revision provided for a filing fee of \$2.50 and an annual rental of 50 cents per acre on the first 40 acres described by the applicant. Payment of fees entitled the payee to prospecting rights for a 2-year period, which could be extended for a third year if the State board believed the conditions warranted. The State was granted a 20-percent royalty on gross receipts. Upon discovery of commercial ore the prospector would file for an operating lease of \$500 with the land commission. The State retained royalty rights with the percentage of be determined by appraisal of the ore body. The lessor was to pay an annual rental of 50 cents per acre for all land held under lease. Fees for metalliferous minerals also were revised. New rates were \$2.50 for the filing fee and annual rental of 75 cents per acre for the first 40 acres described.

In the 10-year period 1946-55 Montana's mineral production advanced from \$62 million to \$167 million. Metal commodities supplied most of the increase (from \$35 million to \$106 million), while the 1946 value for nonmetals (over \$6 million) was tripled and that for fuels (\$21 million) was doubled. Considering the four Pacific Northwest States—Idaho, Montana, Oregon, and Washington—as a unit, Montana's share of the total output value was up from 41 percent in 1946 to 50 percent in 1955. The relative difference in foundation on which the mineral industry in each of the States is based is shown by the fact that metals constitued 63 percent of the State total value compared with 79 percent for Idaho and only 24 and 8 percent, respectively, for Washington and Oregon. Montana was the only substantial fuel-producing State, with output amounting to 25 percent of the total.

Montana was by far the leading mining State in the Pacific Northwest from the standpoint of number of men employed and payrolls and compared with total economic activity in the respective States. In 1955 employment in the mining industry averaged 11,900 persons. This represented 7 percent of all Montana wage earners in nonagricultural employment covered by the State unemployment compensation laws and 37 percent of those engaged in industrial production (mining and manufacturing). About 8,400 were in metal mining, 2,600 in petroleum and natural-gas production, and 900 in coal mining

plus nonmetallic mining and quarrying.

Employment in mining gained from 9,600 in 1947 to 11,900 in 1955.

Petroleum and natural gas had the greatest relative increase in this period, climbing from 1,400 to 2,600. Metal mining gained approximately 1,700 employees, advancing from 6,700 to 8,400. Other peak

years at the metal mines were 1952-53, when 8,200 workers were employed on the average. After dropping sharply in 1954, employment at metal mines again was on the increase. Coal and nonmetal mining decreased considerably-from 1,500 in 1947 to only 900 in The decline in coal production during this period accounted for this decrease.

Yearly wages paid in mining rose steadily from \$25.4 million in the calendar year 1946 to \$49 million in fiscal 1955. Throughout this period, mining had the highest average wage level of all industries in the State, except in 1950, when the construction industry was the highest. In 1955 mining wages per year were \$30 above construction, which was affected by seasonal and other layoffs. Manufacturing ranked third in annual wage level and transportation and utilities fourth.

In mineral manufacturing industries, primary metals employed 4,200 workers; petroleum refining, 1,300; and other industries, such as stone and clay products and industrial chemicals, an estimated 1,000. The total represented about one-third of all employment in manufacturing industries in Montana. Average weekly earnings in 1955 were \$84.95 in primary metals, \$91.63 in all mining, and \$90.77 in metal mining. Comparable figures for December 1955 were \$99.08 in primary metals, \$103.23 in all mining, and \$105.01 in metal mining. There was an upward trend in average weekly earnings in the year due to increases in the wage rate at metal mines and smelters and the shift back to a 6-day week.

TABLE 2.—Estimated employment in mining, primary metals, and petroleum refining, 1947-55 1

	1947	1948	1949	1950	1951	1952	1953	1954	1955
Mining: Metal	6, 700	7, 200	7, 200	7, 800	8,000	8, 200	8, 200	7, 400	8, 400
coalPetroleum and natural	1,000	900	800	700	700	2 1, 100	<sup>3</sup> 1,000	² 900	2 900
gas Nonmetallic and quar-	1, 400	1, 500	1,300	1, 200	1, 200	2, 100	2,400	2, 400	2, 600
rying	500	600	600	500	500	(8)	(3)	(3)	(8)
Total mining Primary metals Petroleum refining	9, 600 4, 200 (4)	10, 200 4, 300 (4)	9, 900 4, 300 (4)	10, 200 4, 000 (4)	10, 400 3, 600 (4)	11, 400 3, 600 (4)	11,600 3,600 1,200	10, 700 3, 300 1, 200	11, 900 4, 200 1, 300

<sup>&</sup>lt;sup>1</sup> Includes all full- and part-time wage and salary workers. Excludes proprietors, etc. from Montana State Employment Service publications.

<sup>2</sup> Includes nonmetallic mining and quarrying. (Compiled

Combined with coal mining.
 Data not published before 1953.

During 1955 the program of the Defense Minerals Exploration Administration (DMEA) continued to encourage systematic investigation of strategic mineral occurrences. Financial assistance under the Government contracts was repayable from royalties on ore discovered and subsequently mined.

TABLE 3.—Average number of wage earners and total wages in mining and all industries, fiscal years 1950-55 1

	Total all industries		Mining				
Fiscal year	Average number of wage earners	Wages	Number of em- ployers	Average number of wage earners	Wages	Annual average wage level	
1950 1951 1952 1953 1954 1955	98, 769 102, 853 102, 926 105, 838 107, 018 108, 048	\$271, 825, 306 312, 401, 996 338, 291, 000 362, 736, 555 372, 638, 135 387, 199, 087	463 458 474 517 528 524	9, 483 10, 561 10, 562 11, 406 11, 635 10, 710	\$31, 502, 931 41, 470, 947 46, 941, 121 53, 308, 193 54, 105, 365 49, 036, 402	\$3, 322 3, 927 4, 444 4, 674 4, 650 4, 578	

<sup>1</sup> Compiled from Montana Unemployment Compensation Commission publications.

TABLE 4.—Average hours and earnings of workers in selected industries, 1950-55 <sup>1</sup>

	1950	1951	1952	1953	1954	1955
Average weekly earnings:						
All manufacturing	\$64.58	\$72.13	\$79.46	\$79, 76	\$79.20	\$85, 66
Primary metals	60.87	75. 75	83, 99	87.64	75. 69	84. 95
All mining	67. 27	79.84	85.74	90. 81	81. 93	91. 63
Metal mining	64.98	78. 37	85. 27	91. 23	77. 43	90, 77
A varage weekly hours.	1 02.00		00.2.	01.20		00
All manufacturing	40.1	41.2	41.0	41.4	39.9	41. 3
Primary metals	40.4	45.0	45.4	45. 1	39. 4	41. 5
All mining	39.1	42.3	41.4	41.6	38. 1	40.3
Metal mining	38.9	42.6	41. 9	42.6	37.1	40. 3
Average hourly earnings:	00.0	12.0	71.0	12.0	01.1	20. 0
All manufacturing	\$1.61	\$1.75	\$1.86	\$1.93	\$1.99	\$2.08
Primary metals	1.51	1.68	1.85	1. 95	1. 92	2.05
All mining	1.72	1. 89	2 07	2. 18	2. 15	2. 28
Metal mining	1.67	1.84	2.03	2. 14	2.09	2. 25
Bietai mining	1.07	1.04	2.00	2. 14	2.00	2. 20

<sup>&</sup>lt;sup>1</sup> Excludes administrative and salaried personnel. Earning include overtime and other premium pay. (Compiled from Montana State Employment Service publications.)

In addition to the value of minerals 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, selenium, tellurium, gallium, and germanium. 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 refining such metals as copper and lead and those obtained in other ways. It is not possible in many such instances to distribute the mineral products by State or 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 uranium produced cannot be credited, inasmuch as such information is not available under existing regulations of the Atomic Energy Commission.

TABLE 5.—Defense Minerals Exploration Administration contracts active during 1955

				-	~
				Contract	
County and contractor	Property	Commodity	Date	Total amount	Govern- ment partici- pation, percent
BROADWATER					
Hogan and Pohl	Silver Saddle January	Lead Lead, zinc, copper	June 6, 1955 Jan. 28, 1952	\$16, 460 36, 450	50 50
Boss Mines, Inc  DEER LODGE AND GRANITE	Boss & Atlantus	Lead, zinc	Dec. 7, 1954	24, 146	50
Sunshine Mining Co	Storm Lake	Tungsten	Sept. 14, 1953	61, 355	75
Daniel T. Barham et al	Thumper Lode	Mica	Sept. 15, 1955	14,000	75
GRANITE					
American Machine & Met- als, Inc.	Mullen	Manganese	Dec. 15, 1953	84, 610	75
Peter Antonioli	Scratch Awl	Manganese, lead,	July 28, 1954	128, 320	621/2
Copper Queen Mining Syn- dicate.	Sunrise	Copper	Aug. 20, 1953	21, 460	50
Jennie M. Moore	Mystery Manga-	Manganese	Apr. 12, 1955	48, 700	75
Taylor Knapp Co  JEFFERSON	nese. True Fissure & Durango.	do	Feb. 1, 1954	648, 727	75
Norman Boe and Kenneth Curtis.	Bulware	Copper	Nov. 13, 1953	26, 730	50
Elkhorn Consolidated, Inc George Hoffman Neuberg Bros. & Sloan	Dunstone White Pine Eva Mae	Lead, zinc, copper Uranium Lead, zinc, copper	Nov. 22, 1954 May 18, 1955 June 5, 1953	26, 110 26, 025 45, 400	50 75 50
POWELL					
Boulder Ores, Inc	Snowshoe	Tungsten	Aug. 24, 1953	33, 600	75
Irving & Nelson West Slope Mining Co	Plutus Birdie	Manganese Tungsten	Sept. 21, 1953 Jan. 29, 1952	25, 830 10, 080	75 75

# REVIEW BY MINERAL COMMODITIES METALS

Aluminum.—Dedication ceremonies for the new Anaconda Aluminum Co. aluminum-reduction plant at Columbia Falls were held August 15 and output at the capacity rate of 5,000 tons per month was reached by December. Total production during the year, according to The Anaconda Co. annual report, was 14,800 tons of aluminum metal. Building of the \$65 million plant was begun in the spring of 1953, and adaptations of the plant design of France's largest aluminum producer, the Pechiney Co., were incorporated in the construction. A low rate of electrical consumption and improved controls over air contamination were claimed for the plant, which housed 2 potlines of 120 pots each in four 1,080-foot-long buildings. The plant was to con-

sume annually about 120,000 tons of alumina obtained from the Reynolds Metals Co. under contract. About 450 persons were to be

employed at the facility.

During the year The Anaconda Co. investigated establishment of a plant in the Moscow, Idaho, area to produce alumina from clay. Company officials were optimistic over results of investigations into acid leaching of calcined clays to produce alumina economically, providing an adequate supply of natural gas was available.

The Anaconda Wire & Cable Co. aluminum-rod rolling mill at Great Falls began operations during the summer, utilizing bars supplied by

the Anaconda Aluminum Co.

Chromite.—Output of chromite concentrate by the American Chrome Co. at the Mouat mine in Stillwater County was 114,007 short dry tons (118,703 short tons, estimated gross weight), making total output through 1955 under the company contract with the Government 258,268 dry tons. Although output in 1955 was about 4 percent less than the 1954 total of 118,172 short dry tons, operations were ahead of the schedule needed to meet the Government contract which calls for delivery of 900,000 short dry tons of chromite concentrate containing 38 percent Cr<sub>2</sub>O<sub>3</sub> by December 31, 1961. The price received by the company for concentrate delivered to the Government during 1955 was renegotiated on the basis of the company cost of operation during 1954, the first full year of production. According to the annual report of Goldfield Consolidated Mines Co., of which American Chrome Co. is a subsidiary:

The first repricing of the contract was completed the latter part of 1955, setting a price of \$32.62 (per ton of concentrate) for the calendar year. The price compared to \$34.97 for the preceding year when milling was carried on at a higher rate, price of the preceding year when milling was carried on at a higher rate, and the province of the preceding year. using ore available from the previous operation, to accumulate a surplus (40,262 tons) of deliveries under the contract as insurance against default.

The company report also noted the formation of a subsidiary, Chrome Metals Co., at the end of 1955. Patent-application rights on a process for producing chromium of high purity were acquired, and pilot-plant testwork was undertaken, along with other research.

Copper.—Mine production of recoverable copper (81,542 tons) was the greatest annual yield since 1945. There was a gain of 37 percent over the previous year's below-normal output, and Montana again ranked third among the States after dropping to fifth place in 1954. Virtually all the copper came from the Butte Hill operations of The Anaconda Co., although copper ore was mined at three small mines east of Butte, Silver Bow County, and comparatively small quantities of copper were recovered from lead and lead-zinc ore mined in other areas of the State and from copper-lead ore produced by Norman Rogers Mining Co. at the Mike Horse mine, Lewis and Clark County.

Production was not interrupted at The Anaconda Co. operations owing to work stoppages, as workers at the company mines and plants remained on the job during wage negotiations in contrast to the situation in other Western States where major copper mines and smelters were closed on July 1 by a widespread strike involving 22,000

employees.

Production at the Belmont mine at Butte was resumed on February 1 after the mine had been idle for about a year due to marketing conditions, and in July The Anaconda Co. began to convert the workweek for miners from 5 to 6 days, thus ending a shortened week, which had been in effect since early in 1954 at the Butte mines. The mines had been operated 6 days a week, but each mine employee had been working on a 5-day basis. It was reported that a factor preventing a further increase in production in 1955 was the shortage of qualified hard-rock miners, which continued despite recruiting efforts, including moves directed toward obtaining miners from distant areas.

Butte Hill was in the process of the biggest expansion in its 90-year history as The Anaconda Co. began 3 new projects in addition to the Greater Butte project, which was begun in 1948 and reached the production stage in 1952. Because of the importance of the projects to the future of the mining industry in the State, an excellent description of the various projects is quoted from The Anaconda Co. annual report for 1955:

Butte Hill embraces a highly mineralized area, roughly four miles east and west by three miles north and south. The high-grade copper veins, which have been mined for many years by selective mining methods, are centrally located in the District. Outward from the copper mines, particularly to the north and west, are the zinc mines. Important manganese ore bodies occur within the perimeter extensions of the zinc veins, notably in the southwest extension of the District.

In the eastern part of the District, the great copper veins spray out into the lower grade so-called "horsetail" zones. Here are located the large reserves of the Greater Butte Project currently being mined in the caving blocks of the Kelley mine. With the start of mining on the 1300 level about mid-year Kelley mine production was stepped up to capacity of 15,000 tons of ore per day. This production of low-grade copper ore was supplemented by about 3,000 tons per day of similar-type ore from small-scale open-pit operations located in and adjacent to the Skyrme and Shannon veins.

South of the Kelley ore zones and extending still further eastward an altered granite area contains many small veinlets and disseminated copper mineralization. This area, because of secondary enrichment, forms an ore zone under relatively shallow surface waste overburden, susceptible to mining by open-pit methods. The program of churn drilling initiated during 1954 has already progressed sufficiently during 1955 to assure a reserve in this area of 100,000,000 tons of ore averaging 0.8% plus copper. In the southeast corner of this new ore area an experimental pit was opened during the year which has served to check drill hole assays and has furnished sufficient ore for metallurgical testing at the Anaconda Reduction Works to assure satisfactory recoveries of the copper and silver values in the ore. Surface waste stripping of this open-pit project, now known as the Berkeley Pit, began in March, 1955. During the balance of the year approximately 4,400,000 tons of waste overburden were removed and before year-end ore had been exposed. Berkeley Pit development will be actively continued during 1956.

A tentative production schedule calls for removal of 3,000 tons of ore per day during the first part of 1956, with increases to 5,000 tons per day by mid-year, 10,000 tons per day by the end of 1956, and 17,500 tons per day by mid-1957. When this daily tonnage is attained, the Berkeley Pit will add about 65,000,000 pounds per year to Montana copper production. Capital expenditures on this project will amount to approximately \$7,000,000 for mine equipment, including large electric shovels and haulage trucks, a primary crushing plant, conveyor system and ore bins, and approximately \$9,000,000 for mill and smelter changes at Anaconda and new railway rolling stock for handling the increased tennage.

at Anaconda and new railway rolling stock for handling the increased tonnage.

During the year a program of development in the northwest portion of the Butte District to be known as the Northwest Project was undertaken. Geological information discloses substantial copper and zinc ore reserves in this area. A new hoisting shaft to be known as the Ryan Shaft, together with large modern hoisting equipment, is proposed as part of this project and work will start early in 1956. The program of development and large-scale hoisting involved in the Northwest Project will result in (1) development and mining of vein-type copper and zinc ores in a hitherto undeveloped part of the Butte District, (2) substantial increases in Montana copper and zinc production, (3) relief for deep-level hoisting

at the older producing shafts in the north and west portions of the District, and (4) provision in the future of adequate facilities for handling low-grade copper

and zinc ores known to exist in this area.

Also during the past year a program of special development work was carried on having as its objective the testing of areas in which favorable geological possibilities for additional ore reserves are indicated. This special development work was largely confined to copper ore development and comprised churn and diamond drilling from surface in addition to underground work in hitherto undeveloped areas. As a result important vein-type copper ore discoveries were made. In addition, substantial tonnages of low-grade copper ore, mineable by open-pit or block-caving methods, were disclosed.

Gold.—There was an increase of 19 percent in gold production due to the greater output from Butte copper and lead-zinc mines and to a substantial gain in the quantity recovered at placer mines.

80 percent of the total was produced in Silver Bow County.

Lode production in areas outside Silver Bow County decreased markedly. Lode mines besides the Butte properties contributing to the State gold output included the Yellow Band, operated by Shafer Renz, Beaverhead County; Marietta, worked by Al Dance, Broadwater County; Gold Coin mine, H. H. Hoben, Deer Lodge County; Trout (Algonquin), Trout Mining Div., Granite County; Alta, Lahey Leasing Co., Jefferson County; Drumlummon, Montana Rainbow Mining Co., Lewis and Clark County; and Marget Ann property of Mitchell Mining Co. in Silver Bow County.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc, 1946-50 (average), 1951-55, and total, 1862-1955, in terms of recoverable metals <sup>1</sup>

Year	Mines	producing	Material sold or	Gold (lode	and placer)	Silver (lode	and placer)
1 car	Lode	Placer	treated 2	Fine ounces	Value	Fine ounces	Value
1946-50 (average) 1951 1952 1953 1954 1955	242 198 164 142 113 100	43 16 9 7 11 12	2, 911, 850 3, 965, 875 4, 625, 750 6, 101, 348 5, 104, 288 7, 259, 917	67, 642 30, 502 24, 161 24, 768 23, 660 28, 123	\$2, 367, 470 1, 067, 570 845, 635 866, 880 828, 100 984, 305	5, 889, 564 6, 393, 768 6, 138, 185 6, 689, 556 5, 177, 942 6, 080, 390	\$5, 266, 757 5, 786, 685 5, 555, 367 6, 054, 386 4, 686, 299 5, 503, 060
1862-1955			(3)	17, 451, 038	395, 239, 542	805, 804, 342	598, 350, 933
	o	opper	Le	ead	Z	ine	
	Short tons	Value	Short tons	Value	Short tons	Value	Total value
1946–50 (average) 1951 1952 1953 1954 1955	57, 144 57, 406 61, 948 77, 617 59, 349 81, 542	\$22, 702, 959 27, 784, 504 29, 982, 832 44, 552, 158 35, 015, 910 60, 830, 332	16, 082 21, 302 21, 279 19, 949 14, 820 17, 028	\$4, 803, 721 7, 370, 492 6, 851, 838 5, 226, 638 4, 060, 680 5, 074, 344	48, 683 85, 551 82, 185 80, 271 60, 952 68, 588	\$12, 705, 276 31, 140, 564 27, 285, 420 18, 462, 330 13, 165, 632 16, 872, 648	\$47, 846, 18; 73, 149, 81; 70, 521, 09; 75, 162, 39; 57, 756, 62; 89, 264, 68;
1862-1955	7, 143, 456	2, 194, 533, 360	861, 510	128, 062, 196	2, 466, 482	455, 783, 936	3, 771, 969, 96

<sup>&</sup>lt;sup>1</sup> Includes recoverable metal content of gravel washed (placer operation); ore milled; old tailings re-treated; and ore, old slag, and copper precipitates shipped to smelters during calendar year indicated.

<sup>2</sup> Does not include gravel washed.

3 Figure not available.

At placer mines E. T. Vincent & Clay Lewis and Montana Gold & Chemical Co. were the major producers. Vincent & Lewis operated the LaChambre and Twin Creek placers in Nine Mile district, Missoula County, from January to May, using a dragline excavator and a portable washing plant and in August began work at the Calumet location on Quartz Creek in Mineral County. Montana Gold & Chemical Co. of Seattle, Wash., began production in January at placer holdings on Reservoir Gulch near the town of Gold Creek in Pioneer district, Powell County, employing an electric, bucket-type dredge. The company hoped to recover tungsten in addition to gold. Production by Valley Mining Co. of Drummond at the Deep Gulch placers in First Chance (Garnet) district, Granite County, also represented a new venture.

TABLE 7.—Gold produced at placer mines, 1946-50 (average) and 1951-55, by classes of mines and methods of recovery

	Mines	Material treated	Gold re	Average value per	
Class and method	produc- ing 1	(cubic yards)	Fine ounces	Value	cubic yard
urface placers: Gravel mechanically handled:				ł	
Bucketline dredges:			100		
1946-50 (average)	3	3, 455, 352	13, 599	\$475, 958	\$0.13
1951-54					
1955	1	447,000	1,764	61,740	. 13
Dragline dredges:					
1946-50 (average)		268, 829	1, 467	51, 338	. 19
1951		692, 400	996	34, 860	. 05
1952	1	250	46	1, 610	6.44
1953					
1954		82, 500	1,394	48, 790	. 59
1955	4	123, 000	1, 443	50, 505	.41
Nonfloating washing plants: 2 1946–50 (average)	7	343, 069	1,711	59, 892	.17
1940-50 (average)		940, 009	1, 111	00,002	1
1953		42, 500	1, 216	42, 560	1.00
1954	2	3, 950	79	2 765	70
1955		10,700	84	2, 765 2, 940	. 27
Gravel hydraulically handled:	-	10,100	01	2,010	
1946-50 (average)	2	5,076	79	2,772	. 540
1951		2,500	14	490	. 19
1952		600	9	315	. 52
1953-54					
1955	1	200	4	140	.70
Small-scale hand methods: 3	1				i
1946-50 (average)	27	8, 091	130	4, 557	. 56
1951	12	3, 400	64	2, 240	. 65
1952		2,500	23	805	. 32
1953	4	400	7	245	. 613
1954	6	1,350	53	1,855	1.37
1955	4	50	57	1, 995	39.90
Inderground placers: Drift:	2	1 004	51	1 771	1.72
1946-50 (average)	2	1,024	91	1,771	1.72
1951-53		200	3	105	. 52
1954 1955	1	200	3	100	
1900					
frand total placers:					
1946-50 (average) 4	43	4, 082, 441	17,043	596, 512	.140
1951	16	698, 300	1,074	37, 590	. 054
1952	- j	3, 350	78	2,730	. 81
1953	7	42, 900	1, 223	42, 805	. 99
1954		88,000	1, 529	53, 515	. 608
	12	580, 950	3, 352	117, 320	. 20

Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal

right to property.

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."

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 Montana.

Includes 6 ounces of gold from Becker-Hopkins dredges.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1955, by counties, in terms of recoverable metals

County			ines ucing	Gold (lode a	nd placer)	Silver (lode and placer)		
		Lode	Placer	Fine ounces	Value	Fine ounces	Value	
Broadwater Cascade				1, 041	\$36, <b>43</b> 5	7, 595 14, 417	\$6, 874 13, 048	
Deer Lodge Granite Jefferson		1 4 11	2	43 584 420	1, 505 20, 440 14, 700	387, 093 39, 676	350, 339 35, 909 248	
Judith Basin Lewis and Clark Madison Meagher		13 9	1 1 1	231 68 30	8, 085 2, 380 1, 050	274 21, 420 632 577	19, 386 572 522	
Phillips Silver Bow Undistributed <sup>1</sup>		1	7	22, 262 3, 440	779, 170 120, 400	307 5, 577, 999 30, 398	278 5, 048, 371 27, 511	
Total		100	12	28, 123	984, 305	6, 080, 390	5, 503, 060	
	Co	Copper		Lead		Zine	Total	
County	Short tons	Value	Short tons	Value	Short tons	Value	value	
Broadwater Cascade Deer Lodge			4		47 12	\$11, 562 2, 952	\$69, 473 20, 172 1, 507	
Granite Jefferson Judith Basin	18 6	\$13, 428 4, 476	43 22		1, 400 80	344, 400 19, 680	858, 833 142, 709 1, 738	
Lewis and Clark Madison Meagher		44, 014 4, 476	71	3 212, 474 8 2, 384	4, 139 1	1, 018, 194 246	1, 302, 153 5, 582 10, 220	
PhillipsSilver BowUndistributed 1	81, 428 25	60, 745, 288 18, 650	14, 33 1, 22		62, 588 321	15, 396, 648 78, 966	418 86, 240, 115 611, 769	
Total	81, 542	60, 830, 332	17, 02	8 5, 074, 344	68, 588	16, 872, 648	89, 264, 689	

<sup>&</sup>lt;sup>1</sup> Includes values and quantities that cannot be shown separately for Beaverhead, Mineral, Missoula, Park, Powell, and Sanders Counties.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1955, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January February March April May June July August September October November December	2, 270 2, 030 2, 200 2, 060 1, 520 2, 230 2, 020 3, 390	472, 500 434, 020 484, 160 475, 250 553, 860 460, 350 433, 540 479, 030 462, 850 601, 060 626, 970 596, 800	6, 338 6, 355 6, 705 7, 204 6, 859 6, 072 6, 265 6, 736 6, 250 7, 370 7, 874 7, 514	1, 362 1, 437 1, 570 1, 394 1, 587 1, 496 1, 051 1, 193 1, 292 1, 688 1, 434 1, 524	5, 858 5, 650 6, 136 5, 788 6, 178 5, 784 5, 213 5, 336 5, 578 5, 860 5, 578 5, 531
Total	28, 123	6, 080, 390	81, 542	17, 028	68, 588

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1955, by classes of ore or other source materials, in terms of recoverable metals

Source	Num- ber of mines 1	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zine (pounds)
Ore: Dry gold Dry gold-silver Dry silver	18 7 5	1, 298 8, 032 1, 153	1, 190 525 23	4, 584 35, 043 37, 693	10, 300	20, 100 260, 000 58, 800	16, 500 118, 300 66, 300
Total	30	10, 483	1, 738	77, 320	14, 770	338, 900	201, 100
Copper Lead Lead-zinc Zine	16 33 23 2	5, 760, 564 8, 280 1, 433, 199 4, 830	10, 083 577 12, 276 85	2, 732, 585 48, 161 3, 143, 641 76, 812	33, 255 4, 605, 489	155, 300 1, 806, 100 30, 563, 200 304, 200	73, 900 176, 500 127, 476, 500 1, 006, 000
Total	74	7, 206, 873	23, 021	6, 001, 199	159, 549, 935	32, 828, 800	128, 732, 900
Other "lode" material: Dry gold: Old tail- ings Copper: Precipitates Zinc:	1 1	10	5	16	3, 518, 795		
Old tailings Old slag	1 2	208 42, 343	7	1, 376 218	500	1, 800 886, 500	23, 900 8, 218, 100
Total	5	42, 561	12	1, 610	3, 519, 295	888, 300	8, 242, 000
Total "lode" ma- terial	100 12	7, 259, 917 (²)	24, 771 3, 352	6, 080, 129 261	163, 084, 000	34, 056, 000	137, 176, 000
Total, lode and placer	112		28, 123	6, 080, 390	163, 084, 000	34, 056, 000	137, 176, 000

Detail will not necessarily add to total, because some mines produce more than 1 class of material. 2 580,950 cubic yards.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery and types of material processed, in terms of recoverable metals

Type of material processed and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zine (pounds)
Lode: Amalgamation Concentration, and smelting of concentrates: Ore.	91 21, 608	7 5, 712, 940	156, 688, 529	30, 530, 400	107 407 000
Total	21, 699	5, 712, 947	156, 688, 529	30, 530, 400	127, 465, 200 127, 465, 200
Direct smelting: Ore Old tailings Old slag Copper precipitates	3, 060 12	365, 572 1, 392 218	2, 876, 176 500	2, 637, 300 1, 800 886, 500	1, 468, 800 23, 900 8, 218, 100
Total	3, 072 3, 352	367, 182 261	3, 518, 795 6, 395, 471	3, 525, 600	9, 710, 800
Grand total	28, 123	6, 080, 390	163, 084, 000	34, 056, 000	137, 176, 000

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1955, by counties and districts, in terms of recoverable metals

TRBBE 16: Mills promotes as Bern, and a									
County and district	Mines produc- ing	roduc	-	Gold (lode and placer) (fine	Silver (lode and placer) (fine	Copper (pounds)	I.ead (pounds)	Zinc (pounds)	Total value
OCCUPANT AND CONTROL	Lode	Placer	(short tons)	ounces)	ounces)				
Broadwater County: Backer, Beaver, and Park or Indian Creek 1. Cedar Plains Cascade County: Montana.	<b>H</b>		1, 120 134 279 50	1,041	7, 313 282 14, 417		93, 200 4, 800 28, 000	29, 100 64, 900 24, 000	\$60, 520 8, 953 20, 172 1, 507
Deer Loge County: Georgebown. Granite County: First County: First County: Dearnee, Gold Creek, and Rock Creek!	. <del></del> .	61	16 30, 412	242 342	33,060	36,000	874,000	2, 800, 000	8, 500 850, 333
Jefferson Corenty: Cataract, and Clancy and Lump Gulch 1 Colorado, Blkhorn, and Whitehall 1	200-		8, 251 64	25 395	1, 898 37, 778 274	11,700	55, 100 400, 900 10, 000	18,900	13, 240 129, 469 1, 738
Judith Basin County: Barker Levis and Clark County: Levis and Clark County: Bear Gulch Levis and Marysville I		-	3 5, 192	9 198	13 16, 931	117, 900	533, 800	114, 200	222 159, 813 140
Using Guich.  Madison Guich.  Rimini Scratch Gravel.	-ma-		54 55 302 42, 213	4:51 &	3,989	100	5,300 3,900 883,000	3, 700 6, 400 8, 153, 700	2, 211 5, 295 1, 134, 472
Smelter Madison County: Pony and South Boulder Rochester and Virginis City 1. Sherdan and Willow Creek 1.		1	9 89 21 10	¥8°°	399 191 13		3,300	1, 700	3, 442 1, 017 257
		-	006	30	8	12.000	28,000		1, 057 9, 163
Castle Mountain and Mussell Shell 1. Phillips County: Little Rockies. Silver Bow County: Summit Valley.	222	7	7, 159, 693 11, 131	22, 262 3, 440	5, 577, 999 30, 398	162, 856, 000 50, 000	28, 662, 000 2, 458, 000	125, 176, 000 642, 000	418 86, 240, 115 611, 769
Total Montana.	100	12	7, 259, 917	28, 123	6, 080, 390	163, 084, 000	34, 056, 000	137, 176, 000	89, 264, 689

Combined to avoid disclosing individual company confidential data.

I Combined to avoid disclosing individual company confidential data.

I combined values and quantities which cannot be shown separately for Argenta, Bannock, Blue Wing, Bryant, and Polaris districts, Mineral Country, Coloma, Copper Cliff, and Nine districts, Missoula Country, New World district, Park Country, Nigger Hill, Ophir Gulet, and Ploneer districts, Powell Country, and Eagle and Prospect Creek districts, Sanders Country.

Iron Ore.—Ralls & Harris Bros. mined and shipped 6,631 long tons of iron ore averaging 40 percent iron to the Ideal Cement Co. cement plant at Trident for use in making certain types of cement. was trucked to the plant from the Iron Cross open-pit mine in Broadwater County near Radersburg.

Lead.—Increased mine production of lead in Silver Bow County more than offset a decline in other producing areas and brought about

a gain of nearly 15 percent in State output.

Silver Bow County production, which was derived largely from The Anaconda Co. operations at the Anselmo, Lexington, and Orphan Girl mines (lead-zinc ore) and Emma mine (manganese ore), increased nearly 25 percent compared with 1954 and supplied 84 percent of the Montana total. The output of lead in other counties dropped from 3,304 tons in 1954 to 2,697 in 1955; of this total about one-sixth was récovered at The Anaconda Co. East Helena slag-fuming plant by

processing slag from a smelter dump.

In Sanders County the Jack Waite mine of American Smelting Refining Co. was closed several months by a strike beginning August 23; this property was situated on the Montana-Idaho boundary and at the eastern edge of the Coeur d'Alene, Idaho, mining district, where a protracted labor dispute idled mines of a 16-operator group. Of the other mines producing lead, the Hand mine in Beaverhead County and the Trout (Algonquin) and Scratch Awl properties in Granite County contributed the largest quantities to the State total. Crude lead ore was shipped from a number of small mines to the American Smelting & Refining Co. East Helena smelter. The smelter was closed by a strike of the International Union of Mine, Mill and Smelter Workers from July 3 to August 12.

Manganese. —Output of manganese ore and concentrate (35 percent or more Mn) increased markedly in 1955. Three companies reported production totaling 106,026 short tons, gross weight. The Anaconda Co. operations in Silver Bow County contributed the bulk of the total; ore from mines at Butte was processed into high-grade (55-60 percent Mn) nodules at the company metallurgical plant at Anaconda in Deer Lodge County. In Granite County, Trout Mining Division, American Machine & Metals, Inc., continued output of batterygrade concentrate from its Trout (Algonquin) property near Philips-burg. The company also shipped to a consumer 6,341 short tons, gross weight, of middling containing 20-25 percent Mn during 1955; this output of manganiferous ore (less than 35 percent Mn) represented a sizable increase over 1954. Also in Granite County, the Taylor-Knapp Co. operation at the True Fissure mine contributed to the Montana output of ore and of concentrate containing more than 35 percent Mn; sinter analyzing 40-45 percent Mn was shipped under the carlot program to the National Stockpile.

Operations in Montana shipped 60,197 short dry tons of ore and concentrate valued at \$1,257,023 to the Government low-grade stockpiles in Butte and Philipsburg compared with 56,606 short dry tons valued at \$1,202,052 in 1954. Shipments to the low-grade stockpiles are not included in State mineral production totals until the ore is removed from the stockpiles and beneficiated for commercial use.

A Bureau of Mines report detailing the results of exploration for additional reserves of manganese ore in the Philipsburg mining

district was published.4

Silver.-Mine production advanced 17 percent compared with 1954 owing to the increased output from Butte base-metal mines, the principal source of silver in the State and the main factor in maintaining Montana as one of the leading silver-producing States. largest of the other mines adding to the total were the Trout (Algonquin) and Scratch Awl, Granite County, which also produced manganese, lead, and zinc, and the Marget Ann gold-silver mine in Silver Bow County.

Tungsten.—Tungsten ore and concentrate production during 1955 was nearly twice the record high output achieved in 1954; 1,211 short tons (60 percent WO3 basis) recoverable content of ores and concentrates was produced compared with 678 short tons in 1954. in 1954, operations at the Minerals Engineering Co. open-pit Ivanhoe property in Beaverhead County accounted for most of the output. High-grade concentrate from the company mill near Glen was shipped to the General Services Administration (GSA) for the National Stockpile, and low-grade concentrate was shipped to the Salt Lake Tungsten Co. in Salt Lake City, Utah, for processing into a high-grade

synthetic scheelite product. Expansion of Minerals Engineering Co. milling facilities was undertaken during the year. Mill capacity was increased to 800 tons per day in February, and a new crusher plant was installed in August. The mill was built in 1953 and placed in operation about the middle of November of that year; after that time it became one of the leading domestic producers. During 1955 the company continued exploratory drilling of the Ivanhoe deposit and investigation of neighboring properties. In May the nearby Birch Creek deposit was acquired under a lease-and-purchase option. Several test lots of ore from this property, as well as ore from a number of other Montana producers, were treated at the Glen mill during 1954.

Uranium.—Counties in which uranium prospecting and development activity was reported included Broadwater, Gallatin, Jefferson, Mineral, Madison, Lewis and Clark, Sanders, and Wheatland. Ore was reported shipped by Western American Uranium Exploration Corp. from Winston in Broadwater County to Vitro Uranium Co. at

Salt Lake City, Utah.

Zinc.—Production of this metal increased nearly 13 percent compared with 1954, but the total was well under the output in 1951-53, which established Montana as the leading zinc-producing State. As in previous years, most of the zinc was mined at Butte by The Anaconda Co., with the Anselmo, Lexington, and Orphan Girl lead-zinc mines and the Emma manganese mine supplying the bulk of the production in 1955. In other areas the main producers were the East Helena fuming plant, Lewis and Clark County, which treated zinc slag; the Trout (Algonquin) and Scratch Awl mines, Granite County; and the Jack Waite mine, Sanders County.

Mine production in Silver Bow County increased 17 percent and the county accounted for 91 percent of the State output. In other

<sup>4</sup> McNabb, J. S., Jr., Manganese Exploration in the Philipsburg District, Granite County, Mont.: Bureau of Mines Rept. of Investigations 5173, 1955, 25 pp.

counties the yield dropped 19 percent owing to a decline in tonnage of old slag processed at East Helena and to a shutdown at the Jack Waite mine in the latter half of the year as the result of a strike.

Miscellaneous Metals.—Byproduct metals from The Anaconda Co. refineries in the State included arsenious oxide, cadmium, and vanadium redcake precipitate at Anaconda and bismuth, cadmium, indium, palladium, and platinum at Great Falls. According to The Anaconda Co. annual report for 1955, total production of cadmium was 1,552,004 pounds, compared with 1,244,416 in 1954. The report also gave arsenic production as 2,080 and 1,600 short tons in 1955 and 1954, respectively.

#### NONMETALS 5

Barite.—Production of barite by Finlen & Sheridan Mining Co. of Butte increased about 28 percent. The company operated a mine and grinding plant near Greenough, Missoula County. Crude barite was shipped to sugar refineries, and a ground product was sold for use

as rotary-drilling mud.

Cement.—Increased demand for cement led to capacity operations by Ideal Cement Co., Montana Division, at its Trident plant in Gallatin County, and production was appreciably greater than in 1954. Raw materials included limestone from the Trident quarry; gypsum from the company-operated Hanover mine, Fergus County; and small tonnages of silica rock and iron ore, which were purchased. The bulk of the output was shipped to destinations within the State. In midyear the company announced plans for an extensive expansion

program at the Trident quarry. Clays.—A 9-percent increase was reported in production of fire clay and miscellaneous clay in Montana in 1955. National Lead Co., Baroid Sales Division, mined bentonite near Alzada, Carter County, for use as rotary-drilling mud, as a bonding medium in the manufacture of refractories, and for various other purposes. Output of fire clay in the State was limited to material extracted from the underground Armington mine in Cascade County by The Anaconda Co. The clay was shipped to the Anaconda Reduction Works, where it was used to manufacture refractories. The Harold Snow fire-clay mining operation in Deer Lodge County was reported inactive the entire year. Production normally also was shipped to the Anaconda metallurgical plant. Plants making building brick and tile and other heavy clay products were active in Cascade, Fergus, Hill, Powell, and Yellowstone Counties.

Fluorspar.—Production of fluorspar by the Cummings-Roberts operation at the Crystal Mountain mine, 30 miles east of Darby, Ravalli County, totaled 28,951 tons compared with 16,936 tons in Increased consumption by the Columbia-Geneva Division, United States Steel Corp., Geneva, Utah, the principal consumer, explained the larger output. Smaller tonnages of fluorspar were shipped for use at iron foundries, other metallurgical plants, and cement plants. Total shipments were 25,223 tons compared with

15,102 tons in 1954.

Gem Stones.—Information on production of gem stones in Montana was difficult to obtain because most of the stones were gathered by

Norman S. Petersen, commodity-industry analyst, Region I, assisted in preparing this section.

The estimated value of crude gem stones gathered private collectors. annually is \$25,000. Some data on gem-stone production in the State were obtained in 1955 from gem shops, collectors, and other Agate (Montana moss agate) was reported to be the only gem stone found in quantity in the State. Hobbyists and a few commercial collectors recovered this material from gravel bars along the Yellowstone River from Billings northeastward to the North Dakota line. Alluvial gravels of streams tributary to the Yellowstone yielded some smaller agates, as did the hills along the river and streams. Only about 10 percent of the field run of agate was found to be usable. Rains and floodwaters wash out a small quantity of new material each year. According to one report, six commercial collectors in eastern Montana sold to gem shops. Jasper and petrified wood were other varieties of quartz recovered in Montana as gem materials.

The Montana Bureau of Mines and Geology indicated that the Yogo sapphire deposit in Judith Basin County was perhaps the most important gem deposit in the United States, although the mines in this area had not been operated since 1929. Before that time some \$20-\$30 million in gems was produced from these mines. erty was operated by the New Mines Sapphire Syndicate. Perry-Schroeder gold-dredging operation, inactive, was reported to have recovered a large quantity of sapphires; some of these have been marketed from time to time. Sapphire was offered for sale to

tourists at two roadside stands in Granite County.

Gypsum.—Increased production of gypsum was recorded by the two mines in Fergus County. Total production in the State was 11 percent greater than in 1954. The United States Gypsum Co. Shoemaker mine and Heath plant and the Ideal Cement Co. Hanover

mine were active throughout the year.

Lime.—In common with most of the other industrial materials in the State, production of lime increased substantially (44 percent). Elliston Lime Co. operated 2 kilns and a hydrator at its plant at Elliston, 18 miles west of Helena. The company reported that costs of marketing advanced, owing chiefly to an increase in freight rates. A further increase of costs was expected in early 1956. Quicklime was sold for use at aluminum plants, and hydrated lime was shipped to consumers at ferromanganese plants, ore concentrators, petroleum refineries, chemical works, and water purification and softening installations. Most of the output was shipped to destinations within the State. Output at The Anaconda Co. limekiln, a part of the Anaconda Reduction Works in Deer Lodge County, also was greater than in the previous year, owing principally to demands of the copper The quicklime produced was used in the ore-concentration process, for protection of phosphate shipping bags, and for neutralizing Four rotary kilns were operated.

Phosphate Rock.—Production of marketable phosphate rock increased 14 percent in 1955. Montana Phosphate Products Co. produced rock at its Anderson, Graveley, and Luke mines in Powell The company Gimlet mine was reported to be temporarily inactive throughout the year. Output by Victor Chemical Works from the Maiden Rock mine, Silver Bow County, and the Canyon Creek operation, Beaverhead County, also increased over 1954.

George Relyea reported a slight decrease in production from his mine near the Montana Phosphate Products Co. operation in Powell County.

Montana Phosphate Products Co. began a building and mine-development program that would cost \$2 million to complete. planned to start a new open pit near the Anderson mine, which would produce phosphate rock at the rate of about 600 tons per day. Northern Pacific Railway Co. built a 5-mile railroad spur from its main line to the junction of the Anderson and Relyea mines roads on Brock Creek, which reduced truck haulage from the Anderson mine from 7 miles to 2. A new adit was started at Brock Creek junction to connect with the 4,600 level of the Anderson. It was reported that completion of the development program would permit production of phosphate rock from the Anderson mine at the rate of 1,000 tons per day.

The J. R. Simplot Co. planned open-pit mining of phosphate rock in the Centennial Mountain phosphate area along the Montana-Idaho Production of phosphate rock was planned for the summer of

1956 from this operation.

Increased production of triple superphosphate and phosphoric acid at The Anaconda Co. plant at Anaconda was reported.

obtained from the company-operated mine at Conda, Idaho.

The Federal Geological Survey 6 made a study of the physical stratigraphy of the Phosphoria formation in southwestern Montana. The Permian Phosphoria formation of the central and northern Rocky Mountains constitutes one of the world's largest reserves of phosphate This formation extends from Utah northward into Wyoming, Idaho, and Montana.

Pyrite.—Pyrite concentrate was recovered by The Anaconda Co. from copper-plant tailing. Output increased 10 percent in 1955. The product was used in manufacturing sulfuric acid, which in turn was utilized in making triple superphosphate and phosphoric acid

at Anaconda.

Sand and Gravel.—Production of 13.8 million tons of gravel valued at \$6.6 million was slightly higher than the 1954 output of 13.3 million tons valued at \$7.5 million. Output was distributed between commercial, 2 million tons (\$1.9 million), and Government-and-contractor, 11.8 million tons (\$4.7 million). Comparable figures for 1954 were commercial, 2.5 million tons (\$2.5 million), and Government-and-contractor, 10.9 million tons (\$5 million). Production in 1955 was recorded in 33 of the State's 56 counties. A large quantity of the Government-and-contractor material was used by the Bureau of Reclamation for construction at the Tiber Dam site in Liberty County and by the Montana State Highway Department, which reported a 10-percent increase in the use of sand and gravel for roadbuilding and maintenance.

Stone.—Total production of stone was 1.3 million tons valued at \$1.2 million, a decline of about 10 percent compared with the 1.3 million tons valued at \$1.4 million produced in 1954. Production

was recorded from 17 of the State's 56 counties.

<sup>&</sup>lt;sup>6</sup> Cressman, Earl R., Physical Stratigraphy of the Phosphoria Formation in Part of Southwestern Montana: Geol. Survey Bull. 1027-A, 1955, 31 pp.

TABLE 13.—Sand and gravel sold or used by producers, 1954-55, by classes of operations and uses

		1954			1955		Perce	
		Value			Value		Ton-	Aver-
	Short tons	Total	Aver- age	Short tons	Total	Aver- age	nage	age value
COMMERCIAL OPERATIONS								
Sand: Building	306, 873	\$554, 699	\$1.81	210, 112	<b>\$34</b> 5, 563	\$1.64	-32	!
Molding Road material Other	30, 067 266, 609	27, 629 139, 896	. 92 . 52	51, 746 165, 321	59, 548 95, 334	1. 15 . 58	+72 -38	+2 +1
Total sand	603, 549	722, 224	1. 20	427, 179	500, 445	1.17	-29	_
Gravel:  Building  Road material  Railroad ballast  Other	467, 857 832, 731 351, 246 195, 941	636, 984 793, 909 269, 533 87, 997	1.36 .95 .77 .45	393, 072 489, 674 390, 608 307, 003	563, 394 421, 730 286, 463 142, 608	1. 43 . 86 . 73 . 46	-16 -41 +11 +57	+
Total gravel	1, 847, 775	1, 788, 423	.97	1, 580, 357	1, 414, 195	. 89	-14	_
Total sand and gravel	2, 451, 324	2, 510, 647	1.02	2, 007, 536	1, 914, 640	. 95	-18	_
GOVERNMENT-AND-CONTRACTOR OPERATIONS Sand: BuildingRoad material	31, 090 127, 482	46, 582 24, 684	1.50 .19	113, 209 6, 763	47, 932 1, 030	. 42 . 15		 
Total sand	158, 572	71, 266	. 45	119, 972	48, 962	. 41	-24	_
Gravel: BuildingRoad material	4, 380, 213 6, 350, 435	1, 481, 352 3, 396, 995	. 34	5, 204, 433 6, 439, 668	1, 747, 833 2, 903, 891	. 34		_
Total gravel	10, 730, 648	4, 878, 347	. 45	11, 644, 101	4, 651, 724	. 40	+09	
Total sand and gravel	10, 889, 220	4, 949, 613	. 45	11, 764, 073	4, 700, 686	. 40	+08	
TOTAL ALL OPERATIONS			}					
Sand: Building Road material Other	337, 963 157, 549 266, 609	601, 281 52, 313 139, 896	1. 78 . 33 . 52	58, 509	393, 495 60, 578 95, 334	1. 22 1. 04 . 58	1 -63	1 +2
Total sand	762, 121	793, 490	1.04	547, 151	549, 407	1.00	) <u>-28</u>	3
Gravel: Building Road material Railroad ballast Other		2, 118, 336 4, 190, 904 269, 533 87, 997	. 44 . 58 . 77 . 48	6, 929, 342 7   390, 608	2, 311, 227 3, 325, 621 286, 463 142, 608	.73	$\begin{vmatrix} 8 & -04 \\ 3 & +1 \end{vmatrix}$	1 -
Total gravel	12, 578, 423	6, 666, 770	- 55	3 13, 224, 458	6, 065, 919	.4	6 +0.	5
Total all sand and	10.010.511	7, 460, 260	. 50	6 13, 771, 609	6, 615, 326	. 4	8 +0	3 -

Output of limestone increased substantially owing to a greater demand by industrial users and totaled 715,700 tons. High-quality limestone was produced for use in manufacturing cement and lime and at metallurgical works and sugar refineries. The bulk of the output was from mining operations carried on as part of integrated facilities of industrial companies. Active quarries included those of the Big Horn Limestone Co. in Bighorn County; The Anaconda Co.

Brown's Quarry, Deer Lodge County; Ideal Cement Co. Trident quarry, Gallatin County; American Crystal Sugar Co. Drummond quarry, Granite County; Maronick Limestone Co. McClellan Creek quarry, Jefferson County; and the Elliston Lime Co. quarry, Powell County. The Anaconda Co. quarry was operated intermittently for 114 days. However, production was increased 32 percent to fill requirements of the copper and ferromanganese plants. Production by Maronick Limestone Co. was affected by a 6-week strike at the East Helena lead smelter, the principal consumer.

Industrial silica was produced by two companies that mined and crushed quartzite for use in metallurgical works. Russken Mining Co. acquired the Russel B. Luke quarry near Anaconda, Deer Lodge County, in May 1955. Victor Chemical Works operated its quarry

near Melrose in Beaverhead County.

Talc.—Talc production by Tri-State Minerals Co. and Sierra Talc & Clay Co. was increased considerably, resulting in a gain of about onethird in State output. Output also was reported by Nonmetallics, Tri-State Minerals Co. operated the Smith-Dillon mine in the Dillon area, Beaverhead County, and the Treasure State and Keystone mines in Madison County. The company completed constructing a new talc-grinding mill at Barratts, 8 miles south of Dillon, on the Union Pacific Railroad. Previously the company facility at Barratts consisted of a talc-washing plant; washed talc was shipped to a companyowned plant at Ogden, Utah, for grinding. It was reported that early in 1956 the Ogden plant would receive ground talc from Montana to blend with California talc. Sierra Talc & Clay Co. operated the Yellowstone mine near Norris, Madison County, and shipped crude talc to the company mill at Grand Island, Nebr., for grinding. The third active establishment, Nonmetallics, Inc., operated a mine near Alder, Madison County, and a grinding plant at East Helena, Lewis and Clark County. The company reported that mining difficulties and high cost of mining restricted sales.

Vermiculite.—Montana ranked as the largest vermiculite-producing State owing to the activity of Zonolite Co. at its open-pit mine near Libby, Lincoln County. Production of screened and cleaned crude vermiculite increased somewhat over 1954. The company also operated mines in the southeastern United States and was believed to be the largest producer and processor of vermiculite in the world. Exfoliated vermiculite, which found use as an insulation material, as concrete and plaster aggregate, in precast slabs and blocks, for agricultural purposes and in cements, refractories, and plasters, also was produced at Libby. The company in 1955 installed a new wet-processing plant at Libby to enable processing of lower grade vermicu-

lite ores, which were found in large tonnages at the mine.

Robinson Insulation Co. produced exfoliated vermiculite from purchased crude material at a plant in Great Falls.

### MINERAL FUELS

Coal.—Production of bituminous coal declined about 18 percent from 1954. Coal production was reported from 10 counties. Output from 2 mines in Rosebud County and 9 mines in Musselshell County accounted for over 98 percent of the total. Other producing counties,

in order of production, were Carbon, Sheridan, Richland, Custer,

Blaine, Dawson, Cascade, and Hill.

The Rosebud mine, operated by Foley Bros., Inc., and owned by the Northwestern Improvement Co., a subsidiary of the Northern Pacific Railway Co., continued to be the leading coal-producing mine in Rosebud County and the State. The Republic Coal Co. underground mine near Roundup, Musselshell County, was the second

largest coal-producing mine.

The Federal Geological Survey published four technical bulletins on coal reserves in eastern Montana.<sup>7</sup> This region comprises the western portion of the Fort Union-Powder River coal region of North and South Dakota, Wyoming, and eastern Montana. The coal, subbituminous in rank, can be utilized for fuel and as raw material for production of synthetic liquid fuels and other chemical derivatives. Much of the region is suited ideally to large-scale strip mining. Rank of the coal increases from lignite in the eastern portion of the field to subbituminous in the western portion. Throughout Montana, coal of subbituminous rank predominates. A report of cleaning tests on

Montana coal was released by the Bureau of Mines.8

Petroleum and Natural Gas.— Crude-oil production increased from 14.2 million barrels valued at \$31.2 million to 15.7 million barrels valued at \$35.4 million, a 10-percent advance compared with 1954. Output was reported from seven new fields—Bredette, Roosevelt County; Bynum, Teton County; Cupton and Pennel, Fallon County; Rudyard, Hill County; and Wolf Springs, Yellowstone County. No production was reported from the abandoned Cadmus field, Glacier County. Poplar field, Roosevelt County, again was the major producer in the State with over 3 million barrels. Five other fields, in order of output—Cut Bank and Glacier (Pondera and Toole Counties), Sumatra (Rosebud County) Elk Basin (Carbon County), Kevin-Sunburst (Toole County), and Pine (Wibaux County) produced over 1 million barrels. Of 407 wells completed during 1955, 167 produced oil, 25 produced gas, and 215 were dry—representing an increase of 70 completed wells over 1954.

Continued exploration and development of the Baker-Glendive anticline, a major oil-bearing structure in the Williston Basin, resulted in a total of eight producing fields. Additional new discoveries extended the Williston Basin's eastern boundary. A new development along the Cedar Creek anticline looked promising; Shell Oil Co. was particularly active in this development. New discoveries at Wolf Springs west of the Williston Basin probably would stimulate further

development and expansion in that direction.

An average of 27,018 barrels of crude oil was processed daily by the 10 refineries in the State. Completion of the Butte pipeline late in 1955 was expected to have an important effect on Montana's 1956 production by alleviating high shipping costs, which previously had hampered oil production.

A 7-percent decrease was recorded in natural-gas withdrawals. The Cut Bank field, including Reagan, continued to be the most

<sup>7</sup> Work cited in footnote 3.
8 Geer, M. R., and Yancey, H. F., Cleaning Characteristics and Cleaning Tests of Montana Coal: Bureau of Mines Rept. of Investigations 5103, 1955, 47 pp.
9 Production figures for crude oil and natural gas, by fields, were obtained from the Montana Oil and Gas Statistical Bulletin, a monthly publication of the State Oil and Gas Conservation Commission.

important producer, with more than double the output of Cedar Creek and Bowdoin fields combined, the second and third largest producers, respectively, in the State.

## REVIEW BY COUNTIES AND DISTRICTS 10

Beaverhead.—A second 400-ton milling unit was placed in operation at the tungsten operation of Minerals Engineering Co. near Glen, and plans were underway to increase daily capacity to 1,000 tons. About 90 men were employed at the mill and open-pit mines. Concentrate was shipped to the company refinery at Salt Lake City and to the GSA. A small production of tungsten ore was recorded by Griff Williams at the Birch Creek mine. Minor tonnages of manganiferous ore were shipped to the Government low-grade stockpile from the M. D. (M. D. Mines), Blue Ore (Angus McDonald), Blackstone 1 and 2 (Olive K.

Quick), and Gob (James Richmond) mines.

Continued production of phosphate rock from the Canyon Creek mine near Melrose and output of quartzite for flux from an operation in the same area were reported by the Victor Chemical Works. The J. R. Simplot Co. in July began developing its Centennial Mountain prospect on the Idaho-Montana border near Lakeview. Plans called for an open-pit operation at first, followed by underground mining. It was expected that this mine would develop into one of the largest phosphate-rock operations in the West. For utilization in the manufacture of paint, ceramics, and textiles, talc was shipped to Ogden, Utah, for grinding by the Tri-State Minerals Co. from its Smith-Dillon mine near Dillon. Construction of a company-owned talcgrinding mill was completed late in the year at Barratts, 8 miles south of Dillon.

Argenta District.—The Maulden mine at the old mining camp of Argenta on Rattlesnake Creek 20 miles west of Dillon continued as the largest metal producer in the district. The mine was operated throughout 1955 by John and Ida B. Hand, and crude lead ore shipped to a smelter totaled 2,610 tons, containing 52 ounces of gold, 10,400 ounces of silver, 26,000 pounds of copper, 727,000 pounds of lead, and 78,000 pounds of zinc. Gold ore was reported shipped from the Shafer mine by Shafer-Renz. Other active operations included the Ferdinand, Goldsmith, Lucky Strike, and Governor Tilden lead mines.

Bannock District.—L. N. Eberline, lessee, developed the Wadhams mine on Grasshopper Creek from January 25 to March 25 and shipped

a small tonnage of lead ore.

Blue Wing District.—The Charter Oak mine, developed by F. E.

Herr for 4 months, yielded 50 tons of lead ore.

Bryant District.—L. B. Lively shipped 18 tons of lead-zinc ore from the Hecla property. Exploration and development comprised

200 feet of drifting.

Polaris (Lost Cloud) District.—The partnership of Barry & James was formed in November to operate the Polaris mine on Billings Creek, 38 miles northwest of Dillon. The operators reported cleaning out and retimbering a 50-foot shaft and doing exploratory opencut work with a bulldozer.

<sup>10</sup> John L. Beh, commodity-industry analyst, Region I, Albany, Oreg., assisted in preparing this section.

TABLE 14.—Value of mineral production in Montana, 1954-55, by counties 1

County	1954	1955	Minerals produced in 1955, in order of value
Beaverhead	\$2, 853, 170	\$4, 584, 855	Tungsten, clays, phosphate rock, lead, stone, tale, silver, gold, zinc, copper.
Beaverneau	ψ2, 000, 210		tale, silver, gold, zine, copper.
Big Horn	219,009	348, 878	Petroleum, Sand and graves.
Blaine	1,066,679	657, 455	Petroleum, coal. Iron ore, gold, sand and gravel, lead, zinc,
Broadwater	194, 832	138, 815	
· •	4, 685, 085	4, 250, 078	Petroleum, coal, stone, sand and gravel.
Carbon	4, 000, 000	(2)	
CarterCascade	321, 558	449, 858	Sand and gravel, coal, silver, clays, lead, zinc.
Chouteau	(2)	(2)	Sand and gravel.
Custor	46, 688	89, 272	Sand and gravel, coal. Petroleum, sand and gravel, coal.
Dowgon and McCone	2, 427, 508	2, 235, 552	Tungsten, pyrites, lime, stone, sand and gravel,
Deer Lodge	749, 786	1, 258, 872	gold, silver.
	616, 873	1, 567, 467	Potroloum sand and gravel.
Fallon		(2)	Gynsum, sand and gravel, clays.
Fergus	(2) 319, 404	178, 395	Stone sand and gravel.
Flathead	(2)	(2)	Cement, stone, sand and gravel.
Gallatin Garfield and Petroleum 3	539, 058	446, 779	Petroleum.
Glacier, Pondera, Teton, and Toole.	12, 454, 523	12, 731, 011	Petroleum, sand and gravel, stone.
Golden Valley		(2) (2)	Petroleum.
Granite	2, 021, 468	(2)	Manganese, silver, zinc, lead, stone, gold
· ·	, ,	22.0	copper, tungsten. Sand and gravel, coal, petroleum, clays.
Hill	80, 809	(2) (2)	Sand and graver, coar, perforcing only
Toffomnom	1 399, 190 (	(2)	Stone, lead, silver, zinc, gold, copper. Sand and gravel, lead, silver.
Terdith Rogin	l (*) . I	(2)	
		1 400 725	Zing lead sand and gravel, stone, copper
Lewis and Clark	1, 683, 509	1, 477, 735	Zinc, lead, sand and gravel, stone, copper silver, gold.
		2, 129, 726	I Sand and gravel, Delivieum, some.
Liberty	(2)	2, (2)	Trampionlite gond and gravel.
Lincoln Madison	(2)	(2)	Talc, tungsten, lead, gold, silver, zinc.
Mooghor	(2)	10, 220	Copper, lead, gold, silver.
Minoral	87, 085	(2)	Sand and gravel, gold, zinc, silver. Barite, sand and gravel, stone, gold, lead
Missoula	281, 087	360, 474	silver.
		2, 612, 260	a 1 - tuelerm stone
Musselshell	2, 344, 039	2, 612, 200	gtong sand and gravel, lead, Silver, gold.
Park	281, 584	(2)	Sand and gravel, silver, gold.
Phillips	2, 771, 246	(2)	Sand and gravel, silver, gold.  Phosphate rock, lime, gold, stone, sand an
Powell	2, 111, 210	1	gravel, clays, lead, sliver, zinc.
Prairie		(2)	Ctono
Ravalli		(2)	Fluorspar, sand and gravel.
Dichland		176, 596	Petroleum, coal. Petroleum, sand and gravel.
Roosevelt	_ 5, 785, 001	6, 659, 824	Petroleum, sand and graver.
Posehud	3, 714, 789	5, 160, 055	I god gine silver, copper, gold,
Sanders	565, 778		
Sheridan		94, 137, 939	
Silver Bow	58, 901, 159	91, 101, 800	phosphate rock, sand and graver.
G+33	(2)	3, 723, 509	Chromite, petroleum.
StillwaterTreasure	(2)	(2)	Sand and gravel.
Valley	(2)	26,000	
Wibany	837,003	2, 128, 03	Petroleum.
Vollowstone	681, 253	393, 27	3   Sand and graver, perioteum, clays.
Yellowstone Undistributed 4	17, 597, 365	19, 388, 65	liquids, gem stones.
<u></u>			mdnigs, sem stores.
	100 412 000	166, 993, 00	n
Total 5	126, 412, 000	100, 000, 00	* [

Big Horn.—Total crude-oil production increased 45 percent over All fields increased output substantially. Soap Creek field, the major producer, yielded 123,000 barrels, and recovery at Ash Creek and Hardin fields boosted the county total to 220,000 barrels valued at \$310,000. Natural gas totaling 69.8 million cubic feet was withdrawn from the Hardin field. From sand and gravel Chester

¹ The following counties are not listed because no production was reported: Daniels, Powder River, Sweet Grass, and Wheatland.
² Value included with "Undistributed" to avoid disclosing individual company confidential data.
² Dawson and McCone; Garfield and Petroleum; Glacier, Pondera, Teton, and Toole Counties are combined because of joint oilfield production.
⁴ Includes value of gem stones, natural gas, natural-gas liquids, and sand and gravel that cannot be assigned to specific counties, and values indicated by footnote 2.
⁵ Total has been adjusted to eliminate duplicating the value of stone.

Raup and county highway crews processed building and paving material.

Blaine.—Blaine County ranked ninth in production of crude oil. However, the yield from the Bowes field dropped from 980,000 barrels valued at more than \$1 million in 1954 to 510,000 barrels valued at \$602,000 in 1955. Natural gas was produced at an increased rate compared with 1954. G. S. & J. W. Sargent continued mining coal near Chinook.

Broadwater.—About 6,630 tons of iron ore averaging 40 percent iron was shipped to the Ideal Cement Co. plant at Trident by Ralls

& Harris Bros. from an open pit near Radersburg.

Gravel for railroad ballast and sand for car bedding were extracted near Three Forks by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co. The company also produced limestone for riprap at a quarry near Eustis.

Backer District.—Gold ore and old tailing were reported produced

at the Miller-Slim Jim property by Beavertail Mining Corp.

Beaver District.—Lead ore from the January mine constituted the principal production of Beaver district. Gold ore was reported shipped from the Big Jim claims, the Custer Copper property, and the Edna No. 2 mine; lead ore was produced from the H & H-Custer, Little Bonanza, and Silver Saddle mines.

Cedar Plains District.—Roy E. Nicolls reported shipment of 3 carloads of crude zinc-oxide ore and 1 trucklot of crude lead ore from the Blackhawk and North Star mines, 18 miles southwest of Toston. Development comprised 80 feet of drifting and a 55-foot raise; a new small air compressor was added to mine equipment during the year. The mine was developed by an incline shaft to a depth of 620 feet.

Park or Indian Creek District.—The Marietta mine, operated by Al Dance & Harry Q. Anders, yielded a substantial tonnage of gold ore. Exploration and development were reported as 100 feet of drifting, 1,500 feet of diamond drilling, and 100 feet of raisework.

Production also was reported from the Erickson dump.

Carbon.—The Elk Basin field, which ranked fourth in the State, yielded the major portion of crude oil produced in the county. Output from Dry Creek, Clark's Fork, Frannie, and Golden Dome fields boosted the county total to 1.7 million barrels valued at \$3.9 million. No production was reported from the Jack Creek field. Dry Creek field was an important producer of natural gas; Golden Dome and Elk Basin also contributed to the county total. Production of coal was continued at underground operations of the Brophy Coal Co., Smokeless & Sootless mine of Deer Lodge and from the Foster mine of the Smith Mine Coal Dock at Washoe. Big Horn Limestone Co. Denver, Colo., crushed limestone from its Warren pit for use in sugar refining. Structural gravel was produced by Zelanka Trucking Co., Frombert, and Tony Rom, Red Lodge. The Northern Pacific Railway Co. produced gravel for fill and railroad ballast.

Carter.—Mineral activity in Carter County was confined to production of bentonite by the National Lead Co., Baroid Sales Division, at its Alzada pit. The bentonite was extracted and marketed for

use as rotary-drilling mud and for refractory purposes.

Cascade.—The electrolytic copper refinery and electrolytic zinc plant at Great Falls were operated continuously in 1955 and processed

copper anodes and zinc concentrate produced at Anaconda, Deer Lodge County, and toll zinc concentrate received from mining companies in the Western States and several foreign countries. Anaconda Wire & Cable Co. manufactured copper wire, rod, and cable at its plant adjacent to the reduction works and completed an aluminum-rod plant equipped with imported Swedish machinery. The new facility, which would employ a new process for drawing wire, was to be supplied with raw material from the aluminum-reduction plant at Columbia Falls, Flathead County. Output was to be consigned to five eastern plants of the Anaconda Wire & Cable Co.

Sand and gravel was processed by the Great Northern Railway Co., the Bureau of Reclamation, county highway crews, and four commercial producers. Gravel for railroad fill and ballast and for construction and roadbuilding purposes was produced. In addition the Bureau of Reclamation utilized a small quantity of sandstone for Production and shipment of coal was reported by the East Belt Coal Mine at Belt. Clay was mined by The Anaconda Co. for use at its firebrick plant at Anaconda, Deer Lodge County. Great Falls Brick Co. continued to manufacture brick and tile from clay extracted from its Gianinni pit. Vermiculite was expanded and marketed for use in insulation, concrete aggregate, and plaster aggregate by Robinson Insulation Co. of Great Falls.

Montana District.—Ore containing values in silver, lead, and zinc from the Rochester-Boss-Atlantus property of Boss Mines, Inc., constituted the sole metal production credited to Cascade County.

Chouteau.—Gravel was produced by the county for highway

maintenance.

Custer.—The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. produced sand and ballast gravel from a company pit near Paragon. The county highway department and commercial producers obtained sand and gravel for structural and paving purposes. T. J. Fleming reported output of coal from underground workings near Miles City. A quantity of agate was recovered near Miles City by collectors.

Dawson and McCone.—Output of crude petroleum for the combined counties was 1.1 million barrels compared with 1.2 million barrels in The Glendive field, seventh largest producer in the State, contributed over 70 percent of the Dawson County production; Deer Creek and Gas City fields, the latter a recent discovery, also produced important amounts. Smaller quantities were reported produced from Yellowstone and Woodrow fields. Richey Southwest was the only field reporting production in McCone County. Building and paving sand and gravel were recovered by Knoll & Sons and Minot Sand & Gravel Co., both of Glendive, Dawson County. The Dawson County Highway Department extracted a small quantity of gravel for road use. Coal was strip mined near Glendive by Clyde Clapp, Jr., and Gordon Peuse. The Montana Gem Shop reported collecting a quantity of agate for cutting and polishing.

Deer Lodge.—At the Anaconda Reduction Works, East Anaconda, a new crushing plant and conveyor system for delivering crushed copper ore to the concentrator bins was put in operation in May. Construction to increase the capacity of the copper concentrator at Anaconda was begun in 1955 to treat additional tonnages of low-grade copper ore from the Berkeley pit at Butte; this work was expected to be completed early in 1957. Only two of the numerous small tungsten mines in the county were reported active—the Tip Top mine of Tip Top Mining Co. (formerly B. H. & M. Tungsten) and the Olson Mountain property of Heaphy & Moe. Henderson Tungsten Co. milled 3,700 tons of ore from the Tip Top mine. Sunshine Mining Co., which had been carrying out an exploration project under a \$45,000 contract with DMEA, abandoned its Storm Lake tungsten

prospect early in 1955.

Pyrite extracted from tailings of the copper mill was utilized at The Anaconda Co. sulfuric-acid plant. Limestone produced at Brown's quarry was burned to quicklime by The Anaconda Co. for use in ore-processing and metallurgical operations. Clay from the Armington pit in Cascade County was fabricated into firebrick at the Anaconda Reduction Works brick plant, and phosphate rock from the company mine at Conda, Idaho, was used in manufacturing triple superphosphate and phosphoric acid. Construction was in progress on an additional fluosolids roasting unit and a new contact acid plant near the phosphate plant. The new unit was to supplant the original chamber acid plants, which had become obsolete. Near Anaconda the Russken Mining Co. crushed quartzite for fluxing purposes. Two firms marketed building and paving sand and gravel, as well as a small quantity of engine sand. Small quantities of crushed limestone were recovered for road metal and railroad ballast.

Georgetown District.—H. H. Hoben worked the Gold Coin mine from January 1 to January 20 and from March 15 to April 14. Fifty tons of crude ore milled in a stamp mill and treated by amalgamation yielded 43 ounces of gold and 2 ounces of silver. The mill was made up of 10 stamps, with a capacity of 27 tons; 20 more stamps were idle.

Fallon.—Production of crude petroleum from 6 fields totaled 828,886 barrels valued at approximately \$1.6 million. The Cabin Creek field yielded over 75 percent of the crude petroleum produced in the county; other producing fields, in order of output, were Little Beaver, Fertile Prairie, Pennel, East Little Beaver, and Cupton. The Cupton and Pennel fields were new discoveries, and first production was reported in 1955. In terms of natural-gas withdrawals the Cedar Creek field ranked second in the State. Baker Cement Products Co. near Baker prepared sand and gravel and pumice for manufacturing

concrete-aggregate building blocks.

Fergus.—The underground gypsum operations of the Ideal Cement Co. (Hanover mine) and the United States Gypsum Co. (Shoemaker mine) supplied the major portion of the county mineral output. The former company processed the crude commodity for utilization as a retarder in manufacturing cement, as well as for agricultural purposes; the latter concern made and marketed wallboard, rock lath, and ground, raw gypsum. The Lewistown Brick & Tile Co., largest producer of clay products in the State, fabricated heavy clay products from materials extracted from its pit near Lewistown. Building sand and gravel was processed at the Cerovski Cement Products Co. workings near Lewistown, and the Chicago, Milwaukee, St. Paul & Pacific Railroad Co. produced gravel for railroad ballast. Collection of a small quantity of sapphire was reported by E. Arnold Johnson of Lewistown.

Flathead.—Anaconda Aluminum Co. began production at its new \$65 million reduction plant at Columbia Falls in August and expected to reach capacity output of 60,000 tons of aluminum annually in 1956. Construction expenditures amounted to \$62.1 million, of which \$14.2 million was expended in 1955. The plant consisted of 4 main buildings, each with 2 potlines, together with necessary auxiliary facilities. Alumina was to be supplied to the new facility from the Corpus Christi, Tex., and Hurricane Creek, Ark., plants of Reynolds Aluminum Co. Anaconda officials stated that the Columbia Falls site was selected and the plant laid out to expand production as required by conditions in the industry. In addition to supplying two fabricating subsidiaries of The Anaconda Co., a substantial tonnage was to be sold in the open market.

Sandstone and gravel were mined and processed into ballast by the Great Northern Railway Co.; three companies, all at Kalispell, produced sand and gravel for building and paving.

Gallatin.—The Ideal Cement Co. operated a quarry and plant at Trident and continued as the outstanding mineral producer in the county. In the Bozeman area four operators produced sand and gravel for local construction projects. County road crews quarried granite, limestone, and sandstone, as well as sand and gravel for riprap and paving materials.

Garfield and Petroleum.—Production from the Cat Creek oilfield on the Garfield-Petroleum County border declined for the eighth consecutive year. Total output for the field was 173,599 barrels valued at \$446,000. The Rattlesnake Butte field in Petroleum County

resumed production after being idle in 1954.

Glacier, Pondera, Toole, and Teton.—The Cut Bank oilfield, which included acreage in Glacier, Pondera, and Toole Counties, continued as a major producer of both crude petroleum and natural gas. ranked second in the State, with output of nearly 2.7 million barrels of crude oil valued at over \$7.6 million. Astride the Pondera-Teton County border was the Pondera field, another important source, which produced 490,814 barrels of crude petroleum valued at almost \$1.3 million. Other active fields in Glacier County were Reagan and Landslide Butte, with a total production of 224,635 barrels of crude oil valued at nearly \$638,000. The major share was produced The Cadmus field was abandoned in 1954. from the Reagan field. Excluding the yield of the Cut Bank and Pondera fields, Pondera County's production was only 1,883 barrels, with a value of \$4,483, all of which was supplied by the Brady-Midway field. Toole County delivery of crude petroleum, excluding Cut Bank, was over 1.1 million barrels valued at \$3.1 million. The Kevin-Sunburst field ranked fifth in the State and supplied nearly all of the county crude oil; Border and Berthelote fields contributed minor quantities. Not including output from the Pondera field, two Teton County operations contributed a small output: Bynum (a new discovery) and Bannatyne yielded 1,497 barrels worth \$3,770. The gross product for the combined counties amounted to about 4.6 million barrels of crude petroleum with a valuation of about \$12.6 million. In addition, over 14 billion cubic feet of natural gas was withdrawn. Sand and gravel was excavated and processed into building and paving materials by 2 firms in Shelby (Toole County) and 1 each in Billings and Cut Bank (both in Glacier County). The Federal Bureau of Reclamation processed a small quantity of structural gravel, and some crushed stone was utilized by the United States Bureau of Public Roads for roadbuilding.

Golden Valley.—The only recorded mineral output in the county was a small quantity of crude petroleum produced from the Women's

Pocket field. The field was inactive in 1954.

Granite.—Bon Terre Mining Co. and Flint Creek Contractors produced minor tonnages of tungsten ore in 1955 and shipped to Minerals Engineering Co., Beaverhead County. The True Fissure (Moorlight group), Trout (Algonquin), and Scratch Awl mines in Flint Creek district were the principal shippers of manganiferous ore to the Government low-grade stockpiles at Butte and Philipsburg, and manganese ore was shipped to the National Stockpile from the True Fissure and Trout (Algonquin) operations. The latter also supplied manganese ore for commercial users. Small manganese mines active included Bi-Metallic, Climax, Iron Age and Redemption, Comanche, Sweet Home, Mountain View, and Marie.

The American Crystal Sugar Co. (formerly Frank Norberg Co.) produced limestone for sugar refining. In addition, the company supplied some fluxing material for the Bunker Hill (Idaho) smelter.

A small quantity was used for railroad ballast.

First Chance (Garnet) District.—Metal production consisted of placer gold recovered by Valley Mining Co. at the Bearmouth mine in Deep Gulch. Operations were carried on from April 1 to October 1; about 5,000 cubic yards of gold-bearing gravel was washed and 35,000 cubic yards of overburden removed. Equipment comprised a 100-yard-per-hour Pitcher washing plant, Lima ¾-yard excavator, and D-8 bulldozer as well as a light plant, welding machine, and trucks.

Flint Creek District.—The largest mining operation in the district and county was the Trout (Algonquin) mine and 100-ton flotation mill of Trout Mining Division, American Machine & Metals, Inc., 2½ miles east of Phillipsburg. The mine was operated continuously and yielded lead-zinc-manganese ore at an increased rate compared with 1954. Exploration and development totaled shaftwork, 155 feet; drifting, 1,500 feet; and diamond drilling, 280 feet. The Scratch Awl mine (Peter Antonioli) and True Fissure operation (Taylor-Knapp Co.) produced zinc-manganese ore. A deep-well, turbine-type pump was installed to dewater the lower part of the True Fissure shaft.

Gold Creek (South Gold Creek) District.—A dragline and washing plant were reported operated on placer claims held by Master Mining

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Rock Creek District.—The Rock Creek mine was said to have yielded a small tonnage of gold ore, which was shipped crude to a

smelter.

Hill.—Sand and gravel was prepared by the Havre Sand & Gravel Co. for building. Rudyard, a newly discovered field, yielded its first crude oil—370 barrels valued at \$740. Nearly 90 million cubic feet of natural gas was withdrawn from the Box Elder field on the Blaine County border. A small quantity of coal was taken from the Rocky Boy underground mine near Box Elder by Alfred Laursen. Building brick and tile were fabricated by the Havre Brick Co.

Jefferson.—Maronick Limestone Co., operating under lease from the American Smelting & Refining Co., quarried, processed, and shipped limestone by rail to the lead smelter at East Helena.

Cataract District.—The following mines were reported active during

part of 1955: Aurora (lead ore), Daily West (lead-zinc ore), and

Silver Hill (gold-silver ore).

Clancy and Lump Gulch District.—Production comprised silver ore from the Mammouth Lode and lead ore from the Nellie Grant mine.

Colorado District.—The Alta mine of Lahey Leasing Co. yielded a large tonnage of gold-silver ore in 1955. Lead ore in varying quantities was reported shipped from the Belle, Silver Claim, and Silver Mint mines in the course of development work.

Elkhorn District.—New Elkhorn Queen, Inc., reported working the New Elkhorn Queen lead mine, 20 miles northeast of Boulder, from May 16 to December 18. Development totaled 200 feet of drifting and a raise of 100 feet.

Whitehall District.—Lead ore was reported shipped from the Car-

bonate mine by Lester Lindquist.

Judith Basin.—Building sand and gravel, as well as paving gravel,

was washed and screened by Keith Royston at Moore.

Barker District.—Croff & Montague developed the Tiger mine in No other metal 1955 and shipped a small tonnage of crude lead ore. mines were reported active in the district or county.

Lake.—The only mineral activity in Lake County was that of the Clairmont Trucking Co. of Polson. Sand and gravel from the San Pablo Reservoir area was processed into building and paving materials.

Lewis and Clark.—The American Smelting & Refining Co. lead smelter at East Helena operated continuously except for a shutdown of 5 weeks due to a strike. The plant processed crude ore and concentrate from mines in Montana, Idaho, and Washington; residues from electrolytic zinc plants at Anaconda and Great Falls; and concentrate from several foreign countries.

Helena Sand & Gravel Co. and Valley Gravel Products, both of Helena, produced building and paving sand and gravel. Granite for riprap was crushed near Wolf Creek by the Great Northern Railway

Bear Gulch District.—Fred Schwarzhaus reported shipping a small quantity of gold ore from the Aurora mine, which was worked from

January 1 to September 24.

Canyon Ferry District.—Goodwin & Peura shipped 402 tons of lead ore from the Nick & Dick-Black Jack-Jack Pot groups, and Louis Peura produced 2,675 tons of ore from the Nick & Dick dump near Oregon Gulch; operations were carried out from May 5 to December 31.

Heddleston District.—The Mike Horse mine, worked by Norman

Rogers Mining Co., yielded copper ore.

Lincoln District.—A gold placer in Lincoln Gulch was reported operated by Owners Operating Co., Inc., of Helena.

Madison Gulch District.—Ray W. Crum, owner, intermittently operated the Humdinger mine, 21 miles north of Avon, and produced a few ounces of gold. A small stamp mill having 3 stamps with capacity of about 5 tons in 8 hours was operated at the mine.

Marysville District.—The Drumlummon gold mine and the Shokope

lead mine were worked during part of 1955.

Rimini District.—The Free Speech mine (gold-silver ore), the Evergreen property (lead ore), and the Sally Belle mine (lead ore) vielded

small tonnages of ore during exploration and development.

Scratch Gravel District.—Silver ore produced by Louis Peura from the Silver Coin mine from January 3 to April 18 constituted all the metal production of Scratch Gravel district with the exception of a small tonnage of gold ore shipped by the same producer from the

Umatilla open-pit mine near Birdseye.

Smelter District.—Large tonnages of zinc, as well as smaller quantities of lead, were recovered from the East Helena old slag dump at The Anaconda Co. fuming plant. The slag was from operations in earlier years of the adjacent lead smelter of the American Smelting & Refining Co. When the quantity of molten slag necessary for capacity operation was not available from current lead-smelting operations, the deficit was made up by mining old slag from the dump where the lead blast-furnace slag had been stored for many years before the slag-treatment plant was constructed. Output from this old slag was credited to current mine-production statistics and supplied a large share of the mineral production of the county. The dump contained enough slag for many years' operation. Zinc fume produced in the flues and baghouse was shipped to Great Falls for further

Liberty.—Construction of the Tiber Dam by the Federal Bureau of Reclamation resulted in production of considerable quantities of gravel and stone. A total of 5.2 million tons of gravel for earth-filldam construction and 153,000 tons of riprap was supplied under contract during the year. The Whitlash field furnished 95 percent of the county total production of 146,423 barrels of crude oil. Den and Flat Coulee fields yielded minor quantities. Total value of crude petroleum produced was \$344,000. Over 3 billion cubic feet of natural gas was withdrawn from 4 contributing fields; Whitlash, Keith-Block, and Utopia were the major producers with Bears Den

reporting a smaller output.

Lincoln.—From its open-pit operation and processing plant 7 miles northeast of Libby, the Zonolite Co. continued to market both crude and exfoliated vermiculite and remained the largest single producer in the United States. Operation of the new processing plant, designed to utilize much material hitherto considered as waste, was begun in The new plant was expected to reduce the cost of production. Leary Libby Sand & Gravel Co. marketed pit-run gravel. The Great Northern Railway Co. produced gravel near Yaak for fill and railroad ballast.

Madison.—Development ore totaling 1,000 tons from the Strawberry mine was milled by Pony Tungsten Enterprises. The ore was crushed in an old stamp mill, and concentration was done on tables. The company did considerable development work on the second level of the mine and readied some stopes for production. Small shipments of manganiferous ore to the Government low-grade stockpile were reported from the Lost Lode mine by John T. McCale and from the Kent & Miller operation by Herman Miller.

Talc, the only nonmetallic mineral mined in the county, was produced by three companies. Tri-State Minerals Co. (Treasure State and Keystone mines) and Sierra Tale & Clay Co. (Yellowstone mine)

shipped crude talc to company-owned grinding plants in Utah and Nebraska, respectively. Nonmetallics, Inc., of Helena continued to operate its mine and shipped talc to East Helena to be ground for use in paints.

Pony and South Boulder District.—Basil and Denzil Nicholson operated the Ridgeway gold mine intermittently in the summer and

fall. Rochester District.—Blaine Jensen, lessee, worked the Calvin lead mine about 8 months; assessment work at the Strugglers mine by Lester Shorten of Three Forks produced a small tonnage of lead ore.

Sheridan District.—Work at the Billy Bennit and Sky Chief mines

supplied the metal production of Sheridan district.

Tidal Wave (Twin Bridges) District.—Gold ore was shipped from the Black Ace mine during development by Lewis C. Rollins, and Fred Starner worked the High Ridge gold mine briefly at the end of 1955 before giving up his lease.

Virginia City District.—The Eastern-Pacific group was reported to

have yielded gold in 1955.

William Creek District.—A small quantity of lead ore was reported

shipped from the Uranium King operation.

Meagher.—Beaver (Thomas Creek) District.—Thomas Creek Mining Co., Inc., of White Sulphur Springs operated a Pitcher washing plant and D-8 bulldozer on the Prosperous placer claims from July 1 to September.

Castle Mountain District.—The Queen-Daisy open-pit copper mine on Henseley Creek, 13 miles northwest of Lennep, was operated by D & V Mining Co. from August 25 to September 26, when operations were suspended for the winter. Lead ore was shipped from the Cumberland mine, and the Montana-Elliston-Franklin group yielded a small tonnage of copper ore.

Musselshell District.—George Gormley developed the Copperopolis mine for 300 days and shipped 175 tons of copper ore crude to a

smelter.

Mineral.—The Mineral County Highway Department mined and

processed road gravel for its highway-maintenance program.

Cedar and Trout Creek District. - E. T. Vincent and Clay Lewis began dredging gold at the Calumet placers, employing a dragline and nonfloating washing plant to work stream gravel; Carl Westfall operated the Mineral Creek placer claim by small-scale hand methods from July 1 to 30 during assessment work and recovered a few ounces of gold; and George M. Gildersleeve hydraulicked his Stemwinder placer claims from June 1 to July 15.

Iron Mountain District.—Production comprised zinc ore from the

Nite Owl mine.

Missoula.—Three sand and gravel companies maintained active operations at Missoula; stock-car sand was produced for the Northern Pacific Railway Co. at McQuarrie; and the Chicago, Milwaukee, St. Paul & Pacific Railroad Co. processed gravel for railroad ballast at its Frenchtown pit. The Lyons Construction Co. of Clinton crushed stone for railroad ballast. Barite mined near Greenough, 30 miles east of Missoula, by Finlen & Sheridan Mining Co. represented the only production of this commodity in the State. Output was marketed for use both in rotary-drilling mud and sugar refining.

Coloma (Garnet) District.—William Dittrich, owner, operated the Crystal Spring mine from May 30 to November 1 and produced some gold ore.

Copper Cliff District.—Shipment of lead ore from the Blacktail

mine was reported.

Nine Mile District.—Placer gold recovered by E. T. Vincent and Clay Lewis at the LaChambre and Twin Creek placers made up the

only metal production credited to the district.

Musselshell.—The county continued in second place in coal output and first in the number of active coal mines. Each of 9 mines produced over 1,000 tons. All of the coal-mining activity was near Roundup. Leading producers were Klein No. 2, Republic Coal Co.; Roundup No. 3, Roundup Mining Co.; and Montana Queen, Mountain States Mining Co. The surface operations of the Nies Bros. mine was destroyed by fire; however, early reconstruction was planned. Output of crude petroleum, totaling 425,015 barrels of crude petroleum valued at \$786,000, declined slightly. The Big Wall field supplied the major portion of the total; Melstone, Ivanhoe, Ragged Point, and Gage fields, in order of their importance, furnished the balance. A small quantity of natural gas was recovered from the Big Wall and Ragged Point fields during the year. Riprap from sandstone was produced by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co.

Park.—Railroad ballast, riprap, and stock-car sand were produced by Lyons Construction Co. for the Northern Pacific Railway Co. At Livingston the Eggar Construction Service operated a sand and

gravel plant for production of building sand and gravel.

New World District.—The only metal production credited to the district and county was lead ore from the Hudson and St. Jude mines.

Phillips.—Astride the Phillips-Valley County border, the Bowdoin field yielded 4.7 billion cubic feet of natural gas but dropped, in order of volume production, from second to third position in the State. Gaylord LaFondé Sand & Gravel Co., Malta, reported producing building and paving sand and gravel; and the Morrison-Knudson Co., from an operation near Cole, prepared railroad ballast, fill, building gravel, and stock-car sand for the Great Northern Railway Co.

Little Rockies District.—Prospecting and development at the Little Ben mine by Little Rockies Mining & Development Co. of Landusky were carried out throughout 1955; a small tonnage of gold-silver ore was shipped to a smelter. A 50-ton flotation plant was under construction at the operation. Exploration and development consisted of shaftwork, 52 feet; drifting, 325 feet; and trenching, 2,000 feet.

Powell.—Phosphate-rock mining continued to be the principal mineral activity in the county. Operation of the Anderson, Graveley, and Luke mines by the Montana Phosphate Products Co., a subsidiary of Consolidated Mining & Smelting Co. of Canada, Ltd., yielded raw materials for use in the company fertilizer and chemical plants at Trail and Kimberley, British Columbia. The company-owned Gimlet mine was inactive. George A. Relyea continued operating the nearby Relyea phosphate mine. The Elliston Lime Co. produced quicklime and hydrated lime at Elliston; the company also crushed and processed limestone for use as metallurgical flux and roadstone. The Mastodon Sand & Gravel Co., Deer Lodge, produced sand and gravel for structural and paving purposes, and the Chicago, Milwaukee, St. Paul &

Pacific Railroad Co. prepared local gravel for railroad ballast. Building brick was manufactured by Western Clay Manufacturing Co.

Nigger Hill District.—Charter Oak Mining Co. operated the Charter Oak mine from January 10 to December 12; shipped 70 tons of lead ore, with gross content of 16 ounces of gold, 551 ounces of silver, and 14,200 pounds of lead; and completed construction of a 50-ton selective floatation plant. The Negros lead mine was worked from January 1 to March 1 and from June 15 to August 1 by John F. Hopkins.

Ophir Gulch District.—The Julia lead mine was reported active

during part of 1955.

Pioneer District.—Montana Gold & Chemical Co. of Seattle, Wash., operated a bucketline dredge from January 19 to November 12 on the Reservoir placer claims in Reservoir Gulch about 1½ miles from the old town of Pioneer. The Yuba electric dredge was equipped with seventy-five 3-cubic-foot buckets. The Garnett lode-gold mine was reported active for a brief period.

Prairie.—Some sandstone was utilized for riprap by the Bureau of Reclamation. B. M. Ward and Herman H. Graff reported obtaining

gem-grade agate near Terry.

Ravalli.—Continued production of fluorspar was reported by S. A. Cummings and H. E. Roberts (Compton, Calif.) from the Crystal Mountain mine near Darby. The bulk of the output was shipped to the Geneva, Utah, plant of the United States Steel Corp., and the balance was utilized in manufacturing cement. The county road department extracted sand and gravel to supply its road-maintenance program.

Richland.—Production of crude petroleum from the Brorson field, the only producing field in the county, dropped about 9 percent compared with 1954. Lignite was mined from underground operations by Joe Bemer and the Jennison Coal Co., both of Culbertson, and

the Thiel Coal Co. of Sidney.

Roosevelt.—The Poplar field was again the largest producer of crude petroleum in the State, yielding 3.2 million barrels. Initial production from the Bredette field, as well as output from Northwest Poplar field, boosted the county total to 3.3 million barrels valued at \$6.7 million. The Wolf Creek field continued inactive. A small quantity of natural gas was withdrawn from the East Poplar field. Building and fill gravels were mined by the Nitschke Gravel Co. at Wolf Point.

Rosebud.—Rosebud County maintained its position as an important producer of mineral fuels. A total yield of 1.5 million barrels of crude petroleum ranked the county third highest in the State. The Sumatra field continued to increase output, doubling its 1954 figure. A small quantity of natural gas was withdrawn. Despite a continued decline in tonnage output of coal, the county maintained its position as the principal coal producer in Montana owing largely to production from the Northwestern Improvement Co. Rosebud mine. B. M. Ward, Miles City, reported collecting gem-grade agate.

Sanders.—Eagle District.—American Smelting & Refining Co. worked the Jack Waite lead-zinc mine from January 1 to August 24, at which time the operation was shut down by a strike for the remainder of 1955. Crude ore mined was processed in a 250-ton flotation mill on the property. There was 6,788 tons of ore mined in

1955 compared with 9,771 tons in 1954, according to the Jack Waite Mining Co. annual report. At the mill, costs per ton averaged \$3.59 as compared with \$2.59 in 1954. During operations, employment The mine was worked under averaged 23 men in all departments. terms of a 40-year agreement entered into between Jack Waite Mining Co. and American Smelting & Refining Co. in 1934.

Prospect Creek (Burns) District.—Lead-zinc ore was shipped from the Montana Standard property to the Golconda mill at Wallace,

Idaho.

Sheridan.—The Acme coal mine at Dagmar and the Lagerquist coal mine at Westby had reported output exceeding 1,000 tons; the Great Northern Railway Co., from a gravel source near Plentywood, maintained its supply of ballast and fill; and the Sheridan County Highway Department processed sand and gravel for roadbuilding.

Silver Bow.—Output of copper reached the highest level since the emergency production periods of World War II. The county supplied 99 percent of the copper, 84 percent of the lead, 91 percent of the zinc, 79 percent of the gold, and 92 percent of the silver produced by Montana mines in 1955. Operations of The Anaconda Co. at Butte, Summit Valley district, supplied the bulk of the manganese ore produced in the State and accounted for nearly all of the other metal output in the county. As a result of greatly increased output of high-grade manganese concentrate by the company, Montana regained first ranking in output of this commodity after yielding the position to Nevada in 1954

when marketing conditions forced a substantial reduction.

Shipments of low-grade manganese ore to the Government lowgrade stockpile at Butte from Silver Bow County mines totaled 22,900 long tons, net weight, with value of \$493,900. Irving G. Irving and R. H. Nelson (Norwich-Plutus-Little Sara), Lloyd Bernie (Nettie-Hubernic), Butte Mines Merger Corp. (Minnie Jane and

TABLE 15.—Mine production of gold, silver, copper, lead, and zinc in Silver Bow County, 1946-50 (average), 1951-55, and total 1882-1955, in terms of recoverable metals

Year	Mines pro- ducing	Material sold or treated (short tons)	Gold, lode and placer (fine ounces)	Silver, lode and placer (fine ounces)
1946-50 (average)	15 21 19 22	2, 554, 971 3, 780, 943 4, 425, 605 5, 998, 457 4, 987, 849 7, 159, 693	16, 962 15, 674 16, 921 19, 871 17, 395 22, 262	5, 105, 975 5, 950, 647 5, 518, 194 6, 289, 415 4, 663, 439 5, 577, 999
1882-1955		(1)	2, 196, 204	596, 896, 577
	Copper (pounds)	Lead (pounds)	Zine (pounds)	Total value
1946-50 (average)	113, 652, 000 123, 118, 000 155, 040, 000 118, 480, 000	21, 353, 960 33, 260, 000 32, 324, 000 33, 534, 000 23, 032, 000 28, 662, 000	84, 775, 280 161, 000, 000 151, 936, 000 150, 340, 000 107, 054, 000 125, 176, 000	\$41, 965, 174 68, 493, 990 65, 806, 893 72, 566, 257 54, 498, 289 86, 240, 115
1882-1955	2 7, 105, 133	<sup>2</sup> 361, 296	<sup>2</sup> 2, 123, 352	3, 133, 638, 109

Data not available.
Short tons.

Scheiltan), and Frank Antonioli (Emma, Little Emma, and Mapleton) were the largest producers; and output was recorded also by Peter Antonioli, Sr. (Tzarena), Art Barsonti (Magna Charta), Niles Bertrand (Great Republic), Hugh Handlin (Chief Joseph), Adrien LeCoure (Eagle Bird), Magna Charta Mines (Magna Charta), William Mason (Uinta), Wm. R. & Robert McDonel (Great Republic), Robert McKay (Magna Charta), Frank McNulty (Eagle Bird), John Medvit (Scotia), George Monger (Brilliant), Edward Scheiltan (Great Republic), and Earnest Simon and Rudy Fortune (Cumberland).

Operations continued at the Victor Chemical Works elemental phosphorus plant at Silver Bow and Maiden Rock mine near Melrose. The F & S Contracting Co. of Butte marketed pit-run sand for mine fill, and Pioneer Concrete & Fuel, Inc., also of Butte, processed building

and paving sand and gravel.

Summit Valley District.—At the Kelley mine, a block-caving operation, capacity production of 15,000 tons of copper ore daily was reached early in 1955 after additional hoisting facilities were completed. Ore reserves were first estimated at 130 million tons; but the ore body was found to be considerably larger than expected. according to reports, and the deposit was later estimated to contain 180 million tons, exclusive of the ore already brought to the surface through the Kelley shaft. About 3,668,000 tons of low-grade ore was mined and shipped to the Anaconda Reduction Works in 1955. It was reported that plans called for at least one shaft similar in size to the Kelley shaft to reach the lower levels of some of the original copper mines on Butte Hill. Officials stated that production was limited by inadequate hoisting facilities at these mines, which made it costly to handle ore from the lower levels, some of which had reached 4,700 feet, despite the high-grade nature of the ore mined. A total of 1,190,000 tons of ore was shipped from the Mountain Con, Belmont, Leonard, and Tramway mines in 1955; they continued to supply the largest share of the Butte copper output. The new Berkeley openpit mine yielded 36,000 tons of development ore in 1955 to mark the first large-scale production by open-pit methods at Butte. posit consisted of a secondarily enriched layer in an area of Butte Hill east of the St. Lawrence mine, and reserves were estimated at 100 million tons. The Gagnon pit produced 11,127 tons of ore, the East Colusa pit supplied 4,805 tons, and mine-water precipitates totaled 4,718 tons. Production of lead-zinc ore, including manganese ore yielding lead and zinc, reached 1,399,000 tons. This material was derived largely from the Anselmo, Lexington, and Orphan Girl zinc mines and the Emma manganese mine; the Elm Orlu-Black Rock zinc development and the Syndicate pit yielded small tonnages. Walkerville in the Butte area, Mitchell Mining Co. operated the Marget Ann gold-silver mine; east of Butte, Norman Rogers worked the Bertha and Rabbit copper mines, and Joe T. Farrow operated the Sarsfield copper property. Butte Hill mine production of manganese ore totaled 341,000 tons, which was shipped to the manganese concentrator and nodulizing plant at Anaconda. Production of 73,813 long tons of nodules, 21,970 long tons of ferromanganese, and 1,350 long tons of silicomanganese was noted in The Anaconda Co. 1955 annual report to stockholders.

Stillwater.—At the Mouat mine, production by American Chrome Co. totaled 114,007 tons of approximately 38 percent chromic oxide content chromite concentrate, all of which was delivered to the GSA in accordance with a contract calling for production of 900,000 short tons over an 8-year period. Total deliveries to the end of 1955 were 258,268 tons, which left 641,732 tons to be delivered in the remaining 6-year term. Experimental work in milling was continued to improve chromite recovery and also to recover additional minerals from the ore. Pilot-plant tests of some phases of this work were to be carried out in 1956.

Production from the Lake Basin oilfield increased slightly and

totaled 1,733 barrels of crude oil valued at \$4,627.

Treasure.—The Treasure County Highway Department mined and processed sand and gravel.

Valley.—Tampico Sand & Gravel Co., Glasgow, reported produc-

tion of structural sand and gravel.

Wibaux.—The Pine oilfield produced 1 million barrels of crude petroleum and ranked sixth in the State. Additional production from the Wibaux field brought the county total to 1.1 million barrels valued

at over \$2.1 million. This nearly tripled the 1954 output.

Yellowstone.—Initial output was reported for the Wolf Springs oilfield, the largest producer in the county during the year. It was anticipated that further development and expansion would take place in this area. The Mosser field suffered a slight decline in output during the year. Total for the county was 33,810 barrels of crude petroleum valued at \$66,000. The Great Northern Railway Co., from a pit near Mossmain, obtained gravel for railroad ballast, and three companies prepared building and paving material from sand and gravel. Heavy clay products were fabricated by the Lovell Clay Products Co. of Billings.



# The Mineral Industry of Nebraska

By D. H. Mullen 1



RODUCTION of petroleum, natural gas, and natural-gas liquids dominated the mineral industry of Nebraska in 1955. The value of all minerals produced was \$54 million, a 28-percent increase over 1954 and a new record. Crude petroleum composed 57 percent of the State total. Shipments (measured by pipeline sales) were valued at \$31 million, an increase of \$9 million or 44 percent over 1954. Natural gas (marketed production) advanced 84 percent in volume and more than threefold in value over 1954.

Of the nonmetallic minerals, cement ranked first in value, although the quantity and value of shipments decreased from 1954. Declines were noted in clay and in sand and gravel. The quantity of pumicite produced increased slightly but at a lower value. Stone increased 16 percent in quantity and 19 percent in value over 1954.

TABLE 1.—Mineral production in Nebraska, 1954-55 1

	19	54	1955		
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	
Clays	163, 831	\$163, 831	150, 835 (2)	\$150, 835 2, 400	
Natural gas million cubic feet Petroleum (crude) thousand 42-gallon barrels Sand and gravel Stone	6, 801 7, 783 8, 547, 876 2, 660, 170	796, 000 21, 400, 000 6, 992, 314 3, 511, 494	12, 515 11, 203 8, 405, 197 3, 081, 247	2, 553, 000 30, 810, 000 6, 192, 797 4, 177, 361	
Value of items that cannot be disclosed: Cement, natural-gas liquids, and pumice	2,000,170	10, 637, 123		11, 143, 474	
Total Nebraska 3		42, 393, 000		54, 237, 000	

Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Value of uranium ore is excluded.
 Weight not recorded.
 The total has been adjusted to eliminate duplication in the value of clays and stone.

## REVIEW BY MINERAL COMMODITIES

#### MINERAL FUELS

Natural Gas.—Production of natural gas in Nebraska in 1955 was 18,000 million cubic feet, double that in 1954. Production was from Banner, Chevenne, Deuel, and Kimball Counties, with Chevenne

<sup>1</sup> Commodity-industry analyst, Region III, Bureau of Mines, Denver, Colo.

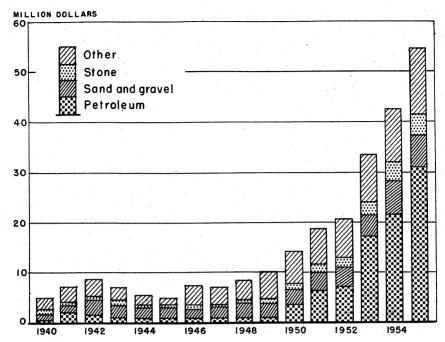


FIGURE 1.—Value of petroleum, sand and gravel, and stone, and total value of mineral production, in Nebraska, 1940-55.

County producing 78 percent of the total. Three gas wells were completed during the year-2 in Cheyenne County and 1 in Deuel The principal-producing areas were the S. W. Sidney and Huntsman fields in Chevenne County and the Big Springs field in Deuel County. Fifty-four wells produced only gas and supplied 67 percent of the total production; the remainder was recovered from Of the total production, 12,515 million cubic feet (70 percent) was marketed within the State, 355 million cubic feet (2 percent) was repressured, and 5,130 million cubic feet (28 percent) was flared or otherwise wasted. Nebraska received 93,358 million Total consumption was 102,177 million cubic feet from other States. Major uses were: Residential, 30,570 million cubic feet cubic feet. (30 percent); commercial, 16,073 million cubic feet (16 percent); field use, 1,347 million cubic feet (1 percent); other industrial, including the generation of electric power, 54,187 million cubic feet (53 percent).

Natural-Gas Liquids.—Natural gas from the Huntsman and S. W. Sidney fields in Cheyenne County was processed at a plant in the Huntsman field. The plant had a daily capacity for processing 13 million cubic feet of gas to recover 6,000 gallons of natural gasoline and 16,000 gallons of butane and lighter fractions. Production in 1955 more than doubled that in 1954.

Petroleum.—Petroleum production showed a substantial gain in 1955 because of wildcat- and development-drilling success, rapid field

development, and the increased pipeline-outlet capacity that was completed in 1954. Sand fracturing was widely used to increase

output.

The fields in Richardson County in eastern Nebraska, where the first discovery in the State was made in 1939, produced about 2 percent of the State total. The first discovery in western Nebraska was made in 1949 in Cheyenne County, in the Denver-Julesburg Basin. Exploration and development extended the productive area into Banner, Kimball, and other western counties. In 1955 the perimeters of these areas were extended northward and eastward to Dawes and Garden Counties to the Chadron Arch and eastward as far as Hitchcock County to the Cambridge Arch. Geophysical (seismograph) work declined from 165 crew weeks in 1954 to 117 crew weeks in 1955 and was confined to the western Nebraska counties.

Wildcat and development drilling nearly doubled in 1955. Total completions increased from 458 in 1954 to 875 in 1955. Kimball County led in the number of wells drilled, the number of successful wells drilled, and total footage. The proportion of successful completions (1 to 10) and availability of exploratory acreage resulted in an influx of new operators and the formation of syndicates to explore in Nebraska and gave considerable impetus to new leasing activities. It was estimated that in 1955, 1 million acres had been added to the

9 million acres already under lease.

Two wildcat wells completed late in 1955 were of some significance. One in Garden County (the Baumgartner No. 1 Kaschke) flowed gas at 700,000 cubic feet a day, and a drill-stem test late in December recovered 50 feet of heavy-oil cut mud and 85 feet of salt water. The second in Hitchcock County—the Jones, Shellburn & Farmer No. 1 Fritz—completed late in December, produced at the rate of 3 barrels a day. The Baumgartner well in Garden County could extend the producing areas of Banner and Morrill Counties eastward to the Chadron Arch. The well in Hitchcock County near the Kansas State line and about 100 miles east of previous production is on the western side of the Cambridge arch. This is the structure on which the Norton field to the southeast in Norton County, Kans., has been developed.

Four fields showed notable development during the year. The Harrisburg field in Banner County, the largest in Nebraska, was discovered in 1951. During 1955, 42 wells were drilled, of which 29 were successful. Kimball field, which lies partly within the Kimball city limits, was discovered in 1954. Twenty-three wells were drilled in 1955, of which 20 were successful. Travis field in Kimball County was discovered in March 1955. By the end of the year 34 wells had been drilled, of which 29 were producing. Olsen field in southwestern Morrill County and extending into Banner County was discovered in August 1955. In addition to the discovery well, 17 wells—all producers—had been drilled in Morrill and Banner Counties

by the end of the year.

Refinery capacity remained at 3,200 barrels per day; and a new catalytic re-forming unit was put into operation at the refinery at Scottsbluff, increasing the octane number of regular gasoline from 85 to 90.

TABLE 2.—Wildcat and development completions in 1955, by counties
[Oil and Gas Journal]

County	Oil	Gas	Dry	Total	Footage
Hast completions.					
Ideat completions:	4	100	62	66	399, 40
Banner	4			15	53, 40
Box Butte			15		
Buffalo			1	1	3, 80
Chase			3	3	10, 50
Cherry.			3	3	13, 50
Chevenne	9	1	91	101	511, 60
Cuming 1	1.7		3	3	4, 60
Dawes			8	8	28, 90
Deuel			5	5	19, 30
			ĭ	ĭ	2, 00
Dodge 1					
Franklin 1			1	1	4,0
Frontier			2	2	7, 2
Furnas			1	1	3, 5
			7	7	28, 30
Grant			il	i	4.00
Trales	1		2	3	7, 9
Harlan 1					
Hayes			. 1	1	4, 2
Hitchcock 1	1			1	4, 3
Jefferson 1			2	2	4, 2
Kimball	28		101	129	815, 9
Logan			i	1	3, 9
	1		20	21	94, 2
Morrill	1				
Perkins.			3	3	10, 6
Phelps			1	1	4,0
Red Willow			1	1	4,0
Richardson 1	1		13	14	38.7
Scotts Bluff	•		10	10	52, 2
			3	3	11, 2
Sheridan					
Sioux			5	5	28, 5
Washington 1			1	1	2, 0
Webster 1			2	2	8, 3
Total	45	1	370	416	2, 188, 1
velopment completions:					
Banner	65		49	114	683, 3
Chevenne	47	1	56	104	529, 2
	7.1	2	2	4	13. 7
Deuel.			94	232	1, 474, 8
Kimball	138		94		1, 4/4, 8
Morrill	13			13	69, 8
Total developments	263	3	201	467	2, 770, 8
Total all drilling	*308	4	571	883	4, 958, 9

<sup>&</sup>lt;sup>1</sup> Data from American Institute of Mining, Metallurgical, and Petroleum Engineers, Petroleum Branch, Statistics of Oil and Gas Development and Production. Vol. 10, 1955. Pp. 458-471.

#### **NONMETALS**

Cement.—Portland and masonry cements were produced at plants at Louisville, Cass County, and at Superior, Nuckolls County. The entire production of portland cement comprised types I and II (general use and moderate heat), of which 7 percent was air-entrained. Both plants produced masonry cement; one plant used cement clinker as a base, and the other finished portland cement. Limestone and shale used in cement production were obtained from company-owned deposits near the plants and from a limestone deposit in Kansas. Seven kilns were in operation the entire year, and production was nearly at rated capacity.

Shipments of both portland and masonry cements declined nearly 5 percent from 1954. Stocks of finished cement increased substantially. The price of portland cement in 1955 was \$2.82 per barrel, compared with \$2.79 in 1954. The major portion of the cement shipped went to Nebraska points; however, substantial shipments were

made to Iowa, Kansas, Minnesota, and South Dakota, with smaller shipments to Colorado, Oklahoma, North Dakota, and Texas.

Clays.—Clays were produced in seven counties in 1955. principal production was miscellaneous clay and shale used for manufacturing building brick, drain tile, and other heavy clay products and portland cement. One producer manufactured art pottery and flower pots from material classified as stoneware clay. Production in 1955 was 150,835 tons, an 8-percent decrease from 1954.

Gem Stones.—Chalcedony and agate having an estimated value of

\$2,400 were produced near Orella in Sioux County.

Perlite.—Crude perlite produced in New Mexico was expanded at two plants in Omaha. A major portion of the expanded product was used as a plaster aggregate and the remainder as a lightweight

aggregate in concrete.

Pumice.—Nebraska pumicites range in color from white or cream to bluish gray and have been used extensively in cleansing and scouring compounds and soaps. The pumicite darkens when wet and has been replaced by other materials in many products. Pumicite produced in 1955, from deposits near Calloway in Custer County, increased 2 percent over 1954 and was used in scouring compounds, for abrasives, and for oil filtering. The value decreased 5 percent.

Sand and Gravel.—Sand and gravel, representing 11 percent of the value of all minerals in Nebraska in 1955, was produced in 57 counties. Virtually all came from deposits in the valleys of the Platte and Republican Rivers and their principal tributaries. Douglas County led the State in value of sand and gravel produced, followed by Cass, Dodge, and Platte. The largest quantity was from Cass County, followed by Douglas, Dodge, and Platte. Production in 1955 decreased 2 percent in volume and 11 percent in value compared with 1954. Paving and road construction consumed 61 and building 37 percent of this production. The remaining 2 percent was for engine sand, railroad ballast, packing irrigation wells, and other uses. Virtually all (98 percent) of the commercial sand and gravel was screened or prepared, whereas only 50 percent of the Governmentand-contractor sand and gravel was prepared. Transportation was principally by truck (68 percent); the remainder was shipped by railroad.

The 10 leading commercial producers, arranged alphabetically, were: Christensen Sand & Gravel Co., Thomas Gearheart, Inc., Gerhold Co., J. W. McCann Co., Lincoln Sand & Gravel Co., Lippencott Construction Co., Lyman-Richey Sand & Gravel Corp., Western Sand & Gravel Co., Whitney Sand & Gravel, and Carl Whitney.

Stone.—Stone produced in Nebraska, consisting of dimension limestone, crushed limestone, and crushed sandstone, composed 8 percent of the value of the State's mineral production. Dimension limestone was reported in Cass and Lancaster Counties in 1955 and in Cass. Lancaster, and Douglas Counties in 1954. Total production declined 8 percent from 1954. The bulk of the dimension stone (68 percent) was sawed and the remainder sold as rough construction stone and Production of crushed limestone increased 17 percent in volume and 20 percent in value over 1954. The principal uses were for concrete aggregate and road stone (34 percent), riprap (31 percent), agriculture (8 percent), cement manufacture, flux, and fillers.

TABLE 3.—Sand and gravel sold or used by producers, 1954-55, by classes of operations and uses

	# 1	1954			1955	
		Val	ue		Val	11e
	Short tons	Total	Average per ton	Short tons	Total	Average per ton
COMMERCIAL OPERATIONS	. 8				100	
Sand: Molding	13, 319	\$8,744	\$0.66			44.5
Building Paving Engine	692, 468 333, 192	579, 345 232, 554	.84 .70	1, 402, 906 1, 037, 660 84, 840	\$998, 755 629, 775 49, 026	\$0.71 .61 .58
Filter	1, 242 10, 050 36, 423	2, 484 4, 229 26, 299	2.00 .42 .72	17, 478 10, 738	5, 707 1, 900	. 38
Building Paving Other	1, 429, 103 4, 571, 888 6, 017	1, 202, 923 4, 001, 378 11, 360	. 84 . 88 1, 89	1, 701, 460 3, 547, 557 45, 678	1, 296, 874 2, 919, 942 56, 917	. 76 . 82 1. 25
Total commercial sand and gravel	7, 093, 702	6, 069, 316	. 86	7, 848, 317	5, 958, 896	. 76
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand: Building Paving Gravel:	5, 000 351, 720	3, 750 171, 880	.75 .49	7, 032 160, 242	2, 979 40, 045	. 45
Building Paving	3, 446 1, 094, 008	1, 763 745, 605	.51 .68	389, 606	190, 877	.49
Total Government-and-con- tractor sand and gravel	1, 454, 174	922, 998	. 63	556, 880	233, 901	. 45
Grand total	8, 547, 876	6, 992, 314	.82	8, 405, 197	6, 192, 797	.74

duction of crushed sandstone decreased 81 percent from 1954. The major use—riprap—was replaced by limestone.

Principal producers of commercial stone in 1955 were: Ash Grove Lime & Portland Cement Co., Hopper Brothers Quarries, George W.

Kerford, Nelson Quarries, Inc., and Stone Products Co.

Talc.—Crude talc from deposits in Montana and California was ground at a plant at Grand Island. The ground product was used for ceramics, insecticides, paint, rubber and textile fillers, and toilet preparations.

Vermiculite.—Vermiculite was exfoliated at Omaha from crude material produced in Montana. The processed product was used for loose-fill insulation and as a lightweight aggregate in plaster and

concrete.

### **REVIEW BY COUNTIES**

This review describes operations in those counties that produced two or more commodities or where a single commodity was significant

because of quantity, use, or other consideration.

Adams.—The Western Brick & Supply Co. produced miscellaneous clay for manufacturing building brick, tile, and other heavy clay products at its plant in Hastings. Lippencott Construction Co. and L. J. Vontz produced sand and gravel for building and road construction. The county highway commission produced paving sand.

Banner.—Banner County ranked third in the production of petroleum. Production was mainly from the Harrisburg field—the largest in Nebraska. A substantial quantity of natural gas also was produced. The Harrisburg field, discovered in 1951, has been developed rapidly and is the first field on a trend east and west through Banner and Morrill Counties toward the Chadron Arch. The county highway department produced paving sand.

Buffalo.—Building and paving sand and gravel was produced by Bruner Bros., Dean Camp, Harry Johnson, Carl Whitney, Whitney Sand & Gravel, and the Buffalo County Highway Department. The State highway department contracted for paving gravel. The quan-

tity produced decreased 5 percent compared with 1954.

TABLE 4.—Value of mineral production in Nebraska, 1954-55, by counties12

County	1954	1955	Minerals produced in 1955 in order of value
Adams		\$147, 842	Sand and gravel, clays.
Antelope			
Banner	(3)	(3)	Petroleum, natural gas, sand and gravel.
Boone.	(3)	14, 826	Sand and gravel.
Boyd.		4,000	Do.
Brown		23, 526	Do.
Buffalo		142, 386	Do.
Butler		14, 495	Do.
Cass		10, 480, 619	Cement, stone, sand and gravel, clays
Cedar	155, 224	47, 708	Sand and gravel.
Chevenne	(3)	(8)	Petroleum, natural gas.
Clay		57, 892	Sand and gravel.
Colfax		48, 881	Do.
Cuming		123, 870	Do.
Custer		(3)	Pumice.
Dakota			1 dimico.
Dawes			
Dawson		137, 240	Sand and gravel.
Deuel		(8)	Natural gas.
Dixon		12, 509	Sand and gravel.
Dodge		524, 717	Do.
Douglas.	1, 085, 238	1, 083, 508	Sand and gravel, clays.
Dundy	7, 560	8, 971	Sand and gravel, clays.
Fillmore		45, 515	Do.
Franklin		40, 554	
Frontier	102, 790		Sand and gravel, stone.
	69 405	173	Stone.
Furnas	63, 425	66, 716	Sand and gravel, stone.
Gage	(8) 725	85, 869	<b>D</b> 0.
Garden	120	0.000	Cond and manal
Garfield		2, 288	Sand and gravel.
Gosper		5,042	Do.
GreeleyHall			Com d om d
		139, 791	Sand and gravel.
Hamilton		50, 487	Do.
Harlan		(3)	Sand and gravel, petroleum.
Hayes.		14, 379	Sand and gravel.
Hitchcock		24, 276	Do.
Holt	50, 277	54,009	Do.
Jefferson	198, 560	162, 817	Sand and gravel, clays.
Kearney		(3)	Sand and gravel.
Keith	30, 767	14,077	Do.
Kimball	(4)	(9)	Petroleum, natural gas, sand and
Knox	07 000	F 500	gravel.
	67, 639	7,500	Sand and gravel.
Lancaster	207, 849	202, 204	Stone, clays.
Lincoln	73, 300	5, 590	Sand and gravel.
Loup	15, 527	15,006	Do.
Madison	13, 750	21, 594	Do.
Merrick	148, 326	52, 890	Do.
Morrill	(2)	(9)	Petroleum, sand and gravel.
Nance	78,000	2,793	Sand and gravel.
Nemaha	<u>@</u>	l 🖭	Stone.
Nuckolls	(2)	(9)	Cement, stone, sand and gravel.
Otoe	10,010	12, 575	Clays.
Pawnee	101, 146	566,038	Stone.

See footnotes at end of table.

TABLE 4.—Value of mineral production in Nebraska, 1954-55, by counties 1 2-Continued

County	1954	1955	Minerals produced in 1955 in order of value
Perkins	\$10, 330	\$8,067	Sand and gravel.
Phelps	41,000	73, 286	Do.
Pierce	89, 272	82, 950	Do.
Platte	246, 300	315, 747	<b>D</b> o.
Polk Red Willow	14,000		
Red Willow	62, 889	114, 773	Sand and gravel.
Richardson	593, 484	824, 376	Petroleum, stone, sand and gravel.
Saline	69, 087	69, 024	Sand and gravel.
Sarpy	741, 905	347, 666	Sand and gravel, stone.
Saunders	138, 559	68, 903	Sand and gravel.
cotts Bluff		55, 864	Do.
seward	(3)	(3)	Stone.
SiouxStanton	14, 934	3,600	Gem stones, sand and gravel.
Stanton	65, 587	51, 325	Sand and gravel.
Thayer	171, 194	(3)	Stone, sand and gravel.
Thomas	6, 200		
Valley		143, 537	Sand and gravel.
Webster	670	5,001	Sand and gravel, clays.
York	(3)	24, 450	Sand and gravel.
Undistributed	426, 408, 662	38, 376, 125	
Total 5	42, 393, 000	54, 237, 000	

<sup>&</sup>lt;sup>1</sup> The following counties are not listed because no production was reported: Arthur, Blaine, Box Butte, Burt, Chase, Cherry, Grant, Hooker, Howard, Johnson, Keya Paha, Logan, McPherson, Rock, Sheridan, Sherman, Thurston, Washington, Wayne, Wheeler.

<sup>2</sup> Value data of natural-gas liquids and some sand and gravel are excluded from county totals and included with "Undistributed" to avoid disclosing individual company operations.

<sup>3</sup> Value included with "Undistributed" to avoid disclosing individual company operations.

The total has been adjusted to eliminate duplication in the value of clays and stone.

Cass.—Cass County ranked first in the State in the value of mineral production, excluding petroleum. Cement remained in first place, followed by stone, sand and gravel, and clay. The Ash Grove Lime & Portland Cement Co. produced types I and II (general use and moderate heat) portland cement and masonry cement at its plant at Louisville. Finished portland cement was used as a base for manufacturing masonry cement. Limestone and shale used was produced by the company from deposits near the plant. Gypsum and iron-bearing material was purchased from producers. The county led the State in the production of limestone. Total production increased 13 percent and value increased 45 percent over 1954. greatest increase was in crushed limestone. Producers of crushed limestone were Ash Grove Lime & Portland Cement Co., Cass Co., Chicago, Burlington & Quincy Railroad, Kelly Bros. & Co., George W. Kerford, Olson Quarries, Inc., Stone Products Co., United Mineral Products Co., and Western Limestone Products Co., Inc. Kelly Bros. & Co. and Lester A. Waldo produced dimension stone, most of which was sawed, for building purposes. Riprap was produced by the United States Army Engineer Corps. Crushed limestone was used for manufacturing cement and concrete aggregate, and for road construction, agriculture, riprap, flux, and other uses. Sand and gravel production decreased slightly from 1954; however, the county retained its lead as the principal producer in the State. Lyman-Richey Sand & Gravel Corp., Olson Quarries, and Western Sand & Gravel Co., operating pits at Cedar Creek and South Bend, produced engine and building sand and building and paving gravel. Kahler Pottery Co.,

Inc., produced stoneware clay for manufacturing art pottery and flower

pots.

Cheyenne.—Cheyenne County ranked first in the State in the production of natural gas and second in the production of petroleum. Since the discovery of oil in the county in 1949, development has been rapid and production has increased steadily. Production in 1955 was from 45 fields with the bulk from the Potter Southwest, Doran, Malley, and Lodgepole fields. Gas was produced from 13 fields, with the major portion from the Huntsman and S. W. Sidney. The Ohio Oil Co. produced liquified-petroleum products at its plant at Huntsman. The plant had a capacity to process 13 million cubic feet of gas daily to recover 6,000 gallons of natural gasoline and 16,000 gallons of liquified-petroleum gases.

Cuming.—Albers & Anderson, Christensen Sand & Gravel Co., Einung Sand & Gravel Co., and West Point Gravel Co. produced building and paving sand and gravel. Production was 27 percent

below that in 1954.

Custer.—The LaRue-Axtell Pumice Co. produced pumicite from pits near Calloway. Production increased 2 percent, but value decreased 5 percent from 1954. The material was used for scouring soaps and cleansers, for abrasives, and for oil filtering.

Dawson.—R. E. Davis, Cleo Hunt, C. Kirkpatrick & Son, Harold E. Kirkpatrick, and Overton Sand Co. produced building and paving sand and gravel. Other gravels were used for packing irrigation wells and for roofing. Production in 1955 increased 16 percent over 1954.

Deuel.—Deuel County ranked second in the State in the production of natural gas. Production was from the Big Springs field. The field has been developed by 25 wells, of which 21 were producing at the end of the year. One new development well was completed and began production.

Dodge.—Dodge County was third in the State in the production of sand and gravel in 1955. Production decreased 12 percent from 1954. Building and paving sand and gravel, railroad ballast, and engine sand were produced. Principal producers were Lincoln Sand & Gravel Co., Lyman-Richey Sand & Gravel Corp., Christensen

Sand & Gravel Co., and Lux Sand & Gravel Co.

Douglas.—Douglas County ranked second in the State in 1955 in the production of sand and gravel, surpassing Dodge County, which held that position in 1954. Production in the county increased 24 percent over 1954. Principal producers were Lyman-Richey Sand & Gravel Corp., operating four plants, J. W. McCann Co., Hartford Sand & Gravel Co., and Acme Sand & Gravel Co. The Omaha Brick Works produced miscellaneous clay for the manufacture of building brick, tile, and heavy clay products. Production was 26 percent greater than in 1954. Western Mineral Products Co. operated plants at Omaha for the production of expanded perlite from crude material produced in western States and exfoliated vermiculite from material mined in Montana. The expanded perlite was used as an aggregate in plaster and lightweight concrete. Exfoliated vermiculite was used for loose-fill insulation, as a lightweight aggregate in plaster and concrete, for agricultural, and other uses. In October the company acquired the plant of the Richlite Perlite Co. at Omaha.

Franklin.—Production of sand and gravel decreased 57 percent and crushed sandstone 65 percent from 1954. Amman Sand & Gravel Contractors, Bladen Sand & Gravel Co., and Olson Sand & Gravel Co. produced gravel for building, paving, and other uses. List & Clark Construction Co. produced crushed sandstone for use as riprap.

Furnas.—Herman E. Obering produced building and paving sand and paving gravel and Paul Weverka produced paving gravel. Production was 9 percent greater than in 1954. Bushman Construction

Co. produced crushed sandstone for use as riprap.

Gage.—Wymore Lime & Rock Co. produced crushed limestone for agricultural use. The Marshall County (Kansas) Highway Department produced paving gravel for use on Marshall County

highways.

Hall.—Structural and paving sand and gravel and gravel for well packing and roofing were produced by H & M Equipment Co., Third City Sand Co., Armour Construction Co., Lilley Sand & Gravel Co., Riverside Sand & Gravel Co., and Murt Gilroy. Production increased 19 percent over 1954. The Sierra Talc & Clay Co. operated its grinding plant at Grand Island, using crude talc from company mines in Montana and California. The ground product was employed for ceramics, insecticides, paint, rubber and textile fillers, and toilet preparations.

Harlan.—Petroleum was produced from the South Alma and Hausserman fields. A new field, the Bantam, was discovered and began production. Olson Gravel Co. produced gravel for building,

paving, and well packing.

Jefferson.—Endicott Clay Products Co., acquired from Endicott Brick & Tile Co. in March 1955, and Western Brick & Supply Co. produced miscellaneous clay for manufacturing building brick, tile, and heavy clay products. Production increased 17 percent over 1954. Building and paving sand and gravel were produced by R. M. Weblemoe Co., Steele Bros., Stamper & Wagner, and Consolidated.

Production was 21 percent below that of 1954.

Kimball.—Kimball County ranked first in the State in the production of petroleum and third in the production of natural gas, which was recovered from oil wells. Production was from 49 fields; however, the major portion came from the Long, Enders, Kimball, Torgeson, and Travis. Development of the Kimball and Travis fields was outstanding in 1955. The Kimball field, partly within the Kimball city limits, was discovered in 1954. By the end of 1955, 26 wells were producing, of which 21 were drilled in 1955. The Travis field was discovered in March 1955, and by the end of the year 29 wells were producing. Wilson Bros. Ready Mix produced building sand and gravel.

Lancaster.—Yankee Hill Brick Manufacturing Co. produced miscellaneous clay for manufacturing building brick, tile, and heavy clay products at a plant in Lincoln. Production exceeded that in 1954 by 19 percent. Schwarck Quarries, Inc., produced dimension lime-stone for rough construction and crushed limestone for road construction and agriculture. The county highway department produced

crushed limestone for road construction.

Morrill.—Morrill County increased its petroleum production in 1955 with discovery of the Olson field on the Morrill-Banner county

line in August. The field was the most active in western Nebraska, and at the end of the year 18 wells in the 2 counties were producing Other production was from the Hart field, discovered in 1952 and producing from four wells. Paving sand, engine sand, and building and paving gravel were produced by Lyman-Richey Sand & Gravel Corp. and Dolson Gravel Co.

Nemaha.—Crushed limestone for use as riprap and concrete aggregate, in road construction and for agriculture was produced by Nelson Quarries, Inc., and Heebner Quarries. Riprap was produced for the United States Corps of Engineers. Production in 1955 was nearly

2.5 times that of 1954.

Nuckolls.—Nuckolls County (except for petroleum and natural gas) ranked second in the State in value of mineral production. The Nebraska Division, Ideal Cement Co., produced types I and II (general use and moderate heat) portland cement and masonry cement at its plant at Superior. Portland-cement clinker was used as a base for manufacturing masonry cement. Limestone used at the plant was produced by the company at a quarry in Jewell County, Kans. Sand, gypsum, and other raw materials were purchased from producers. C. F. Bondegard and the county highway department produced paving gravel.

Otoe.—The Western Brick & Supply Co. produced miscellaneous clay for manufacturing building brick, tile, and other heavy clay products at its plant at Nebraska City. Production was 12,575 tons,

a 26-percent increase over 1954.

Pawnee.—Hopper Bros. Quarries produced crushed limestone for concrete aggregate and road construction and agricultural use. Production in 1955 was more than four times greater than in 1954.

Platte.—Sand and gravel for building, paving, and railroad ballast was produced by Ace Sand & Gravel Co., Gerhold Co., and Lyman-Richey Sand & Gravel Corp. Production in 1955 was nearly three

times that in 1954.

Red Willow.—Building and paving sand and gravel and railroad ballast were the only mineral commodities produced in the county in 1955. Production increased more than threefold over 1954. Principal producers were Davidson & Merritt Sand Co., Davidson Gravel Co., Clarence A. Gillen, Midwest Sand & Gravel Co., and Frank Gillen.

Richardson.—Petroleum was produced from the Dawson, Barada, Falls City, and Snethen fields. The Searle Petroleum Corp. operated its 1,000-barrel-per-day refinery at Salem. Heebner Quarries and the United States Corps of Engineers produced crushed limestone for riprap. The county highway department produced paving gravel.

Sarpy.—General Rock, Inc., produced crushed limestone for road construction and for agricultural use. Lyman-Richey Sand & Gravel Corp. and Richfield Sand & Gravel Co. produced building and

engine sand and building and paving gravel.

Scotts Bluff.—The Nebraska Consumers Cooperative Refinery Association operated its 2,200-barrel-per-day skimming and cracking plant at Scottsbluff. Crude was from the Harrisburg field in Banner County and from eastern Wyoming. A new catalytic reforming unit was put into operation and increased the octane number of regular gasoline from 85 to 90. The estate of Tony Trettenero and the

Gearing and Fort Lorance Irrigation District produced building sand and paving gravel.

Sioux.—Gem stones, chalcedony, and agate were recovered near Orella. The county highway department produced paving sand.

Thayer.—Mark Allen Bergt produced building sand and paving

gravel. Thayer County Quarries produced agricultural limestone.

Valley.—Hartford Sand & Gravel Co., Ernest Ulrich, Ulrich Gravel
Co., and Cash Welniak produced sand and gravel for building and paving. Production in 1955 increased more than fourfold over that in 1954.

Webster.—Western Brick & Supply Co. produced miscellaneous clay at Red Cloud for the manufacture of building brick and other heavy clay products at its plant in Hastings. Earl R. Richards and Seil & Martin produced paving gravel.

# The Mineral Industry of Nevada

This chapter was prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, Department of the Interior, and the Nevada Bureau of Mines.

## By L. E. Davis and Warren C. Fischer



THE VALUE of Nevada mineral production passed the \$100 million mark in 1955. This advance in value continued a trend begun in 1950. High market prices and Government purchase programs have been major factors in this continually increasing mineral production. Metals and metal ores have been affected more noticeably than nonmetals.

During 1955 only gold and iron ore declined under the previous year. Production of three principal metal commodities (copper, tungsten, and manganese ore) increased appreciably, contributing

over 75 percent of the State total mineral value.

In national ratings, Nevada led as a producer of tungsten and ranked 2d in mercury and manganese production, 4th in copper output, and 26th in production of all mineral commodities. The decline in gold production was due primarily to the continued fixed price, which was no incentive to potential producers.

Iron-ore shipments decreased owing to a drop in foreign demand, as nearly all Nevada iron ore was mined for export. This was the only mineral commodity with production seriously affected by a foreign market. Most nonmetal production increased. Value advanced

appreciably for the field in general.

The outlook for petroleum remained bright. Production was confined to the Eagle Springs unit of Shell Oil Co. in Nye County, but considerable exploration work was done in other counties, particularly Elko and Lander.

<sup>1</sup> Commodity-industry analyst, Region II, Bureau of Mines, San Francisco, Calif.

TABLE 1.—Mineral production in Nevada, 1954-55 1

	19	54	1955		
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	
Barite Clays Copper (recoverable content of ores, etc.) Gold (recoverable content of ores, etc.) Tron ore (usable)	79, 067 654, 422- 351, 250 3, 041 (2) 12, 870 4, 974 33 3, 531, 291 560, 182 1, 832, 781	8, 787 41, 428, 030 2, 767, 345 2, 217, 273 2, 024, 794 833, 234 (2)	5, 750 64 3, 580, 260 845, 397 1, 611, 942 10, 732 6, 155 2, 670	1, 669, 512 110, 000	
Total Nevada 4		89, 138, 000		113, 231, 000	

<sup>&</sup>lt;sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption

Production as measured by mine simplicities, saids, or managements by producers).

Figure withheld to avoid disclosure of company confidential data.

Shipments to Government low-grade depots and custom mills not included, but quantity and value for this material are as follows: 1954—manganese ore, 872 short tons, \$63,775, and manganiferous ore, 1,187 short tons, \$45,812; 1955—manganese ore, 3,213 short tons, \$262,142, and manganiferous ore, 1,254 short tons, \$50,278.

The total has been adjusted to eliminate duplication in the value of stone.

TABLE 2.—Average prices of selected mineral commodities, 1946-50 (average) and 1951-55 1

Commodity	1946-50 (average)	1951	1952	1953	1954	1955
Copper 2	33. 95 35. 00 4. 03 14. 5 83. 84	24. 2 41. 41 35. 00 5. 46 17. 3 210. 13	24. 2 46. 35 35. 00 6. 09 16. 1 199. 10 60. 0	28. 7 49. 48 35. 00 6. 76 13. 1 193. 03 60. 0	29. 5 50. 21 35. 00 6. 99 13. 7 264. 39 60. 1	37. 3 45. 04 35. 00 7. 12 14. 9 290. 35
Silver 5cents per troy ounce_ Tungsten concentrate	88.6	90. 5+ 61. 02	90. 5+ 63. 44	90. 5+ 6 62. 46		
Zine 2dollars per short-ton unit WO3 cents per pound	12.8	18. 2	16.6	11.5	10.8	12. 3

Prices are discussed in detail in the commodity chapters of volume I, Minerals Yearbook.
 Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946-47 includes bonus payments by Office of Metals Reserve for overquota production.
 Price under authority of Gold Reserve Act of Jan. 31, 1934.
 Average quoted price at New York.
 Treasury buying price for newly mined silver, 1943 to June 30, 1946-\$0.71111111: July 1, 1946 to Dec. 31, 1947-\$0.905; 1948-55-\$0.9050505.

<sup>6</sup> Based on average of GSA purchases.

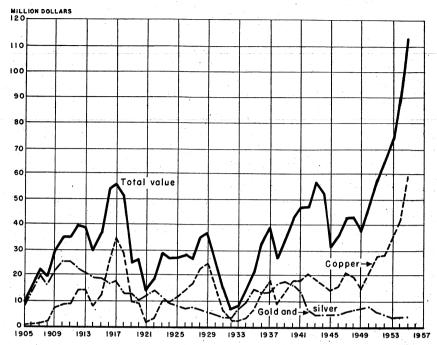


FIGURE 1.—Value of gold, silver, copper, and total value of mineral production in Nevada, 1905-55.

## CONSUMPTION AND MARKETS

The relatively small population and limited industrial acitivity in Nevada resulted in small mineral consumption. Proximity to smelting and manufacturing centers in California and Utah places the State in a rather enviable position for marketing its major metals and industrial minerals.

Pumice and pumicite, salt, sand and gravel, stone, and volcanic cinder were some of the minerals produced in Nevada and wholly utilized within the State. Part of the clay, gypsum, and limestone was consumed locally and with commodities such as perlite, magnesite, and manganese ore and concentrate, was further processed in the State. Some producers converted minerals such as gypsum and limestone to finished products. Others sold nonmetallic commodities such as marl and sulfur directly to the user or to grinding plants.

Metal ores and concentrates were marketed somewhat differently. One producer shipped copper precipitates to a smelter outside the State. Another company smelted its own copper ore and concentrate, contracted for concentrating ores to be smelted and purchased direct-smelting custom ores. Tungsten producers milled their own ores or shipped to custom mills; all concentrate was sold to GSA.

Manganese ores and concentrates were shipped to depots or the National Stockpile. Producers of mercury, in most instances, sold directly to consumers or distributors. Most gold and silver bullion produced in Nevada was sold directly to the United States Mint. A small quantity was marketed at smelter-refineries outside the State.

Custom Mills and Smelters.—The Kennecott Copper Corp. McGill smelter, only smelter in Nevada, treated its own and under contract, Consolidated Coppermines Corp. ore and concentrate. It also accepted fluxing ores for smelting that contained gold, silver, and copper which came from a number of mining districts in the eastern part of the State.

The Caselton mill of Combined Metals Reduction Co. in Lincoln County received small tonnages of manganese ores containing lead and zinc, and some lead and zinc ores for custom milling; it also purchased similar ores outright. Several mills throughout the State accepted tungsten ores for custom milling. These included the plants of Getchell Mine, Inc., Humboldt County; Gabbs Exploration Co., Nye County; Nevada Scheelite Corp. (subsidiary of Kennametal, Inc.), Mineral County; and Nevada-Massachusetts Co., Pershing

Brokers and Ore Buyers.—Most of the iron ore mined in Nevada and an appreciable part of the magnesite produced was sold for export through brokers in California. An important tonnage of small-lot tungsten concentrate, lots too small to be accepted by GSA, was marketed to ore buyers and brokers outside the State. Purchases of mercury by local brokers and of gold and silver bullion by licensed buyers were small.

### **GOVERNMENT PARTICIPATION**

Defense Minerals Exploration Administration.—Aid in finding new sources of strategic and critical minerals was provided under the DMEA program. Twenty-three such projects were in effect during all or part of 1955. Thirteen were initiated within the year; 6 of the projects were for tungsten exploration and development; 5, for lead-zinc; 1 each, for mercury and manganese. The program was administered in the field by teams based in Reno, Nev., and provided by the Bureau of Mines and the Geological Survey.

Other Government Assistance.—Purchase contracts in effect between Nevada producers of copper, manganese, and titanium and the Federal Government were authorized under the Defense Production Act of 1950. No new contracts have been initiated since 1953.

TABLE 3.—Defense Minerals Exploration Administration contracts active during 1955

	<del></del>	1 1000			
				Contract	
County and contractor	Property	Commodity	Date	Total amount	Govern- ment partici- pation (percent)
CHURCHILL			-		
Tungsten Mountain Minin Co.	g Hilltop	Tungsten	Sept. 13, 1954	\$32, 268	7.
Murray A. SchurtzBoundy & Sons	Marshall Monarch	Copper Tungsten	Sept. 28, 1952 May 23, 1955	73, 726 6, 500	50 78
ESMERALDA					
Nelson, Nelson & Clair HUMBOLDT	4 Aces	Lead, zine	Mar. 30, 1955	8, 436	50
Apollo Mines, Inc	Saddle Moonlight Mountain Queen		Oct 28 1054	14, 520 20, 750 23, 003	75 75 75
LANDER		P			
Peterson, Lowe, Bush & Campbell.  LINCOLN	Last Chance	Manganese	Apr. 28, 1955	10, 155	75
Combined Metals Reduction		,	Mar. 2, 1955	98, 200	50
Comet Mines, Inc. Consolidated Uranium Mines, Inc.	CometSchofield	Tungsten	Apr. 16, 1952 June 24, 1954	190, 000 77, 035	50 75
Raymond Combined Mines Co. Wah Chang Mining Corp Yuba Dike Mines, Inc	Prince Henry Lincoln Yuba Dike	Lead, zinc Tungsten Lead, zinc	Mar 17 1055	108, 466 76, 300 21, 750	50 75 50
MINERAL					
Schoff, Bednar, Jones & Rei- miller.	Windup	Tungsten	Dec. 7, 1954	7, 440	75
El Capitan Mining Co	El Capitan	do	Apr. 25, 1955	41, 190	75
PERSHING	_	-			
O. A. Coppin	Redbird	Mercury	July 5, 1955	17, 180	75
WASHOE				1.	
Ogle Swingle WHITE PINE	Leadville	Lead, zinc	June 21, 1955	15, 300	50
Caviglia & Parodi Ielmar Mining & Milling Co., Inc	Essex Teresa	Manganese Tungsten	Apr. 1, 1954 Sept. 12, 1955	27, 300 24, 900	75 75
M. I. A. Mines Co Mount Wheeler Mines, Inc Do	Minerva Mount Wheeler do	dodo Lead, zinc	Jan. 27, 1953 Jan. 29, 1952 Mar. 15, 1955	171, 400 170, 424 303, 200	75 75 50

TABLE 4.—Contracts for purchase of minerals under the Defense Production Act, as of Dec. 31, 1955

				Contingent purchase	Fina	ncing		
Contractor	County	Com	modity	commit- ment (short tons)	Amount	Туре		
Anaconda Co	Lyon Clark	Copper_ Titanium Mangane trate.		128, 000 1, 500 3 830, 000	\$15, 000, 000	Advance.		
Contractor	Tax amorti- zation (percent)	Approximate term of contract (years)	Date production starts	Comm	Commitment purchase price			
Anaconda Co	75 90	6 5 9	Dec. 6, 195 May 1, 195 Jan. 1, 198	2 \$5.00 or I	market a pound. <sup>1</sup> market a pound. <sup>2</sup> long-ton unit of containe			

Contracted at overceiling price (ceiling price was 24)½ cents a pound for most producers).
 Sponge metal. Contract has clause to allow for differential between ingot and sponge purchased.
 Long tons.
 Includes escalator clause.

General Services Administration Purchase Depots.—GSA maintained purchase depots for stockpiles of strategic minerals in several States. Manganese ore was shipped from Nevada to Butte, Mont.; Avondale, Colo.; Deming, N. Mex.; and Fort Worth, Tex. The Manganese, Inc., nodule plant at Henderson, Nev., shipped to a stockpile at Ravenna, Ohio. The stockpiling depots at Avondale, Colo., and Deming N. Mey. and Deming, N. Mex., were closed during the year. Tungsten concentrate was purchased by GSA at milling points, where shipping instructions were issued to the producers.

# FLOW OF MINERALS

Domestic Shipments.—Intrastate movement of mineral commodities was predominantly by motortruck. The one exception was transportation of copper ore from the pits in the Robinson district, White Pine County, to the concentrator at McGill, Nev., by the Kennecott Copper Corp. railroad. Because of limited railroad facilities, most of the interstate movements of minerals are a combination railroadmotortruck transportation. Major tonnages of materials shipped from Nevada included the following commodities: Barite, blister copper, brucite, diatomite, fluorspar, gypsum, lime and limestone, magnesite, manganese, mercury, metal ores, concentrates, and precipitates, crude perlite, silica sand, and titanium sponge. The principal mineral materials entering the State included cement, magnesium, coal, petroleum products, salt, sulfur ores, and rutile for titanium tetrachloride.

Imports and Exports.—The chief basic mineral commodity import, for eventual use in Nevada, was rutile, used to make the titanium tetrachloride shipped into the State. The principal export materials produced in Nevada were iron ore and calcined magnesia, transported by rail to west coast ports and shipped to Japan.

# EMPLOYMENT IN THE MINERAL INDUSTRIES

Employment and Wages.—Mineral-industry employment in Nevada has continued to expand, owing to increased mineral production. The fluctuation in average earnings has two possible explanations but probably was a combination of both. In 1954 the work week was reduced from 7 to 6 and in some instances to 5 days. This shorter work week, coupled with increasingly extensive wage-data compilation, would explain the variation in earnings for the last 2 years. The average weekly earnings in Nevada mines, mills, and smelters was \$90.83, more than \$3.00 a week higher than 1954.

Accidents.—Although mineral-industry fatalities increased, injuries dropped appreciably. Disabling injuries, fatal and nonfatal,

per thousand workers were the lowest in several years.

## **REVIEW BY MINERAL COMMODITIES METALS**

Antimony.—During 1955 several hundred tons of antimonial lead ore was shipped from the New Potosi mine in Mineral County. The smelter paid the shipper a per unit price for the contained antimony. A few tons of antimony ore was shipped from Nye County to an Austin, Lander County mill, but apparently the ore was not processed. Reports from other known properties in Nevada indicated idleness. The quantity of antimony metal recovered by smelters from basemetal ores received from Nevada is unknown; available returns show over 27 tons of recoverable antimony from base-metal ores and concentrates shipped from 9 Nevada counties to a California smelter.

Cadmium.—The smelter returns show a few tons of recoverable cadmium in concentrate shipped from the Pioche district, Lincoln County. Recoverable cadmium from other base-metal ores throughout the State was not determined, but zinc and lead-zinc ores mined

in Eureka County are known to contain this metal.

Copper.—The 1955 production of copper was the highest on record with the exception of 1942, a production year undoubtedly influenced by entry of the United States into World War II. This record production in 1955 was definitely aided by the high price throughout the year. Despite record output, Nevada dropped to fourth place in the domestic production of copper. In the Robinson district, White Pine County, Nevada Mines Division, Kennecott Copper Corp., second in State production, took over the Veteran pit in July, completed mining its Kimbley pit on December 31, and announced completion of the Deep Ruth and Kellinske shafts after more than 3 years of work by Foley Bros., contractors, of New York. Also in the Robinson district, Consolidated Coppermines Corp. began stripping work on its new Tripp open pit. The newly formed Battle Mountain Copper Co. purchased Copper Canyon Mining Co. and began pro-

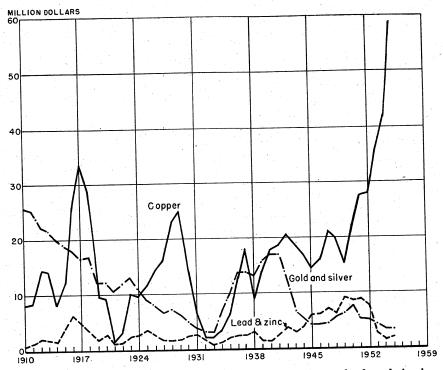


FIGURE 2.—Value of mine production of gold, silver, copper, lead, and zinc in Nevada, 1910-55.

ducing at the mill in December. About 50 men were employed; nearly 300 tons of copper ore a day was produced. Anaconda Co. at Weed Heights, Yerington district, Lyon County, was the States leading producer. Consolidated Coppermines Corp., through its work at the Kimberly and Ruth pits, Robinson district, White Pine County, ranked third. Ore from the three Consolidated pits was treated at the Kennecott McGill plant. These three companies produced 98 percent of copper output in Nevada in 1955.

Gold.—Nevada produced less than 7,000 fine ounces of placer gold in 1955; most of the ore came from alluvial deposits in the Battle Mountain district, Lander County, chiefly by bucketline dredging.

Ten mines in 5 counties contributed placer-gold output.

The Natomas Co. bucketline dredge in Lander County stopped producing during the first quarter of the year, resulting in the slightly lower overall gold yield for Nevada in 1955. The higher yield of gold from copper ores of the Ruth and Kimbley pits in White Pine County

partly compensated for this decline.

The yield of Kennecott Copper Corp. and Consolidated Coppermines Corp., chief producers, was the principal factor in the increased gold output from lode mines. The London Extension Mining Co. Goldacres mine, Bullion district, Lander County, was the leading producer of gold from gold ore, treated primarily by cyanidation. Getchell Mine, Inc., announced the near completion and encouraging results of the Fluo-Solids testing program on sulfide gold ore in Humboldt County. Byproduct gold from base-metal ores was the chief source of the less than 70,000 ounces of gold produced at the 134 mines.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc, 1946-50 (average), 1951-55, and total, 1859-1955, in terms of recoverable metals <sup>1</sup>

Year	Mines 1	oroducing 2	Material sold or	Gold (lode	and placer)	Silver (lod	e and placer)
	Lode	Placer	treated 3 (short tons)	Fineounces	Value	Fine ounces	Value
1946-50 (average)	199 114 125 119 134	32 12 11 9 17 10	6, 634, 437 7, 183, 733 7, 313, 697 8, 027, 402 9, 843, 202 10, 760, 337	120, 024 121, 036 117, 203 101, 799 79, 067 72, 913	\$4, 200, 847 4, 236, 260 4, 102, 105 3, 562, 965 2, 767, 345 2, 551, 955	1, 551, 135 981, 669 941, 195 697, 086 560, 182 845, 397	\$1, 379, 566 888, 460 851, 829 630, 898 506, 993 765, 127
1904-55 4 1859-1955			(5) (5)	14, 691, 584 26, 518, 460	362, 224, 543 606, 707, 776	311, 721, 417 600, 134, 266	213, 098, 992 550, 257, 215
Year	Co	pper	Le	ad	Zi	ne	
Tear	Short tons	Value	Short tons	Value	Short tons	Value	Total value
1946-50 (average) 1951 1952 1953 1954 1955	56, 474 57, 537	\$18, 616, 686 27, 333, 416 27, 847, 908 35, 501, 900 41, 428, 030 58, 878, 050	8, 829 7, 148 6, 790 4, 371 3, 041 3, 291	\$2, 604, 932 2, 473, 208 2, 186, 380 1, 145, 202 833, 234 980, 718	20, 391 17, 443 15, 357 5, 812 1, 035 2, 670	\$5, 247, 134 6, 349, 252 5, 098, 524 1, 336, 760 223, 560 656, 820	\$32, 049, 165 41, 280, 596 40, 086, 746 42, 177, 725 45, 759, 162 63, 832, 670
1904-55 4 1859-1955		773, 378, 042 774, 024, 670	371, 002 608, 793	56, 690, 207 79, 326, 769	469, 112 469, 112		1, 495, 254, 532 2, 100, 179, 178

Includes recoverable metal content of gravel, washed (placer operations); ore milled; old tailing or slimes re-treated; and ore, old tailings, and slag shipped to smelters during calendar year indicated.
 Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal

right to property.

Does not include gravel washed.
From 1904 when first satisfactory annual canvass of mine production was made to 1955, inclusive. 5 Figure not available.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in 1955, by counties, in terms of recoverable metals

County	Mines pr	oducing 1	Gold (lode a	and placer)	Silver (lode and placer)		
	Lode	Placer	Fine ounces	Value	Fine ounces	Value	
Churchill Clark Douglas Elko Esmeralda Eureka Humboldt Lander Lincoln Lyon Mineral Nye Pershing Storey Washoe White Pine	13 16 4 8 3 16 8 16 10 14 14	(3)	22 2 63 (2) 90 108 1, 964 4 45 4 26, 934 2, 655 27 245 649 211 314 135 39, 451	\$770 2 2, 205 (2) 3, 150 3, 780 68, 740 4 1, 575 4 942, 690 92, 925 22, 715 7, 385 10, 990 4, 725 1, 380, 785	5, 001 2 13, 818 (2) 73, 465 353, 470 124, 532 147 46, 133 74, 197 74 24, 238 3, 318 62 10, 696 101 115, 875	\$4, 526 2 12, 506 (2) 66, 496 319, 908 112, 705 67, 155 67, 155 33, 006 9, 689 104, 876	
Total	134	. 10	72, 913	2, 551, 955	845, 397	765, 12	

County	Cop	per	Le	ad	Zi	ne	Total	
Country	Pounds	Value	Pounds	Value	Pounds	Value	value	
Churchill Clark	200 26, 500	\$75 9,885	34, 400 2, 267, 800	\$5, 126 337, 902	400 1, 431, 800	\$49 176, 111	\$10, 546 2 538, 609 (2)	
DouglasElko	152, 800	56, 994	1, 006, 400	149, 954	237, 600	29, 225	305, 813 323, 688	
Esmeralda Eureka Humboldt	19,000 7,800	7, 087 2, 909	1, 853, 600	276, 186	180, 300 200	22, 177 25	486, 898 4 4, 886	
LanderLincoln	835, 400 104, 400	311, 604 38, 941	8,900 1,158,800	1, 326 172, 661	5, 400 3, 477, 400	664 427, 720	4 1, 298, 037 799, 399 25, 303, 840	
Lyon Mineral Nye	67, 836, 000 30, 900	25, 302, 828 11, 526	109, 000 23, 900	16, 241 3, 561	3, 300 3, 000	406 369	58, 685 29, 648 7, 441	
Pershing Storey			2,800	417	100	12	20, 670 5, 245	
Washoe White Pine	88, 837, 000	33, 136, 201	116, 400	17, 344	500	62	34, 639, 265	
Total	157, 850, 000	58, 878, 050	6, 582, 000	980, 718	5, 340, 000	656, 820	63, 832, 670	

<sup>1</sup> Excludes itinerant prospectors, "snipers," "high-graders," and others, who gave no evidence of legal right to property.

2 Douglas County lode combined with Clark County to avoid disclosing individual output.

3 From property not classified as a mine.

4 Humboldt County placer combined with Lander County to avoid disclosing individual output.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1955, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January. February. March April May. June July. August September October November December Total	4, 855 5, 059 7, 068 8, 029 6, 457 6, 027 2, 689 4, 855 7, 725 5, 913 6, 411	37, 082 36, 232 49, 083 51, 169 30, 470 36, 473 26, 508 95, 291 103, 751 104, 751 124, 420	5, 835 6, 289 6, 605 7, 471 7, 432 7, 104 2, 688 5, 402 8, 129 7, 626 6, 858	256 268 363 298 183 214 160 195 219 303 504 328	60 46 99 110 95 138 200 234 298 441 456 493

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1955, 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)
Lode ore: Dry gold Dry gold-silver Dry silver	27 8 17	166, 480 1, 188 22, 454	22, 265 772 110	8, 614 34, 979 404, 367	400 5, 500 71, 100	900 900 156,000	124, 300
Total	52	190, 122	23, 147	447, 960	77, 000	157, 800	124, 300
Copper Lead Lead-zinc Zinc	40 26 10	10, 520, 428 5, 511 27, 731 4, 589	40, 011 2, 185 349 5	126, 014 154, 469 86, 556 10, 491		600 2, 457, 600 1, 528, 100 221, 900	24, 100 3, 430, 600 1, 414, 500
Total	77	10, 558, 259	42, 550	377, 530	157, 754, 900	4, 208, 200	4, 869, 200
Other "lode" material: Old tailing 2 Old slag and manganese	5	6, 455	341	11, 814	300	14, 500	6, 200
ore 3 4 Lead residue	4 1	1, 100 4, 401	86 21	6, 613 597	14, 900 2, 900	289, 500 1, 912, 000	340, 300
Total	10	11, 956	448	19, 024	18, 100	2, 216, 000	346, 500
Total "lode" material Gravel (placer operations)	139 10	10, 760, 337	66, 145 6, 768	844, 514 883	157, 850, 000	6, 582, 000	5, 340, 000
Total, all sources	149		72, 913	845, 397	157, 850, 000	6, 582, 000	5, 340, 000

<sup>&</sup>lt;sup>1</sup> Details will not necessarily add to totals because some mines produce more than 1 class of material.

<sup>2</sup> Metal recovered, by class of old tailings, as follows: Gold, 175 tons—49 ounces gold, 19 ounces silver; gold-silver, 5,940 tons—277 ounces gold, 9,852 ounces silver; silver, 340 tons—15 ounces gold, 1,943 ounces silver, 300 pounds copper, 14,500 pounds lead, 6,200 pounds zinc.

<sup>2</sup> Combined to avoid disclosing individual output.

4 Manganese-ore tonnage not included. <sup>5</sup> 685,802 cubic yards.

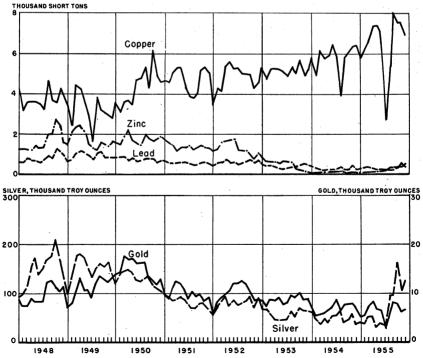


FIGURE 3.—Mine production of gold, silver, copper, lead, and zinc., 1948-55. by months, in terms of recoverable metals.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

	Material shipped		Gı	ross metal co	ntent	
Class of material	or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CON	CENTRATE	SHIPPED TO	O SMELTER	s		
Dry gold	1 155 266, 860 1, 064 3, 157	32 38, 415 270 153	16, 952 112, 055 40, 798 9, 130	3 31 157, 300, 846 17, 763 18, 919	13 770 993, 542 90, 065	1, 83 99, 073 3, 374, 22
Total: 1955	271, 237 259, 135	38, 870 34, 880	178, 935 197, 721	157, 337, 562 141, 860, 778	1, 084, 390 1, 504, 630	3, 475, 12 899, 02
Dry gold: Crude ore Dry gold-silver: Crude ore	6, 069 1, 188	2, 488 765	6, 509 34, 785	571 5, 620	488 1,428	
Crude ore	2, 774 340 216	65 15 1	34, 344 1, 943 209	83, 760 444 6, 902	159, 124 14, 628 11, 631	155, 386 7, 884 17, 213
Copper: Crude ore Lead: Crude ore Residue	104, 595 5, 251 4, 401	1, 596 2, 185 21	17, 433 151, 408 597	4, 158, 607 14, 585 3, 636	1,056 2,534,010 1,977,679	319, 98
Lead-zinc: Crude ore	2, 618 884	14 1	45, 084 1, 099	4, 306 1, 806	629, 061 146, 304	285, 78 198, 17
Crude ore	4, 589	11	11, 596	2, 943	245, 661	1, 577, 16
Total: 1955	132, 925 98, 374	7, 162 5, 760	305, 007 331, 265	4, 283, 180 3, 043, 604	5, 721, 070 4, 225, 934	2, 561, 60 940, 32

<sup>&</sup>lt;sup>1</sup> Combined to avoid disclosing individual output.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

### A. For material treated at mills

	Material		erable in llion	Concen	trate shi	pped to	smelters 1 and	i recovera	ble metal
	treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zine (pounds
			·	BY COUN	TIES	<u>'</u> :	· .		
Churchill	95	16	30	2	2	2, 646		1, 200	
Clark, Elko, and Mineral <sup>2</sup> .				149	32	16, 624		700	1, 20
Douglas Esmeralda Humboldt	18, 130 410	25 41	353, 447 16	7		59			20
Lander Lincoln	159, 111	19, 071	1, 983	4. 195	421	46, 841	33, 400	1, 042, 200	3, 374, 70
Lyon Nye Pershing	(3) 729	529	436	(3)		339	(3)	11,900	
Persning Storey Washoe	6, 065 288	297 135	9, 867 46						
White Pine	<sup>3</sup> 10, 415, 933	100		3 266, 871	38, 415	108, 796	3 153, 608, 700	6, 500	
Total: 1955 1954	10, 627, 412 9, 744, 828	20, 121 21, 761	365, 829 9, 990	271, 237 262, 426	38, 870 34, 384	175, 305 220, 954	153, 642, 100 137, 496, 200	1, 062, 500 1, 971, 300	3, 376, 10 1, 336, 00
***************************************	<u> </u>	! I	Y CLASSE	S OF MAT	erial tr	EATED		!	
Ory gold:	l .				1	l			l I
Orude ore Old tailings Ory gold-	160, 411 175	19, 775 49	2, 265 19	2	2	26		500	
silver: Crude ore Old tailings	cleanup 5, 940	7 277	258 9,852						
Ory silver: Crude ore Copper: Crude	19, 680	13	353, 435	155	32	16, 683		700	1,40
ore Lead: Crude	10, 415, 833			266, 860	38, 415	108, 694	153, 608, 500		
ore ead-zinc: Crude ore	260			25		3, 061	200	19, 100	
and manga- nese ore <sup>2</sup> <sup>4</sup>	25, 113			4, 195	421	46, 841	33, 400	1, 042, 200	3, 374, 700
Total: 1955	10, 627, 412	20, 121	365, 829	271, 237	38, 870	175, 305	153, 642, 100	1, 062, 500	3, 376, 100
	В	Y CLASSE	s of con	CENTRATE	SHIPPEI	TO SMEI	TERS 1		
Ory gold Ory silver				155	32	16, 683	150 000 500	700	1,400
	per precipita	tes 2			32 38, 415 270 153	16, 683 108, 694 40, 798 9, 130	153, 608, 500 15, 100 18, 500	700 976, 200 85, 600	1, 400 77, 400 3, 297, 300

Footnotes at end of table (p. 14).

## B. For material shipped directly to smelters

	Material		Recov	erable metal	content	
	shipped (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zine (pounds)
	В	Y COUNTIES	3			
Churchill Clark	37 9, 356	4 61	2, 325 13, 806	200 26, 500	33, 200 2, 267, 800	400 1, 431, 800
DouglasElko	7, 583	86	73, 450	152, 800	1, 006, 400	237, 600
Esmeralda Eureka Humboldt and Washoe 2	28 5, 209 195	83 1, 964 4	23 124, 532 397	19,000 7,800	1, 853, 600 2, 800	180, 300 100
Lander Lincoln Lyon	17, 942 7, 411 (3)	1, 316 2, 234 (3)	43, 330 27, 356 (³)	835, 400 71, 000 (3)	8, 900 116, 600	5, 400 102, 700
Mineral Nye	1, 204 305	213 108	7, 629 2, 538	30, 900	108, 300 12, 000	2, 100 3, 000
Storey White Pine	<sup>21</sup> 83, 633	<sup>3</sup> 1, 063	829 8 7, 153	3 3, 064, 300	109, 900	500
Total: 1955 1954	132, 925 98, 374	7, 154 5, 676	303, 380 326, 763	4, 207, 900 2, 937, 800	5, 519, 500 4, 110, 700	1, 963, 900 734, 000
	BY CLASS	ES OF MAT	ERIAL			
Dry gold: Crude ore	6, 069	2, 488	6, 323	400	400	
Dry gold-silver: Crude ore	1, 188	765	34, 721	5, 500	900	
Dry silver: Crude oreOld tailingsSlag	2,774 340 216	65 15 1	34, 249 1, 943 209	71, 100 300 5, 200	155, 300 14, 500 11, 500	122, 900 6, 200 13, 600
Copper: Crude ore	104, 595	1, 596	17, 320	4, 105, 800	600	15,000
Lead: Crude ore	5, 251 4, 401	2, 185 21	151, 408 597	10, 900 2, 900	2, 438, 500 1, 912, 000	24, 100
Lead-zinc: Crude ore	2, 618 884	13	45, 037 1, 082	3, 100 1, 200	621, 100 142, 800	221, 900 160, 700
Zinc: Crude ore	4, 589	5	10, 491	1, 500	221, 900	1, 414, 500
Total: 1955	132, 925	7, 154	303, 380	4, 207, 900	5, 519, 500	1, 963, 900

Excludes concentrate treated only by amalgamation and/or cyanidation.
 Combined to avoid disclosing individual output.
 Lyon County combined with White Pine County to avoid disclosing individual company confidential data.
 Manganese-ore tonnage not included.

TABLE 11.—Gold and silver produced at placer mines, 1946-50 (average) and 1951-55, in fine ounces, in terms of recoverable metals

Year	Material handled (cubic yards)	Gold (fine ounces)	Silver (fine ounces)	Total value	A verage gold value per cubic yard
1946–50 (average)	2, 154, 020	14, 857	4, 332	\$523, 799	\$0. 241
	6, 165, 850	30, 509	14, 017	1, 080, 501	. 173
	5, 625, 620	33, 079	11, 011	1, 167, 730	. 206
	2, 670, 110	16, 310	2, 412	573, 033	. 214
	3, 014, 130	17, 246	2, 475	605, 850	. 200
	685, 802	6, 768	883	237, 679	. 345

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery and types of material processed, in terms of recoverable metals

Type of material processed, and method of recovery			Copper (pounds)	Lead (pounds)	Zine (pounds)
Lode: Amalgamation and cyanidation:					
OreOld tailings	19, 795 326	355, 958 9, 871			
Total recoverable in bullion	20, 121	365, 829			
Concentration, and smelting of con- centrates:					
Ore	38, 870	175, 305	153, 642, 100	1, 062, 500	3, 376, 100
Total	38, 870	175, 305	153, 642, 100	1, 062, 500	3, 376, 100
Direct smelting: Ore	7, 117 15 1 21	299, 549 1, 943 1, 291 597	4, 198, 300 300 6, 400 2, 900	3, 438, 700 14, 500 154, 300 1, 912, 000	1, 783, 400 6, 200 174, 300
Total	7, 154	303, 380	4, 207, 900	5, 519, 500	1, 963, 900
Placer	6, 768	883			
Grand total	72, 913	845, 397	157, 850, 000	6, 582, 000	5, 340, 000

metals 1	Total value		\$6,610 587 3,041 98	1, 716 248, 297 287, 245 35	53, 519 141, 989 1, 654 379	17, 299 199 12, 597 182	2, 533 320, 332 215	19, 847 42, 470 418, 286 1, 239 3, 835 1, 221	496 6 397, 841 3, 267 533	1, 293 73, 168 642, 615	956 25, 302, 884
silver, copper, lead, and zinc in 1955, by counties and districts, in terms of recoverable metals	Zine	(spunod)	300	1, 431, 800	185, 500	34, 000 17, 900		19, 500 160, 700	5, 400	1, 600 101, 100 3, 374, 700	
erms of re	Lead	(spunod)	32, 500 1, 300	11, 500 344, 300 1, 912, 000	400 528, 300	44, 100 1, 300 67, 500		42, 600 142, 800 1, 655, 500 6, 900 5, 800	8,900	800 110, 700 1, 047, 300	
tricts, in t	Copper	- 1		23, 600 2, 900	134, 300 3, 000 3, 900	9,900		200 1, 200 7, 500 10, 100	834,000	70, 900 33, 500	67, 836, 000
s and dis	Silver (lode and placer, 3	fine ounces)	1, 757 30 3, 068 108	13, 040 15, 040	2, 481 43,000 143	3,076 255 46	14 353, 435 6	10, 906 1, 082 111, 893 111, 233 37	45 6 43, 273 13 12	1,041 18,886 48,427	23
countie		Total	4.01 2.2	21	222	. ca   ca 4	27 13 6	1,930	1, 303 1, 303 93	20 433	1 26
1955, by	Gold (fine ounces)	Placer			4				(9)		
zinc in	GoI	Lode	74 16 2	21 21	. 25 T 2 - 2 T 2 T 2 T 2 T 2 T 2 T 2 T 2 T 2	0 04	5229	33 1,930	13 1, 303 93	20 433	26 1
lead, and	Lode material	(short tons)	28 44 52 1	8 4,943 4,401	3,352 2,298 273	202 205 205	28 18, 100 11	1,206 2,884 396 149 35	17, 928 521 12	58 1, 321 25, 243	29 4, 535, 578
copper,	oducing 2	Placer			9				1		
	Mines producing	Lode	H-84	101 -	2 4 4 4 6	1			122		-
TABLE 13.—Mine production of gold,	County and district		Churchill County: Chalk Mountain. Eastgate. Holy Cross. Wonder	Clark County; Charleston Mountain Goalsprings Las Vegas Dougliss County:	Elko County: Contact Delanot Norse	Rallmad Rallmad Ruby Range Ruby Valley Tusearora.	Esmeralda County: Goldfield Silver Peak Tokop	Eureka County: Cortez. Diamond Bureka Rish Creek. Vanggle Creek	Lander County: Aspen. Battle Mountain. New Pass. Reese River.	Lincoin County: Ely Springs Jackrabbit. Pioche	Lyon County: Silver City Yerington

45, 802 97 236 10, 148 1, 824	19, 585 19, 585 322 1, 949 4, 510	214 1, 835 214 1, 625	20, 670 479 4, 766	12, 159 422 266 351 34, 617, 469	1, 713 6, 885 1, 070, 565	63, 832, 670
3, 300	3,000		100	900	909	5, 340, 000
105, 200	9,300		2,800	69, 000 2, 700 1, 200	4, 000 39, 500 383, 700	6, 582, 000
25, 700 4, 700				400	1, 600 600 9, 600	157, 850, 000
23, 558 107 54 466 406	189 176 8 27 2, 038	471 48	10, 696 55 46	1, 485 22 294 112, 642	536 856 34, 423	845, 397
240	555 9 55 26	65 6 43 6 43	314	11 9 39, 430	27, 960	72, 913
	12	52 6 43			6,651	6, 768
240	25. 25. 26.	9	314	11 9	21, 309	66, 145
2, 218 4 2 370 107	620 241	24	6, 086	160 3 15 46 5,963,567	40 128 166, 256	10, 760, 337
	2	(f) 1	*		4	ဌ
8080-	(3) 21 21 21	2	4 63	8	1 3 17	134
Mineral County: Condelaria. Hawthorne. Bay Gross. Banta Fe. Surfa Fe. New Countries.	Lodi. Manhattan. Northumberland. Round Mountain. Tonopal.	Seven Troughs Seven Troughs Trinity Trinity Willow Oreek	Comstock Lode. Washoe County: Galeus Ullighouse. White Pine County:	Aurum Horse Canyon. Newark. Oscola. Robinson.	Ward. White Pine. Undistributed 1.	Total Nevada

\*\*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."
\*\*Excludes titnerant prospectors, "snipers," "figh-graders," and others who gave no evidence of legal right to property.
\*\*Excludes titnerant prospectors, snipers," "figh-graders," and others who gave no evidence of legal right to property.
\*\*Excludes titnerant property not classed as a mine.
\*\*Excluded with "Undistributed" to avoid disclosing individual company operations.
\*\*Exclusive of placer output, which is included with "Undistributed" to avoid disclosing individual company operations.
\*\*Exclusive of placer output, which is included with "Undistributed" to avoid disclosing in Clark Country; Buckskin in Douglas Country; Island Mountain, Kinsley, and Tecoma in Elic Country; Allanta in Lincoln Country; Walker Lake in Mineral Country; Bellehelen, Reveille, and Silver Bow in Nye Country; and Rabbit Hole in Pershing Country.

Iron Ore.—Mine production of iron ore in Nevada increased over 1954; however, shipments actually declined, and stocks at the mines were greater. Most activity centered around three operations southeast of Lovelock in the Buena Vista Hills, Pershing and Churchill Counties. Other areas of activity included the Buckskin district, Douglas County; the Amarilla district, Eureka County; the Jackson Creek district, Humboldt County; and the Lodi district, Nye County.

Nevada iron ore was mined mostly for export to Japan, however, several thousand tons went to eastern furnaces and California steel plants. Seven producers in 5 districts mined nearly 400,000 tons of magnetite and hematite ores with an average grade of 60 percent iron. The leading producer in the State was Dodge Construction, Inc., principally in the Buena Vista district, Pershing County.

Lead.—Although the lead output in Nevada during 1955 exceeded that of the previous year by 0.5 million pounds, production remained low, owing primarily to continued curtailment of work in the Pioche district, Lincoln County, by Combined Metals Reduction Co. Clark County, leading in State lead production, obtained lead residue from manganese ores treated in the Las Vegas district. Eureka County ranked second by virtue of the lead ores from the Eureka district. Elko County, a close third in rank, produced mostly from the lead-zinc ores of the Delano district and the lead ores of the Island Mountain district.

In spite of curtailment of activities by Combined Metals Reduction Co., Lincoln County ranked fourth in State output; production came from the Jackrabbit (Bristol) and Pioche (Ely) districts. The rest of Nevada lead production, about 5 percent of the total, came from small mines in Churchill, Lander, Mineral, Nye, Washoe, and White

Pine Counties.

Manganese.—Manganese-ore production continued to grow in 1955, increasing in quantity and improving more than 2 percent in average grade. Output increased in spite of a labor strike at Manganese, Inc., chief producer in the State near Henderson, Nev., where nodules were produced by treating ore from the Three Kids mine, a considerable tonnage of which was obtained from a nearby GSA stockpile. This stockpile ore, averaging about 25 percent manganese, was mined from an open-pit developed by Manganese Ore Co., under contract with Metals Reserve Company during the war years 1942–44. This same company ran the Defense Plant Corp. hydrometallurgical plant and treated some 75,000 tons of ore, producing approximately 14,000 tons of nodules in this same war period. Manganese, Inc., during 1955, blended about 10 percent of the remaining stockpile with ore from its pit for treatment at the company-owned nodulizing plant.

Some synthetic battery-grade ore was produced at the American Potash & Chemical Corp. Henderson plant from manganese ores of the Pioche district, Lincoln County, mined by Combined Metals Reduction Co. Metallurgical-grade ore from the Nevada district, White Pine County, was shipped to the National Stockpile. The tonnage of low-grade manganese ores mined and shipped dropped to less than 10 percent of the figure for the same period of the previous

vear.

No manganiferous ore was produced in the State during 1955. Activity under a DMEA loan continued in the Nevada district of White Pine County, and manganese exploration was begun with DMEA assistance in the Reese River district, Lander County. Counties contributing to the State production of manganese ore containing 35 percent or more manganese were, in order of importance tonnagewise, Clark, White Pine, and Lincoln.

Mercury.—Nevada, ranking second in the Nation's mercury output for 1955, produced approximately 30 percent of the total—noteworthy considering the lower average grade of ore mined. Production increased in 1955, but shipments were less than in the previous year. Stocks, comparatively high at the beginning of 1954, were subsequently

reduced during that year, supplying the difference.

Only 2 counties, Humboldt and Pershing, produced more than 100 flasks each; however, 33 producers in 33 districts in 8 counties contributed production. Cordero Mining Co. in the McDermitt district, Humboldt County, continued to be the State's leading producer. United Mercury Co. announced completion of a development program, which included construction of roads, housing facilities, and a kiln of 100-ton-a-day capacity at its mercury property, 65 miles southwest of Battle Mountain, Lander County.

The only activity in cinnabar exploration under the DMEA program during the year was begun in the Antelope Springs district,

Pershing County.

TABLE 14.—Mercury production by methods of recovery 1946-50 (average) and 1951-55

	Direct f	urnaced	Rete	orted	Unclassi- fied <sup>1</sup>	То	tal	Operat-
Year	Ore (short tons)	Flasks (76 pounds)	Ore (short tons)	Flasks (76 pounds)	Flasks (76 pounds)	Flasks (76 pounds)	Value *	ing mines
1946-50 (average)	15, 437	2, 878 8, 053	191 621	23 116	8	2, 901 1, 400 3, 523 3, 254	\$250, 502 294, 182 701, 429 628, 120	5 12 9 12
1954 1955	67, 865	10, 259	3, 149	465		4, 974 5, 750	1, 315, 076 1, 669, 512	21 33

<sup>&</sup>lt;sup>1</sup> Includes mercury recovered from miscellaneous dump material.

Value calculated at average price at New York.

Molybdenum.—The State's one producer of this commodity recovered molybdenum sulfide concentrate as a byproduct at the McGill concentrator of Kennecott Copper Corp. from porphry-copper ores, which had been mined by Consolidated Coppermines Corp. and Nevada Mines Division, Kennecott Copper Corp. in the Robinson district, White Pine County. Production was sold for domestic use; shipments declined from 1954, in spite of greater molybdenum-concentrate output.

Silver.—Silver production in Nevada rose 34 percent over 1954, undoubtedly reflecting reopening of the Mohawk silver mine in Esmeralda County by Bruhi Mining Co.—August was the first month

for full-scale production. The cyanide plant at Silver Peak was constructed to treat silver ore from this mine. This made Esmeralda County the leading producer of the 16 counties that supplied silver.

The lead ores of Elko and Eureka Counties, copper ores of White Pine County, gold-silver ores of Lander and Storey Counties, and lead and silver ores of Mineral County were the principal sources of the State silver output. Several thousand ounces of silver was recovered at smelters in Clark County from the zinc ore shipped from Government Stockpiles and from lead residues resulting from treating manganese ores in the Henderson area. Placer mining supplied less than 1,000 ounces of silver.

Titanium.—No titanium minerals were mined or processed in Nevada during the year; however, Titanium Metals Corp. of America, a principal national producer of titanium, chlorinated rutile at its Henderson, Nev. plant to make titanium tetrachloride for use in produc-

ing metal.

Titanium-sponge production by the Bureau of Mines, under a DMPA contract was concluded in 1954. The Bureau of Mines Electrometal-lurgical Experiment Station at Boulder City, Nev., under a cooperative agreement with Wah Chang Corp., began research on an improved process for producing titanium sponge metal. GSA entered into a cooperative agreement with the Bureau of Mines in September to develop an economical process for producing titanium tetrachloride from abundant titanium-bearing materials, including slag; subsequent chlorination of the titanium slag was to be done at the Bureau's Boulder City, Nev., laboratory.

Tungsten.—Nevada continued to lead the Nation in the mine production of tungsten, which increased appreciably over the previous year, and was contributed by 222 individual operations in 201 mining districts of 15 counties throughout the State. Actually, 5 producers

in 4 counties supplied over 85 percent of the State total.

The leading counties were Humboldt, Pershing, Lincoln, Mineral,

and Nye, in that order.

The principal mining companies in order of production, were: Nevada-Massachusetts Co., Mill City district, Pershing County; Union Carbide Nuclear Co., Riley mine, Humboldt County; Wah Chang Mining Corp., Lincoln Mine Division, Tem Piute district, Lincoln County; Getchell Mine, Inc., Potosi district, Humboldt County; and Nevada Scheelite Corp., Rawhide district, Mineral County.

Consolidated Uranium Mines, Inc., suspended work at its Linka property, Lander County, 20 miles southeast of Austin, in order to rebuild and install new machinery to increase mill capacity. Mined ore was processed by Getchell Mine, Inc., Humboldt County, in the

interim.

Although production of tungsten concentrate in the State continued to increase, the success of the industry was based directly upon the domestic tungsten program. As the quota for purchase by GSA under this program was nearly filled, 1956 may see production of even the major producers seriously affected unless a new purchase program is

<sup>&</sup>lt;sup>2</sup>Baroch, C. T., Kaczmarek, T. B., Barnes, W. D., Galloway, L. W., Mark, W. M., and Lee, G. A., Titanium Plant at Boulder City, Nev.: Its Design and Operation: Bureau of Mines Rept. of Investigation 5141, 1955, 76 pp.

With a shift to current world prices for tungsten concenenacted.

trate, many Nevada mines could not continue to produce.

Tungsten exploration continued under the Defense Minerals Exploration Administration program in the Nevada and Mount Washington districts, White Pine County; the Garfield Hills district, Mineral County; the Tem Piute district, Lincoln County; and the Alpine district, Churchill County. New activity under DMEA was begun in the Varyville and Potosi districts, Humboldt County; the Spruce

TABLE 15 A.—Tungsten concentrate produced from ore in 1955, by counties

<b>0</b>	Producing		Ore 1	Concen- trate		
County	mines and prospects	Mined (short tons)	To mills (short tons)	Milled 3 (short tons)	produced 1 (pounds)	Contained WO <sub>3</sub> 1 units
Churehill Clark Douglas Eiko Esmeralda. Humboldt Lander Lincoln Lyon Mineral Nye Ormsby Pershing Washoe White Pine Undistributed  Total	17 2 15 12 5 5 17 8 3 6 6 27 42 3 28 5 12	1, 783 (f) 1, 094 3, 174 346, 302 24, 838 226, 252 226, 252 30, 385 (3) 245, 887 309 8, 293 182	1, 983 (2) 1, 094 3, 174 346, 302 24, 838 226, 252 226, 252 30, 385 (3) 246, 177 309 7, 687 7, 687 945, 978	1, 864 (*) 4 3, 120 1, 911 235 348, 508 24, 704 225, 492  5 50, 946 30, 927 (*) 114 4, 891 174 937, 637	36, 183 (9) 331 8, 628 2, 297 4, 117, 212 2, 238, 235 1, 443, 045 935, 865 (4) 973, 439 1, 869 152, 344 3, 194 11, 238, 543	1, 09 (3) 4 3, 22 27 6 131, 89 7, 62 66, 23 48, 72 28, 53 (1) 71, 100 57 5, 156 87

B.—Production and shipments of tungsten concentrate in 1955 credited to Nevada counties in which ore was mined

<del></del>					i wo mined		
					Concentrate	es	
	County		Prod	Produced 1			
			Pounds	Units	Pounds	Contained WO <sub>3</sub> units	Value <sup>1</sup>
Eiko Esmeralda Humboldt Lander Lincoln Lyon Mineral Nye Pershing Washoe White Pine Undistributed	7		41, 774 80, 238 5, 080 4, 003, 091 229, 484 6, 273 1, 584, 207 929, 285 2, 007, 075 8, 147 302, 001 3, 379	1, 157 1, 336 2, 571 163 128, 230 7, 694 67, 570 204 28, 353 72, 244 253 10, 195 93	38, 192 41, 774 80, 233 5, 080 4, 003, 091 229, 484 1, 536, 354 6, 273 1, 606, 135 940, 125 1, 885, 815 302, 001	1, 157 1, 336 2, 571 108 128, 230 7, 694 62, 453 204 54, 516 28, 665 71, 799 93	71, 271 82, 298 158, 374 10, 041 7, 898, 988 473, 990 3, 847, 105 12, 566 3, 388, 186 1, 765, 764 4, 422, 818 15, 585 628, 012 5, 724
Total			11, 879, 169	373, 812	10, 786, 083	369, 329	22, 750, 6

<sup>1</sup> Partly estimated.
2 Ore actually milled in county, including material from other counties and States.
3 Included with "Undistributed" to avoid disclosing individual company operations.
4 Includes material from California mines.
5 Includes small quantities of tailings.
6 Based on average of \$61.60 per unit, GSA, San Francisco, Calif.
7 Includes Clark and Ormsby Counties.

Mountain district, Elko County; the Gabbs district, Nye County; the Regan district, White Pine County; and the Tem Piute district,

Uranium.—Prospecting for uranium minerals during 1955 continued undiminished, and interest remained high. Important uranium mineralization, which may consist of carnotite, torbernite, or uraninite, has been discovered in Humboldt, Lander, Lincoln, Mineral, and Washoe Counties. The minerals are of secondary origin, found along fracture zones and bedding planes in the Esmeralda formation or

along shear zones and fractures in the Miocene Lake beds.

Uranium-bearing minerals have been found in the State from Lincoln County in the east to Washoe County in the west; however, most activity has centered in Lander County. The most significant deposits in Nevada are in the Reese River and Valley View districts, Lander County; the Kincaid district, Mineral County; the Kings River district, Humboldt County; and the Red Rock district, Washoe County. During 1955 ore shipments were made from these districts and from the Atlanta district, Lincoln County; with the most consistent production coming from Humboldt County. In Lander County, Uranium Mines, Inc., was absorbed by Apex Uranium, Inc., in October 1955.

Zinc.—Despite some curtailment of its work during the first part of 1955, the efforts of Combined Metals Reduction Co. made Lincoln County the leading zinc producer in the State. Clark County held second place owing to shipments of zinc ore to smelter-fuming plants outside the State. This ore was drawn from the Government stockpile at Jean and originally came from the Good Springs (Yellow Pine)

district, Clark County.

The lead-zinc ore of the Delano district was a major factor ranking Elko third in production; a smaller output came from the lead-zinc ore of the Ruby Valley district and from the zinc-containing lead and silver ores of the Railroad district. Eureka County placed fourth owing to shipments of lead-zinc slag obtained from ores mined and treated many years ago in the Diamond district, probably coming originally from the Phillipsburg (Francis) mine. This slag was shipped from Palisades, Nev., to smelter-fuming plants in California and Utah.

Other appreciable contributions to State zinc production came from lead-zinc and silver ores, Battle Mountain district, Lander County; and silver ores, Candelaria (Columbus) district, Mineral

County, and Tonopah district, Nye County.

# SECONDARY-METALS CONSUMPTION

Iron and Steel Scrap.—Very little of the iron and steel scrap consumed in Nevada was produced in the State. Virtually all State production came from industrial centers in Washoe and Clark Counties and from numerous mines throughout the State. Scrap was consumed principally by copper producers in Lyon and White Pine Counties. More than 1 pound of ferrous scrap is required in producing 1 pound of cement copper. Light-gage steel sheet (largely detinned cans) obtained mostly outside the State, usually from California and Utah was utilized.

#### **NONMETALS**

Barite.—The tonnage of mined crude barite dropped slightly from the previous year. Sales and dollar value increased appreciably as stockpiles were reduced. After construction of the road over Mill Creek Summit, the test plant near Beowawe, Eureka County, closed; and ore from the Graystone mine in Lander County was stockpiled at the Magnet Cove Barium Co. plant, just west of Battle Mountain, Lander County, pending completion of the plant. Late in the year, production of ground barite began, primarily for drilling mud; output was shipped to the company warehouse in Houston, Tex.

Crude barite from the Carlin, Boulder Creek, and Railroad districts (Elko County), the Argenta, Beowawe, and Reese districts (Lander County), the Santa Fe district (Mineral County), and the Ellendale district (Nye County) was shipped to California processing plants.

Brucite.—Brucite was produced by Basic Refractories, Inc., east of Gabbs, Nye County. The ore was treated in a heavy-medium separation plant for upgrading before shipment to Ohio, where it was mixed with dolomite and calcined to produce "Basifrit." Standard Slag Co., also east of Gabbs, reports brucite in its magnesite ore, but no attempt at separation was made.

Clays.—Despite a continued competitive market from California, clay production, mostly captive tonnage, increased about 12 percent over 1954. Small tonnages of bentonitic clay, from pits in Clark and Nye Counties and of fuller's earth, from a pit in Lyon County, were produced. The principal industrial activity continued to be in fire clay for mortar and pressed brick obtained chiefly from pits in Washoe and White Pine Counties.

Diatomite.—Nevada production increased above that in 1954, chiefly through the efforts of Eagle-Picher Co. in Storey County and Great Lakes Carbon Corp. in Esmeralda County, producing most of the State output. A few thousand tons was mined in Churchill County. All diatomite was mined from open pits and processed in company mills near the pit sites; it was used mostly as filler for paints, paper, and insecticides.

Fluorspar.—Nevada continued to supply a moderate tonnage of crude fluorspar for the chemical and steel industries of the Pacific Coast States. Six mines in four counties produced the crude ore in 1955, and the inadequacy both in grade and in quantity promoted intensive exploration. Reserves were being rapidly depleted, and no new deposits of large potential were found, which might soon result in buyers looking to other sources to fill their needs.

A large percentage of 1955 production went for manufacturing hydrofluoric acid. The remainder was shipped to California, mainly for utilization as a flux in preparing pig iron and steel.

Gem Stones.—The semiprecious stone industry of Nevada, one of the Nation's chief producers, was centered around production of fire opal, rhodonite, and turquois. The production of turquois for ornamental use by companies in Esmeralda and Lander Counties supplied a substantial part of the State's total gem-stone output. One of the most noted deposits of fire opal in the world is in Virgin Valley, Humboldt County. The area has been mined intermittently since 1908, and a small quantity was produced in 1955.

Gypsum.—The value of gypsum production ranked ahead of lime and second only to sand and gravel among the nonmetallic minerals of the State. Production increased over the previous year and came chiefly from deposits in two widely separated places. In Clark County, Blue Diamond Corp. mined the mineral from an open pit and operated a plaster, lath, and wallboard plant at Blue Diamond about 30 miles southwest of Las Vegas; Pabco Products Co. produced gypsum at its White Eagle open-pit mine and crushing plant a few miles northwest of Henderson.

Pabco Products, Inc., planned to construct a processing mill 6 miles east of Lovelock, Pershing County, for crushing, grading, upgrading, and loading its gypsum product to supply its wallboard plant at Newark, Calif. In Pershing County, United States Gypsum Co. mined gypsum at its Empire quarry about 10 miles south of Gerlach and operated a mill and calcining plant in Washoe County a few miles northwest of its Empire quarry. An appreciable tonnage from these deposits was shipped to board and cement plants in

California.

TABLE 16.—Crude gypsum mined, 1946-50 (average) and 1951-55

	Y	ear	Active mines	Productions (short tons)	Value
1946–50 (average) 1951			5 5 4 4 4	527, 322 643, 637 608, 284 701, 584 654, 422 836, 744	\$1, 345, 014 1, 811, 757 1, 666, 938 1, 975, 053 2, 217, 273 2, 835, 922

Lime.—The record production of lime in Nevada in 1955 contrasted with the output of other areas that witnessed a partial recovery from a major decline, Nevada exceeded its previous output by one-fifth. Owing to the fact that the greater percentage of the State's lime production went for metallurgical and building uses, the steel strikes

did not adversely affect Nevada's output.

Magnesite.—The production of magnesite in Nevada increased substantially over 1954; virtually all output came from Basic Refractories, Inc., and Standard Slag Co. near Gabbs, Nye County. Most of this magnesite was calcined to produce caustic-calcined magnesia used primarily in manufacturing oxychloride and oxysulfate cements, and refractory magnesia for manufacturing bricks and shapes for the steel and copper industries. A part of the magnesia production by Standard Slag Co. was shipped to west coast ports for export.

Marl, Calcareous.—As one of the Nation's chief producers of calcareous marl, Nevada continued its moderate production with a 12-percent decrease from the record year 1954. The use of marl as a filler for poultry grits and animal foods has created a market for the State's production, most of which has been shipped to California,

where feeds are processed in large quantities.

Perlite.—Production of crude perlite decreased again in 1955, as demand by the construction industry lessened. Four mines, 2 in Lincoln County and 1 each in Pershing and Clark Counties, furnished the total yield. Demand for expanded perlite for local consumption was supplied by plants in Washoe and Clark Counties. The large percentage of Nevada crude perlite was crushed, sized, and shipped

to out-of-State expansion plants.

Pumicie, Pumicite, and Volcanic Cinders.—These commodities continued their downward trend in production in Nevada. The small quantity of pumice and pumicite produced in the State was utilized for concrete aggregate and as a filler for scouring compounds. Volcanic cinders utilized as concrete aggregate represented most production this year. The curtailment of construction in the principal consuming centers of the State was reflected by a sharp decline in cinder production. Further decline in production was brought about through less utilization in road construction.

Salt.—A small quantity of salt was surface-mined from a dry lake bed by Leslie Salt Co., Churchill County. Output was utilized locally primarily for curing hides, feeding livestock, and de-icing high-

ways.

Sand and Gravel.—Nevada's sand and gravel production, harmonizing with the Nation's economic trend, increased moderately over 1954. A sharp rise for asphaltic use more than compensated for a decline in structural products, particularly concrete. Production of glass and molding sand in Clark County also increased significantly. J. R. Simplot Co. announced purchase of Nunn Co. of Overton, Nev., and production of silica under the name Simplot Silica Products, Inc. The plant has a capacity of 10,000 tons of high-grade silica a month.

The Hunt Foods, Inc., of Fullerton, Calif., purchased the Nevada Silica Sands, Inc., property at Overton, Nev.; the output of silica sand will be used in manufacturing glass containers. It is interesting to note that the number of producers of sand and gravel in Washoe

County increased fourfold over the previous year.

Stone.—In accordance with industrial activity in the State, production of crushed limestone increased slightly over the previous year. Utilization of this raw material periodically fluctuated most significantly in the greatly increased production of metallurgical flux. Output of crushed granite used in concrete increased four times over that of the previous year. Although a considerable quantity of basalt was utilized by one producer in 1954, none was produced in Nevada in 1955. The small output of marble for terrazzo by one producer in the State was slightly greater than in the previous year. Since 1951, production of dimension sandstone in this State has been expanding to an output that was more than double the quantity in the previous year—from 6 producers in 3 counties.

Production of crushed sandstone in Nevada increased threefold over the previous year; the insignificant quantity produced was marketed for roofing granules. Production in the miscellaneous crushed-stone industry changed slightly over the previous year; the

State continued its small output of riprap and railroad ballast.

TABLE 17.—Sand and gravel sold or used by producers 1954-55, by classes of operations and uses

		1954			1955	
	Short Value		ue		Value	
	tons	Total	Total Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS					,	
Sand: Glass Molding Building Paving Engine	(1) 47, 420 343, 716 (1)	(1) 122, 753 519, 310 (1)	(1) \$2. 59 1. 51 (1)	(1) 84, 286 288, 899 (1) 600	(1) \$249, 327 332, 456 (1) 250 (1)	(1) \$2, 96 1, 15 (1) . 42
Other	(1) 384, 400 150, 927	(1) 574, 959 102, 657	(1) 1.50 .68	(1) 293, 134 757, 805	363, 151 651, 010	1. 24 . 86
Railroad ballastOtherUndistributed sand and gravel	15, 000 154, 661	12, 300 567, 320	. 82 3. 67	298, 005	50 939, 810	. 74 3. 18
Total commercial sand and gravel	1, 096, 124	1, 899, 299	1.73	1, 722, 797	2, 536, 054	1.4
GOVERNMENT-AND-CONTRACTOR OPERATIONS <sup>2</sup>						
Sand: BuildingPaving	100 13, 513	50 6, 834	. 50 . 51	40, 318	21, 451	. 5
Total Government-and-contractor sand	13, 613	6, 884	. 51	40, 318	21, 451	.5
Gravel: Building Paving	2, 000 2, 419, 554	1, 500 1, 048, 854	. 75 . 43	129, 228 1, 687, 917	36, 922 1, 167, 957	.6
Total Government-and-contractor gravel	2, 421, 554	1, 050, 354	. 43	1, 817, 145	1, 204, 879	.6
Total Government-and-contractor sand and gravel	2, 435, 167	1, 057, 238	. 43	1, 857, 463	1, 226, 330	.6
ALL OPERATIONS SandGravel	559, 410 2, 971, 881	1, 216, 267 1, 740, 270	2.17 .59	712, 108 2, 868, 152	1, 543, 294 2, 219, 090	2. 1 . 7
Grand total		2, 956, 537	. 84	3, 580, 260	3, 762, 384	1.0

Included with "Undistributed" to avoid disclosing individual company confidential data.
 Includes figures for State, counties, municipalities, and other Government agencies.

TABLE 18.—Stone commercial and Government-and-contractor, sold or used by producers in 1954-55, by uses <sup>1</sup>

Use	19	54 •	1955	
Use	Quantity	Value	Quantity	Value
Dimension stone:  Building stone:  Sawed stone and cut blockscubic feet Approximate equivalent in short tonscubic feet Approximate equivalent in short tonscubic feet	62, 480 3, 124	\$90, 101 	72, 320 6, 149 9, 410 734	\$107, 374 14, 930
Total dimension stone (quantities approximate, in short tons)	3, 124	90, 101	6, 883	122, 304
Crushed and broken stoneshort tons_	1, 829, 657	1, 920, 491	1, 605, 059	2, 486, 596
Grand total (quantities approximate, in short tons)		2, 010, 592	1, 611, 942	2, 608, 900

<sup>1</sup> Includes basalt, granite, limestone, marble, sandstone, and miscellaneous stone.

Sulfur.—Intermittent activity in developing sulfur ore in Nevada can be attributed to competition from Frasch sulfur produced in the Gulf States. Following an idle year in 1954, a small output was reported in 1955 for agricultural purposes. All of the State's production came from the Sulphur district, Humboldt County. A crushing, grinding, and cleaning plant was built at Sulphur, Humboldt County,

to process ores from a nearby sulfur deposit.

Talc and Soapstone.—The quantity and value of talc and soapstone production for Nevada doubled over the previous year. The use of these commodities as a carrier for insecticides and filler for asphalt and paper showed the most notable gain. The entire tonnage was ground in California. As in recent years, Esmeralda was the only producing county. Sierra Talc & Clay Co. discovered cosmetic grade talc, equal to imported Italian grades, at its property in Esmeralda County, 55 miles southwest of Goldfield, Nev.

#### MINERAL FUELS

Crude Petroleum.—Nevada's potential as an oil-producing State continued to be of major interest during the year; drilling was carried on in Clark, Elko, Eureka, Lander, and Nye Counties. The Shell Oil Co. wells in Railroad Valley, Nye County, were the only producers. The success or failure of Richfield Oil Corp. in the Rabbit Creek area of Elko County and of J. D. Blalock in the Battle Mountain Basin, Lander County, was of great interest. A significant discovery in these areas would improve the outlook for Nevada's petroleum future.

In 1955 six wells were being drilled at the beginning of the year. During the year 8 were spudded, 2 were placed on production, 5 were abandoned, and 7 were still being drilled at year end. Shell Oil Co., the most active company in the State, drilled 6 wells during the year—4 in the Eagle Springs unit and 2 in adjacent areas of Railroad Valley. The 2 wells nearest the discovery well became productive, but by the end of the year 1 was almost abandoned and the other temporarily shut in. The Eagle Springs unit produced all Nevada oil in 1955.

#### **REVIEW BY COUNTIES**

Four Nevada counties produced over 75 percent of the State mineral commodities. White Pine County led in copper production; Lyon County ranked a close second. Humboldt County topped all other counties in tungsten output, and Clark County led the State and the Nation in producing manganese. Mercury output from several counties placed Nevada second only to California in the national standing; however, Humboldt County again produced considerably more than all other counties combined. Clark County was far in front in producing nonmetallic commodities, chiefly gypsum, lime, sand and gravel. Nye County was the sole producer of crude petroleum in the State.

Churchill.—Several large deposits of diatomaceous earth occur in the county. Aquafil Co. recovered this mineral from two open-pit mines, the Chick Bed (North) mine east of Fernley and Hoover's mine south of Fallon. Sand and gravel has become an important mineral commodity in Churchill County from the standpoint of production value. This material was produced commercially for concrete-product companies and by the Churchill County Road Department, the Nevada State

Highway Department, and their contractors.

Sixteen operators produced over 1,000 units of WO<sub>3</sub> from 13 mines in 2 mining districts of the county. The Sand Springs district yielded by far the greater part of the total. The chief producers in this district were: Churchill Tungsten Mining Co., Red Ant mine; Carl Polcher, Red Top No. 1 and Carter mines; St. Anthony Development Co., Inc., St. Anthony mine; John R. Young, Red Top No. 2 mine; and R. Ambrose and A. Mathews, Big Chief mine. The Alpine district was the other important tungsten-producing district in the county principally at the Tungsten Mountain Mining Co. Hilltop mine. Churchill Tungsten Mining Co. operated a gravity-concentration mill at its mine. All other producers shipped ore to custom mills in adjacent counties and in California.

TABLE 19.—Value of mineral production in Nevada, 1954-55, by counties

County	1954	1955	Minerals produced in 1955 in order of value
Churchill	\$497, 607	\$558, 508	Diatomite, sand and gravel, tungsten, iron ore, fluorspar lead, silver, salt, gold, stone, pumice, copper, zinc.
Clark	12, 497, 511	15, 212, 17 <b>2</b>	Manganese ore, lime, sand and gravel, stone, gypsum, lead, zinc, silver, copper, tungsten, gold, clays.
Douglas Elko	221, 043 599, 007	120, 037 952, 068	Tungsten, sand and gravel, iron ore, stone, gold, silver. Sand and gravel, tungsten, lead, barite, silver, copper, zinc, stone mercury, gold, gem stones.
Esmeralda	1 453, 879	884, 212	Diatomite, silver, tale and soapstone, gem stones, sand and gravel tungsten, mercury, gold.
Eureka	1 454, 591	761, 609	Lead, iron ore, silver, stone, gold, sand and gravel, zinc,
$\mathbf{Humboldt}_{}$	1 7, 818, 859	1 10,133, 719	Tungsten, mercury, iron ore, sand and gravel, stone, gem stones copper gold, sulfur ore, silver, zinc.
Lander	1 1, 813, 364	1 2, 301, 104	Gold, barite, tungsten, copper, silver, gem stones, mercury, sand and gravel, lead, zinc.
Lincoln	1 4, 497, 214	1 5, 440, 890	Tungsten, zinc, manganese ore, stone, perlite, lead, gold, sand and gravel, silver, copper, mercury.
Lyon Mineral	1	25, 386, 961 4, 051, 082	Copper, sand and gravel, tungsten, clays, gold, silver. Tungsten, fluorspar, barite, stone, silver, lead, copper, gold, gem stones, sand and gravel, mercury, zinc, pumicite.
Nye	2, 912, 217	3, 159, 865	Tungsten, magnesite, iron ore, petroleum, fluorspar, sand and gravel, gold, stone, volcanic cinder, mercury, lead, silver, clays, barite, zinc.
Ormsby Pershing	27, 348 6, 695, 720	4, 945 6, 483, 802	Sand and gravel, tungsten. Tungsten, gypsum, iron ore, sand and gravel, perlite, mer- cury, gold, silver.
StoreyWashoe	933, 399 1, 061, 508	1, 120, 054 663, 272	Diatomite, gold, silver, sand and gravel.  Sand and gravel, marl, stone, tungsten, clays, gold, gem  stones lead silver zinc.
White Pine	1 29,038, 687	1 35,967, 091	Copper, gold, tungsten, lime, stone, molybdenum, silver, manganese ore, sand and gravel, lead, zinc.
Undistributed	65, 293	29, 604	Gem stones, barite, mercury.
Total	89, 138, 000	113, 231, 000	

<sup>&</sup>lt;sup>1</sup> Excludes value of manganese and low-grade manganese ores sold and blended at Government low-grade stockpiles for future beneficiation.

Minerals Materials Co. Buena Vista open-pit mine, Buena Vista district, produced an appreciable tonnage of iron ore and was leased during the last 3 months of the year by Dodge Construction Co. Magnetite ore was mined and the entire production was shipped for export.

Fluorspar was mined 23 miles northeast of Stillwater and shipped to the flotation mill of Kaiser Aluminum & Chemical Corp. at Fallon.

The output of only a few hundred tons was a 100-percent increase over 1954. The 100-ton-a-day capacity Kaiser mill also received fluorspar ores from mines in Lander, Nye, and Pershing Counties. The mill produced acid-grade fluorspar, which was shipped to a Cali-

fornia chemical plant for use in making hydrofluoric acid.

Most of the gold produced came from the gold ores of the Gold Ledge group, Eastgate district, the Camp Terrell group, Holy Cross district, and the lead ore of the Big Ben mine, Chalk Mountain district. No placer gold was produced in Churchill County. The Big Ben and Pyramid mines, Holy Cross district, produced the greatest quantity of silver and lead in the county, Big Ben also produced some zinc. Lead ore of the Creeore group of claims, I. X. L. district, yielded some silver, lead and zinc and supplied the only copper production. The Jack Pot mine, Wonder district, produced a small quantity of silver.

Leslie Salt Co. was the State's only salt producer at a deposit and plant near Fallon on property owned by Fallon Development Co. Production in 1955, although relatively small, more than doubled

that in the previous year.

Fallon Concrete Products Co. mined pumice at its February mine about halfway between Salt Wells and Stillwater for use at its concrete-block plant in Fallon, Nev. The Nevada Highway Department and its contractors produced small tonnages of miscellaneous

stone for use in road construction.

Clark.—This county led the State and Nation in producing manganese ore and concentrate, which were obtained at the Manganese, Inc., Three Kids mine, Las Vegas district. The company treated ore from this mine at its Henderson concentrator and nodulizing plant; manganese nodules were produced which were shipped under a Government contract; lead residue, containing some gold, silver, and copper was recovered from the calcining at the concentrator and shipped to a Utah smelter. Also in the Las Vegas-Boulder City area, American Potash & Chemical Corp. produced synthetic Battery-grade manganese at its Henderson plant from ores purchased in Lincoln County, Arizona, and Mexico. These ores were blended for treatment in the

company plant, formerly Western Electrochemical Co.

Lime production has become a major industry in Clark County; three plants of United States Lime Products Corp. provided this output. The Apex quarry and plant, northeast of Las Vegas, equipped for crushing and screening, shipped limestone to the steel and beet-sugar industries outside the State and to the company Sloan plant, south of Las Vegas, for further processing. The Henderson plant, in the Las Vegas-Boulder City area, equipped with four rotary kilns and hydrating, pulverizing, and packing facilities, produced lime products for out-of-State steel, chemical, metallurgical, and construction industries. The Sloan quarry and plant was equipped for crushing, screening, calcining, and hydrating. It supplied lime products to the previously mentioned industries and furnished dolomitic limestone both to the steel industry for refractory purposes and to the Henderson plant for further processing.

The Overton area was the source of a variety of industrial sands in 1955. Hunt Foods, Inc. (formerly Nevada Silica Sands, Inc.), processed glass and molding sands at a washing and drying plant at

Simplot Silica Products, Inc. (formerly The Nunn Co.), processed sand in a hydroclassification plant at its open pit. Molding sand was produced by Fred L. Morledge (West Coast Silica) at the Red Gorge pit and the Moapa Placer claims and by Snoreen & Son

at its Kaolin Wash pit.

Atlas Ready Mix Concrete (formerly run by Stewart & Hitchcock), Las Vegas Building Materials, Inc., Stocks Mill & Supply Co., and Tri-City Rock & Sand, Inc., produced structural sand and gravel from pits adjacent to the city of Las Vegas. Las Vegas Building Materials, Inc., Wells Fargo, Inc., and J. M. Murphy Construction Co. of Las Vegas also produced sand and gravel for paving. Fargo, Inc., used portable washing plants at its three Las Vegas pits. Appreciable tonnages of sands for miscellaneous use were also produced by Hunt Foods, Inc., Fred L. Morledge, and Las Vegas Building Materials, Inc., at open pits. Sand and gravel for roadwork was produced by the Clark County Road Department, Nevada Highway Department and its contractors, and the National Park Service.

Production of crude and calcined gypsum was considerably above that in the preceding year. Blue Diamond Corp. worked its open-pit gypsum mine and operated a plaster mill and wallboard plant southwest of Las Vegas. Some crude gypsum was sold for use as a cement retarder and for agricultural purposes. Production in excess of requirements for plaster and wallboard at the Blue Diamond plant was shipped to plants in California. Pabco Products, Inc., mined gypsum at its White Eagle open-pit mine west of Henderson and shipped the entire production to its wallboard plant in Southgate, Calif.

The production of stone, excluding limestone, in 1955 increased chiefly because of output of crushed granite by the City of Las Vegas and its contractors for use in concrete and road metal. Harry W. Amey leased the Nevada Red sandstone quarry on the Tonopah Highway northwest of Las Vegas and produced dressed building stone and flagstone. John Ballance leased the Red Bluff mine (formerly operated by Nevada Flagstone Quarries, Inc.) northwest of Goodsprings and produced building stone, flagstone, and rubble. Diamond Gold Mining Co. produced several thousand tons of roofing granules from sandstone in this same district at its mill in Jean, Nev. The Nevada State Highway Department and its contractors produced a small tonnage of miscellaneous stone used as riprap in road construction.

The lead residue collected as a result of treating manganese ores at the concentrator of Manganese, Inc., supplied most of the lead produced in the county. This residue, which also contained some gold, silver, and copper, was shipped to a Utah smelter. Most of the remaining gold production and a little silver came from the Blossom mine of Searchlight Uranium Co., Searchlight district. Nearly all county zinc production came from ore obtained at the National Stockpile at Jean, Jean district. These ores, containing considerable silver, copper, and lead, were mined in the Goodsprings (Yellow Pine) This same district furnished the remaining gold, silver, copper, lead, and zinc production from ores mined in 1955. The copper came from the Azurite mine, "99" mine, and Ruth group; silver from these 3 mines, plus the Bell, Maiden Rock, and Root-Zinc mines; and lead from the 6 aforementioned mines and the Mineral King mine.

The Bunkerville district was the source of the tungsten produced in the county. Tri State Metals, Inc., shipped concentrate from the

Silver Leaf mine near Mesquite to ore buyers.

Silicates Corp. mined a small tonnage of bentonite clay at the Frances mine, northeast of Las Vegas. The entire production was shipped out-of-State for ultimate use in cosmetics and pharmaceuticals.

Nevada Perlite Co. expanded perlite at a processing plant in South Las Vegas, Nev., from crude material obtained from California mines. Cind-R-Lite, Inc., manufactured several types of concrete brick, hollow tile, blocks, precast slabs, and pipe at a plant a few miles south of Las Vegas, using volcanic cinder in the aggregate from its quarry in Nye County. At Henderson, a chemical plant of Titanium Metals Corp. of America produced titanium sponge and ingots by a modified Kroll process. Considerable quantities of chlorine, magnesium metal, and coke, all from out-of-State, were consumed in the process. shipment of uranium ore was made by Wm. C. Bushman from the First Chance mine in the Gold Butte district during the last half of the year.

Douglas.—Tungsten ore and concentrate were the chief mineral commodities produced in the county in 1955. The Mountain House (Pine Nut) district yielded all of the tungsten production. Although more properties were worked, the short-ton units of WO3 declined 40 percent from the previous year. Metallurgical Development Co. operated the Owl, Ramona, Scheelite, Tungstate, and Tungsten Hill mines, milled tungsten ore, accepted ore for custom milling, purchased concentrate either for beneficiation or blending at its mill, and as sole producer, marketed all the tungsten concentrate. Other producers of tungsten ore were: Claude B. Lovestedt, at the Snow Bird and Last Laugh mines and Vern Bennett, also at the Last Laugh mine.

Appreciable tonnages of paving sand and gravel were produced by the Nevada Highway Department and the Douglas County Highway Department and contractors. Production rose over 100 percent from the previous year. The Nevada Highway Department also produced a small tonnage of crushed granite, which was used in surfacing roads.

Standard Slag Co. produced magnetite for export at its Minnesota open-pit mine in the Buckskin district. Although mine production had increased, shipments were about one-fourth those of the previous year. Thus accumulated stocks were appreciable at the end of 1955. Also in this district, some gold and silver were produced from the Buckskin mine, operated by E. F. Shultz, and from the Artful Dodger

group of claims, operated by Scanlan Gold Mining Co.

Elko.—The value of sand and gravel produced in 1955 increased almost 400 percent over 1954, owing to the increased activity of State and county agencies and their contractors. White & Alter produced washed sand and gravel commercially at about the 1954 rate for structural use in concrete and mortar from deposits on the Humboldt River near Elko. Contract Mining & Trucking Co. produced a small tonnage of roofing granules from miscellaneous stone at its open pit and crusher a few miles south of Wendover Junction.

Elko County mines yielded more than 2,500 short-ton units of WO<sub>3</sub> in 1955, slightly above 1954. The greatest output came from the Ruby Valley district. The leading producers were: George F. Ogilvie and Lowell Thompson, Star mine; Hugh Baldwin, Baldwin lease; Jim Stinnett, Climax mine; and Jessie Gilbert and Floyd Olsen, Anna D. mine. Other tungsten-producing areas of note were: The Jarbridge district, where Gilbert & Madden operated the Montana group of claims, and the Contact district where Donald L. Fife worked the Tunnel mine. The Ruby Range, Kinsley, and Mountain City districts each contributed small quantities to the county total. Most of the ore mined in the county was treated by Getchell Mine, Inc., in Humboldt County. Small lots of concentrate were sold to ore buyers. During the year tungsten exploration was begun under DMEA in the Spruce Mountain district.

In producing base-metal ores, this county ranked fourth in copper and lead and third in zinc. Most copper yield was derived from the direct-smelting ores of the Bonnie Copper, Lucky Boy, Marshall, and Zetta Blanchard mines in the Contact district. The copper ore of the Marshall mine also contained considerable silver. The Delno mine in the Delano district and the Diamond Jim group of claims in the Island Mountain district together produced most of the lead and silver credited to the county in 1955. Some copper and gold were recovered in smelting these lead ores. The Delno mine was the chief producer of zinc in the county, by virtue of the metal recovered at a California smelter-fuming plant. Other districts producing base metals and silver were: Loray, Railroad, Ruby Valley, and Tecoma.

Although there was only a token production of barite in Elko County during the year, shipments to California plants were only slightly under those in 1954. Stocks at the Rossi mine of the Baroid Division, National Lead Co., were appreciable at the beginning of the year, and shipments were made from this stockpile to the companyowned plant at Merced, Calif. A small tonnage of barite was produced by E. J. Solomon at the Dixie claims near Palisades and shipped to the Chemical & Pigment Co. plant in Alameda County, Calif.

About 10 flasks of mercury was retorted from ore produced at the Staggs and Quilici underground mine in the *Ivanhoe* district; a small quantity was obtained by retort from ore mined by Whinery & Williams at the Berry Creek open pit in the *Tuscarora* district.

Esmeralda.—Of the three Nevada counties that produced diatomite during the year, Esmeralda was second in total output. The Dicalite Division, Great Lakes Carbon Corp., worked an open pit where it maintained a plant for crushing, drying, and air separation, a few miles southeast of Basalt. Most of the diatomite was used for filler in paper, paint, and insecticides. The demand for this commodity in 1955 remained about the same as in the previous year, and production increased only slightly.

Output of the Mohawk mine and subsequent cyanide treatment of the mined ore by Bruhi Mining Co. in the Silver Peak district made Esmeralda County the largest silver producer in Nevada for 1955. The mine produced the entire year, and silver-bullion shipments from the mill to a California smelter-refinery began in October. A few ounces of gold was recovered in processing the bullion. The Newmont Mining Corp. Florence mine in the Goldfield district was the source of gold ore, which yielded most of the gold and some silver. This fluxing ore was treated at the McGill, Nev., copper smelter. Other districts that contributed to the county gold and silver produc-

tion were the Gilbert, Tokop, and White Wolf.

All of the active mining of talc and soapstone deposits in the State is conducted in the area between Dyer and Lida on the west slope of Silver Peak Range in Esmeralda County. Huntley Industrial Minerals, Inc., and Sierra Talc & Clay Co. mines in the Palmetto Mountains area shipped talc to their respective grinding plants in California. These companies also purchased talc and soapstone for their plants from the mines in the Sylvania area, where the leading talc producers were Archie Brady (White King mine) and Goehring, Goehring & Gann (C. C. Talc mine). H. N. Stewart (Gates and Hide Out mines) was the leading soapstone producer.

American Gem Co. produced an appreciable quantity of high-grade turquoise at its Lone Mountain turquoise mine in the Lone Mountain area for commercial sale as a gem stone at its shop in Tonopah, Nev. The Nevada Highway Department prepared gravel for paving from various deposits in the county. The tonnage was about four times

that of the previous year and slightly higher in unit value.

Three districts furnished virtually all the tungsten in Esmeralda County during 1955. Don Burgner (Black Horse mine), in the Miller Mountain district, was the leading producer. Most of his output was sold to a California mill as ore; a few units of WO<sub>3</sub> in concentrate was sold to an ore buyer. Don Clair (4 Aces mine) in the Sylvania district and Charles Pedro (Constellation mine) in the Pilot Peak area each produced a few units of WO<sub>3</sub>, which were sold to an ore buyer. Three other producers, as a result of test and development work, sold small quantities of tungsten concentrate to an ore buyer.

A few flasks of mercury was produced at the Red Rock mine in the Buena Vista district by Walter F. Dunnigan. The ore was treated in a 30-ton-a-day rotary furnace and in two D-type retorts. The Kollsman Mineral & Chemical Corp. did considerable work at the B & B Quicksilver property in the same district preparing the open-pit

mine, mill, and extraction plant for production early in 1956.

Eureka.—This county ranked second in Nevada in both lead and silver production and fourth as a producer of zinc and gold in 1955. In the Eureka district the Diamond and Excelsior mines of Consolidated Eureka Mining Co. were the leading producers of lead, silver, and gold; Richmond Eureka mine, of Eureka Corp., Ltd., output contained a considerable quantity of lead and silver; and the Blue Star mine, operated by Edgar, Edgar & Edgar, yielded a few tons of copper and some silver. Dump material from the Cortez property in the Cortez district, shipped by McFarland & Hullinger to a California smelter-fuming plant, yielded appreciable quantities of lead, zinc, silver, and gold. Direct-smelting ore from the Francis mine of Keller & Pruitt in the Diamond district was the source of a large percentage of the county zinc and some lead, silver, and copper. Approximately half of the copper came from the Good Hope mine operated by N. W. Keller in the Maggie Creek district. Appreciable quantities of lead and silver also were produced from ores mined at the Juniper mine in

the *Union* district and from the Antelope group in the *Fish Creek* district.

Although its Modarelli mine, in the Amarilla district, was idle until September, Simplot Iron Mines, Inc., had mined nearly 100,000 tons of hematite ore by the end of the year. Less than half this tonnage was shipped to the west coast for export, the remainder accumulated

as stock. The mine had been idle since early 1953.

Over 100,000 tons of miscellaneous stone was produced by Archie L. Till, under contract with Southern Pacific Railroad Co., for road ballast. A portable crushing plant was used in preparing this stone. The Nevada Highway Department and its contractors prepared considerable tonnages of paving sand and gravel for use in road construction and maintenance. D. L. Pruitt shipped a small tonnage of volcanic ash from a deposit northwest of Carlin, to an Alameda County, Calif...

grinding plant.

Humboldt.—Humboldt County mines were the leading tungsten producers in Nevada, yielding more than one-third of the output in the State in 1955. The Osgood Mountains, north of the Humboldt The Osgood Mountains, north of the Humboldt River, and the Sonoma Range, south of the river, were the source areas for this production. The leading producers were Union Carbide Nuclear Co. (Riley mine) and Getchell Mine, Inc., both in the Potosi The latter company milled ore for the former under contract and also treated ore purchased from other producers in the The mill handled all but a few hundred tons of the county tungsten-ore production; the remainder was purchased by miscellaneous ore buyers. Two other important producers of tungsten ore in the Potosi district were TNT, Inc., at the Mountain Queen claims and Spitzer, Hosking & Etchart at the Valley View mine. Ore from both properties was shipped to the Getchell Mine, Inc., mill. Production of tungsten concentrate in the county increased approximately 25 percent from the previous year.

The McDermitt district was the principal mercury-producing area in the County and State. Cordero Mining Co. operator of the Cordero mine and reduction plant in this district, was the leading producer of that metal in the Nation. Ore from this underground mine was treated in a 100-ton-per-day Herreshoff furnace, and the mercury product was sold to various buyers. The only other area in the county that produced mercury during the year was the Poverty Peak district, with small yields from the Cahill, Conchita, and McAdoo mines.

Humboldt County was the second-ranking producer of iron ore in the State. The output was magnetite from the Iron King open pit worked by A & B Mining Co. in the *Jackson Creek* district. Total production was slightly below that in the previous year, and most of

the ore was shipped to eastern steel furnaces.

The tonnage of paving sand and gravel prepared and used by the Nevada Highway Department and its contractors was more than five times that of 1954. Pacific Stone, Inc. (formerly Owyhee Stone Co., Inc.), quarried sandstone west of Denio, dressing and palleting the stone at its mill near Winnemucca. Wegman Bros., contractors, produced rough architectural sandstone from the same property. Stone production in 1955 was more than three times that in the previous year. The value of gem-stone output during the year amounted to several thousand dollars. The Rainbow Rock Shop

produced common and fire opal from the Rainbow Ridge and Bonanza mines in the Virgin Valley area and Clifford C. Zarley produced

rhodonite near Golconda for gem-stone and specimen use.

Nearly all copper and silver produced in the county in 1955 was recovered from dump material shipped to a Utah smelter from the Morning Glory and Morning Star mines in the Battle Mountain district. Consolidated Mines produced gold and silver by amalgamating ore at the Alabama mine in the Awakening district. Frank Gliko mined at the Jumbo group of claims in the National district, and silver and zinc were recovered from the ore at a California smelter-fuming plant. A few ounces of gold was produced from ancient river and stream gravels by small-scale hand methods in the Awakening and Gold Run districts.

Humboldt County had the only production of sulfur ore in Nevada in 1955. Sulphur Products, Inc., mined a few hundred tons of ore at the Vitallo mine near Sulphur, which was crushed and sold for agricultural use. A very small tonnage of low-grade manganese ore was taken from the Black Diamond mine in the *Iron Point* district and shipped to the GSA depot at Butte, Mont. Uranium Metals, Inc., made two shipments of uranium ore from the *Kings River* district

during the year.

Lander.—Nearly all of the county gold production came from two districts. Placer gold was mined from alluvial gravel using a bucketline dredge, at the Greenan placer claims in the Battle Mountain district, operated by Natomas Co. Lode gold was obtained from ore of the Goldacres open pit in the Bullion district and cyanided by London Extension Mining Co. The efforts of these two companies gave Lander County a gold-production value second to White Pine County. Most copper and silver and all lead and zinc came from ores of the Battle Mountain district. The chief copper and silver producers that shipped ore to smelters were: E. H. Potter (Carissa mine); A. R. Hider (Contention mine); Battle Mountain Copper Co. (Copper Basin claims); Balch, Games & Coulter (Copper King mine); Hinman & Sellers (Extension mine); Burns & Belaustegui (Henrietta mine); Cole, Layton & Dolezal (Independence mine); Elquist & Stoner (Superior lease); and Hugh B. Hullinger (Galena mine) who salvaged various mine dumps in the district. Most of the county lead and zinc were recovered at a Utah concentrator-smelter from ore mined by Hugh B. Hullinger and Joe Belaustegui. Although gold production dropped slightly, the yields of silver, copper, lead, and zinc were appreciably above those in 1954.

In 1955 Nevada ranked fourth nationally in crude barite production; Lander County furnished nearly 70 percent of that yield. Barium Products, Ltd., operated the Argenta mine and the Mountain Springs mine, 15 and 26 miles south of Battle Mountain, respectively; both were open pits. The barite was shipped to the companyowned plant at Modesto, Calif. Magnet Cove Barium Corp. mined barite by open-pit methods at its Greystone-Wildhorse group of claims, 37 miles southeast of Battle Mountain, crushing and grinding the crude mineral at the Beowawe mill in Eureka County until late in the year, when the new company plant at Battle Mountain was completed. Most production was used in preparing "Magcobar" drilling mud at company-owned plants outside the State. Alfred

Shelton mined barite at the Second Chance open-pit mine and Andrew J. Shelton at the Baryte No. 1 mine, both about 16 miles east of Battle Mountain. Paul R. Sloan mined the crude mineral at the White Rock group in the Beowawe area. The last three producers shipped their output to an Alameda County, Calif., grinding mill. Production of barite in the county increased over 50 percent over the previous year.

Production of tungsten concentrate in the county during 1955 was more than 10 times greater than in the previous year. The chief reason for the increase was the yield of the Linka mine and mill run by Consolidated Uranium Mines, Inc., in Big Smoky Valley near Spencer Hot Springs. Another leading producer in this area was Gale G. Peer at the Conquest mine. T. D. Shuck operated the

Sunnyside Mill, also in this same area.

All county mercury production came from the McCoy mine in the Wild Horse district. After a small yield during the first 2 months of the year by McCoy, Casteel & Pedler, the mine was leased to United Mercury Corp., which spent most of the year in development

and construction work.

Other activities in the mineral industry of the county included shipment of a small tonnage of low-grade manganese ore from the Last Chance mine in the New Pass district by the Last Chance Mining Co., to the GSA depot at Butte, Mont., and the mining of an appreciable quantity of turquoise from the Blue Gem lease in the Battle Mountain district by Wendell and Bert King. The Lander County Road Department and the Nevada Highway Department produced several thousand tons of paving gravel for use in road maintenance. Uranium Mines, Inc., from the Reese River district, and Valley View Uranium Mining, from the Valley View area, shipped uranium ore during the second half of the year.

Lincoln.—This county contained the State's leading individual producer and ranked third in output of tungsten concentrate. The Lincoln Mine Division, Wah Chang Mining Corp., Tem Piute district, shipped tungsten-bearing material to Salt Lake Tungsten Co. in Utah and to Union Carbide Nuclear Co. in California for chemical treatment. The company consigned medium-grade concentrate to Wah Chang Corp., at Glen Cove, N. Y., for further treatment and sold commercial-grade concentrate to GSA. A 750 ton-per-day gravity and flotation mill was operated at the mine location. Y–Z Mining Co. and Molybdenum Corp. of America worked the North Tempiute mine. The former shipped ore and concentrate to a California custom mill, and the latter sold concentrate to an ore buyer. Production in the county increased approximately 25 percent over the previous year. Combined Metals Reduction Co. produced all Lincoln County

Combined Metals Reduction Co. produced all Lincoln County manganese output in 1955. Manganese ores from the Pioche No. 1 and No. 2 mines, *Pioche* district, were treated at the Caselton mill during the first part of the year, and the manganese concentrate produced was shipped to Pioche Manganese Co., an affiliate, at Henderson, Clark County. Later some of this material and manganese ore from the Southpaw mine in the *Pahranagat* district was consigned to an electrolytic manganese dioxide plant at Henderson. Manganese ore from the Southpaw mine also was shipped to the Deming, N. Mex.,

and Wenden, Ariz., Government Purchase Depots.

Nearly all of the copper, lead, and zinc produced in the county came from ore mined in the Bristol Range. Lincoln County led the State in zinc production and ranked third in the output of lead. The properties of Combined Metals Reduction Co. in the Pioche district yielded a large part of the silver, lead, zinc, considerable copper, and some gold from zinc and lead concentrates treated at Montana and Utah smelters, respectively. The Bristol mine in the Jackrabbit district, operated by Bristol Silver Mines Co., contributed most of the county copper output and appreciable quantities of silver, lead, and zinc from copper-lead-zinc ore reduced at a Utah smelter-fuming plant. The Atlanta mine, Atlanta district, furnished most of the county gold production and several thousand ounces of silver from flux ore smelted at the McGill, Nev., copper smelters. A shipment of uranium ore was made from the district by Hulse, Parks & Hezzlewood in the first 6 months of 1955.

Morrison-Knudsen Co., under contract to Union Pacific Railroad Co., quarried and crushed approximately 200,000 tons of miscellaneous stone near Caliente for use as riprap and railroad ballast. Contractors for the Nevada Highway Department produced nearly 100,000 tons of paving sand and gravel for use in road construction and repair. Crude perlite was quarried by Combined Metals Reduction Co. at the Hollinger property, 17 miles northeast of Pioche, and by Delamar Perlite Co., at the Mackie mine in the Ferguson district. The crude perlite in each instance was shipped to out-of-State expanding plants.

The Bluenose mine in the Viola district, operated by Crystal Mining Corp. of Nevada, yielded a small quantity of mercury, which was

sold to a California broker.

Lyon.—The yield of cement copper at Anaconda Co. open-pit mining and leaching plant at Weed Heights near Yerington made Lyon County the second-ranking copper producer in the State; tonnage increased appreciably over the previous year, was shipped to a company smelter in Montana. The J. B. Bookman, Mason Valley mine, in the same area, produced direct-smelting ore which yielded considerable copper and a few ounces of silver. The Dayton mine, operated by Steve Brighenti in the Silver City district produced a small quantity of gold and silver through smelting of flux ore at the McGill, Nev., copper smelter. Gold production dropped sharply from the previous year; no placer gold was mined in 1955.

The Nevada Highway Department and its contractors produced an appreciable tonnage of paving sand and gravel for use in road construction and repair. Industrial Minerals & Chemical Co. output of fuller's earth at the Jupiter mine north of Weeks was mined under contract by John Holly for shipment to California and was the only production of this commodity in the State. The Aquafil Co. mill and drying plant, Fernley, processed diatomite produced at its mines in

Churchill County.

Tungsten production in Lyon County came from 6 mines worked by 6 producers, in the *Red Mountain* and *Churchill* districts and was less than half that in the previous year. Claude B. Lovestedt, who operated the Blue Star mine, Garett, and S. P. leases, was the leading producer. The entire yield of tungsten concentrate was sold to ore buyers for further beneficiation.

Mineral.—Over 50,000 short ton units of WO3 was produced in 1955 at mines in Mineral County, the fourth-ranking tungstenproducing county in Nevada. Nevada Scheelite, Division of Kennametals, Inc., the leading producer in the county and fifth-ranking State producer, mined tungsten ore in the Rawhide district, milled company and purchased ores, and purchased concentrate from other producers. The Silver Dyke mine in the Silver Star district was mined by several producers during the year. Joe Kaufman, leading producer, shipped ore to a California custom mill and sold concentrate to an ore buyer. Consolidated Uranium Mines, Inc., mined tungsten ore at the Lindsay and Gun Metal mines in the Pilot Mountain district and shipped to its Linka mill in Lander County. Phil Heater worked the Old Gentry mine in the Walker Lake district, operated a 5-ton gravity mill, and shipped the tungsten concentrate to Nevada Scheelite Corp. Minada Corp. carried on exploration and development work at the Eagle mine in the Santa Fe district and shipped tungsten ore to a California custom mill. Exploration and development work was carried on by Schaff, Bednar Jones & Reinmiller at the Windup tungsten property in the Garfield district under the DMEA program.

Kaiser Aluminum & Chemical Corp. mined fluorspar at the Kaiser mine in the Broken Hills district and shipped the mineral to its concentrator at Fallon, Churchill County, for upgrading to acid quality. Macco Corp. worked the Noquez Barium property, Santa Fe district, and shipped barite to a processor in Los Angeles, Calif.

Ores of the Candelaria district yielded most of the county silver, The leading silver producer was the Northern Belle mine operated by Argentum Mining Co. of Nevada, which shipped silver concentrate to Nevada and California smelters. Secondranking producer was the New Potosi mine, operated by G. A. Peterson & H. Hunter, which yielded direct-smelting lead ore; this mine also led in gold and lead production from ore containing substantial quantities of recoverable antimony. The Petrol mine, in the same district, yielded several hundred ounces of silver and furnished most of the county zinc output from ore treated at a California smelter-fuming plant. Direct-smelting copper ore from the Hercules and Last Chance mines in the Silver Star (Marietta) district and Bluelight mine in the Walker Lake district yielded nearly all of the copper produced in the county in 1955 and an appreciable quantity The lead ore shipped to a California smelter from the Towe mine, worked by Ernie McQueens, in this district, contained considerable lead and some silver.

Sonora Marble Aggregates Co. quarried a few tons of marble southwest of Luning. The crushed product, "Neva Chips," was sold for terrazzo. C. W. Cooper mined a small tonnage of pumicite in the Sodaville area and used it as concrete aggregate. Frey Mineral Enterprises mined a few tons of muscovite mica for use as mineral specimens and Clifford C. Zarley collected several hundred pounds of petrified wood for commercial sale. The Nevada Highway Department produced several thousand tons of paving gravel for use in road maintenance. A. E. Taylor recovered a small quantity of mercury from ore treated at the Moser mine in the Pilot Mountain district and sold the output to a California broker. International Metals Co. (Big M Uranium Co.) made one shipment of uranium ore from the

Kincaid district during the first part of the year.

Nye.—Despite the output from more than 40 operations by nearly 50 producers, the county produced less than 30,000 short-ton units of WO<sub>3</sub> compared with more than 35,000 in 1954. Several districts contributed to the county total tungsten output; the Lodi district yielded the greatest part. Leading producers in this district, in order were: Gabbs Exploration Co., owners of the Victory mine and gravity and flotation mill, and El Capitan Mining Co., which leased the El Capitan mine and shipped the ore to Yaney Milling Co. at Gabbs, Nev. Exploration and development work for tungsten ore was begun under a DMEA project at the El Capitan property. The Terrell, Doris, and Commodore mines also contributed a few hundred units of WO<sub>3</sub> to the district total. The Bobbie mine, principal source of tungsten ore in the Twin River district, was worked by at least nine separate producers. The Goldenrod mine, (Butterfield Marsh district), the Grand Junction group (Carrara district), the Nyco mine (Union district) and the Nye mine (Troy district) also yielded ore, which contributed an appreciable number of units of WO3 to the county total.

In 1955, all Nevada magnesite and brucite was produced from deposits on the west slope of the Paradise Range near Gabbs. Basic Refractories, Inc., mined the Betty O'Neal pit, ran the rotary kiln in its plant at the property, and produced caustic-calcined magnesia. This company, sole producer of brucite, mostly shipped its product to company-owned plants outside the State for use in manufacturing "Basifrit"; a small tonnage went to California plants for chemical Standard Slag Co. produced magnesite from the pit of its Greenston Addition mine and ran a calcining plant, 3 miles east of Gabbs. The mined material contained some brucite but no attempt was made for separation. A high percentage of the calcined product was shipped to west coast ports for export. At the leased Phelps-Stokes open pit a few miles north of its magnesite property, Standard Slag Co. also mined iron ore mostly for export; some was used in preparing dead-burned magnesia at Gabbs.

Nye County was also the sole producer of crude petroleum in the State in 1955. The only production came from wells of the Shell Oil Co. Eagle Springs Unit. The company added to its established production in Railroad Valley and maintained the largest geologic and geophysical staff in the State. Of the total of 10 wells drilled, only three produced; two were producing at year end. During December, Shell Oil Co. announced its sales contract with Douglas Oil Co., of Bakersfield, Calif., for the entire 1956 production, which

was about double that in the previous year.

J. Irving Crowell, Jr., mined Metallurgical-grade fluorspar at the Daisy group, 5 miles east of Beatty, and shipped the crude mineral to iron and steel furnaces in California. In the same area the New Discovery mine, operated by L. R. Moretti as trustee for Silicates. Corp., yielded a small tonnage of bentonitic clay, which was shipped to a California plant and prepared for special use in manufacturing pharmaceuticals. At the Jumbo mine near Tonopah, Nev., Chemical & Pigment Co. produced a small tonnage of barite and consigned the material to its plant at Oakland, Calif.

Nevada Highway Department and its contractors and the Nye County Highway Department prepared appreciable tonnages of paving sand and gravel for use in road construction. The Nevada Highway Department also produced a small quantity of crushed miscellaneous stone for use as riprap. Mercury Quartz Co. produced a moderate tonnage of roofing granules from its open pit northwest of Indian Springs, using a portable plant to crush the sandstone. Cind-R-Lite, Inc., produced several thousand tons of volcanic cinder from an open quarry south of Beatty and shipped the material to its

block plant in Clark County.

The Manhattan district yielded all of the placer gold and most of the lode gold in the county. Placer mining was limited to a drift mine on stream and bench gravels and a small-scale hand operation on an ancient stream bed. The Gold Metals group of claims, mined by Nathan Blake and leading in lode-gold production, processed gold ore by amalgamation. The Reveille mine, Reveille district, shipped lead ore to a Utah smelter, was the leading producer of lead and considerable silver. Tailing, shipped to a California smelter-fuming plant from the Liberty property in the Tonopah district by L. D. Foreman & Co., furnished a large percentage of the silver and zinc production and appreciable quantities of lead and copper in the county. Direct-smelting ore from the Black Butte mine in the Lodi district and the Johnnie mine in the Silverbow district was treated in California and Nevada smelters, respectively, and yielded some silver.

A few flasks of mercury was produced in 1955 from four mines. The Prescott mine in the *Union* district and the Magee mine in the *Jett* district were the chief producers in the order named. Most of the county mercury yield was marketed in California; relatively few

flasks were sold to a local broker.

Ormsby.—The nature of mineral deposits and the relatively small area of Ormsby County have limited mineral yield. All of the production value in 1955 came from sand and gravel and tungsten concentrate. The Nevada Highway Department and its contractors produced and prepared paving sand and gravel for highway maintenance. The Forbusch mine, Carson City district, the Kings Canyon mine, Voltaire district, and an unidentified prospect were credited with all of the short-ton units of WO<sub>3</sub> produced. Tungsten ore from the mines was shipped to a nearby custom mill in Douglas County; output of tungsten concentrate from the prospect was purchased by an ore buyer.

Pershing.—During 1955, the county led in output of iron ore and ranked second in tungsten concentrate, gypsum, mercury, and perlite in the State. Tungsten production reached more than 70,000 shortton units of WO<sub>3</sub>, a slight increase over the previous year. Nevada-Massachuse ts Co., leading individual producer of tungsten concentrate in the State, worked the Tungsten group of mines in the Mill City (Central) district and supplied approximately 90 percent of the county tungsten yield. Company ore was treated at the mill by gravity concentration, flotation, magnetic separation, and acid leaching. Wolfram Co., the second-ranking county producer of tungsten concentrate, worked the Nightingale mine in the Nightingale district and ran a custom mill at Toulon. The principal producers of the remaining tungsten at more than 30 mines in 12 districts were Stormy Day mine in the Hooker district, mined successively by Fred

M. Anderson & Associates, Modoc Mines & Exploration Co., and Nev-Tah Oil & Mining Co.; M. G. L. mine in the Ragged Top district, where Carson Tungsten Co. mined and Acme Mining Co. salvaged tailings from the tailing pond for treatment at a Douglas County custom mill; L. K. Johnson, who operated the Rose Creek mine, Sierra district, which shipped ore to a mill in Humboldt County; Wm. Cooney & Sons, who worked the Newlite No. 5, Sage Hen properties, Trinity district; and the Sugar Hill and Holiday Extension properties in the adjacent Seven Troughs district, which shipped concentrate to a Mineral County mill.

United States Gypsum Co. operated the Empire Gypsum quarry, 10 miles south of Gerlach, and the adjacent processing plant extending into Washoe County. This company contracted with John Pedro to mine perlite at its Pearl Hill quarry northwest of Lovelock, for crushing by the Wolfram Co. (under contract with United States Gypsum Co.) at the Kodak perlite mill near Lovelock and expansion at the Empire

plant in Washoe County.

Pershing County supplied over 40 percent of Nevada iron-ore production, mostly mined by Dodge Construction, Inc., from the Segerstrom & Heizer open pit, Mineral Basin district. Total production in 1955 was substantially below that in 1954. The ore mined was magnetite, and nearly all was shipped to west coast ports for export and ultimate use in making iron and steel. The Thomas mine in the Relief (Antelope Springs) district was worked by two producers in 1955. Nevada Iron Ore Co., Inc., mined hematite by open pit at the north end of the deposit for sale either to eastern steel plants or to a California broker for local steel producers. Parker Bros., at the southern end of the Thomas deposit, mined magnetite ore mostly for shipment to eastern steel plants.

Mercury production came principally from five districts in the The Relief (Antelope Springs) district was the most productive, where the Eastern Star, Redbird, Last Chance, and Lori No. 1 mines and the Vulture group of claims supplied most of the yield. Other producers of mercury were the Black Jack mine in the Humboldt district, the Freckles mine in the Table Mountain district, the Hillside mine in the Spring Valley district, and the Eureka mercury mine in

the Kennedy district.

Most gold and silver production in the county was from placer deposits. Constant Minerals Separation Process, Inc., mined alluvium in the Rabbit Hole district; Barber Mining Co. in the Sierra district, and Hunter, Hunter & Hagler, in the Willow Creek district, washed stream gravel. All three used stationary washing plants to recover the gold and silver. In the Seven Troughs district, L. J. Nickerson, at the Chevrolet property, and W. A. Busch, at the Lookout No. 6 claim, mined a few ounces of lode gold and silver.

The Nevada Highway Department and its contractors produced about 175,000 tons of paving sand and gravel for use in road con-

struction and maintenance.

Storey.—The Celatom mine east of Sparks, under lease to Eagle-Picher Co., produced a large part of Nevada diatomaceous-earth output in 1955. The deposit was worked by open-pit methods, and the output was trucked 7 miles to the company plant at Clark Station on Highway No. 40, where it was crushed, ground, screened, dried,

classified, and calcined. The product was shipped to eastern outlets; and some to Canada for use in insulation, refractories, filters, and miscellaneous applications. Demand for the diatomite was strong, and

production exceeded that of 1954.

The Comstock Lode district yielded all of the relatively small gold and silver output in the county in 1955; a large part came from the Six Mile Canyon mine. The material was cyanided at the Donovan mill in the adjacent Silver City district, Lyon County. Some gold and silver were recovered at the Overman mine during a mill cleanup, and a small tonnage of fluxing ore was shipped to the McGill, Nev., copper smelter. The properties of Consolidated Virginia Mining Co., Sutro Tunnel Coalition Co., and Dayton Consolidated Mining Co. also yielded some gold and silver. A production has been recorded each year from this district since the discovery of placer gold in 1850, and it became famous from silver output instead of gold. The peak production year was 1878; nearly \$200 million in gold and silver was recovered from 4 million tons of ore mined and treated during the

period from 1871 to 1880.

Washoe.—The Reno area, one of the two important industrial sections of the State, has placed an increasing demand on the construction industry. Two stationary and at least 5 portable plants in the area produced more than 0.5 million tons of sand and gravel during The leading producers were: Smith-Petersen & Co., structural sand and gravel for mortar and concrete; Isbell Construction Co. (portable plant), paving sand and gravel; Bob Williams, structural sand and gravel; and Earl E. Gomes (portable plant) structural gravel. George E. Miller used portable plants to produce several thousand tons of crushed granite for concrete and road metal. The Nevada Highway Department and its contractors produced over 100,000 tons of paving sand and gravel for use in road construction and about 200 tons of crushed miscellaneous stone for riprap. Near Pyramid Lake, Double Check Products Co. produced calcareous marl from its Double Check open quarry. This material was ground and mixed with other ingredients in preparing poultry and livestock feeds. Reno Press Brick Co. mined fire clay and miscellaneous clays at the Faith and Geiger pits in the Steamboat Spring area about 6 miles east of Sparks, and at the Revelation pit. The clay was used to manufacture refractory brick and block, and heavy clay products at the company's Reno Production of clays in 1955 was slightly above that in the pre-ear. Frey Mineral Enterprises of Reno collected samples of sulfur ore, piedmontite, and schroeckingerite for mineral specimens. Constant Minerals Separation Process, Inc., shipped a few tons of lead ore containing a few ounces of silver and some zinc from the Galena Hill mine in the Galena district to a California smelter-fuming plant. In the Olinghouse district, dump ore from the Cabin No. 2 and Texas No. 2 claims was amalgamated and yielded more than 100 ounces of The Empire mill of United States Gypsum Co., gold and some silver. Empire, processed gypsum from the adjacent quarry, in Pershing County and expanded crude perlite received from its quarry in Pershing County. During the first half of the year, Siskon Corp. shipped uranium ore from the Buckhorn Group of claims in the Red Rock district, which borders on Lassen County, Calif.

White Pine.—This county led all Nevada counties in total mineral production in 1955; it was first in output of copper and gold, second in lime, and third in silver yield. In addition, it furnished the only molybdenum concentrate in the State. A very large percentage of the State copper, gold, and silver production and all the molybdenumconcentrate output came from combined pit and underground operations in the Robinson district of the State's second- and third-ranking copper producers—the Kennecott Copper Corp., Nevada Mines Division, and Consolidated Coppermines Corp. Kennecott milled porphyry copper ores at its McGill concentrator and smelted copper concentrate at its McGill smelter. Blister copper was shipped to eastern plants for refining. The McGill smelter also received fluxing ores containing copper, gold, and silver from 39 mines in Nevada, California, and Utah. The White Pine County properties in this group included: The Horseshoe and Union Chief mines (copper ore), Sunnyside mine (silver ore), Robinson district; the Siegel mine (silver ore), Aurum district; Bay State mine (silver ore), Newark district; and Grand Prize mine (copper ore), White Pine district. Producers of lead in the county, who were also contributors of several hundred ounces of silver to the State total, shipped ore to a smelter and a smelter-fuming plant, both in Utah. The leading producers were: Grand Deposit Mining Co., Grand Deposit mine, Aurum district; D. A. & Blanca Jennings, Belmont mine, Ivan Lewis, Rocco Homestake mine, White Pine district; O. B. Mining Co., Good Luck claim, Ward district; Knapp Bros., Hana (Hannah) mine, Horse Canyon district; and Donald McCord, Delmac mine, Robinson district. Delmac mine was the source of the small zinc output in the county in 1955.

The Minerva mine, Shoshone district, yielded most of the tungsten approximately 10,000 short-ton units of WO<sub>3</sub>, produced in the county. The ore was mined by M. I. A. Mines Co. and milled by Minerva Scheelite Mining Co., owner of the Minerva mill. Lester & Maynard Bisoni at the Bald Mountain mine, Bald Mountain district, and Laird & Stinnett at the Bay State mine, Newark district, mined ore, which was milled in Humboldt County. Ore from the Teacup mine, Cherry Creek district, was sold to a Utah custom mill. Minerals Engineering Co. custom mill near Ely received ores from the Filmore mine and the Happy Group, Cherry Creek district. Helmar Mining & Milling Co. operated the Tungstonia mine and mill, Tungstonia district, and sold tungsten concentrate to a Utah mill. Several smaller companies in the Cherry Creek, Osceola, and Mount Washington districts sold tungsten ore and concentrate.

Kennecott Copper Corp. quarried limestone near McGill and prepared lime at its kiln for plant use and some stone for use as flux in the smelter. Near Baker, Star Dust Mines, Inc., quarried a small tonnage of quartzite which it sold for flagging. Ely Sand & Gravel produced several thousand tons of structural sand and gravel, for use in concrete and mortar, from a deposit in Spring Valley. Stewart & Hitchcock used a portable plant to prepare an appreciable quantity of paving gravel. The White Pine County Road Department and the Nevada Highway Department and its contractors produced large

tonnages of paving sand and gravel. The latter quarried a small

tonnage of miscellaneous stone for use as riprap.

Manganese ore, mined in the Nevada district by Manganese Mining Co., was shipped to the National Stockpile. In the Robinson district Consolidated Coppermines Corp. mined manganese ore on the Isaacs claim, and Sam Robinson produced low-grade manganese ore at the Keystone mine for shipment to the GSA depot at Butte, Mont.

# The Mineral Industry of New Hampshire

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the New Hampshire State Planning and Development Commission.

By Robert D. Thomson 1 and Mary E. Otte 2



EW HAMPSHIRE mineral production in 1955 was valued at \$2.6 million a 23-percent increase over 1954. The gain in value largely resulted from increased demand for sand and feldspar as a structural and paving material and as a flux in pottery, respectively. Sand and gravel was the principal mineral product in New Hampshire for the second consecutive year. Every county in the State contributed to the mineral economy in 1955. Merrimack, Grafton, and Cheshire Counties, in order of decreasing value of output, continued as the centers of greatest activity.

TABLE 1.—Mineral production in New Hampshire, 1954–55 1

	19	)54	1955	
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate	35, 681 255	\$6, 960 35, 681 433	20 35, 184 (3) (3)	\$11, 975 35, 184 (²)
Mica Sand and gravel Stone Value of items that cannot be disclosed: Abrasive stones, feldspar, peat, and values indicated by footnote 2	346 2, 240, 548 72, 486	246, 033 1, 094, 474 473, 298	2, 432, 146 (²)	5, 000 203, 693 1, 592, 580 (2)
Total New Hampshire.		255, 226 2, 112, 000		756, 504 2, 605, 000

<sup>&</sup>lt;sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

3 Figure withheld to avoid disclosure of individual company confidential data.

Acting chief, Division of Mineral Industries, Region V, Bureau of Mines, Pittsburgh, Pa.
 Statistical clerk, Region V, Bureau of Mines, Pittsburgh, Pa.

# REVIEW BY MINERAL COMMODITIES

#### **NONMETALS**

Abrasives (Scythestones).—Sales of scythestones in 1955 increased slightly, compared with 1954. Norton Pike Co., established in 1823, was the only company in New Hampshire supplying abrasive stone. Sales were made from a stockpile of material quarried in 1945 at

Piermont, Grafton County.

Clays.—Production of clays in 1955 in New Hampshire was about the same as in 1954. Output was limited to miscellaneous clay. Four companies—2 in Rockingham County and 1 each in Grafton and Strafford Counties—produced from open-pit mines. Each company used the output at its local plant to manufacture building,

facing, and sewer brick.

Feldspar.—Production of crude feldspar increased in 1955 over 1954, mainly because of a greater demand for ground feldspar in manufacturing pottery. Three companies operated a total of 5 mines—2 each in Cheshire and Grafton Counties and 1 in Sullivan County. Most of Golding-Keene Co. crude feldspar, produced in Cheshire and Grafton Counties, was ground in Cheshire County, N. H.; a small quantity was processed in Mercer County, N. J. J. F. Morton, Inc., ground crude feldspar produced in Sullivan County at its plant in Cheshire County. Both companies sold the ground feldspar to the pottery industry. Crude feldspar produced by the third company was shipped out of the State for processing.

Gem Stones.—Gem-stone production resulted largely from the efforts of amateur collectors. In recent years gem stones have been found in Carroll, Cheshire, Coos, Grafton, Rockingham, and Sullivan Counties. Activity in 1955 was centered in Cheshire, Grafton, and

Sullivan Counties.

Mica.—Sales of sheet and scrap mica in 1955 from mines in New Hampshire dropped 90 percent in tonnage and 17 percent in value under 1954. Tonnage declined largely because of greatly reduced sales of scrap mica; increased sales of hand-cobbed mica to the Franklin, N. H., and Spruce Pine, N. C., Government Purchase Depots helped maintain the high level of total value. Industry purchased punch, hand-cobbed, half-trimmed, and scrap mica. Hand-cobbed, half-trimmed, and scrap mica. Hand-cobbed, half-trimmed, and subsidized price program. Sheet mica was sold to industry at an average price of \$0.15 per pound and to GSA at \$7.86 per pound under a subsidized price program. Concord Mica Corp. at Penacook, Merrimack County, only producer of ground mica in New Hampshire in 1955, marketed its ground mica for making paint, rubber, wallpaper, and plastics. Crude mica for this operation was purchased factory scrap mica, locally produced mine scrap, and imported scrap.

Sand and Gravel.—Sand and gravel, continuing as the principal mineral product in New Hampshire, contributed 61 percent of the total State value. The sand and gravel industry increased 9 percent in tonnage and 46 percent in value, based on the material sold or used by producers in 1955, compared with 1954. Larger quantities of structural and paving sands were used in 1955; sands for engine,

filter, and miscellaneous uses and gravel for structural, paving, railroad ballast, and other uses decreased in 1955. Seventy-nine percent of sand and gravel tonnage was used as paving material and 20 percent as construction material. Sand and gravel companies were active during the year in every county except Sullivan. Hillsboro and Merrimack Counties reported sand and gravel produced by, or directly for, State and local Government highway departments.

Stone.—Output of stone sold or used by producers decreased slightly in 1955 under 1954. Decreased demand for dimension granite for rough construction and crushed granite for concrete aggregate and roadstone was the principal factor in the decline of New Hampshire stone industry. Granite quarried in Coos and Merrimack Counties was crushed and sold as concrete aggregate and roadstone. In addition, dimension granite was quarried in Merrimack County. In 1955 all the miscellaneous stone produced in the State was quarried in Rockingham County and crushed for concrete aggregate and roadstone. No stone was produced for use by Government agencies.

#### METALS

Beryllium.—New Hampshire, the fifth-ranking State in sales of crude beryl, showed increased tonnage and value compared with 1954. As in 1954, the Government purchased all the beryl sold in 1955. Mines were active principally in the Cheshire, Grafton, and Sullivan Counties; most of the output came from Grafton County.

Columbium-Tantalum.—The entire production of columbite-tantalite was purchased by the Government. Output increased in 1955

over 1954 and was limited to Grafton County.

### MINERAL FUELS

Peat.—Chiefly because of the expanding market for soil conditioners, production of peat was increased in 1955 in New Hampshire. Perkins Peat Bog, the only active producer in 1955, produced reed or sedge peat from a bog near Center Barnstead.

## **REVIEW BY COUNTIES**

Belknap.—Sand and gravel and peat were the only mineral commodities produced in Belknap County in 1955. The only producer of sand and gravel during part of the year was the Tilton Sand & Gravel, Inc., pit at Tilton. The sand and gravel was used principally for road construction, smaller quantities were used for building. Perkins Peat Bog, Center Barnstead, recovered reed or sedge peat.

Carroll.—Mineral production in Carroll County in 1955 consisted of sand and gravel. Sparks Construction Co., Ossipee, sold a small

quantity of sand and gravel for building purposes.

Cheshire.—Cheshire County continued to rank third in value of mineral output in 1955. It produced sand and gravel, feldspar, mica, and beryl. A small quantity of unwashed sand and gravel recovered by Warren H. Plimpton, Dublin, was sold for maintenance and construction of highways. Cold River Sand & Gravel Corp. prepared

TABLE 2.—Value of mineral production in New Hampshire, 1954-55, by counties

County	1954	1955	Minerals produced in 1955 in order of value
Belknap	(1) (1) \$220, 321 (1) 405, 869	(1) (1) \$298, 384 8, 369 443, 341	Sand and gravel, peat. Sand and gravel, Sand and gravel, feldspar, mica, beryl, gem stones. Sand and gravel, stone. Sand and gravel, mica, feldspar, beryl, clays, abrasives, columbium-tantalum, gem stones.
Hillsboro Merrimack Rockingham Strafford Sullivan Undistributed 2	(1) 1, 034, 368 (1) (1) (1) 86, 687 364, 860	(1) (1) (1) (1) (1) 1,854,842	Sand and gravel. Sand and gravel, stone. Stone, clays, sand and gravel. Sand and gravel, clays. Mica, feldspar, beryl, gem stones.
Total	2, 112, 000	2, 605, 000	

<sup>1</sup> Figure withheld to avoid disclosure of individual company confidential data; included with "Undistributed."
2 Includes counties indicated by footnote 1 and a quantity unspecified by county.

sand and gravel for paving uses, and Keene Sand & Gravel, Inc., sold building and filter sands and paving sand and gravel. Golding-Keene Co. mined potash feldspar at the Colony underground mine near Alstead and ground the material at a local company plant. Whitehall Co., Inc., produced a small quantity of mixed potash-soda feldspar at the Turner open-pit mine, Marlow, and shipped the crude feldspar to its grinding plant at Manchester, Conn. Hand-cobbed mica was produced at the French mine, Gilsum, by Charles E. Dufour, Otto K. Lassman, and John L. Maderic and sold to the GSA Franklin, N. H., Government Purchase Depot. In addition, Otto K. Lassman sold punch and hand-cobbed mica to industry. Strafford Mines, Inc., and Homer Hise produced and sold hand-cobbed mica produced from the Blister mine, Alstead, and Nichols mine, Gilsum, to GSA at Franklin. Beryl was produced by Golding-Keene Co. Colony mine near Alstead; Homer Hise, Nichols mine, Gilsum; and Otto K. Lassman, French mine, Alstead. All the beryl was sold to the GSA at Franklin, N. H.

Coos.—In 1955, mineral production in Coos County declined sharply under 1954. Output of minerals was confined to sand and gravel and stone. Fred Corrigan, from a pit near Randolph, and Clyde B. Gray recovered paving sand. Lessard Sand & Gravel Co., Gorham, sold paving sand and gravel. Maine Central Railroad Co. produced railroad ballast from a pit near Colebrook. Henry A. St. Laurent crushed and sold a small quantity of granite as concrete aggregate and roadstone.

Grafton.—In terms of total value, Grafton County continued to rank second among New Hampshire counties in 1955 and increased slightly over 1954. Mineral commodities produced, in order of decreasing value, were: Sand and gravel, mica, feldspar, beryl, clays, abrasives, and columbium-tantalum. Littleton Sand & Gravel, Inc., at a pit and fixed plant near Littleton, produced structural and paving sand and gravel. Twin State Sand & Gravel Co., Inc., and Daniels Construction Co., West Lebanon, produced paving sand and gravel. Campton Sand & Gravel Co., West Campton, produced a small quantity of sand and sold it as paving sand. Mica was produced from 38 mines by 22 operators in 1955. Only one of the operators sold

scrap mica. Two producers sold sheet mica to industry; the remainder was sold to the Government, principally to the GSA, Franklin, N. H., Government Purchase Depot; a small quantity went to the GSA, Spruce Pine, N. C., Purchase Depot.

The 10 leading mica operators in Grafton County in 1955 were as

follows:

Company:	Mine	Location
Whitehall Co., Inc	Ruggles	Grafton.
Ashley Mining Co	Keyes	Orange.
Ďo	Palermo	Grafton.
Strafford Mines, Inc.	Nancy	Groton.
Do	Ruggles	Grafton.
Charles E. Dufour	do	Do.
Do	Hoyt Hill	Orange.
Do	Rumney	Rumney.
George H. Wilson	Ruggles	Grafton.
W. D. Wood, Inc	Big Hoyt	Orange.
Do	Currier, Dufour	Wentworth.
Do	Draper	Groton.
Do	East Hoyt Hill, Hoyt Hill,	Orange.
	Hoyt Hill Prospect.	<b>a</b> .
John L. Maderic	Bernice, Brown Lot, Davis, New Valencia, Puffer.	Groton.
Do	Hemeon	Hebron.
Do	Hoyt Hill, Keyes	Orange.
Do	Fletcher	Groton.
Do	Plum	North Groton.
Do	Rumney	Rumney.
Homer Hise	Pikes Ledge	Groton.
Donald E. Esty	Fletcher	Do.
Do	Tucker	Alexandria.
Arthur G. Lee	Ruggles	Grafton.

Golding-Keene Co. mined crude potash-feldspar at the Lot No. 10 mine near Canaan, and Whitehall Co., Inc., reported mixed potash-soda feldspar from the Ruggles mine near Grafton. In 1955, all beryl in New Hampshire, mined principally in Grafton County, was sold to GSA at the Franklin, N. H., Government Purchase Depot. The following companies mined beryl in Grafton County: Whitehall Co., Inc., Grafton; C. Everett Tucker & H. T. Patten, Alexandria; W. D. Wood, Inc., Ashley Mining Corp., John L. Maderic, Martha B. Tibbetts, and Paul Hemeon, Groton. Miscellaneous clay produced by Densmore Brick Co. at an open pit near Lebanon, was used in manufacturing building brick. Whitehall Co., Inc., Ruggles mine near Grafton, and Ashley Mining Corp. Palermo and Keyes mines near Groton also produced columbite-tantalite. Norton Pike Co., Littleton, sold abrasives from its stockpile.

Hillsboro.—The only mineral produced in Hillsboro County in 1955 was sand and gravel. Robie Construction Co., Inc., Manchester, produced sand and gravel for building and paving purposes, while The Harris Construction Co., Inc., Peterborough, reported building sand and building and paving gravel. Manchester Department of Highways produced sand and gravel for use as paving material.

Merrimack.—Merrimack County was the leading county in total value of mineral output in New Hampshire in 1955. Manchester Sand, Gravel & Cement Co., Inc., produced sand and gravel from a pit and two fixed plants near Hooksett during part of 1955. Most of the sand and gravel was screened for building and paving uses; a

small quantity was sold as engine sand. Paving sand was produced by construction and maintenance crews of the Concord Commissioner of Public Works from a pit near Concord. The New Hampshire Department of Public Works and Highways produced and purchased from contractors sand and gravel for road material. The John Swenson Granite Co., Inc., Concord, quarried granite dimension stone for rough construction, rubble, dressed architectural, and curbing and flagging. A small quantity of granite was crushed by The John Swenson Granite Co., Inc., and sold as concrete aggregate and road-stone.

Rockingham.—Mineral production of Rockingham County in 1955 consisted of stone, clay, and sand and gravel. The estate of John Iafolla leased the Iafolla quarry at Portsmouth to Morrison-Knudsen Co., Inc. Landers & Griffin, Inc., produced miscellaneous stone for road construction. Eno Bros. Brick Co., Exeter, and W. S. Goodrich, Inc., Epping, mined miscellaneous clay from open-pit mines and used it in manufacturing heavy clay products. A small quantity of building sand and gravel for fill was quarried by L. Chester & Clayton W.

Simpson from an open pit near Exeter.

Strafford.—Sand and gravel and clay were the only minerals produced in Strafford County in 1955. Dover Sand & Gravel, Inc., mined sand and gravel from a pit near Madbury and trucked the material to its preparation plant at Dover to be sold as building material. Miscellaneous clay, recovered from an open pit near Rochester by the New England Brick Co., was used for manufacturing

heavy clay products.

Sullivan.—Mica was the leading mineral produced in Sullivan County in 1955, followed by feldspar and beryl. The total production of hand-cobbed and full-trim mica was sold to the GSA at Franklin, N. H. Producers of mica from nine active mines were Homer Hise, Kent mine, Sunapee; John L. Maderic, Smith mine, Newport; Marjorie A. Milovich, Kent and Ledge Road mines, Sunapee; Henry L. Robinson, Lower Smith, Upper Smith, and Smith mines, Newport; Smith Mica Co., Upper Smith mine, Newport; Kenneth L. Smith, K. L. Smith mine, Unity; Fred L. Smith, Upper Smith, Lower Smith, and Smith mines, Newport; Strafford Mines, Inc., Smith, and Lower Smith mines, Newport; Martha B. Tibbetts, Plater, Prospect, and Crystal mines, Springfield. Crude potash feldspar, recovered by J. F. Morton, Inc., from an underground mine north of Alstead in Sullivan County was ground at the company plant at Cold River, Cheshire County. Beryl was produced by James Brooks, Acworth; Smith Mica Co., Claremont; Smith & Smith Co., East Lempster; and Martha B. Tibbetts, Springfield. All the companies with the exception of Smith & Smith Co. at Franklin, N. H., sold beryl to GSA.

# The Mineral Industry of New Jersey

By Joseph J. Wallace 1 and C. Geraldine Cleary 2



EW JERSEY mineral production in 1955 increased 22 percent in value over 1954. Stone, sand and gravel, and iron ore supplied 31, 29, and 24 percent, respectively, of the total. Output of most commodities was substantially increased in 1955 compared with 1954. Zinc was a notable exception, dropping nearly 70 percent in value owing largely to exhaustion of the ore body at the Franklin mine.

Principal producing counties for all minerals, in order of decreasing value, were: Morris, Somerset, Sussex, Cumberland, and Passaic,

supplying 70 percent of the total mineral value of the State.

	19	54	1955	
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	578, 344 476, 192 214, 931 2, 101 10, 005, 325 5, 772, 200 (3) 37, 416	\$1, 246, 099  6, 621, 881 (3) 184, 834 14, 704, 474 12, 109, 950 (3) 7, 992, 058	644, 192 (2) 759, 550 213, 370 (2) 11, 152, 552 4 8, 357, 599 7, 404 11, 643	\$1, 561, 99- 11 13, 633, 37- (3) 16, 424, 41 4 17, 527, 89 243, 98 2, 863, 94

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2 Weight not recorded.

Weight not recorded.
 Figure withheld to avoid disclosure of individual company confidential data.
 Excludes certain stone to avoid disclosure of individual company confidential data.
 Excludes certain stone to avoid disclosure of individual company confidential data.
 Recoverable zinc valued at the yearly average price of Prime Western slab zinc, East St. Louis market.
 Represents value established after transportation, smelting, and manufacturing charges have been added to the value of ore at mine.

Mine Examination and Exploration Engineer, Region V, Bureau of Mines, Pittsburgh, Pa.
 Statistical clerk, Region V, Bureau of Mines, Pittsburgh, Pa.

## **REVIEW BY MINERAL COMMODITIES**

#### **METALS**

Iron Ore.—Production of crude iron ore in New Jersey and shipments of usable ore increased 42 percent and 60 percent, respectively, compared with 1954. Seventy-eight percent of total usable ore shipments came from concentrators. Three of the 4 active mines (all underground) in the State were in Morris County; 1 was in Warren County. Warren Foundry & Pipe Corp., Morris County, resumed mining iron ore in June after a shutdown since January 1955. Its capacity was doubled from that in previous years by extensive development and production at two new, small, iron-ore mines.

TABLE 2.—Production and shipments of iron ore, 1946-50 (average) and 1951-55, by uses, in long tons

	Num-				Shipm	ents of u	sable ore		
Year	ber of mines	Crude ore mined	Direct shipping ore	Concen- trates for pig iron	Cement	Paint	Miscel- laneous	Total ship- ments	Value
1946-50 (average) 1951 1952 1953 1954 1955	4 4 5 5 5 4	927, 924 1, 166, 495 1, 318, 599 1, 558, 384 1, 025, 057 1, 455, 891	129, 926 193, 143 166, 962 177, 475 18, 584 164, 238	329, 027 454, 555 505, 136 633, 128 456, 379 595, 312	10, 6 0 9, 967 13, 272 5, 302 1, 229	287 74 96	2, 405 191	472, 245 657, 930 685, 466 815, 905 476, 192 759, 550	\$4, 120, 55; 7, 810, 776 6, 760, 46; 10, 114, 976 6, 621, 88; 13, 633, 376

Magnesium Compounds.—Northwest Magnesite Co., Cape May County, produced refractory magnesia from sea water and calcined dolomite in 1955. Johns-Manville Corp., Somerset County, and J. T. Baker Chemical Co., Warren County, manufactured various refined magnesium compounds from purchased dolomite and raw magnesium compounds. To avoid duplication in mineral-production data, only magnesia produced from sea water is included in the mineral output of New Jersey.

Manganiferous Residuum.—An iron-manganese raw material was

recovered as a byproduct of zinc mining in Sussex County.

Zinc.—Ore mined at New Jersey Zinc Co., Sterling Hill mine, Sussex County (the only producing zinc mine in the State), was crushed at the mill nearby and shipped to the company Palmerton, Pa., smelter. The mine was idle from August 22 through the remainder of the year due to a labor dispute. The output of the State declined 69 percent compared with 1954, owing to exhaustion in late 1954 of the famous Franklin mine and the labor dispute.

TABLE 3.—Mine production of recoverable zinc, 1946-50 (average) and 1951-55

Year	Short tons	Year	Short tons
1946-50 (average)	64, 734	1953	45, 700
1951	62, 917	1954	37, 416
1952	59, 190	1955	11, 643

#### **NONMETALS**

Clays.—The production of clays increased 11 percent compared with 1954. Production came from 21 open pits in 10 counties; 10 pits in Middlesex County furnished 57 percent of the total State output. Fire clay and miscellaneous clay used in manufacturing building brick, paving brick, draintile, sewer pipe, and kindred products supplied 83 percent of the State output. Sayre & Fisher Brick Co. and Natco

Corp., Middlesex County, were the leading producers in the State.

Gem Stones.—In 1955, Ben L. Cash, an Albuquerque, N. Mex.,
gem and precious stone dealer, reported a small quantity of semiprecious gem stones (prehnite) from an unspecified source in New

Jersey.

Greensand Marl.—Inversand Co., Sewell, and Permutit Co., Birmingham, refined all output for use in water conditioning. Chemical Co., Medford, sold its untreated product for soil conditioning.

Lime.—Limestone Products Corp. of America, Sussex County, and Peapack Limestone Quarry, Inc., Somerset County, were the only producers of lime in the State. The lime was used for building,

chemical, industrial, and agricultural purposes.

Perlite.—Crude perlite from Colorado and New Mexico was expanded and sold by Certified Industrial Products, Inc., Union County; Coralux Perlite Co. of New Jersey, Middlesex County; PerAleX of New Jersey, Inc., Passaic County; Johns-Manville Corp., Somerset County.

Pigments.—In New Jersey, E. I. du Pont de Nemours & Co. (Essex County), Stabilized Pigment Co. (Middlesex County), and Columbian Carbon Co. (Mercer and Middlesex Counties) manufac-

tured black, brown, red, and vellow iron oxides.

Sand and Gravel.—Output of sand and gravel by commercial producers was reported from 17 counties of the State, principally from (in decreasing order of output) Cumberland, Morris, Middlesex, Bergen, and Monmouth. The number of commercial producers reporting to the Bureau of Mines decreased from 95 in 1954 to 91 in 1955; output increased 7 percent over the previous year. Sand and gravel was used primarily for building (43 percent), paving (28 percent), molding (13 percent), and glass manufacture (8 percent). Contractors for Government agencies produced 4 percent of the State total.

Stone.—The output of stone increased 45 percent compared with 1954. Crushed basalt for riprap, concrete, road metal, and railroad ballast supplied 87 percent of the State total. Twenty-six quarries produced granite, marble, basalt, and limestone: 17 produced basalt; 4, granite; 4, limestone; and 1, marble. The principal producers were North Jersey Quarry Co., Kingston Trap Rock Co., and Somerset Crushed Stone Inc., Somerset County; and Samuel Braen & Sons and Consolidated Stone-Sand Co., Passaic County. This year for the first time the Bureau of Mines canvassed the producers of oystershell as part of stone production. J. Dallas Castor of Delsea Drive, Vineland, N. J., was the only commercial collector in the State. oystershell was used for poultry grit and manufacturing lime. Roofing granules were produced by Great Notch Corp., Passaic County; Central Commercial Co., Somerset County; and Flintkote Co., Bergen County.

TABLE 4.—Sand and gravel sold or used by producers, 1954-55, by classes of operations and uses

Uses	19	54	198	55
Uses	Short tons	Value	Short tons	Value
COMMERCIAL OPERATIONS				
Sand: Glass Molding Structural Paving Blast Fire or furnace Engine Filter Other 2 Gravel: Structural Paving Railroad ballast Other Undistributed	2, 713, 056 1, 952, 931 121, 912 (1) (1) (1) 710, 429 1, 603, 660 562, 041	\$1, 815, 581 3, 195, 493 2, 596, 220 1, 702, 822 465, 938 (1) (1) 1, 689, 567 2, 475, 963 (1) 147, 127 146, 606	901, 096 1, 493, 294 3, 219, 280 1, 722, 610 120, 610 20, 605 (1) (1) 541, 133 1, 597, 621 932, 978 (1) 56, 007 69, 087	\$2, 152, 264 3, 682, 833 3, 035, 794 11, 455, 233 411, 446 38, 417 (1) 1, 496, 894 2, 684, 510 (1) 67, 261 113, 209
Total	10, 005, 325	14, 704, 474	10, 674, 327	16, 194, 482
GOVERNMENT-AND-CONTRACTOR OPERATIONS				
Sand:			430, 475	206, 950
Gravel: Paving			47, 750	22, 985
Total			478, 225	229, 935
Grand total			11, 152, 552	16, 424, 417

<sup>1</sup> To avoid disclosure of individual company confidential data, figures are included with "Undistributed."
2 Includes ground sand.

TABLE 5.—Stone sold or used by producers, 1954-55, by uses

Uses	19	1954		1955	
	Short tons	Value	Short tons	Value	
Crushed and broken stone: Riprap	93, 818 5, 196, 925 5, 761 120, 030 355, 666	\$186, 472 9, 966, 349 14, 915 412, 131 1, 530, 083	913, 310 6, 970, 022 (1) 126, 696 347, 571	\$1, 779, 270 13, 924, 48' (1) 435, 07 1, 389, 05'	
Total	5, 772, 200	12, 109, 950	8, 357, 599	17, 527, 89	

<sup>1</sup> Included with "Other" to avoid disclosure of individual company confidential data.

Sulfur—Brimstone was recovered in Gloucester County by the Freeport Sulphur Co. Public Service Electric & Gas Co. recovered flotation sulfur paste by the Thylox flotation sulfur process at its Camden and Harrison plants in Camden and Hudson Counties.

Vermiculite.—F. E. Schundler & Co., Inc. (Essex County), Vermiculite Industrial Corp. (Essex County), and Zonolite Co. (Mercer County) produced exfoliated vermiculite from material shipped from South Africa, South Carolina, and Montana.

## MINERAL FUELS

Peat.—Reed or sedge peat for soil improvement purposes, mixed fertilizers, and highway uses in curing concrete was recovered in Morris, Passaic, and Sussex Counties.

### **REVIEW BY COUNTIES**

Atlantic.—Sand and gravel, the only mineral commodity produced in Atlantic County in 1955, was used for building and molding. Producers were Taggart Brimfield Co., and Tri-State Sand Co., Cedar Lake; Somers Point Sand & Gravel Co., Somers Point; Absecon Island Sand Co., Oceanville; and Dominic Macrie, Folsom.

Bergen.—Sand and gravel and clays were produced in Bergen County in 1955. Sand and gravel output was sold for structural and paving purposes. Producers active in 1955 were McKee Bros., Inc., Ramsey; Braen Sand & Gravel Co., Wyckoff; Samuel Braen & Co., Mahwah; and F. & M. DiMaggio, Paramus. Tri-County Brick Corp., Moonachie, and Hackensack Brick Co., Little Ferry, produced common clay for heavy clay products.

TABLE 6.—Value of mineral production in New Jersey, 1954-55, by counties

County	1954	1955	Minerals produced in 1955 in order of value
Atlantic Bergen Bergen Burlington Camden Cape May Cumberland Essex Gloucester Hudson Hunterdon Mercer Middlesex Monmouth Morris Ocean Passaic Salem Somerset Sussex Union	\$181, 018 1, 296, 532 705, 329 782, 481 1, 817, 011 6, 169, 847 (2), 978 (1) 63, 378 (1) 1, 812, 523 896, 665 6, 987, 949 820, 056 5, 111, 986 (2) 4, 070, 564 12, 283, 470 1, 970, 217	\$118, 507 1, 350, 537 1, 179, 747 900, 770 2, 518, 600 6, 821, 922 (1) 641, 891 87, 650 840, 683 966, 594 2, 539, 162 917, 886 14, 447, 638 844, 527 4, 475, 389 (1) 7, 367, 406 7, 194, 728 1, 269, 727 2, 320, 001	Sand and gravel. Sand and gravel, clays. Sand and gravel, clays, recoverable sulfur. Magnesium compounds, sand and gravel. Sand and gravel, clays, oystershell. Stone. Sand and gravel, recoverable sulfur, greensand marl. Sand and gravel, recoverable sulfur, greensand marl. Sand and gravel, sulfur. Stone, sand and gravel. Sand and gravel, clays, stone. Sand and gravel, clays, stone. Sand and gravel, clays, stone, peat, clays. Iron ore, sand and gravel, clays, peat. Sand and gravel. Stone, sand and gravel. Stone, clays, lime. Zinc, manganiferous zinc residuum, stone, lime, peat, sand and gravel. Stone. Iron ore, stone, sand and gravel, clays.
Undistributed Total	765, 420 47, 044, 000	691, 629 57, 495, 000	

<sup>1</sup> Included with "Undistributed."

Burlington.—Graham Brick Mfg. Co., Maple Shade, mined clay for its manufacture of heavy clay products, but gave notice of intention to liquidate its business in 1956. Heavy clay products were produced from clay mined by Church Brick Co., Fieldsboro. Burlington Clay & Engineering Co. did not produce during the year. Permutit Co. and Zeolite Chemical Co., near Birmingham and Medford, respectively, obtained greensand marl from surface mines. Production was used for water and soil conditioning. Sand and gravel was produced by Amico Sand & Gravel Co., Riverside; Lockhart, Inc., East Riverton; George F. Pettinos, Inc., Mount Holly; and H. R. Sherman, Burlington. Whitehead Bros. Co. sold its plant to Mount Holly Cement Co., April 1, 1955. Amico Sand & Gravel Co. and Lockhart, Inc., dredged on the Delaware River.

Camden.—Bridgeton Sand Co. (Williamstown Junction), Pine Valley Sand & Gravel Co., Inc. (Albion), Reading Sand Co. (Penbryn), and Russell W. Ward, Inc. (Palmyra) dredged sand and gravel in

1955 for building, paving, molding, and miscellaneous uses. George F. Pettinos, Inc., Grenloch, and Taggart Brimfield Co., Mayville, produced molding sand. Alliance Clay Product Co., Winslow Junction, open-pit mine produced miscellaneous clay for use in manufacturing heavy clay products. Public Service Electric & Gas Co., Camden, used the Thylox process to produce flotation sulfur paste from gases at its Camden coke plant in 1955.

Cape May.—The principal mineral commodity in value produced in Cape May County was refractory magnesia from sea water and dolomite. The Cape May plant of Northwest Magnesite Co. produced this commodity. Courtland Sand & Gravel Co., Cape May Court House, and John F. Gandy, with portable plants at Ocean View

and Villas, produced building and paving sand and gravel.

Cumberland.—J. Dallas Castor crushed oystershell for use in poultry grit and in lime manufacture. The leading sand-and-gravel-producing county in New Jersey was Cumberland. Output was utilized for molding, glass, blast, engine, and filter sands, as well as for structural and paving material. Producers were Armstrong Cork Co., South Vineland; Brunetti Bros. and Diamond Sand & Stone Co., Vineland; Daniel Goff Co., Inc., Menantico-Tuckahoe Sand & Gravel Co., and New Jersey Silica Sand Co., Millville; George F. Pettinos, Inc., Port Elizabeth; South Jersey Sand Co., Newport and Dividing Creek; Whitehead Bros., Dividing Creek and Dorchester; and Jesse S. Morie & Son, Inc., Mauricetown. Daniel Goff Co., Inc., mined fire clay near Millville.

Essex.—Crushed and broken traprock for concrete aggregate and road stone was produced by Orange Quarry Co., West Orange. Vermiculite Industrial Corp., Newark, and F. E. Schundler & Co., Inc., South Kearny, produced expanded vermiculite at plants in

Essex County in 1955.

Gloucester.—Greensand marl, produced at a surface mine 2 miles from Sewell by Inversand Co., was sold for water-treatment purposes. The Eagle Point plant of Freeport Sulfur Co. near Westville recovered sulfur by the modified Baehr process. L. R. Curtis and F. R. Warner, Inc. (Bridgeport), Downer Silica Co. (Downer), and Wenonah Sand & Gravel Co., Mount Royal, produced structural, paving, and furnace sands in 1955.

Hudson.—Public Service Electric & Gas Co. recovered sulfur paste as a byproduct of gas production at its Harrison Gas Works during 1955. Koppers Co., Inc., produced hydrogen sulfide by hot-vacuum actification at its Seaboard plant near Kearny. Sand and gravel for building and paving purposes was produced by Thomas Henry Material, Inc., West New York, and J. P. Callaghan and

Harrison Supply Co., Harrison.

Hunterdon.—Stone was again the only mineral commodity produced in Hunterdon County in 1955. Trimmer Stone Co. quarried a granitic gneiss for concrete aggregate and road base. Crushed basalt for use as riprap, concrete aggregate, road material, and railroad ballast was quarried by Lambertville Quarry Co. and Barlow Materials Co. of New Jersey. Mulligan lime quarry at Clinton yielded crushed limestone for blast-furnace flux, concrete aggregate, and road material.

Mercer.—Crushed and broken basalt was quarried by Pennington Quarry Co. for use as riprap, concrete, road material, and railroad ballast.

Building and paving sand and gravel were produced by Crosswicks Sand & Gravel Co., Groveville; J. B. Richardson, and Tattersall Co., both near Trenton. Zonolite Co., Trenton, produced exfoliated vermiculite from crude material shipped from Montana and South Carolina.

Middlesex.—Middlesex County in 1955 was the leading clay-producing area in New Jersey. Fire clay, principally for refractory use, was produced by Crossman Co. and Whitehead Bros. Co., Sayreville; Natco Corp., Keasbey; Quigley Co., Inc., and Such Clay Co., South Amboy; Valentine Fire Brick Co., Woodbridge; and Marcus S. Wright, Inc., and William S. Wright, Milltown. Coralux Perlite Corp. of New Jersey expanded perlite at its plant near Metuchen from material purchased in the southwestern part of the United States. Sand and gravel, predominantly for building and paving purposes, was produced by Crossman Co. and Whitehead Bros. Co., Sayreville; Dallenbach Sand Co., Inc., South Brunswick Township; Glenn Rock Concrete Products Co., Jamesburg; Herbert Sand Co., Inc., Milltown; and Raritan River Sand Co., Nixon.

Monmouth.—Sand and gravel and clay were the only mineral com-

Monmouth.—Sand and gravel and clay were the only mineral commodities produced in Monmouth County in 1955. The principal sand and gravel producers were Bennett Sand & Gravel Co., Inc., Manasquan; Hause Gravel Co., Allenwood; New Jersey Gravel & Sand Co., Inc., Farmingdale; W. S. Van Hise, Belmar; and Joseph Scarano and Benjamin Fary, Wayside. Output was sold for structural, paving, and filter sand and gravel. Oschwald Brick Works, Inc., near Lawrence Harbor, mined clay from an open pit. Output

was used in manufacturing building brick.

Morris.—Morris County ranked first in New Jersey in value of mineral products, which included clay, iron ore, peat, sand and gravel, and stone. Logansville Pottery Co., Basking Ridge, produced a small quantity of miscellaneous clay for manufacturing flowerpots. Iron ore was produced by Scrub Oak mine, Alan Wood Steel Co.; Richard Ore mine, Colorado Fuel & Iron Corp.; and Mount Hope

mine, Warren Foundry & Pipe Corp.

Morris County was again the second-ranking sand- and gravel-producing area in New Jersey. Sand and gravel, principally for structural and paving, was produced by Consolidated Stone & Sand Co., Riverdale; North Jersey Quarry Co., Netcong; Seguine-Bogert Co., Inc., Kenvil; Alan Wood Steel Co., Dover; Thomas Landi & Sons, Morristown; Pequannock Sand & Gravel Co., Pequannock, Wharton Sand & Stone Co., Montville; and Morris County Land Improvement Co., Whippany. Pompton Crushed Stone Div. (Riverdale), Alan Wood Steel Co. (Mine Hill), and Wharton Sand & Stone Co. (Montville) produced granite for concrete aggregate, roadstone, railroad ballast, stone sand, and riprap.

Ocean.—Sand and gravel was the only mineral commodity produced in Ocean County in 1955. Producers were Brown & Burdge, Herbertsville; Ralph Clayton & Sons and North Jersey Quarry,

Lakewood; Clayton's Sand & Gravel, Inc., Barnegat; New Jersey Pulverizing Co., near Bayville; and J. Kalsch & Son, Stafford Township. Most of the county output was used as building and paving material. New Jersey Pulverizing Co. output was used predomi-

nantly for molding and glass sand.

Passaic.—Clay, sand and gravel, stone, and peat were produced in Passaic County in 1955. Major stone producers were Samuel Braen & Sons, Haledon and Hawthorne; Consolidated Stone & Sand Co., Montclair Heights; Great Notch Corp., Great Notch; Sowerbutt Quarries, Inc., Clifton and Prospect Park; and Union Building & Construction Corp., Clifton. Output was used principally for concrete aggregate, road stone, riprap, and railroad ballast. Samuel Braen's Sons, Pequannock; H. J. Hinchman & Son, Paterson; Van Orden Sand & Gravel Co., Paterson; and Van Decker Bros., Inc., Preakness, produced sand and gravel for structural purposes in Passaic County in 1955. Expanded perlite was produced from material imported from the southwestern United States by PerAleX of New Jersey, Inc., in its Paterson plant. Paterson Brick Co., Inc., mined clay from an open pit near Little Falls in 1955 for producing building brick.

Salem.—A. W. Davis Lumber Co., Quinton Township, and Flora S. Richman, Woodstown, produced sand in Salem County in 1955 for

building and paving purposes.

Somerset.—Somerset County was the leading stone-producing area in New Jersey in 1955. Fanwood Stone Crushing Quarry Co. (Westfield), Kingston Trap Rock Co. (Kingston), North Jersey Quarry Co. (Bound Brook and Millington), and Somerset Crushed Stone, Inc. (Bernardsville) produced crushed and broken basalt for concrete aggregate, roadstone, riprap, and railroad ballast. Johns-Manville Corp., Manville, manufactured precipitated magnesium carbonate from dolomite rock for use as insulation. Sand and gravel was not produced in Somerset County in 1955. The sole producer of burnt lime in Somerset County was Peapack Limestone Quarry, Inc., Peapack. New Jersey Shale Brick & Tile Co. mined clay from an open pit near Somerville.

Sussex.—The mines and quarries of Sussex County produced stone, sand and gravel, manganiferous zinc ore, lime, and peat in 1955. The open quarries of Limestone Products Corp. of America, Newton, and Farber White Limestone Co., Ogdensburg, yielded limestone for riprap, blast-furnace flux, concrete aggregate, road material, agricultural stone, rubber filler, poultry house and barn

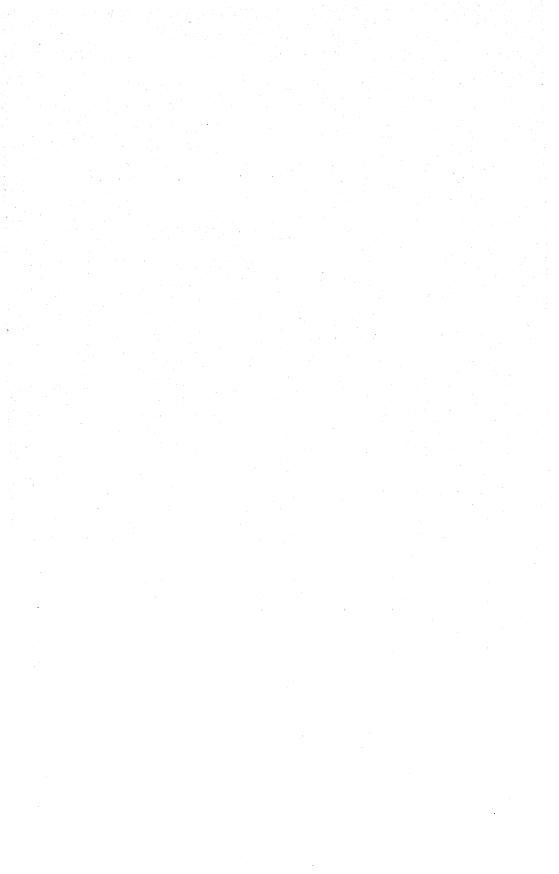
floors, and mineral feeds.

Limestone Products Corp. of America Lime Crest plant produced hydrated lime during 1955 for building, agricultural, water purification, and water-softening purposes; it also produced sand and gravel as did F. W. Bennett & Son Co., Sparta. The manganiferous-zinc-ore-producing Sterling Hill mine was temporarily closed, from August 22, 1955 through the remainder of the year, owing to a labor dispute.

Union.—North Jersey Quarry Co. near Summit, again the only mineral producer in Union County, quarried and crushed basalt for concrete aggregate and roadstone. Certified Industrial Products,

Inc., Hillside, produced expanded perlite.

Warren.—Iron ore, stone, sand and gravel, and clays were produced in Warren County in 1955. The sole producer of iron ore was the Washington mine of Alan Wood Steel Co. near Oxford. Sand and gravel was produced by H. W. Folkner, Buttzville; Portland Sand & Gravel Co., Carpentersville; Steckel Concrete Co., Phillipsburg; and Harvey Stevens, Great Meadows. In New Jersey, marble was produced only in Warren County at the open quarry of Royal Green Marble Co., Inc., near Phillipsburg. The output was crushed for terrazzo. Natco Corp. mined clay from an open pit near Port Murray. J. T. Baker Chemical Co. manufactured magnesium compounds at its plant near Phillipsburg from purchased magnesium carbonate.



# The Mineral Industry of New Mexico

By Frank J. Kelly, William H. Kerns, Breck Parker, and Alfred L. Ransome<sup>2</sup>



CONTINUATION in 1955 of the general advance in output of New Mexico's principal minerals (except sand and gravel, and excluding manganese ore shipped to the National Stockpile and uranium) raised the total value of its mineral production 17 percent to a new record high figure of \$435.9 million, compared with the previous record of \$373.5 million in 1954. Petroleum, potassium salts, copper, natural gas, and natural-gas liquids together composed 95 percent of the total value in 1955; the increases for these commodities overbalanced by far the relatively small decreases for other minerals and were directly responsible for the overall gain.

The value of crude petroleum produced increased 10, natural gas 37, natural gasoline 31, and liquefied-petroleum gases 19 percent over 1954, and all 4 established new records for both quantity and value. New Mexico continued to rank seventh among the States in petroleum production. There were eight refineries in the State in 1955 (the same as in 1954), but a large part of the crude oil pro-

duced continued to be refined in other States.

Among the nonmetals produced in New Mexico, potash was by far the most important. Both production and shipments of potash again established new records. As in 1954, the 5 mines in New Mexico supplied 90 percent of the total United States production

of potash in 1955.

Metals contributed only 13 percent of the total value of all minerals produced in New Mexico in 1955. This represented a moderate gain over the comparative proportion in 1954 but was still below 1953. Copper, as heretofore, ranked first among metals by a wide margin, and output increased 10 percent in quantity (following a 16-percent decline in 1954) owing largely to a continued heavy demand for copper both in the United States and abroad; the gain was attained despite a strike that curtailed production in July and August. Because of the higher price for copper (highest since the Civil War) the value of copper output in 1955 gained 39 percent. Lead output increased fourfold in 1955, and zinc production advanced to 15,000 tons compared with only 6 tons in 1954. Gold production in New Mexico in 1955 was the lowest on record in the past 88 years.

Uranium mining and exploration continued to center in McKinley,

Valencia, and San Juan Counties.

Many ores contain valuable minor constituents, such as arsenic, bismuth, cadmium, cobalt, nickel, platinum-group metals, selenium,

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tellurium, and some minor metals, such as gallium and germanium. These quantities sometimes are unknown and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages or credited to the mine of origin. These minor constituents are recovered at plants, frequently treating mixtures of materials from many sources, including residues from refining such metals as copper, lead, and others and in other ways. In many such instances it is impossible 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 seldom can be separated as to source—is byproduct sulfuric acid.

The Government, through the Defense Minerals Exploration Administration (DMEA), continued to aid in financing exploration

in search of strategic and critical minerals.

TABLE 1.—Mineral production in New Mexico, 1954-55 1

	1	954	19	55
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrategross weight	117 47, 832 123, 099 2, 093 60, 558	\$43, 771 83, 085 727, 372 3, 558 35, 729, 220	106 45, 351 201, 579 76 66, 417	\$56, 420 108, 582 1, 236, 125 129 49, 547, 082
Fliorsper Gem stones Gold (recoverable content of ores, etc.) troy ounces Gypsum Helium thousand cubic feet	8, 876 (3) 3, 539 887 41, 755	(2) (2) 123, 865 2, 661 735, 183	(2) (3) 1, 917 53, 721	25, 000 67, 095
Iron ore (usable)long tons, gross weight Lead (recoverable content of ores, etc) Manganese ore (35 percent or more Mn) gross weight Manganiferous ore (5 to 35 percent Mn)	3, 316 887	243, 038	1, 390	(2) 982, 208 (2)
Mica: gross weight. Sheet. pounds. Scrap. Natural gas. million cubic feet.	2, 054	82, 184 13, 845 35, 049, 000	40, 320 9, 431 84 540, 664	(2) 64, 930 2, 475 48, 119, 000
Natural-gas liquids: Natural gasoline thousand gallons LP-gases do Perlite Petroleum (crude) thousand 42-gallon barrels Potassium salts K:0 equivalent Pumice Salt Sand and gravel Silver (recoverable content of ores, etc.) troy ounces	6, 519, 339 109, 132	11, 744, 000 5, 704, 000 885, 824 205, 760, 000 64, 366, 641 1, 060, 096 333, 255 8, 340, 251 98, 770	261, 023 278, 403 147, 805 82, 958 1, 826, 118 393, 597 49, 738 4, 556, 447 251, 072	15, 425, 000 6, 767, 000 1, 091, 250 227, 310, 000 69, 057, 754 780, 339 596, 780 6, 004, 554 227, 233 1, 546, 665
Stone	6	714, 037 1, 414 1, 296	1, 573, 441 1 15, 277	1, 546, 665 3, 036 3, 758, 142 2, 187, 727
Total New Mexico				435, 911, 000

Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Value of low-grade manganese ore shipped to General Services Administration Purchase Depots and uranium ore is excluded.
 Figure withheld to avoid disclosing individual company confidential data.
 Weight not recorded.
 A recetable too.

<sup>4</sup> Less than 1 ton.

TABLE 2.—Average values of selected mineral commodities in New Mexico, 1954-55  $^{\rm 1}$ 

Commodity		1954	1955
Beryl	short ton	\$374, 111	\$532, 264
Clays	do	1. 737	2. 394
Doal	do	5. 909	6. 132
Columbium-tantalum	pound	1.700	1.697
Copper 2	do	. 295	. 373
3old 3	troy ounce	35.000	35.000
Helium	thousand cubic feet_	17.607	17. 618
.ead <sup>2</sup>	pound	. 137	. 149
Manganiferous ore (5 to 35 percent Mn)	short ton	4.000	4.018
Mica:	•		
Hand-cobbed	do	600.000	540.000
Scrap	do		29. 464
ScrapNatural gas	thousand cubic feet	. 078	.089
Natural-gas liquids:			
LP-gases.		. 025	.024
Natural gasoline	do	. 052	. 059
Perlite (crude)	short ton	7. 978	7. 383
Perlite (crude)	42-gallon barrel	2.750	2. 740
Potassium salts	short ton	37. 158	37. 817
Pumice Salt	do	2.913	1. 983
8alt	do	6. 577	11.998
Sand and gravel	do	1. 279	1.318
Silver 5		.905+	. 905
Stone	short ton	. 925	. 983
Zine 2	pound	.108	. 123

<sup>1</sup> Prices are based on average value f. o. b. mines or mills reported by the producers except as otherwise

Prices are based on average value 1. 6. b. mines or mins reported by the producers except as otherwise noted.

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).

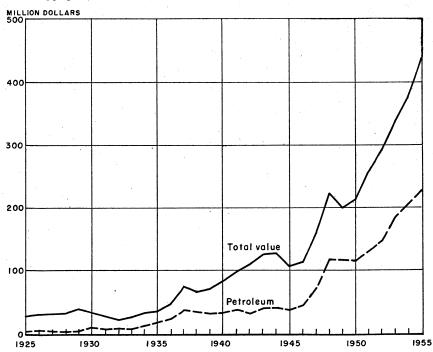


FIGURE 1.—Value of petroleum production and total value of all minerals produced in New Mexico, 1925-55.

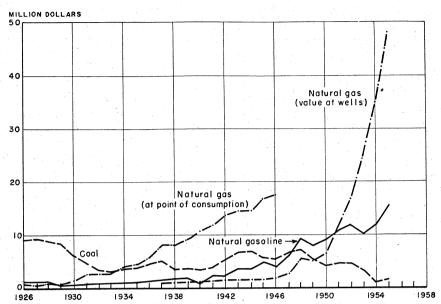


FIGURE 2.—Value of natural gas, natural gasoline, and coal in New Mexico, 1926-55.

TABLE 3.—DMEA contracts in 1955

			Contract			
County and contractor	Property	Commodity	Date	Total amount	Govern- ment partici- pation percent	
McKinley County: Colo-	State Claims 1-27	Uranium	May 17, 1955	\$114, 430. 50	75	
mer Corp.  McKinley and Valencia	Christmas Day	do	May 23, 1955	12, 555. 00	75	
Counties: Colomer Corp. Santa Fe County: Western Development Co. of Del- aware.	group. Bottom Dollar and Black Hornet prospects.	Lead-zinc	Sept. 29, 1955	16, 710. 00	50	
Total				143, 695. 50	72	

### REVIEW BY MINERAL COMMODITIES

#### **METALS**

Beryllium.—Output of beryl from New Mexico in 1955 came mainly from the Harding mine near Dixon, Taos County, the principal beryl-producing mine in the United States. Other smaller producers of beryl were the Old Priest mine near Ribera, San Miguel County, and the Rocking Chair Lode, Rio Arriba County. The beryl, marketed at the Government Purchasing Depot, Custer, S. Dak., and at Beryl Ores Co., Arvada, Colo., was recovered from pegmatite by hand sorting. The purpose of the Government purchase program was to encourage expansion of beryl output by small producers by providing

a uniform price scale and purchase depot for the ore. Prices paid were \$40 a unit for ore containing 8.0 to 8.9 percent BeO; \$45 for 9.0 to 9.9 percent; and \$50 for 10 percent or over. Ores containing less

than 8 percent BeO by weight were not accepted.

Columbium-Tantalum.—Production of columbite-tantalite was reported from a mine in Rio Arriba County. The material was produced from pegmatites and shipped to the General Services Administration Purchasing Depot at Custer, S. Dak., under the same buying program as beryl. Production of columbium-tantalum concentrate from the State was only 76 pounds in 1955 compared with 2,093 pounds (gross weight) in 1954. The price during 1955 was stationary at \$1.697 per pound for a combined pentoxide of 50 percent columbium-tantalum.

Copper.—Following a 16-percent drop in 1954 compared with 1953, copper output from New Mexico increased 10 percent in 1955. However, due to the higher price for copper, the value of output in 1955 gained 39 percent above 1954. The increased output was due primarily to continued heavy demand for copper both in the United States and abroad. The price of copper rose to the highest point since

the Civil War.

The bulk of the copper output in the State in 1954 came from the Chino open-pit mine of the Chino Mines Division, Kennecott Copper Corp., at Santa Rita in Grant County. Output would have been greater if a labor strike had not curtailed operations and production between July 1 and August 17. Other substantial producers of copper were the Banner Mining Co. Miser's Chest group and the Atwood Mines, Inc., Atwood mine near Lordsburg in Hidalgo County.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc, 1946-50 (average), 1951-55, and total 1848-1955, in terms of recoverable metals <sup>1</sup>

37	Mines	producing	Material sold or	Gold (lode	and placer)	Silver (loc	de and placer)
Year	Lode	Placer	treated 2 (short tons)	Fine ounces	Value	Fine ounces	Value
1946-50 (average) 1951	83 66 55	3 3 1 2 4 6	7, 223, 931 8, 670, 489 9, 120, 841 8, 070, 056 6, 763, 529 7, 446, 772	3, 446 3, 959 2, 949 2, 614 3, 539 1, 917	\$120, 624 138, 565 103, 215 91, 490 123, 865 67, 095	422, 189 443, 267 479, 318 205, 309 109, 132 251, 072	\$375, 536 401, 179 433, 807 185, 815 98, 770 227, 233
1848-1955			(3)	2, 211, 036	50, 720, 453	71, 015, 772	55, 896, 579
Year	C	pper	Le	ad	z	ine	/D-4-1
1 ear	Short tons	Value	Short tons	Value	Short tons	Value	Total value
1946-50 (average) 1951 1952 1953 1954 1955	61, 354 73, 558 76, 112 72, 477 60, 558 66, 417	\$24, 673, 163 35, 602, 072 36, 838, 208 41, 601, 798 35, 729, 220 49, 547, 082	5, 547 5, 846 7, 021 2, 943 887 3, 296	\$1, 647, 318 2, 022, 716 2, 260, 762 771, 066 243, 038 982, 208	36, 063 45, 419 50, 975 13, 373 6 15, 277	\$9, 222, 018 16, 532, 516 16, 923, 700 3, 075, 790 1, 296 3, 758, 142	\$36, 038, 659 54, 697, 048 56, 559, 692 45, 725, 959 36, 196, 189 54, 581, 760
848-1955	1, 955, 901	704,851,027	317, 672	42, 004, 299	1, 114, 204	203,620,594	1, 057, 092, 952

<sup>1</sup> 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

Does not include gravel washed or tonnage of precipitates shipped.
 Figure not available.

Gold.—Gold production in New Mexico in 1955 was the lowest on record in the past 88 years. It declined from 3,539 fine ounces in 1954 (highest since 1951) to the record low of 1,917 ounces in 1955. Most of this decline was explained by a drop in the output of blister copper (from which gold is recovered as a byproduct) and an increased output of fire-refined copper (from which no gold is recovered) by

TABLE 5.—Gold and silver produced at placer mines, 1946-50 (average) and 1951-55, in terms of recoverable metals

	Go	ld	Silv	ver	Total	Year	Gold		Silver		Total
Year	Fine ounces	Value	Fine ounces	Value	value	1000	Fine ounces	Value	Fine ounces	Value	value
1946-50 (average) 1951 1952	16 4 2	\$553 140 70	5	\$4 	\$557 140 70	1953 1954 1955	5 14 81	\$175 490 2,835	2 10	\$2 9	\$177 490 <b>2,</b> 844

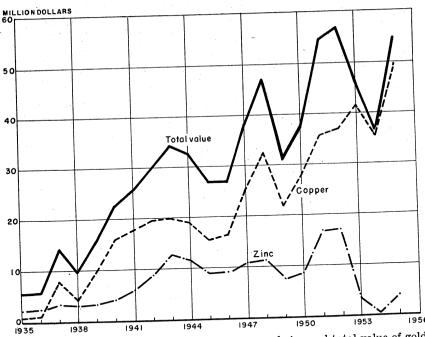


FIGURE 3.—Value of mine production of copper and zinc and total value of gold, silver, copper, lead, and zinc in New Mexico, 1935-55. The value of gold, silver, and lead produced annually has been relatively small.

Kennecott Copper Corp. from copper ore mined from the Chino open pit. The production of blister copper depends upon the market for fire-refined copper. When the demand for fire-refined copper diminishes, the corporation's refinery is placed on a standby basis, and the copper is cast as blister copper, which goes to an electrolytic copper refinery where gold is recovered from the sludge or residue. Primarily as a result of this, copper ores were the source of only 57 percent of the total gold output in the State in 1955 compared with 90 percent in 1954.

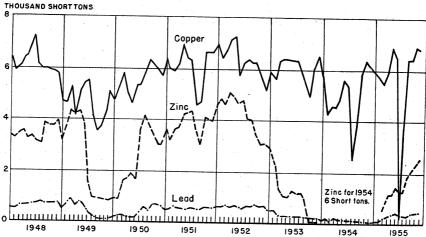


FIGURE 4.—Mine production of copper, lead, and zinc in New Mexico, by months, 1948-55, in terms of recoverable metals.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in 1955, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zine (short tons)
January February March April May June July August September October November December Total	139 414 223	7, 300 8, 241 14, 400 25, 156 28, 080 24, 735 16, 073 20, 922 23, 378 25, 878 28, 152 28, 757 251, 072	6, 178 5, 643 5, 396 5, 947 6, 843 6, 492 187 3, 432 6, 354 6, 362 6, 843 6, 740 66, 417	50 61 176 248 302 416 302 283 274 383 395 406	534 1, 109 1, 106 1, 449 1, 204 1, 215 1, 874 2, 024 2, 270 2, 492

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1955 by counties and districts, in terms of recoverable metals

	Mines pro-	Material sold or	Gold (lode a	nd placer)	Silver (lode at	nd placer)
County and district	(lode and placer) 1	treated 2 (short tons)	Fine ounces	Value	Fine ounces	Value
Catron County: Mogollon Dona Ana County: Organ	1 1	54 6	18	\$630	282	\$255 5
Grant County: Burro Mountain Central Eureka Pinos Altos 3 Steeple Rock Swartz	2 6 1 7 1 1	7, 289, 242 888 53 2, 619 9	690 5 25 376	24, 150 175 875 13, 160	128, 719 3, 107 30 28, 410 89	116, 497 2, 812 27 25, 712 81 145, 129
Total 3 Guadalupe County: Pintado	18	114				
Hidalgo County: LordsburgSan Simon	3 2	122, 992 67	684	23, 940	83, 751 51	75, 799 46
Total	5	123, 059	684	23, 940	83, 802	75, 845
Lincoln County: Nogal (Bonita)Red Cloud	1 1	3 250	<u>1</u>	35	205	186
Total Luna County: Victorio Mora County: Cuba	. 1		1 1	35 35	212 175 7 410	193 153 0
Sandoval County: Cuba (Nacimiento Mountains)	2	1,729			410	
Santa Fe County: Cerrillos San Pedro (New Placers)	3		17 17	595 595	223	93 20
Total	4	725	34	1, 190	1, 261	1, 14
Sierra County: Cabalfo	1 2 - 1 2 - 2 3	1 205 9 17 3 10	60	2, 100 245	4 650 22 41 11 5 3	58 2 3 1
Total 3	10		67	2, 34	731	- 66
Socorro County: Hansonberg Magdalena		25, 343 5 1, 571	16	560		3, 3
Total		6 26, 914	16	56	3,741	3, 3
Taos County: Picuris Red River		1 70 1 20			55 23	
Total		2 27	1		78	
Valencia County: Hell's CanyonCopperton		1 23 1 5			12 1	
Total		2 28	0		13	
Total New Mexico 3		7, 446, 77	2 1, 917	67, 09	251, 072	227,

See footnotes at end of table.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1955 by counties and districts in terms of recoverable metals—Continued

County and district	Cor	per	Le	ad	Zi	ne	Total
County and district	Pounds	Value	Pounds	Value	Pounds	Value	value
Carton County: Mogollon Dona Ana County: Organ			2,000	\$298			\$885 303
Grant County: Burro Mountain Central Eureka Pinos Altos Steeple Rock Swartz	12, 600 128, 167, 600 600 300 2, 900	\$4,700 47,806,515 224 112 1,081	5, 207, 500 52, 600 200 3, 700	775, 918 7, 837 30 551	30, 207, 200 53, 400 200 300 900	\$3,715,485 6,568 25 37 111	4, 700 52, 438, 565 17, 616 1, 069 39, 990 743
Total Guadalupe County: Pintado_	128, 184, 000 4, 000	47, 812, 632 1, 492	5, 264, 000	784, 336	30, 262, 000	3, 722, 226	52, 502, 683 1, 492
Hidalgo County:  Lordsburg  San Simon	4, 509, 800 200	1, 682, 155 75	17, 500 4, 500	2, 608 670	2, 000 6, 000	246 738	1, 784, 748 1, 529
Total	4, 510, 000	1, 682, 230	22,000	3, 278	8,000	984	1, 786, 277
Lincoln County: Nogal (Bonita) Red Cloud			100 7, 900	15 1, 177			21 1, 398
Total			8,000	1, 192			1, 419
Luna County: Victorio Mora County Sandoval County: Cuba	2,000	746	2,000	298			491 752
(Nacimiento Mountains)	60,000	22, 380					22, 751
Santa Fe County: Cerrillos San Pedro (New Placers)	4, 300 17, 700	1, 604 6, 602	60,000	8, 940	88, 000	10, 824	22, 902 7, 399
Total	22,000	8, 206	60,000	8, 940	88,000	10, 824	30, 301
Sierra County: Cabalfo	5,600	2, 089	100 8, 100 1, 500 300	15 1, 207 223 45			19 3, 884 243 82 2, 259 248
Total	6,000	2, 238	10,000	1, 490			6, 735
Socorro County: HansonbergMagdalena	26,000	9, 698	1, 034, 900 189, 100	154, 200 28, 176	196, 000	24, 108	154, 200 65, 928
Total	26,000	9, 698	1, 224, 000	182, 376	196, 000	24, 108	220, 128
Taos County: PicurisRed River	1, 400 12, 600	522 4, 700					572 4, 721
Total	14,000	5, 222					5, 293
Valencia County: Hell's Canyon Copperton	5, 900	2, 201 37					2, 212 38
Total	6,000	2, 238					2, 250
Total New Mexico	132, 834, 000	49, 547, 082	6, 592, 000	982, 208	30, 554, 000	3, 758, 142	54, 581, 760

<sup>1</sup> All lode mines except for 7 placer mines as indicated in footnote 3.
2 Does not include gravel washed or tonnage of precipitates shipped.
3 Includes 5 placer mines with a total output of 23 fine ounces of gold valued at \$805 and 6 ounces of silver valued at \$5 in Pinos Altos district and 1 placer mine with an output of 58 ounces of gold valued at \$2,030 and 4 ounces of silver valued at \$4 in Los Animas district.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1955, by classes of ore and other source materials, with content in terms of recoverable metals

Source	Num- ber of mines 1	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore: Dry gold Dry gold-silver Dry silver Total	4 2 11 17	135 2, 673 2, 404 5, 212	157 394 1 552	111 28, 692 1, 587 30, 390	3, 660 2, 900 66, 500 73, 060	10, 500	300
Copper- Copper-zinc Lead Lead-zinc Zinc	18 1 6 10 2	2 7, 281, 739 3 4 25, 991 78, 522 54, 788	1, 096 15 159 11		3107,201,861 300 5,000 649,030 18,000	17, 660 1, 137, 900	100 27,800 23,893,300 6,632,500
TotalOther "lode" material: Slag, etc. 5	36	7, 441, 043 517 15, 221	1, 281	220, 084 588	292, 580 24, 594, 169	6, 564, 420 17, 080	30, 553, 700
Total "lode" material Gravel (placer operations)	50	15, 738 7, 461, 993	3 1,836 81	588 251, 062 10	24, 886, 749 132, 834, 000	17, 080 6, 592, 000	30, 554, 000
Total, all sources	56	7, 461, 993	1, 917	251, 072	132, 834, 000	6, 592, 000	30, 554, 000

<sup>1</sup> Detail will not necessarily add to totals because some mines produce more than one class of ore.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery and types of material processed, in terms of recoverable metals

	Material	Recoverable metals							
Type of material processed and method of recovery	treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zine (pounds)			
Lode: Amalgamation 1	2 2	36	11						
Concentration, and smelting of concentrates 1	7, 354, 981	1, 204	201, 451	106, 962, 441	6, 447, 960	30, 525, 000			
Direct-smelting: Ore Copper precipitates Mill cleanings Old slag	91, 272 15, 221 95 422	593 2 1	49, 012 551 37	984, 810 24, 594, 169 570 292, 010	126, 960 16, 980 100	29, 000			
Total	107, 010	596	49,600	25, 871, 559	144, 040	29,000			
Placer	(3)	81	10						
Grand total	4 7, 461, 993	1, 917	251, 072	132, 834, 000	6, 592, 000	30, 554, 000			

Detail will not necessarily add to totals because some mines produce more than one class of ore.
 Includes 120,000 tons of newly mined ore treated by heap leaching.
 Includes 160,700 pounds of copper recovered from precipitates obtained from newly mined ore treated in a heap-leaching plant.
 Includes 25,343 tons of lead-barite ore yielding 800 tons of lead concentrate, averaging 66 percent lead, and 2,928 tons of barite.
 Slag: Silver, 3 tons; copper, 419 tons. Mill cleanings: Lead, 95 tons.

Ore only; no old tailing, etc., processed by this method in New Mexico in 1955.
 Excludes 50 tons of lead-zinc ore included in tonnage of ore concentrated from which 1 ounce of gold was recovered by amalgamation.
3 Data not available.

<sup>4</sup> Excluding placer gravel.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

## A. For material treated at mills

	Material		rable in lion	Concen	trate shi	pped to	smelters and	recoveral	ole metals
	treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Con- cen- trate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds
			вч	COUN	TIES		•		
Grant Hidalgo Lincoln			8	223, 922 7, 507 15	558 639 1	131, 431 67, 756 205		5, 255, 420 6, 400 7, 900	8,00
Santa FeSierraSocorroValencia	468 1 3 26, 190 50	7	3	138 1,042 1		971 1, 087	700 3,400 100	60, 000 1, 118, 240	88,00
Total: 1955 _ 1954 _	1 3 7,354,983 6, 672, 467	36 48				201, 451 81, 870	<sup>2</sup> 106, 962, 441	6, 447, 960	30, 525, 00 10, 00
	В	Y CLAS	sses of	FMAT	ERIAL	TREAT	ED		
Dry gold Copper Copper-zinc	´´´3		11	196, 803 (4)	1, 034	20	<sup>2</sup> 106, 295, 111 300		10
Lead Lead-zinc Zinc	<sup>3</sup> 25, 593 78, 513 54, 788	1		815 27, 782 7, 225	158 11	120, 692 8, 153	649,030	1, 042, 800 5, 207, 960 197, 200	23, 892, 40 6, 632, 50
Total: 1955_	137, 354, 983	36	11	232, 625	1, 204	201, 451	<sup>2</sup> 106, 962, 441	6, 447, 960	30, 525, 00
В	Y CLASSE	S OF C	ONCE	TRAT:	E SHIP	PED TO	SMELTE	RS	
				197, 062	1,038	73, 393	2 106, 404, 311	8, 700	7, 20
Copper Lead Lead-zinc Zinc				5, 714 1 29, 848	115 1 50	92, 962 4 35, 092		5, 879, 370 200	793, 50 10 29, 724, 20

See footnotes at end of table.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

## B. For material shipped directly to smelters

			v			**
	Mate-		Recov	erable meta	l content	
	shipped (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zine (pounds)
ВУ	COUN	TIES	· · · · · · · · · · · · · · · · · · ·			
Catron	54	18	282		l	
Dona AnaGrantGuadalupe	63, 382 114	486	28, 910	25, 413, 759 4, 000	2, 000 8, 580	1, 20
HidalgoLincoln	39, 904	45	7	322, 000	15, 600 100	
Luna Mora Sandoval	57 37 1,729	1	175 7 410	2, 000 60, 000		
Santa FeSierra	257 242	29 2	290 724	21, 300 6, 000	10, 000	
Socorro Taos Valencia	724 271 230	15	2, 654 78 12	22, 600 14, 000 5, 900		27, 80
Total: 1955 1954	107, 010 108, 631	596 489		25, 871, 559 29, 825, 300		29, 00 2, 00
Dry gold	133 2, 673			3, 660 2, 900		30
Silver: Crude ore Slag	2, 404		1, 587	66, 500	10, 500	
Total silver materials	2, 407	1	1,603	66, 500	10, 600	
Copper: Crude ore Precipitates <sup>5</sup> Tailing precipitates	85, 655 15, 197 24		17, 032	906, 750 24, 569, 640 24, 529		
Slag	419		21	292, 010		
Total copper materials	101, 295	63	17, 053	25, 792, 929	17, 660	
Lead: Crude ore Mill cleanings				5, 000 570		
Total lead materials	493	16	2, 063	5, 570	112, 080	27, 80
Lead-zinc	9		89		3, 700	90
Total: 1955	107, 010	596	49, 600	25, 871, 559	144, 040	29, 00

Includes 120,000 tons of newly mined ore treated by heap leaching.
 Includes 160,700 pounds of copper recovered from 109 tons of precipitates obtained from newly mined ore treated in a heap-leaching plant.
 Includes 25,343 tons of lead-barite ore yielding 800 tons of lead concentrate, averaging 66 percent lead, and 2,928 tons of barite.
 Less than 1 ton.
 Excludes 109 tons obtained from newly mined ore treated by heap leaching.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

CONCENTRATE	SHIPPED 7	O SMELTERS
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Ologo of made 1	Quantity shipped		Gr	oss metal cor	ntent	
Class of material	or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Copper Lead Lead-zinc Zinc	5 714	118	92, 962 4	$\epsilon$	5, 999, 729 241	1, 017, 51
Total: 1955 1954		7. 275	281, 268	1 109, 306, 919	6, 629, 528	34, 049, 55
ORES,	ETC., SHIF	PED DIR	ECTLY TO	SMELTE	RS	
Dry gold	133 <b>2</b> , 673	122 394	100 28, 692			2, 21
Dry silver: Crude ore Slag	<b>2</b> , 404	1	1, 587 16	69, 455 55		
Total silver materials	2, 407	1	1, 603	69, 510		
Copper: Crude ore Precipitates 2 Tailing precipitates	85, 655 15, 197 24	116	17, 508	1, 250, 779 25, 048, 343		
Slag	419	13	226	311, 159		
Total copper materials.	101, 295	129	17, 734	26, 635, 310	28, 702	
Lead: Crude ore: Mill cleanings	398 95	14 2	1, 513 551	5, 325 658	96, 786 17, 282	35, 614
Total lead materials	493	16	2, 064	5, 983	114, 068	35, 614
Lead-zinc	9		89	22	3, 727	1, 190
Total: 1955	107, 010 108, 631	662 539	50, 282 27, 661	26, 717, 590 30, 752, 782	162, 537 208, 762	39, 022 6, 715

<sup>&</sup>lt;sup>1</sup> Includes 165,713 pounds of copper contained in 109 tons of precipitates obtained from newly mined ore

treated in a heap-leaching plant.

2 Excludes 109 tons obtained from newly mined ore treated by heap leaching.

Iron Ore.—The quantity of iron ore shipped from New Mexico in 1955 nearly tripled the 1954 figure. The iron ore (magnetite) mined from the Pearson iron pit on the Hanover-Bessemer property in Grant County by Mathis & Mathis was used mainly in manufacturing

Lead.—New Mexico lead output increased from 887 tons in 1954 to 3,296 tons in 1955, a fourfold increase. Despite this marked gain in 1955 compared with 1954 and an increase over 1953 (2,943 tons), the output was low relative to 1952 (7,021 tons) and prior years. The higher output in 1955 was due to reopening in March 1955 of operations at the State's outstanding lead producer, Ground Hog group of mines, operated by American Smelting & Refining Co. Because of the low price for lead and zinc, this mine was closed in February 1953 and remained inactive throughout 1954.

Other mines that were reopened late in 1955 (because of the increased price for lead and zinc where lead was recovered as a byproduct of zinc ore mined) were the Hanover zinc mine operated by New Jersey Zinc Co. and the Kearney zinc mine operated by New Mexico

Consolidated Mining Co.

Lead recovered from lead-zinc ore comprised 79 percent of the The remaining total lead output and lead from lead ore 17 percent. 4 percent came from zinc, copper, and silver ore and from cleanup Ninety-eight percent of the lead was recovered from concentrate by smelting, and the remaining 2 percent was recovered

from ore and cleanup material by smelting.

Manganese and Manganiferous Ore and Concentrate.—The Manganese Corp. of Arizona shipped manganese concentrate from the Socorro, RFC, and Nigger Head group of mines in New Mexico to the Government Purchasing Depot at Deming in 1955 under the "carload-lot" program that required a manganese content of at least 40 percent. Quantity of manganiferous ore (ferruginous manganese ore), which contained 10.8 percent manganese mined and shipped from the Boston Hill mine by Luck Mining & Construction Co. to Colorado Fuel & Iron Corp. for use in making steel at its plant at Pueblo, Colo., doubled that

in 1954.

Shipments of manganese and manganiferous ore and concentrate were made to the Government Purchasing Depot at Deming under the "low-grade" program up until November 30, 1955, when the quota was filled and the depot closed. This output was not credited to the mineral production in the State in 1955 because further beneficiation is necessary to make it usable; it will be recorded in the year it is prepared and shipped from the depot. A total of 62 mining operations in 10 counties in the State shipped manganese (35 percent manganese) and manganiferous (5 to 35 percent manganese) ore and concentrate to the depot under this program in 1955. These shipments constituted 35,500 long dry tons of manganese ore averaging 37.9 percent manganese content with a total value of \$2.6 million and 49,400 long dry tons of manganiferous ore averaging 25.1 percent manganese content with a total value of \$1.6 million.

Molybdenum.—Shipments of molybdenum concentrate and the molybdenum content in this concentrate from the two producers in New Mexico in 1955 were greater than in 1954. Molybdenum concentrate recovered as a byproduct from copper ore mined from the Chino open pit and treated at Kennecott Copper Corp. mill at Hurley, Grant County, continued to be the major source of molybdenum in the State in 1955. The Questa molybdenum mine (known locally as the Moly mine), 6 miles east of Questa in Taos County, also continued as an important producer of molybdenum concentrate

in the State in 1955.

Rare Earths.—Interest in rare-earth minerals in 1955 resulted in extensive prospecting and exploration of deposits. The New Mexico Copper Corp. completed revamping its 50-ton base-metal mill at Carrizozo to recover rare-earth oxides by tabling. The company produced 55,000 pounds of bastnaesite concentrate but no sales were The U.S. Rare Earths, Inc., and Onego Corp. also reported exploration and development activities at their bastnaesite properties near Corona, Lincoln County, and San Geronimo, San Miguel County.

Silver.—Output of silver in New Mexico in 1955, recovered mainly as a byproduct from ores of copper, lead, and zinc, more than doubled that in 1954, owing principally to reopening of the Ground Hog lead-zinc mine by American Smelting & Refining Co. Other large producers of silver were Banner Mining Co. Miser's Chest copper mine and Steeplerock Exploration Syndicate East Camp group gold-These three mines supplied 84 percent of the total silver output in the State in 1955. Silver recovered from lead-zinc ore was 48 percent of the total silver output; copper ore accounted for 36 percent. Ten fine ounces of silver was recovered, along with some gold, from two placer-mining operations in the State in 1955.

Tungsten.—Two operators together produced 1 short ton of 60percent WO<sub>3</sub> concentrate in New Mexico in 1955. David D. Osmer mined tungsten ore from the Morning Star mine in Grant County, and D. H. Abel & Willis Westfall shipped ore from the Wichita group in Rio Arriba County to Wah Chang and Tungsten Refining, Inc.,

near Boulder, Colo.

Uranium. Uranium production in New Mexico grew significantly during 1955 as the Anaconda Co. Jackpile mine in Valencia County added an increasingly important share to the State total. Valencia County was the major producing area, followed by McKinley and, to a much smaller extent, San Juan and Socorro Counties. Minor shipments were also reported from Catron, Hidalgo, Rio Arriba, and San

Miguel Counties.

Private exploration drilling of all types totaled 1.25 million feet, with an increase in rate during the fall stimulated by discovery of the Ambrosia Lake district. Ambrosia Lake by year end was considered one of the three most important uranium districts in the United States, along with the Jackpile and Big Indian districts (Valencia County, N. Mex., and San Juan County, Utah, respectively). The Ambrosia Lake discovery, coupled with extension of reserves at the Jackpile mine, led to emergence of New Mexico as the foremost State in the country with respect to uranium-ore reserves.

Capacity to process uranium ores also increased substantially uring 1955. Expansion of Anaconda carbonate-leach plant at during 1955. Bluewater was completed early in the spring, and the first circuit of the company larger acid-leach plant went into operation in Decem-At Shiprock (San Juan County) Kerr-McGee Oil Industries, Inc., whose mill was placed in operation in late 1954, was operating in full capacity. Alteration in the mill circuit was undertaken in the

fall to increase capacity further.

Vanadium.—Uranium ore containing vanadium was mined but was not processed for recovery of the vanadium content. Shipments of such material came primarily from McKinley, San Juan, and Valencia Counties, with minor amounts reported from Catron, Hidalgo, San Miguel, and Socorro Counties.

Zinc.—The remarkable increase in the output of zinc in New Mexico—from 6 tons in 1954 to 15,277 tons in 1955—can be attributed primarily to the rise in price of zinc from an annual average weighted price of 10.8 cents per pound in 1954 to 12.3 cents in 1955. result of this, the Ground Hog lead-zinc mine, previously one of the leading zinc producers in the State, which was closed in February 1953 because of the depressed price of lead and zinc, resumed operation in March 1955 and furnished the major part of the 1955 output. Two other large zinc mines that reopened in 1955 and contributed to the total output of zinc were New Jersey Zinc Co. Hanover mine and New Mexico Consolidated Mining Co. Kearney mine, both in the Central district, Grant County. The Ground Hog, Hanover, and Kearney mines produced 99 percent of the New Mexico zinc output in 1955.

### **NONMETALS**

Barite.—Lead-barite ore produced by the Mex-Tex Mining Co., Inc., continued to be the only source of barite in the State during 1955. Shipments of ground barite increased 21 percent from the 1954 total, owing mainly to an intensive mining program that followed development work completed in 1954. Ground barite from the company mill at San Antonio was shipped to the major petroleum-producing areas for use as an admixture in preparing oil-well-drilling mud.

Clays.—Despite the general building throughout the West, the output of clay in New Mexico used in manufacturing building brick and other structural-clay products decreased another 5 percent in 1955 following the 3-percent loss reported in 1954. The basic cause for the decline can be attributed to a lower demand for structural-clay

products.

The bulk of the clay produced in 1955 was miscellaneous or shale, smaller quantities of fire clay being mined. Mining activity was concentrated in Bernalillo, Dona Ana, and McKinley Counties, where mine output was largely miscellaneous clay or shale. A limited quantity of a special type of clay in McKinley County was utilized in oil-well drilling. Brick and structural-clay plants, the only markets open to the clay-mining industry, are located in or near the population centers of Albuquerque, Santa Fe, Gallup, and Las Vegas and also El Paso, Tex

Diatomite.—A small quantity of ground diatomite was sold in 1955 by James H. Rhodes Pumice, Inc. This product was recovered in cleanup operations at the company Santa Fe mill which was shut down

in 1954.

Fluorspar.—Owing to the continued competition from foreign producers, all fluorspar mines in the State remained closed throughout 1955. The General Chemical mill at Deming was operated for part of the year, using stockpiled ore and tailing as mill feed, and the flotation concentrate was shipped to manufacturers of hydrofluoric acid. The mill was closed in September and remained idle for the balance of the year.

TABLE 12.—Shipments of fluorspar, 1946-50 (average), 1951-55, and total 1909-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average) 1951 1952 1953	20, 952 24, 402 16, 443 11, 890	\$686, 176 1, 163, 098 823, 320 (1)	1954 1955 1909–55	8, 876 (¹)	(1) (1) 2 \$11,846,728

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosing individual company confidential data.

2 Value estimated for some years.

Gypsum.—The White Eagle Gypsum Co., Inc., reported that its open-pit gypsum mine near Las Lunas, Valencia County, was idle

during 1955.

Gem Stones.—In 1955 the Bureau of Mines expanded its statistical canvass on gem and ornamental stones to include all collectors, mineralogical societies, and dealers. The value of production in New Mexico was reported at \$25,000 and included agate, chalcedony, ricolite, fluorite, and desert scenic stone. Output was concentrated in Eddy, Hidalgo, Luna, San Juan, and Sierra Counties; Luna County

was the principal producer, in terms of value.

Mica.—The availability of a market for hand-cobbed and block mica at the Custer, S. Dak., Government Purchasing Depot, provided a stimulus for increased output by mica producers in New Mexico in 1955. Sales of hand-cobbed mica in 1955 rose to 110 tons valued at \$64,930 compared with 23 tons worth \$13,845 in 1954—almost a five-fold increase. Of the Western States shipping to the Custer Depot, New Mexico sent the largest amounts—three times as much as South Dakota, the second most important State. Although mining activity continued to be concentrated in Rio Arriba County, with J. H. Stivers and Continental Mine Products Co. the largest producers, production was also reported in San Miguel, Santa Fe, and Taos Counties. A number of new producers entered the field in 1955 and included Petaca Mining Co. and George R. Campbell, Sr., in Rio Arriba County; E. L. McKinley and Onego Corp. in San Miguel County; Robert Osthoff in Santa Fe County; and Nu-Mex Mica Corp. in Taos County.

In conjunction with the production of hand-cobbed mica, 84 tons of scrap mica was sold locally by New Mexico producers in 1955. A number of new scrap-grinding operations were initiated during the year—2 at Santa Fe and 1 at Petaca. Only a mill operated by R. E. Osthoff reported any shipments of ground mica. The Petaca Mining Corp. mill at Petaca was by far the most important new development. Construction of the \$300,000 mill was begun in January and dedication ceremonies were held on October 5. The company is controlled by the Christian Bros. of St. Michael's College at Santa Fe. The mill was designed to process 300 tons of mica a day and produce 60 to 75 tons of ground material when in full production. The company

has 22 mining claims covering 40 acres.

Perlite.—Production of crude perlite in New Mexico in 1955 continued to rise and reached 148,000 tons, a 33-percent increase over 1954. Nearly all the output of the United States Gypsum Co., F. E. Schundler & Co., Inc., and Great Lakes Carbon Corp. was expanded and used in oil-well concretes and lightweight aggregate.

In its eighth year of production in the State, perlite has risen to fourth in the nonmetals field, based on value of output. The strong demand for expanded perlite kept 50 men employed in mining and milling operations in New Mexico for 295 days, producing a commodity valued at \$1 million. The only expanded perlite plant in the State was operated by Great Lakes Carbon Corp. at Socorro.

Potash.—New Mexico was the Nation's leading producer of potash, and production and sales in 1955 reached 1.9 million tons and 1.8 million K₂O equivalent, respectively. The value of potash sales was \$69 million—the highest of any mineral produced in the State except

petroleum. The State supplied 90 percent of the total potash produced in the United States. The five producing companies, all of which operated mines and refineries in the Carlsbad region, Eddy County, were the Duval Sulphur & Potash Co., International Minerals & Chemical Corp., Potash Co. of America, Southwest Potash Corp., and United States Potash Co., Inc.

TABLE 13.—Production and sales of potassium salts, 1946-50 (average) and 1951-55, in short tons

	Crude sal	ts; 1 mine		Marke	table potas	h salts	
Year	produ	iction	Prod	ıction		Sales	
	Gross weight	K <sub>2</sub> O equivalent	Gross weight	K2O equivalent	Gross weight	K2O equivalent	Value
1946-50 (average)	4, 945, 732 6, 615, 891 7, 852, 732 9, 100, 671 9, 975, 460 10, 956, 466	1, 029, 058 1, 349, 572 1, 644, 034 1, 908, 280 1, 985, 626 2, 159, 010	1, 706, 818 2, 138, 439 2, 530, 596 2, 937, 960 3, 007, 724 3, 196, 799	925, 559 1, 223, 139 1, 468, 029 1, 721, 435 1, 763, 378 1, 883, 766	1, 713, 066 2, 126, 391 2, 439, 042 2, 661, 587 2, 954, 043 3, 097, 771	928, 658 1, 217, 617 1, 411, 125 1, 552, 831 1, 732, 240 1, 826, 118	\$33, 608, 221 43, 427, 717 52, 483, 464 58, 076, 435 64, 366, 641 69, 057, 754

<sup>1</sup> Sylvite and langbeinite.

In 1955, 3,500 persons were directly employed by the 5 potash companies and received \$1.5 million a month in wages, most of which was retained in Eddy County and the State. The economic impact of this segment of the mineral industry can be emphasized further when it is realized that, in addition to its material purchases and taxes, freight charges paid on freight originated by the industry have been

estimated at \$100,000 a day—more than \$35 million a year.

The demand for 60 percent muriate of potash accounted for the bulk of 1955 sales, but other grades sold included 50 percent muriate of potash and 22 percent manure salts. In addition, a hydrochloricacid plant owned by International Minerals & Chemical Corp. continued operations in 1955, with most of the output going to the oil industry. The magnesium-compound production facility of International was operated for the first time in 1955. The bulk of the magnesium oxide produced was used in manufacturing refractories, and smaller quantities were consumed by the uranium-processing industries.

Mine development under way in the area included the sinking of two 20-foot-diameter, 1,800-foot shafts for National Potash Co. in Lea County. By the end of 1955 the shafts were down to 500 feet and were being advanced at a rate of 100 feet a month. National mine will be the sixth in the potash area and the first to produce in Lea

 ${f Countv.}$ 

Expansion programs continued to dominate the activities in the potash field. The Potash Division of International Minerals & Chemical Corp. announced plans for an expansion program costing over \$1 million to increase production of potassium sulfate by 40,000 tons a year. Southwest Potash Corp. also reported a \$2.5 million modification and expansion program. The mine and refinery, which started operation late in 1952, were designed for 3,000-ton-per-day

ore capacity. This was to be increased to 4,000 tons. National Farmers Union and Kerr-McGee Oil Industries, Inc., signed an agreement in March under which Kerr-McGee will produce potash from National Farmers Union holdings along the Lea-Eddy County line. Kerr-McGee was to construct the plant; and a new company, Farm Chemical Resources Development Corp., was to be formed to

exploit ore reserves estimated at 100 million tons.

Pumice.—Output of pumice, pumicite, and scoria in New Mexico in 1955 recovered slightly from the precipitous drop reported in 1954 by rising to 394,000 tons, a gain of 8 percent over 1954. However, producers of this material faced increased competition from such substitutes as perlite and bloated shale for the concrete-aggregate market. Higher freight rates, coupled with increased cost of production, were the difficulties facing New Mexico producers. In 1955 pumice (pumicite and scoria) used for concrete aggregate rose to 251,000 tons (231,900 tons in 1954). The only other important use was for railroad ballast, which rose from 122,000 tons in 1954 to 137,000 tons in 1955.

The origin of the bulk of the mine output was the same as in 1954-

Union, Dona Ana, and Rio Arriba Counties.

Some high-grade ground pumice for use in cleaning and scouring compounds, as an abrasive, and in acoustic plaster was sold by General Pumice Co., Rio Arriba County, and James H. Rhodes Pumice, Inc., Sandoval County. Output of these products was considerably below 1954.

Salt.—Although the quantity of salt sold in 1955 dropped 2 percent compared with 1954, the value of sales rose 79 percent. This development was due largely to a decrease in the sales of salt cake to cattle ranchers and increased sales of a more specialized product used in

oil-well-drilling mud.

Production in 1955 was again concentrated in Eddy County, where the large stockpiles of potash mill tailing provided a source of raw material. The principal producer was the Salt Supply Co., Inc. Production of processed salt from potash tailing was reported for the first time in Lea County by the Champion Chemical Co. Solar evaporated salt was produced by the Curtis Salt Co. at its Quemado,

Catron County facility.

Sand and Gravel.—Despite a 30-percent decline in the output of sand and gravel in New Mexico during 1955 the value of output (\$6 million) of this commodity ranked second in the nonmetal group. The activity of State and county highway departments was a dominant factor in this segment of the mineral industry, as the bulk of the sand and gravel output resulted from contracts let by these agencies. Of the total State output in 1955, 3.1 million tons or 68 percent was produced by contractors working on highway contracts. Using a productivity rate of 8,460 tons of sand and gravel per man developed from the report of the State mine inspector and applying it to the production reported in this chapter, an average of 5,400 men was employed by companies producing sand and gravel in the State.

Stone.—The accelerated highway-construction program throughout the country was reflected in a twofold increase in the production of all types of stone in New Mexico during 1955. The proportions of various types of stone produced, as related to the total, varied from

1954, owing to the shifting geographic pattern of highway work, as it is customary to use stone from sources close to road projects.

In 1955 sandstone comprised the bulk of the output, followed by miscellaneous stone and limestone. In addition, some crushed marble and dimension sandstone were sold for building purposes. The major portion of the State output of stone was produced in Valencia, Bernalillo, and Guadalupe Counties.

Sulfur.—The production of elemental sulfur recovered as a byproduct from natural gas remained a minor contributor to the total value of output of the State mineral industry. Sales in 1955 increased twofold over 1954, and two plants operated by El Paso Natural Gas Co. and Warren Petroleum Corp. in Lea County pro-

vided the entire output. Vermiculite.—The plant of Southwest Vermiculite Co., Albuquerque, produced exfoliated vermiculite for use in concrete and plaster aggregate and insulation from crude material received from out of the State.

#### MINERAL FUELS

Carbon Dioxide.—Natural carbon dioxide-gas production and value decreased 10 percent from the previous year. New Mexico usually produces between one-third and one-half of the Nation's total output of the gas and in 1955 was the largest producing State. The gas was produced from fields in Harding and Union Counties, and occurrences have also been reported in Colfax, Mora, and Torrance Counties. During 1955 Carbonic Chemicals Corp. drilled 3 wells in Harding County, and Knight & Stockley completed 1 well in Union County; CO2 gas was reported in 3 of the 4 wells—the exception being a Carbonic Chemicals well for which a report is lacking.

Coal.—Mine output of coal from 31 operations in the State rose to 201,600 tons, a considerable increase over the 1954 figure but still less than half of the 1953 total. McKinley County replaced Colfax as the leading coal-producing area in the State.

TABLE 14.—Production of coal, 1954-55, by counties, in short tons (Exclusive of mines producing less than 1,000 short tons annually)

	195	4	195	5
County	Produc- tion	Average value per ton <sup>1</sup>	Produc- tion	Average value per ton <sup>1</sup>
Colfax. McKinley Rio Arriba Sandoval San Juan Santa Fe. Socorro	67, 234 34, 033 10, 190 (2) (2) (2) (2) (2)	\$6.05 5.22 5.65 (2) (2) (2) (2) (2) (2)	75, 639 88, 123 14, 860 3, 797 16, 032 3, 128	\$6. 08 6. 63 5. 48 4. 28 4. 68 6. 25
Other counties	ìí, 642	`7.34		
Total	123, 099	5. 91	201, 579	6. 13

¹ Value received or charged 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).
² Included in "Other counties"; not published to avoid disclosing individual company confidential data.

In August Kaiser Steel Corp. acquired properties in Colfax County from the St. Louis, Rocky Mountain & Pacific Co., including the Koehler (largest in the State), the Brilliant No. 2, and the Van Houten mines. The purchase gave Kaiser a reserve of coking coal for the steel mills at Fontana, Calif.

Shipments of coking coal from New Mexico to California totaled only 12,000 tons in 1955 (no shipments to Colorado in this year). Shipments to these 2 States were 62,000 tons in 1954 and 359,000 in

1953.

Major mines for the year, in terms of production, were the Koehler mine, Colfax County, and the Roberts mine (strip) and the Window Rock mine, McKinley County. The Roberts mine, operated by Roberts Coal Co., was reported to have exported coal to South Korea.

Helium.—Shipments of helium from the Bureau of Mines-operated plant at Shiprock, San Juan County, were 53.7 million cubic feet, an increase of 29 percent over 1954, and represented 23 percent of the Nation's total. Production of the gas in New Mexico exceeded ship-

ments by 335,000 cubic feet.

Natural Gas.—Marketed production of natural gas increased 20 percent over 1954 to 541 billion cubic feet. Of this quantity 40 percent was consumed within the State. Major uses of natural gas in New Mexico for the year follow: Field use (drilling, pumping, etc.), 46 percent; carbon-black manufacture, 23 percent; other industrial, 12 percent; electric utility fuel, 10 percent; domestic and commercial heating, 8 percent; and refinery fuel, 1 percent.

Two-thirds of the natural-gas production came from oil and gas fields of Lea County, and one-third was produced from the gas fields of San Juan County. Minor amounts (totaling 4 percent) were sup-

plied from Rio Arriba, Eddy, and Chaves Counties.

Construction of the Pacific Northwest pipeline from the San Juan Basin to Washington and Oregon was begun in 1955, and the resulting stimulus to development of natural-gas production was reflected in drilling activity, which showed an increase in the northwestern counties of 70 pages of the page of the same of the sa

of 70 percent over the previous year.

The manufacture of carbon black is an important use of natural gas in New Mexico (approximately 2 pounds of carbon black being obtained from each thousand cubic feet burned), and plants were operated in Lea County by Cabot Carbon Co. at Hobbs and Columbian Carbon Co., Continental Carbon Co., and United Carbon Co., Inc., at Eunice.

Natural-Gas Liquids.—Production of natural-gas liquids gained 22 percent in 1955 compared with 1954 and totaled 539 million gallons valued at \$22.2 million. Natural-gas liquids rank fifth in value of the State minerals, following petroleum, potash, copper, and natural

gas

In 1955 production almost doubled the 1953 output of 293 million gallons. In the 2-year period 1954–55 processing plants grew both in number (from 17 to 22) and in average size, and output capacity within the State increased from 1.15 to 2.28 million gallons per day. During 1955 a reported 480 billion cubic feet of natural gas was processed to recover natural-gas liquids.

Processing plants were concentrated in the southeastern counties and reflect the older established gas-producing fields of that area,

TABLE 15.-Operating natural-gasoline and cycling plants, December 31, 1955

[Daily capacity in gallons]

				LP-gases			Natural gasoline		Type of	
Operator	Town and county	Propane	Butane	Iso- butane	Iso- pentane	LP-gas mixture	and other products	Total	process	
A tlantic Refining Co. El Paso Natural Gas Co. Do. Do.	Lovington, Lea. Blanco, San Juan Kirland, San Juan Wingate, McKinley.	50,000	50,000				40, 000 154, 000 57, 000	140, 000 332, 000 68, 000	Abs. Abs. Fract. Abs.	
Do. Do. Do.	Jaj, Jea. - do - do - do	} 80,000 32,000	49,000			000 06	120, 000 86, 000	249, 000 142, 000 30, 000	(Abs. Abs. Abs.	
Frontier Natural Gaso. Co- Guil Oil Corp. Maljamar Cooperative I. Permian Bastn P. L. Co	Loco Hills, Eddy Eunice, Lea Mailamar, Lea Hobbs, Lea	62, 150 10, 000 30, 000	20, 350 9, 000 35, 000			000 (07	87.8.52.8.65.65.65.65.65.65.65.65.65.65.65.65.65.	135, 300 140, 000 85, 000	Abs. Abs. Abs.	
Fullips Petroleum Co. Do. Skelly Oil Co.	Oil Center, Lea Equite, Lea Equite, Lea	148,000	68,000	25,000		2 (65,000)	112,000 158,000 12,000	2,500 6,218,64 6,000 6,0	Fract. Abs. Abs.	
Southern Union Gas Co. Valley Gas Corp.  When Detroloum Corp.	Blovmfield, San Juan Loco Hills, Eddy Lovington, Lea	6,300 10,000 15,000	10, 500 6, 000 6, 000 75, 000	25.000	20,000		8,4,4, 5, 8,000 9,000 9,000 9,000	28, 100 28, 000 30, 000	A DS. Refrig. Refrig. A Ds.	
Total	Monument, Lea	675, 450	456, 850	50,000	20,000	20,000	1,060,500 2,282,800	2, 282, 800		1 1

1 Estimate. Monadditive; fractionator capacity treating natural gasoline from other sources and therefore not considered as primary capacity.

The San Juan Basin, whose potential has developed in recent years, does not yet have a complement of subsidiary industry commensurate with its gas-producing potential.

Petroleum.-Petroleum output continued to increase, and a gain of 11 percent over the preceding year was recorded. by counties was: Lea, 91 percent; Eddy and Chaves, 8 percent; and

Rio Arriba, San Juan, McKinley, and Sandoval, 1 percent.

Development of the Caprock field in Chaves and Lea Counties was carried out; and the gaps between several smaller fields were proved, with a net result of consolidating the following fields: Caprock, Drickey, North Caprock, and South Drickey. The consolidated Caprock Queen field was approximately 20 miles long and contained a producing area of 22,000 acres. In 1955 the field produced 3.4 million barrels of oil, most of which was credited to Chaves County

and substantially increased that county's annual output.

In the San Juan Basin exploration for petroleum resulted in eight discoveries along the western and southern perimeter of the Blanco gas field. Six of the discoveries-4 in Sandoval and 2 in San Juan Counties—were low-yield wells and required pumping. Of the remaining 2, C. M. Carrol No. 1 Ute had an initial production from the Tocito formation of 190 barrels per day on pump, and El Paso Natural Gas Co. No. 1 Kelly State (Bisti discovery) flowed from the Gallup sandstone at an initial rate of 180 barrels of oil per day plus some gas.

Daily crude-oil capacity of the State 8 refineries totaled 23,850

barrels at yearend.

TABLE 16.—Production of crude petroleum, 1951-55, by districts and fields, in thousand barrels

[Oil and Gas Journal]

District and field	1951	1952	1953	1954	1955
Southeast: Bagley. Brunson Caprock-East Crossroad Denton Dollarhide-West Drinkard Eunice-Monument Fowler Gladiola Grayburg-Jackson Hare. Hobbs Langlie-Mattix Lovington and East Maljamar Moore. Saunders and South Vacuum Warren.	1, 662 2, 515 (7) 787 873 (873 (1) 6, 037 10, 590 (1) (1) 1, 545 1, 277 4, 380 1, 700 (1) 1, 829 (1) 4, 865 (1)	2, 447 3, 511 (1) 939 4, 329 9, 588 (1) 8, 1353 2, 027 780 1, 353 2, 027 1, 635 1, 136 1, 136 1, 1571 4, 496 (1)	2, 033 3, 007 1, 886 939 8, 668 1, 978 3, 454 9, 321 (1) 1, 304 1, 162 2, 047 3, 663 1, 669 2, 472 1, 792 921 1, 792 921 1, 164 4, 281 1, 438	1, 867 2, 264 2, 135 1, 355 10, 651 3, 251 2, 828 9, 029 837 1, 571 1, 114 1, 642 3, 340 1, 402 3, 250 1, 790 1, 166 2, 200 3, 832 1, 469	1, 655 1, 691 2, 244 1, 193 11, 031 3, 164 1, 362 1, 290 1, 054 1, 290 1, 054 1, 290 3, 3, 397 1, 641 3, 316 1, 292 3, 3, 394 1, 293 1, 3, 3, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4,
Other fieldsNorthwest 3	15, 392 327	13, 872 566	2 15, 466 776 2 70, 441	* 17, 112 715	2 24, 26 1, 01

<sup>1</sup> Included in "Other fields."
2 Bureau of Mines data.

TABLE 17.—Wildcat and development completions in 1955, by counties
[Oil and Gas Journal]

	7.				
County	Oil	Gas	Dry	Total	Footage
WILDCAT COMPLETIONS	6		15	21	94. 800
ChavesColfax			4	4	15, 500
Eddy	5		20	25	91, 800
Guadaluna I			4	4	21, 300
Lea	22		39	61	477, 400
Lincoln			1	1	3, 600
McKinley			4	4	10, 100
Otero 1			1 4	1 14	5, 600 58, 600
Rio Arriba		10	2	2	15, 200
Roosevelt	4		8	12	44, 600
Sandoval San Juan		1	9	14	74, 900
San Miguel <sup>1</sup>			ĭ	1	1,800
Sierra 1			1	1	8, 600
Socorro 1			3	3	6, 600
Torrance 1			1	1	600
Total wildcats	41	11	117	169	931, 000
DEVELOPMENT COMPLETIONS					
Chaves	263	4	17	284	862, 400
Eddy	97	1	24	122	364, 500
Lea	456	36	68	560	3, 008, 600
Rio Arriba	2	240	13	255	1, 053, 800
Sandoval		1	1 11	282	10, 700 869, 900
San Juan		271	, 11,	282	009, 900
Total developments	818	553	134	1, 505	6, 169, 900
Total all drilling	859	564	251	1, 674	7, 100, 90
	1	1	1	Į.	1

<sup>1</sup> SOURCE: New Mexico State Bureau of Mines and Mineral Resources and New Mexico Institute of Mining and Technology. Totals have been modified accordingly.

## **REVIEW BY COUNTIES**

Bernalillo.—The mining and preparation of nonmetals constituted the sole activity of the mineral industry of Bernalillo County. The quarrying and preparation of sand and gravel yielded a product valued at \$777,000. The production of stone with a value of \$196,000 and clay at \$16,000 ranked second and third in terms of output.

The value of structural sand and gravel sold accounted for the bulk of the county value of mineral production, and the largest commercial producers (Albuquerque Gravel Products Co. and Springer Transfer Co.) employed an average of 19 men who worked a total of 3,900 man-days. In addition, contracts let by the Federal Bureau of Reclamation and the District Engineer, United States Corps of Engineers, resulted in the production of 74,000 tons of paving sand and gravel. Total commercial and Government-and-contractor sales in 1955 were 42 percent smaller than 1954 due to fluctuations in highway-construction work.

The demand for building brick and other structural-clay products in the county was satisfied mainly by Kinney Brick Co., which operated a brick plant at Albuquerque on clay mined nearby. Mine output totaled 16,000 tons of common clay and 2 men were employed for 200 days.

A small quantity of crushed basalt was quarried and used as riprap in road construction, and 277,000 tons of crushed sandstone was used in concrete aggregate for highway construction. Exfoliated vermiculite for use in concrete and plaster aggregate and insulation was produced

TABLE 18.—Value of mineral production in New Mexico, 1954-55, by counties 123

gravel, gem stones.				
Sand and gravel, salt, gold, silver.	County	1954	1955	Mineral production in 1955 in order of value 2
Sand and gravel, salt, gold, silver.	Bernalillo	\$1 361 136	\$000.201	Cond and
Calfax	Catron			sand and gravel, stone, clays.
Colfax	Chaves	125 570		Sand and gravel, salt, gold, silver.
Curry	Colfor			Sand and gravel, clavs.
Dona Ana   323, 651   221, 421   Eddy	Cumar	- 510, 881	466, 521	Coal, stone.
Dona Ana   323, 651   221, 421   Eddy	Curry	- 400,000		
Eddy	De Baca		27, 250	Sand and gravel.
Grant.   35, 487, 883   53, 773, 331   Copper, silver, gem stones, respectively and provided in the compound of the copper content of the compound of the copper content of th			221, 421	Pumice and pumicite, sand and gravel clave
Copper, zinc, molybdenum, lead, ferruginor manganese ore, silver, stone, iron ore, gold clays, tungsten, sand and gravel.		1 3,000,000	69, 679, 142	Potash, salt, magnesium compounds, sand and
Clays, tungsten, sand and gravel.   Clays, tungsten, sand and gravel.	Grant	35, 487, 883	53, 773, 331	Copper, zinc, molybdenum, lead ferruginous
Stone, copper.   Ston				manganese ore, silver, stone, iron ore, gold,
Hidalgo	Guadaluna	70 700	100 100	clays, tungsten, sand and gravel.
Lea (*) 549,771 Lincoln	Hidelgo	70,700	109, 492	Stone, copper.
Satistic Sand and gravel, sulfur.   Satistic Sand and gravel, sulfur.   Satistic Sand and gravel, sulfur.   Satistic Sand and gravel, sulfur.   Satistic Sand and gravel, sulfur.   Satistic Sand and gravel, sulfur.   Satistic Sand and gravel, sulfur.   Satistic Sand and gravel, sulfur.   Satistic Sand and gravel.   Sand and gravel.	Log		1, 797, 760	Copper, silver, gold, clays, lead, gem stones, zinc.
Luna         (4)         271,986         Filtorspar, gem stones, sand and gravel, lead silver, gold.           McKinley         206,878         607,902         752         752         Copper, silver.         Copper, silver.         Copper, silver.         Sand and gravel.         Do.         Coal, mica, pumice and pumicite, diatomite tungsten, stone, beryl, columbium-tantalum sand and gravel.         Do.         Coal, mica, pumice and pumicite, copper, coal, stone, silver sand and gravel.         Do.         Coal, mica, pumice and pumicite, copper, coal, stone, silver sand and gravel.         Pumice and pumicite, copper, coal, stone, silver sand and gravel, oral and gravel, mica, stone.         Pumice and pumicite, coal, gem stones.         Beryl, sand and gravel, mica, stone.         Beryl, sand and gravel, coal and gravel, coal gem stones.         Beryl, sand and gravel, mica, stone.         Beryl, sand and gravel, mica, stone.         Beryl, sand and gravel, mica, stone.         Pumice and pumicite, sand and gravel, coal silver, silver, send and gravel, coal silver, send and gravel.         Silver, gem stones, sand and gravel.         Pumice and pumicite, copper, coal, stone, silver sand and gravel.         Pumice and pumicite, sand and gravel, coal silver, gem stones.         Beryl, sand and gravel.         Pumice and pumicite, sand and gravel, coal silver, gem stones.         Perlite, lead, opper, clays, gold, silver, gem stones.         Perlite, lead, barite, manganese, zinc, copper silver, stone, sand and gravel, gold.         Perlite, molybdenum, beryl, copper, mica, silver	I incoln	(*)		Salt, sand and gravel, sulfur.
McKinley         206,878         607,902         silver, gold.           Mora         752         Copper, silver.           Otero         607,174         236,088           Quay         24,000         15,824           Rio Arriba         602,752         171,294           Roosevelt         1,500         D.           Sandoval         71,173         101,942           San Juan         243,577         212,024           Santa Fe         370,697         480,089           Sierra         789         6,855           Scoorro         596,799         66,855           Taos         556,038         667,632           Torrance         556,038         667,632           Torrance         556,038         667,632           Torrance         556,038         67,632           Valencia         378,031         384,484           Valencia         378,031         365,235,128           303,535,754         303,535,754	T	863	1,419	Lead, silver, gold.
McKinley         206, 878         607, 902 Otero         Silver, gold.           Otero         607, 174 Otero         236, 088 Otero         Copper, silver.           Quay         24, 000 otero         15, 824 otero         15, 824 otero           Rio Arriba         602, 752 otero         171, 294 otero         171, 294 otero         Do.           Roosevelt         1, 500 otero         1, 500 otero         1, 500 otero         20, 249 otero         20, 249 otero         212, 024 otero         20, 249 otero         2	Luna	( <del>1</del> )	271, 986	Fluorspar, gem stones, sand and gravel, lead.
Coal, clays   Coper, silver   Cool, mica, pumice and pumicite, copper, coal, stone, silver   Sand and gravel   Coal, mica, pumice and pumicite, copper, coal, stone, silver   Sand and gravel   Coal, mica, pumice and pumicite, copper, coal, stone, silver   Sand and gravel   Coal, mica, pumice and pumicite, copper, coal, stone, silver   Sand and gravel   Coal, mica, pumice and pumicite, copper, coal, stone, silver   Sand and gravel   Coal, mica, pumice and pumicite, copper, coal, stone, silver   Sand and gravel   Coal, mica, pumice and pumicite, copper, coal, stone, silver   Sand and gravel   Coal, mica, pumice and pumicite, copper, coal, stone, silver   Sand and gravel   Coal, mica, pumice and pumicite, copper, coal, stone, silver   Sand and gravel   Coal, mica, pumice and pumicite, copper, coal, stone, silver   Sand and gravel   Coal, mica, pumice and pumicite, copper, coal, stone, silver   Sand and gravel   Coal, mica, pumice and pumicite, copper, coal, stone, silver   Sand and gravel   Coal, mica, pumice and pumicite, copper, coal, stone, silver   Sand and gravel   Coal, mica, pumice and pumicite, copper, coal, stone, silver   Sand and gravel   Coal, mica, stone, silver   Sand and gravel   Coal, mica, stone, silver   Sand and gravel   Coal, mica, stone, silver   Sand and gravel   Coal, mica, stone, silver   Sand and gravel   Coal, mica, stone, silver   Sand and gravel   Coal, mica, stone, silver   Sand and gravel   Coal, mica, stone, silver   Coal, mica, pumica and pumicite, copper, silver   Sand and gravel   Coal, mica, pumica and pumic	M-77:1			suver, gold.
Total Corport   Total Corpor	Mckimey	206, 878	607, 902	Coal, clays.
Sand and gravel   Sand and gravel   Do.   Coal, mica, pumice and pumicite, diatomite tungsten, stone, beryl, columbium-tantalum sand and gravel	Mora		752	Copper, silver.
Quay         24,000         15,824         Do.         Coal, mica, pumice and pumicite, diatomite tungsten, stone, beryl, columbium-tantalum sand and gravel.           Roosevelt         1,500         101,942         Pumice and pumicite, copper, coal, stone, silver sand and gravel.           San Juan         243,577         212,024         Sand and gravel.         Sand and gravel, coal, gem stones.           Santa Fe         370,697         480,089         Beryl, sand and gravel, mica, stone.           Sierra         789         6,855         66,855           Socorro         596,799         816,884         Perlite, lead, copper, clays, gold, silver, mica.           Taos         556,038         667,639         Ferlite, lead, barite, manganese, zinc, copper silver, stone, sand and gravel, coal price, sand and gravel, soal price, sand and gravel, soal price, sand and gravel, coal price, sand and gravel, soal price, sand and gravel, soal price, sand and g	Otero	607, 174	236, 088	Sand and gravel
Roosevelt	Quay	24,000		
Roosevelt	Rio Arriba	602, 752		
Roosevelt		,		tungston stone heryl columbiam tantal
Note				sand and gravel
Sandoval	Roosevelt	1 500		Sand and graver.
San Juan	Sandoval			Durming and numicity
San Juan       243, 577       212, 024       Sand and gravel, coal, gem stones.         San Miguel       26, 387       20, 249       Beryl, sand and gravel, mica, stone.         Santa Fe       789       6, 855       Gold, copper, clays, gold, silver, mica.         Socorro       596, 799       816, 884       Ferlite, lead, barite, manganese, zinc, copper silver, stone, sand and gravel, gold.         Taos       556, 038       667, 639       Ferlite, molybdenum, beryl, copper, mica, silver         Torrance       53, 211       Tunion       136, 454       384, 484         Valencia       378, 031       500, 522       303, 535, 754         Undistributed       265, 235, 128       303, 535, 754		11,110	101, 942	runice and pumicite, copper, coal, stone, silver,
San Miguel         26, 367         20, 249         Beryl, sand and gravel, mica, stones.           Santa Fe         370, 697         480, 089         Beryl, sand and gravel, mica, stone.           Sierra         789         6, 855           Scoorro         596, 799         816, 884         Funice and pumicite, sand and gravel, opper, clays, gold, silver, mica.           Taos         556, 038         667, 639         Furite, lead, opper, lead, silver, gem stones.           Taos         56, 038         667, 639         Furite, lead, opper, lead, silver, gem stones.           Taos         56, 038         667, 639         Furite, lead, opper, lead, silver, gem stones.           Torrance         53, 211         Purite, stone, sand and gravel, mica, stone.           Valencia         378, 031         384, 484           Valencia         378, 031         500, 522           Undistributed         265, 235, 128         303, 535, 754    Stone, perlite, sand and gravel, mica, stone.  Purite, ead, opper, clays, gold, silver, mica, copper, silver, stone, sand and gravel, gold.  Perlite, lead, opper, lead, silver, gem stones.  Purite, lead, opper, lead, silver, gem stones.  Perlite, lead, opper, lead, silver, mica, silver, mica, silver, mica, silver, mica, silver, mica, silver, mica, silve	San Juan	949 577	010.004	sand and gravel.
Santa Fe.         370, 697         480, 089         Pumice and pumicite, sand and gravel, coal zinc, lead, copper, clays, gold, silver, mica.         Cold, copper, lead, silver, gem stones.         Cold, copper, lead, silver, gem stones.         Perlite, lead, barite, manganese, zinc, copper silver, stone, sand and gravel, gold.         Perlite, lead, barite, manganese, zinc, copper silver, stone, sand and gravel, gold.         Perlite, lead, barite, manganese, zinc, copper silver, stone, sand and gravel, gold.         Perlite, lead, barite, manganese, zinc, copper silver, stone, sand and gravel, gold.         Pumice and pumicite, sand and gravel, copper, silver, silver, mica.         Stone, perlite, sand and gravel, coal zinc, lead, silver, gem stones.         Pumice and pumicite, sand and gravel, coal zinc, lead, silver, gem stones.         Perlite, lead, barite, manganese, zinc, copper silver, stone, sand and gravel, gold.         Pumice and pumicite, sand and gravel, coal zinc, lead, silver, gem stones.         Perlite, lead, barite, manganese, zinc, copper silver, stone, sand and gravel, gold.         Pumice and pumicite, sand and gravel, coal zinc, lead, silver, gem stones.         Perlite, lead, barite, manganese, zinc, copper silver, stone, sand and gravel, gold.         Pumice and pumicite, sand and gravel, coal zinc, lead, silver, gem stones.         Pumice and pumicite, sand and gravel, gold.         Perlite, lead, barite, manganese, zinc, copper silver, stone, sand and gravel, gold.         Pumice and pumicite, sand and gravel, gold.         P	San Mignel			Sand and gravel, coal, gem stones.
Sierra	Santa Fa	20, 307	20, 249	Beryl, sand and gravel, mica, stone.
Sierra		1	480, 089	Pumice and pumicite, sand and gravel coal
Socorro	Siarra	700		zine, lead, copper, clays, gold, silver, mica
Section	Cocomo			Utold, copper, lead, silver, gem stones
Taos         556, 038         667, 639         667, 639         Silver, stone, sand and gravel, gold.         Ferlite, molybdenum, beryl, copper, mica, silver           Union         136, 644         384, 484         750, 522         303, 635, 754         Tumice and pumicite, sand and gravel.         Stone, perlite, sand and gravel.	50corro	596, 799	816, 884	Perlite, lead, barite, manganese, zinc, conner
Document	m			Silver, Sione, Sand and gravel gold
Union       136, 454       384, 484       Pumice and pumicite, sand and gravel.         Valencia       378, 031       500, 522       Stone, perlite, sand and gravel, copper, silver.         Undistributed       265, 235, 128       303, 535, 754	Taos	556, 038	667, 639	Perlite, molybdenum, beryl, conner mica silver
Valencia 378, 031 500, 522 Undistributed 265, 235, 128 303, 535, 754 Stone, perlite, sand and gravel, copper, silver.	1 orrance	53, 211		, , ,
Valencia 378, 031 500, 522 Undistributed 265, 235, 128 303, 535, 754 Stone, perlite, sand and gravel, copper, silver.	Union	136, 454	384, 484	Pumice and pumicite, sand and gravel
Undistributed 265, 235, 128 303, 535, 754	Valencia	378, 031		Stone, perlite sand and gravel copper cilvor
Total	Undistributed	265, 235, 128		The state of the s
	Total	373, 519, 000	435, 911, 000	
	<u>and the second </u>		,,,	

1 The following counties are not listed because no production was reported: Harding, Los Alamos.
2 Values of some beryl (1954), carbon dioxide (natural), gem stones (1954 and some in 1955), helium, natural gas, natural-gas liquids, petroleum, some sand and gravel, some stone, and vanadium (1954) that cannot be assigned to specific counties are excluded from county totals and included with "Undistributed" to avoid disclosing individual company confidential data.
3 Value of low-grade manganese ore shipped to GSA Purchase Depots and uranium ore is excluded.
4 Value included with "Undistributed."

at the Albuquerque plant of Southwest Vermiculite Co. from raw material received from out of the State.

Catron.—Stimulated by the letting of contracts by the Federal Bureau of Public Roads and Forest Service, local contractors produced paving sand and gravel valued at \$61,000 in 1955; this compares with \$33,000 in 1954.

The solar-evaporation facility of Curtis Salt Co. at Quemado operated throughout the year. Shipments of salt to feed dealers for livestock use and as a water softener were reportedly made to Arizona as well as local consumers.

Small quantities of gold and silver were recovered from gold-silver ore mined by C. T. McLendon from the Confidence mine and shipped to American Smelting & Refining Co. El Paso, Tex., copper smelter.

Chaves.—Sand and gravel and clay were the only two nonmetals reported in the county during 1955. Sand and gravel sales for residential and to a limited extent for industrial construction were reported by F. M. Reeves & Sons, Inc., and F. A. Stacy & Son,

Clay for use in drilling oil wells was reported by Native Blanco Clay Co. of Lovington. Two men were employed 100 days in mining activities for this company.

Colfax.-Mineral activity in the county during 1955 was reported

by the coal and stone segments of the mineral industry.

Production and sales of basalt were reported by three contractors engaged in road construction for Government agencies. Riprap, consisting of heavy, irregular blocks, constituted the entire output of the county.

Dona Ana.—In order of importance, pumice, sand and gravel, clays, and lead made up the value of mineral production in Dona

Ana County.

The activities of the District Engineer, United States Corps of Engineers, provided a stimulus for the production of paving sand by

local contractors engaged in construction projects.

The steady demand for brick and structural-clay products in the El Paso, Tex., area continued to provide a ready market for raw clay mined at the Brickland pit of El Paso Brick Co. However, the Bowen quarry of International Brick Co. was abandoned, and subsequently the output of clay in Dona Ana County dropped considerably below that in 1954.

One ton of lead was produced from 6 tons of ore shipped to American Smelting & Refining Co.'s El Paso lead smelter by Albert Beasley

& Tony Silva.

Manganiferous ore was shipped from the Black Crow No. 3 mine by M. V. Dempsey and from the Rincon mine by Emilio Garcia (Central Mining Co.) to the Government Purchasing Depot at Deming under the "low-grade" program. This ore (total of 320 long dry tons averaging 27.6 percent manganese) was not credited to production in 1955 but will be recorded when it is treated and a useful product is shipped from the depot.

Eddy.—In 1954 Eddy County again ranked first in the State in terms of value of mineral output, despite the fact that only three segments of the mineral industry reported activity. Potash valued at \$69 million contributed the bulk of the mineral value followed by

salt and sand and gravel.

Because demand for refined potash in 1955 surpassed the record established in 1954, the county economy was sustained through the continued employment of 3,500 men by the 5 producing companies, and mining activity was accelerated to pace refinery operations.

Rock salt produced by Salt Supply Co., Inc., Carlsbad Salt Products, Inc., and Southwest Salt Co., all of Carlsbad, constituted the bulk of the salt sales in 1955. Although the tonnage sold decreased 33 percent in 1955 compared with 1954, the value of sales increased 8 percent. The tonnage dropped owing to the general drought conditions in the Southwest, which reduced the cattle herds, the largest single consumer of salt. On the other hand, the continued increase in the value of sales resulted from the production of a cleaner, more specialized product. The utilization of salt in drilling for oil has opened a new market potential for the county producers of this commodity.

Output of sand and gravel continued to grow, and sales in 1955

reached 80,000 tons valued at \$86,000.

Grant.—Over 96 percent of the combined value of the gold, silver, copper, lead, and zinc production in New Mexico came from Grant County in 1955. The combined value of the 5 metals (\$52.5 million) was 52 percent above that figure for 1954 (\$34.5 million). increase resulted from gains in output of copper, lead, and zinc, be-

cause of advanced prices for the metals.

Most of the State and county output of copper came from the Chino open-pit mine of Kennecott Copper Corp., Chino Mines Division, at Santa Rita. According to Kennecott Copper Corp. annual report for 1955, 63,490 short tons of copper was recovered from 7 million short tons of ore mined and milled in 1955, compared with 58,197 tons of copper from 6.5 million tons of ore in 1954. The ore mined from the pit was transported by railroad to treatment plants The Hurley mill had a daily capacity of 22,500 tons of at Hurley. The copper concentrate recovered from the ore was smelted in the company smelter adjacent to the mill. Copper precipitate recovered by leaching dumps was also smelted. Siliceous copper ore from the pit was used as a flux for the smelter charge of concentrate and precipitate. Molybdenum was recovered in the concentration mill as a byproduct. Gold and silver were not recovered from the copper bullion that was fire-refined at Hurley but from the blister copper shipped to the electrolytic refinery. Work of moving the mine shops and part of the town of Santa Rita to extend the mining area was completed early in 1955. As the corporation reported, the area freed for mining covered a minimum of 33 million tons of ore. During the year benches were established in this deposit, and mining was begun.

The Ground Hog mine of American Smelting & Refining Co. was the principal producer of lead and zinc in the State in 1955. It resumed operation in March 1955 after being closed down since February 1953. New Jersey Zinc Co. Hanover mine and the New Mexico Consolidated Mining Co. Kearney mine, large producers of zinc in past years, were reopened in 1955 and became the second and

third largest producers, respectively, in the State. Eighty tons of copper was recovered by Douglas B. White (Zuniga Mines, Inc.) from 120,000 tons of copper ore from the Zuniga open-pit mine by leaching. At the close of the year it was changing the treatment process from heap to vat leaching. Steeplerock Exploration Syndicate shipped from the East Camp group 2,619 tons of gold-silver ore (which contained 376 fine ounces of gold, 28,410 ounces of silver, 2,991 pounds of copper, and 2,218 pounds of zinc) to American Smelting & Refining Co. El Paso copper and lead smelters. In all, 18 mines, classed as lode mines, produced gold, silver, copper, lead, and zinc in Grant County in 1955. In addition, 5 individual mining operations, classed as placer mines, recovered a total of 23 fine ounces of gold and 6 ounces of silver.

Luck Mining & Construction Co. shipped 36,000 long wet tons of manganiferous ore (ferruginous manganese ore) with a 10.8-percent manganese content to Colorado Fuel & Iron Corp. Pueblo plant for use in making steel in 1955. From 8 mining operations in Grant County in 1955, 529 tons of manganiferous ore averaging 31.7 percent manganese and 222 tons of manganese ore averaging 35.5 percent manganese were shipped to the Government Purchasing Depot

at Deming.

All of the iron ore (magnetite—9,218 long tons) mined and shipped in New Mexico came from Mathis & Mathis Pearson iron-pit operation in Grant County and was used mainly in manufacturing cement. The tungsten produced in the county was recovered from ore mined by David D. Osmer from the Morning Star mine.

Because of the depressed price for domestic fluorspar, the Shrine mine of General Chemical Division, Allied Chemical & Dye Corp., as well as a number of smaller mines, were idle throughout 1955.

Stone was the most important nonmetal as to value produced in the county. Kennecott Copper Corp. reported the production and use of crushed limestone for smelter flux and Marblelite Products Co. the sale of a small quantity of crushed marble. The output of sand and gravel in the country resulted from sale of paving gravel by Wade White. El Paso Perlite Co., Inc., abandoned its expandedperlite plant near Deming. The Amber Pearl perlite mine near Lordsburg of Kirk's Perlite Industries remained idle throughout the year.

Mine production of fire clay was sustained in 1955 by the demand for refractory products by Phelps Dodge Corp. smelter facilities at Douglas, Ariz. The company employed 2 men for 200 days at the Pratt fire-clay quarry and produced fire-clay furnace stoppers for its furnaces. In addition to the quantity of clay mined for its own use,

the company reported the sale of a small quantity.

Guadalupe.—Drunzer & Casner shipped 114 short tons of siliceous copper fluxing ore containing 2 tons of copper to the El Paso smelter in 1955 from the Stauber open-pit mine, 15 miles southwest of Santa

Rosa, which was operated during January.

Hidalgo.—The value of the output of copper in Hidalgo County in 1955 (\$1.7 million) composed 94 percent of the total value of mineral

production in the county (\$1.8 million).

As in each year since 1936, the Banner Mining Co. Miser's Chest group, 5 miles south of Lordsburg, was the principal producer of copper in the county and second largest in the State in 1955. copper ore was treated in the company mill, and the concentrate produced was shipped to American Smelting & Refining Co. El Paso copper smelter to recover the contained copper, gold, and silver.

It ranked second in the State in output of silver.

The Atwood mine near Lordsburg was operated by Atwood Mines, Inc., from January 1 to November 15, and was the second largest (next to Miser's Chest) producer of gold, silver, and copper in the county. Lead was also recovered as a byproduct of the copper ore. The mine was subleased to Werner Lake Nickel Mines, Ltd., which began rehabilitating the Henry Clay shaft during the latter part of the year but had no production in 1955. In addition to the Atwood and Miser's Chest mines, the Rosa, Moon-Star-Comet, and North Star were producers of silver, copper, lead, and zinc in the county in 1955.

Combined Minerals, Inc., shipped 152 tons of manganese ore averaging 41.9 percent manganese to the Government Purchasing

Depot at Deming from the Ridge No. 1 mine.

Lea.—Lea County continued to supply nine-tenths of the oil and two-thirds of the natural gas produced in New Mexico. Carbon-

black plants were operated at Eunice and Hobbs; natural-gas liquidsprocessing plants were operated at Jal, Hobbs, Lovington, and other towns (see table 15); and one refinery was operated by Famariss

Oil & Refining Co. at Monument.

Champion Chemical Co., a newcomer to the salt industry, began processing potash tailings and recovering salt in 1955. The bulk of the output was consumed in the oil fields of eastern New Mexico and western Texas. Sand and gravel was the next most important nonmetal, and 105,000 tons combined output of structural sand and structural paving gravel was reported by Lea County Sand & Gravel, Inc. El Paso Natural Gas Co. and Warren Petroleum Corp. continued to operate their byproduct sulfur plants, and output in 1955 was 2½ times greater than in 1954.

Lincoln.—Two mining operations—T. A. & Dorotha Jeter on the Jeter claim and New Mexico Copper Corp. on the Conqueror-Surprise Park Gold mine-furnished the entire mineral production (gold,

silver, and lead) in the county in 1955.

Luna.—The continued foreign competition forced all fluorspar mines in the county to remain closed in 1955. The Deming mill of Allied Chemical & Dye Corp. operated for only a short period on stockpiled ore and tailings. Structural sand and gravel was produced by O'Kelley's Motor Transport & Transfer Co., and 12 tons of agate was reported as having been collected in the Deming area.

A total of 4,416 long dry tons of manganiferous ore averaging 25.4 percent manganese was shipped to the Government Purchasing Depot at Deming from 9 mines in the county in 1955. The Manganese Valley mine, operated by Florida Manganese, Inc., was the major producer in the county and among the leading five producers in the State. In addition, 5 tons of manganese ore averaging 37.8 percent manganese was shipped to the Government Purchasing Depot at Deming from 1 mine in the county.

Small quantities of gold, silver, and lead were recovered from silver ore mined by H. E. McCray from the Victorio group and shipped to

the El Paso copper smelter.

McKinley.—Gallup Brick & Tile Co. operated strip and underground clay mines throughout 1955 and employed 3 men for an average of 185 days supplying raw clay to the company brick and raw-clay The bulk of the 1955 clay output was sold for oil-welldrilling mud, and the remainder was utilized in manufacturing refractory brick and block and mortar.

Coal and petroleum were produced in McKinely County, and one refinery was operated by El Paso Natural Gas Co. at Prewitt.

Mines in McKinley County produced an important share of the uranium output of New Mexico from deposits in the Todilto limestone and the Westwater Canyon sandstone. Some active producers were: Haystack Mountain and Poison Canyon mines of Haystack Mountain Development Co., Mesa Top and Flat Top mines of Holly Minerals Corp., and Largo No. 2 of Four Corners Uranium Corp.

In 1955 the first discovery of uranium ore in the Westwater Canyon sandstone of the Ambrosia Lake district was made by Louis Lothman of Mid-Continent Exploration Co. in sec. 11, T. 14 N., R. 10 W. Rapid drilling by other operators indicated that the district was of major importance with ore bodies in sec. 10, 15, 22, 23, 24, 25 of the

same township and also in the southwestern portion of T. 14 N., R. 9 W. Ownership of the discovery ore body was transferred to Rio de Oro Uranium Mines, Inc., which in December was completing the Dysart shaft in the southwest corner of sec. 11.

Otero.—The backbone of the county mineral industry in 1955 continued to be the sand and gravel operators who recovered a product that supplied the entire value of mineral production in Otero County.

Roadwork provided the stimulus that resulted in the production of 261,000 tons of paving sand and gravel. Contracts let by the Federal Bureau of Public Roads comprised the bulk of the activity in 1955, and Frank P. Llewellyn, Inc., reported that 14 men worked 252 days producing paving sand and gravel.

La Luz Clay Products Co. shut down its plant at La Luz owing to

high labor cost in manufacturing tile by hand methods.

Rio Arriba.—The values of output of beryl, columbite-tantalite, diatomite, pumice (pumicite and scoria), and sand and gravel in Rio Arriba County declined sharply from 1954. Despite increases in coal- and mica-output value the county total mineral-production value

decreased over 70 percent.

Shipments of hand-cobbed and full-trimmed mica moved from \$14,000 in 1954 to \$61,000 in 1955—a fourfold increase. The largest producing mine in the county and State was the Apache mine operated The Globe mine operated by Continental Mine by J. H. Stivers. Products Co. was second, followed by a group of claims worked by Petaca Mining Co. Shipments of full-trimmed mica were made by J. H. Stivers and Carl Roseberry from the Apache and Globe mines. The increased production was due to the continued market for handcobbed and block mica at the Custer, S. Dak., Depot of the General Services Administration.

The production of pumice for abrasive and scouring compounds remained relatively stable, but the output of scoria used for concrete aggregate dropped considerably below 1954. Folsom Cinder Co., the only producer of scoria, curtailed its activities in this area. A small quantity of diatomite was sold from cleanup operations at the Santa Fe grinding plant of James H. Rhodes Pumice, Inc., shut down in 1954, and contractors for the Federal Bureau of Reclamation produced 135 tons of structural gravel and 300 tons of crushed sandstone.

Tungsten concentrate was produced from ore mined by D. H. Abel and Willis Westfall from the Wichita group. Columbium-tantalum and beryl ore were produced by one mine each in the county in 1955.

Sandoval.—Pumice continued to be the most important mineral in terms of value, and the demand for pumice for use in concrete aggregate consumed the entire production of Big Chief Mining Co., Dooley Bros. Pumice, Inc., and Lava Pumice, Inc. The only other nonmetals mined during 1955 were small quantities of sand and gravel and stone. Some coal was mined.

Silver and copper were produced from the Cecil-Hope group by Temexucol Uranium Vanadium Exploration & Development Co., Ltd., and L. Messer and from the San Miguel and Chalcocite No. 1 mines by Great Eastern Mines. Manganese ore (not credited to production) from the Landers mine was shipped to the Government Purchasing Depot at Deming by S. C. Landers and Jim McRee.

San Juan.—The production and sale of structural and paving sand and gravel were the most important activities in terms of value of output. The major producers were Jensen Ready Mix Co., Inc. operating its Navajo and Dallas pits, and the San Juan Gravel Products Co.

The Farmington plant of El Paso Natural Gas Co. remained idle since its purchase from Imperial Sulphur & Acid Co. The plant, rated at 1 ton of sulfur per hour, drew sour natural gas from the Barker Dome field.

Barker Dome field.

Natural gas totaling a third of the State output was produced from the Blanco and numerous smaller fields. Coal, helium, natural-gas

liquids, and petroleum also were produced in the county.

The uranium mill at Shiprock operated by Kerr-McGee Oil Industries treated ores from Apache County, Ariz., and a small quantity from the western border of San Juan County. Some ore was reported shipped to the plant from the Big Indian district in Utah. Modification and expansion of the plant were undertaken during the fall of the year.

San Miguel.—Although sand and gravel and beryl contributed the bulk of the county value of mineral production, stone quarries and mica mines reported some activity. Henry Young Gravel Co. engaged 4 men for a total of 180 days quarrying and processing structural and paving gravel. Crushed sandstone for use in concrete aggregate and roofing chips, as well as dimension sandstone, was quarried by Taylor Quarries. Las Vegas Brick Co. plant at Las Vegas was idle throughout the year.

Beryl ore was produced from the Old Priest mine by Pablo Lopez and The Onego Corp. and sold to Beryl Ores Co. of Arvada, Colo.,

in 1955

Santa Fe.—Mining activity in Santa Fe County resulted in the production of a number of mineral commodities. In addition to pumice—the most important mineral in terms of value—output of sand and gravel, coal, copper, gold, lead, zinc, mica, clay, and silver were also reported.

Concrete-block plants and concrete-aggregate producers received crude pumice from Crego block plant, as well as mines in other counties. Sales of prepared pumice in 1955 showed a 46-percent increase

over 1954, contrary to the downward trend of statewide sales.

The sand-and-gravel industry was dominated by the activities of Kauffman Trucking Co. which quarried structural sand and gravel and supplied all county production. New Mexico State Penitentiary manufactured building brick and tile from purchased clay, which was sold to building supply firms and to private individuals.

Robert O. Osthoff operated a mica-grinding plant for a short period,

using scrap mica produced in Rio Arriba County.

Gold, silver, copper, lead, and zinc were recovered from ores from the Bottom Dollar, Evelyn, Tom Payne, and San Pedro mines in Santa Fe County in 1955. Western Mines, Inc., which operated both the Bottom Dollar and Tom Payne mines, was the largest producer. The company shipped all of the ore mined to American Smelting & Refining Co. Deming mill for concentration. The Tom Payne mine was unwatered and rehabilitated during 1955 by the company.

Sierra.—Nine lode mines and 1 placer mine produced gold, silver, copper, and lead in Sierra County in 1955, compared with 2 lode mines producing only gold and silver in 1954. All mines in 1955 were small producers with an output of less than 20 tons of ore, except for the Vindicator mine operated by McDaniel Investment Co. (November 1-December 31, 1955) which shipped 200 tons of silver ore to American Smelting & Refining Co. El Paso copper and lead smelters. At the close of the year the lease was surrendered and the mine returned to the owner, George Koepke. Max Hiltscher produced gold and silver from the Green Horn placer mine.

From 4 mining operations in the county in 1955, 370 long dry tons of manganese ore that averaged 40.7 percent manganese was shipped to the Government Purchasing Depot at Deming. In addition, 41,047 long dry tons of manganiferous ore that averaged 25.0 percent manganese was shipped to the depot from 14 mining operations. The manganese and manganiferous ore shipped had a total value of \$1.3 million. The two largest producers were the Lake Valley mine operated by Haile Mines, Inc., and the Ellis mine operated by Tower

Mining & Refining Co.

Socorro.—The most important mineral commodity in terms of value of output was perlite, mined and processed by Great Lakes Carbon Corp. at its Blanco Vista open-pit mine, where 4 men were employed an average of 260 days. The expanding plant near the mine was

operated 260 days, employing 5 men.

The Royal Flush and other claims 5 miles south of Bingham operated by Mex-Tex Mining Co., Inc., continued to be the only sources of barite in the State. The production of ground barite results from milling the lead-barite ore for lead and recovering barite from the discharge from the lead circuit. Sales in 1955 were 21 percent above the 1954 level, and all output was used in oil-well-drilling mud.

The activities of the construction industry with regard to its utilization of stone and sand and gravel resulted in the quarrying of a small quantity of crushed basalt for riprap. Some structural gravel was produced by contractors working for the Federal Bureau of

Reclamation.

Lead composed 55 percent of the value of the metals produced in Socorro County in 1955. Other metals produced, in terms of value of output following lead, were manganese, zinc, copper, silver, and gold. The Malchite (Royal Flush) mine near Bingham operated by Mex-Tex Mining Co., Inc., supplied most of the lead. The company mined 25,343 tons of lead-barite ore, which was treated in its gravity mill (equipped with jigs) near San Antonio (35 miles from the mine) and which yielded 800 tons of lead concentrate that contained 528 tons of lead.

Six other operations produced gold, silver, copper, lead, and zinc in the county in 1955. F. Allen had a production from a cleanup at the Magdalena millsite. Elayer Co., Inc., conducted exploration and development work at the Lynchburg mine and shipped some lead-zinc ore to Empire Zinc Division, New Jersey Zinc Co., custom mill at Hanover for treatment. W. R. & W. L. Dobson partnership operated the Nitt-Silver Bell-Ozark copper mine the last 7 months of 1955. Mrs. Sadie Papa and her sons operated the Queen group of mines

throughout the year and shipped lead ore from which gold, silver, copper, and zinc were also recovered as byproducts of the lead ore. The Sixty silver mine was operated by S. S. Thurmond, Jr., during April and May 1955. Silver (327 fine ounces) and copper (1,370 pounds) were contained in the 105 tons of ore mined and shipped directly to the smelter. The Waldo group of American Smelting & Refining Co. was operated by Chamberlin & Scartacinni (partnership) during part of the year in 1955.

Manganese ore was shipped from the Socorro, RFC, and Nigger Head group of mines in Socorro County to the Government Purchasing Depot at Fort Worth, Tex., under the "carload lot" program by Manganese Corp. of Arizona in 1955. In addition, manganese and manganiferous ore and concentrate were shipped to the Purchase Depot at Deming under the "low-grade" program (not reported as production) from 20 mining operations in the county. Six of the operations shipped a total of 34,707 long dry tons of manganese ore and concentrate that averaged 37.8 percent contained manganese and that was valued at \$2.6 million to the depot. Three of the largest producers of ore were Joe Gianera (Black Canyon mine), Tower Mining & Refining Co. (Lucky Strike No. 2 mine), and Manganese Corp. of Arizona (Socorro Manganese). The latter operation shipped some manganese ore to the Butte, Mont., Government Purchasing Depot. The remaining 14 mining operations shipped 3,113 long dry tons of manganiferous ore and concentrate averaging 24.4 percent manganese and valued at \$121,000 to the Deming Depot. Of these, the three largest producers were Clarence Barrett (Gloryana mine), Yacoma, Inc. (Manganese Chief No. 2 and 6 mine), and Manganese Corp. of Arizona (Nigger Head mine).

Uranium ores were produced from the Jeter mine of Florida Miner-

als, Inc., and the Lucky Don mine of Holly Minerals Corp.

Taos.—The value of output by the mineral industry of the county increased from \$556,000 in 1954 to \$668,000 in 1955. The most important mineral in terms of value was perlite followed by molyb-

denum, beryl, copper, mica, and silver.

F. E. Schundler & Co., Inc., operated its No Agua crude perlite property for 305 days, employing an average of 3 men in mining operations; in addition, 21 men were employed at the preparation plant for 305 days. The demand for expanded perlite for concrete aggregate, oil-well drilling, and other uses continued its upward trend, and sales in 1955 gained 20 percent over the 1954 total.

As a result of a market for sheet mica at the Custer, S. Dak., Government Purchasing Depot, the county mica district continued to report mining activity. Nu-Mex Mica Corp. mined the U.S. Hill mica deposit, and a small quantity of hand-cobbed mica was shipped

to Custer.

Molybdenum Corp. of America operated its molybdenum mine near Questa. The concentrate produced from the ore in the company mill at the mine was shipped to the company refining plant at Washington, Pa., where it was used to produce molybdenum oxide, ferromolybdenum, and other molybdenum products.

In 1955 beryl was produced by Arthur Montgomery from the

Harding mine near Dixon. This mine was again the largest producer

of beryl in the State and the United States in 1955. The bervl was sold to the Government Purchasing Depot and to Beryl Ores Co. of

Arvada, Colo.

Silver and copper were recovered from silver ore mined from the Aztec dump by the Aztec Copper Mines, Inc., and from copper ore mined from the Red River claims by the Taos Uranium Exploration Co. and shipped to the American Smelting & Refining Co. smelter

at El Paso for treatment.

Union.—Output of pumice (scoria), sand and gravel, and carbon dioxide was reported by the mineral industry of the region. Mining of scoria was centered around Des Moines, where Twin Mountain Rock Co. operated the Twin Mountain pit, producing scoria for railroad ballast. Colorado & Southern Railway Co. reported production of 163,000 tons of gravel for railroad ballast.

Valencia.—Stone, perlite, sand and gravel, copper, and silver were

mined and sold in the county during 1955.

The Grants quarry, operated by United States Gypsum Co., produced a large quantity of crude perlite in 1955. The mine operated 300 days in 1955 and employed an average of 3 men. The processing plant was also operated 300 days, and 13 men were employed.

In addition to a small quantity of crushed basalt used in road construction, the Sharp & Fellows Construction Co. produced limestone

and sandstone for railroad ballast.

The Federal Bureau of Reclamation was active in the county during 1955; as a result of contracts let by this agency, a small tonnage of paving sand and gravel was produced by private contractors. Belen Sand & Gravel Co. also reported sales of structural and paving sand

An open-pit gypsum deposit near Las Lunas operated by White Eagle Gypsum Co., Inc., during 1954 was idle throughout the year.

Beginning May 1 and continuing throughout the year, International Uranium Corp. opened a prospect and shipped 230 tons of ore to American Smelting & Refining Co. El Paso copper smelter. Twelve fine ounces of silver and 3 tons of copper were contained in the ore. Grants Mining & Leaching Corp. conducted tests in a pilot plant on copper oxide ore from the Mirabel Copper mine during 1955

and recovered a few pounds of copper.

Valencia County became the leading uranium-producing area in 1955 as Anaconda Co. increased mine production with near completion of its acid-leach plant. One circuit of the new plant was placed in operation late in the year and a second circuit was scheduled for completion early in 1956. Expansion of the smaller and older carbonate-leach mill was completed in the spring of the year. As construction of the new mill units neared completion, Anaconda announced that purchase of custom ore would cease in order to treat its own ores. from the Jackpile, Woodrow, and other mines in the Laguna area Anaconda reported that \$12.1 million was spent on its New Mexico operations in 1955, most of which went into mine and mill plant and subsidiary facilities in Valencia County.

Uranium exploration was carried out by Anaconda and St. Anthony

Uranium Corp. in the Laguna area.

# The Mineral Industry of New York

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

By Joseph J. Wallace and Geraldine C. Slaypoh 2



EW YORK's mineral production rose 13 percent in value in 1955 compared with 1954, primarily because of increased output of portland cement, iron ore, and stone. Nonmetals comprised 68 percent of the total mineral value for the State, metals 27 percent, and mineral fuels 5 percent. Portland cement, stone, sand and gravel, and salt accounted for 90 percent of the value of nonmetal production; iron, zinc, and titanium concentrate accounted for 99 percent of the value of metal production; and petroleum accounted for 90 percent of the value of mineral fuel production. St. Lawrence, Erie, Essex, and Columbia Counties remained the principal producers of minerals.

TABLE 1.—Mineral production in New York, 1954-55 1

	15	954	19	)55
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement: Portland	(2) (1, 199, 158 9, 758 1, 133, 579 5 2, 802, 873 1, 187 (3) 2, 598 3, 257 3, 412, 636 30, 082, 333 34, 576 114, 929 19, 410, 121 53, 199	132, 313 4,005, 353 531, 706, 570 325, 238 (3) 847, 000 11, 140, 000 22, 754, 118 29, 756, 301 31, 293 1, 742, 048 31, 425, 701 11, 490, 984	16, 906, 607 1, 035, 519 (3) 1, 393, 665 10, 735 (4) 1, 249, 119 3, 201, 927 1, 037 82, 890 3, 637 2, 904 3, 779, 547 25, 561, 941 66, 162 90, 668 22, 812, 222 53, 016	\$48, 725, 030 3, 425, 069 3, 425, 069 1, 676, 215 151, 455 38, 018, 783 309, 026 1, 365, 481 1, 073, 000 10, 310, 000 25, 214, 191 25, 542, 363 59, 880 1, 344, 715 37, 919, 063 13, 041, 936
Total New York 7		192, 738, 000		216, 907, 000

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

<sup>2</sup> Portland cement used in making masonry cement included with portland cement.

<sup>3</sup> Figure withheld to avoid disclosure of individual company confidential data.

 Quantity not reported.
 Includes crude iron oxide for pigments. Revised figure

7 Less value of clays and limestone used to manufacture cement and lime to avoid duplication.

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# REVIEW BY MINERAL COMMODITIES

### METALS

Iron Ore.—Five mines in 3 counties produced iron ore in New York in 1955, namely, Jones & Laughlin Steel Corp. Benson mine at Starlake, St. Lawrence County; Republic Steel Corp. Fisher Hill, New Bed-Harmony, and Old Bed mines at Mineville, Essex County, and Lyon Mountain, Clinton County; and National Lead Co. MacIntyre mine at Tahawus, Essex County.

Crude ore produced and usable ore shipped increased 9 and 14 percent, respectively, compared with 1954. Direct-shipping ore, con-

centrate, and sinter are classified as usable ore.

Pig-iron production in New York centered in the Buffalo area because of the excellent facilities for shipping iron ore and limestone by water on the Great Lakes and the availability of low-cost coal and coke from nearby coal-producing States.

TABLE 2.—Production and shipments of iron ore, 1946-50 (average) and 1951-55

Year	Number of mines	Crude ore mined (long tons)	Usable ore shipped (long tons)	Value
1946-50 (average)	7	5, 968, 694	2, 333, 574	\$20, 395, 445
	7	7, 741, 434	3, 649, 531	39, 819, 368
	6	7, 267, 202	2, 896, 531	34, 514, 879
	6	8, 691, 395	3, 414, 859	36, 346, 279
	6	7, 396, 516	2, 802, 873	31, 706, 570
	6	8, 078, 965	3, 201, 927	38, 018, 783

Lead.—Lead was recovered from a predominantly zinc ore produced by St. Joseph Lead Co. at its Balmat mine in St. Lawrence County. Production declined 13 percent compared with 1954, because the lead content of the ore decreased. The tonnage of crude ore milled at the company mill was virtually the same as in 1954.

Silver.—Smelter recovery of silver as a byproduct from St. Joseph Lead Co. Balmat mine zinc-lead ore increased 91 percent compared

with 1954.

Titanium (Ilmenite).—Ilmenite was recovered as a coproduct of iron ore at the National Lead Co. MacIntyre mine in Essex County. National Lead Co. announced a new discovery of titanium ore 1½ miles from its present plant at Tahawus. Reserves of 50 million tons have been proved, and indications are that this deposit will contain over 100 million tons of ore somewhat richer in grade than that now being mined.3

Zinc.—St. Joseph Lead Co. Balmat and Edwards mines produced at capacity throughout the year. The recoverable zinc produced remained virtually the same as in 1954, when a record high was

established.

<sup>3</sup> Mining Congress Journal, vol. 41, No. 11 November 1955 p. 95.

TABLE 3.—Mine production of silver, lead, and zinc, 1946-50 (average) and 1951-55, in terms of recoverable metals

	Mines	Material sold or	Sil	ver	L	ead		Zine	
Year	produc- ing	treated (short tons)	Fine ounces	Value	Short tons	Value	Short tons	Value	Total value
1946-50 (average)	3 2 2 2 2 2 2 2	458, 637 500, 490 437, 099 646, 041 662, 665 650, 877	21, 598 47, 568 38, 895 35, 398 34, 576 66, 162	\$19, 240 43, 051 35, 202 32, 037 31, 293 59, 880	1, 320 1, 500 1, 120 1, 435 1, 187 1, 037	\$384, 462 519, 000 360, 640 375, 970 325, 238 309, 026	35, 498 40, 051 32, 636 51, 529 53, 199 53, 016	\$9, 136, 951 14, 578, 564 10, 835, 152 11, 851, 670 11, 490, 984 13, 041, 936	\$9, 540, 654 15, 140, 615 11, 230, 994 12, 259, 677 11, 847, 515 13, 410, 842

### **NONMETALS**

Cement.—Portland and masonry cements composed 24 percent of the mineral production in the State; there were 12 plants in production. Counties producing in 1955, in order of decreasing output, were Erie, Columbia, Greene, Warren, Schoharie, Onondaga, and Ulster. One

plant in Ulster County produced natural cement.

Lone Star Cement Corp., New York, reported a large backlog of construction requirements in the United States, necessitating a larger cement capacity than at present. As a result, the company continued its expansion program, which was to add 1 million barrels of cement to its existing plant at Hudson, Columbia County. The expansion called for addition of a fifth kiln, a new crushing plant, raw and finish grinding mills, dust collectors, coal-handling system, raw storage, and powerplant extension. Lehigh Portland Cement Co. added 24 cement-storage silos to its Buffalo, N. Y., cement plant. The silos furnished an added 350,000 barrels of cement storage, permitting faster loading for railroad cars and trucks and providing stockpiling facilities during the winter.5

North American Cement Corp. acquired three tracts of land containing shale deposits to be quarried for use in cement production at the company Howes Cave, Schoharie County, plant. Clay deposits in the vicinity, used for many years by the company, reportedly had been exhausted. The newly acquired property is about 8 miles from the cement plant. A railroad siding was constructed along the

mountain for hauling the shale and rock to the plant site.6

TABLE 4.—Shipments of portland cement, 1946-50 (average) and 1951-55

Year	Barrels	Value	Year	Barrels	Value
1946-50 (average)	12, 071, 571	\$24,811,734	1953	14, 965, 164	\$39, 388, 183
1951	13, 862, 522	34,687,090	1954	14, 496, 876	38, 861, 205
1952	14, 624, 274	36,679,379	1955	16, 906, 607	48, 725, 030

<sup>4</sup> Mining Congress Journal, October 1955, p. 72.
5 Rock Products, vol. 59, No. 6, June 1956, p. 55.
6 Rock Products, vol. 58, No. 1, January 1955, p. 78.

Clays.—The production of clay increased 16 percent in 1955 compared with 1954; 21 pits in 10 counties reported production. The five leading counties, in decreasing order of output, were Ulster, Albany, Orange, Dutchess, and Erie. Of the total output, 94 percent was used in manufacturing heavy clay products and cement.

Emery.—The entire production of emery came from two mines in Westchester County—DeLuca and Kingston. Output from these properties was used as a nonskid agent in concrete floors and steps

and for abrasive purposes.

TABLE 5.—Emery sold or used by producers, 1946-50 (average) and 1951-55

	Short	V	alue		Short	Va	lue
Year	tons	Total	Average per ton	Year	tons	Total	Average per ton
1946-50 (average) 1951 1952	5, 650 11, 634 10, 352	\$66, 932 160, 212 141, 911	\$11. 85 13. 77 13. 71	1953 1954 1955	10, 562 9, 758 10, 735	\$143, 974 132, 313 151, 455	\$13. 63 13. 56 14. 11

Garnet, Abrasive.—Barton Mines Corp. Barton mine in Warren County, and Cabot Carbon Co. Willsboro mine in Essex County were the only producers of garnet in New York. The garnet produced by Cabot Carbon Co. was a byproduct of wollastonite production. Barton Mines Corp. sold its garnet for sandpaper manufacturing and

glass grinding and polishing.

Gypsum.—Gypsum production increased 10 percent in 1955 compared with 1954. United States Gypsum Co., Oakfield, and National Gypsum Co., Clarence Center, were the largest producers of gypsum. Other producers were Certain-teed Products Corp., Akron; The Ruberoid Co., Wheatland; and Universal Atlas Cement Co., Clarence Center. United States Gypsum Co. planned to open a new gypsum plant at Stony Point.

TABLE 6.—Production of crude gypsum, 1946-50 (average) and 1951-55

	Active mines	Short tons	Value	
Year			Total	Average per ton
1946-50 (average)	6 5 5 5 5 5 5	1, 037, 790 1, 259, 484 1, 143, 920 987, 156 1, 133, 579 1, 249, 119	\$2, 910, 110 4, 010, 766 3, 816, 148 3, 507, 207 4, 005, 353 4, 403, 895	\$2. 80 3. 18 3. 34 3. 55 3. 53 3. 53

Iron Oxide Pigments.—Clinton Metallic Paint Co. produced crude iron oxide pigments (hematite) material. Part of the production was used in making finished natural red iron oxide at Clinton Metallic Paint Co. plant, and the remainder was sold to manufacturers in

other States. Rossie Iron Ore Co. also manufactured finished natural red iron oxide pigments from crude iron oxide imported from outside the State

Lime.—Kelley Island New York Corp., Erie County, was the largest producer of lime in the State. Other producers were International Lime & Stone Co., Inc., and Balducci Crushed Stone Co. in Clinton and St. Lawrence Counties, respectively. Quicklime and hydrated lime were used, in descending order of importance, for chemical, industrial, agricultural, and building purposes.

Perlite.—Expanded perlite was manufactured by five companies from crude material shipped from Colorado and Nevada. The plants were in Erie, Genesee, and Onondaga Counties. The expanded perlite was used as a plaster and concrete aggregate, soil

conditioner, fertilizer, filterer, and acoustical grade plaster.

Salt.—In terms of value, production of salt was the fifth largest mineral industry in New York. Output was derived from evaporated salt, rock salt (halite), and brine. Counties producing salt were Livingston, Onondaga, Schuyler, Tompkins, and Wyoming.

TABLE 7.—Salt sold or used by producers, 1946-50 (average) and 1951-55

Year	Evaporated		Rock and brine	
	Short tons	Value	Short tons	Value
1946-50 (average) 1951 1952 1953 1954 1954	502, 216 6, 508, 317 6, 532, 924 7, 529, 602 8,	\$5, 550, 012 6, 419, 061 6, 674, 698 7, 832, 362 8, 734, 524 9, 655, 884	2, 465, 612 3, 016, 499 2, 909, 126 2, 789, 735 2, 883, 034 3, 211, 050	\$6, 890, 084 10, 133, 829 10, 071, 764 9, 518, 749 14, 019, 594 15, 558, 307

Sand and Gravel.—Output of sand and gravel decreased 15 percent in 1955 compared with 1954. Of the total, 94 percent was produced by commercial operators and 6 percent by Government agencies and contractors. Suffolk, Nassau, and Eric Counties were the leading producers. Building and paving utilized 47 percent and 45 percent, respectively, of the total production.

Slate.—Output of slate decreased 21 percent in 1955 compared with 1954. The demand for slate decreased somewhat, owing to the floods in New England States. The slate quarries are centered at Granville, Hampton, and Whitehall in Washington County, the northeastern part of New York. Of the total slate production, 99.9 per-

cent was used for flagging, granules, and flour.

Stone.—Stone ranked third in value of the minerals produced in New York. Production rose 18 percent in 1955, compared with 1954. Limestone, basalt, sandstone, marble, granite, and miscellaneous stone were used for building purposes and crushed or broken for highway and railroad construction and maintenance, concrete aggregate, and riprap. The leading stone-producing counties were Onondaga, Dutchess, Rockland, Erie, and Greene.

TABLE 8.—Sand and gravel sold or used by producers, 1954-55, by classes o operations and uses

명시 사장에 얼마를 되었다.	19	954	1955	
	Short tons	Value	Short tons	Value
COMMERCIAL OPERATIONS				
Sand:			4.1	
Molding	271, 477	\$720, 879	316, 092	\$879, 883
Dulluling	10 280 834	9, 468, 050	7, 525, 795	7, 443, 321
T 3 VIII 2	4, 577, 719	4, 616, 755	6, 058, 430	5, 204, 455
Filter	28, 176	36, 726	(1)	(1)
Other	1, 452, 726	564, 453	1, 044, 363	448, 165
Gravel:	-		45, 548	68, 129
The second secon			, , , , , , , , , , , , , , , , , , , ,	00, 120
		9, 089, 761	4, 307, 193	6, 328, 538
Paving Railroad ballast	3, 865, 249	3, 964, 047	4, 046, 077	3, 984, 741
			39, 232	23, 630
Undistributed (sand and gravel) 3	650, 598	386, 319	593, 247	454, 425
(sand and graver)	113, 656	86, 603		
Total commercial sand and gravel	27, 852, 021	00 000 200		
Table and Brayon	21, 002, 021	28, 933, 593	23, 975, 977	24, 835, 287
GOVERNMENT-AND-CONTRACTOR OPERATIONS 4				
Sand:				
Building	17, 195	4, 157	2, 086	0.000
raving	171, 499	49, 391	450, 630	2, 639
dravel:	1 2, 200	10, 001	400,000	224, 897
Building	73, 219	6. 417	103, 618	37, 391
Paving	1, 968, 399	762, 743	1, 029, 630	442, 149
M-4-1 (G-			2, 020, 000	114, 149
Total Government-and-contractor sand and				
gravel	2, 230, 312	822, 708	1, 585, 964	707, 076
Grand total				. 31, 010
Grand total	30, 082, 333	29, 756, 301	25, 561, 941	25, 542, 363

Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
 Includes engine, filter, railroad ballast, and data indicated by footnote 1.
 Includes railroad ballast sand and gravel, fire and furnace sand, grinding and polishing sand, and glass sand.

sand.
4 Includes figures for State, counties, municipalities, and other Government agencies.

TABLE 9.—Slate sold by producers, 1946-50 (average) and 1951-55, by uses

77	. `	Roofing		Flagging, granules, flour, and other uses		
Year	Operators	Squares (100 square feet)	Value	Short tons	Value	Total value
1946-50 (average)	16 19 20 20 13 13	1 1, 418 450 600 566 242 82	1 \$40, 346 19, 580 21, 456 20, 037 10, 879 5, 587	131, 917 125, 880 125, 694 113, 345 114, 832 90, 635	\$1, 555, 795 1, 980, 526 1, 789, 409 1, 713, 295 1, 731, 169 1, 339, 128	\$1, 588, 072 2, 000, 106 1, 810, 865 1, 733, 332 1, 742, 048 1, 344, 715

<sup>14-</sup>year average.

TABLE 10.—Stone sold or used by producers, 1954-55, by uses

Use	19	954	1955		
	Short tons	Value	Short tons	Value	
Dimension stone: Building stone Curbing and flagging	12, 826 18, 267	\$417, 377 457, 882	22, 603 19, 654	\$662, 274 446, 789	
Total dimension stone	31, 093	875, 259	42, 257	1, 109, 063	
Crushed and broken: Riprap Crushed stone Furnace flux Agricultural Other Limestone for cement and lime Total crushed and broken	309, 499 13, 745, 470 94, 487 307, 859 2, 148, 177 2, 773, 536	769, 300 23, 561, 950 123, 625 949, 662 2, 714, 171 2, 431, 734 30, 550, 442	(1) 15, 528, 682 (1) 430, 169 2, 671, 716 4, 139, 398 22, 769, 965	(1) 27, 020, 109 (1) 1, 048, 467 4, 773, 015 3, 968, 409	
		30, 330, 442	22, 769, 965	36, 810, 000	
Grand total	19, 410, 121	31, 425, 701	22, 812, 222	37, 919, 063	

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosing individual company confidential data; included with "Other."

Talc.—Production of talc increased 14 percent compared with 1954. Three companies mined talc, all in St. Lawrence County. Gouverneur Talc Co., Inc., and International Talc Co., Inc., operations at Gouverneur were underground mines, while the Reynolds Talc Co. operation at Edwards was open pit.

Vermiculite.—Zonolite Co. in Albany County produced exfoliated vermiculite from material shipped from Montana, South Carolina, and South Africa.

Wollastonite.—Cabot Carbon Co. of Boston, Mass., continued to operate the Fox Knoll mine and mill for the production of wollastonite. This material was refined and sold as a filler in the manufacture of paint, ceramics, and plastics.

### MINERAL FUELS

Peat.—Three peat bogs were in operation in Dutchess and Seneca Counties in 1955. These bogs consisted of humus, moss, and reed or sedge peat. Reflecting the trend in United States cities toward suburban living, the 1955 peat production was double the 1954 output due to increased use of peat as a soil conditioner for lawns and home gardening.

Natural Gas.—The marketed production of natural gas in New York increased 1,039 million cubic feet compared with 1954. As of December 31, 1955, the proved recoverable reserves were 75,760 million cubic feet, an increase of 6,398 million cubic feet over those in 1954. This increase was due to new discoveries and changes in underground storage 7

Dome Gas & Oil Corp. struck natural gas at a depth of 5,360 feet at Shandaken, a small rural town in the heart of the Catskill Mountains. The flow—50,000 cubic feet a day—was not enough for commercial use. However, drilling at a greater depth may disclose worthwhile quantities. If it does, it will be the first usable natural gas discovery in the Catskills.<sup>8</sup>

American Petroleum Institute, Petroleum Facts and Figures: Ed. 12, 1956, p. 161.
 Business Week, Issue 1332, Mar. 12, 1955, p. 80.

Petroleum.—The production of crude petroleum decreased 353,000 barrels compared with 1954. The number of producing wells decreased from 22,500 in 1954 to 22,300 in 1955. No new oil wells were discovered in 1955. As of December 31, 1955, the proved reserves of crude oil were 42,943,000 barrels.9

TABLE 11.—Petroleum production, 1946-50 (average) and 1951-55

Year	Thousand barrels (42 gallons)	Value (thousand dollars)	Year	Thousand barrels (42 gallons)	Value (thousand dollars)
1946–50 (average) 1951 1952	4, 563 4, 254 4, 242	18, 584 17, 990 17, 940	1953 1954 1955	3, 800 3, 257 2, 904	16, 260 11, 140 10, 310

### REVIEW BY COUNTIES

Albany.—The mineral products of Albany County in 1955, in order of decreasing value of output, were stone, sand and gravel, and clays. Crushed and broken limestone for riprap, blast-furnace flux, concrete aggregate, road material, and agricultural purposes was produced at Plant No. 1 of The Callanan Road Improvement The Grippy quarry operated by Julian Bocchi yielded dimension stone for use as rubble in wall facing and fireplaces. County again had eight active commercial sand and gravel producers. Albany Gravel Co., Inc., had four operations at Albany, Loudonville, and Cedar Hill, producing building and paving material. Charles M. Guptill's Latham operation produced paving and road sand and gravel for structural pruposes. Whitehead Bros. Co. recovered molding sand from its pits at Selkirk, Slingerlands, and West Albany. Harold S. Vincent & Son recovered gravel for paving and structural purposes at its Selkirk operation. Selkirk Molding Sand Co., Inc., at Selkirk produced molding sand.

Clay producers active during 1955 in the county were Powell & Minnock Brick Works, Rex Clay Products Co., Inc., Albany, Roah Hook Brick Co., and Sutton & Suderley Brick Co., all at Coeymans. Their production consisted of miscellaneous clay used for manufac-

turing brick and heavy clay products.

Zonolite Co. manufactured exfoliated vermiculite at its plant near

Allegany.—Alfred-Atlas Gravel & Sand Corp. and Buffalo Slag Co., Inc., at Alfred Station and Thomas Moogan at Friendship produced building and paving sand and gravel. Nick Codispoti produced sand

at his Belmont pit.

Broome.—Broome County had three active commercial sand and gravel producers in 1955. Barney & Dickenson, Inc., Vestal, and Binghamton Crushed Stone & Gravel Co., Binghamton, produced structural sand and gravel from their pits. The Vestal pit owned by structural sand and gravel from their pits. Royal Winne produced building gravel for construction purposes.

W. R. Strong & Sons near Deposit quarried dimension sandstone for architectural and flagging purposes. Corbisello Quarries reopened

American Petroleum Institute, Petroleum Facts and Figures: Ed. 12, 1956, pp. 122, 158.

its operation on May 6, 1955, and produced crushed and broken sandstone for riprap, concrete, and road material.

Miscellaneous clay for use in heavy clay products was produced at the Binghamton pit of Binghamton Brick Co., Inc.

TABLE 12.—Value of mineral production in New York, 1954-55, by counties 1 2

County	1954	1955	Minerals produced in 1955 in order of value 2
Albany	\$1, 580, 180	\$1, 538, 008	Stone, sand and gravel, clays.
Allegany	248, 398	261, 003	Sand and gravel, clays.
Broome	660, 280	816, 182	Sand and gravel, stone, clays.
Cattaraugus	555, 147	463, 163	Sand and gravel.
Cayuga	374, 168	(3)	Stone, sand and gravel.
Chautauqua	428, 462	423,008	Sand and gravel.
Chemung	/0\	(3)	Sand and gravel, clays.
Chenango	(3)	(3)	Sand and gravel
Clinton Columbia	. (3)	4, 852, 994	Iron ore, stone, lime, sand and gravel.
Joint Dia	. (3)	13, 670, 167	
ortland		92, 318 438, 977	Sand and gravel.
Delaware	538, 163	438, 977	Stone, sand and gravel.
Outchess	6, 789, 050	(3)	Stone, sand and gravel clave neat
Ssex		22, 656, 249	clays.
	, , , , , , , , , , , ,	20, 689, 116	Iron ore, titanium concentrate, wollastonite, san and gravel, garnet.
ranklin		111,647	Stone, sand and gravel.
'ulton	207, 160	30, 887	Sand and gravel.
lenesee		3, 293, 768	Gypsum, stone, sand and gravel.
dreene	8, 954, 732	(3)	Cement, stone, sand and gravel
Ierkimer efferson	793, 135	(3)	Stone, sand and gravel.
Cings		768, 959	Do.
Awie	(3)	50, 620	Sand and gravel.
ewisivingston	56, 022 7, 617, 866	29, 773	Sand and gravel, stone.
Adison	275, 562	(3)	Salt, sand and gravel.
Ionroe		243, 408	Stone, sand and gravel. Stone, sand and gravel, gypsum.
Iontgomery	276, 651	2, 750, 812	Stone, sand and gravel, gypsum.
assau	7, 373, 606	5, 979, 130	Stone, sand and gravel.
ew York	1,010,000	354	Clays, sand and gravel. Sand and gravel.
iagara	748, 661	1, 243, 705	Sand and gravel. Sand and gravel, stone.
noido		1, 673, 118	Stone sand and gravel, stone.
nondaga	9, 862, 286	10, 514, 240	Stone, sand and gravel, crude iron oxide pigments. Salt, stone, cement, sand and gravel, clays.
nondaga ntario	634, 343	668, 861	Sand and gravel, stone.
range	1,001,949	733, 693	Sand and gravel, clays.
rleans	(3)	(3)	Stone, sand and gravel.
swego	(3)	285, 399	Sand and gravel.
tsego	(3)	62, 670 197, 500 397, 290	Do.
utnam	(3)	197, 500	Stone.
ensselaer	259, 132	397, 290	Stone, sand and gravel, clays.
ockland	8, 778, 086	(8)	Stone, sand and gravel.
t. Lawrence	(3)	34, 493, 983	Iron ore, zinc, talc, stone, lead, sand and gravel
	22		silver lime
aratoga	698, 022	662, 578	Sand and gravel, stone.
chenectady	(3)	(3)	j band and gravel.
choharie	(3)	(3)	Cement, stone.
chuylereneca	4, 509, 717	(3)	Sand and gravel, salt.
euben	(3)	(3)	Peat.
ıffolk	262, 582 5, 903, 448	232, 017	Sand and gravel.
ıllivan	0, 900, 448	6, 178, 841	Do.
iega	293, 411	255, 900	Do.
ompkins	(3)	155, 089	Do.
lster	3, 357, 460	9 745 959	Salt, stone, sand and gravel.
arren	4 5, 539, 246	2, 745, 252	Stone, cement, clays, sand and gravel.
ashington	1 977 915	1, 476, 304	Cement, garnet, stone, gem stone.
avne	1, 977, 815 27, 026 1, 013, 647	(3)	Slate, stone, sand and gravel.
estchester	1.013.647	808, 659	Stone, sand and gravel.
estchesteryoming	(3)	(3)	Stone, sand and gravel, emery. Salt, stone, sand and gravel.
ates	(3)	12,008	Sand and gravel.
ndistributed	<sup>6</sup> 69, 018, 126	74, 949, 459	Sand and Stavel.
Total	§ 192, 738, 000	216, 907, 000	

<sup>&</sup>lt;sup>1</sup> The following counties are not listed because no production was reported: Bronx, Hamilton, Queens, and Richmond.

<sup>2</sup> Fuels, including natural gas and petroleum, not listed by counties as data not available; value included with "Undistributed."

<sup>3</sup> Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

<sup>4</sup> Excludes limestone and clay used to manufacture cement and lime.

<sup>6</sup> Revised figure.

Cattaraugus.—The only mineral commodity produced in Cattaraugus County in 1955 was sand and gravel. Building and paving sand and gravel was obtained from the pits of Buffalo Slag Co., Inc., at its Allegany and Franklinville plants. Other producers were E. F. Lippert & Co. and William Lippert, both near Allegany; Upper Allegany Sand & Gravel Co., Inc., Onoville; Ray Vogtli & Son, Gowanda; and Work & Silvis, Allegany.

Cayuga.—Mineral commodities produced in Cayuga County in 1955 were sand and gravel and stone. The Auburn quarry of the General Crushed Stone Co. yielded crushed and broken limestone for use in highway and railroad construction. Structural and paving sand and gravel were produced by J. J. Harrington at his pit and fixed plant

near Auburn.

Chautauqua.—The largest commercial sand and gravel operator in Chautauqua County was Evans Builders Supply, operating a wet pit and fixed preparation plant at Silver Creek. Other producers of sand and gravel in the county were A. K. Builders Supplies, Inc., W. Lee Bull, Inc., Mahoney Sand & Gravel, and Sack's Pit, all of Jamestown; Hildom Cinder Block Co., Falconer; and Saybold Bros., Inc., Dunkirk.

Chemung.—Chemung County in 1955 had three commercial sand and gravel producers. Dalrymple Gravel & Contracting Co., Inc., near Elmira worked its pit and fixed plant, producing structural and paving sand and gravel. Elmira Transit Mix, Inc., produced structural and paving sand and gravel at its pit and fixed plant near Horseheads. It was assumed that sand and gravel for building purposes was produced at the pit and fixed plant of Frank Treat, Breesport, although no report was received from him.

Consolidated Brick Co., the only clay producer in the county, recovered miscellaneous clay at its Horseheads open-pit mine, to be

used in heavy clay products.

Chenango.—The only mineral product of Chenango County—sand and gravel—was recovered from pits worked by Bundy Concrete Co.,

Sherburne, and B & B Building Supplies, Greene.

Clinton.—Mineral commodities produced in Clinton County in 1955 were iron ore, stone, lime, and sand and gravel. Iron ore, representing 85 percent of the total value of the county production, ranked The Chateaugay underground and open-pit mine of Republic Steel Corp. continued to produce magnetite iron ore. This property ranked fourth among the iron-ore mines of New York. Clinton County stone production in 1955 was limited to limestone and miscellaneous stone. International Lime & Stone Corp. quarried crushed limestone for use in highway maintenance and agricultural purposes. It also continued to produce quicklime and hydrated lime for chemical uses at the Chazy plant. Crushed limestone for road construction was produced at the Plattsburg quarry of Lancaster Development, Miscellaneous crushed stone for road construction Inc., Dunkirk. and railroad ballast was produced as a byproduct by the Chateaugay mine of Republic Steel Corp. Structural gravel was produced at pits operated by Bero Construction Co., Buffalo, and Vernon Christiana, Jr., Utica. Highway-maintenance sand and gravel was produced at pits in the county by Clinton County Highway Department, Plattsburg, and State of New York Department of Public Works.

Columbia.—The second largest cement-producing area in New York in 1955 was Columbia County. Universal Atlas Cement Co. and Lone Star Cement Corp. operated their limestone quarries and cement plants near Hudson and Greenport, respectively. The heavy demand at the Greenport plant of Lone Star Cement Corp. resulted in full operation.

Crushed limestone for highway maintenance and agricultural purposes was produced by A. Colarusso & Son. Catskill Mountain Stone Corp. produced crushed limestone and sandstone for use in highway

maintenance.

Columbia Sand & Gravel Corp. and F. H. Stickles & Son produced building and paving sand and gravel from their pits near Martindale Depot and Hudson, respectively. Mark Kearney, Hudson, produced sand for paving and structural purposes. Whitehead Bros. Co. recovered molding sand from pits at Stuyvesant.

Cortland.—Cortland Ready Mix Concrete Co. of Cortland and the Cortland County Highway Department produced building and paving

sand and gravel.

Delaware.—The North River quarry of American Bluestone Co. near Unadilla produced rough and dressed sandstone for building construction. Other dimension sandstone producers in Delaware County in 1955 included Johnson & Rhodes Bluestone Co., East Branch, and Earl Tomkins, Hancock. A small tonnage of sand and gravel for highway maintenance was produced by the Delaware County Highway Department.

Dutchess.—Limestone was the most significant mineral product, in terms of value, in Dutchess County in 1955. Two quarries were active during the year; the largest was the New York Trap Rock Corp. quarry at Clinton Point near New Hamburg. Output from this operation was used for riprap and highway and railroad maintenance.

Crushed limestone for concrete and road material was produced

at a quarry owned by Dutchess Quarry & Supply Co., Inc.

Fourteen commercial and 2 Government-and-contractor sand and gravel pits were active during 1955. Commercial producers included David Alexander, Poughkeepsie; Amenia Sand & Gravel, Amenia; Ralph Bierce, Pawling; Andrew J. Cooper, Poughquag; Fishkill Builders Supply Corp., Beacon; Stanford Sand & Gravel Plant, Stanfordville; Walter Hermans, Red Hook; and Frank J. Melito, Poughkeepsie. The two Government-and-contractor sand-and-gravel producers were the Dutchess County Highway Department and the State of New York Department of Public Works.

Dennings Point Brick Co., Beacon, recovered miscellaneous clay

at its open-pit mine which was used for heavy clay products.

Humus peat was recovered by Black Fox Humus Corp. in 1955. Erie.—Erie County ranked second in total value of mineral output among New York counties in 1955, and cement was its most significant mineral product in 1955. Lehigh Portland Cement Co. and Penn-Dixie Cement Corp. produced portland and masonry cement at plants near Buffalo. Louisville Cement Co. of New York produced natural cement at its plant near Akron.

The largest sand-and-gravel producer was Clarence Sand & Gravel Corp., Clarence, which produced building sand and gravel. Other sand and gravel producers included Bush Bros., Inc., Marilla; Gravel Products

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Corp., Lake Erie; Meyer & Meyer, Clarence; Pfohl Bros., Inc., Cheektowaga; and Pine Hill Concrete Mix Corp., Lancaster. The Erie County Highway Department produced a sizable amount of gravel

for paving in 1955.

Buffalo Crushed Stone Corp. produced crushed limestone for highway and railroad maintenance and for bituminous mixes at its Bowmansville quarry. Federal Crushed Stone Corp. operated its Cheektowaga quarry which produced crushed and broken limestone for riprap, concrete, railroad ballast, and asphalt filler. Louisville Cement Co. of New York, Akron, produced limestone for use in making masonry cement.

Erie County again had three active gypsum producers; the largest was National Gypsum Co., which worked its mine and plant at Clarence Center and its mill at Akron. Certain-teed Products Corp. and Universal Atlas Cement Co., both of Clarence Center, were also

active producers.

The largest lime producer in New York in 1955 was Kelley Island New York Corp., which produced quicklime and hydrated lime for building, chemical, and agricultural purposes at its plant at Buffalo.

Acme Shale Brick Co., Inc., the largest clay producer in the county, recovered miscellaneous clay at its Lake View pit to be used in heavy clay products. Buffalo Brick Corp. and John H. Black Co., both of West Falls, also mined clay for use in heavy clay products and lightweight aggregate.

Buffalo Perlite Corp. (Buffalo), National Gypsum Co. (Clarence Center), and Certain-teed Products Corp. (Akron), manufactured expanded perlite from crude perlite shipped in from Colorado and

Nevada.

Essex.—Essex County ranked first in usable iron-ore output and third in total value of mineral production among counties in New York in 1955. Wollastonite and titanium (ilmenite) concentrate were produced from Essex County mines.

National Lead Co. recovered iron ore and titanium concentrate from titaniferous magnetite ores at its MacIntyre mine and mill at Tahawus. Republic Steel Corp. worked its New Bed-Harmony-Old

Bed mines near Minesville throughout the year.

Cabot Carbon Co. produced wollastonite for use as a paint, ceramic and plastic filler at its Fox Knoll location near Willsboro. Byproduct garnet also was recovered.

Sand and gravel for road construction was produced from pits owned by Saranac Lake Sand & Gravel Co. and Clarence G. Brooks, Saranac Lake, and Mrs. Ernest Smith, Elizabethtown.

Louis Mayersohn, Albany, produced road gravel.

Franklin.—The only minerals produced in Franklin County in 1955 were stone and sand and gravel. Structural and paving sand and gravel was produced from pits owned by L. & F. Pero near Malone. Paul Smiths College, Paul Smiths, produced paving sand. The Franklin County Highway Department and Farmers National Bank, with a pit at Malone, produced paving gravel. Other sand-andgravel producers were Norman Boyea, Malone; Herman LaBounty, St. Regis Falls; Walter Rock, Saranac Lake; Saranac Inn, Inc., Saranac Inn; Paul Smiths Hotel Co., Paul Smiths; Dave Williams, Malone; and Achille Blain, location unknown.

Adirondack Sandstone Quarry, Inc., prepared dimension sandstone for architectural use (rough blocks) at its quarry near Malone. Highway Department of the Village of Malone recovered crushed

sandstone from its own pits.

Fulton.—Fulton County had seven sand-and-gravel plants in operation in 1955. E. G. Delia & Sons Construction Corp. worked its pit and fixed plant at Northville and produced paving sand and gravel. Other sand-and-gravel producers during the year included Edward Bradt, A. Frederick, and Art Stone, Gloversville; John Edwards, Ephratah; Fred Machold Estate, Broadalbin; and Norman Smith, St. Johnsville.

Genesee.—Gypsum, in terms of value, was the leading mineral in Genesee County in 1955. The United States Gypsum Co. mine and

plant near Oakfield was the only producer.

Limestone was crushed for riprap, road material, railroad ballast, and agricultural purposes. Active producers were the General Crushed Stone Corp., LeRoy; Genesee Stone Products Corp., Stafford; and LeRoy Lime & Crushed Stone Corp., LeRoy.

Sand and gravel for structural and paving uses was recovered by Batavia Washed Sand and Gravel Co., Inc., at its Batavia pit. Other producers were Vincent Frens, address unknown; LeRoy Crushed Stone, LeRoy; and Genesee County Highway Department and State of New York Department of Public Works.

Greene.—Greene County in 1955 had an abundant output of limestone, which was crushed for use in portland and masonry cement. Producers were Alpha quarry, Alpha Portland Cement Co., Čementon; Alsen quarry, Lehigh Portland Cement Co., Alsen; and the Catskill plant, North American Cement Corp., Alsen.

The Cairo plant of Catskill Mountain Stone Corp. quarried sand-

stone, which was crushed for road material.

Molding sand was recovered from the Catskill and Coxsackie pits owned by Whitehead Bros. The Windham pit owned by Lawrence Bros. also produced molding sand. The only Government-andcontractor producer of gravel was State of New York Department of Public Works, District No. 1.

Herkimer.—General Crushed Stone Co. worked its Jordansville quarry and crusher in 1955, producing crushed limestone for road construction and agricultural purposes. Newport Quarries, Inc., operated its Newport limestone quarry, which yielded crushed limestone for road material.

Eastern Rock Products, Inc., Barneveld, and F. J. Steber, Poland, produced structural and paving sand and gravel. Herkimer County

Highway Department produced paving sand and gravel.

Jefferson.—The mineral products of Jefferson County in 1955 were limestone and sand and gravel. The Watertown quarry of the General Crushed Stone Co. and Carbola Chemical Co., Natural Bridge, yielded limestone, which was crushed for highway and railroad maintenance, agricultural purposes, chemical uses, whiting, and The Highway Department of the Town of Cape Vincent produced limestone for use as riprap.

In 1955 structural and paving sand and gravel was produced by Colwell Bros. and Anthony Marzano, Watertown; Rural Hill Sand & Gravel Co., Belleville; Tomlinson Bros., Gouverneur; Angelo Vespa, Watertown; Donald Cool and Frank Sischo, Adams; and James Stephany, Alexandria Bay; Jefferson County Highway Department; and State of New York Department of Public Works.

Kings.—Building sand was prepared by F. E. Grauwiller Trans-

portation Co., Inc.

Lewis.—The town of Lowville produced limestone for use as con-

crete aggregate and road material.

Structural and paving sand and gravel were recovered by Roy Allen & Son; Lewis County Highway Department; and State of New York Department of Public Works, District 7.

Livingston.—Salt and sand and gravel were the only minerals produced in Livingston County in 1955. The underground mine of

International Salt Co., Inc., at Retsof yielded rock salt.

Valley Sand & Gravel Corp., with a pit at Avon, again produced sand and gravel. Colburn & Davis, Livingston County Highway Department, and Superintendent of Highways Department of Public

Works produced paving gravel.

Madison.—Crushed limestone for riprap, road material, agricultural, and other purposes was the principal mineral product of Madison County in 1955. Output came from the Conley quarry of Munnsville Limestone Corp., Munnsville, and Worlock Stone Co., Inc., John Filose produced a small quantity of miscellaneous stone for use in rock gardens from a quarry near Chittenango.

Sand and gravel for paving and railroad purposes was recovered by Munnsville Limestone Co. and Snyder Construction Co., both of Munnsville, Worlock Abrasive Co., Canastota, and New York

Ontario & Western Railroad.

Monroe.—Mineral products of Monroe County in 1955 were stone, sand and gravel, and gypsum. Dolomite Products Co. produced crushed and broken limestone for riprap, concrete, highway and railroad construction, and agricultural purposes. Central Materials Corp. near the town of Sweden produced crushed and broken limestone for highway construction and maintenance. Sand and gravel for building and road construction was produced by Brockport Ready Mix Concrete, Spencerport; Roy E. Dewitt and Hoadley Sand & Gravel Co., Webster; Elam Bros. Corp., Irondquoit; Ingersoll Supply & Equipment Corp., Spencerport; and Redman Sand & Gravel Corp., Penfield. Producers in the Rochester area were Dolomite Products Co., Inc., Newport Sand & Gravel Co., Penfield Gravel Co., Rappl & Hoenig, and Hemmerich Sand & Gravel. Monroe County Highway Department and Department of Public Works, District No. 4, produced gravel for paving. The only producer of gypsum in Monroe County in 1955 was The Ruberoid Co., with a mine and mill at Wheatland.

Montgomery.—Crushed limestone for riprap, railroad ballast, highway construction and maintenance was produced at a quarry operated by Crushed Rock Products, Inc., and the South Amsterdam quarry of Cushing Stone Co., Inc. Sand and gravel for structural purposes was produced by St. Johnsville Supply Co., Inc., at its pit and plant in

Nassau.—Mineral products of Nassau County included sand and gravel and clay. The largest of 10 commercial operations, according to value, was Metropolitan Sand & Gravel Corp., with a plant and pit near Port Washington. The other producers in the county were Builders Sand & Gravel Corp., East Meadow; Colonial Sand & Stone Co., Inc., North Hempstead and Port Washington; Flatlands Sand Excavating Corp., Syosset; Metropolitan Sand & Gravel Corp., Port Washington; Penn Industries, Inc., Roslyn; Pine Hollow Sand & Gravel Co. and Approved Sand & Gravel Corp., both of Oyster Bay; and Milburn Contracting Co., Inc., and Baldwin & Gotham Sand & Gravel, Port Washington.

Nassau Brick Co., Inc., only producer of clay in the county in 1955, manufactured common brick from clay recovered at its pit at

Farmingdale.

New York.—The New York Central Railroad produced sand to

be used as railroad ballast.

Niagara.—The principal mineral products of Niagara County in 1955 were limestone and sand and gravel. Building and paving sand and gravel were produced at the Lockport pit and fixed plant of Gasport Sand & Gravel Co., Inc., Lockport.

Gasport Sand & Gravel Co., Inc., Lockport.

Niagara Stone Corp., Niagara Falls, produced crushed limestone for highway construction. Royalton Stone Corp., Gasport, and Frontier Stone Products, Inc., Lockport, produced crushed limestone

for riprap, road material, and metallurgical work.

Oneida.—Eastern Rock Products, Inc., quarried limestone at its Oriskany Falls and Prospect quarries in 1955 for riprap, railroad and

highway construction, and agricultural purposes.

There were 11 commercial producers of sand and gravel in Oneida County in 1955. Molding sand was produced by George W. Bryant Core Sands, Inc., and Whitehead Bros. Co., McConnellsville, and Eastern Rock Products, Inc., Boonville. Building, paving, and engine sand was produced at pits operated by Eastern Rock Products, Inc., Boonville; and Hanicker Bros. and Rome Sand, Inc., both of Rome. Other producers of sand and gravel included Frank Cittadino, Jones Gravel, and Humphrey D. Jones, Clayville; and Grover C. Crill and Mrs. Belva Driscoll, Barneveld. Oneida County Highway Department produced gravel which was used for structural purposes.

Clinton Metallic Paint Co. continued to produce red iron oxide for use as a pigment in paint manufacture at its mine and mill at Clinton.

Onondaga.—Stone, salt, sand and gravel, cement, and clays were obtained from the quarries, wells, mines, pits, and plants in Onandaga County in 1955. Allied Chemical & Dye Corp., Solvay Process Division, operated wells at Tully and a plant at Solvay for producing evaporated salt. Crushed limestone for use in highway and railroad construction and agricultural purposes was produced at the Jamesville quarry of Allied Chemical & Dye Corp., Solvay Process Division, and the Brickyard Falls Farm quarry at Pompey.

Building and paving sand and gravel for structural and paving purposes was produced in Onondaga County by S. F. Clough, Harlow H. Galster, Steve Kravec, Clarence Nichols, W. F. Saunders, and Solvay Process Division, all of Syracuse; Syracuse Sand & Gravel Co. Inc. Nedrow: and William V. Young and Coolle Porry, Clay

Co., Inc., Nedrow; and William V. Young and Cecile Perry, Clay. Syracuse Brick Corp., Cicero, and Syracuse Pottery Co., Inc., Syracuse, produced miscellaneous clay for use in heavy clay products, as well as for art pottery. Onondaga Brick Corp., Warners, produced clay for use in lightweight aggregate.

Alpha Portland Cement Co. operated its Jamesville plant in 1955 and produced portland and masonry cement. Minerals Processing Corp., Syracuse, manufactured expanded perlite from crude Colorado

perlite.

Ontario.—Stone and sand and gravel were the mineral products of Ontario County in 1955. Building and paving sand and gravel were produced by Nathan Oaks & Sons, Oaks Corners; Ontario Sand & Gravel Co., Inc., Phelps; Mackenzie Sand & Gravel, Clifton Springs; and the General Crushed Stone Co. and Harold Weigert, locations unknown. Gravel for paving purposes was produced by Ontario County Highway Department and Department of Public Works, District 4. General Crushed Stone Co. quarried and crushed limestone for highway and railroad construction at the Geneva quarry near Oaks Corners.

Orange.—The mineral products reported in Orange County in 1955 were sand and gravel and clays. Sand-and-gravel producers were Delaware Valley Sand & Gravel Co., Inc., Port Jervis; A. W. Hollenbeck, Inc., Chester; Newburgh Sand Stone & Gravel and Cornwall Rock Products Co., Inc., Newburgh; John Thurston and E. C. Townsend Estate, Cornwall; Windsor Building Supplies Co., Inc., Plum Point; Dickinson Sand & Gravel, Bloomingburg; and Orange County Highway Department. Miscellaneous clay was produced by

Jova Brick Works at its Newburgh plant.

Orleans.—Mineral products of Orleans County in 1955 were stone and sand and gravel. Oak Orchard Sand & Gravel, with a pit and fixed plant at Medina, produced structural sand and gravel, as well as gravel for miscellaneous uses. Arnold H. Pickett Sand & Gravel Co., operating at Gaines, recovered bank-run gravel for use as fill. B. R. Dewitt, Inc., and Crawford Hucknell produced paving and structural sand and gravel. Orleans County Highway Department and State of New York Department of Public Works produced paving sand and gravel for road construction. Clarendon Stone Co., Inc., at its Clarendon quarry produced crushed limestone, which was used for concrete, road material, and screenings.

Oswego.—General Crushed Stone Co. produced building and paving sand and gravel at its Lacona pit. Whitehead Bros. Co., Pulaski, operated a pit that continued to yield molding sand. Other producers of building and paving sand and gravel were Massaro Co. Inc., Fulton; Davies Sand & Gravel Co., Scriba; and Morris Hatcliffe. Oswego County Highway Department produced paving and road

gravel in 1955.

Otsego.—Sand and gravel was the only mineral product reported in 1955 in Otsego County. Seward Gravel Co., the largest producer of building and paving sand and gravel in the county, operated a pit at Colliersville. Other active sand-and-gravel producers in the county in 1955 were Unadilla Concrete Products Co., Unadilla, and Otsego County Highway Department.

Putnam.—The only mineral produced in Putnam County in 1955 was stone, and the only producer was Eastern Mineral Co., Inc. It produced crushed limestone at its quarry near Patterson for agri-

cultural purposes and flooring compounds.

Rensselaer.—Stone, sand and gravel, and clays were the mineral products of Rensselaer County in 1955. Fitzgerald Bros. Construc-

tion Co., Inc., operated the Campbell Mountain quarry near Brunswick, which yielded Rensselaer grit (a conglomerate) and sold for use

as riprap, concrete aggregate, and roadstone.

The largest sand and gravel producer in the county was Albany Gravel Co., Inc., whose output was used for road construction. Other sand and gravel producers were Albert Flaxmyer and Everett Holser, Averill Park; Sidney B. Sharpe, Wynantskill; C. W. Wicks, West Sand Lake; Valente Sand & Gravel, Troy.

Bleau Brick Works, Inc., Troy, and Champlain Brick Co., Mechanicville, produced clay for use in manufacturing heavy clay

products and high-grade tile.

Rockland.—Rockland County had three active basalt quarries in 1955. The Haverstraw quarry of New York Trap Rock Corp. was the largest producer, and its output was crushed for use in highway and railroad construction and maintenance. The other producers of basalt were Suffern Stone Co., Suffern, and West Nyack Trap Rock Co., West Nyack, which liquidated its business as of November 30, 1955.

Tomkins Cove plant of New York Trap Rock Corp. yielded crushed limestone, which was used for riprap and highway construction and

maintenance.

Ramapo Sand & Gravel Corp. produced building and paving sand and gravel at its Ramapo operation near Suffern. Other sand-and-gravel producers were Graney Building Material Corp., Sparkill; Mount Ivy Sand & Gravel Co., Inc., Rockland; Ward Pavements, Inc., Thiells; William H. Larenzen & Son, Pearl River; Ellinor Allison, Stony Point; and McKee Bros., location unknown.

St. Lawrence.—St. Lawrence County ranked first among mineral-producing counties in the State in 1955. Mineral products, listed in order of decreasing value, were iron ore, zinc, talc, stone, lead, sand

and gravel, silver, and lime.

The Balmat and Edwards mines of St. Joseph Lead Co. operated at maximum capacity throughout 1955. The Balmat mine produced

silver, lead, and zinc and the Edwards property zinc.

Jones & Laughlin Steel Corp. continued to work its Benson mine near Starlake throughout 1955. Concentrate produced was sintered before shipment to the company steel mills in the Pittsburgh, Pa., area.

Rossie Iron Ore Co. manufactured finished iron oxide pigments

from crude iron oxide imported from outside the State.

Crushed limestone for agricultural purposes and use in highway maintenance and construction was produced by Balducci Crushed Stone Co., Gouverneur; Barrett Division, Allied Chemical & Dye Corp., Norwood; and McConville, Inc., Ogdensburg. Barrett Division, Allied Chemical & Dye Corp. also produced broken stone for riprap.

Building and paving sand-and-gravel producers in St. Lawrence County were James Coffey, Pine Hill; Vance Lucas, Hopkinton; McConville, Inc., Ogdensburg; K. J. Premo & Co., Massena; Putnam-Hawley Building Material Co., Inc., Potsdam; George Cooke, Spragville; Wylie Stout, Brier Hill; and Gaines & Sherman, St. Lawrence

Transit Mix, and Clarence White, address unknown.

St. Lawrence County Highway Department produced paving and

road gravel for highway construction purposes.

International Talc Co., Inc., with a mine near Gouverneur, continued to be the largest producing talc property in New York State. The crude production was ground for use in the paint and ceramics industries, building materials, soap, floor and wall tile, paper, and rubber and textile uses. The other two talc mines active in the county in 1955 were Gouverneur Talc Co., Inc., Gouverneur, and Reynolds Talc Co., Edwards.

Balducci Crushed Stone Co., Gouverneur, produced agricultural

lime.

Saratoga.—Twelve sand-and-gravel producers were active in Saratoga County. Most of the output was molding sand. Producers were Albany Sand & Supply Co., Ushers; Albany Sand & Supply Co., Schuylerville; John B. Belott & Son, Elnora; W. J. Dyer, Gansevoort; G. Fannucci Sons, Waterford; Hudson Valley Sand & Stone Co., Wilton; Hynes Bros. and Archie Meyers, Ushers; Jewett Sand Co., Lashers Switch; William Fawthrop, Halfmoon; and Whitehead Bros. Co., which operated several pits in the county. The Saratoga County Highway Department produced paving and road gravel for highway construction.

Crushed limestone for use as riprap, highway construction, agricultural purposes, and miscellaneous filler was quarried by the Saratoga

Springs quarry of Pallette Stone Corp.

Schenectady.—Molding sand as well as building gravel was produced by DeLuke Sand & Gravel, Inc., Scotia. Other sand-and-gravel producers during the year included Melvin J. Borst, Rotterdam; Ernest Quay and William M. Larnard & Sons, Schenectady; and

Scotia Stone & Gravel Co., Inc., and Bernard Beers, Scotia.

Schoharie.—Portland and masonry cements were made at the Howes Cave plant of North American Cement Corp. Limestone used in making the cement was quarried nearby. At the Masick Soil Conservation Co. quarry operated by A. Arthur Masick agricultural limestone was prepared. Other producers of crushed limestone for use as riprap and in road construction were Schoharie Stone Corp., Schoharie, and Allied Materials Corp., Cobleskill.

Schuyler.—Watkins Glen plants of International Salt Co., Inc., and the Watkins Salt Co. recovered evaporated salt from artificial brines. A larger portion of the output than previously was obtained

by the vacuum-pan process in 1955.

D. & T. Franzese Bros., Inc., recovered structural sand and gravel

from a pit near Watkins Glen.

Seneca.—Moss and reed or sedge peat were recovered by the Finger Lakes Peat Moss Co. and Junius Peat Co. in Seneca County in 1955.

Steuben.—Three sand-and-gravel producers were active in Steuben County in 1955. The largest producer, Rinehart & Son Sand & Gravel Co., produced structural and paving sand and gravel at its pit near Corning. The other two producers of structural and paving sand and gravel were Bath Sand & Gravel Co. and Buffalo Slag Co., Inc.

Suffolk.—The Suffolk County sand-and-gravel production ranked first in the State. The largest producer during the year was Steers Sand & Gravel Corp., with a pit and fixed plant at Northport. Other active sand-and-gravel producers during 1955 were Metropolitan Sand & Gravel Co., with operations at Smithtown and Northport; East Coast Lumber Terminal, Inc., Farmingdale; United States Dredging Corp., Huntington; J. W. Robinson & Sons, New Highway; Commack Sand & Gravel Co., Commack; Coram Sand & Gravel Corp., Coram; Setauket Sand & Gravel Co., Inc., East Setauket; Hubbard Sand & Gravel Co., Bay Shore; and Bellport Sand & Gravel Co., Bellport.

Smithtown Highway Department produced sand and gravel for

road-construction purposes.

Sullivan.—The only mineral produced in Sullivan County in 1955 was sand and gravel. The producers, in order of decreasing value, were Sullivan Highway Products Corp., Summitville; Louis Pshonick, Liberty; and Liberty Sand & Gravel Co., Inc., Swan Lake.

Tioga.—Tioga County had two active commercial sand-and-gravel producers in 1955. Central Materials Corp., Oswego, the leading producer, recovered building and paving sand and gravel. The other

producer was Herman E. Bunce.

Tompkins.—Cayuga Rock Salt Co., Inc., with a rock-salt mine and mill near Myers, operated throughout the year. International Salt Co., Inc., Ludlowville, produced evaporated salt from artificial brines by the recurrence of the salt from artificial brines.

by the vacuum-pan process.

Two dimension sandstone producers were active. The principal producer was Finger Lakes Stone Co., Inc., whose output was used for construction purposes. Paul Mancini & Sons produced dimension stone at its East Ithaca quarry, which was used for paving and construction.

Tompkins County had two commercial sand-and-gravel operations in 1955. The larger producer was Rumsey-Ithaca Corp., with a pit near Ithaca producing structural sand and gravel. University Sand & Gravel, Brooktondale, also produced structural sand and gravel.

Ulster.—Ulster County in 1955 produced stone, clays, sand and gravel, and natural and masonry cement. Callanan Road Improvement Co. quarry and plant No. 3 at Esopus yielded crushed and broken limestone for road construction and riprap. Curbstone was produced at the Jockey Hill quarry of Richard F. Dunn Estate, Elizabeth M. Dunn, Executrix.

James Ricker produced molding sand at his Connelly pit. Paving sand and gravel was produced by Dutchess Quarry & Supply, Wawarsing; Callanan Road Improvement, Kingston; and Dory Trowbridge and G. Ruoff. Department of Public Works in Ulster

County produced paving gravel.

The entire clay output of Ulster County in 1955 consisted of miscellaneous clay. The largest producer was Star Brick Corp., East Kingston, whose production was used for manufacturing heavy clay products. Other producers of miscellaneous clay in the County were Brigham Brick Corp., East Kingston; Hutton Co., Kingston; and Alva S. Staples, Saugerties.

Warren.—The Glens Falls quarry of Jointa Lime Co., Inc., quarried limestone for highway construction and maintenance. Glens Falls

Portland Cement Co. operated its Glens Falls cement plant and limestone quarry in 1955 and produced masonry and portland cement.

The open-pit mine of Barton Mines Corp. near North Creek yielded garnet for sandpaper manufacturing and glass grinding and polishing.

Washington. The one source of slate in New York continued to be Washington County. Thirteen operators were active; the largest was Central Commercial Co., Hampton. Other producers included Darius Slate Products, Adolph A. Hadeka, John G. Hadeka, Theodore Pafundi, Joseph A. Ponda Slate Co., Prehoda Slate Co., Inc., Western Slate Co., and Zayacheck Bros., all of Granville; Hilltop Slate Co., Sheldon Slate Products Co., Inc., Tatko Bros. Slate Co., Inc., all of Middle Granville; and Henry Phillips, Hampton.

Crushed limestone for highway construction and agricultural uses was produced at a quarry of the Hudson Valley Sand & Stone Co.,

 ${f Middle\ Falls}.$ 

The largest sand and gravel producer in Washington County was Warren Barrows, Argyle. Other producers included Hattie Dawson and Julius H. Hunt, Fort Ann; George Keys and James Wever, Salem; Ernest LeClair, Clemons; and Ray Stout and Ralph Yarter, Argyle.

Wayne.—Crushed limestone for use in highway and railroad construction and agricultural purposes was recovered from the Sodus

quarry of the General Crushed Stone Co.

Five commercial sand-and-gravel operators were active in Wayne County in 1955. The largest producers were M. A. Montmorano & Sons, Gustavus W. Young, and Hollis Reed, all of Clyde; Llewellyn Welch, Savannah; and Homer H. Keisinger, Ontario. There were also five Government-and-contractor producers of sand and gravel for paving purposes-Macedon Superintendent of Highways, Palmyra Superintendent of Highways, Rose Superintendent of Highways, Savannah Superintendent of Highways, and Walworth Superintendent of Highways.

Westchester.—Joe DeLuca and DiRubbo & Ellis produced emery

near Peekskill and Croton, respectively.

The Verplanck quarry operated by New York Trap Rock Corp. produced crushed and broken limestone for use in highway construc-

tion and asphalt.

Westchester had four active commercial sand-and-gravel plants in 1955 producing building and paving sand and gravel. Producers included Bedford Hill Concrete Products and Anfo Realty Corp., Bedford Hills; Camarco Materials & Supply Co., Somers; and Peekskill Masons Supply Co., Peekskill.

Wyoming.-Morton Salt Co. at its Silver Springs plant produced

evaporated salt from artificial brines.

American Bluestone Co., Portageville, worked its Ambluco quarry,

producing dressed architectural stone.

The city of Newburgh produced gravel for paving purposes.

Yates.—The only mineral product of Yates County in 1955 was sand and gravel. John N. Jensen, Jerusalem town superintendent, and Department of Public Works produced structural sand and gravel.

# The Mineral Industry of North Carolina

This chapter was prepared under a cooperative agreement for collecting mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior and the Geological Survey of North Carolina.

By J. R. Thoenen and Jasper L. Stuckey



HE TOTAL value of 1955 mineral production in North Carolina

was \$41 million, about the same as in 1954.

Commodities showing gains in value of production over 1954 were: Sheet mica, olivine, sand and gravel, crushed and dimension granite, crushed limestone, crushed marble, talc and pyrophyllite, and tungsten concentrate.

Commodities with lower production values than in 1954 were: Abrasive stones, asbestos, beryllium concentrates, kaolin and miscellaneous clays, feldspar, scrap and flake mica, dimension marble,

crushed miscellaneous stone, and vermiculite.

Slightly more than half of the State mineral-production value was

in mineral aggregates—sand, gravel, and stone.

Production of lithium minerals continued, with expansion of Foote Mineral Co. Kings Mountain plant and construction of Lithium Corporation of America new plant at Bessemer City.

TABLE 1.—Mineral production in North Carolina, 1954-55 1

	1	954	19	955
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
A brasive stones.  Clays. Copper (recoverable content of ores, etc.) pounds. Feldspar long tons. Gem stones. Gold (recoverable content of ores, etc.) troy ounces. Lead (recoverable content of ores, etc.) troy ounces. Lead (recoverable content of ores, etc.) pounds. Sand and gravel. Sand and gravel. Silver (recoverable content of ores, etc.) troy ounces. Stone. Talc and pyrophyllite. Tungsten concentrate, 60-percent WO3 basis. Value of items that cannot be disclosed: A brasive stone (millstones 1954), asbestos, beryllium concentrate, lithium minerals, olivine, tungsten concentrate, vermiculite, and values indicated by footnote *	1, 872, 541 360 230, 744 214 4	\$12, 125 2, 519, 721 106 2, 220, 707 7, 490 1, 049 1, 457, 122 1, 787, 197 5, 508, 284 396 15, 625, 331 88, 428	2, 375, 494 300 242, 724 (4) 190 2 60, 887 553, 444 7, 785, 741 181 10, 903, 366 125, 206 2, 669	3 \$12, 100 1, 792, 081 2, 184, 795 6, 656 1, 377, 085 2, 745, 234 5, 911, 233 5, 911, 233 (5) (5)
Total North Carolina.		41, 651, 000		41, 210, 000

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2 Grinding pebbles and tube-mill liners only.

3 Includes value of millstones.

Quantity not recorded.

§ Figure withheld to avoid disclosure of individual company confidential data.

Former chief, Field Office, Region V, Bureau of Mines, Knoxville, Tenn.
 State geologist, North Carolina Geological Survey, Raleigh, N. C.

TABLE 2.—Average unit value of mineral commodities produced in North Carolina, 1951-55 <sup>1</sup>

Commodity		1951	1952	1953	1954	1955
Asbestos	short ton	\$100.00		2 \$21. 10	2 \$17. 10	2 \$8. 98
	do	300.00		400.00	3 504. 76	591.60
Beryl Clay: Kaolin	do	21.35	\$20, 80	18, 87	18.80	16. 69
Miscellaneous	do	1.18	1.16	1.16	1.15	. 58
	do	1.10	7. 93			
Coal			3, 20			
Columbite-tantalite, 70-percent concent	long ton	7.40	10.05	12, 28	9.62	9.0
Feldspar	10Hg 10H	7.40	10.00	20.00	0.02	
Manganiferous ore (10-35 percent Mn).	about ton	27.44	26, 48	25. 14	23.87	22.6
Mica: Scrap and flake	SHOP COLL_	27	1.12	2.11	3.73	4.9
Sheet	pound	4.47	4.61	5. 70	4. 27	5. 6
Quartz	snort ton	.95	1.11	1.16	1.10	1.1
Gravel	ao	17.80	18.00	17.60	20. 25	21. 9
Grinding pebbles	ao		.38	.47	.47	. 4
Sand	ao	. 34	. 00	. 41		• •
Stone:			1.44	1, 42	1.41	1.4
Granite: Crushed	do	1.43	54. 45	33, 90	41. 13	33. 8
Dimension	do	55.85		1.39	1.39	1. 3
Limestone, crushed	do	1.35	1.35	5.60	6.75	7.8
Marble: Criished	00	2.10	5.34			117. 6
Dimension	do	118.00	117. 50	117. 70	117. 62	1.1
Miscellaneous, crushed	do	1.02	1.08	1. 21	1. 25	
Sandstone: Crushed	do					3.0
Dimension	do		2.40			6.8
Transpole erushed	do	1.26	1. 29		1.46	1.4
Tale and pyrophyllite	do	17.40	4 15. 34	<sup>2</sup> 4.85	2 3. 44	2 4. 8
Tube-mill liners	ao	17.90	21.75	17.95	22.00	22.7
Vermiculite	do	12.68	8.93	8.93	8.92	8.4

For greater detail on prices by grade and market, see vol. I, Minerals Yearbook 1955.
 Value of crude ore at mine.
 Revised figure.
 Average value of products sold or used.

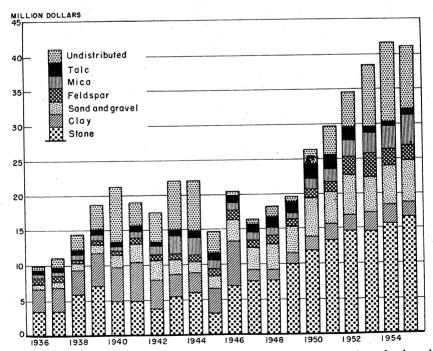


Figure 1.—Value of stone, clays, sand and gravel, and total value of mineral production in North Carolina, 1936-55.

Under the Defense Minerals Exploration Administration (DMEA) program, which gives Government assistance in exploring and developing critical and strategic minerals, 73 projects with 68 contractors were active or completed, compared with 61 in 1954. Expenditures were \$177,298, compared with \$195,945 in 1954, a decrease of 10 percent. The Government share was 75 percent.

As in previous years, the greatest activity under DMEA was in exploration for strategic mica. Of the 73 active projects, 72 were for mica and 1 for tungsten. During 1955, 15 projects in 5 counties, continuing from previous years, were completed in 1955; 42 out of

58 new projects in 1955 were concluded the same year.

## REVIEW BY MINERAL COMMODITIES

#### **NONMETALS**

Abrasive Stones.—Abrasive stones consist of grinding pebbles, mill-stones, and tube-mill liners. Producers were Harris Granite Quarries, Inc., and Gardner Granite Works, both in Rowan County. Production in 1955 was considerably below that in 1954.

Asbestos.—The 1955 amphibole-asbestos production in North Carolina came from one producer in Transylvania County; production declined sharply to less than 5 percent of that in 1954. Mining & Milling Corporation of America stopped producing in Yancey County

in 1954.

Clays.—State clay production again reached an alltime high in tonnage—27 percent more than the previous high of 1954; value, however, was 29 percent below that in 1954. Average unit value of both kaolin and miscellaneous clay dropped considerably compared with 1954. Kaolin tonnage increased 3 percent, but total value declined 9 percent, reflecting an 11-percent drop in value a ton. Miscellaneous clay tonnage rose 37 percent.

Pomona Terra Cotta Co. completed a new plant for manufacturing sewer pipe at the site of its shale mine at Gulf, Chatham County. The pit will supply shale for the new plant, as well as the older one

at Greensboro.

Two new producers of clay or shale for clay products in 1955 were Etowah Brick Co., Inc., in Henderson County and Carolina Tufflite Co. in Rowan County. Eastern Brick & Tile Co., Beaufort County, active in 1954, did not report production in 1955.

There was no change in the list of producers of kaolin in 1955 from

those reporting in 1954.

TABLE 3.—Clays sold or used by producers, 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	1, 161, 313	\$1, 406, 432	1953	1, 466, 232	\$2, 534, 908
1951	1, 462, 030	2, 177, 515	1954	1, 872, 541	2, 519, 721
1952	1, 357, 700	2, 080, 172	1955	2, 375, 494	1, 792, 081

Feldspar.—Feldspar production in 1955 was 5 percent greater in tonnage but 2 percent lower in value than in 1954; unit value was slightly below that in 1954.

TABLE 4.—Crude feldspar sold or used by producers, 1946-50 (average) and 1951-55

Year	Long tons	Value	Year	Long tons	Value
1946-50 (average)	199, 416	\$1, 095, 894	1953	268, 042	\$3, 290, 495
1951	166, 361	1, 230, 404	1954	230, 744	2, 220, 707
1952	240, 364	2, 416, 031	1955	242, 724	2, 184, 793

Mica.—Combined production of scrap, flake, and sheet mica was about the same as in 1954. Scrap- and flake-mica production decreased 162 tons, and sheet-mica output rose 74,200 pounds.

The combined value of scrap, flake, and sheet mica was 27 percent greater in 1955 than in 1954. The value of scrap and flake declined 6 percent, representing a drop of \$1.25 a ton. Sheet-mica value rose 54 percent above that of 1954, reflecting an increase of \$1.23 a pound.

The substantially increased value a pound for sheet mica indicated continuing improvement in the grade of material being marketed.

Mica was mined in 22 counties in 1955, compared with 26 in 1954. Catawba, Cherokee, Clay, Gaston, Iredell, and Vance reported production in 1954 but not in 1955. Stokes and Swain, however, reported in 1955 and not in 1954. Of the remaining 20 counties that reported both years, Mitchell County led in total value, followed in order by Yancey, Avery, Macon, and Cleveland In 1954 the order was Mitchell, Yancey, Macon, Cleveland, and Avery.

In 1955, 530 of the 542 mines in the State marketed sheet mica; 165 marketed scrap mica; 11 mined flake mica. In addition, considerable production was not identified as to county or mine source.

TABLE 5.—Mica sold or used by producers, 1954-55

Kind	1	954	1	955
	Quantity	Value	Quantity	Value
Sheet mica: Uncut punch and circle	339, 980 8, 311 (1) 130, 930	\$39, 070 10, 859 (1) 1, 737, 268	366, 505 3, 263 (1) 183, 676	\$39, 365 4, 094 F(1) 2, 701, 775
Total sheet micado Scrap mica: Total scrap and flake micashort tons	479, 221 61, 049	1, 787, 197 1, 457, 122	553, 444 60, 887	2, 745, 234 1, 377, 035
Grand total (sheet and scrap)dodo	61, 289	3, 244, 319	61, 164	4, 122, 269

<sup>1</sup> Combined with full trim to avoid exposure of individual data.

Olivine.—Combined production of Harbison-Walker Co. (Addie mine) and Balsam Gap Co. (Balsam Gap mine), a new producer, was nearly double 1954 output, but total value increased only about half.

nearly double 1954 output, but total value increased only about half. Quartz.—The quantity of quartz recovered as a mill byproduct from the processing of crude feldspar by Consolidated Feldspar Division (International Minerals & Chemical Corp.), and Feldspar Corp. was

slightly below that of 1954, but total value was greater due to a higher value a ton. In 1955 data, quartz is included under the general heading, Sandstone, Quartz, and Quartzite.

Sand and Gravel.—Production of sand and gravel increased 5 per-

cent above 1954 in tonnage and 7 percent in total value, in conse-

quence of an average increase of 2 cents a ton.

Commercial sand and gravel increased from 60 percent of total mineral production in 1954 to 63 percent in 1955, 9 percent greater in tonnage and value than in 1954. Government-and-contractor sand and gravel production declined 2 percent in tonnage but gained 3 percent in total value.

Sand production (commercial and Government-and-contractor operations) comprised 59 percent of the total sand and gravel tonnage. it was 8 percent greater in tonnage and 13 percent greater in total value than in 1954. Gravel output was only slightly below that in 1954 in tonnage but 4 percent greater in total value.

Sale or use of commercial sand increased 6 percent in tonnage and 11 percent in value over 1954. Production of commercial gravel exceeded that in 1954 by 12 percent in tonnage and 8 percent in value.

Production of Government-and-contractor sand increased 10 percent in tonnage and 17 percent in value as compared with 1954. Production of Government-and-contractor gravel declined 34 percent in tonnage but only 13 percent in value as compared with 1954.

Production of building sand increased 19 percent in tonnage and 24 percent in value over 1954. Building gravel increased 56 percent

in tonnage and 48 percent in value.

Compared with none in 1954, 146,000 tons of Government-andcontractor building sand, valued at \$48,000, and 8,300 tons of Government-and-contractor building gravel, valued at \$8,600 roughly double

that of 1954 were reported in 1955.

Production of Government-and-contractor paving sand in 1955 was 4 percent above 1954 in tonnage and 10 percent above in value. On the other hand, production of commercial paving sand in 1955 was 22 percent below 1954 output in tonnage and 19 percent below in value.

Government-and-contractor paving gravel declined 34 percent in tonnage and 12 percent in value from 1954. Commercial-pavinggravel production increased 3 percent in tonnage but declined 7 percent in value compared with 1954. All Government-and-contractor pro-

TABLE 6.—Sand and gravel sold or used by producers, 1954-55, by uses

	19	54	195	5
Use	Short tons	Value	Short tons	Value
Paving Structural Other	2, 131, 154 1, 941, 670 3, 368, 376	\$2, 291, 492 1, 647, 349 1, 569, 443	4, 804, 936 2, 479, 350 501, 455	\$3, 298, 862 2, 214, 970 397, 391
Total	7, 441, 200	5, 508, 284	7, 785, 741	5, 911, 223

duction was by the North Carolina State Highway and Public Works Commission.

During the year, 98,475 man-days or 882,745 man-hours was worked in producing 4.9 million tons of commercial sand and gravel.

Each man-day furnished 50 tons and each man-hour 5.6 tons.

Roughly, 82 percent of production of commercial sand and gravel (4,046,000 tons valued at \$4,089,000 or \$1.01 per ton) was washed before marketing. Sand and gravel, marketed without washing was 3,433,000 tons valued at \$1,519,000, or 44 cents a ton. The total commercial sand and gravel marketed without washing was 854,000 tons valued at \$565,000, or 66 cents a ton.

Other average unit values per ton for 1954-55 were:

Type	1954	1955
Commercial sand	<b>\$0.</b> 63	\$0.66
Government-and-contractor sand	. 30	. 32
All sand		. 49
Commercial gravel		1. 20
Government-and-contractor gravel	. 69	. 92
All gravel		1. 15
Commercial sand and gravel		. 95
Government-and-contractor sand and gravel	. 41	. 44
All sand and gravel	. 74	. 76

Stone.—Stone again led the mineral commodities in value of production—10.9 million short tons at \$16.5 million, an increase of approximately 8 percent in tonnage and 6 percent in value above 1954.

Production of granite of all types increased in tonnage and in value over 1954. Commercial crushed granite gained 13 percent in tonnage

and 12 percent in value.

Dimension-marble production was slightly below that in 1954 in both tonnage and value, but marketed crushed marble was more than double that in 1954 in both tonnage and value.

Crushed-basalt (traprock) production was only about half that in

1954, due to inactivity of two quarries.

Crushed-limestone production increased 17 percent in tonnage and 16 percent in value over 1954. Noncommercial crushed limestone

rose 2 percent in tonnage and value.

Talc and Pyrophyllite.—Combined production of talc and pyrophyllite in 1955 increased 11 percent in tonnage and 47 percent in total value over 1954. However, talc production dropped 8 percent in tonnage and value, whereas pyrophyllite increased 13 percent in tonnage and 76 percent in total value.

There was no change in the list of producers or active mines from 1954, except that shipments from the Carolina mine by Hitchcock

Corp. were from previously mined stock only.

Unit value for talc remained stable, but that for pyrophyllite

increased 55 percent.

Vermiculite.—Vermiculite production declined for the fifth consecutive year. Tom Henry (Macon County) reported a small initial production.

TABLE 7.—Stone sold or used by producers, 1951-55

	1921	51	119	1952	1953	82	19	1954	1955	55
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Commercial: Basalt, crushed Granife, crushed Granife, dimension Limestone, crushed Marble Stone, miscellancous	4, 669, 493 23, 458 2, 080, 586 3, 475	\$6, 780, 408 1, 309, 981 2, 829, 244 8 1, 282	4, 835, 132 24, 190 2, 534, 446 (1) 181, 119	\$50,000 7,272,919 1,317,249 3,446,841 (1) (1) 249,992	5, 430, 467 40, 825 2, 252, 409 (1)	\$7, 833, 869 1, 403, 666 3, 150, 588 (1)	854.000 6, 275, 889 (2) 1, 735, 098 (2) 4 464, 462	\$1, 249, 000 8, 908, 919 (2) 2, 432, 282 4 1, 945, 016	(1) 7, 088, 873 (1) (1) (1) (1) (1) (1)	(1) \$9, 964, 384 (1) (1) (1) (2) (3) (4, 443, 056
Total 6	6, 774, 012	10, 920, 915	7, 614, 887	12, 337, 001	7, 723, 701	12, 388, 123	9, 329, 449	14, 535, 217	9, 925, 951	15, 241, 164
Noncommercial: Basalt, crushed Grantie, crushed Limestone, crushed Sandstone, crushed Sandstone, miscellancous	75, 164 1, 331, 439 101, 424 330, 928	94, 648 1, 823, 150 117, 310 336, 667	72, 697 1, 378, 302 119, 836 2, 500 459, 291	95, 684 1, 676, 850 137, 068 6, 000 442, 095	1,007,949 105,089 480,084	1, 331, 936 122, 628 581, 636	714, 284 89, 995	988, 119 101, 995	789, 618 91, 828 2, 545 93, 424	1, 040, 381 103, 594 7, 635 140, 136
Total	1, 838, 955	2, 371, 775	2, 032, 626	2, 357, 697	1, 593, 122	2,036,200	804, 279	1,090,114	977, 415	1, 291, 746
Grand total 2.	8, 612, 967	13, 292, 690	9, 647, 513	14, 694, 698	9, 316, 823	14, 424, 323	10, 133, 728	15, 625, 331	10, 903, 366	16, 532, 910

1 Figure withheld to avoid disclosure of individual company confidential data; included in total.
2 Combined with miscellaneous stone.
3 Excludes dimension market.
4 Includes quartz (1964-55) and 1,277 tons of dimension sandstone valued at \$8,762 (1955) and Excludes dimension marble (1951-53) and crushed marble (1962-53).

TABLE 8.—Stone sold or used by producers, 1951-55, by kinds 1

Kind	1921	21	19	.952	19	1953	1954	75	1955	ъĢ
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Basalt (traprock), crushed. Granite, dimension. Granite, crushed. Limestone, crushed. Miscellaneous, crushed. Sandstone, crushed. Sandstone, dimension. Undistributed *	75, 164 23, 458 6, 000, 932 2, 182, 010 330, 928	\$94, 648 1, 309, 981 8, 603, 558 2, 946, 554 336, 667	112, 697 24, 190 6, 213, 434 2, 654, 282 640, 410 2, 500	\$145, 684 1, 317, 249 8, 949, 769 3, 583, 909 692, 087 6, 000	40, 825 6, 438, 416 2, 357, 498 480, 084	\$1,403,666 9,165,805 3,273,216 581,636	854,000 (9,00,173 1,825,093 8 435,019 29,443	\$1, 249, 000 9, 897, 038 2, 534, 277 \$ 679, 609 1, 265, 407		(3) (2) (3) (4) (5) (6) (7) (8) (7) (8) (8) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9
Total	8, 612, 967	8, 612, 967   13, 292, 690	9, 647, 513	9, 647, 513   14, 694, 698	9, 316, 823	14, 424, 323	9, 316, 823   14, 424, 323   10, 133, 728   15, 625, 331   10, 903, 366	15, 625, 331	10, 903, 366	16, 532, 910

1 Excludes marble (1951-53).

\*\*Figure withblet to avoid disclosure of individual company confidential data; included with "Undistributed."

\*\*Includes quarta."

\*\*Includes marble (1954-55) and items indicated by footnote 2.

TABLE 9.—Talc and pyrophyllite production, 1946-50 (average) and 1951-55

	Shor	tons			Shor	t tons	
Year	Crude mined	Products sold <sup>1</sup>	Value <sup>1</sup>	Year	Crude mined	Products sold 1	Value 1
1946-50 (average) 1951 1952	115, 480 116, 722	98, 471 113, 950 115, 481	\$1, 363, 721 1, 982, 927 1, 771, 518	1953	119, 341 112, 704 125, 206		\$578, 239 388, 428 571, 689

<sup>1</sup> Value before 1953 is for products sold; value for 1953-55 is for crude ore as mined.

#### **METALS**

Beryllium Concentrate.—During 1955, only two new producers in Mitchell and Wilkes Counties produced beryl, compared with 7 in 6 counties in 1954. Production was less than 20 percent of that in 1954; average unit value was higher.

Gold, Silver, Copper, and Lead.—H. & H. Mining Co. of Enfield produced: 190 ounces of gold, valued at \$6,650; 181 ounces of silver, valued at \$164; 300 pounds of copper, valued at \$112; and 2 tons of

lead, valued at \$596.

Tungsten Concentrate.—The Tungsten Mining Corp. Hamme mine in Vance County furnished 3,054 tons of concentrate, the equivalent of 2,609 tons on a 60-percent WO<sub>3</sub> basis. Although this was 1 percent more in concentrate production compared with 1954, it was actually 3 percent greater in tons of equivalent 60-percent WO<sub>3</sub> content, reflecting the improved grade of concentrate produced. Total value was 3 percent greater than in 1954. In March 1955 the new company chemical treatment plant began treating low-grade concentrate, formerly shipped elsewhere for upgrading and produced high-grade sintered scheelite.

TABLE 10.—Tungsten concentrate produced and shipped, 1946-50 (average) and 1951-55

	Prod	uced	Shipped fr	om mines
Year	Short tons, 60 percent WO <sub>3</sub>	Units	Short tons, 60 percent WO <sub>3</sub>	Units
1946–50 (average) 1951 1952 1953 1954 1954	770 1, 035 1, 248 2, 525 3, 028 3, 054	46, 168 62, 078 74, 904 128, 645 151, 166 158, 304	764 1, 041 1, 254 2, 074 2, 538 2, 609	45, 852 62, 463 75, 226 124, 465 152, 296 156, 537

## **REVIEW BY COUNTIES**

North Carolina has 100 counties: Edgecombe and Warren reported no mineral production in 1954 and 1955.

TABLE 11.—Value of mineral production in North Carolina, 1954-55, by counties

Country	1054	1055	7.52
County	1954	1955	Minerals produced in 1955 in order of value
Alamance	(1)	\$158, 122	Pyrophyllite, granite, miscellaneous clay, sand and gravel.
Alexander	(1)	(1) 7, 635 (1)	Sand and gravel, mica.
Alleghany		7, 635	Sandstone.
Anson	(1) (1)	(1)	Sand and gravel, granite. Mica, sand and gravel.
Ashe	\$497, 085	900, 013	Mica, sand and gravel.
Avery Beaufort	(1)	45, 872	Mica, kaolin, feldspar, sand and gravel. Sand and gravel.
Bertie	600	10, 012	Dand and graver.
Bladen	3, 610	3,050	Sand.
Brunswick	1, 350	15, 320	Sand and gravel.
Buncombe	814, 355 2, 707 255, 048	(1)	Sand and gravel, granite, mica, feldspar.
BurkeCabarrus	2, 707		Mica. Miscellaneous stone, sand and gravel.
Caldwell	12, 785	(1) (1) (1)	Granite, mica, sand and gravel, miscellaneous clay
Camden	6,000		Granto, mios, band and graver, misconditions diay
Carteret	1, 500		
Caswell	606, 996 7, 915	897, 145 17, 756 231, 027 213, 302	Granite, sand and gravel.
Catawba	7, 915	17, 756	Sand and gravel.
Chatham Cherokee	325, 022 (1)	231, 027	Miscellaneous clay, granite. Talc, marble.
Chowan	33, 000	210, 002	Tale, marble.
Clay Cleveland	43, 125	10	Gem stones.
Cleveland	43, 125 1, 802, 989	(1)	Limestone, mica, miscellaneous clay, sand and
		0.050	gravel.
Columbus	5, 240 4, 500	9, 859 11, 250	Sand and gravel.
Craven	(1)	(1)	Do. Sand and gravel, miscellaneous clay.
Currituck	9,000	(-)	band and graver, miscenaneous cray.
Dare	3,000		
Davidson	460, 113	140, 900	Sand and gravel, miscellaneous stone, miscella
Dowlo	(II)	94 000	neous clay.
Davie	(1) 870	24, 000 2, 660	Sand and gravel.
Duplin Durham	414, 151	(1)	Granite, miscellaneous clay.
Edgecombe	<u>-</u>	'''	
Forsyth	879, 993 2, 250	816, 858 2, 700 36, 353	Granite, sand and gravel.
Franklin Gaston	2, 250 (1)	2,700	Sand and gravel.
Gates	10 500	30, 333	Miscellaneous clay, sand and gravel.
Graham	ìó, 500 101, 875		
Granville.	2, 592	27, 533 20, 700	Granite, sand and gravel. Sand and gravel.
Greene	18,000	20, 700	Sand and gravel.
Guilford	1, 885, 852	2, 938, 857	Granite, miscellaneous clay, sand and gravel.
Halifax Harnett	9,043	7, 552	Gold, lead, silver, copper. Sand and gravel, miscellaneous clay.
Haywood	255, 869	h (i)	Sand and gravel, mica.
Henderson	264, 603	330, 271	Limestone, miscellaneous clay, mica.
Hertford	7, 500		
Hoke	232, 841	(1)	Sand and gravel.
Hyde Iredell	(1) 300	(1)	Miscellaneous clay, sand and gravel.
Jackson	306, 735	(1) (1)	Olivine, miscellaneous stone, mica.
Johnston	32, 500	15,000	Sand and gravel.
Jones	(1)	22, 941 253, 150	Do.
Lee	418, 744	253, 150	Miscellaneous clay.
Lenoir Lincoln	(1) (1)	94, 650 (1)	Sand and gravel.
Macon	446, 833	660, 608	Sand and gravel, mica.  Mica sand and gravel vermiculite gem stones
Madison	(1)	(1)	Mica, sand and gravel, vermiculite, gem stones. Sand and gravel, feldspar.
Martin	900		
McDowell	(1)	(1)	Sand and gravel, limestone, mica.
Mecklenburg	11, 748	4 554 100	Foldenon miss sweets bealin hami
Mitchell	3, 790, 631	4, 554, 198 126, 211	Feldspar, mica, quartz, kaolin, beryl. Miscellaneous clay, sand and gravel, granite.
Moore	$\aleph$	438, 294	Pyrophyllite, sand and gravel.
Nash	(1) 22, 643	5, 215	Miscellaneous clay.
New Hanover Northampton	(1) (1)	(1)	Sand and gravel.
Northampton	(1)	(1)	Sand and gravel, miscellaneous clay,
Onslow.	518, 630	(1)	Limestone, sand and gravel.
Orange	4, 550	114,540	Granite, crushed and dimension, pyrophyllite.

See footnote at end of table.

TABLE 11.—Value of mineral production in North Carolina, 1954-55, by counties—Continued

County	1954	1955	Minerals produced in 1955 in order of value
Pamlico	\$4,000		
Pasquotank			
Pender	650	\$4,950	Sand.
Perquimans	10, 200	4,000	
Person	6,600	9, 050	Sand.
Pitt	14, 880	33, 750	Do.
Polk	37, 750	5, 800	Do.
Randolph		(1)	Granite, pyrophyllite.
Richmond	369	( )	Granto, pyrophymio.
Robeson		8,000	Sand and gravel.
Rockingham	(1)	193, 414	Miscellaneous stone, miscellaneous clay, sand and gravel, mica.
Rowan	1 , ,	1, 230, 780	Granite, miscellaneous clay, sand and gravel, abrasive stones.
Rutherford	(1)	88, 916	Sand and gravel, mica, miscellaneous clay.
Sampson		60, 610	Miscellaneous clay, sand and gravel.
Scotland	351	12,000	Sand and gravel.
Stanly		210, 545	Miscellaneous clay, granite, sand and gravel.
Stokes	(1)	177, 283	Mica, miscellaneous clay, sand and gravel.
Surry	1, 611, 706	(1)	Granite, dimension and crushed, sand and gravel.
Swain	351, 777	(1) (1)	Limestone, feldspar, sandstone, mica.
Transylvania	(1)	/15	Sand and gravel, asbestos, mica.
Tyrrell	300		
Union	839, 260	(1)	Basalt, granite, miscellaneous, clay, sand and gravel.
Vance	(1)	(1)	Tungsten concentrate, granite.
Wake		(1)	Granite, sand and gravel.
Warren			3-11-11-11-11-11-11-11-11-11-11-11-11-11
Washington	5, 700		
Watauga	(1)	(1)	Granite, sand and gravel, mica.
Wayne	(1) (1) (1)	54, 266	Granite, sand and gravel, mica. Sand and gravel.
Wilkes	(1)	13, 752	Granite, mica, beryl.
Wilson	(1)	1, 454, 756	Granite, sand and gravel.
Yadkin	(1)	(1)	Granite.
Yancey	756, 550	899, 202	Mica, feldspar, olivine, halloysite, vermiculite, gem stones.
Undistributed	21, 754, 940	23, 609, 374	Som soomos.
Total	41, 651, 000	41, 210, 000	

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosure of individual company confidential data; included with "Undis tributed."

Alamance.—Boren & Harvey (North State Pyrophyllite Co., Inc.) produced pyrophyllite from the Snow Camp mine at a considerably increased rate over 1954. Hanford Brick Co. increased its miscellaneous clay production but total value declined. The North Carolina State Highway and Public Works Commission quarried 32,000 tons of crushed granite, valued at \$48,000, and mined 2,000 tons of paving sand for its own use on county highways.

Alexander.—Dewey Moose recovered 150 pounds of quartz containing crystals of hiddenite and 600 pounds of similar material con-

taining reticulated rutile crystals.

mission mined 37,000 tons of paving sand valued at \$11,000.

Alleghany.—Alleghany County became a mineral-producing county in 1955 through the activity of the North Carolina State Highway and Public Works Commission, which quarried 2,500 tons of crushed sandstone, valued at \$7,600, for concrete aggregate and road metal.

sandstone, valued at \$7,600, for concrete aggregate and road metal.

Anson.—The only mineral production from Anson County was crushed granite and sand and gravel. W. R. Bonsal Co. mined building sand and paving gravel. B. V. Hedrick Gravel & Sand Co. leased its property to others under the name of "Lessees of B. V. Hedrick

Gravel & Sand Co." Production of sand and gravel for building.

paving, railroad ballast, and filter material continued.

The North Carolina State Highway and Public Works Commission produced: 22,000 tons paving sand valued at \$6,700, 8,000 tons paving gravel valued at \$2,400, 28,500 tons of crushed granite valued at \$36,000 (for its own use).

Ashe.—The three producers obtaining sheet mica from five mines in approximately the same quantity and value as in 1954 were: Lewis Aldridge (Duncan, Hardin No. 1 and Hardin No. 2 mines), Oscar E. Tolliver (Dorie mine), and W. W. Taylor (Taylor mine). Lewis Aldridge was the only producer to continue from 1954. The North Carolina State Highway and Public Works Commission mined 7,700 tons of paving gravel valued at \$7,700.

DMEA cooperated with Shaffer Mining Co. (Shaffer mine) in ex-

ploration for strategic mica.

Avery.—Harris Clay Co. production of kaolin from its Gusher Knob and Kaolin mines exceeded 1954 production by 32 percent in tonnage and 17 percent in value.

Feldspar Corp. produced feldspar from the Charles Ridge, Phillips,

and Buchanan mines.

The North Carolina State Highway and Public Works Commission

produced 1,350 tons of building gravel, valued at \$1 a ton.

Mica was obtained from 59 mines by 48 producers in 1955, compared with 48 active mines in 1954. All 59 mines produced some sheet mica; 3 produced scrap mica; and 1 mine, flake mica but no scrap. Sheetmica production was 26,000 pounds valued at \$255,000 in 1955, compared with 53,000 pounds valued at \$200,000 in 1954. Scrap-mica production was 300 tons valued at \$8,900. Harris Clay Co. recovered flake mica from its Gusher Knob Kaolin mine. Producers of 500 pounds or more of sheet mica were: Waits Avery, Robert Guy, Penland Mining Co., Buena A. Vance, Frank W. Phillips, Elk Mining Co., V. & O. Mining Co., Keller Mining Co., and Superior Mica, Inc.

The principal producer of scrap mica was Elk Mining Co.

TABLE 12.—DMEA mica projects active in Avery County, 1955

Contractor	Property	Total amount
Pancake Miners. Elbert Watson Joe C. Vance Howard Smith T. B. Vance Branch Mining Co. Sam G. Smith C. & D. Mining Co.	Crab Orchard Howard Smith Shaffle Vance Branch Doe Hill	5, 310 3, 240

<sup>&</sup>lt;sup>1</sup> Government participation, 75 percent.

Beaufort.—Mineral production from the county in 1955 was 61,000 tons of paving sand, valued at \$46,000, mined by the North Carolina State Highway and Public Works Commission for its own use on county roads.

Bladen.—The State highway and public works commission mined

30.500 tons of paving sand for use on county roads.

Brunswick.—The State highway and public works commission

mined 153,000 tons of paving sand for use on county roads.

Buncombe.—The total value of mineral production from Buncombe County was appreciably lower in 1955 than in 1954. Minerals mined were sand and gravel, crushed granite, mica, and feldspar. No beryl was reported.

Feldspar Corp. (Goldsmith mine), succeeding Feldspar Milling Co., and H.D. Trantham (Wadkins mine) produced small tonnages of

Both Feldspar Corp. and International Minerals & Chemical Corp.

(Consolidated Feldspar Division) ground feldspar.

The North Carolina State Highway and Public Works Commission quarried 25,000 tons of crushed granite, valued at \$47,000, for concrete

aggregate and road metal.

Bell Sand Co. slightly increased its production of building sand. Grove Stone & Sand Co. produced building and paving sand and gravel and gravel for railroad ballast. McCrary Construction Co. produced paving gravel but at a somewhat reduced rate compared with 1954. Reed & Abee, Inc., mined a small tonnage of building and paving sand. Two other producers, active in 1954, did not report in 1955.

Eight producers mining sheet mica from 10 mines were: Acme Mining Co. (Rocky Fork mine), George Burnett (Prospect mine), Perry A. Johnson (Wilson mine), J. G. Riddle (Moore mine), J. Claude

Self (Beam mine), H. D. Trantham (Watkins mine), R. L. Watson (Burleson, Grovestone & Ray mines), and G. H. Williams (Brushy Mountain mine). Combined production of sheet mica was less than

half that of 1954 in value.

Burke.—Eight producers recovered sheet mica at 9 mines. ducers were Chas. E. DuFour (Hoyt mine), Chas. B. Lovelace (Jasper Logan mine), Guy Martin (Noah Young mine), Arthur Rose (Brown and Cloud mines), Guy Z. Roger (Cannon mine), R. P. Sisk (Carswell mine), R. P. Vanhorn (Prospect mine), and Fred Wilson

Cabarrus.—Superior Stone Co., at its Midland quarry, crushed material, designated by some as basalt (traprock) and by others as

volcanic slate, for concrete and road metal.

The North Carolina State Highway and Public Works Commission mined 6,000 tons of building sand, valued at \$1,500. Lee White Gravel Pit produced paving gravel at the same rate as in 1954.

DMEA participated with Carolina Tungsten Mining Co. in an

exploration project for tungsten ore.

Caldwell.—Moore Brick Co. mined miscellaneous clay for heavy clay products.

The State highway and public works commission produced 3,650

tons of building sand, valued at 50 cents a ton.

Clement Bros. Co., Inc., began producing crushed granite from its Oakvale quarry.

R. L. Auton (Hall & McGee mines) and Bowman Bros. (Bowman

& McRay mines) mined sheet mica from 4 mines.

Caswell.—The North Carolina State Highway and Public Works Commission quarried 165,000 tons of crushed granite, valued at \$247,000, for concrete aggregate and road metal and 35,000 tons of paving sand, valued at \$12,250, for use on county roads. Lambert

Bros. increased production of crushed granite for concrete aggregate and road metal, roughly 17,000 tons over 1954.

Catawba.—Mineral production from Catawba County in 1955 was 57,000 tons of paving sand, valued at \$17,000, and 2,000 tons of

paving gravel, valued at \$600.

Chatham.—Pomona Terra Cotta Co., Chatham Brick & Tile Co., Boren Clay Products Co., and Cherokee Brick Co. all produced clay for company consumption. Combined output was 18 percent above 1954, but value declined 30 percent.

The North Carolina State Highway and Public Works Commission quarried 39,000 tons of crushed granite, valued at \$1.00 a ton, for

concrete aggregate and road metal.

Cherokee.—Hitchcock Corp. continued to operate its Nancy Jordan talc mine but shipped only material from its Carolina mine stockpile. Minerals & Metals Corp. also continued talc production. Combined tonnage and value were 8 percent below 1954.

Columbia Marble Co. decreased its production of monumental and building marble but considerably increased its output of crushed

marble for terrazzo and agricultural uses.

Clay.—Fred O. Scruggs recovered several small ruby and sapphire

crystals.

Cleveland.—Value of mineral production from Cleveland County was somewhat greater in 1955 than in 1954.

Bennett Brick & Tile Co. produced clay for its own use at virtually

the same rate as in 1954.

Superior Stone Co. crushed limestone from its Kings Mountain

quarry for concrete aggregate and road metal.

The North Carolina State Highway and Public Works Commission produced 50,000 tons of paving sand valued at \$15,000. Clayton Humphries continued its output of paving sand at the same rate as in 1954.

Of Cleveland County 35 active mica mines, distributed among 24 operators, 34 (23 operators) produced sheet mica; 1 recovered flake mica only. Sheet-mica production was 1,777 pounds valued at \$18,500 in 1955, compared with 7,636 pounds valued at \$31,700 in 1954.

The four principal producers of sheet mica were W. H. Humphries & R. W. Callahan (Blackman mine), Sam M. Vance (Lutz mine), Fred Taylor (Gant mine), and Oakley Buchanan (Metcalf mine). DMEA participated in four exploration projects for strategic mica.

TABLE 13.—DMEA mica-exploration projects in Cleveland County, 1955

Contractor	Property	Total amount 1
Robt. Lee Rudasill Dave & Ray Wise. Keller Mining Co. W. C. Crotts	Rudasill. Toney. Royster Crotts.	\$3, 500 3, 100 5, 364 3, 664

<sup>&</sup>lt;sup>1</sup> Government participation, 75 percent.

Columbus and Craven.—Mineral production in these two counties was the mining of paving sand by the North Carolina State Highway

and Public Works Commission. Combined tonnage was 85,000 and total value \$21,000.

Cumberland.—Ideal Brick Co. mined clay for heavy clay products, increasing production 26 percent in tonnage but decreasing output

considerably in value.

The North Carolina State Highway and Public Works Commission mined 54,000 tons of paving sand for use on county roads. Bryan Rock & Sand Co. mined building sand and gravel. Becker County Sand & Gravel Co. produced building and paving sand and gravel and special sands. Both companies produced at lower rates than in 1954.

Davidson.—Cunningham Brick Co. mined clay for its own use at

virtually the same rate as in 1954.

The North Carolina State Highway and Public Works Commission produced 26,000 tons of building sand and 153,000 tons of paving gravel, both valued at 50 cents a ton.

Superior Stone Co., at its Bluestone quarry, crushed material, variously classified as basalt and volcanic slate, for concrete aggregate

and roadstone.

Davie and Duplin.—Mineral production from these two counties was 76,000 tons of paving sand, valued at \$27,000, mined by the North Carolina State Highway and Public Works Commission.

Durham.—Borden Brick & Tile Co. increased its production of clay

for its own use approximately 18 percent above 1954.

Nello L. Teer Co. virtually doubled its 1954 production of crushed

granite for concrete aggregate and road metal.

Forsyth.—Piedmond Quarry Co. and W. E. Graham & Son quarried crushed granite for concrete aggregate and road metal. Combined production was greater than in 1954 but value was less.

The North Carolina State Highway and Public Works Commission

mined 80,000 tons of paving sand, valued at 50 cents a ton.

Ira Pope & Sons, Înc., dredged on the Yadkin River to produce sand and gravel reported in 1954 from Davie County; in 1955, from Forsyth County. Carl Spaugh, G. G. Black, and Paul Miller produced only building sand. County production of sand and gravel was considerably above 1954 due to the increase from the Pope Co. dredge.

Franklin.—Mineral production from Franklin County was 4,500 tons of paving sand, valued at \$2,700, produced by the State Highway

and Public Works Commission.

Gaston.—Kendrick Brick and Tile Co. mined clay for its own use; production increased about 70 percent above that of 1954.

The North Carolina State Highway and Public Works Commission

produced 52,000 tons of paving sand, valued at \$15,000.

DMEA participated in two exploration projects for mica in Gaston County: One, dated January 20, 1955, was with Ernest Crowder (Lingerfeldt mine) for \$4,356; the other, dated March 3, 1955, was with Beam Mining Co. (Beam mine) for \$600. The Government portion of the commitment was 75 percent in both contracts.

Granville and Greene.—Mineral production from these two counties was by the State Highway and Public Works Commission. In Granville County, production consisted of 13,000 tons of crushed granite valued at \$26,000 and 2,600 tons of paving sand valued at \$1,500. In Greene

County, production was confined to 28,000 tons of paving sand valued at \$21,000.

Guilford.—Boren Clay Products Co. increased its clay production

36 percent over 1954.

Buchanan Stone Co., Superior Stone Co. (2 quarries), and Pioneer Quarries Co. all produced crushed granite for concrete aggregate and road metal, increasing combined production by 6 percent in tonnage and value over 1954. Pioneer Quarries Co. also increased its tonnage of material crushed and ground for stone sand.

The North Carolina State Highway and Public Works Commission quarried 36,000 tons of crushed granite, valued at \$54,000, for concrete aggregate and road metal and also mined 8,900 tons of building sand, valued at 50 cents a ton, and 10,000 tons of paving gravel,

valued at \$1,500.

Halifax.—H. and H. Mining Co. mined a complex ore, recovering and selling 190 troy ounces of gold, 181 troy ounces of silver, 300 pounds of copper, and 4,200 pounds of lead for a total value of \$7,552.

Harnett.—Norwood Brick Co. mined clay for its own use at vir-

tually the same rate as in 1954.

The North Carolina State Highway and Public Works Commission

mined 59,000 tons of paving sand for use on county roads.

Becker County Sand and Gravel Co. and Southern Sand and Gravel Co. began production. The former company reported output of structural and paving sand and gravel, and some gravel for railroad ballast; the latter company reported production of paving and filter sand and building and paving gravel.

Haywood.—Everett L. Poston and Putnam Bros. mined sheet mica; the quantity recovered was less than in 1954, but the total value was

greater

Sale and Alexander production of building and paving sand and gravel increased 21 percent in tonnage and 16 percent in total value,

compared with 1954.

Henderson.—Moland-Drysdale Corp. operated its Etowah and Fletcher mines for clay for company use. Combined production was 65 percent above 1954. Etowah Brick Co., Inc., produced an initial 22,000 tons of clay for heavy clay products. County production of miscellaneous clay more than doubled that in 1954; total value rose only 10 percent.

Fletcher Limestone Co. and Cogdill Limestone Co. quarried for crushed limestone, concrete aggregate, and road metal; combined production was roughly 30 percent above that in 1954 in both tonnage

and value.

J. R. Freeman continued to produce sheet mica from the Mauldin

and Boyd mines.

Hoke.—Cumberland Gravel and Sand Co. began producing building and paving sand and gravel.

Iredell.—Statesville Brick Co. mined clay for its own use; produc-

tion increased roughly 52 percent above that in 1954.

The North Carolina State Highway and Public Works Commission

produced 73,000 tons of paving sand, valued at \$22,000.

Jackson.—Harbison-Walker Refractory Co. Addie mine increased production of olivine by 24 percent in tonnage over 1954 but at a small decrease in value, reflecting a lowering of unit value. Balsam

Gap Co. opened and began producing olivine at a new mine (Balsam

Gap).

J. L. Colville Construction Co. began producing miscellaneous stone with a portable plant. The method consists of excavating a

coarse gravel and crushing it for sale or use as crushed stone.

Sheet mica was produced at 16 active mica mines (11 operators), which supplied only a little more than 10 percent of the 1954 quantity; value was one-third that of 1954. The principal producers were: Goodmica Mining Co. (Shell Ridge and Engle Cope mines), Jackson Mining Co. (Jackson, Painter, and Vance Bryson mines), Rice Mining Co. (Rice mine), Superior Mica, Inc. (Buzzard Roost mine), Hooper Bros. (Old Sheep Mountain mine), and Edward Owens (Talford Cove mine).

DMEA participated in three mica-exploration contracts.

TABLE 14.—DMEA mica-exploration projects in Jackson County, 1955

Contractor	Property	Total amount 1
Charlie B. Hensley Buchanan Minerals, Inc Alvin & Lee White and Florence Harris	Betty's Creek No. 3	\$5, 350 7, 200 4, 940

<sup>&</sup>lt;sup>1</sup> Government participation, 75 percent.

Johnston.—Mineral production in the county was 15,000 tons of paving sand valued at \$15,000 mined by the North Carolina State Highway and Public Works Commission for county roads.

Jones.—The commission produced 19,000 tons of paving sand, valued at \$14,000. Simmons Marl & Lime Co. at its portable plant produced an initial 1,700 tons of sand for fill and 6,000 tons of paving

gravel.

Lee.—Sanford Brick & Tile Co., Borden Brick & Tile Co., and Lee Brick & Tile Co., continued to mine clay for company use and combined production increased 15 percent above that for 1954.

TABLE 15.—Miscellaneous clay sold or used by producers in Lee County, 1950-55

Year	Short tons	Value	Year	Short tons	Value
1950	280, 250 310, 000 348, 600	\$280, 250 355, 000 397, 200	1953	314, 000 360, 831 415, 000	\$378, 800 418, 564 253, 150

Lenoir.—Barrus Construction Co. production of building sand and gravel was 31 percent below that in 1954, but value declined only 3 percent; this reflects an increase of 24 cents a ton in value.

The North Carolina State Highway and Public Works Commission produced 26,000 tons of paving sand, valued at \$20,000, for use on

county roads.

Lincoln.—The commission reported production of 40,000 tons of paving sand, valued at \$12,000, and 5,000 tons of paving gravel, valued at \$1,400 for its own use.

Five producers operated five mines for mica, but all produced sheet mica only. They were: Roscoe F. Salley (Foster mine), Wilbert Cook (Prospect mine), Buchanan & Burleson Mining Co. (Warlick mine), Nance & Abernathy (Stallings mine), and Millard G. Peeler (Millard mine). None of the four producers active in 1954 reported production in 1955. Southeastern Mica & Feldspar Co. had reported production from the Foster mine in 1954. County production of sheet mica of 158 pounds was valued at \$1,440.

DMEA participated with Ernest Crowder in one mica-exploration

project

Macon.—Robert A. Campbell recovered 5 grams of ruby crystals, valued at \$5, from the Cowee Creek mine near Franklin.

Tom Henry produced a small amount of vermiculite.

During 1955, sheet-mica output, by a total of 30 producers at 36 mica mines, totaled 80,218 pounds, valued at \$377,000; 325 tons of scrap mica was reported from the county but was not positively identified as to the mine source. Producers of 500 pounds or more of sheet mica were: Mica Development Corp. (Chalk Hill mine), A. W. Raid (Mill Knob mine), Mica Industries, Inc. (Rose Creek No. 1 mine), Sam L. Phillips (Mud Cut mine), Mayland Mining Co. (Itola Bowers mine), Jeter Boone Mining Co. (Rock Cut mine), Harris Mining Co. (Harris mine), Roy F. Foutes (Almond Cove mine), Shepherd Knob Mining Co. (Shepherd Knob mine), Ellis and Carpenter (Iota Bradley mine), Knob Mining Co. (Beasley Knob and Lyle Knob mines), and Henry Erlich (Campbell mine).

The North Carolina State Highway and Public Works Commission produced 3,500 tons of paving sand, valued at \$1,800 and 241,000

tons of paving gravel, valued at \$241,000.

TABLE 16.—DMEA mica-exploration projects in Macon County, 1955

Contractor	Property	Total amount 1
Carolina Mining Co	Mudeut. Zeb Angel. Sol Jacobs. Elmore. Harris.	\$10, 838 5, 276 5, 348 5, 064 6, 500

<sup>&</sup>lt;sup>1</sup> Government participation, 75 percent.

Madison.—Feldspar Corp. produced a small quantity of crude feldspar from the Metcalf mine.

McCrary Contracting Service produced a substantial tonnage of

paving gravel with a portable plant.

McDowell,—The North Carolina State Highway and Public Works Commission output was 92,000 tons of crushed limestone, valued at \$104,000 for concrete aggregate and road metal.

Becker County Sand & Gravel Co. increased its production of building and paving sand and gravel and gravel for railroad ballast appreciably over 1954.

C. G. Clark (J. B. Hensley mine), Chas. Woody (Fox mine), B. M. Young (Prospect), and D. & A. Mining Co. (Berger and Ray mines)

mined some sheet mica, but combined production was less than that for 1954.

Mitchell.—Lee McKinney mined a few pounds of beryl from the

No. 1 mine.

Harris Clay Co. mined a small tonnage of kaolin from the James Bartlett property but reported none from the Sparks mine, which was active in 1954. Work at the Bartlett property terminated in March 1955.

In 1955, 5 producers obtained feldspar from 10 mines compared with 13 producers and 19 mines in 1954. International Minerals & Chemical Corp. continued producing from its Kona and Hawkins mines. Feldspar Corp. took over Dogwood Flats and Neilus mines from Feldspar Milling Co. and the Poteat and Wiseman mines from Feldspar Flotation Corp. Steve Sparks Mining Co. continued working the McKinney mine. Making their first appearance were the Cox, Hoyle & Hoyle Mining Co. (Jeter McKinney mine) and Molton Buchanan (Pine Mountain mine). Combined production of feldspar from the 10 mines in 1955 was substantially greater than from the 19 mines active

International Minerals & Chemical Corp., and Feldspar Corp., continued to recover quartz from company feldspar milling; rate of production changed little from 1954, but unit value increased moderately.

During 1955, 188 individual producers actively obtained mica from

251 mines in Mitchell County.

Sheet-mica recovery for the county was 129,000 pounds, valued at Production of scrap and flake mica was 12,900 tons, valued at \$184,000.

Producers reporting 1,000 or more pounds of sheet mica were: Joe West (West No. 1 mine), Abernathy Mining Co. (Abernathy mine), Powder Mill Mining Co., Inc. (Madam Banks mine), Sink Hole Miners (Sink Hole mine and W. B. Ellis tract), Hawkins Mining Co. (Long Cut mine), Dallas Young (Lick Ridge mine), Thomas & Grindstaff (George Howell mine), Howard Boone Mining Co. (Jeff Sparks mine), Sugar Dave Mining Co. (Sugar Dave mine), International Minerals & Chemical Corp. (Hawkins mine), Cook Mining Co. (Robinson mine), Gudger Mining Co. (Gudger mine), Will McKinney (Bailey No. 12 mine), Roy L. Wiseman (Sullins Rock mine), Spencer Mining Co. (Spencer mine), R. B. Phillips Mining Co. (R. B. Phillips mine), Duncan Mining Co. (Duncan No. 1 mine), Lewis Crowder (Huskins mine), and M. G. Sparks & J. C. Buchanan (Anderson mine).

The principal producers of scrap mica were: Lewis Crowder (Huskins mine), Sink Hole Miners (Sink Hole mine), Thomas & Grindstaff (George Howell mine), Abernathy Mining Co. (Abernathy mine), Sugar Dave Mining Co. (Sugar Dave mine), and Hawkins Mining Co.

(Long Cut mine).

Flake mica was produced by International Minerals & Chemical Corp. (Kona and Hawkins mines), Feldspar Corp. (Poteat and Wise-

man mines), and English Mica Co. (Martin mine).

DMEA participated in 32 mica-exploration contracts with 31 producers for a total of \$166,000, of which the Government share was 75 percent.

TABLE 17.—DMEA mica-exploration projects in Mitchell County, 1955

Contractor	Property	Total amount
eter & Howard Boone	Doc Thomas	\$5, 7
loward Boone & John Jarrett		
eb Buchanan & W. R. Johnson		
udy Pittman		6.3
eGroat, Buchanan & Buchanan		
opper, Phillips & Slagle		
To Charles & Stagte		
. K. Sparks urleson & Keller Mining Co	McKinney Cove	
Lineson & Keller Willing Co	Woody Hill	
IcKinney & Young		
D. Dilling & Drawn Granks		
R. Phillips & Brown Sparks		
Do Valter & Lucien Grindstaff	Walter Grindstaff	
ohn Jarrett		
Onn Jarrett		-1 -7 -
R. Phillips aul Fortner & Lee Willis	Black Bull	
aul Former & Lee willis	Bill Greene	
ill Greene & John Phillips		
Iorace Phillips		
oone, Keller & Flynt		
aul & Claude Huskins		
rby Mining Co		
ohn Jarrett & Sam Phillips		
hillips, Ed. & Sherrill Hudson	Sugar Dave	
ohn Phillips & Jim McKinney		
d Huskins & Fred Gage	Randolph John Conley	4.
rindstaff, Thomas & Boone		
V. A. Greene		
aul Freeman		
ohn Phillips	Queen Geo. Howell No. 2	6,

<sup>1</sup> Government participation, 75 percent.

Montgomery.—Mount Gilead Brick Co. produced clay for its own use at virtually the same rate as in 1954.

Harrison Sand Pit produced an initial 57,000 tons of building sand,

valued at \$18,000.

The North Carolina State Highway and Public Works Commission produced 7,000 tons of crushed granite, valued at \$7,250, for concrete aggregate and road metal; 7,000 tons of building gravel, valued at \$7,250; and 17,500 tons of paving sand, valued at \$2,000.

Moore.—Glendon Pyrophyllite Co. and Standard Mineral Co., Inc., continued to mine pyrophyllite from their respective mines, the Glendon and Robbins. Combined production was substantially

greater both in tonnage and value than 1954.

Four of the six sand producers of 1954 continuing in 1955 were Pleasants Sand & Supply Co., Bryan Rock & Sand Co. (2 plants),

Monroe Sand Pit, and Aberdeen Sand & Gravel Co.

Harrison Sand Pit, reporting from Moore County in 1954 and from Montgomery County in 1955, and the T. M. Reid sandpit terminated production in 1954.

Pleasants Sand & Supply Co. marketed both building and paving

sand, but the other three produced only building sand.

Combined sand production for the county was 5 percent less in tonnage but 5 percent greater in total value, reflecting a better unit value in 1955.

Nash.—Mireral production in Nash County in 1955 was miscellaneous clay mined by Nash Brick Co., tonnage increased 20 percent

over 1954

New Hanover.—Mrs. E. L. Robbins produced sand for fertilizer filler at a slightly lower rate than in 1954.

The North Carolina State Highway and Public Works Commission produced 5,000 tons of paving sand for its own use on county highways.

Northampton.—Grant Brick Works mined clay for its own use,

producing 13 percent above 1954.

In 1955, Bryan Rock & Sand Co. produced only building sand and gravel; in 1954, both building and paving sand and gravel were marketed. Production in 1955 was 31 percent less in tonnage but only 9 percent less in value compared with 1954.

Onslow.—Superior Stone Co. produced crushed limestone for con-

crete aggregate and road metal.

The North Carolina State Highway and Public Works Commission mined 181,000 tons of paving sand for its own use.

Orange.—Boren & Harvey began producing pyrophyllite from the Hillsboro mine.

The State highway and public works commission produced 36,000 tons of crushed granite, valued at \$54,000. Duke University prepared

2,600 tons of dimension granite, valued at \$26,000.

Pender, Person, Pitt, and Polk.—Mineral production in these four counties was paving sand mined by the North Carolina State Highway and Public Works Commission. Tonnages were: Pender, 50,000: Person, 15,000; Pitt, 45,000; and Polk, 12,000.

Randolph.—Carolina Pyrophyllite Co. mined pyrophyllite from its Staley mine; 1955 production paralleled that in 1954; total value was

somewhat above that of 1954.

The North Carolina State Highway and Public Works Commission quarried 197,000 tons of crushed granite for concrete and road metal, valued at \$1 a ton.

Robeson.—The only mineral production in Robeson County in 1955 was 80,000 tons of paving sand by the North Carolina State Highway

and Public Works Commission.

Rockingham.—The commission produced 93,000 tons of miscellaneous stone, valued at \$140,000, for unspecified purposes other than concrete aggregate and road metal. The commission also mined 8,400 tons of building sand, valued at \$4,200.

Both Roanoke-Webster Brick Co. and Pine Hall Brick & Tile Co. mined clay for company use. Combined production was 17 percent

above that of 1954.

Spencer Mining Co. mined a small quantity of sheet mica.

Rowan.—Harris Granite Quarries Co., Inc., produced grinding pebbles and tube-mill liners from its Balfour quarry. Output of each product from this quarry was greater than in 1954. Similar material was reported from the company Salisbury quarry in 1954; none came from there in 1955.

Gardner Granite Works increased production of millstones by 17

percent in total value over 1954.

Isenhour Brick & Tile Co. mined shale for its own use at the same rate as in 1954.

Carolina Tufflite reported initial production of shale for manufac-

turing lightweight aggregate.

Harris Granite Quarries Co., Inc., quarried dimension granite at its Collins and Balfour quarries and began producing at its Shuping quarry. Work at the Salisbury quarry was terminated in 1954. G. M. Earnhardt also quarried dimension granite. New producers in 1955 were Banks Shuping and H. P. Stirewalt. J. A. Logan Granite Co., active in 1954, was inactive in 1955. Combined production of dimension granite was somewhat below that in 1954 in both tonnage and value.

Superior Stone Co. worked its Woodleaf and Kanapolis quarries. The North Carolina State Highway and Public Works Commission produced 25,000 tons of building sand valued at 50 cents a ton.

TABLE 18.—Granite (crushed and dimension) sold or used by producers in Rowan County, 1950-55

	Year	Short tons	Value	Year	Short tons	Value
1950 1951 1952		530, 931 410, 782 548, 351	\$1, 030, 616 877, 460 1, 216, 044	1953	482, 446 741, 907 599, 318	\$1, 167, 823 1, 265, 051 992, 526

Carolina Perlite Co., Inc., expanded raw perlite, shipped from outside the State, into lightweight material.

Rutherford.—Bostic Brick & Tile Co. continued to mine clay for its use in manufacturing heavy clay products, but output was only about 25 percent of that in 1954.

A. R. Thompson produced paving gravel; tonnage increased 67 percent over 1954; total value was considerably below that in 1954,

reflecting a reduction in unit value.

The 5 producers (not active in the county in 1954) obtaining sheet mica from 5 active mines were: Frank W. Phillips (Dycus No. 2 mine), Dycus Mining Co. (Dycus No. 1 mine), Alonzo A. Wallace (Philbeck mine), Charlie C. Newton (Huntzinger mine), and W. C. Ashley (Withroe mine). Sheet-mica production for the county was tenfold greater than in 1954.

DMEA participated in two mica-exploration projects as follows: W. A. Martin (Martin prospect), contract date March 7, 1955, for a total of \$4,880; and J. L. Biggerstaff (Dycus mine), date June 28, 1955, for a total of \$9,288. Government participation was 75 percent

in each contract.

Sampson.—Sampson Brick Co., Crumpler Brick Co., and Patterson Brick Co. mined clay for respective company consumption in manufacturing heavy clay products. Combined production doubled that in 1954.

The North Carolina State Highway and Public Works Commission

produced 24,000 tons of paving sand.

Scotland.—The commission produced 12,000 tons of paving gravel,

valued at \$12,000.

Stanly.—Yadkin Brick Yards, Inc., and Stanly Shale Products Co. mined shale for manufacturing heavy clay products. Carolina Solite Corp. mined a "slate" or shale for expansion into lightweight aggregates.

County production of shale and "slate" was 45 percent greater

than in 1954.

The North Carolina State Highway and Public Works Commission quarried 71,500 tons of crushed granite, valued at \$89,400, for concrete aggregate and road metal and 12,000 tons of paving sand, valued at 30 cents a ton.

Stokes.—Pine-Hall Brick & Pipe Co. mined shale from its No. 1 and No. 2 mines for manufacturing heavy clay products. Production in 1955 was 24 percent above that of 1954.

The North Carolina State Highway and Public Works Commission reported production of 83,000 tons of paving sand valued at 50 cents

a ton.

Stokes County became a mica producer in 1955; production came from L. & M. Mining Co. (Steele No. 1 and No. 2 mines) and Horace

Love (Eligha Carnes mine).

Surry.—North Carolina Granite Corp., at its Mount Airy quarry obtained dimension granite, increasing production by more than onethird over 1954. The same company also quarried crushed granite for riprap, concrete aggregate and road metal, stone, and sand and grit for cast stone. Production of crushed granite was also above that of 1954.

W. E. Graham & Sons mined paving gravel; production was sub-

stantially below that in 1954.

Swain.—Needmore Quarries produced 16,000 cubic feet of quartzite flagging, valued at \$9,000 and reported as granite in 1954. mation from the company states that analysis shows the material to be quartzite; hence, in 1955, it is grouped with the sandstone, quartz, and quartzite group.

Nantahala Talc & Limestone Co. increased its production of crushed limestone for concrete aggregate, road metal and agricultural purposes by 9 percent in tonnage and 15 percent in total value in 1955.

reflects an average increase of roughly 6 cents a ton.

Alvin White produced a small quantity of sheet mica from the Alexander mine. No mica was produced in this county in 1954.

Feldspar Corp., successors to Feldspar Milling Co., worked the Alexander mine.

Transylvania.—Powhatan Mining Co. recovered a small quantity of short-fiber amphibole asbestos from its Kilpatrick mine.

McCrary Contracting Service began producing paving gravel.

Of 4 producers at 4 mines for sheet mica in 1955, James E. Moore (Broom mine) was the only one continuing from 1954. The others were: Frank Fanning (Fanning mine), Eugene Buchanan (Owens mine), and J. W. Worley (a small prospect). County production of sheet mica was 63 pounds, valued at \$816.

On June 28, 1955, DMEA contracted with Mines & Mining, Inc., to explore the Farlow Gap property for mica at a cost of \$5,136; the

Government share was 75 percent.

Union.—Superior Stone Co. produced crushed basalt (traprock)

from its Bakers quarry.

Kendrick Brick & Tile Co. worked the Monroe mine for material to use in manufacturing heavy clay products. Production in 1955 was roughly 9 percent above that of 1954.

The North Carolina State Highway and Public Works Commission produced 90,000 tons of crushed granite, valued at \$113,000, for concrete aggregate and road metal. The commission also produced 10,000 tons of paving sand, valued at 30 cents a ton.

Vance.—Tungsten Mining Corp. again increased its shipments of tungsten concentrate and also increased the grade of concentrate owing primarily to improvements in its process treatment and the

opening of a new mill as reported previously in this chapter.

Greystone Granite quarries produced only about one-half the 1954 output of crushed granite for riprap, concrete aggregate, roadstone and railroad ballast, although the average value a ton for the stone increased nearly 10 percent.

Wake.—Bryan Rock & Sand Co. crushed granite from its Rolesville and Crabtree quarries for marketing as concrete aggregate and road Some material from the Rolesville quarry was sold as stone Production in 1955 was 10 percent below 1954, but total value

increased roughly 10 percent in average value a ton.

The North Carolina State Highway and Public Works Commission

produced 4,500 tons paving sand, valued at 60 cents a ton.

Watauga.—The commission produced 10,000 tons of crushed granite for concrete aggregate and road metal, valued at \$1.00 a ton.

W.E. Graham & Son's portable plant began producing paving gravel; this company reported production from Surry County in 1954.

Butler Mica Co. continued to operate the Watauga mine for sheet

mica and was the only producer reporting in the county.

Wayne.—The North Carolina State Highway and Public Works Commission produced 11,500 tons of paving sand, valued at \$1.00 a ton. Bryan Rock & Sand Co. virtually doubled its 1954 production of building sand but at a somewhat reduced value a ton.

Wilkes.—Taylor, Thorton & Williams began producing a small

quantity of beryl and then shut down.

The State highway and public works commission produced 4,500 tons of crushed granite, valued at \$13,500, for concrete aggregate and road metal.

Butler Mica Co. (Wilks mine) and A. M. Snipes (Snipes mine) were the only producers of sheet mica reporting in 1955.

producers reporting in 1954 terminated operations that year.

Wilson.—Bryan Rock & Sand Co. production of crushed granite for concrete aggregate, road metal, and stone sand increased more than 20 percent above 1954 but at some sacrifice in average value a ton.

The North Carolina State Highway and Public Works Comission

produced 68,000 tons of building sand.

Yadkin.—J. E. Dooley reported increased production of crushed granite for concrete aggregate and road metal more than 50 percent, but at an appreciably lower average value a ton.

Yancey. - C. R. Wiseman continued working the Wray mine but

did not quite reach his 1954 production of olivine.

Varigated Vermiculite Co. produced vermiculite from its Woody mine but at a lower rate than in 1954.

Roy Grindstaff reported a small tonnage of halloysite from Mitchell

County in 1954 but from Yancey County in 1955. In 1955, Feldspar Corp. produced feldspar from the Mudhole and Webb mines formerly of Feldspar Milling Co., and the Thomas mine formerly of Feldspar Production Co. In addition, it began producing from the Hurst and Towe mines. Others reporting in 1954 were inactive in 1955. County production in 1955 was somewhat less than in 1954.

Robert A. Campbell collected a few emerald crystals from Crabtree

Mountain near Spruce Pine.

In 1955 84 active mica mines operated by 75 producers compared with 66 active mines in 1954. Considerable sheet mica was produced from unknown mine sources in the county. County sheet-mica production was 21,000 pounds, valued at \$164,000, compared with 28,000 pounds, valued at \$112,000 in 1954. This represents an improvement for the second consecutive year in upgrading sheet mica for marketing. The average value a pound in 1955 was \$7.81, compared with \$3.98 in 1954, and \$1.74 in 1953. The total scrap and flake-mica production in 1955 was 28,000 tons valued at \$637,000, compared with 22,000 tons, valued at \$496,000 in 1954.

Producers of 500 pounds or more of sheet mica were: S. Duncan (No. 1 mine), J. Gouge (No. 1 mine), J. Stewart (Stewart mine), J. E. Wilson (Bee Ridge mine), John Blalock (Cat Tail mine), Rock Mining Co. (Rock mine), P. C. Coletta (Lenzie Autrey mine), Consolidated Mica Co. (Young mine), Thompsor & Carroll (Mudhole mine), L. J. Williams Mining Co. (Little Ray mine), Thad Young (Prospect), and Clarence Sparks (Chestnut Branch mine).

The principal producers of scrap mica were DeWeld Mica Corp., and Wilson Mica Corp. (Halls Chapel and Bailey Mountain mines), Eds Realty Co., Inc. (Carolina Mica mine), and Hassett Mining Co. (Edge and Simpson mines).

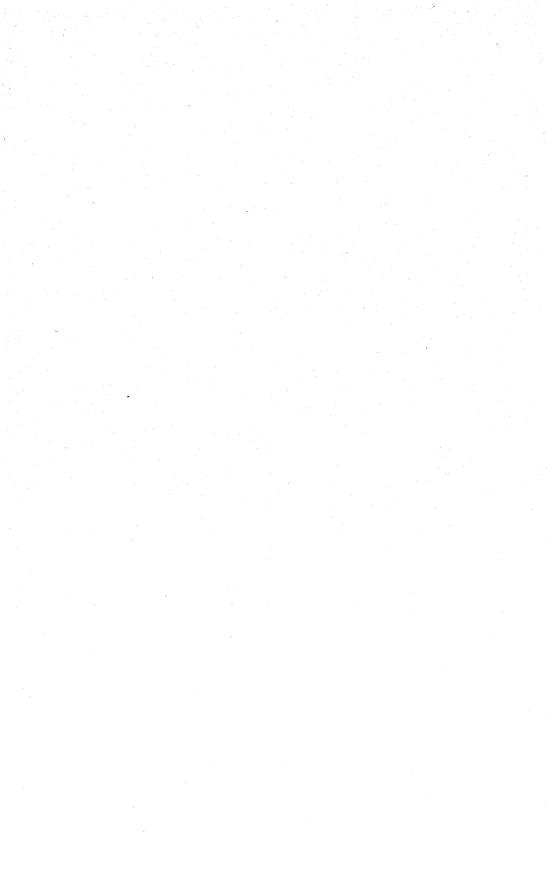
Producers of flake mica were Southern Mica Co. (Briggs, Sparks and Thompson mines) and Deneen Mica Co. (Harris Clay mine).

DMEA contracted with 11 producers to explore 13 properties for strategic mica in 1955, compared with 14 projects in 1954.

TABLE 19.—DMEA mica-exploration projects in Yancey County, 1955

Contractor	Property	Total amount
	Carson Rock Irby Cut S. D. McKinney Laws Lowhern Hughes & Gouge Willie Shanty	3, 938 4, 900 5, 428 5 840

<sup>1</sup> Government participation, 75 percent.



# The Mineral Industry of North Dakota

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

By D. H. Mullen 1



INERAL PRODUCTION in North Dakota in 1955 advanced impressively in value, nearly doubling that in 1954. Almost all of the increase can be attributed to petroleum, natural gas, and natural-gas liquids. 1955 was the first full year of operation of the refineries in Mandan, Dickinson, and Williston that were completed and began operations in 1954. A full year's operation of the natural-gasoline plant at Tioga, using gas previously vented or flared, increased the quantity of marketed natural gas fivefold over 1954. Production of natural-gas liquids increased sevenfold over 1954.

Lignite output increased slightly over 1954. As a group, the mineral fuels, petroleum, natural gas, natural-gas liquids, and lignite accounted for 94 percent of the value of all minerals produced in 1955. Gains, also, were recorded in the value of clays, sand and gravel,

and stone.

TABLE 1.—Mineral production in North Dakota, 1954-55 1

	1954		1955	
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Coal (lignite) Natural gas million cubic feet Petroleum (crude) thousand 42-gallon barrels. Pumice.	(2) 1, 093 6, 025	(2) \$69, 000 12, 890, 000	3, 102, 087 5, 256 11, 143 3, 500	\$7, 261, 120 405, 000 32, 200, 000 10, 000
Sand and gravel	7, 105, 466 1, 419	2, 219, 747 3, 784 7, 040, 820	11, 168, 849 77, 366	2, 637, 988 80, 560 1, 528, 636
Total North Dakota		22, 223, 000		44, 123, 000

Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Value of uranium ore is excluded.
 Figure withheld to avoid disclosing individual company confidential data.

<sup>&</sup>lt;sup>1</sup> Commodity-industry analyst, Region III, Bureau of Mines, Denver, Colo.

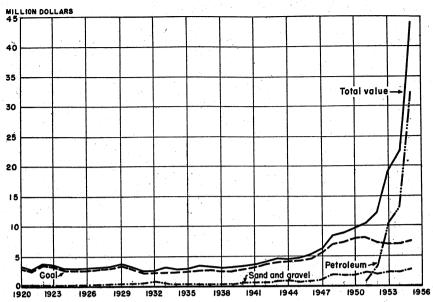


FIGURE 1.—Value of coal (lignite), sand and gravel, 1920-55, value of petroleum 1951-55, and total value of mineral production in North Dakota, 1920-55.

## REVIEW BY MINERAL COMMODITIES

### **METALS**

Uranium.—Limited exploration of uraniferous lignite was continued, and shipments were made to Edgemont, S. Dak., and Grand Junction, Colo., for experimental purposes. Test work by the Atomic Energy Commission, the Bureau of Mines, and private research groups had been encouraging, but no satisfactory process had been developed for recovering uranium from lignite. Passage by the 1st session of the 84th Congress of Public Law 357 in August removed much of the confusion that existed regarding the location of mining claims on lands previously classified as valuable for coal. The law provides that regular mining claims can be located on such lands where uranium The Ohio Oil Co. acquired an or other source materials are found. option on the Gardner, Walch & Schumacher lease in Billings County and planned a drilling program. The Landis-Gress-McCann-Getting Uranium Association did some auger drilling and trenching on the Starlight group, also in Billings County. The Uranco Mining & Exploration Co. outlined mineralized areas on lignite deposits in Slope County.

## **NONMETALS**

Clays.—Production of miscellaneous clay for building brick, tile, heavy clay products, and lightweight aggregates increased 42 percent over 1954. A small quantity of bentonite used for rotary-drilling mud was produced. A major portion (56 percent) of the miscellaneous clay produced was used for the manufacture of lightweight aggregates.

Molite, Inc., operated a plant at Mandan, and Baukol-Noonan, Inc., began production at its Noonlite plant at Noonan in Divide County. Clay for building brick, tile, and heavy clay products was produced

in Adams and Morton Counties.

Sand and Gravel.—Road building by Federal, State, and county governments accounted for the 57-percent increase in production of sand and gravel over 1954. Commercial production decreased 14 percent, whereas Government-and-contractor production advanced 75 percent. Ninety percent of the total sand and gravel produced was utilized for paving and road construction, of which 94 percent was produced by and for the North Dakota State Highway Department. Sand and gravel was reported produced from 31 counties; 23 counties reported commercial production, and 22 reported Government-and-contractor production. Eighty-three percent of the production reported by the State highway department was not identified as to

TABLE 2.—Sand and gravel sold or used by producers, 1954-55, by classes of operation and uses

		1954		1955			
Class of operation and use		Val	ue		Value		
	Short tons	Total	Average per ton	Short tons	Total	Average per ton	
COMMERCIAL OPERATIONS				,	-		
Sand: Bullding Paving Engine Other	213, 035 56, 570 5, 813	\$212, 784 52, 338	\$1.00 .93	201, 924 127, 212 824	\$201, 754 37, 512 830	\$1.00 .29 1.01	
Total commercial sand	275, 418	275, 728	1.00	329, 960	240, 096	. 73	
Gravel: Building. Paving. Railroad ballast. Other.	227, 025 164, 533 481, 868 292, 059	328, 496 123, 261 423, 352 345, 025	1. 45 . 75 . 88 1. 18	241, 274 439, 482 181, 285 45, 213	344, 320 353, 622 162, 023 21, 368	1. 43 .80 .89 .47	
Total commercial gravel	1, 165, 485	1, 220, 134	1.05	907, 254	881, 333	. 97	
Total commercial sand and gravel	1, 440, 903	1, 495, 862	1.04	1, 237, 214	1, 121, 429	. 91	
GOVERNMENT-AND-CONTRACTOR OPERATIONS Sand: Building Paving				168, 750 1, 848, 723	18, 750 300, 986	.11	
Total Government-and- contractor sand				2, 017, 473	319, 736	. 16	
Gravel: Building Paving	1, 600 5, 662, 963	80 723, 805	.05 .13	223, 025 7, 691, 137	262, 670 934, 153	1.18 .12	
Total Government-and- contractor gravel	5, 664, 563	723, 885	.13	7, 914, 162	1, 196, 823	. 15	
Total Government-and- contractorsandandgravel.	5, 664, 563	723, 885	. 13	9, 931, 635	1, 516, 559	.15	
ALL OPERATIONS SandGravel	275, 418 6, 830, 048	275, 728 1, 944, 019	1.00 .28	2, 347, 433 8, 821, 416	559, 832 2, 078, 156	. 24 . 24	
Grand total	7, 105, 466	2, 219, 747	. 31	11, 168, 849	2, 637, 988	. 24	

county of origin. Principal commercial producers were Russell J. Bradshaw, Dakota Sand & Gravel Co., Lindteigen Bros., Minot Sand & Gravel Co., and Morrison-Knudsen Co., Inc. Principal producers of Government-and-contractor material were P. A. Bradbury Construction Co., W. H. Noel Co., Schultz & Lindsay, Tennefos Con-

struction Co., and Clarence Wiseman.

Stone.—Stone production was limited to crushed granite and crushed miscellaneous stone. The Federal Bureau of Reclamation produced crushed granite for riprap in Morton County. The State highway department produced crushed granite in various undesignated counties for riprap, and the McKenzie County Highway Department produced crushed miscellaneous stone for concrete aggregate and road construction.

Sulfur.—Sulfur was recovered from sour gas at the Tioga gasoline plant in Williams County operated by the Signal Gas & Oil Co. Pro-

duction in 1955 was 8,940 long tons; none was sold.

Vermiculite.—The Robinson Insulation Co. exfoliated crude vermiculite (mined in Montana) at its plant at Minot, Ward County. The bulk of the product was used for house insulation. A small portion was used as a lightweight aggregate in plaster and concrete and for soil conditioning.

### MINERAL FUELS

Coal (Lignite.)—Coal (lignite) production in 1955 increased over 1954 and was reported from 45 mines in 15 counties. Forty mines were strip operations, producing 99 percent of the total; the remaining 5 were underground. Mercer, Ward, and Burke Counties, in that order, were the principal producing counties and furnished 70 percent of the total. Principal producers were Truax-Traer Coal Co., Knife River Coal Mining Co., Dakota Collieries Co., and Baukol-Noonan, Inc.

The Federal Bureau of Mines continued its research on the utilization of lignites at the Charles R. Robertson Lignite Research Laboratory at Grand Forks. Reports 2 of results in studies concerning the drying, grinding, and gasification of lignites from various North

Dakota mines were published.

Natural Gas.—Marketed natural gas from oil and gas wells increased nearly fivefold in quantity and nearly sixfold in value over 1954. Total production was 15.5 billion cubic feet, of which 500 million cubic feet was from 28 producing gas wells in Bowman County and 15 billion cubic feet from oil wells in the Beaver Lodge and Tioga fields in Williams, Mountrail, and Burke Counties. Of the 15.5 billion cubic feet produced, 5.3 billion was marketed and 10.2 billion flared or otherwise wasted. Distribution was through lines of the Montana-Dakota Utilities Co. to western North and South Dakota, Montana, and Wyoming. Operation of the natural-gasoline plant in the Tioga field for the entire year and availability of the Montana-

<sup>&</sup>lt;sup>2</sup> Oppelt, W. H., Ellman, R. C., Ongstad, O. C., and Kube, W. R., Experiments in Fleissner Drying of North Dakota Lignite: Bureau of Mines Rept. of Investigations 5122, 1955, 24 pp.
Oppelt, W. H., Kube, W. R., Chetrick, M. H., Kamps, T. W., and Golob, E. F., Gasification cf.Lignite in a Commercial-Scale Plant; Progress Report from July 1, 1980, to Dec. 31, 1951, and a Summary of Work Previous to July 1, 1950: Bureau of Mines Rept. of Investigations 5164, 1955, 80 pp.
Ellman, R. C., and Belter, J. E., Grindability Testing of Lignites: Bureau of Mines Rept. of Investigations 5167, 1955, 38 pp.

Dakota Utilities Co. distribution lines were primary reasons for the increased marketed production. The State was a net importer of natural gas. Exports from the oil and gas fields in the western counties were 43 million cubic feet, but imports to the eastern counties were 4.5 billion. Of the available supply of 9.7 billion, 9.3 billion was consumed by residential, commercial, oil field, and industrial uses, and 393 million was lost in transmission or otherwise unaccounted for.

TABLE 3.—Production of coal (lignite) in 1955 by counties (Exclusive of mines producing less than 1,000 tons)

County	Produc- tion (net tons)	Average value per ton 1	County	Produc- tion (net tons)	A verage value per ton 1
Adams Bowman Burke Burleigh Divide Dunn Grant Hettinger McLean	41, 646 183, 750 500, 078 17, 752 287, 036 12, 657 26, 565 13, 882 224, 697	\$3.00 1.70 2.33 3.29 2.49 2.88 2.83 2.77 2.67	Mercer Morton Oliver Stark Ward Williams	1, 037, 372 31, 937 6, 352 76, 535 630, 769 11, 059 3, 102, 087	\$2. 24 2. 55 2. 25 2. 65 2. 34 3. 20 2. 34

<sup>1</sup> 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 Liquids.—1955 was the first full year of operation of the natural-gas plant at Tioga in Williams County by the Signal Oil & Gas Co. Production of natural gasoline and liquefied-petroleum gases increased sevenfold in both quantity and value over 1954. The plant can process 65 million cubic feet of gas daily, recovering 25,000 gallons of natural gasoline and 110,000 gallons of butane and lighter fractions. In 1955, 10.4 billion cubic feet of natural gas was processed.

Petroleum.—Production of crude petroleum in 1955 increased 85 percent in quantity and 150 percent in value over 1954. reflect the first full-year operation of the 30,000-barrel-per-day refinery of the Standard Oil Co. of Indiana at Mandan, Morton County (increased to 31,600 barrels during 1955), the Queen City Oil & Refinery Co. 2,500-barrel-per-day refinery at Dickinson in Stark County, and the 1,500-barrel-per-day refinery of the Williston Basin Refinery Co. at Williston, Williams County. The latter company was acquired by the Westland Oil Co. in November. Combined throughput of these refineries in 1955 was 11 million barrels. The crude-oil pipeline from Tioga field to Mandan and the products line from Mandan to Moorhead, Minn., both completed in 1954, placed the State on a competitive basis with other oil-producing States of the Mid-Continent field and crude-oil prices were advanced accordingly. At the end of the year the State had established an allowable daily production of 44,000 barrels.

Production in 1955 was from 642 wells in 23 fields in 8 counties. Of the producing wells, 467 were flowing and 145 pumping. Renville County entered the ranks of the oil-producing counties with discovery of the Bluell field on September 25, when the Harold Ritter No. 1 well was completed by Sohio Petroleum Co., at 5,180 feet in the Madison limestone. Four other fields were discovered during the

TABLE 4.—Production of crude petroleum, 1954-55, in barrels, by counties 1

County	1954	1955	Producing fields in 1955			
BillingsBottineau	145, 000 41, 000	231, 000 356, 000	Fryburg. Westhope-N, Landa-NE, Souris-N, Unnamed, Newburg, Westhope.			
BurkeMcKenzie	31, 000 389, 000	110, 000 912, 000	Tioga and Coteau. Charlson, Sanish, Croff, Blue Buttes, Keene.			
Mountrail	1, 286, 000	2, 323, 000 3, 000	Tioga, White Earth, Tioga-E. Bluell.			
Stark Williams	4, 133, 000	5, 000 7, 203, 000	Belfield. Beaver Lodge, Capa, Hofflund, Mc Gregor.			
Total	6, 025, 000	11, 143, 000	$oldsymbol{E}_{i}$			

<sup>&</sup>lt;sup>1</sup> Distribution by county effected through adjusting data of the North Dakota Geological Survey to Bureau of Mines total. Adjustment less than 0.02 percent in 1954 and 0.4 percent in 1955.

<sup>2</sup> Less than 500 barrels.

TABLE 5.—Wildcat and development well completions in 1955, by counties
[Oil and Gas Journal]

County	Oil	Gas	Dry	Total	Footage
WILDCAT COMPLETIONS			2	2	21, 400
Billings	2		28	30	111, 500
Bottineau Burke			5	6	38, 700
Burke	-		i	1	7, 200
Burleigh Dunn			5	5	51,000
Dunn McHenry			2	2	11,000
McHenry	1		3	4	37, 400
McKenzie Nelson			i	1	1,700
Nelson			1	1	1,500
Pembina Renville	1		4	5	26, 300
Renville			1	1	500
Richland Rolette			4	4	15, 300
Rolette			2	2	21, 400
Stark			2	4 2 2	13, 200
Ward	2		. ī	3	25, 900
Williams					
Total wildcat	7		62	69	384,000
DEVELOPMENT COMPLETIONS	3	1		3	28, 200
Billings			8	29	93, 500
Bottineau			ı š	6	48, 900
Burke	1 -1		4	37	330, 300
McKenzie			3	25	207, 900
Mountrail			ĭ	ı i	4,600
Renville	76		1	80	676, 600
Williams	70				
Total development	158		23	181	1, 390, 000
Total all drilling	165		85	250	1, 774, 00

year: The Newburg field in Bottineau County, discovered July 10; the North Souris field also in Bottineau County, on July 26; the Blue Buttes field in McKenzie County, on August 22; and the Coteau field in Burke County, on September 22.

Exploration declined considerably during the year, with only 69 wildcat wells completed compared with 117 in 1954 and 268 in 1953. However, there were seven discoveries, a success ratio of 1:10 and far better than in 1954. Wildcat activity was generally confined to the north and northwestern portions of the State and away from the shallow eastern rim of the Williston Basin. Results east of the Nesson anticline were more encouraging, and the successful explorations

in the Canadian portion of the basin again directed attention toward the eastern rim.

Development drilling declined slightly from 195 completions in 1954 to 181 in 1955. Major development was in Williams, McKenzie, Mountrail, and Bottineau Counties, in that order. Of the successful development completions, 38 were in the Tioga field, 29 in the Beaver Lodge field, and 27 in the Charlson field.

Geophysical (seismograph) work declined from 947 crew weeks in 1954 to 510 crew weeks in 1955. The work was done in 19 counties, with the major portion in Bottineau, McKenzie, Stark, Williams, and

Renville Counties, in that order.

## **REVIEW BY COUNTIES**

Adams.-Virgil Smith produced lignite at the Arrowhead mine, and the Marion Clay Works produced miscellaneous clay for manufacturing building brick and heavy clay products.

Billings.—Billings County ranked fifth in the production of petroleum, which was from two horizons in the Fryburg field. successful development wells in the field were completed. exploration wells were abandoned as dry holes. Production in 1955 was 231,000 barrels, compared with 145,000 barrels in 1954.

Bottineau.—Two new oilfields were discovered in the county during The Lion Oil Co. completed the No. 1 Skarphal on June 6 at 3,018 feet in the Mission Canyon member of the Madison limestone; it was the first well in the North Souris field. Amerada Petroleum Co. completed the No. 1 A. U. Beauchamp on July 10 at 4,080 feet in the Spearfish formation—the first well in the Newburg field. Thirty exploration wells were drilled, of which 2 were successful and thus established new fields. Development drilling consisted of 29 completed wells, 21 of which were successful. The county ranked fourth in petroleum production from the North Westhope, Northeast Landa, North Souris, an unnamed field, Newburg, and Westhope fields, in that order. Production in 1955 was 356,000 barrels compared with 41,000 in 1954.

Bowman.—Natural gas was produced from the North Dakota portion of the Cedar Creek gas field by the Montana-Dakota Utilities Production was from 28 wells and was distributed through the company lines to consumers in North and South Dakota and Montana. Lignite was produced at the Peerless mine by the Knife River

Coal Mining Co. and at the Scranton mine by J. L. Seifert.

Burke.—Burke County ranked third in the value of lignite and sixth in the value of petroleum produced in 1955. Lignite was produced from the Kincaid mine of the Truax-Traer Coal Co. and from the Bonsness mine. Petroleum was produced from the Burke County portion of the Tioga field and from the Coteau field discovered September 22, when the Calvert Drilling Co. completed the No. 1 Gunnar Opseth well at 7,014 feet in the Charles and Mission Canyon members of the Madison limestone. Other drilling consisted of 5 exploration wells, all dry, and 6 development wells, of which 3 were successful. Production was 110,000 barrels in 1955, a threefold increase over the 31,000 barrels in 1954. The Sandberg Construction

TABLE 6.—Value of mineral production in North Dakota in 1954–55, by counties 12

County	1954	1955	Minerals produced in 1955 in order of value
A 3	\$520	\$125, 738	Coal (lignite), clays.
AdamsBarnes		19, 900	Sand and gravel.
Barnes	39, 391	52, 598	Do.
Benson		668, 000	Petroleum.
Billings		1,028,000	Do.
Bottineau		312, 128	Coal (lignite).
Bowman	117, 663	1, 520, 337	Coal, petroleum, sand and gravel.
Burke		149, 396	Sand and gravel, coal (lignite).
Burleigh	(9)	398, 322	Sand and gravel.
Cass		29, 383	Do
Dickey		747, 401	Sand and gravel, clays, coal (lignite).
Divide		36, 482	Coal (lignite).
Dunn		(3)	Sand and gravel.
Eddy	30, 710	1,522	Do.
Foster	1,200	79, 230	Do.
Grand Forks	45,000		Coal (lignite).
Grant	794	75, 151	Sand and gravel.
Griggs	2,014	1, 176	
Hettinger	12, 202	38, 500	Coal (lignite).
McHenry	. (*)		~
McIntosh	1,038	35	Sand and gravel.
McKenzie	004,000	2,674,863	Petroleum, stone, sand and gravel.
McLean.	153, 340	732, 869	Coal (lignite), sand and gravel.
Mercer		2, 337, 722	Coal (lignite), scoria.
Morton	161, 855	239, 036	Sand and gravel, coal (lignite), clays,
Morton		· ·	stone.
Mountrail	2, 963, 950	6, 831, 895	Petroleum, sand and gravel.
Mountran		3,552	Sand and gravel.
NelsonOliver		14, 292	Coal (lignite).
Oliver	4,053	17, 200	Sand and gravel.
Pierce		1, 494	Do.
Ransom		269,000	Sand and gravel, petroleum.
Renville		54, 617	Sand and gravel.
Richland		11,641	Do.
Rolette		3,000	Do.
Sargent	3,400	14, 330	Do
Sheridan	_ 10,012	280, 778	Sand and gravel, petroleum, coal (lig-
Stark	71, 225	200,110	nite).
	5, 479	300	Sand and gravel.
Stutsman		26,600	Do.
Traill		47, 343	Do
Walsh		1, 704, 800	Coal (lignite), sand and gravel.
Ward		1, 104, 800	Cond and gravel
Wells	- (3)	20, 925, 601	Petroleum, sand and gravel, coal (lig
Williams	8, 918, 966		nite).
Undistributed	8, 005, 949	2,649,072	
Total		44, 123, 000	

<sup>&</sup>lt;sup>1</sup> The following counties are not listed because no production was reported: Cavalier, Emmons, Golden Valley, Kidder, LaMoure, Logan, Pembina, Ramsey, Sioux, Slope, Steele, Towner.

<sup>2</sup> Value data of coal (lignite) 1954, natural gas, natural-gas liquids, some sand and gravel and some stone that cannot be assigned to specific counties are excluded from county totals and included with "Undistributed." Excludes value of uranium ore.

<sup>3</sup> Value included with "Undistributed" to avoid disclosing of individual company confidential data.

Co. produced building sand and gravel and paving gravel.

Burke County Highway Department produced paving gravel.

Burleigh.—Ecklund Taplin Coal Co. produced lignite. Sand & Gravel Co. and Wachter's produced building and paving sand and paving gravel. One wildcat oil well was drilled and abandoned

as a dry hole. Cass.—Cass County led all counties in the State in the production of sand and gravel. More than 1 million tons of paving gravel was produced by and for the State highway department. Principal contractors were Haggart Construction Co., Schultz & Lindsay, and Tennefos Construction Co. The city of Mandan produced paving

gravel, and Herbert Reese & Sons produced paving sand.

Divide.—Baukol-Noonan, Inc., produced lignite at Noonan. The corporation also completed and began operations at the Noonlite

lightweight-aggregate plant at Noonan. Raw material was the shale overburden of lignite beds. The bloated product was used as an aggregate for concrete and building blocks. Syg Susag produced paving sand and gravel and the State highway department paving gravel.

Dunn.—Wallace Pelton, Emma L. Sampson, and Joe P. Skalsky produced lignite from strip pits. Five wildcat wells were drilled, and all were abandoned. Depth of holes ranged from 8,411 feet to 13,481

feet.

Grant.—Lignite was produced from strip pits by the Davenport Coal Co. and the Ketterling Coal Co. and at the Coffin Butte mine. The Comet Mining Co. produced lignite from the underground Comet mine.

McKenzie.—McKenzie County ranked third in the State in the production of petroleum. The Blue Buttes field was discovered when The Texas Co. completed the No. 1 A. Helle well on August 22 at 9,418 feet in the Madison limestone. The Charlson field was the leading producing field, followed by the Sanish, Croff, Blue Buttes, and Keene. Four wildcat wells were drilled, of which 1 was the Blue Buttes discovery; the other 3 were dry holes. Thirty-seven development wells were drilled, of which 33 were successful. The failures were in the Charlson field (2) and 1 each in the Croff and Keene fields. Drilling was done by The Texas Co., Amerada Petroleum, and Hunt Oil Co. Production in 1955 was 912,000 barrels, compared with 389,000 barrels in 1954. The McKenzie County Highway Department produced gravel and crushed miscellaneous stone for road construction.

McLean.—McLean County ranked fifth in the State in the production of lignite and sixth in the production of sand and gravel. Burns & Wretling Coal Co., Garrison Lignite Co., Truax-Traer Coal Co., and Underwood Coal Co. produced lignite from strip pits. Lindteigen Bros. produced paving gravel, and the Minneapolis, St. Paul & Sault Ste. Marie Railroad Co. produced gravel for paving and

railroad ballast.

Mercer.—The county was the leading producer of lignite. John Bauer, Dakota Collieries Co., Reinhart Grishkowsky, Knife River Coal Mining Co., Martin Stumpf, and Truax-Traer Coal Co. operated

strip pits.

Morton.—Lignite, clays, sand and gravel, and crushed stone were produced in 1955. Flemmer Coal Co., Kaelberer Coal Co., Olin Coal Co., Edwin Richter, and Tempe & Nilles produced lignite from strip pits. Richard Harnisch produced lignite from an underground mine. Hebron Brick Co. produced clay for manufacturing building brick and other heavy clay products. The company also produced a small quantity of bentonite that was used in drilling mud. Molite, Inc., produced shale and operated its bloating plant at Mandan for producing lightweight aggregate. The 30,000-barrel-per-day Standard Oil Co. of Indiana refinery at Mandan completed its first full year of operation. Crude oil came from the Tioga field through the pipeline completed in 1954. Refined products were marketed locally, and the excess was transported through the products line completed in 1954 from Mandan to Moorhead, Minn., where it connects with the Standard Oil Co. midwestern distribution net.

Mountrail.—The county ranked second in the State in the production of crude oil. Principal production was from that portion of the Tioga field lying in Mountrail County, followed by the White Earth and East Tioga fields. Amerada Petroleum and the California Co. completed 25 development wells, of which 22 were successful. unsuccessful wells were drilled in the White Earth field and 1 in the East Tioga field. Production in 1955 was 2.3 million barrels compared with 1.3 million barrels in 1954, an increase of 81 percent. Morrison-Knudsen Co., Inc., produced sand and gravel for building, paving, railroad ballast, and other uses.

Renville.-In 1954 Renville County entered the ranks of crude-The Bluell field was discovered September 25 petroleum producers. when the Sohio Petroleum Co. completed the No. 1 Ritter well at 5,180 feet in the Charles member of the Madison limestone. wildcat wells were drilled, of which 1 was the Bluell-field discovery; the remaining 4 were abandoned as dry holes. One development well was drilled and abandoned as a dry hole. The United States

Corps of Engineers produced building gravel.

Stark.—Dakota Briquets & Tar Products, Inc., Dickinson Coal Mining Co., and Valentine Walter produced lignite from strip pits. Production of petroleum from the Belfield field, discovered in 1954, increased more than tenfold over the previous year. Two wildcat wells were drilled and abandoned as dry holes. Badinger Sand & Gravel pit and Fisher Sand & Gravel Co. produced building and paving sand and gravel.

Ward.—Ward County ranked second in the production of lignite and second in the production of sand and gravel. Quality Lignite Coal Co., Sawyer Fuels, Inc., Truax-Traer Coal Co., and Valley Coal Co. produced lignite from strip pits, and Vix Coal Co. operated an underground mine. Minot Sand & Gravel Co. and the Minneapolis, St. Paul & Sault Ste. Marie Railroad Co. produced building and paving sand and gravel, railroad ballast, and engine sand.

Williams.—Williams County led the State in the production of crude petroleum, which was obtained from the Beaver Lodge, Tioga, Capa, Hofflund, and McGregor fields, in that order. The county also led in the number of development wells drilled. Eighty wells were completed, of which 76 were successful. Three wildcat wells were completed, and a new field was discovered between the South Beaver Lodge and Hofflund fields, where Amerada Petroleum completed the No. 1 E. Wolff Estate well at 8,472 feet in the Madison limestone in June; an offset well also was completed for a better gage. Major drilling was done by Amerada Petroleum Co., Pure Oil Co., and Hunt Oil Co. Production in 1955 was 7.2 million barrels compared with 4.1 million barrels in 1954. The Williston Basin Refinery Co. and its successor, the Westland Oil Co., operated the 1,500barrel-per-day refinery at Williston the entire year. The M & M Coal Co. produced lignite from a strip mine. The Black Diamond Coal Mine and Dick Vance operated underground mines. George Mockel and Pioneer Sand & Gravel Co. produced building sand and gravel and paving sand. The county highway department produced paving gravel.

## The Mineral Industry of Ohio

By James R. Kerr<sup>1</sup> and Jean A. Pendleton<sup>2</sup>



HIO mineral output value increased 16 percent in 1955 as compared with 1954. Output of all commodities produced in the State except peat increased. Because the value of coal production made up 39 percent of total State mineral wealth, the 14-percent increase in value of coal production led the way in a year of high productivity. Other commodities showing large percentage increases in value of output were clay (41 percent), gypsum (40 percent), petroleum (17 percent), lime (25 percent), natural gas (24 percent), salt (20 percent) and, sand and gravel (15 percent).

Production was reported from 86 counties in 1955. Leading producing counties, in order of value of output, were Harrison, Belmont.

Sandusky, Jefferson, and Tuscarawas.

TABLE 1.—Mineral production in Ohio, 1954-551

	1	954	1955		
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	
Cement: Portland	5, 051, 478 32, 468, 728 2, 549, 046 28, 824 29, 540 3, 880 2, 748, 993 25, 827, 220 32, 626, 737	\$35, 929, 163 11, 136, 478 117, 519, 936 31, 444, 083 6, 111, 000 356, 970 10, 710, 000 12, 358, 521 27, 873, 469 47, 802, 169 2, 084, 098	13, 981, 909 931, 810 6, 297, 413 37, 869, 791 3, 038, 949 33, 756 22, 484 4, 353 2, 905, 028 27, 906, 047 33, 272, 567	\$39, 642, 957 3, 322, 967 15, 677, 388 133, 814, 164 39, 393, 634 7, 595, 000 249, 427 12, 580, 000 14, 768, 761 31, 995, 218 49, 841, 246	
Total Ohio 3		293, 659, 000		340, 457, 90	

<sup>1</sup> Production as measured by mine shipments, sales or marketable production (including consumption by producers).

Totals have been adjusted to avoid duplicating value of stone.

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### REVIEW BY MINERAL COMMODITIES

#### MINERAL FUELS

Coal.—Output of bituminous coal in Ohio in 1955 increased 17 percent over 1954; but value of production increased only 14 percent, as the average per ton of coal dropped slightly. Underground mines accounted for 33 percent, strip mining 63 percent, and auger mining 4 percent. Of the State total production, 43 percent was mechanically cleaned (24 percent by jigs and 76 percent by wet washing other than jigs). Thirty-nine percent was crushed, and 7 percent was treated before shipment. Eighty-nine percent of the underground production was mechanically loaded (84 percent by mobile loaders into mine cars, shuttle cars, and onto conveyors, 13 percent by continuous mining machines, and the remainder by self-loading conveyor or hand loaded onto conveyors). Coal production was reported from 25 counties in 1955. The larger producing counties, in order of decreasing tonnage, were Harrison, Belmont, Jefferson, Tuscarawas, Perry, and Morgan.

Construction of a 60-cubic-yard power shovel by Marion Power Shovel Co. for Pittsburgh Consolidation Coal Co. continued in 1955. The unit, largest of its kind, when completed will move about 100 tons

of overburden every 50 seconds.

Laying of the first section of the 106-mile coal pipeline from the Georgetown cleaning plant of Hanna Coal Co. Division of Pittsburgh Consolidation to Eastlake near Cleveland began October 4, 1955. Pulverized coal mixed with water will be pumped through the line to the Cleveland terminus, where coal will be separated from the water and sent to a Cleveland Electric Illuminating Co. plant. The pipeline, first major conveyor of its kind in the world, will have a capacity

of 1 million tons of coal a year.

Coke and Coal Chemicals.—Ohio ranked second to Pennsylvania in both number of coke ovens and total coke produced in 1955. All told, 16 plants and 2,544 ovens produced 11,701,266 tons of coke valued at \$178,656,563, an average value of \$15.27 per ton. No beehive ovens were active in Ohio in 1955. A total of 16,831,990 tons of coal was carbonized, of which 45 percent was mined in West Virginia, 38 percent in Pennsylvania, 13 percent in Kentucky, and 4 percent in Virginia. About 90 percent of the coke produced was consumed by producing companies in blast-furnace operations. A small quantity was consumed for other purposes. The remaining coke was sold by producers to blast-furnace plants, foundries, and other industrial uses and for residential heating.

TABLE 2.—Bituminous-coal production, 1946-50 (average) and 1951-55

Year	Short tons	Value	Value per ton	Year	Short tons	Value	Value per ton
1946-50 (average)	35, 458, 474	\$130, 009, 993	\$3. 67	1953	34, 736, 773	\$131, 475, 408	\$3. 78
1951	37, 948, 692	146, 677, 710	3. 87	1954	32, 468, 728	117, 519, 936	3. 62
1952	36, 208, 450	138, 090, 700	3. 81	1955	37, 869, 791	133, 814, 166	3. 53

Byproducts and coal-chemical materials obtained in coal carbonizing included 845,284 tons of coke breeze, 170,891 million cubic feet of coke-oven gas, 276,246,700 pounds of ammonium sulfate, 10,103,500 pounds of ammonia liquor, 129,160,200 gallons of coke-oven tar, and 47,704,700 gallons of crude light oil from which 27,465,700 gallons of benzene, 5,211,800 gallons of toluene, 2,051,000 gallons of xylene, and 644,700 gallons of solvent naphtha were derived.

Peat.—Production and value of production of peat in Ohio in 1955 dropped 24 and 30 percent, respectively, as compared with 1954. The State dropped to sixth from third as a peat producer. However, the high unit value per ton of peat in Ohio kept the State in second place in peat value. Wyandot County was by far the largest producer. Other producing counties were Summit, Stark, Portage, Richland,

and Mahoning.

Petroleum and Natural Gas.—Value of production of petroleum and natural gas increased 17 and 24 percent, respectively, in 1955, compared with 1954. A total of 1,259 wells (including 641 oil, 250 gas, 28 service, and 340 dry) were drilled in Ohio in 1955. There were 27 wildcat wells drilled-5 struck oil and 7 gas, and 15 were dry holes. The remaining wells drilled were for development of known fields. Total footage drilled was 2,642,000 feet, an average of 2,098 feet per well. Depth classification of holes drilled was as follows: Under 1,250 feet—394; between 1,250 and 2,500 feet—291; between 2,500 and 3,750 feet—544; between 3,750 and 5,000 feet—24; and between 5,000 and 7,500 feet—6. No completions were deeper than 7,500 feet. the total completions, 1,226 were by cable-tool rigs and 33 by rotarydrilling equipment. Although exploration drilling in Ohio in 1955 was undertaken mainly to extend existing fields, several new discoveries were made. In old Pennsylvania Grade fields, operations proved these fields were far from depleted, and promising areas were being developed. Oil pools were found in Coshocton County, which had large undrilled and potential areas east and south of Layland and east of Perry field. In the Cleveland area west of Rayalton pool, a promising oil occurrence was being developed. Small gasfields were found in Holmes, Knox, Wayne, Perry, Noble, and Wash-The Flint Ridge field was extended east by a disington counties. covery in Muskingum County south of Cottage Hill.<sup>3</sup> Proved reserves, as of January 1, 1956, were crude petroleum and natural-gas liquids, 58 million barrels; and natural gas, 810 billion cubic feet.4

#### **METALS**

Aluminum.—Reynolds Metal Corp. announced plans for increasing primary capacity by 200 million pounds per year by construction of an aluminum plant in the Ohio River Valley. This reflected the growing trend to locate power-consuming industries in the Ohio River Valley area. Proximity to coal-producing areas, cheap water transportation, and a central location in the principal market area of the United States are major advantages to prospective industries.

Iron and Steel.—Ohio ranked second to Pennsylvania in iron and steel production in the United States. There are 53 blast-furnace

<sup>&</sup>lt;sup>3</sup> The oil and gas Journal, Annual Review and Forecast, vol. 54, no. 39, Jan. 30, 1956.

<sup>4</sup> American Gas Association and American Petroleum Institute, Proved Reserves of Crude Oil, Natural-Gas Liquids, and Natural Gas: Vol. 10, Jan. 1, 1956, pp. 9, 10, 19.

stacks (annual capacity—17,445,800 tons), 173 open hearths (capacity—19,359,680), 11 Bessemer converters (capacity—3,129,000), and 38 electric and crucible furnaces (capacity—2,346,980). Blast-furnace capacity, as of January 1, 1955, was 17,259,820 short tons. Republic Steel Corp., United States Steel Corp., and Youngstown Sheet & Tube had 63 percent of steel capacity and 69 percent of pig-iron capacity.

Ohio 1955 pig-iron production (excluding blast-furnace ferroalloys) was 15,372,349 short tons; Ohio 1955 steel production by steel-ingot

producers was 22,528,221 short tons.

Manganese.—Électro Metallurgical Co., a division of Union Carbide & Carbon Corp., began its first full year of production of electrolytic manganese at its new Marietta, Ohio, plant. The plant was to have a capacity of about 6,000 tons a year when all electrolytic units attain

full operation.

Titanium.—Electro Metallurgical Co., a subsidiary of Union Carbide & Carbon Corp., awarded contracts for constructing a \$31 million titanium-sponge plant at Ashtabula. The plant, expected to be the Nation's largest, was a result of the Government's titanium-expansion program under which rapid tax-writeoff allowances and other incentives are given to companies that construct facilities to meet goals set up by the Office of Defense Mobilization.

#### **NONMETALS**

Cement.—Shipments of cement in Ohio increased again in 1955, reflecting continuing high demand from the construction industry. Cement production was reported from seven counties in 1955. Leading producers were Southwestern Portland Cement Co. at Fairborn in Greene County and Medusa Portland Cement Co. at plants in Bay Bridge in Eric County and Toledo in Lucas County. Most producers reported a good demand for the product. An increase in price per barrel of cement was put into effect to offset increased wages. Southwestern Portland Cement Co. installed an additional kiln and raw grinding mill during the year. Alpha Portland Cement Co. announced installation of another clinker-grinding mill and a multiple-drilling rig for its limestone mine. Most of the cement companies reported quarrying the raw material for the cement mills.

TABLE 3.—Finished portland cement produced, shipped, and in stock, 1946-50 (average) and 1951-55

			Ship	nents from m	ills	
Year	Active plants	Production (barrels)		Valu	Stocks at mills on Decem-	
	paulie	(3)	Barrels	Total	Average per barrel	ber 31 (barrels)
1946–50 (average)	9 9 9 9	9, 674, 554 11, 873, 852 11, 270, 431 12, 539, 132 13, 306, 570 13, 965, 839	9, 634, 609 11, 872, 278 11, 377, 806 12, 532, 437 13, 076, 921 13, 981, 909	\$19, 360, 637 29, 498, 956 28, 488, 500 32, 957, 308 35, 929, 163 39, 642, 957	\$2. 01 2. 48 2. 50 2. 63 2. 75 2. 84	672, 301 855, 548 748, 541 755, 237 1 984, 704 838, 914

<sup>1</sup> Revised figure.

Clays.—Again in 1955 Ohio was the leading clay producer in the United States. Clay production increased 25 percent, accompanied by a 41-percent increase in value. Fire clay made up 51 percent of the total clay production, but 77 percent of total value; miscellaneous clay made up 49 percent of production and only 23 percent of value. Major fire-clay usage was for the manufacture of heavy clay products (building and paving brick, draintile, sewer pipe-57 percent), fire brick and block (22 percent), and foundry and steelworks (17 per-The remaining 4 percent was consumed primarily in manufacturing high-grade tile, pottery and stoneware, fire-clay mortar, and other refractories. Miscellaneous clay production was consumed primarily in manufacturing heavy-clay products (67 percent), portland cement (21 percent), and lightweight aggregate (10 percent). The bulk of the remaining production was used in manufacturing high-grade tile. Leading clay-producing counties were Tuscarawas, Stark, Columbiana, Cuyahoga, and Perry. Principal fire-clay producers were American Fire Clay & Products at Canfield in Mahoning County, Natco Corp. at East Canton in Stark County, and McLain Fire Brick Co.—three underground mines at Wellsville in Columbiana Major miscellaneous clay producers were Cleveland Builders Supply Co., two open pits near Garfield Heights and Cleveland and Hydraulic Press Brick Co. at South Park, both in Cuyahoga County. In all, clay was mined from 166 pits (35 underground, 131 open-pit) and processed by 129 company-owned mills in 41 counties in 1955.

TABLE 4.—Clays sold or used by producers, 1954-55, by counties

	19	54	19	55
County	Short tons	Value	Short tons	Value
Carroll. Columbiana. Cuyahoga. Darke. Franklin. Highland. Hocking. Holmes. Jackson. Jefferson. Lawrence. Madison. Medina. Muskingum. Noble. Paulding. Perry. Putnam. Scioto. Seneca. Stark Summit. Tuscarawas. Van Wert. Washington. Wayne. Wayne. Wayne. Wood. Wyandot.	(i) (i) (i) (i) (i) (i) (ii) (ii) (ii)	\$324, 831 1, 275, 004 289, 493 (1) 721, 298 (4) 446, 118 631, 674 562, 846 (1) (1) (1) (2) 45, 644 407, 463 36, 425 (1) 1, 441, 260 33, 670 2, 282, 197 (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	200, 856 543, 608 430, 541 5000 61, 038 17, 111 217, 979 86, 417 223, 517 202, 534 165, 880 1, 112 54, 300 4, 842 34, 559 19, 091 389, 283 24, 578 8, 000 718, 032 77, 233 1, 124, 326 1, 840 1, 841 1, 842 1, 842 1, 842 1, 842 1, 842 1, 184 1,  \$480, 88' 1, 796, 31' 447, 54 447, 54 69 34, 422 349, 41 164, 61; 832, 22 830, 35: 721, 1, 11: 51, 89: 40, 98: 40, 98: 40, 98: 41, 55: 578, 41: 125, 40 3, 229, 344 49, 18 49, 18 49, 18	
Undistributed <sup>2</sup>	1, 608, 590 5, 051, 478	2, 638, 550 11, 136, 478	1, 451, 179 6, 297, 413	2, 597, 19 15, 677, 38

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosing individual company confidential data.
<sup>8</sup> Includes data for the following counties: Ashland, Belmont, Delaware, Hancock, Harrison, Henry, Licking, Mahoning, Marion, Portage, Richland, Vinton and Williams, clays used in cement manufacturing not apportioned by counties, and values indicated by footnote 1.

TABLE 5.—Clays sold or used by producers in 1955, by kinds and uses, in short tons

Use	Fire clay	Miscella- neous clay	Total
Pottery and stoneware:			
Stoneware, including chemical stoneware	6,048		6, 048
Art pottery and flower pots	1,559		1, 559
Tile, high-grade	82, 735	57, 772	140, 507
Architectural terra cotta	2,056		2,056
Portland and other hydraulic cements		638, 466	638, 466
Refractories:	1		
Fire brick and block	698, 944		698, 94 <b>4</b>
Fire-clay mortar	29, 651	(1)	29, 651
Foundries and steelworks	552,606		552, 606
Kiln furniture: Saggers, pins, stilts, and wads	512		512
Zinc retorts and condensers	723		723
Other refractories	5, 435		5, 435
Heavy day products	1, 846, 403	2, 064, 583	3, 910, 986
Rotary-drilling mud	1,811		1, 811
Lightweight aggregate		308, 109	308, 109
Grand total	3, 228, 483	3, 068, 930	6, 297, 413

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosing individual company confidential data, included with "Heavy clay products."

Kaiser Aluminum & Chemical Corp., Chemicals Division, announced plans to build a basic refractories plant at Columbiana,

Ohio, at a cost of approximately \$4 million.

Natco Corp., the Nation's largest structural clay-products manufacturer, continued an expansion and modernization program, announcing plans for expansion at the Diamond plant in Hocking County and for the East Canton plant. A \$500,000 fire loss was suffered at East Canton on October 24. Full production was not restored until November 14.

Alliance Brick Corp. also began a \$300,000 expansion of facilities at Alliance plant in Stark County, which will, in effect, double brick

production.

Grindstones.—Constitution Stone Co. and Hall Grindstone Co., both of Constitution in Washington County, and the Nicholl Stone Co., of Kipton, Lorain County, produced grindstones in 1955.

Gypsum.—Ottawa County again in 1955 was the only gypsum-producing area in Ohio. United States Gypsum Co., at an underground operation near Gypsum, and The Celotex Corp., at an open pit mine near Port Clinton, produced crude gypsum and calcined the output for use primarily in making wallboard and lath. Value of crude gypsum output increased 40 percent compared with 1954.

Lime.—Value of lime output in Ohio in 1955 increased 25 percent over 1954. Nineteen lime plants were active in 10 counties. Seventy-six percent of lime production was sold as quicklime and 24 percent as hydrated. Uses for the product were: Building, 21 percent; agricultural, 1 percent; refractory material, 42 percent; and chemical and industrial, 36 percent. Leading producers were Basic, Inc., in Seneca, Ottawa, and Sandusky Counties; Columbia-Southern Chemical Corp., in Summit County; and Dolite Co., in Sandusky County. Leading producing counties, in order of decreasing output, were Sandusky, Seneca, Summit, Ottawa, and Wyandot.

TABLE 6.—Lime (quick and hydrated) sold by producers, 1946-50 (average) and 1951-55, by types

Year		cultural urnt)	Building		Chemical and other industrial		Refractory		Т	'otal
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
	50, 082 47, 092 53, 467 52, 376 68, 460 43, 852	519, 367 637, 589 618, 108 889, 070	623, 236 578, 088 556, 537 516, 679	8, 290, 569 8, 009, 903 8, 328, 900	437, 891 407, 007 922, 655 1, 040, 082	4, 139, 066 7, 350, 473 9, 135, 604	1, 181, 254 1, 166, 870 1, 414, 232 923, 825	\$9, 646, 520 15, 744, 947 15, 606, 702 19, 012, 872 13, 285, 717 18, 668, 581	2, 289, 473 2, 205, 432 2, 945, 800 2, 549, 046	28, 393, 260 35, 310, 353 31, 444, 083

Magnesium Compounds.—Diamond Alkali Co., Lake County, produced no magnesium compounds in 1955 and reported permanently abandoning its plant.

Natural Salines.—Pomeroy Salt Corp. at White Rock plant near Minersville in Meigs County produced calcium-magnesium chloride from well brines. The company operated 167 days in 1955 and

reported demand slightly higher than the previous year.

Perlite (Expanded).—Four companies in four counties produced expanded perlite in 1955. The Cleveland Gypsum Co., at a plant near Cleveland in Cuyahoga County, was the largest producer. Others were Indoken Perlite Co., Cincinnati; J. P. Loomis Concrete & Supply Co., Akron; and Schumacher Industries, Dayton. Raw material for these operations was purchased from mines in the West—Colorado, New Mexico, and Nevada. Chief uses for the expanded-perlite product were as plaster and concrete aggregate for insulating purposes and industrial uses.

Iron Oxide Pigments.—The Minnesota Mining & Manufacturing Co. processed pyrite cinders purchased from Pyrites Co., Wilmington, Del., at a plant near Copley in Summit County producing manufac-

tured red iron oxides.

Salt.—The value of salt output in Ohio in 1955 increased 20 percent over the previous year. The bulk of the production was in the form of brines (82 percent). The remainder (18 percent) was evaporated salt. Of the evaporated salt, 74 percent was produced by the vacuumpan method, 20 percent by the open-pan method, and 6 percent as pressed blocks. The brine was sold exclusively for manufacturing chlorine and soda ash. Evaporated salt was sold for a wide variety of purposes, the leading of which were to meatpackers, feed dealers, for soap and detergents, and for other chemical uses. Salt production was reported from four counties in 1955. Leading producers were Diamond Alkali Co. at Painesville, Lake County; and Columbia-Southern Chemical Corp. at Barberton, Summit County.

Sand and Gravel.—Production of sand and gravel in Ohio in 1955 increased 8 percent compared with 1954. Principal uses of the product again in 1955 were in the construction industry, as 88 percent of the total output was used for building and paving purposes. Considerable quantities were also used for molding sand, railroad ballast sand and gravel, fire and furnace sand, filter sand, engine sand, and

TABLE 7.—Salt sold or used by producers, 1946-50 (average) and 1951-55, by kinds

Year	Evaporated		Br	ine	Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1946-50 (average)	452, 504 479, 246 461, 289 498, 438 482, 906 509, 905	\$4, 087, 693 3, 908, 141 4, 189, 883 5, 175, 816 5, 361, 838 6, 113, 567	2, 164, 566 2, 633, 226 2, 366, 166 2, 541, 799 2, 266, 087 2, 395, 123	\$1, 409, 601 1, 940, 337 1, 801, 743 2, 308, 979 6, 996, 683 8, 655, 194	2, 617, 070 3, 112, 472 2, 827, 455 3, 040, 237 2, 748, 993 2, 905, 028	\$5. 497, 294 5, 848, 478 5, 991, 626 7, 484, 795 12, 358, 521 14, 768, 761

grinding and polishing and blast sand. Production was reported from 297 operations in 69 counties in 1955. Leading counties, all with over 1 million tons production, were Hamilton, Franklin, Montgomery, Portage, Butler, and Stark. By far the major producers were American Aggregates Corp. operations at Urbana in Champaign County, at Columbus in Franklin County, and at Dayton in Montgomery County, and Ohio Gravel Co. at Miamiville in Clermont County and at Miamitown, Camp Dennison, Cleves, Newton, and Cincinnati, all in Hamilton County.

George M. Brewster & Sons Co. was building a sand-and-gravel plant near Glouster City, Ohio, in Athens County at a cost of about \$800,000 to dredge and prepare sand and gravel from the Delaware River.

American Aggregates Corp. announced plans to construct a new sand-and-gravel plant in Moraine Township near Dayton in Darke County.

Sidney Sand & Gravel Co. opened a 150-ton-per-hour sand-and-gravel plant along Van Demark Road in Shelby County.

TABLE 8.—Sand and gravel sold or used by producers, 1954-55, by uses

	1954	1955		
Use	tons Value	Short tons	Value	
6,00 4,42 4 55 5,16 7,02	4, 537 3, 104 6, 314, 504 4, 079, 043 7, 607 8, 992 911, 515 7, 568 7, 713, 627 293, 920 5, 773 1, 878, 142	453, 056 5, 968, 730 4, 762, 545 49, 804 777, 204 5, 083, 077 8, 692, 037 395, 183 1, 724, 411	\$1, 352, 772 <b>6, 2</b> 76, 596 4, 553, 402 2, 692, 872 5, 663, 178 9, 319, 566 316, 664 1, 747, 417	
38	2, ( 5, 7	022 293, 920 1, 878, 142	22 293, 920 395, 183 1, 878, 142 1, 724, 411	

<sup>1</sup> Includes glass and polishing sands, blast sand, fire or furnace sand, engine sand, railroad ballast, and other sands. Also includes ground sand for 1955.

Stone.—Output of stone in Ohio, which consisted predominantly of crushed limestone, increased 2 percent in 1955 compared with the preceding year. Crushed limestone made up 98 percent of the total stone output. The remaining output was crushed and dimension sandstone and a small quantity of dimension limestone. Of the

crushed limestone, 42 percent was used in concrete and roadstone, 27 percent in manufacturing cement and lime, 16 percent as flux in the iron and steel industry, 6 percent for agricultural purposes, 4 percent for railroad ballast, and the remainder for use as riprap and other purposes. Major limestone producers were National Lime & Stone Co. at operations in eight counties, Marble Cliff Quarries at operations in Franklin and Preble Counties, Chemstone Corp. (formerly Kelley Island Co.) in Ottawa County, and Wagner Quarries in Erie County.

TABLE 9.—Commercial sand and gravel sold or used by producers, 1954-55, by counties

		1954			1955	
County	Number of pits	Short tons	Value	Number of pits	Short tons	Value
Adams	(1)	(1)	(1)	1 3	675 46, 117	\$270 29, 470
Ashtabula	5	175,071	\$155, 455	5	154, 471	162, 659
AthensAuglaize	(2)	(2) 291, 802	(2) 313, 288	2 4	41, 200	49,800
Butler	9	965, 560	973, 228	9	292, 186 1, 277, 606	333, 155 1, 297, 807
Champaign	(2)	(2)	(2) 282, 322	2	567, 076	514, 967
ClarkClermont	(2)	288, 489 (2)	282, 322	6	339, 912 492, 284	325, 584 539, 287
Coshocton	9	292, 021	288, 605	10	287, 947	246, 508
Crawford	(2) 11	(2)	1 412 000	1	34, 153	29, 701
Cuyahoga Darke	7	1, 243, 025 1, 104, 303	1, 413, 000 1, 272, 222	9	958, 973 259, 568	1, 169, 656 272, 280
Erie	3	47, 337	82, 560	(2)	(2)	(2)
Fairfield Franklin	5 4	132, 351 1, 603, 979	150, 697 1, 703, 422	6 4	219, 520 3, 016, 434	237, 037 3, 415, 661
Geauga	6	503, 799	594, 350	5	629, 594	784, 325
Greene	6	238, 582	165, 414	7	322, 871	276, 659
HamiltonHancock	(2) 10	3, 030, 748 (2)	3, 459, 459	10 1	3, 941, 853 54, 045	4, 277, 076 64, 066
Henry	2	(2)	(2)	2	36, 902	48, 561
Highland Holmes	(2)	(2) 80, 784	(2) 74, 126	1	9, 327	5, 965 (2)
Huron	4	144, 018	141, 345	(2) 3	114, 261	115, 809
Jefferson	(3)	(2)	(2)	1	43, 672	57, 497
Knox Lake	7 7	481, 804 244, 497	672, 706 250, 853	7 9	717, 733 124, 086	931, 962 136, 932
Licking.	7	484, 254	454, 414	6	342, 390	341, 093
Logan	(2)	(2)	(2)	6	58, 248	67, 294
Lucas Marion	(2) (2) (2)	(2) (2)	(2) (2)	4	220, 091 41, 195	202, 159 45, 314
Medina		(2)	(2)	3	498, 559	584, 814
Miami	6 17	272, 805	294, 747	.7	292, 267	337, 514
Montgomery Morgan		2, 215, 871 (2)	1, 834, 108	17 2	2, 725, 779 98, 428	2, 370, 749 117, 300
Morrow	(2) (2) (2) (2)	(2)	(2)	1	39, 000	40, 785
Muskingum	(2)	(2)	(2)	4	350, 556 18, 776	399, 059 59, 144
Pike	6	1, 084, 659	1, 199, 839	5	340, 270	457, 679
Portage	14	1, 442, 412	2, 021, 311	15	1, 492, 620	2, 297, 659
Preble Richland	(2) 3	114, 756	125, 901	3 4	144, 040 157, 188	153, 551 135, 117
Ross	7	1, 251, 475	1, 079, 979	8	603, 877	585, 980
Sandusky	(2) (2)	(2)	(2)	1	25, 222	36, 572
Shelby Stark	(') 11	1, 127, 168	1, 101, 571	4 12	151, 865 1, 134, 000	157, 434 1, 115, 659
Summit	11	594, 806	615, 558	15	746, 900	783, 112
Trumbull	(2)	(2)	(3)	1	130, 000	144, 000
Tuscarawas Warren	9	663, 164 406, 492	719, 939 367, 798	7 7	535, 051 398, 992	684, 033 412, 509
Washington	4	94, 854	92, 492	10	327, 848	445, 723
Wayne Williams	(2) 6	(2)	(2)	3	17, 112	14, 357
Wyandot	(3)	289, 175 (2)	264, 877	6 3	141, 288 93, 106	95, 525 91, 232
Wyandot Undistributed	64	4, 656, 279	5, 591, 790	26	2, 270, 775	2, 624, 714
Total	280	25, 566, 340	27, 757, 376	297	27, 377, 909	30, 122, 775

<sup>&</sup>lt;sup>1</sup> Data not available.
<sup>2</sup> Included with "Undistributed" also includes data for Carroll, Clinton, Columbiana, Erie, Gallia, Hardin, Hocking, Holmes, Lawrence, Lorain, Madison, Mahoning (1954), Meigs, Mercer, Pickaway, and Union to avoid disclosing individual company confidential data.

The sandstone-mining industry was made up of dimension stone (35 percent) and crushed and broken stone (65 percent). The major uses of crushed sandstone were in manufacture of concrete, as roadstone, and as refractory material (ganister). Sawed and dressed sandstone made up the bulk of the dimension stone. Major sandstone producers were Irwin W. Imhof of Lorain County, who had taken over operation of The Cleveland Quarries Co. Westview operation in 1954 and Harbison-Walker Refractories in Portage County. Leading dimension-stone producers were Cleveland Quarries Co., Lorain County, and Briar Hill Stone Co., Holmes County.

Miami River Quarries, Inc., leased 115 acres near Lockington in Shelby County for quarrying limestone and dolomite. Minerals & Chemical Corp. announced plans to purchase limestone properties at

Marblehead, Ohio, in Ottawa County.

TABLE 10.—Stone sold or used by producers, 1954-55, by kinds

	19	<b>)54</b>	1955	
	Short tons	Value	Short tons	Value
Dimension stone: Limestone Sandstone	37, 535 156, 074	\$117, 503 5, 134, 475	7, 187 177, 424	\$14, 347 6, 254, 099
Total dimension stone	193, 609	5, 251, 978	184, 611	6, 268, 446
Crushed and broken stone: Limestone Sandstone	32, 022, 315 410, 813	40, 139, 155 2, 411, 036	32, 751, 130 336, 826	41, 717, 687 1, 855, 118
Total crushed and broken stone	32, 433, 128	42, 550, 191	33, 087, 956	43, 572, 800
Grand total	32, 626, 737	47, 802, 169	33, 272, 567	49, 841, 246

Recovered Sulfur.—Republic Steel Corp. at the Cleveland District plant in Cuyahoga County produced brimstone, using the Thylox process in liquid purification of gas.

process in liquid purification of gas.

Vermiculite (Exfoliated).—Wyodak Chemical Division of Federal Foundry Supply Co. produced exfoliated vermiculite from raw material purchased from Libby, Mont., at a plant near Cleveland, Cuyahoga County, for use as industrial and home insulation.

#### REVIEW BY COUNTIES

Adams.—Limestone was quarried and crushed by Plum Run Stone Division, New York Coal Co., at Peebles and was used primarily in manufacturing concrete. Considerable quantities were also used for railroad ballast, agricultural purposes, and as rockdust in coal mines. The Adams County Highway Commissioners produced limestone for use in highway and road maintenance.

Allen.—Crushed limestone—the only mineral produced in Allen County—was quarried by The National Lime & Stone Co., the largest producer, and Western Ohio Stone Co., both of Lima; Bluffton Stone Co., Bluffton; and A. J. Suever Stone Co., Delphos. The bulk of the output was consumed in cement manufacture. Railroad ballast and agricultural purposes claimed the balance of production.

Ashland.—The E. Biglow Co. produced shale from an open pit near

New London, Huron County, north of Ashland County, which was hauled to the company factory in Ashland County and processed for use in manufacturing drain tile.

TABLE 11.—Limestone sold or used by producers, 1954-55, by counties

		1954			1955			
County		Τ	T		1	ı — — —		
	Number of pits	Short tons	Value	Number of pits	Short tons	Value		
Adams	. 1	390, 287	\$553, 314	2	461, 305	\$609,942		
Allen	4	591, 227	759, 910	4	741, 931	938, 904		
Athens	(1)	(1)	(1)	2	91, 039	206, 899		
Belmont	2	31, 520	65, 908	$\bar{2}$	35, 275	78, 240		
Brown	1	32, 638	37, 807	$\bar{2}$	32, 104	36, 921		
Butler		12, 587	16, 363	ī	20, 060	26, 078		
Clark	l ī	80, 975	131, 921	(1)	(1)	(1)		
Clinton	. 1	281, 837	347, 699	1	385, 923	441, 278		
Delaware	4	499, 597	656, 562	4	523, 124	639, 329		
Erie	2	1, 447, 846	1,890,304	3	2, 271, 862	2, 167, 572		
Fairfield	(2)	(2)	(2)	ı	11, 707	16,071		
Fayette	. 3	563, 373	728, 378	3	603, 870	748, 683		
Franklin	2	2, 611, 747	2, 965, 602	2	3, 006, 629	3, 463, 343		
Guernsey	ī	111, 147	152,000	ĩ	119, 909	184, 403		
Hamilton	. 4	31, 935	44, 146	3	22, 486	28, 528		
Hancock	3	406, 355	478, 951	3	432, 929	521, 693		
Hardin		319, 032	408, 471	2	392, 249	495, 188		
Harrison		163, 380	220, 469	î	181, 097			
Highland	3	298, 150	405, 333	3	360, 331	242, 518		
Lawrence	3	589, 135	633, 147	4		474, 951 784, 640		
Logan	(1)	(!)	(1)	3	642, 367 162, 943	188, 703		
Lucas	4	1, 833, 134	2, 258, 118	6	0 014 600	2, 632, 194		
Mahoning	i	1, 238, 103	2, 377, 884	1	2, 214, 600			
Marion	(1)	1, 200, 100	2, 311, 004	3	1,421,648	2, 803, 662		
Mercer	2	381, 518	461, 179	2	686, 469	847, 899		
Miami	1 1	591, 319	1, 187, 347		430, 209	530, 479		
Monroe	1 2	32, 012		1	691, 397	1, 373, 059		
Morgan	1 1	33, 788	58, 136	2	23, 808	41, 585		
Muskingum	_ 2		75, 080	1	29, 613	71, 262		
Noble		836, 692	979, 496	2	804, 535	1,064,995		
Putnam	- 4	38, 812	65,099	1	73,000	96, 500		
Conductor	- 4	254, 519	332, 470	4	280, 687	364, 802		
Sandusky	- 8	2, 858, 003	3, 606, 887	8	2, 703, 544	<b>3</b> , 563, 460		
Seneca	- 3	2, 101, 672	2, 333, 518	4	2, 107, 282	2, 336, 684		
Union	- <sup>(1)</sup>	(1)	(1)	2	303, 342	382, 846		
Van Wert		249, 023	295, 767	3	284, 532	334, 493		
Wood	- 5	563, 169	709, 087	5	645, 855	810, 551		
Undistributed	_ 24	3 12,585,318	3 15,020,305	20	9, 558, 656	12, 183, 679		
Total	_ 100	32, 059, 850	40, 256, 658	112	32, 758, 317	41, 732, 034		

<sup>1</sup> Included with "Undistributed", also includes data for Champaign (1954), Crawford, Greene, Lake (1955), Meigs (1955), Montgomery, Ottawa, Paulding, Preble, Ross (1954), Stark, Summit, Vinton, and Wyandot to avoid disclosing individual company confidential data.

2 Data not available.

3 Revised figure.

TABLE 12.—Value of mineral production in Ohio, 1954-55, by counties 1 2

County	1954	1955	Minerals produced in 1955 in order of value 2
Adams Allen Ashland Ashland Ashland Ashland Athens Auglaize Belmont Brown Butler Barroll Dhampaign Plark Dlermont Blinton Columbiana Doctonotes at end of tab	\$553, 314 855, 797 (3) 155, 455 2, 840, 542 424, 477 23, 845, 462 68, 479 989, 591 1, 555, 396 (3) 591, 111 (4) 6, 001, 237 3, 511, 294	\$610, 212 938, 904 (3) 162, 659 2, 743, 213 27, 741, 207 36, 921 1, 223, 885 2, 385, 911 514, 967 (9) 7, 122, 543 3, 567, 566	Stone, sand and gravel. Stone. Clays, sand and gravel. Sand and gravel. Coal, stone, sand and gravel. Sand and gravel, stone. Coal, stone, clays. Stone. Sand and gravel, stone. Coal, clays, stone, sand and gravel. Sand and gravel. Sand and gravel, lime, stone. Sand and gravel, stone. Coal, clays, and and gravel. Stone, sand and gravel. Coal, clays, sand and gravel. Coal, clays, sand and gravel. Coal, clays, sand and gravel.

TABLE 12.—Value of mineral production in Ohio, 1954-55, by counties 12.—Con.

County	1954	1955	Minerals produced in 1955 in order of value 2
Prawford	(8)	(3)	Stone, sand and gravel.
hvahoga	\$1, 702, 493 1, 276, 222	\$1,617,698	Sand and gravel, clays, sulfur.
Juyahoga Darke	1, 276, 222	277, 280	Sand and gravel, clays.
)elaware	1.061.881	1, 136, 602	Stone, lime, clays, sand and gravel.
Crie	4, 859, 124 150, 697 728, 378 5, 315, 864	(3)	Cement, stone, sand and gravel.
Cairfield Cayette	150, 697	253, 108 748, 683 7, 651, 944	Sand and gravel, stone.
ayette	728, 378	748, 683	Stone.
ranklin .	5, 315, 864	7, 651, 944	Sand and gravel, stone, lime, clays.
Hallia Heauga Freene	(0)	(3)	Coal, sand and gravel.
leauga	594, 350	784, 325	Sand and gravel.
reene	11, 462, 244	(3)	Cement, sand and gravel.
uernsey	(3)	2, 223, 150	Coal, stone.
lamilton	3, 503, 605	4, 305, 604 687, 969	Sand and gravel, stone.
Iancock	649, 527	(3)	Stone, clays, sand and gravel. Stone, sand and gravel.
Iardin	04 000 704	34, 291, 313	Cool stope eleve
Harrison	24, 068, 704	(3)	Coal, stone, clays. Sand and gravel, clays.
Ienry Iighland	(3)	515, 138	Stone, clays, sand and gravel.
lighland	434, 552	1, 383, 331	Clays, coal, sand and gravel.
locking	1,200,071	(3)	Stone, clays, sand and gravel, coal.
101mes	1, 236, 571 1, 531, 500 221, 945 2, 351, 128	115, 809	Sand and gravel.
iuron	221,940	3, 105, 480	Coal, clays.
ackson	2, 551, 128	15, 620, 435	Coal, clays. Coal, clays, sand and gravel.
locking		1, 252, 517	Sand and gravel.
Cnox	681, 092 8, 501, 280 7, 130, 381	1, 202, 017	Coment selt send and gravel
ake	7 120 201	(3)	Cement, salt, sand and gravel. Cement, coal, clays, sand and gravel, stone. Sand and gravel, clays.
awrence	1, 130, 381		Sand and gravel clays
icking	469, 187 199, 578	253, 397	Stone, sand and gravel.
oganorain	199,070	2 953 490	Stone, sand and gravel, grindstones.
.orain	3, 312, 739	3, 853, 420 6, 628, 095	Cement, stone, sand and gravel.
ucas	5, 709, 701	(3)	Cond and graval clave
Madison	E 451 454	6 707 769	Sand and gravel, clays. Stone, coal, clays, peat. Stone, clays, sand and gravel.
Mahoning	5, 451, 454	6, 707, 768 959, 033	Stone alove sand and graval
Marion	(3)	639, 114	Sand and gravel, clays.
Medina	1 8	3, 143, 751	Coal, sand and gravel, salt, stone, natural saline
Meigs		(3)	Stone, sand and gravel, sait, stone, natural saint
Medina Meigs Mercer	1 400 004	1, 710, 573	Do.
Miami	1, 482, 094	41, 585	Stone.
Monroe	1, 998, 748	(3)	Sand and gravel, stone.
Montgomery	1, 998, 748	4, 823, 574	Coal, sand and gravel, stone.
Morgan		55, 148	Sand and gravel.
Morrow	8, 571, 264	(3)	Cement, coal, sand and gravel, stone, clays.
Muskingum	(3)	2, 910, 778	Coal, stone, clays.
Noble		(3)	Lime, gypsum, stone.
Ottawa	(8)	3	Stone, clays.
Paulding Perry Pickaway Pike	8, 761, 380	8, 845, 195	Coal, sand and gravel, clays.
Perry	(8)	(3)	Sand and gravel.
Pickaway	1, 199, 839	460, 479	Do.
P1K0	3, 032, 382	3, 825, 964	Sand and gravel, stone, coal, clays, peat.
Portage	528, 968	(3)	Lime, sand and gravel, stone.
Preble	368, 895	406, 358	Stone, clays.
Putnam	(3)	302, 536	Clays, sand and gravel, peat.
Richland	(3) 1, 090, 979	585, 980	Sand and gravel.
Ross Sandusky	13, 890, 751	16, 840, 954	Lime, stone, sand and gravel.
sandusky Scioto	1, 772, 564	2, 470, 215	Stone, clays, sand and gravel.
		(3)	Lime, stone, clays.
Seneca	(3)	157, 434 10, 101, 133	Sand and gravel.
seneca	8, 684, 006	10, 101, 133	Cement, coal, clays, sand and gravel, peat.
Didl A	10, 114, 435	(3)	Salt, lime, stone, sand and gravel, clays, peat.
วนมมมีเป็น	(3)	144,000	I Cond and graval
Fundantan	11, 205, 823	11, 872, 661	Coal, clays, sand and gravel.
Union.	(3)	(3)	Stone, sand and gravel.
Van Wert	1 -12	336, 833	Stone, clays.
Vinton	951, 644	(3)	Coal, clays, stone.
v 1110011	951, 644 367, 798	412, 509	Sand and gravel. Coal, clays, sand and gravel. Stone, sand and gravel. Stone, clays. Coal, clays, stone. Sand and gravel.
washington	498, 546	1, 044, 635	Sand and gravel, coal, grindstones, clays.
™aaılııgwı	2, 525, 044	(3)	Salt, coal, clays, sand and gravel.
Warren Washington Wayne Williams	280, 537	(3)	Sand and gravel, clays.
wood	1, 341, 315	1, 665, 448	Lime, stone, clays.
Wood		(3)	Stone, lime, peat, sand and gravel, clays.
Wyandot	- (9)		Decision pour pour auta gravos, our de
Undistributed 4	41, 609, 689	125, 601, 088	
	293, 659, 000	340, 457, 000	1
Grand total			

<sup>1</sup> The following counties are not listed because no production was reported: Defiance and Fulton.

2 Fuels, including natural gas, petroleum, and natural gas liquids, not listed by counties as data are not available; value included with "Undistributed."

3 Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

4 Includes mineral fuel and values indicated by footnote 3.

Sand and gravel was produced by Bolin & Son Crushed Gravel, Mifflin; Ashland County Highway Department; and Young's Sand & Gravel Co., Loudonville. The Richland County Highway Department produced sand under contract for use in road maintenance.

Ashtabula.—Sand and gravel used primarily for building and paving purposes was produced. A small portion of the output was utilized for molding sand. Producers were Pinney Dock & Transport Co., and Northeast Materials, Inc., Kingsville; A. C. Meade Construction Co., Inc., Lakeville; Peerless Mineral Products Co., Conneaut; and Melvin Miller for Carter Sand & Gravel Co., Ashtabula.

Athens.—The mineral commodities of Athens County in 1955 were bituminous coal, limestone, and sand and gravel. The underground operation of Gem Coal Co. yielded over half the county coal output. The balance of underground production came from numerous smaller mines, the larger of which included Oskey Coal Co., White Coal Co., Valley No. 6 Coal Co., Inc., Trace Run Coal Co. and Wolfe Hollow Coal Co. The larger strip pits were operated by Furr Coal Co., Perry Coal Co., Yonker Coal, Inc., and Buckles Coal Co.

Diamond Stone Quarries, Inc., and Dickson Bros., both of Albany, produced crushed limestone for use as concrete aggregate, roadstone,

and screenings.

Sand and gravel was quarried by Athens Building Material Co. at Athens and John Slater & Son, The Plains. Output was used for building and paving purposes. George M. Brewster & Sons Co., Bogota, Ohio, started building a sand and gravel plant in Glouster The plant will dredge and process sand and gravel from the Delaware River at a capacity of 200 tons per hour.

Auglaize.—Wapak Sand & Gravel Co. operated a fixed plant at Wapakoneta and produced nearly two-thirds of the county output. Other producers in 1955 were Western Ohio Stone Co. and Quality

Sand & Gravel Co., both of Wapakoneta.

National Lime & Stone Co. produced crushed limestone at Buckland quarry near Wapakoneta for concrete, roadstone, and agricultural

purposes.

Belmont.—Belmont County ranked second in the State in bituminous coal output, three-fourths of which was mined from underground The Powhatan Mining Co. was by far the largest producer, mining over one-third of the county production. Other leading underground producers were Youghiogheny & Ohio Coal Co., The Saginaw Dock & Terminal Co., The Lorain Coal & Dock Co., and The David Z. Norton Co. Several large strip producers active in the county were United States Coal Co., R & F Coal Co., Humphrey Coal Co., Lafferty Coal Co., Wells Coal Co., and McConnell Coal Co. Crushed limestone for use in concrete and for agricultural purposes

was quarried by W. J. Plumly, owner and operator of Somerton

Crushing Co., Somerton; and George & C. H. McCort, Malaga.

Miscellaneous clay for heavy clay products was mined by Belmont brick pit near Bellaire. This company took over Standard Stone &

Brick Co. on July 25, 1955.

Brown.—Crushed limestone was quarried by Howard S. Watson, Georgetown, for concrete aggregate and agricultural purposes. It was also produced by Brown County Highway Department.

Butler.—In terms of value, Butler County was the sixth ranking sand and gravel producing area in the State. Of active operations in the county, American Materials Corp., Hamilton, was by far the largest. Other producers were: The Middletown Sand & Gravel Co. and Moorman Sand & Gravel Co., Middletown; Central Gravel & Ready Mix Co., Oxford; and The Hamilton Gravel Co., North Cincinnati Sand & Gravel Co., and Sipp Sand Co., and W. J. Cisle & Son (owners of Ross Township Gravel), all of Hamilton. The entire output was used for building and paving purposes. North Cincinnati Sand & Gravel Co. also produced crushed limestone near Hamilton for concrete aggregate.

Carroll.—Bituminous coal, primarily from strip pits, clay, dimension sandstone, and sand and gravel were the mineral commodities of Carroll County. The strip pits of the county were operated by the following companies, in order of decreasing output: The James Bros. Coal Co., Billman Coal Co., Clarence Mining, Inc., McCleery Mining Co., Farbizo Coal Co., W. J. Moore & Son Coal Co., Whitacre-Greer Fireproofing Co., King Coal Co., and James & James Coal & Clay Co. Of the several underground producers John M. Hirst & Co.

was the largest.

Four companies reported output of fire clay and miscellaneous clay, which was used solely for manufacturing heavy clay products. The largest producer was Metropolitan Brick, Inc., Minerva (north of Carroll County in Stark County); Natco Corp., Magnolia (northwest of Carroll County in Stark County); Whitacre-Fireproofing Co. No. 6 and No. 4 pits, Magnolia; and The Robinson Clay Product Co., Malvern. James Bros. Coal Co., a clay producer in 1954, reported no production in 1955.

Dimension sandstone was quarried by Rainbow Stone Co., Sherrods-ville, and utilized for architectural purposes. Mineral City Sand Co.

produced molding sand in 1955.

Champaign.—Sand and gravel was prepared by American Aggregates Corp. at a fixed plant near Urbana. Output was used for paving purposes and railroad ballast. Walter R. Dorsey produced a small quantity of gravel for paving purposes at his portable plant near Cable.

Clark.—Production of sand and gravel, the principal commodity, was reported by the following companies: Eagle City Sand & Gravel, operator for Springfield Cement Products, Springfield Gravel & Excavating Co., and M. L. Eidemiller, all of Springfield; Porter Bros. Washed Sand & Gravel Co., and New Carlisle Sand & Gravel Co., both of New Carlisle; and J. E. Martin, owner of Enon Sand & Gravel Co., Enon. Output was utilized for building and paving purposes.

The county output of crushed limestone, used for agricultural purposes, concrete, and as flux for blast furnaces, was produced by The Moores Lime Co. near Durbin. Part of the company output went into the manufacture of lime, which in turn was used for agricultural purposes, mason's lime, paper, sewage, fertilizers, rubber, and water purification.

Clermont.—Sand and gravel, the only mineral product of Clermont County in 1955 was prepared at the fixed plant of Ohio Gravel Co. at Miamiville. Output was used for building and paving purposes and

railroad ballast. The company also reported a considerable tonnage

of crushed boulders.

Clinton.—Clinton County contributed crushed limestone and sand and gravel to the mineral value of Ohio in 1955. The Melvin Stone Co., Melvin, produced crushed limestone for concrete and roadstone, agricultural purposes, refractory material (dolomite), blast-furance flux, riprap, and fertilizer.

Sand and gravel was also quarried by this company at a plant near Wilmington for building and paving purposes. The Clinton Asphalt Paving Co. produced a small quantity of gravel for paving purposes.

Paving Co. produced a small quantity of gravel for paving purposes.

Columbiana.—In terms of value, Columbiana County was the third largest clay producer and the seventh ranking bituminous-coal producer. Considerable quantities of sand and gravel were also produced in 1955. Mineral value increased approximately 20 percent over that in 1954. The bulk of coal production came from strip pits. Primary producers were The Buckeye Coal Mining Co., Inc., Ferris Coal Co., A B C Mining Co., Industrial Mining & Engineering Co., McCleery Mining Co., R & R Coal Co., Inc., Sunnyside Coal Mining Co., Torrance Bros., Burn Rite Coal Co., and Burns & Son Coal Co.

Fire clay, used primarily in manufacturing refractories and heavy clay products, was mined by McLain Fire Brick Co., Division of H. K. Porter Co., Inc., at Wellsville and Hammondsville; Metropolitan Brick, Inc. (formerly West Darling Clay), Negley; Natco Corp. East Palestine plant, East Palestine; and Kay Mining Co., Lisbon. Miscellaneous clay, used almost entirely for heavy clay products, was mined by Summitville Face Brick Co., Summitville; American Vitrified Products Co., at two plants at Lisbon and East Liverpool; and Adams Clay Co., Lisbon.

Iron City Sand & Gravel Corp. dredged sand from the Ohio River near East Liverpool for building and paving. A small quantity was

also quarried by The Morgan Sand Bank near Leetonia.

Coshocton.—The mines and quarries of Coshocton County yielded coal, sand and gravel, and sandstone. Coshocton ranked 10th out of 25 coal-producing counties. Over 80 percent of coal output was from strip pits operated by Mt. Perry Coal Co., Adams Mills Coal Co., Fresno Coal Co., Blue Crystal Mines, Inc., Freeport Gas Coal Co., Hutt Coal Co., H. D. Williamson, Ebony Coals, Inc., and Donald Glazer. The larger of the numerous underground operations were

Mason & Sons Coal Co., Sun Coal Co., and Green Coal Co.

Sand and gravel, primarily for building and paving, was quarried at 10 commercial operations in the county. They were B. W. Boyd & Son, Coshocton; George E. Miller, Newcomerstown (Tuscarawas County); W. P. McCarren Co., Canal Lewisville; Arthur J. Wentz, owner of Shady Bend Sand & Gravel Co., Newcomerstown; W. P. McCarren Co., Walhonding; Fletcher Pew, Warsaw; and E. E. Murphy and Eugene Porcher, both of Newcomerstown. E. F. & James A. Meyer, Layland, and Baird Supply Co., Coshocton, produced molding sand and other sand. The Guernsey County Highway Department produced gravel in the county for its own use. Ayers Mineral Co. produced molding sand (quartzite) for foundry use at its plant and mill near Blissfield. Sawed sandstone for architectural use was quarried by The Pearl Sandstone Co. at Fresno.

Crawford.—A large quantity of limestone, crushed for use as concrete aggregate for agricultural purposes and railroad ballast was produced by The National Lime & Stone Co. near Bucyrus.

The Galion Gravel Co. quarried sand and gravel for building and paving uses and for filter sand at a quarry in Jefferson Township.

Cuyahoga.—Production of sand and gravel, used predominantly for building and paving, was reported by the following companies: Testa Bros., Inc., Glenwillow; Newburgh Sand & Gravel Co. and The Schmidt Bros. Sand & Supply Co., Garfield Heights; The Canal Sand & Gravel Co., Charles Loparo Sand & Gravel Co., The Shaker Sand & Gravel Co., Schaaf Road Sand Co., and The Kaiser-Nelson

Co., Valley View Village and Lytle Bros., all of Cleveland.

Miscellaneous clay was mined by Cleveland Builders Supply Co. at the Warner plant and Pearl plant near Garfield Heights and Cleveland, respectively; Hydraulic-Press Brick Co., South Park; Collinwood Shale Brick & Supply Co., and Ohio Clay Co., Cleveland; and Berea Tile Co., Berea. Output was used almost entirely for heavy clay products, although Hydraulic-Press Brick Co. reported considerable quantities used for lightweight aggregate.

Republic Steel Corp. plant near Cleveland recovered sulfur in the

liquid purification of gas at the company plant near Cleveland. Expanded perlite was processed by The Cleveland Gypsum Co. at

a plant near Cleveland.

Exfoliated vermiculite was produced by the Wyodak Chemicals Division, Federal Foundry Supply Co., from crude material mined

at Libby, Mont.

Darke.—Six sand-and-gravel and one clay company were active. American Aggregates Corp. at a quarry near Fort Jefferson was the leading sand and gravel producer. The balance of output was produced by Aubrey Shields and Slagle Gravel Co., Greenville; C. F. Poeppelman and L. C. Ilgen, Versailles; and R. S. Hollinger, New Madison. The commodity was used predominantly for building and paving purposes. A small quantity also was used for mason sand and farm ballast.

Darke County Tile Co. mined miscellaneous clay from an open pit

near Greenville for heavy clay products.

Delaware.—Limestone, the leading commodity in Delaware County, was mined from the quarries of Penry Stone Co., Radnor; The Owens Stone Co., Ostrander; Scioto Lime & Stone Co., Inc., Delaware; and Shawnee Stone Co., Inc., Powell. The material was used for road paving, agricultural purposes, and riprap. The Scioto Lime & Stone Co. processed half of its production for manufacturing lime, which in turn was employed for metallurgical purposes, sewage, water purification, paper bleach, and chemical uses.

Galena Shale Tile & Brick Co., Galena, and The Delaware Clay Co., Delaware, mined miscellaneous clay for heavy clay products. A small quantity of paving gravel was produced by the Ohio State

Highway Department for use in road maintenance.

Erie.—Limestone was produced by The Wagner Quarries Co., Sandusky; Castalia Quarries Co., operator for Wagner Quarries Co., operator for Wagner Quarries Co., Castalia; and Medusa Portland Cement Co., Baybridge. Output from The Wagner Quarries Co. and Castalia Quarries Co. was crushed and utilized for concrete and roadstone, railroad ballast, agricultural purposes, and riprap. The Medusa Portland Cement Co. processed its entire output for use in manufacturing cement.

Sand and gravel was quarried for building purposes by The Keener Sand & Clay Co., Huron, and Kelley Island Co., Sandusky.

Fairfield.—Sand and gravel was quarried at six pits in Fairfied County in 1955. The F. H. Brewer Co., Lancaster, was the leading producer, followed by Industrial Minerals Co. and Krystal Rock Products Co., Bremen; Sargent Gravel Co. and Homer Taylor & Son, Lancaster; and Neal E. Miller, Carroll. The operation of Neal E. Miller was opened in 1955 and was not operating at full capacity. Building and paving purposes were the major uses of the product, except for a small quantity used for molding sand and railroad-ballast gravel.

Rushcreek Limestone, Lancaster, quarried limestone for concrete

aggregate and agricultural purposes.

Fayette.—Limestone, crushed for use as concrete aggregate and railroad ballast and for agricultural purposes and riprap, was the only mineral produced in Fayette County in 1955. Active producers were Blue Rock, Inc., Fayette Limestone Co., Inc., and Sugar Creek

Stone Co., all of Washington.

Franklin.—Franklin County ranked second in value of sand-andgravel production and third in value of stone production in Ohio. Lime and clay were also produced. American Aggregates Corp., Columbus, reported the largest output of sand and gravel in the Other producers were Jackson Pike Sand & Gravel Co., Mason's Sand & Gravel Co., and Arrow Sand & Gravel Co., subsidiary of Marble Cliff Quarries, all of Columbus. Output was used for building and paving purposes and for railroad ballast. The Ohio Highway Department also quarried a small quantity for its own use.

Limestone, quarried by Marble Cliff Quarries, Columbus, was crushed for use in metallurgical work, as concrete aggregate and railroad ballast, and for agricultural purposes. The balance of production was utilized in manufacturing lime. The Ohio State

Highway Department crushed limestone for riprap.

The Columbus Clay Manufacturing Co. and The Claycraft Co. mined miscellaneous clay from open pits near Blacklick. Production

was used in manufacturing heavy clay products.

Gallia.—Bituminous coal and sand and gravel were mined in Gallia County in 1955. Strip-coal operators were Ohio River Collieries Co., Gallia Coal Co., and Middleport Coal Co. Larger underground producers were Fitch Coal Co., Wood Coal Co., Dale Mulford, Prince Coal Co., Oma L. Wood Coal Co., and Charles Wise Coal Co. M. T. Epling Co. and The Keener Sand & Clay Co., Gallia, mined

sand and gravel for molding sand, building and paving purposes, and

railroad ballast.

Geauga.—Sand and gravel was prepared for building and paving purposes and for fire or furnace and foundry sand. Producers were R. W. Sidley, Inc., Thompson; Jefferson Materials Co., Burton; and Sperry Road Sand & Gravel Co., John Skiba, and Barnes Gravel Pit, all of Chardon.

Greene.—Greene County continued to be the leading cementproducing area in Ohio. This position was due to output from the plants of Southwestern Portland Cement Co. and Universal Atlas

Cement Co., Fairborn. These companies also quarried crushed

limestone for their own use in manufacturing the cement.

Seven companies reported producing sand and gravel. Charles F. McNamee, Fairborn, was the largest producer, followed by Green Township Gravel Co., Cedarville; Phillips Sand & Gravel Co., Dayton (Dayton is in Montgomery County—west of Greene County); Jesse Barnett Sand & Gravel Co., Spring Valley; Hemp Road Gravel, Dayton; and Whitacre & Roberts and Xenia Gravel Co., Xenia The output was utilized for building and paving.

Guernsey.—Bitimunious coal and limestone were produced. Over 70 percent of coal output was from strip pits. Strip producers were Virginia Mining Co., the foremost producer, C. V. & W. Coal Co., Inc., and Quaker Valley Coal Co. Virginia Mining Co. also mined a considerable quantity from an auger operation. The balance of output was obtained from the underground mines of Byesville Coal Co., Rome Coal Co., The Hamilton Trenner Coal Co., C. H. Fogle & Son Coal Co., Yakubisin Coal Co., B & B Coal Co., and Russell & Edwards Coal Co.

John Gress quarried limestone for concrete and roadstone at a quarry near New Concord. (New Concord is in Muskingum County

west of Guernsey but is virtually on the borderline).

Hamilton.—Hamilton County continued to be the principal sandand-gravel producer. Ten plants were active, of which 5 were operated by Ohio Gravel Co. near Miamitown, Camp Dennison, Cleves, Newton, and Cincinnati. The Cincinnati plant closed permanently in 1955 and reported stockpiled tonnage only. Other producers in the county were Willey-Ruckstuhl, Miamitown; H. Lynne Barber and George L. Rack, Inc., Cincinnati; Skinner Sand & Gravel Co., Reading; and Terrace Park Gravel Co., Terrace Park. Output of these plants was consumed primarily by the building and paving industries. Limestone was also produced by Ohio Gravel Co. from three

quarries at Miamitown, Camp Dennison, and Newton. The company

crushed the product for agricultural purposes.

The Highway Maintenance Division of the city of Cincinnati

quarried granite and limestone for its own use.

Expanded perlite was produced by The Indoken Perlite Co. near

Cincinnati.

Hancock.—Limestone, the most important mineral commodity obtained from Hancock County was quarried by The National Lime & Stone Co. and The Tarbox-McCall Stone Co., Findlay; and Pifer Stone Co., Williamstown.

Miscellaneous clay was mined by Hancock Brick & Tile Co., Find-

lay, for manufacturing heavy clay products.

Hobbs Bros. Sand & Gravel Co., McComb, mined sand and gravel

for filtering and building and paving purposes.

Hardin.—Limestone was quarried by The Herzog Lime & Stone Co., Forest, and Hardin Quarry Co., Dunkirk, for furnace use, concrete aggregate, agricultural purposes, and railroad ballast.

A small quantity of sand and gravel for paving purposes was

produced by Bell Sand & Gravel, Belle Center.

Harrison.—Harrison County ranked first in the State in the production of bituminous coal in 1955; 70 percent was mined from strip pits. The principal properties were the strip and underground

operations of Hanna Coal Co. Division, Pittsburgh Consolidation Coal Co., the underground mines of Youghiogheny & Ohio Coal Co., the strip pits of The Cadiz Mining Co., R & F Coal Co., Powhatan Mining Co., Bedway Coal Co., and B & P Coal Co., and the auger mines of Powhatan Mining Co., Germano Coal Co., and Moore Mining Co.

Hanna Coal Co. also quarried limestone near Short Creek for con-

crete aggregate and agricultural purposes.

Miscellaneous clay was mined by Bowerston Shale Co., Bowerston. Henry.—Sand and gravel for building purposes was quarried by Arthur A. Williams, McClure, and Napoleon Sand & Gravel Co., The Henry County Highway Department produced sand and gravel for its own use.

Miscellaneous clay was mined by August Honeck & Sons, Malinta,

and Napoleon Brick & Tile Works, Napoleon.

Highland.—The minerals produced in Highland County in 1955 included limestone, clay, and sand and gravel. Highland Stone Co., Division of New York Coal Co., Hillsboro, was the leading limestone producer. Other producers were Ohio Asphaltic Limestone Co., Inc., New Vienna (New Vienna is in Clinton County, northwest of Highland County); and Clay-Wilcox Quarry, Rainsboro. The commodity was utilized for concrete aggregate and agricultural purposes.

The sole producer of miscellaneous clay for heavy clay products

was The Mowrystown Brick & Tile Co., Mowrystown.

Uhrig & Collins, Hillsboro, produced gravel at a portable plant.

Output was used for building and paving and as fill.

Hocking.—Hocking County was a leading source of fire clay. The county production was mined from the pits of Natco Corp. at Haydenville and Nelsonville and General-Hocking Brick Co., Logan. General-Hocking Brick Co. also mined miscellaneous clay. Output was used in manufacturing heavy clay products.

Producers of strip-mined bituminous coal were Wilkinson Coal Corp., Chandler Bros. Coal Co., Red Arrow Coal Co., W. A. Gurtler, Wharton Coal Co., and H. S. Furr Coal Co. The leading underground producers were Dumont Hollow Coal Co., Lost Run Coal

Co., and Kennard Coal Co.

Sand and gravel was mined by The F. H. Brewer Co., Enterprise,

and Hocking Valley Sand & Gravel Co., Logan.

Holmes.—Briarhill Stone Co., Glenmont, and Nicholl Stone Co., Killbuck, quarried dimension stone, the most important mineral commodity of Holmes County in 1955. The product was utilized as sawed architectural stone, dressed or cut stone, and flagging. Clay, sand and gravel, and coal constituted the balance of mineral output.

Fire clay and miscellaneous clay were mined by General Clay Products Co., Baltic (Baltic is in Tuscarawas County southeast from Holmes, virtually on the borderline), and Holmes Clay Division, Holmes Limestone Co., Berlin. Output was used for firebrick and block, steelworks, in the petroleum industry, and for heavy clay

products and pottery.

Sand and gravel was mined by Close Sand & Gravel Co. and Feikert Sand & Gravel Co., both of Millersburg; and F. E. Kaser,

Production was used for paving and structural Holmesville. purposes.

The county output of bituminous coal was mined at the strip pits

of Holmes Limestone Co. and Kuhn & Smith, Inc.

Huron.—Sand and gravel was produced by Huron Sand & Gravel Co., Peru, and Greenwich Sand & Gravel Co., Greenwich. In addition to a small amount for filter sand, output was used primarily for

building and paving.

Jackson.—Ninety-five percent of the bituminous-coal output of Jackson County in 1955 was strip-mined. The leading producers were Broken Aro Coal Co., Collins & Walton Coal Co., Waterloo Coal Co., Clinton Coal Co., Sharon Contractors, Inc., Lesta Ramey, and Bauer & Bates Coal Co. Of the five reporting underground operators, B M Coal Co. and Kriebel Bros. Coal Co. were the larger.

Fire clay was mined from the following six pits: Cedar Heights Clay Co., Poetker & House, The Pyro Refractories Co., General Refractories Co., Aetna Fire Brick Co., and Jefferson Clay Co., all of Oak Hill. Sixty-one percent of output was used for firebrick and The balance of production was used for refractories, agricul-

tural terra cotta, and floor and wall tile.

Jefferson.—Jefferson County ranked third in bituminous-coal production in 1955. Primary producing properties were the underground mines of Hanna Coal Co., Division of Pittsburgh Consolidation, the strip mine and auger mine of Powhatan Mining Co., the underground mine of The Warner Collieries Co., and the strip pits of Ohio Edison Co., The Zinnox Coal Co., Pier Coal Co., Teramana Bros. Coal Co., Nuri Coal Co., Polen Coal Co., and Bedway Coal Co.

Fire clay and miscellaneous clay were mined for use in manufacturing heavy clay products and firebrick and block by McLain Fire Brick Co., Division of H. K. Porter Co., Inc., and Frederick J. Dando Co., Irondale; The Kaul Clay Manufacturing Co., Toronto; Toronto Fire Brick Co., Stratton; Union Clay Manufacturing Corp., Empire;

and Peerless Clay Corp., Toronto.

The Brilliant Sand Co., Brilliant, produced sand for building

Knox.-Sand and gravel was produced by The Mill-Wood Sand Co., Millwood; Fredericktown Sand & Gravel Co., and R. D. Malick & Son Gravel Co., Fredericktown; Killbuck Sand & Gravel Co., Brinkhaven; Goodwin Sand & Gravel Co., and J. Harry Baughman, Mount Vernon; and Charles C. Engle, Gambier. The output was used largely for building and paving purposes, and the Millwood Sand Co. prepared ground glass and foundry sand. Production from contract operators was also reported by the Knox County Engineer, Mount Vernon, for paving use.

Lake.—Cement, manufactured by Standard Portland Cement Division of Diamond Alkali Co. at Painesville, was the leading commodity of Lake County in 1955. The Diamond Alkali Co. also produced brine from wells near Painesville for use in manufacturing soda ash and chlorine. Although this company was the only producer of cement and salt in the county, the county ranked fourth and second, respectively, in value of output of these commodities in the State. Nine producers of sand and gravel reported production in 1955; however, the county was not an exceptionally large producer. panies, in order of decreasing value, were Leonard Granger, and W. W. Metcalf, Mentor; Erie Road Gravel, and Bradshaw & Thorne, Willoughby; and Paul Bosley, Donald Keeney, Richard Wheelock,

Jack Neff, Inc., and Audrey Dewey.

Lawrence.—Cement, coal, clay, sand and gravel, and stone were the mineral commodities of Lawrence County in 1955. Cement was manufactured by the Alpha Portland Cement Co., Ironton; and Marquette Cement Manufacturing Co., Superior. Limestone was mined by Alpha Portland Cement Co. for use in its cement plant and by Southern Ohio Products Co. for agricultural purposes and con-The Lawrence County Highway Department crete aggregate. quarried limestone for concrete and roadstone.

Bituminous coal was mined from 7 strip pits and 3 underground mines. Strip producers were Buckeye Coal & Limestone Co., Greasy Ridge Coal Co., McComas Coal Co., Callicoat Coal Co., Harry Hatfield & Co., Leslie Hatfield, and Cambria Clay Products Co. Underground production was reported by Joe Addis & Son, Earl Carmon,

and Lawrence Mining Co.

Fire clay (88 percent) and miscellaneous clay (12 percent) were mined primarily for refractories. The leading producer was International Minerals & Chemical Corp., Pedro. Other producers included Harbison-Walker Refractories, Bear Run mine; Cambria Clay Products Co., Blackford; The Carlyle Tile Co., Inc., Ironton; and Lawrence Clay Refractories Co., Pedro.

George B. Wilson (Chesapeake) and S. G. Goldcamp (Ironton)

produced sand and gravel for building and paving purposes.

Licking.—Sand and gravel for building and paving was mined by Dry Creek Crushed Gravel Co., The Vanatta Gravel Co., North Fork Gravel Co., and Paul E. Jones, all of Newark; E. H. Hammond, Granville; and Alexandria Sand & Gravel Co., Alexandria. Newark Sand & Gravel Co., the primary producer in 1954, was idle in 1955.

A small quantity of miscellaneous clay was mined by Bowerston

Shale Co., Hanover.

Logan.—Limestone and sand and gravel were produced. Limestone was quarried and crushed for use as concrete aggregate and railroad ballast and for agricultural purposes. Producers were The National Lime & Stone Co., East Liberty; Northwood Stone Co., Belle Center; and Western Ohio Stone Co., Huntsville.

Sand and gravel producers were Neer's Engineering Laboratories, Degraff; Northwood Stone, National Lime & Stone, Belle Center Stone, all of Belle Center; Moraine Sand & Gravel, and Walter Dorsey,

both of West Liberty.

Lorain.—Lorain County was the leading area in 1955 in value of stone production. This position was due to the production of dimension and crushed sandstone by The Cleveland Quarries, Amherst, and The Nicholl Stone Co., Kipton. Output was used predominantly for architectural purposes, although curbing, flagging, and riprap were also important uses. Nicholl Stone Co. also reported output of grindstones.

Lorain Elyria Sand Co. dredged sand near Lorain for building and

paving purposes.

Lucas.—Cement production continued at the Medusa Portland Cement Co. plant at Toledo. The company also quarried limestone near Silica for use in manufacturing cement. Limestone for use as concrete aggregate and railroad ballast and for agricultural purposes was quarried by Maumee Stone Co., and Toledo Stone & Glass Co., both of Sylvania; and the two operations of The France Stone Co. at Waterville and Holland.

Sand and gravel was mined for building purposes by The Lake Sand & Gravel Co., Lake Erie Sand & Transport Co., Maritime Trades, Inc. (formerly Vermilion Sand & Supply Co.), and Kuhlman

Supply, all of Toledo.

Madison.—The West Jefferson Sand & Gravel Co. operated a fixed plant 3 miles northwest of West Jefferson and produced building and paving sand and gravel.

Miscellaneous clay was mined by The Madison Tile Co., London,

and used in manufacturing heavy clay products.

Mahoning.—Limestone, coal, clay, and peat were produced in Mahoning County in 1955. The Carbon Limestone Co., Poland Township, one of the largest limestone producers in the State, quarried stone for use as blast-furnace flux, concrete aggregate, agricultural purposes, and foundry use. The company also crushed a comparatively small quantity for coal-mine rock dust, mineral food, asphalt, and poultry grit. Bessemer Limestone & Cement Co. broke ground for a \$35 million cement plant at Youngstown, to be completed in 1956.

Bituminous coal, all from strip pits, was mined by the following producers: The Marshall Mining Co., The Earl Fairfield Coal Co., Keller Mines, Inc., DeLauter Coal Co., Poland Coal Co., The Carbon Limestone Co., Davis Coal Co., Lisbon Coal Co., Thompson Coal

Co., and Vulcan Mining Co.

Mahoning County was a leading source of fire clay. American Fire Clay & Products Co., at the Fiske mine near Canfield, was the principal producer. The Pen-Hio Clay Co., Youngstown, was also a producer. Miscellaneous clay was mined by The Alliance Clay Output was used for foundries and steelworks Products Co., Alliance. and heavy clay products.

Humus peat was produced by Beaver Peat Products Co., near

Damascus. Marion.—The mineral commodities produced in Marion County in 1955 were limestone, clay, and sand and gravel. Limestone output was used for concrete aggregate, railroad ballast, and agricultural Producers were The National Lime & Stone Co. and J. M. Hamilton & Sons Co., both of Marion, and Tri County Limestone Co.,

The only producer of clay in the county was Marion Brick Tile Corp. near Iberia. (Iberia is in Morrow County on the Marion County border.) This company mined miscellaneous clay for heavy clay products. La Rue Tile Co., La Rue, a producer in previous years, was idle in 1955.

Penry Sand & Gravel Co. Prospect was the only commercial producer of sand and gravel. The Ohio State Highway Department

mined sand under contract for its own paving purposes.

Medina.—Sand and gravel was mined by Quillin Bros. Construction Co., Lodi, and Brunswick Sand & Gravel Co., Brunswick, for building and paving purposes. Allied Supply Co., Lodi, mined gravel only.

Miscellaneous clay for heavy clay products was mined from an

open pit near Wadsworth by Wadsworth Brick & Tile Co.

Meigs.—Bituminous coal, sand and gravel, salt, stone, and natural salines (calcium chloride) were the mineral commodities of Meigs County in 1955. Auger operations yielded the bulk of coal output. Major producers were Swisher Coal Co., Goeglein Bros. Coal Co.. and Branch Fleming Coal Co., all with auger and strip operations, and the underground mines of Adrienne Coal & Dock Co., Oma L. Wood Coal Co., Bailey Coal Co., and Jacobs Coal Co., Inc. Bailey Coal Co. also operated a strip pit.

Tri-State Materials Co. mined building and paving sand and

gravel near Pomerov. Richards & Son and Harry Pickens produced

gravel.

Pomeroy Salt Corp. (at the White Rock plant, Minersville) and Excelsior Salt Works, Inc. (Pomeroy) produced brine from wells that was evaporated and utilized by meat packers, food dealers, and watersoftener manufacturers. Natural salines (calcium chloride) were also produced by Pomeroy Salt Co. at the White Rock plant.

The Meigs County Highway Department quarried a small quantity

of limestone.

Mercer.—The John W. Karch Stone Co., Celina, and Rockford Stone Co., Rockford, quarried limestone for concrete aggregate, agricultural purposes, and riprap. A small quantity of sand and gravel was also obtained by both companies as a byproduct of the limestone operations.

Miami.—Limestone was quarried by Armco Steel Corp. Piqua Quarries at Piqua for a variety of uses, the most important of which

was blast-furnace flux.

Sand and gravel for building and paving purposes was produced by Fenton Construction Co. and Estey Sand & Gravel Co., Troy; Walter J. Steiner, Ludlow Falls; Vandalia Sand & Gravel, Inc., Tipp City; B. & M. Sand & Gravel near New Carlisle (New Carlisle is in Clark County east of Miami County on the border), Armco Steel Corp., Piqua; and Laura Gravel Co., near Phillipsburg (Phillipsburg is in Montgomery County a few miles south of Miami County).

Monroe.—Walter L. and Nova A. Christman and H. F. Zerger, both of Woodsfield, quarried crushed limestone for concrete aggregate

and railroad ballast in Monroe County in 1955.

Montgomery.—Montgomery County ranked third in value of sand and gravel. Producers, in order of decreasing value, were American Aggregates Co., Central Sand & Gravel Co., Southern Hills Pit, Inc., Wysong Gravel Co., the Keystone Gravel Co., John W. Thomas Gravel Co. (operator for North Dayton Anglers & Gun Club), Pyper Sand & Gravel, Hurst Sand & Gravel Co., M. G. Snyder & Sons, Inc., Hutt Sand, Gravel & Cement Co., James E. Christman, Guy E. Rowe, William J. Jones (owner of Broadway Sand & Gravel Co.), and Haas Gravel Co., all of Dayton; Miller Bros., Butler Township; Englewood Sand & Gravel Co., Inc., Englewood; and Zimmerman Sand & Gravel Co., West Carrolton. Output was used primarily for building and

paving purposes. American Aggregates Corp. planned to build a

new sand-and-gravel plant on a 150-acre site near Dayton.

Crushed limestone for concrete aggregate, riprap, agricultural purposes, blast-furnace flux, and railroad ballast was quarried by Laura Gravel & Stone Co., Phillipsburg, and Limestone-Dayton Co., Dayton.

Schumacher Industries, Inc., produced expanded perlite near Day-

ton.

Morgan.—Bituminous coal was the principal mineral product of Morgan County. Strip production constituted over three-fourths of output and was mined predominantly by Central Ohio Coal Co. Haines & Lawrence Coal Co., Maiden Co., and Rummer Bros. were the other strip operators of the county. Deep mine production was reported by Muskingum Coal Co., Thomas Coal Co., and Hogsett Coal Co.

The primary producer of sand and gravel was Stockport Sand & Gravel Co., Stockport. Douglas Ervin, also of Stockport, reported

producing gravel.

Limestone was crushed for concrete aggregate by Chesterhill Stone

Co., Hackney.

Morrow.—The only mineral commodity of Morrow County in 1955 was sand and gravel produced for commercial use by Chesterville Sand & Gravel Co., Chesterville. The Morrow County Board of Commissioners mined gravel for its own paving purposes. The Ohio Highway Department reported sand-and-gravel production from con-

tract operations.

Muskingum.—Cement, bituminous coal, sand and gravel, stone, and clay were produced in Muskingum County in 1955. The area ranked third in value of cement, which was manufactured by Pittsburgh Plate Glass Co. at the East Fultonham plant. Limestone for use in the cement was quarried by the company Columbia Cement Division, White Cottage operation. Sidwell Bros., South Zanesville, also quarried limestone, predominantly for concrete aggregate, although a considerable quantity was utilized in cement manufacture. Columbia Cement Division, Pittsburgh Plate Glass Co., plans an addition to the White Cottage operation to be completed at the end of 1955 that will boost production by approximately 50 percent.

The bulk of bituminous coal was mined from strip pits operated by Central Ohio Coal Co. (foremost producer), Bruns Coal Co., Inc., White Cottage Coal Co., Sunset Enterprises, Inc., Rose Coal Co., General Mining, Inc., and James H. Cain & Son. Among the several deep mines, Ten X Coal Co., Frank J. Paul & Sons Coal Co., and

Monroe Coal Co. were the largest.

Muskingum River Gravel Co., Duncan Falls, and The Zanesville Gravel Co., Dresden, were the primary producers of sand and gravel for building, paving, and filter purposes. C. N. Corbet, Zanesville, and Sidwell Bros. also reported production. The Ayers Mineral Co., Zanesville, produced highly ground sand for use as foundry sand.

Fire clay was mined by Clyde Nelson, Roseville, and Tionesta Clay Co., Zanesville. The product was used for stoneware and art pottery. Noble.—Noble County strip mines supplied 99 percent of the coal

output. Strip producers included Central Ohio Coal Co., Electro Metallurgical Co., Division Union Carbide & Carbon Corp., Bruns Coal Co., Inc., Belle Valley Coal Co., Moscrip Mining Corp., and Rummer Bros. Coal Co. The Electro Metallurgical Co. also operated deep and auger mines. Charles Wilkos reported production from an underground mine.

Limestone was quarried by James Merry near Caldwell and used for concrete aggregate, railroad ballast, and agricultural purposes.

Ava Brick Co., Ava, mined miscellaneous clay from an open pit

for heavy clay products.

Ottawa.—Ottawa County was the only source of gypsum in the State and was also an important lime- and limestone-producing area in 1955. Chemstone Corp., formerly Kelley Island Lime-Transport Co., quarried the bulk of limestone output from a quarry near Marblehead. This stone was crushed for use in blast furnaces as concrete aggregate, for agricultural purposes, as riprap, and for lime manufacture. The United States Gypsum Co., Genoa, quarried dolomite primarily for use in manufacturing lime, although a considerable quantity was used for concrete aggregate.

quantity was used for concrete aggregate.

Basic, Inc., took over the White Rock plant of Kelley Island Co. near Clay Center and produced lime for building and agricultural purposes. United States Gypsum Co. continued to operate a plant near Genoa. Output was used predominantly as building lime. Other

uses included lime for chemical use and fertilizer.

Celotex Corp., Port Clinton, and United States Gypsum Co., Gypsum, continued gypsum operations in 1955.

Paulding.—Limestone was quarried by Auglaize Stone Co., Oakwood, and Consolidated Cement Corp., Paulding, for concrete aggregate, blast-furnace flux, and cement manufacture.

Miscellaneous clay for heavy clay products was mined by Haviland Clay Works Co., Haviland; and Dangler Drain Tile Co. and Baugh-

man Tile Co., Paulding.

Consolidated Cement Corp. announced construction of a new cement plant at Paulding. The new works will have an annual productive capacity of 1,250,000 barrels of cement and will be on the site

of the company limestone quarry.

Perry.—Perry County ranked fifth in the value of coal and sand-and-gravel output in 1955 and was also an important clay-producing area. Strip mines in the county furnished 85 percent of the coal tonnage. Strip operators were: Sunnyhill Coal Co. (the largest producer, which also operated an auger mine), Mt. Perry Coal Co., Sidwell Bros., J. T. Coal Co., Star Mining Co., Sandra Coal Mining Co., and Boyle Coal Co. Muskingum Coal Co. and Ohio Land & Railway Co. were large deep-mine operators.

Central Silica Co. produced crushed sandstone near Glenford for glass, foundry, and pottery use. H. N. Rose quarried sand for The Industrial Minerals Co. near New Lexington for foundry uses.

Nine producers mined fire and miscellaneous clay for heavy clay products, floor and wall tile, and lightweight aggregate. In order of decreasing value, they were: Logan Clay Products Co. near Logan, which is south of Perry County in Hocking County; Ludowici Celadon Co., Sunnyhill Aggregates Corp., and J. T. Coal Co., New Lexington; The Claycraft Co., Shawnee; Straitsville Brick Co., near Gore on the Hocking County line; Rush Creek Clay Co. and Junction City Clay Co., Junction City; and The Belden Brick Co., Somerset.

Pickaway.—The Sturm & Dillard Co., Circleville, mined sand and gravel in 1955 for building and paving uses and for railroad ballast. The Ohio State Highway Department reported gravel production

from contractors for use in road preservation.

Pike.—The only mineral commodity of Pike County in 1955 was sand and gravel. Producers were Ohio Mineral Co., Inc., and Sharon Silica Co., Beaver; Standard Slag Co., Sargents; Scioto Valley Sand & Gravel Co., Jasper; and Barch Gravel Co. Output was used for building and paving purposes, molding sand, fire or furnace sand, and refractory and metallurgical purposes. The Pike County commis-

sioners mined gravel for road maintenance.

Portage.—Portage County ranked fourth in the State in value of sand and gravel output. Stone, coal, clays, and peat also were produced. Sand-and-gravel producers, in order of decreasing value, were: Industrial Silica Corp. plants, Geauga Lake and Garrettsville; Standard Slag Co., Mantua; Hugo Sand Co., Kent; Roy S. Troyer, Mantua; Twin Lakes Sand, Inc., and Evans R. Beck, Kent; J. P. Loomis Concrete & Supply Co., Ravenna; Stroup & McMackin, near Mogadore (which is west of Portage on the Summit County line); Sober Sand & Gravel Co. and Karl Brugmann, Ravenna; Brugmann Sand & Gravel, Mantua; G. H. Flesher, Streetsboro; Mrs. Charles Smallfield, Kent; and George B. Towner, Ravenna. Output was used generally for building and paving, but Industrial Silica Corp. also reported output of molding, engine, blast, grinding and polishing, and filter sands and sand for refractories.

Harbison-Walker Refractories Co. produced crushed sandstone for

silica brick at Allyn quarry near Nelson.

Bituminous coal was mined from a strip pit operated by Peterson

Coal Co., the only coal company in the county.

Universal Sewer Pipe Corp., Palmyra, mined miscellaneous clay for heavy clay products.

Moss and humus peat was produced by Green Oaks Peat Moss Co.,

Ravenna.

Preble.—Marble Cliff Quarries produced limestone from an underground operation near Lewisburg. The bulk of the output was used at the company lime plant at the same location for manufacturing lime. Balance of production was utilized for agricultural purposes, concrete aggregate, and blast-furnace flux.

Producers of sand and gravel for building and paving were Blue Bank Sand & Gravel Co. and Steiner Washed Sand & Gravel, West

Alexandria; and White Gravel Co., Camden.

Putnam.—Limestone was quarried by four companies in Putnam County in 1955. Producers were The National Lime & Stone Co., Columbus Grove; The Putnam Stone Co. and Ottawa Stone Co., both of Ottawa; and Schumacher Stone Co., Pandora. The product was used as concrete aggregate and for agricultural purposes and riprap.

Miscellaneous clay for heavy clay products was mined from the open-pit mines of Glandorf Tile Co., Glandorf; The Snyder Tile Co., Continental; Miller Bros. Clay Works, Ottoville; and Etter Tile &

Cole Co., Dupont.

Richland.—Clay, sand and gravel and peat were the mineral commodities produced in Richland County in 1955. Producers of miscellaneous clay for heavy clay products were Richland Shale Brick Co.

and Ohio Lumber & Face Brick Co., both of Mansfield.

Harvey W. Fleck & Son, Inc., Lexington, was the primary producer of sand and gravel in the county. D. H. Bowman (Belleville), The Killbuck Sand & Gravel Co. (Lucas), and Paul Farst (Jefferson Township) produced paving gravel. Gravel for road paving was reported by Richland County Highway Department from contractor operations.

Foster C. Reynolds and Leo H. Swank, Shelby, reported peat output

for soil conditioning.

Ross.—Sand and gravel was produced in Ross County in 1955 for use in building and paving, as railroad ballast and molding sand, and for ice control. Producers were Basic Construction Materials Division, New York Coal Co., Central States Construction Co., Brewer & Brewer Sons, Inc., and H. H. DuBois, all of Chillicothe; Miami Gravel Co., and A. & W. Gravel Co., Richmond Dale; and The

Paint Valley Sand & Gravel Co., Bainbridge.

Sandusky.—In 1955 Sandusky County was the leading lime-producing area and ranked second in the value of stone output in Ohio. Eight companies reporting lime manufacture accounted for over one-third of State value received from lime. These companies were: The Dolite Co., National Gypsum Co., Gibsonburg Lime Products Co., and Basic, Inc., all of Gibsonburg; Ohio Lime Co., Standard Lime & Cement Co., and Woodville Lime Products Co., all

of Woodville; and J. E. Baker Co., Millersville.

Half of the county limestone output was used in manufacturing lime. Other uses included concrete aggregate, agricultural purposes, railroad ballast, flux for blast furnaces and open-hearth plants, riprap, chemical uses, and paint and rubber filler. Producers were: Ohio Lime Co. and Standard Lime & Cement Co. Woodville; J. E. Baker Co., Millersville; Gibsonburg Lime Products Co., National Gypsum Co., and Basic, Inc., all of Gibsonburg; The Gottron Bros. Co., Fremont; and The France Stone Co. near Bellevue, which is on the Huron County line.

The Home Sand & Coal Co. dredged sand near Fremont for building

purposes

Scioto.—Dimension sandstone quarried by Waller Bros. Stone Co. and The Taylor Stone Co., both of McDermott, was the most important mineral commodity of Scioto County in 1955. The stone was

utilized for sawed architectural blocks and for flagging.

Clay output was reported by five operators. They were: International Minerals & Chemical Corp., Eastern Clay Products Department (Bondclay Plant), Harbison-Walker Refractories Co., and Oak Hill Fire Brick Co., South Webster; The Pyro Refractories Co., Wheelersburg; and Aetna Fire Brick Co. near Oak Hill, which is in Jackson County northeast of Scioto. Output was used for fire brick and block and in foundries. The Scioto County engineer reported gravel production from contractor operations.

Seneca.—Seneca County was the second largest lime-producing area in Ohio in 1955. Output of Basic, Inc., plant at Maple Grove was used entirely for producing dead-burned dolomite. Limestone for lime manufacture was produced by this company, as well as lime-

stone for agricultural purposes, blast furnaces, open hearth plants, concrete aggregate, refractory material (dolomite), and other metallurgical uses. Limestone output was also reported by The France Co., Bloomville, and Northern Ohio Stone Co., Flat Rock.

Arnold Gerhardstein reported miscellaneous clay output for St.

Stephen Tile Co., St. Stephen.

Shelby.—The only commodity produced in Shelby County in 1955 was sand and gravel produced by Sidney Washed Sand & Gravel Co., Sidney; and Ernst Sand & Gravel, C. E. Duff, and Carl Tunks.

Stark.—Cement, coal, clay, sand and gravel, and peat were produced in Stark County in 1955. The Diamond Portland Cement Co. quarried limestone at Middlebranch for use in its cement-manufac-

turing plant at the same location.

Except for one deep mine, operated by The Merrick Coal Co., the county output of bituminous coal was produced at strip pits. primary producers were The Truck Coal Co., Tri Seam Mining, Inc., Magnolia Mining Co., Kroman Coal Co., Weaver Coal Co., Huth Hill Co., D & M Coal Co., The Garaux Bros. Coal Co., and Newport

Thirteen companies reported mining fire clay and miscellaneous clay for heavy clay products and floor and wall tile. They were Natco Corp. and Stark Ceramics, Inc., both of East Canton; Metropolitan Brick, Inc., Mapleton Clay Products Co., Robertsville Brick Co., Inc., Garaux Bros. Co., and Magnolia Mining Co., all of Canton; Alliance Clay Products Co., Alliance; United States Ceramic Tile Co. and Sparta Ceramic Co., East Sparta; James & James Coal & Clay Co., and The Preston Clay Co., North Industry; and The Belden

Brick Co., Waco.

Sand and gravel was produced primarily for building and paving purposes. A small quantity of filter and molding sands was also Producers were: Massillon Washed Gravel Co., Navarre; Standard Slag Co. and Miller Gravel Co., Massillon; Ray C. Oster, The United Sand & Gravel Co., Acme Sand & Gravel Co., Diamond Washed Gravel Co., Gilbert Supply Co., and Fred Hann, all of Canton; Uniontown Sand & Gravel Co., Uniontown; Tuscora Foundry Sand Co., Canal Fulton; and Superior Sand & Gravel Co., by Esther & Wilbur A. Gesaman near Massillon.

Production of humus peat was reported by Lab Peat Moss Co. and

Lantz Peat Moss Co., both of Canton.

Summit.—Summit County was the major source of salt in Ohio in Lime, limestone, sand and gravel, clays and peat were also d. Columbia-Southern Chemical Corp. (Barberton) and reported. Diamond Crystal Salt Co. (Akron) produced brine from wells. bulk of Columbia-Southern's output was used in brine form for chemical manufacture. Diamond Crystal reported the major portion of its output recovered as evaporated salt. Columbia-Southern Chemical Corp. also quarried limestone for chemical use, concrete aggregate, and agricultural purposes, as well as for use in manufacturing lime at the company lime plant. These operations were also at Barberton.

Sand and gravel was mined almost entirely for building and paving Principal producers were: Rubber City Sand & Gravel Co., Vanselow & Busson Gravel Co., The Botzum Bros. Co., and Portage Lake Sand & Gravel Co., all of Akron; Twinsburg Silica Sand

& Gravel near Bedford (which is north of Summit County in Cuyahoga County); Busson Bros., Copley; Wilson Sand & Gravel, Peninsula; C. A. Heyl, Barberton; and J. P. Loomis Concrete & Supply Co., Cuyahoga Falls. Niles Fire Brick Co. quarried silica sand. Botzum Bros. Co., J. P. Loomis Co., and The Niles Fire Brick Co. reported their operations abandoned during the year.

Fire clay and miscellaneous clays were mined by The Robinson Clay Product Co. and The Camp Bros. Co., both of Mogadore.

Output was used for heavy clay products.

H. W. Codding reported output of peat from a bog near Copley. J. P. Loomis Concrete & Supply Co. produced expanded perlite at a plant near Akron.

Trumbull.—Kinsman Sand & Gravel Co. produced sand and gravel

near Kinsman for building and paving purposes.

Tuscarawas.—Tuscarawas County led in the production of clay and ranked fourth in the value of bituminous-coal output. Sand and gravel was also produced in 1955. Three-fifths of the coal output was mined from strip pits; however, the underground mine of Columbia-Southern Chemical Corp. was the largest producing property. Principal strip operators were Paul Varga & Sons, Inc., Copperhead Coal Co., Inc., The Truck Coal Co., Cross Creek Coal Co., Clyde A. Wallick, Eberhart Coal, Inc., The Beaver Fork Coal Co., and Black Bird Coal Mines.

Fire clay and miscellaneous clay were mined from 28 mines in 1955. Output was used primarily for heavy clay products, although a sizable quantity was used for firebrick and block. The principal operations were the 2 operations of Belden Brick Co., near Port Washington and Sugarcreek; Goshen Brick & Clay Corp., Newcomerstown; The Evans Pipe Co., Superior Clay Corp., and Stillwater Clay Products Co. Ultrichaville: Devideo Minima Lea. New Philital Clay Products Co., Uhrichsville; Davidson Mining, Inc., New Philadelphia; the 2 operations of The Robinson Clay Product Co. near Dover and Strasburg; The Stone Creek Brick Co., Stone Creek; Columbia Fire Brick Co., Strasburg; and Fox Valley Mining Co., Gnadenhutten.

Industrial Silica Corp., the largest sand-and-gravel producer in the county, mined molding and fire or furnace sands at a fixed plant near Dundee. Sand-and-gravel output for building and paving was reported by Spring Bros. and Clarence Hensel, New Philadelphia; Tri County Gravel Co., Sandyville; Stocker Gravel Plant, Gnadenhutten; Edgar Spring, Inc., Midvale; and The Superior Sand Corp., New Cumberland. Stocker Gravel Plant reported producing a small

quantity of filter sand.

Construction was begun on a new \$1,750,000 brick plant on a 700-acre site near Sugar Creek, Ohio, by Belden Brick Co. A com-

plete line of facebrick and building tile will be manufactured.

Union.—Clymer Materials Co., Millcreek Township, the major producer, and H. E. Rockhold & Sons, York Center, reported production of crushed limestone in Union County in 1955. Output was used for concrete aggregate, agricultural purposes, and riprap. The Clymer Materials Co. also produced sand and gravel near Milford Center for road material.

Van Wert.—Limestone was quarried and crushed in Van Wert County by Union Quarries Co. (Van Wert), Delphos Quarries Co. (near Delphos on the Allen County line), and The France Co. (Middlepoint), for use as concrete aggregate and for agricultural purposes and riprap.

A small quantity of miscellaneous clay for heavy clay products was mined by Weck Tile Plant, Van Wert, and Fred Minzing &

Son, Delphos.

Vinton.—Production of bituminous coal was reported by 10 operators in Vinton County in 1955. Although there was an equal number of strip and underground mines, strip production constituted 70 percent of output. Producers were Loper Coal Co., Todd Bros., Power Coal Co., Fuller Coal Co., and Prator Coal Co. Underground producers were Benedict, Inc., Clinton Coal Co., J. A. Crow Coal Co., Ruper & Davis Coal Co., and R. & W. Coal Co.

The McArthur Brick Co. (McArthur), mined miscellaneous clay for heavy clay products and Hope Fire Clay Co. (Zaleski) mined

fire clay for firebrick and block.

McArthur Stone & Coal Corp. produced crushed limestone near

McArthur for concrete aggregate and agricultural purposes.

The Vinton County Highway Department also reported crushed

limestone output for road paving.

Warren.—The only mineral commodity produced in Warren County in 1955 was sand and gravel. The largest producer was Van Camp Sand & Gravel Co., Morrow. Other producers were:Frank lin Sand & Gravel Co. and Harold V. Martz, Franklin; Armitage & Lin Sand & Gravel Co. and Harold V. Martz, Franklin; Armitage & Lin Sand & Gravel Co. and Harold V. Martz, Franklin; Armitage & Lin Sand & Gravel Co. Son, with two plants at South Lebanon and Waynesville; and Vernon

H. Michael, Loveland.

Washington.—In 1955 Washington County produced sand and gravel, coal, grindstones, and clay. The Ohio River Sand & Gravel Corp. was by far the largest sand and gravel producer, with 3 operations, 2 near Marietta, 1 of which was operated by R. H. & Alma Smith, and 1 near Parkersburg. The Parkersburg plant produced crushed gravel only. Other reporting companies were Fred Price Contracting, Waterford; Marietta Concrete Corp., Briggs Gravel Co. and L. C. Riley, all of Marietta. Shelly & Sands, A. H. Smith & Son, and Stockport Sand & Gravel produced a relatively small output. The Washington County Highway Department reported production from contract operations.

The Peaker Run Coal Co. and Hunter Coal Co. mined bituminous

coal from strip pits.

Grindstone output was reported by Hall Grindstone Co. and Constitution Stone Co. from operations near Constitution, Ohio.

Fire and miscellaneous clays were mined near Marietta by Briggs Gravel Co. and Marietta Concrete Corp. Beslite Plant, respectively. Briggs Gravel Co. output was utilized for furnace lining. Marietta Concrete Corp. production was used for lightweight aggregate.

Wayne.—Morton Salt Co., Rittman, produced evaporated salt by the open- and vacuum-pan methods from well brines.

Mullet Coal Co. mined bituminous coal from a strip and auger operation and was the only active coal company in the county.

Miscellaneous clay for heavy clay products was mined from open pits operated by The Medal Brick & Tile Co., Wooster; and Orrville Tile Co., Orrville.

Gravel for road material was produced by P. D. Siebert, Wooster; and Charles Zollinger, Rittman. These companies also mined building sand, and P. D. Siebert reported output of a small quantity of filter sand.

Williams.—The largest producer of sand and gravel in Williams County was Tri-State Gravel Co., operator of a dredge one-half mile southeast of Pioneer. Other operations were reported by Mason Sand & Gravel Co., Edon; Vincent H. Wortkoetter, Montpelier; and Easler Sand & Gravel, Edgerton.

Stryker Drain Tile Co., Stryker, mined miscellaneous clay for

heavy clay products.

Wood.—Limestone was quarried in Wood County in 1955 by Pugh Quarry Co., Custar; National Gypsum Co., Luckey; Wood County Stone & Construction Co., Bowling Green; The France Stone Co., North Baltimore; and O. F. Brough, West Millgrove. Output was crushed and utilized largely for concrete aggregate, agricultural and metallurgical purposes, and riprap. National Gypsum Co. used approximately half its production in the lime-manufacturing plant, also at Luckey.

A small quantity of miscellaneous clay for manufacturing drain tile was mined from the open pit of Perrysburg Tile & Brick Co. near

Perrysburg.

Wyandot.—Limestone, lime, peat, sand and gravel, and clay were the mineral commodities produced in Wyandot County in 1955. National Lime & Stone Co., Carey, the predominant producer, and J. L. Foucht, Upper Sandusky, quarried and crushed limestone for concrete aggregate, metallurgical work, glass factories, railroad ballast, and agricultural purposes. National Lime & Stone Co. utilized a portion of output for manufacturing quick and hydrated lime.

Wyandot County was the leading area in peat production. The Humus Co. and Smith Agricultural Chemical Co. reported output of

humus peat from bogs near Carey.

Sand and gravel was mined by Wilson Sand Co. and Corfman Gravel Co., both of Upper Sandusky. Building and paving was the most important use of the product.

Claycraft Co. mined miscellaneous clay for heavy clay products

from an open pit near Upper Sandusky.



# The Mineral Industry of Oklahoma

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

By Peter Grandone 1 and William E. Ham 2



KLAHOMA mineral production was a record \$711 million compared with \$650 million in 1954. Production of 12 minerals and 5 mineral fuels was reported from 76 of the State's 77 counties. Compared with other States in 1955, Oklahoma was the second largest producer of LP-gases, third largest producer of natural gas, fourth largest producer of crude petroleum and natural gasoline, and fifth largest producer of zinc. Appreciable quantities of cement, coal, gypsum, sand and gravel, and stone also were The mineral fuels—petroleum, natural gas, natural-gas liquids, and coal—were the State's most important minerals in value, accounting for 94 percent of Oklahoma's total value of mineral production. Metals and nonmetals were responsible for the remaining 6 percent. Petroleum was produced in 57 of Oklahoma's 77 counties; natural gas in 55 counties, most of which also produced oil; nonmetals in 63 counties; and metals (lead and zinc) in Ottawa County only. Oil and natural gas were produced in a wide belt extending from the northeastern part of the State to the southwestern and northwestern parts; nonmetal mining was distributed widely over the northeast, north-central, and central regions and in the Arbuckle and Wichita Mountain areas of the southern part.

Commodity-industry analyst, Region IV, Bureau of Mines, Bartlesville, Okla.
 Geologist, Oklahoma Geological Survey, Noman, Okla.

TABLE 1.—Mineral production in Oklahoma, 1954-55 1

	19	954	198	55
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays Coal Lead (recoverable content of ores, etc.) Natural gas Natural gas Natural gas liquids: Natural gasoline and cycle products thousand gallons LP-gasesdo Petroleum (crude)thousand 42-gallon barrels. Sand and gravel Stone Zinc (recoverable content of ores, etc.) Value of items that cannot be disclosed: Asphalt (native), bentonite, cement, gypsum, lime, pumice, salt (common), miscellaneous stone, sulfur, and tripoli.	452, 050 1, 914, 834 14, 204 616, 355 478, 590 453, 810 185, 851 5, 424, 131 43, 171	\$1, 282, 848 11, 264, 692 3, 891, 896 43, 145, 000 24, 332, 000 13, 506, 000 518, 520, 000 4, 265, 031 8, 9, 146, 995 9, 324, 936	2 724, 156 2, 163, 536 14, 126 614, 976 504, 692 512, 320 202, 817 6, 293, 798 10, 933, 355 41, 543	2 \$726, 856 12, 667, 563 4, 209, 548 45, 508, 000 28, 770, 000 14, 297, 000 563, 830, 000 3, 785, 786 12, 295, 274 10, 219, 578
Total, Oklahoma		4 650, 205, 000		4711, 089, 000

<sup>&</sup>lt;sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption

Freducers).
 Excludes bentonite.
 Excludes certain stone; figure withheld to avoid disclosing individual company confidential data.
 Total adjusted to avoid duplicating values of clays and stone.

## CONSUMPTION AND MARKETS

Oklahoma mineral industries processed a significant part of their output into finished and semifinished products for in-State consumption and out-of-State shipments. These industries included oil tion and out-of-State shipments. refineries; natural-gasoline and cycle plants stripping natural gas of condensible liquids; zinc smelters reducing zinc concentrate mined in Oklahoma; brick, tile, pottery, glass, and cement plants using Oklahoma clays, shales, silica sands, and limestone, and producers of building materials made of Oklahoma gypsum. Large quantities of oil and natural gas continued to be transmitted by pipelines to industrial sections of the Eastern and North-Central States.

The State regulatory body under the Interstate Oil Compact permitted the allowable production of oil to increase 9 percent above the 1954 allowable in 1955 to conform with the indicated demand for the

State's petroleum.

# TRENDS AND DEVELOPMENTS

Increased demand for Oklahoma crude petroleum resulted in a higher allowable and more production. Proved recoverable reserves of petroleum increased about 3 percent over the previous year; exploratory drilling centered mainly in the southern and far northwestern counties and in Osage County. Carbon black from refinery waste gases was produced at the \$2\%-million carbon-black plant of Continental Blacks, Inc., at Ponca City.

In the refining of petroleum, the trend toward more production of Premium-Grade motor fuel and toward raising the octane rating of motor fuels even higher was continued. The competitive race for upgrading motor fuels was evidenced by new installations or contracts for catalytic cracking units and catalytic reformers at refineries at Enid and West Tulsa.

Custom Mills and Smelters.—Six custom mills in Oklahoma treated lead-zinc ores mined locally and from Kansas, and 3 mine mills treated

lead-zinc ores from company mines only.

Three smelting companies operated three horizontal-zinc-retort plants in Oklahoma in 1955. These were the plants of American Metals Co., Ltd., at Blackwell, Kay County; National Zinc Co. at Bartlesville, Washington County; and Eagle-Picher Co. at Henryetta, Okmulgee County.

TABLE 2.—Average unit value of mineral commodities produced in Oklahoma, 1951-55

Cement, portland	1952	1953	1954	1955
Miscellaneous   Short ton   1.02	\$4. 75	\$4. 75	\$4. 75	\$4. 75
Miscellaneous   Short ton   1.02	2. 47	2.54	2.64	2.72
Bentonite		2.01	2.01	2.12
Bentonite	1.04	1,02	1.09	1.01
For cement	15.00	9. 64	10.00	4.50
Coal	1.00	1.00	1.00	1.00
Crypsum	5. 78	6. 10	5.88	
Dime	2.64	2.76	2. 81	5. 86
Dime	322, 00	262.00	274.00	2.94
Natural gas	10. 25	8. 67	9. 85	298. 00
Natural-gas liquids:   Natural gasoline and cycle products per gallon.   .069     LP-gases   .037     Purnice   short ton     Salt (common)   do   .7.50     Sand and gravel   do   .73     Stone:   do   .123     Granite   do   .123     Granite   do   .146     Limestone   do   .144     Miscellaneous (grushed)   do   .44     Miscellaneous (grushed)   do   do   do       Miscellaneous (grushed)   do       Miscellaneous (grushed)   do       Miscellaneous (grushed)   do       Miscellaneous (grushed)	054	. 069		9. 55
Petroleum	.004	. 009	. 070	. 074
Petroleum	. 073	. 065		
Common   C	. 037	. 036	. 051	. 057
Common   C	2. 56	2.70	. 030	. 028
Salt (common)       do       7.50         Sand and gravel       do       .73         Stone:       do       123.62         Granite       do       1.46         Limestone       do       1.11         Miscellaneous (crushed)       do       1.44	9. 87	2. 70 9. 54	2. 79	2.78
Sand and gravel	7. 47	7. 47	8.36	
Granite	77		7. 62	7. 83
Sandstone		. 85	. 79	.76
Sandstone	95. 76	102, 34	00.40	
Limestone do 1.11	8.37		60.40	1 67. 91
Miscellaneous (crushed)		. 60	1.45	1.16
ulfur (recovered)	1.09	1.07	1.08	1.15
	.46	. 41	. 34	. 47
Sulfur (recovered) do do Pripoli do do do do do do do do do do do do do		2 26. 74	26. 50	26. 50
	332.00	2 5. 00 230. 00	3. 00 216. 00	3.00 246.00

Dimension granite.
 First year reported.

Mineral Brokers.—Several smelting companies maintained mineral brokers or ore buyers in the Tri-State district of Oklahoma, Kansas, and southwest Missouri. No metal concentrates were stockpiled at the mines as all production continued to be purchased f. o. b. the mill by the brokers.

# EMPLOYMENT IN THE MINERAL INDUSTRIES

Employment.—Total employment in the Oklahoma mineral industries increased slightly to an alltime high of 52,000 from the previous

vear.

Accidents.—Sixty-six accidents were reported in the mineral-fuel industry in Oklahoma in 1955. Of this number, 10 were fatal accidents compared with 2 in 1954. There were 9 permanent-partial disabling accidents and 2 fatal accidents in the metal- and non-metal-mining industries of the State.

TABLE 3.—Employment in mineral industries, 1947-50 (average) and 1951-55 <sup>1</sup>
(In thousands)

	1947-50 average	1951	1952	1953	1954	1955
Oil and gas mining	37. 3 2. 2 2. 9	40. 6 1. 8 2. 8	42. 5 1. 5 2. 8	44.7 1.5 2.0	46. 5 1. 3 2. 2	48.3 1.3 2.4
Total	42.4	45. 2	46.8	48. 2	50.0	52. 0

<sup>1</sup> Oklahoma Employment Security Commission, Handbook of Employment Statistics of Oklahoma, 1939-55.

# REVIEW BY MINERAL COMMODITIES

### MINERAL FUELS

Oklahoma continued to be a leading domestic producer of crude petroleum and natural gas in 1955 and a major supplier of refined products. Native asphalt and a substantial quantity of a low-ash bituminous coal also were produced.

Asphalt (Native).—Output of native rock asphalt (bituminous limestone and bituminous sandstone) was reported from Murray County in 1955. Production in 1955 was down 34 percent from the previous year.

Coal.—The 6-year decline trend of coal output in Oklahoma was reversed in 1955, as a 13-percent gain in both tonnage and value over 1954 was reported. There were 35 operators in 13 counties. Haskell, Rogers, Pittsburg, Le Flore, and Okmulgee Counties were the 5 principal producers, each reporting over \$1 million in value.

TABLE 4.—Coal production, 1946-50 (average) and 1951-55

	Thou-			Thou-	Value		
Year	sand short tons	Total (thou- sand dollars)	Average per ton	Year	sand short tons	Total (thou- sand dollars)	A verage per ton
1946-50 (average)	3, 046 2, 223 2, 193	14, 291 13, 873 12, 688	\$4, 69 6, 24 5, 78	1953 1954 1955	2, 168 1, 915 2, 164	13, 227 11, 265 12, 668	\$6. 10 5. 88 5. 86

Natural Gas.—Oklahoma continued to rank third in the Nation in marketed production of natural gas. Marketed production amounted to 615 billion cubic feet valued at \$45.5 million, slightly less in quantity but a 5.6-percent gain in value compared to 1954. Production was reported from 55 counties, of which Texas, Beckham, Garvin,

Oklahoma, and Grady led in the order named. In addition to the gas marketed, 125,945 million cubic feet was used for repressuring and 214,709 million cubic feet was vented. The industry continued its search for more reserves in 1955 by completing 359 gas wells out of a total of 8,411 wells of all types as reported by The Oil and Gas Journal. Exploratory drilling alone accounted for 32 gas discoveries out of 916 exploratory tests. Again, the most significant exploratory activity centered in the Hugoton Embayment of the Oklahoma Panhandle, where 15 tests in Beaver County and 3 tests in Texas County proved gas productive. Estimated proved recoverable reserves of natural gas increased 7 percent in Oklahoma in 1955 to 13,204,739 million cubic feet, according to the Committee on Natural-Gas Reserves of the American Gas Association.3

Cities Service Gas Co. completed a 26-inch gas pipeline, which extends 90 miles from Blackwell, Okla., to a point on the company system near Independence, Kans.

TABLE 5.—Marketed production of natural gas, 1946-50 (average) and 1951-55 1

		7alue	due		Value		
Year	Million cubic feet	Total (thou- sand dollars)	Per thou- sand cubic feet, cents	Year	Million cubic feet	Total (thou- sand dollars)	Per thou- sand cubic feet, cents
1946-50 (average) 1951 1952	439, 629 538, 756 554, 033	19, 234 28, 554 29, 918	4. 4 5. 3 5. 4	1953 1954 1955	599, 955 616, 355 614, 976	41, 397 43, 145 45, 508	6.9 7.0 7.4

<sup>1</sup> Comprises gas either sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas pipelines.

TABLE 6.—Gross withdrawals and disposition of natural gas, 1951-55, million cubic feet

	,	Withdrawals 1			Disposition			
Year	From gas wells	From oil wells	Total	Marketed production 3	Repressur- ing	Vented and wasted *		
1951 1952 1953 1954 1955	420, 000 420, 000 460, 000 503, 000 460, 000	338,000 404,100 425,000 410,000 495,000	758, 000 824, 100 885, 000 913, 000 955, 000	538, 756 554, 033 599, 955 616, 355 614, 976	57, 119 80, 109 92, 136 106, 119 125, 945	162, 125 189, 958 192, 909 190, 526 214, 079		

Marketed production plus quantities used in repressuring, vented, and wasted.
 Comprises gas sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas in pipelines.
 Partly estimated. Includes direct waste on producing properties and residue blown to air.

<sup>&</sup>lt;sup>1</sup> American Gas Association and American Petroleum Institute, Proved Reserves of Crude Oil, Natural-Gas Liquids, and Natural Gas, Dec. 31, 1955: Vol. 10, p. 19.

Natural-Gas Liquids.—Production of natural-gas liquids by 76 natural gasoline plants and 2 cycling plants in Oklahoma amounted to 1,017 million gallons in 1955 and was valued at \$43 million. This followed a price increase for the first time in 2 years, as both gasoline stocks and gasoline demand were up. Natural gasoline and cycle products composed 49 percent of the quantity and 67 percent of the value, LP-gases the remainder. According to American Petroleum Institute, estimated proved recoverable reserves of natural-gas liquids in Oklahoma in 1955 were 354 million barrels, a gain of 20 million barrels over 1954 estimates.

TABLE 7.—Natural-gas liquids produced, 1946-50 (average) and 1951-55

	Natural gasoline and cycle products		LP-gases		Total	
Year	Thousand gallons	Value (thousand dollars)	Thousand gallons	Value (thousand dollars)	Thousand gallons	Value (thousand dollars)
1946–50 (average)	292, 158 397, 236 405, 720 433, 650 478, 590 504, 692	19, 936 27, 498 29, 459 28, 066 24, 332 28, 770	202, 671 339, 528 376, 026 414, 036 453, 810 512, 320	7, 283 12, 436 14, 090 14, 886 13, 506 14, 297	494, 829 736, 764 781, 746 847, 686 932, 400 1, 017, 012	27, 219 39, 934 43, 549 42, 952 37, 838 43, 067

Petroleum.—Oklahoma remained the Nation's fourth largest producer of petroleum in 1955, with an output of 203 million barrels valued at \$563.8 million. Petroleum was reported from 57 counties, the leading 5 producers being Garvin, Carter, Stephens, Osage, and

Seminole.

In 1955 Oklahoma had 69,930 producing oil wells, compared with 65,390 in 1954. The daily average output per well rose to 8.2 barrels from 7.9 in 1954, due partly to increases in prorated allowables. The average price per barrel of petroleum at the wells was \$2.78 in 1955, compared with the 1954 average of \$2.79. According to The Oil and Gas Journal, 8,411 wells were completed in Oklahoma in 1955; of these, 5,131 were oil wells, 2,588 were dry, and the remainder were either gas or service wells. The Oil and Gas Journal also reported that exploratory crews in the State drilled 832 test wells compared with 859 in 1954; of the 832 tests, 154 were oil productive and 31 gas productive. The heaviest exploratory activity occurred in the southern and far northwestern counties, expecially in Beaver County. The State's productive depth record was broken by completion of an

Work cited in footnote 3.

oil well in the Tulip Creek sand at 14,076 feet in the Bradley area, Grady County. Estimated proved reserves of crude oil in Oklahoma were reported by the American Petroleum Institute at 2 billion barrels, up only 3 percent over 1954 estimates.

The indicated demand for total petroleum in 1955 was 205.3 million barrels compared with 187.6 million barrels in 1954. Crude-oil stocks in the State, as of December 31, 1955, were 2,861,000 barrels at

refineries and 21,491,000 barrels in pipelines and tank farms.

At the end of 1955 Oklahoma had 19 operating refineries, which

had a daily crude-oil capacity that totaled 352,100 barrels.

In the refining industry of the State, upgrading of motor fuels was continued by the installations of a new 5,000-barrel-per-day catalytic polymerization unit at the Champlin Refinery Co., Enid, Okla., and a 9,000-barrel-per-day combination platforming and unifining unit at West Tulsa refinery of The Texas Co. At D-X Sunray Oil Co. refinery, West Tulsa, a new delayed coking unit was placed in operation that has a charge capacity of 7,000 barrels of oil daily and makes 244 tons of coke and 4,000 barrels of gas oil daily.

TABLE 8.—Production of petroleum (crude), 1946-50 (average) and 1951-55

	Thou-	Valu	в		Thou-	Valu	ie .
Year	sand 42- gallon barrels	At wells (thousand dollars)	Average per barrel	Year	sand 42- gallon barrels	At wells (thousand dollars)	Average per barrel
1946-50 (average) 1951 1952	149, 305 186, 869 190, 435	334, 924 480, 250 487, 510	\$2. 24 2. 57 2. 56	1953 1954 1955	202, 570 185, 851 202, 817	546, 940 518, 520 563, 830	\$2.70 2.79 2.78

TABLE 9.—Indicated demand, production, and stocks of petroleum (crude) in 1955, by months

	Thousand 42-gallon barrels				Thousand 42-gallon barrels			
Month	Indicated demand	Production	Stocks originating in Oklahoma	Month	Indicated demand	Production	Stocks originating in Oklahoma	
January	16, 611 15, 963 16, 407 17, 511 17, 087 17, 235 17, 966	16, 238 15, 709 17, 413 16, 828 16, 481 16, 139 17, 049	23, 789 23, 535 24, 541 23, 858 23, 252 22, 156 21, 239	August September October November December Total: 1955 1954	17, 610 16, 612 18, 090 15, 390 18, 867 205, 349 187, 558	17, 011 16, 428 17, 167 17, 502 18, 852 202, 817 185, 851	20, 640 20, 456 19, 533 21, 645 21, 630	

TABLE 10.—Production of crude petroleum, 1951-55, by fields, in thousand barrels

[Oil and Gas Journal]

	2				
Field	1951	1952	1953	1954	1955
					7, 1 1 1 7
Allen	1, 447	1, 336	1, 456	1,709	1, 73
Bebee	1.073	1, 244	1, 087	926	83
Burbank Cache Creek	2, 318	3, 157	3, 476	1 3, 466	2 10, 13
Cache Creek	1, 289	1,042	956	787	70
Camp.	(3)	975	1,606	1, 329	
Cement	4. 127				(4)
Oum harland		3, 964	4,070	3, 517	4, 18
Cum berland	3, 475	3, 102	2, 562	1,690	1,84
Cushing	2, 816	2, 889	3, 385	3, 176	2,82
Dilworth	(3)	(3)	(8)	1, 279	1, 13
Doyle	(3)	2, 475	3, 934	2, 976	2, 68
Elk City	7, 426	7, 248	6, 380	5, 348	6, 27
Eola	891	1, 178	1, 651	1, 424	\$ 2, 19
Fox-Graham	3, 196	5, 532	5, 920	1, 121	
				4, 559	(4)
	2, 502	2, 252	2, 145	2,045	1, 98
Healdton	2, 267	2, 183	2, 288	2, 171	2,30
Hewitt	3, 694	3, 173	2,703	6 3, 339	5 3. 41
Holden ville-East	(3)	(8)	(8)	1, 149	7 1, 47
Hoover-Northwest	887	693	601	8 1, 189	9 1. 66
Knox	1, 725	1, 627	1, 595	1, 165	1, 14
Milroy	(8)	1,091	2, 325	1, 755	(4)
Oklahoma City	6, 303				
Olympic		5, 513	5, 187	4, 148	3,80
	1, 485	2, 013	4,064	4,083	2,66
Payson-East	(3)	(8)	1, 725	1,076	10 91
Ringwood	2, 288	1, 338	855	727	55
Seminole district:					
Bowlegs	1.178	1,003	1, 121	872	71
Little River	945	852	826	756	69
St. Louis	1, 560	1, 440	1, 507	1, 464	1.67
Seminole	1, 207	1,077	1, 211	998	
Sholem-Alechem					92
The Tal Comment	10, 557	12, 239	12, 736	10, 261	(4)
Sho-Vel-Tum					4 30, 31
South Burbank	776	617	894	1, 429	(2)
Tatums	3, 378	3.466	3, 892	3, 321	(4)
Velma-West	16, 089	18, 999	16,064	8, 435	(4)
West Edmond	3, 482	4, 471	1, 887	11 1, 821	1.73
Witcher	1, 655	1, 120	660	541	43
Yale-Quay	1, 352	1, 120	2, 171		
				1, 915	1, 47
Other fields	95, 478	90, 323	12 99, 630	12 99, 005	12 110, 37
Total Oklahoma	186, 866	191, 523	12 202, 570	12 185, 851	12 202, 81
		1			

<sup>1</sup> Includes Burbank South and Fairfax.
2 Includes Burbank, Burbank South, Little Chief, Northeast, and Little Chief, West, consolidated in 1955.
3 Included with "Other fields."
4 Included with Sho-Vel-Tum. The following pools were consolidated in 1955: Alma, North; Alma, Northeast; Alma, Southwest; Ava; Ava, North; Ava, Northwest; Camp; Camp, Southeast; Fox-Graham; Milroy, West; Sholem-Alechem; Sholem-Alechem, Northwest; Sholem-Alechem, Southwest; Sholem-Alechem, West; Tatums; Velma; and Wheeler.
5 Includes Eola, North and Eola, Northwest; consolidated in 1955.
6 Includes Brockwest and Lone Grove, Southwest.
7 Includes Greek.
8 Includes Hoover, North; Brady, Southeast; and Roady, Northeast.
9 Includes Hoover, North; East and Holdenville, West; consolidated in 1955.
10 Includes Payson, consolidated in 1955.
11 Includes Edmond, Northwest and Lockridge, Northeast.
12 Bureau of Mines figure.

TABLE 11.—Exploratory oil and gas wells drilled in 1955, by counties 1

County	Exp	oloratory	wells	County	Exp	loratory	wells
	Oil	Oil Gas			Oil	Gas	Dry
AdairAlfalfaAtoka	3		1 7 2	LincolnLogan	20	1	58 31
Beaver Beckham Bryan	12 2	15	14 2 7	Love	8		7 2 6 5
Caddo Carter Choctaw	1 9		12 15 4	McCurtain McIntosh Murray	2		5 6 8
Cimarron Cleveland Coal	5 3	2	8 15 3	Muskogee Noble Okfuskee	11 3	1	30 11
Comanche Cotton Creek Creek	4	<u>1</u>	16 6 16	Oklahoma Okmulgee Osage	4 2 19		5 3 52
Custer Delaware Garfield	4		1 1 17	Ottawa Pawnee Payne	1 5 10		25 28
Garvin Grady Grant Greer	5 5	2	22 15 13	Pittsburg Pontotoc Pottawatomie Pushmataha	1 4		3 11 12
Harmon Harper Haskell		1	15 5 2	Seminole Sequoyah Stephens			5 3 27
Hughes Jackson Jefferson		2	11 4 12	Texas Tillman Washita	6 3 3	1 3	5 20
Johnston Kav	8	1	2 29 1	Woods Woodward	1		i
Kingfisher Kiowa Le Flore	1		17 1	Total: 1955	213 156	32 25	671 678

<sup>&</sup>lt;sup>1</sup> National Oil Scouts and Landmen's Association, Oil- and Gas-Field Development in the United States and Canada; Austin, Tex., vol. 26, pp. 629-642.

TABLE 12.—Sales of petroleum products, 1951-55, in thousand 42-gallon barrels

Product	1951	1952	1953	1954	1955
Gasoline <sup>1</sup>	17, 692	18, 891	19, 328	19, 637	21, 916
	1, 884	1, 761	1, 588	1, 458	1, 414
	1, 012	942	852	763	753
	2, 223	2, 192	2, 436	2, 368	2, 493
	3, 773	2, 939	2, 351	1, 479	1, 783

<sup>&</sup>lt;sup>1</sup> American Petroleum Institute.

#### **METALS**

Output of metallic minerals in 1955 declined from the previous year, but the total value—\$14.4 million—represented a 9-percent gain. Advances in zinc concentrate prices from \$68.00 to \$80.00 per short ton mainly accounted for the gain in value.

Cadmium, Germanium, Indium, and Gallium.—These minor metals, occurring as trace elements in the lead-zinc concentrates of Oklahoma, were recovered from the flue and zinc dusts of zinc-retort smelters and from the precipitates of electrolytic zinc smelters. Production of these metals cannot be assigned to the State of origin, because they are recovered at the smelters from the accumulated flue dusts and

residues of ores from various domestic and foreign sources.

Lead.—Mine production of lead in 1955, all from Ottawa County, was slightly more than in 1954 in terms of concentrate (galena) and slightly less in terms of recoverable metal. The value of the 14,126 short tons of recoverable lead, produced in 1955, was \$4.2 million, an 8-percent gain over the 1954 value. The largest producer of lead in the State was Eagle-Picher Co., followed by American Zinc, Lead & Smelting Co., Dewey Sims (Ritz), John Henderson (Acme), and Tom Kiser (Wesah Greenback). One labor strike was reported within the State.

The price of lead opened at 15.0 cents per pound, New York, in 1955 and remained quite stable throughout the year, closing at 15.5

cents at the year end.

Zinc.—Mine production of recoverable zinc in 1955, all in Ottawa County, declined 4 percent from the previous year to 41,543 tons, even though metal prices rose during 1955. Zinc output was valued at \$10.2 million, a 10-percent gain over the 1954 value. Eagle-Picher Co. was the principal producer in the State, followed by American Zinc, Lead & Smelting Co., Buffalo Mining Co., C. & M. Mining, and Dewey Sims.

Zinc-metal price at the beginning of 1955 was quoted at 11.5 cents per pound, East St. Louis, rose gradually to 13.0 cents per pound on September 8, 1955, and remained stable to the end of the year.

TABLE 13.—Mine production of lead and zinc, 1946-50 (average), 1951-55, and total  $1891{-}1955$ , in terms of concentrates and recoverable metals  $^{1}$ 

	Lead concentrate		Zinc concentrate		Recoverable metal content <sup>2</sup>			
		lena)	(sphalerite)		Lead		Zine	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946–50 (average)	22, 703 22, 613 20, 473 12, 213 19, 004 19, 555	4, 714, 358 4, 104, 934 1, 915, 195 3, 194, 245	61, 896 84, 444	12, 297, 096 11, 714, 605	16, 575 15, 137 9, 304 14, 204	5, 734, 950 4, 874, 114 2, 437, 648 3, 891, 896	53, 450 54, 916 33, 413 43, 171	18, 232, 112 7, 684, 990 9, 324, 936
1891-1955		156, 750, 430	9, 641, 074	474, 764, 154			5, 083, 382	759, 656, 564

<sup>&</sup>lt;sup>1</sup> Based on Oklahoma ore ("dirt") and old tailings treated at mills during calendar year indicated.

<sup>2</sup> In calculating metal content of the ores from assays, allowance has been made for smelting losses of both lead and zinc. In comparing the values of concentrate ("ore") and metal, it should be borne in mind that the value given for the concentrate is that actually received by the producer, whereas the value of the lead and zinc is calculated from the average price for all grades.

TABLE 14.—Tenor of lead and zinc ore milled and concentrates produced, 1954-55

	1954	1955
Total material milledshort ton Recovery of concentrate and metal from material milled:	s 2, 754, 373	3, 007, 23
Galena. do Sphalerite de de Galena do Galena de Sphalerite de de Galena de	t 0.69 3.07	19, 55, 78, 72 0, 6 2, 6
Dead		0. 4 1. 3 73. 7 57. 3
Galena concentrate	\$168.08 \$64.74	\$172. 2 \$76. 1

<sup>&</sup>lt;sup>1</sup> 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 15.—Mine production of lead and zinc in 1955, by months, in terms of recoverable metals

Month	Lead (short (tons)	Zine (short tons)	Month	Lead (short tons)	Zine (short tons)
January February March April May June July	1, 225 1, 197 1, 298 1, 363 1, 251 1, 199 981	3, 528 3, 230 3, 645 3, 829 3, 619 3, 491 3, 120	August September October November December Total	1, 060 1, 107 1, 099 1, 179 1, 167	3, 580 3, 634 3, 422 3, 304 3, 141 41, 543

#### TRI-STATE DISTRICT

The Tri-State district of Oklahoma, Kansas, and Southwest Missouri produced 4,140,281 tons of crude ore in 1955, compared with 4,092,278 tons in 1954. This ore yielded 26,992 tons of lead concentrate (including 44 tons from old tailings remilled), containing 19,679 tons of recoverable lead; and 131,026 tons of zinc concentrates (including 2,736 tons from old tailings remilled), containing 69,696 tons of recoverable zinc. Lead-concentrate recovery was up 10 percent and zinc-concentrate recovery up 3 percent from 1954. Oklahoma supplied 72 percent of the district's lead concentrate and 60 percent of the zinc concentrate, Kansas 27 percent of the district's lead concentrate and 39 percent of its zinc concentrate, while Southwest Missouri was responsible for less than 1 percent of the district's lead concentrate and 1 percent of its zinc concentrate. The district's combined lead-zincconcentrate recovery of 3.41 percent in 1955 compared with a combined lead-zinc-concentrate recovery of 3.69 percent in 1954.

About 55 mining properties were operating in the Tri-State district in 1955, and most of the output was being concentrated in 4 large mills. Through September 1955, 2,825,208 tons was treated with a metallic recovery of 1.90 percent zinc and 0.55 percent lead. Most of the production comes from mines operated by Eagle-Picher Co., National Lead Co., and American Zinc Co., all of which employ trackless mining methods.

TABLE 16.—Quoted prices of 60-percent zinc concentrate and 80-percent lead concentrate at Joplin, Mo., in 1955 1

Zinc concentrate	Lead concentrate		
Week ended—	Price per short ton	Week ended-	Price per short ton
Jan. 4-Apr. 4 Apr. 12-June 14 June 21-Sept. 5 Sept. 14-Dec. 27	\$68 72 76 80	Jan. 4–Sept. 21 Sept. 27–Dec. 27	\$187.85 195.05

<sup>1</sup> E&MJ Metal and Mineral Markets.

TABLE 17.—Mine production of lead and zinc concentrates in the Tri-State district, 1946-50 (average) and 1951-55

	Lead concentrate		Zinc concentrate		Recoverable metal content			
		alena)			Lead		Zine	
	Short	Value	Short	Value	Short tons	Value	Short tons	Value
1946-50 (average) 1951 1952 1953 1954	36, 140 36, 300 36, 333 17, 403 24, 497	\$6, 700, 330 7, 720, 550 7, 388, 754 2, 715, 987 4, 127, 232	183, 916 170, 263 167, 474 102, 821 127, 053	\$18, 236, 352 21, 023, 818 19, 537, 949 7, 455, 540 8, 483, 611	27, 309 26, 906 27, 356 13, 273 18, 314	\$7, 975, 188 9, 309, 476 8, 808, 632 3, 477, 526 5, 018, 036	98, 480 91, 553 90, 512 55, 729 64, 322	\$25, 066, 092 33, 325, 292 30, 049, 984 12, 817, 670 13, 893, 552
1955: Kansas Southwest Missouri Oklahoma	7, 362 1 75 5 19, 555	1, 352, 876 12, 750 3, 368, 713	51, 252 2 1, 048 678, 726	3, 980, 849 74, 528 5, 997, 071	5, 498 <sup>3</sup> 55 <sup>7</sup> 14, 126	1, 638, 404 16, 390 4, 209, 548	27, 611 4 542 8 41, 543	6, 792, <b>3</b> 06 133, 332 10, 219, 578
Total: 1955	26, 992	4, 734, 339	131, 026	10, 052, 448	19, 679	5, 864, 342	69, 696	17, 145, 216

TABLE 18.—Tenor of lead and zinc ore milled and concentrates produced in Tri-State district, 1951-55

	1951	1952	1953	1954	1955
Total material milled: Crude ore	5, 990, 100 746, 673	6, 140, 155 604, 350	3, 454, 980	4, 092, 278 18, 000	4, 140, 281 486, 280
material milled:  Galenapercent _  Sphaleritedo  Lead 'do	0. 54 2. 53 . 40 1. 36	0.54 2.48 .41 1.34	0.50 2.98 .38 1.61	0.60 3.09 .45 1.56	0. 58 2. 83 . 43 1. 51
Average lead content of galena concentrate percent	75. 62	76. 79	77.81	76. 28	74. 41
Average zinc content of sphalerite concentratepercent	59. 74	60.04	60. 22	56. 24	59. 09
Average value per ton: Galena concentrate Sphalerite concentrate	\$212. 69 \$123. 48	\$203.36 \$116.66	\$156.06 \$72.51	\$168. 48 \$66. 77	\$175. 40 \$76. 72

<sup>&</sup>lt;sup>1</sup> Figures represent metal content of the crude ore (dirt) only insofar as it is recovered in the concentrate. Data on tailing losses not available.

<sup>1</sup> Includes 5 tons from old tailing remilled.
2 Includes 217 tons from old tailing remilled.
3 Includes 3 tons from old tailing remilled.
4 Includes 105 tons from old tailing remilled.
5 Includes 39 tons from old tailing remilled.
6 Includes 2,519 tons from old tailing remilled.
7 Includes 24 tons from old tailing remilled.
8 Includes 1,281 tons from old tailing remilled.

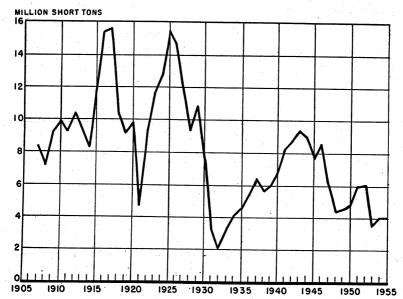


FIGURE 1.—Quantity of crude ore (rock) milled in the Tri-State district, 1907-55.

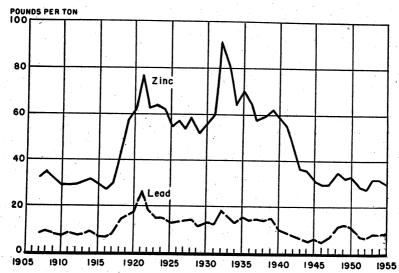


FIGURE 2.—Metal recovered per ton of crude ore (rock) milled in the Tri-State district, 1907-55.

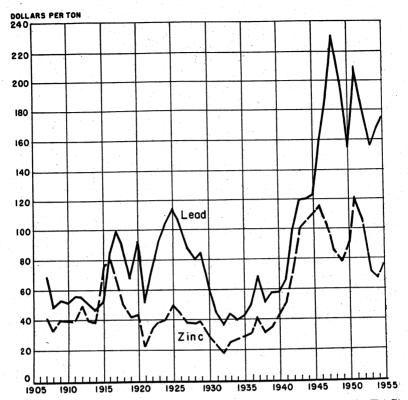


FIGURE 3.—Average prices received by sellers per ton of concentrate in the Tri-State district, 1907-55.

A production cut was announced by American Zinc, Lead & Smelting Co., at Picher, Okla., where operations were to be resumed on a re-The company stated that the properties could not be operated economically at present because of low-grade ore and excessive operating expenses.

Five churn drills, the smallest number in the past 65 years, were

engaged in exploration in the Tri-State district.

Three zinc retort smelters in Oklahoma operated in 1955. were American Metals Co., Ltd., at Blackwell, Kay County; Eagle-Picher Co., at Henryetta, Okmulgee County; and National Zinc

Co., at Bartlesville, Washington County.
Uranium.—The Atomic Energy Commission completed preliminary investigations of 4 uranium strikes northeast of Foss in Custer County, 2 near Cheyenne in Roger Mills County, and 1 south of Clinton in Washita County. A small uranium boom developed in Tulsa, with discovery of uranium ore in the sands of the Arkansas River. An assay sample from one claim was reported to be of commercial quality.

#### **NONMETALS**

Nonmetallic minerals produced in Oklahoma reached a new record value of \$31.6 million in 1955, surpassing by 20 percent the old record of \$26.3 million established in 1954. Increased construction activity and new plants manufacturing diverse nonmetallic products explained the new production records.

Commodities that established individual alltime high values in

1955 were cement, gypsum, sand and gravel, stone, and lime.

Cement.—Cement was the leading product in terms of value of the nonmetals produced in Oklahoma in 1955. Two plants, at Dewey in Washington County and Ada in Pontotoc County, reported a combined 20-percent increase in output in 1955, which established a new

production record.

Clays.—Oklahoma has extensive clay resources. Production in 1955 was used primarily in manufacturing brick and tile, and to a smaller extent in manufacturing portland cement and lightweight expanded-clay products. Brick and tile were produced in Creek, Custer, Garfield, Greer, Oklahoma, Pittsburg, Pontotoc, Seminole, and Tulsa Counties. Bentonite was produced in Dewey County. Expanded lightweight aggregate was made from clay in Tulsa and Oklahoma Counties.

TABLE 19.—Clays sold or used by producers 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	511, 614	\$392, 932	1953	577, 556	\$637, 082
1951	551, 144	561, 644	1954	452, 050	1, 282, 848
1952	520, 050	577, 420	1955	724, 156	726, 856

Clays sold or used in 1955, including clays used for cement, totaled 724 thousand tons valued at \$727 thousand—a 60-percent increase

in tonnage compared with 1954.

An almost inexhaustible deposit of clay suitable for the manufacture of brick was discovered near Ponca City, Kay County, Okla., according to the Oklahoma School of Geology. United Brick & Tile Co., Oklahoma City was constructing a new plant to replace the existing one. Chandler Materials Co. was producing daily 120 cubic yards of expanded shale aggregate at its Garnett plant 12 miles east of Tulsa. This was the second lightweight-aggregate plant in Oklahoma.

Gypsum.—Alltime high tonnage and value of gypsum was recorded in Oklahoma in 1955, in response to continued higher demands for wallboard, plasters, and portland cement. All production was from Blaine County, where United States Gypsum Co. operated a plant and quarries at Southard, Universal Atlas Cement Co. operated a quarry near Watonga, and S. A. Walton & Sons a quarry near Southard.

Lime.—A 39-percent increase in lime production in Oklahoma was reported for 1955. Part of the increase resulted from restoration of operations after the period of conversion in 1954 from quarrying to underground mining by St. Clair Lime Co. in Sequoyah County.

Salt.—Output of salt, reported by 3 producers in 3 counties, increased 12 percent in 1955. At Sayre, Beckham County, salt continued to be produced by injecting fresh water through wells into a salt bed and recovering the brine for suface evaporation. In Woods County salt was produced from surface encrustations on the Big Salt Plain of the Cimarron River; in Harmon County it was recovered by solar evaporation of brine from springs. Principal uses were for stock food and for recharging water softeners.

and for recharging water softeners.

Sand and Gravel.—Sand and gravel deposits, suitable for concrete aggregate and road surfacing, occur along and adjacent to most of the larger streams in Oklahoma. Production was reported from 51 counties in the State in 1955. Johnston, Tulsa, Oklahoma, Muskogee, Murray, and Logan were the leading counties, supplying half of the total value.

Most sand and gravel produced in Oklahoma was used for paving concrete and mortar. Second in tonnage and value was high-purity glass sand, produced at three plants in the Arbuckle Mountain district. In addition to glass manufacturing, a small part of this high-purity

sand was used as foundry sand and for making sodium silicate.

Sand and gravel (including glass sand) produced in Oklahoma during 1955 amounted to 6.3 million tons valued at \$4,786,000.

TABLE 20.—Sand and gravel sold or used by producers, 1946-50 (average) and 1951-55

na katawa Maria	Commercial		Governn contr		Total		
Year	Short tons	Value	Short tons	Value	Short tons	Value	Average value per ton
1946-50 (average)	1, 481, 589 2, 164, 382 2, 353, 559 2, 997, 504 3, 210, 890 3, 654, 173	\$1, 135, 070 2, 103, 710 2, 209, 098 2, 927, 681 3, 379, 576 3, 719, 267	810, 380 1, 018, 869 1, 416, 104 2, 013, 862 2, 213, 241 2, 639, 625	\$273, 505 217, 943 702, 747 1, 330, 904 885, 455 1, 066, 519	2, 291, 969 3, 183, 251 3, 769, 663 5, 011, 366 5, 424, 131 6, 293, 798	\$1, 408, 575 2, 321, 653 2, 911, 845 4, 258, 585 4, 265, 031 4, 785, 786	\$0.6 .7: .7' .8 .7'

Stone.—Oklahoma stone producers in 1955 reported an output of 10.9 million tons of crushed limestone, crushed and dimension granite, dimension sandstone, dimension limestone, and crushed sandstone. The reported value—\$12.3 million—was a one-third gain over 1954. Production was reported from 32 counties, with Tulsa, Comanche, Murray, and Ottawa producing the major stone tonnage. Crushed limestone, reported by 37 of the 63 stone producers in 1955, was used primarily for concrete and road construction.

Chat.—"Chat" is the term used in the West Central States to denote the coarse tailing obtained in milling zinc and lead ores. The 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 1955 operators reported 38 percent less tonnage than in 1954.

Granite.—The dimension-granite industry of Oklahoma was centered in the Wichita Mountain district, in the southwestern part of the State, where seven producers operated quarries in Comanche, Greer, Johnston, and Kiowa Counties in 1955.

TABLE 21.—Stone sold or used by producers, 1951-55, by kinds

Year	Granite		Lime	estone	Sandstone	
	Short tons	Value	Short tons	Value	Short tons	Value
1951 1952 1953 1954 1955	4, 267 5, 337 6, 862 11, 022 576, 187	\$527, 500 511, 073 702, 250 665, 753 1, 276, 088	4, 765, 419 1 6, 355, 780 5, 654, 022 1 2 6, 974, 697 2 8, 828, 730	\$5, 279, 311 1 6, 940, 219 6, 029, 258 1 2 7, 527, 413 2 10, 139, 700	146, 317 1, 350 228, 897 160, 883 236, 778	\$213, 625 11, 300 137, 407 233, 469 275, 702

Year	Other	stone	Total	
	Short tons	Value	Short tons	Value
1951 1952 1953 1954 1955	2, 050, 673 3, 274, 008 2, 600, 213 2, 092, 209 1, 291, 660	\$897, 112 1, 511, 742 1, 061, 822 720, 360 603, 784	6, 966, 676 1 9, 636, 475 2 8, 489, 994 1 2 9, 238, 811 2 10, 933, 355	\$6, 917, 548 1 8, 974, 334 2 7, 930, 737 1 2 9, 146, 995 2 12, 295, 274

Production was from Pre-Cambrian granites, which are predominantly pink and red. The granite was used mostly for monumental stone and partly for exterior trim. Much of the stone was finished in plants in the Wichita Mountains, and some was shipped as rough rock to other States. In 1955, granite production was

reported to be 6,187 tons with a value of \$420,188.

Limestone and Dolomite.—Limestone or dolomite was produced from quarries in 25 counties; the greatest production was from Tulsa, Comanche, and Murray Counties. Chemical-grade limestone was quarried at Marble City in Sequoyah County for lime making and for a flux in glass manufacturing, fertilizers, and mineral feeds. Dimension limestone was quarried for building stone in the Arbuckle Mountains in Pontotoc County and near Eldorado in Jackson County; limestone for portland cement was quarried in Washington and Pontotoe Counties.

Sandstone.—Dimension sandstone produced in Oklahoma was used for building and veneer stone in building construction. The stone was cut in slabs 11/2 to 6 inches thick from shallow, open-face quarries in Pushmataha, Okmulgee, Sequoyah, and Mayes Counties. proximately 1,000 tons valued at \$13,000 was produced in 1955.

(Stone, Crushed Government-and-Contractor).—Stone crushed by municipal, county, and State agencies included limestone and sand-

stone obtained from local quarries throughout the State.

Sulfur.—Increases of 25 percent in both tonnage and value of sulfur, produced from waste natural gases by Joe L. Parker at Madill, Marshall County, was reported in 1955.

<sup>&</sup>lt;sup>1</sup> Excludes dimension limestone.
<sup>2</sup> Includes limestone used in cement and lime.

Tripoli.—Tripoli, mined in eastern Ottawa County in 1955, showed a 40-cent gain over that produced in 1954. All tripoli mined was shipped to Seneca, Mo., where it was processed by American Tripoli Corp. and sold chiefly for buffing compounds and foundry use.

#### REVIEW BY COUNTIES

Production of metals, nonmetals, and mineral fuels in 1955 was reported from 76 of the 77 counties in Oklahoma. Roger Mills was the only nonproducing county.

Adair.—Sand and gravel was produced for highway use.

Alfalfa.—A small quantity of petroleum was produced from the McWillie, Northfield, and three oil-discovery wells were completed in the county in 1955. Construction sand and gravel was produced by Earl Kirkpatrick; other sand and gravel was produced by the county and State highway departments.

Atoka.—Limestone was crushed at the Southwest Stone Co. quarry near Stringtown for use as railroad ballast, road base, and aggregate in concrete. A small quantity of petroleum was produced west of

Wesley, and one oil-discovery well was completed.

Beaver.—Everett Bush quarried construction sand from a pit east of Beaver City. Petroleum and natural gas were produced mainly from the Greenough, Floris, Camp Creek, and Light fields. Explora-

tory drilling proved 12 oil and 15 gas wells.

Beckham.—Salt was produced from wells southwest of Sayre by Oklahoma Salt Industries, Inc. Petroleum and natural gas were produced from four fields, but mostly from the Elk City field. Naturalgas liquids were produced by Shell Oil Co. Two oil-discovery wells were completed.

TABLE 22.—Value of mineral production in Oklahoma, 1954-55, by counties 1

County	1954	1955	Minerals produced in 1955 in order of value
Adair		(2) \$50, 222	Sand and gravel.
Alfalfa	\$68,016	\$50, 222	Sand and gravel, petroleum.
Atoka	416, 480	289, 871	Stone, sand and gravel, petroleum.
Beaver	1, 164, 768	2, 148, 831	Natural gas, petroleum, sand and gravel.
Beckham	16, 580, 523	26, 060, 772	Petroleum, natural-gas liquids, natural gas, salt.
Blaine		(2)	Gypsum.
Bryan		2, Ò16, 431	Petroleum, sand and gravel, stone, natural gas.
Caddo	13, 316, 836	13, 887, 291	Petroleum, natural gas, natural-gas liquids, stone, sand and gravel.
Canadian	489, 252	353, 414	Petroleum, natural gas, sand and gravel.
Carter		58, 949, 629	Petroleum, natural-gas liquids, natural gas.
Cherokee		(2)	Sand and gravel.
Choctaw		(2)	Do.
Cimarron		1, 447, 760	Natural gas, petroleum, sand and gravel.
Cleveland		7, 947, 487	Petroleum, natural gas, natural-gas liquids.
Coal		2, 205, 728	Petroleum, stone, natural gas, coal.
Comanche	1, 843, 856	2, 550, 103	Stone, petroleum, natural gas.
Cotton		4, 813, 058	
Craig		110, 753	Coal, petroleum, natural gas.
Creek		31, 276, 145	Petroleum, natural-gas liquids, natural gas, stone clays, sand and gravel.
Custer	(2)	(2)	Clays.
Delaware		(2) (2) (2)	Sand and gravel.
Dewey		(2)	Bentonite.
Ellis		(2)	Sand and gravel.
Garfield		7, 278, 812	Petroleum, natural-gas liquids, natural gas, clays
Garvin		81, 626, 943	Petroleum, natural-gas liquids, natural gas, sand and gravel.

See footnotes at end of table.

TABLE 22.—Value of mineral production in Oklahoma, 1954-55, by counties 1—Continued

· .		***************************************	Johnned
County	1954	1955	Minerals produced in 1955 in order of value
Grady	\$8, 715, 251	\$16, 735, 306	
Grant	1,821,866	1, 783, 855	and gravel. Petroleum, natural gas.
Greer	108, 583	189, 002	Petroleum, stone, sand and gravel, clays.
Harmon	-1 153, 865	174, 122	Natural-gas liquids, salt.
Harper	1 20 920	174, 122 25, 935	Natural gas, sand and gravel, petroleum, stone.
Haskell Hughes	- 2, 795, 944	4, 189, 584 12, 822, 773	Coal, sand and gravel, natural gas.
Hughos	- 14, 676, 018	12, 822, 773	Petroleum, natural gas, natural-gas liquids, sand
Jackson	1, 570, 295	1, 964, 499	and gravel. Petroleum, stone, natural gas.
Jefferson	2, 552, 028	2, 362, 831	Petroleum, natural gas.
Johnston		1, 278, 097	Stone. sand and gravel.
Kay	,,	12, 519, 079	sand and gravel.
Kingfisher	1, 422, 910	1, 146, 063	Felfoleum, nathral gas, sand and gravel
Kiowa Latimer		965, 988	Stone, petroleum, sand and gravel, natural gas.
LeFlore	- (2) - 2, 435, 493	315, 801	
Lincoln	25, 622, 697	24, 268, 790	Coal, natural gas, stone, sand and gravel. Petroleum, natural gas, natural-gas liquids, stone.
Logan	10, 706, 827	2, 102, 590 24, 268, 790 10, 347, 395	Petroleum, natural gas, natural-gas inquius, stone.  Petroleum, natural gas, natural-gas inquius, stone.  and gravel.
Love		534, 706	Petroleum.
Major	3, 075, 292	534, 706 2, 865, 231	Petroleum, natural-gas liquids, natural gas, sand
Marshall	5, 203, 540	5, 694, 620	and gravel.  Petroleum, natural-gas liquids, natural gas, recove
Mayes	9 507	115 940	I ered shiffer sand and graval
McClain	8, 507 6, 501, 884	115, 346 6, 570, 047 254, 370 628, 929	Sand and gravel, stone, petroleum. Petroleum, natural gas.
McCurtain	.  (2)	254, 370	Sand and gravel, stone.
McIntosh	. 527, 590	628, 929	Coal, petroleum, natural gas, sand and gravel.
Murray	1, 756, 737	1 2,007,591	Stone, sand and gravel, asphalt (native), petroleum.
Muskogee Noble	1, 209, 415 7, 974, 173	1, 492, 850	Stone, sand and gravel, asphalt (native), petroleum. Petroleum, sand and gravel, coal, natural gas. Petroleum, natural gas, natural-gas liquids, sand
110010111111111111111111111111111111111	1, 814, 118	8, 871, 939	and gravel.
Nowata	11, 882, 474	13, 683, 708	Petroleum, stone, natural gas.
Okfuskee	12, 140, 945	11, 971, 541	Petroleum, natural gas, natural-gas liquids, sand
Oklahoma	05 055 550		and gravel.
Oklanoma	35, 375, 750	35, 248, 226	Petroleum, natural-gas liquids, natural gas, sand
Okmulgee	6, 217, 827	7, 680, 766	and gravel, clays.  Petroleum, coal, natural-gas liquids, natural gas, stone, sand and gravel.
Osage	36, 825, 130	56, 223, 179	Petroleum, natural-gas liquids, natural gas, stone, sand and gravel.
Ottawa		15, 153, 134	Zinc, lead, stone, tripoli,
Pawnee	6, 252, 247	6, 845, 128	Zine, lead, stone, tripoli. Petroleum, sand and gravel, natural-gas liquids,
Payne	10 041 010	10.000.100	naturai gas.
		13, 386, 137	Petroleum, natural gas, natural-gas liquids, stone, sand and gravel.
Pittsburg Pontotoc	2, 299, 336 20, 005, 511	2,014,983	Coal, stone, natural gas, sand and gravel, clays.
1 0410100	20,000,011	19,631,267	Petroleum, cement, natural-gas liquids, stone, sand and gravel, natural gas, clays.
Pottawatomie	12, 632, 486	12,830,112	Petroleum, natural-gas liquids, natural gas, sand
Puchmataha	<b>(1)</b>		and gravel.
Pushmataha	4, 327, 285	222, 750 4, 720, 823	Sand and gravel, stone.
RogersSeminole	31, 204, 639	33, 293, 324	Coal, petroleum, clays, natural gas. Petroleum, natural-gas liquids, natural gas, stone,
			clays.
Sequoyah	1, 387, 489 70, 163, 129	1,506, 971 57,929, 516	Lime, coal, stone, sand and gravel, natural gas.
Stephens Texas	70, 163, 129	57,929,516	Petroleum, natural-gas liquids, natural gas
1 CAGO	24, 648, 657	21,584, 128	Natural gas, natural-gas liquids, petroleum, sand and gravel, stone.
Tillman	643, 071	862, 774	Petroleum, sand and gravel.
Tulsa	6, 381, 912	6,523,799	Petroleum, stone, sand and gravel, clays, natural
Waganar			gas .coal. natural-gas liquids
Wagoner Washington	754, 686	1,108, 834	Petroleum, sand and gravel, stone, natural gas, coal.
Washita	16, 288, 538 1, 070, 917	20,811,697	retroieum, cement, stone, clays, natural gas.
Woods	31, 989	20,811,697 1,780,224 787,314	Petroleum, natural gas.  Natural gas, petroleum, sand and gravel, salt.
Woods Woodward	(2)	(Z) (	Sand and gravel.
Various Undistributed	284, 141	ì78, 098	Stone.
ondistributed	2, 067, 513	1,616,771	
Total 3	650, 205, 000	711,089,000	
		, ,	

Roger Mills County not listed because no production was reported.
 Included with "Undistributed" to avoid disclosing individual company confidential data.
 Total has been adjusted to avoid duplicating the value of clays and stone.

Blaine.—Gypsum was produced from quarries and crushed at plants at Southard by U. S. Gypsum Co. Northeast of Watonga, it was produced by Universal Atlas Cement Co. and west of Okeene by S. A. Walton & Sons. U. S. Gypsum Co. also operated a large

calcining, sheet-rock, and plaster plant at Southard.

Bryan.—Construction sand and gravel was produced from the pits of M & K Sand & Gravel Co. near Colbert by C. R. Scoval north of Durant and by H. C. Rustin Sand & Gravel Co. Petroleum and natural gas were produced from the Aylesworth, Southeast, field. Seven exploratory wells all proved dry. Government-and-contractor crushed stone was produced for highway use.

Caddo.—Petroleum and natural gas were produced from three Cement, the largest of these fields, produced 4.1 million barrels of oil in 1955. One oil-discovery well was completed. gas liquids were produced by the Apache Gasoline Co. Construction sand and gravel was produced for construction purposes by three operators and for highways by the State highway department. was crushed for highway purposes by Amis Construction Co.

Canadian.—Petroleum and natural gas were produced only from the Edmond, West, field. Construction sand and gravel was pro-

duced by Tindel Material Co.

Carter.—Carter County ranked second in the value of minerals and mineral fuels produced in the State. Petroleum and natural gas were produced from 20 fields, of which Fox-Graham, Healdton, Hewitt, Sholem-Alechem, and Tatums were the largest. Natural-gas liquids were produced by Magnolia Petroleum Co., Shell Oil Co., Signal Oil & Gas Co., and Harry Ells, Inc. Nine oil-discovery wells were completed in 1955.

Cimarron.—Petroleum and natural gas were produced from 2 fields in the Keys area, and 2 gas-discovery wells were drilled. Construction sand and gravel was produced northwest of Boise City by

Two gas-discovery wells were completed. Jack Parker.

Cleveland.—Petroleum and natural gas were produced from 19 elds. Natural-gas liquids were produced by Sun-ray Mid-Continent Petroleum Corp. Five exploratory wells proved oil productive.

Coal.—Petroleum and natural gas were produced from five fields. The Dolese Bros. Co. operated a crusher and limestone quarry near Coal was strip-mined by Dunn Fuel & Lumber Co. in

1955. Three exploratory wells proved oil productive.

Comanche.—Unfinished dimension granite was quarried in the western part of the county by Ira Smith & Son Granite Co., and crushed limestone was produced by Dolese Bros. Co. from its Richard Spur quarry north of Lawton. Petroleum and natural gas were produced from a group of small fields, comprising three districts and the Fort Sill Reservation field. Three oil-discovery wells were drilled.

Cotton.—Petroleum and natural gas were produced from a group of fields in the Walters and Cache Creek districts and from five other A small quantity of construction sand and gravel was pro-

duced by the Morris Weryavah and Robert Sims.

Craig.—Coal was strip mined at two pits of Patch Coal Co.

quantities of petroleum and natural gas were produced.

Creek.—Petroleum and natural gas were produced from 51 fields; of these, the prolific Cushing and Glenn fields accounted for 4.8 million barrels of petroleum during the year. Natural-gas liquids were recovered by plants of Sinclair Oil & Gas Co., Kerr-McGee Oil Industries, Inc., Pure Oil Co., Gulf Oil Corp., and The Texas Co. Clay for manufacturing brick and tile was produced at the Sapulpa plant of Sapulpa Brick & Tile Co.; for pottery, it was produced at Sapulpa by Frankhoma Pottery Co. A small quantity of sand and gravel was produced for highway purposes. Four oil-discovery wells and one gas-discovery well were drilled.

Garfield.—Petroleum and natural gas were produced from 26 fields. Natural-gas liquids were produced by Sterling Oil Co. of Oklahoma near the East Spring Valley field. A 5,000-barrel-per-day Platformer was placed in operation at the Enid refinery of Champlin Refining Davies Brick & Tile Co. continued to produce clay for manufacturing brick at its quarry south of Enid. Exploratory drilling

accounted for oil production at four wells.

Garvin.—Garvin County moved to first position in the value of minerals and mineral fuels produced in the State. Petroleum and natural gas were produced from 44 fields, which produced 73.4 million barrels of oil in 1955. Natural-gas liquids were recovered by Sohio Petroleum Co., Lone Star Gas Co., Otha H. Grimes, and Warren Petroleum Co. Construction sand and gravel was obtained from deposits east of Pauls Valley by Elmer Long and by Lamar Lawson. Government-and-Contractor sand and gravel was produced for highways. Exploratory drilling proved productive at 17 oil wells and 1 gas well.

Grady.—Petroleum and natural gas were produced from 11 fields. Natural-gas liquids were recovered by Magnolia Petroleum Co. Five exploratory wells proved oil productive. Construction sand and gravel was obtained from pits near Tuttle by Dolese Bros. Co.

Grant.—Petroleum and natural gas were produced from 10 fields. Exploratory drilling resulted in the discovery of oil in 5 wells and gas

in 2 wells.

Greer.—Granite was quarried by the Granite Monument Works near the town of Granite. Clay was produced from the pit of Mangum Brick & Tile Co. south of Mangum. Construction sand and gravel was produced by D. J. Cox, J. G. Dillahunty, Granite Gravel Co., and S. D. Vaughn. Petroleum was produced from the Lake Creek oilfield.

Harmon.—Natural-gas liquids were recovered by the Lone Star Gas Co. Salt was produced by W. W. Flowers & Sons by solar

evaporation of brine from salt springs.

Harper.—Small quantities of petroleum, natural gas, and stone were produced. Sand and gravel was produced for highways.

1 oil well and 1 gas well drilled proved productive.

Haskell.—Haskell County ranked first in value of coal produced. Coal was mined underground by Lone Star Steel Co. and Dock Coal Co.; strip-mined by Garland Coal Mining Co., Cedar Creek Coal, Sallisaw Stripping Co., Cary Contracting Co., and Choctaw Coal Co., Inc. Five operations were underground. Natural gas was produced from the Quinton and Kinta districts. One exploratory oil well was completed.

Hughes.—Petroleum and natural gas were produced from 39 fields. The Holdenville, East, field, discovered in 1946, produced 1.5 million barrels of oil. Natural-gas liquids were recovered by Grimes Gasoline Co. Exploratory drilling explained the discovery of oil in 9

wells and gas in 2.

Jackson.—Petroleum and natural gas were produced from five fields southeast of Altus. Dimension limestone was quarried by Eldorado Building Stone Co., and granite was crushed by the United States Air Base at Altus.

Jefferson.—Petroleum and natural gas were produced from eight fields: Asphaltum; Headton; Oscar; Oscar, North; Ringling, North; Seay; Spring; and Woodrow. Four wells were drilled and found oil

productive.

Johnston.—Pennsylvania Glass Sand Corp. of Oklahoma continued to produce glass sand and ground silica from pits north of Mill Creek. Claud Lamb produced construction sand from a pit east of Tishomingo. Government-and-contractor sand and gravel was produced for highways. The Rock Products Manufacturing Corp. produced crushed dolomite from its quarry near Troy. One gas well was discovered.

Kay.—Petroleum and natural gas were produced from 29 fields, and natural-gas liquids were recovered by Cities Service Oil Co. At Ponca City, Continental Blacks, Inc., operated its new \$2,750,000 carbon-black plant. Cities Service Gas Co. completed a 26-inch gas pipeline from Blackwell to a station near Independence, Kans. Crushed limestone was produced by Cookson Stone Co. from its quarry northeast of Ponca City and by Mervine Stone Co. Near Blackwell, sand and gravel was produced by the Midwest Concrete Supply Co. and Blackwell Sand & Gravel Co. Another producer was Otoe Sand & Gravel Co. Exploratory drilling resulted in the discovery of eight oil wells. American Metal Co., Ltd., zinc smelter at Blackwell successfully tested its new charging machines.

Kingfisher.—Construction sand and gravel was produced from pits near Dover by Dolese Bros. Co. Petroleum and natural gas were produced from three fields: Cashion, northwest; Dover, southwest;

and Edmond, west.

Kiowa.—Dimension granite was quarried near Snyder by Century Granite Co. and by the Roosevelt Granite Co. Near Mountain Park granite was quarried by J. P. Gilman Granite Co. and Wichita Granite Co. Crushed granite also was produced. Construction sand and gravel was produced by Lugert Sand & Gravel Co. and Southwest Sand Co. Petroleum and natural gas were produced from nine fields. One oil-discovery well was drilled.

Latimer.—Coal was strip-mined by Kinta Stripping Co. and mined underground by Limestone Prairie Coal Co. Natural gas was pro-

duced from the Red Oak and Morris fields.

Le Flore.—Coal was mined by 10 operators, 4 using strip mining and the rest underground mining. The county was the fourth leading coal producer in the State. Crushed sandstone was produced by Dixie Material Co., Inc.; contractor sand and gravel was produced for highway surfacing. Natural gas was produced mainly from three fields

Lincoln.—Petroleum and natural gas were produced from 71 fields, of which the East Payson produced about 918,000 barrels in 1955. Natural-gas liquids were produced by Highway Gasoline Co., The Texas Co., Magnolia Petroleum Co., and Moran Gasoline Corp.

Extensive exploratory drilling in the county resulted in the discovery of oil in 20 wells and gas in 1 well. Crushed sandstone was produced for highways.

Logan.—Petroleum and natural gas were produced from 41 fields, and natural-gas liquids were recovered by the Eason Oil Co. Eight oil wells and one gas well were drilled and found productive. Construction sand was produced by John McConnel and Dolese Bros. Co.

Major.—Petroleum and natural gas were produced from the Ringwood and Seiling, Northeast, fields. Natural-gas liquids were recovered by Warren Petroleum Co. at Ringwood. Construction sand and gravel was produced near Cleo Springs by Orin Sand Pit, Concho Sand & Gravel, and Orin Law; other sand and gravel was produced for highways.

Marshall.—Petroleum was produced from 6 fields, of which the Cumberland field supplied 1.8 million barrels. The Warren Petroleum Corp. and Universal Gasoline Co. recovered natural-gas liquids. Sulfur from waste sour gas was recovered by Joe E. Parker plant east of Madill. Eight oil wells were found productive. Sand and gravel was produced for highways.

McClain.—Petroleum and natural gas were produced from 27 fields and exploratory drilling accounted for oil production in 4 wells.

McIntosh.—Coal was strip-mined by Leavell Coal Co. Petroleum and natural gas were produced from the Coalton and Morris fields. Sand and gravel was produced for highways.

Murray.—Asphaltic limestone and sandstone were produced near Dougherty by Southern Rock Asphalt Co. Limestone was crushed at Rayford and Big Canyon quarries of Dolese Bros. Co., and construction gravel was produced by Makins Sand & Gravel Co. near Dougherty. Glass sand was produced by the Oklahoma Glass Sand Corp. Petroleum was produced from the Sulphur, Northwest, field. Two oil-discovery wells were completed.

Muskogee.—Petroleum and natural gas were produced from 12 fields. Sand and gravel was pumped from the Arkansas River north of Muskogee by Yahola Sand & Gravel Co. Coal was strip-mined by Bill Rogers.

Noble.—Petroleum and natural gas were produced from 27 fields, and natural-gas liquids were recovered by the Lucien unit plant of the Gasoline Plant Management Co. Sand and gravel was produced by the Noble County Highway Department. Eleven oil-discovery wells and one gas-discovery well were completed.

Nowata.—Petroleum and natural gas were produced from six fields. Crushed limestone was produced by Peerless Rock Co.

Okfuskee.—Petroleum and natural gas were produced from 72 fields, of which the Olympic field furnished 2.7 million barrels of oil in 1955. Natural-gas liquids were recovered by two plants of C. W. and C. H. Grimes. Three oil-discovery wells were drilled.

Oklahoma.—Petroleum and natural gas were produced from 23 fields, of these, Oklahoma City and West Edmond each had oil production that exceeded 1 million barrels. Natural-gas liquids were recovered by Patton & Swab, Inc., Phillips Petroleum Co., and Cities Service Oil Co. Clay was obtained from pits in the west part of Oklahoma City by the Acme Brick Co. and the United Brick & Tile Co. for the manufacture of brick and tile. Near Choctaw clay

for lightweight aggregate was produced by the Oklahoma Lightweight Aggregate Co. Construction sand was produced north of Oklahoma City by Dolese Bros. Co.; east of Oklahoma City, construction sand and gravel was produced by Vinsonite Sales Co. and Sizemore Sand & Gravel Co. Paving sand was produced by Steelman Construction Co. Other sand and gravel was produced by the State highway

department. Four oil-discovery wells were completed.

Okmulgee.—Coal was mined near Henryetta by Starr Coal Co., Carbon Hill Coal Co., Ben Hur Coal Co., and McGinnis & Grafe, Inc. The Ben Hur coal mine, 1½ miles northeast of Henryetta, was reopened during August, 1955. Petroleum and natural gas were produced from 27 fields, and natural-gas liquids were recovered by Phillips Petroleum Co. Two oil-discovery wells were drilled. A sandstone quarry was operated near Henryetta by the Ada Stone Co. Sand and gravel was produced for highways.

Osage.—Osage, the fourth leading oil-producing county, produced oil and gas from 127 fields. The Burbank field, with a production of 10.1 million barrels of oil, remained the most prolific. Natural-gas liquids were recovered by Phillips Petroleum Co., Skelly Oil Co., Neal Gasoline Co., and Sunray Oil Corp. Limestone was quarried and crushed east of Burbank by the Burbank Rock Co. Nineteen

exploratory wells proved oil productive.

Ottawa.—All of Oklahoma's lead and zinc output and a major part of the Tri-State district's output was supplied from 52 operating mines in Ottawa County. Chat, a byproduct of zinc and lead milling, was supplied by four producers. Tripoli was quarried in east central Ottawa County by the American Tripoli Co. and processed in its plant at Seneca, Mo. One exploratory well proved oil productive.

Pawnee.—Petroleum and natural gas were produced from 28 fields, and natural-gas liquids were recovered by Frame Natural Gasoline Co. Construction sand and gravel was produced near Cleveland by Osage Sand Co. and near Ralston by Ralston Sand Co. Others included Tulsa Sand Co. and Means Sand Pit. Exploratory drilling

resulted in the discovery of oil in five wells.

Payne.—Petroleum and natural gas were produced from 71 fields, of which the Yale-Quay, with a yearly production of 1.7 million barrels of oil, was the largest in the country. Natural-gas liquids were recovered by Mid-Continent Petroleum Corp. near Stillwater. Sand and gravel was produced by the county highway department; crushed limestone was produced by Cookson Stone Co. Ten oil-discovery wells were drilled.

Pittsburg.—Pittsburg County ranked third in coal production. Coal was mined underground by Lone Star Steel Co. and McAlester-Alderson Coal Co. Natural gas was produced from three fields near Quinton. Sand and crushed limestone were produced for highway construction. Clay for manufacturing brick and tile was produced

by the Oklahoma State Penitentiary west of McAlester.

Pontotoc.—Petroleum and natural gas were produced from 23 fields, and natural-gas liquids were recovered by the plants of the Carter Oil Co. Building limestone was quarried near Fittstown by the Townsend Quarry and the Ada Stone Co.; shale and limestone were quarried near Lawrence by Ideal Cement Co. for use in its plant at Ada. Molding sand was produced by Grade A Sand & Gravel Co.

and Mid-Continent Glass Sand Co. Light-burning clay was produced east of Ada by Ada Brick Co. and Frankhoma Pottery Co. Red-burning clay was produced at Ada by Ada Brick Co. One exploratory well proved oil productive.

Pottawatomie.—Petroleum and natural gas were produced from 68 fields, of which the St. Louis was the largest. Natural-gas liquids were recovered by the plants of Warren Petroleum Co. and Sinclair

Oil & Gas Co. Four oil-discovery wells were drilled.

Rogers.—Coal was strip-mined by McNabb Coal Co. and Rogers County Coal Co. Petroleum and natural gas were produced from three fields, of which the Chelsea district accounted for most of the

oil produced.

Seminole.—Petroleum and natural gas were produced from 76 fields, of which the Seminole City, with a yearly production of about 1 million barrels of oil, was the most prolific. Natural-gas liquids were recovered by the plants of Carter Oil Co., Sinclair Oil & Gas Co., and Phillips Petroleum Co. Clay for manufacturing brick and tile was obtained west of Wewoka by Wewoka Brick & Tile Co. Exploratory drilling resulted in the discovery of oil in 5 wells.

Sequoyah.—Coal was strip-mined by the Sallisaw Stripping Co. Limestone was crushed north of Marble City at the quarry of Marble Stone Co. Part of the limestone crushed at Marble City was burned at Sallisaw in the kilns of the St. Clair Lime Co. Dimension sandstone was quarried by Cookson Hills Stone Co. Natural gas was produced

from a small field.

Stephens.—The county ranked third in petroleum production. Petroleum and natural gas were produced from 38 fields. Naturalgas liquids were recovered by Magnolia Petroleum Co. and Skelly At the Duncan refinery of Sunray Oil Corp., a new 5,000barrel-per-day Platformer was placed in operation. Sand and gravel was produced for highways. Exploratory drilling accounted for 6 oil-productive wells and 1 gas-productive well.

Texas.—Natural gas from the vast Hugoton gasfield and petroleum were produced during the year. Natural-gas liquids were recovered in the vicinity of Guymon by Cities Service Oil Co. and Hugoton Plains Oil & Gas Co. Three oil-discovery wells and three gas-discovery wells were drilled. Construction sand and gravel and crushed limestone were produced north and south of Guymon by

Stewart Bros.

Tulsa.—Petroleum and natural gas were produced from 23 fields, and natural-gas liquids were recovered by the plant of Pioneer Corp. near Bixby. Coal was mined underground east of Tulsa by Acme Coal Co. Brick and tile were manufactured by Acme Brick Co. and United Brick & Tile Co.; in Collinsville by United Brick & Tile Co. East of Tulsa near Garnett crushed limestone was produced by Anchor Stone Co. and Chandler Materials; elsewhere by Standard Industries and Ed Tinlin. Construction sand was produced near Jenks by Bagby-Harris Co. Near Sand Springs sand was produced to the Construction of the Co by Arkansas River Sand Co. and Sand Springs Sand Co. Near Tulsa construction sand was produced by Bagby-Harris Co., Chandler Materials Co., McMichael Concrete Co., Smith Sand Co., Young Materials Co., and Tulsa Sand Co. Crushed limestone also was produced. The Texas Co. completed installing a new combination platforming and unifining unit at its West Tulsa refinery. The new unit has a capacity of 9,000 barrels of oil per day. A new delayed-coking unit, placed in operation at D-X Sunray refinery at West Tulsa, has a charge capacity of 7,000 barrels of oil daily and makes 244 tons of coke daily.

Uranium ore was discovered in the sands of the Arkansas River near Tulsa. The claim was confirmed to be of commercial quality,

but the quantity of ore-bearing sand remained uncertain.

Washington.—Petroleum and natural gas were produced from five districts. Limestone and clay were quarried near Dewey for manufacturing portland cement by Dewey Portland Cement Co. Part of the limestone quarried at Dewey was marketed as crushed limestone. Crushed stone also was produced near Bartlesville by Matoako Stone Co.

Woods.—Construction sand and gravel was produced near Waynoka by Waynoka Sand & Gravel Co. Salt was produced west of Freedom by Ezra Blackmon. Petroleum and natural gas were produced from 1 field, and 1 exploratory drilling proved oil productive.

# The Mineral Industry of Oregon

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Oregon State Department of Geology and Mineral Industries.

By Kenneth D. Baber, Frank B. Fulkerson, and Albert J. Kauffman, Jr.2



OTAL VALUATION (\$31.7 million) of all mineral commodities produced in Oregon during 1955 decreased about 3 percent compared with the preceding year. Nonmetals, consumed for the most part by construction activities, comprised about 92 percent of the total output value. The multi-million-dollar dam project at The Dalles, plus the State's \$72 million highway-construction program,

stimulated the aggregate, cement, and related industries.

The Dalles Dam project was approximately half completed, with the major portion of the concrete poured. Damming the river's main channel was to require an estimated 2.5 million cubic yards of material—mainly quarry rock. The State's multi-million-dollar high-way program was nearing completion, with only \$1.75 million, including accrued interest, of contracts to be let. Construction work contracted during the year involved 183 separate agreements varying in cost from \$9,600 to nearly \$1.3 million and averaging about \$168,000. A total of \$65.6 million was expended for work performed; nearly half of it was paid during 1955.

TABLE 1.—Mineral production in Oregon, 1954-55 1

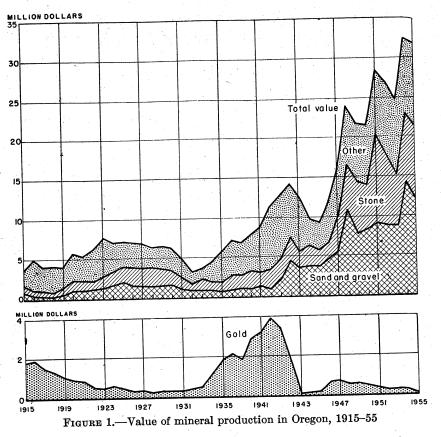
			1. 1		
	1	954	1955		
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	
Chromite Clays. Copper (recoverable content of ores, etc.). Gold (recoverable content of ores, etc.). troy ounces. Iron ore (limonite). long tons. Lead (recoverable content of ores, etc.). Mercury. Mickel ore	6, 655 (2) 5 6, 520 5 1, 993 67, 852 13, 157, 239 14, 335 5, 872, 353 (3)	\$537, 928 (2) 2, 950 228, 200 1, 370 129, 287 (3) 177, 515 14, 149, 380 1, 12, 974 8, 617, 795 (2) 9, 634, 139	5, 341 250, 608 4 1, 708 1, 786 3 3, 1, 056 4, 181 (2) 11, 953, 878 8, 815 7, 741, 937	\$463, 514 275, 916 2, 984 59, 780 (2) 894 306, 610 (2) (11, 832, 344 7, 978 9, 417, 834 (2)	
Total 4		32, 268, 000		31, 736, 000	

<sup>&</sup>lt;sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Figure withheld to avoid disclosing individual company confidential data.

<sup>3</sup> Less than 1 ton. 4 Total has been adjusted to eliminate duplicating the value of clays and stone.

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The impending arrival of natural gas in the Pacific Northwest created intense interest. Portland Gas & Coke Co. announced plans for a \$20 million expansion program in anticipation of approximately 500 percent expanded sales within the ensuing 5 years. Additional new industries utilizing natural gas as fuel or as a source for raw

materials were expected.

In the 10-year period from 1946-55, Oregon's mineral production advanced from \$11.8 million to \$31.7 million. Output of nonmetal commodities was chiefly responsible for the gain; it increased in value from nearly \$11 million to over \$29 million. Metal commodities increased somewhat (less than \$1 million to \$2.6 million), and fuels production remained negligible. Considering the four Pacific Northwest States—Idaho, Montana, Oregon, and Washington—as a unit, Oregon's share of the total output value was up slightly from 7.7 percent in 1946 to 9.5 percent in 1955. The relative difference in the foundation on which the mineral industry in each of the States is based is shown by the fact that nonmetal production in Oregon in 1955 constituted 92 percent of the State total value compared with 69 percent for Washington and only 21 and 12 percent, respectively, for Idaho and Montana.

Mining industries in Oregon employed a relatively small number of workers—about 1,200. This number remained about the same

for at least the 9 preceding years. Nonmetallic mining and quarrying employed 88 percent of the workers and metal mining only 12 percent. In comparison with total industrial activity in the State, mining was less important than in the other three Pacific Northwest States. Also, it was more seasonal, being made up in large part of production of raw materials for the construction industry, which in turn was the most seasonal of all nonagricultural industries in Oregon.

TABLE 2.—Average number of employees, payrolls, and earnings of employees in mining firms subject to State Unemployment Compensation Act, 1946-50 (average) and 1951-55 <sup>1</sup>

Year	Average number of em- ployees	Total pay- rolls	Approxi- mate wage level	Median earnings
1946-50 (average)	1, 219	\$4, 041, 975	\$3, 315	\$1, 617
	1, 250	5, 032, 565	4, 026	2, 450
	1, 176	4, 999, 464	4, 251	1, 960
	1, 202	5, 307, 721	4, 416	2, 383
	1, 182	5, 304, 031	4, 487	2, 167
	1, 188	5, 559, 191	4, 679	1, 870

<sup>&</sup>lt;sup>1</sup> Data for average number of employees, total payrolls, and median earnings were compiled from Oregon Unemployment Compensation Commission bulletins. Approximate wage-level figures represent division of total payrolls by figures for average number of employees.

TABLE 3.—Average weekly hours and earnings for Oregon and the United States in metals industries, 1950-55

	Oregon		United States				
Year	Primary and fabri- cated metals <sup>1</sup>		Primary and fabricated metals 1 Primary metals 2		Fabricate	ed metals 2	
	Average	Average	Average	Average	Average	Average	
	weekly	weekly	weekly	weekly	weekly	weekly	
	earnings	hours	earnings	hours	earnings	hours	
1950	\$71. 01	40. 8	\$67. 24	40.8	\$63. 42	41. 4	
1951	75. 66	39. 6	75. 12	41.5	68. 81	41. 7	
1952	78. 93	39. 6	77. 33	40.7	72. 38	41. 6	
1962	83. 79	39. 3	84. 25	40.9	77. 15	41. 7	
1963	86. 70	39. 0	80. 88	38.7	77. 33	40. 7	
1964	90. 28	40. 2	92. 29	41.2	82. 17	41. 5	

Oregon State Unemployment Compensation Commission data.
 Monthly Labor Review, June 1956, vol. 79, No. 6, pp. 734-735.

TABLE 4.—Employment and payrolls in mineral manufacturing industries, 1955 1

		, 2000
Industry	Average number of employees	Total pay- rolls
Primary metals. Stone and clay products. Products of petroleum and coal. Industrial chemicals.	4, 058 1, 268 432 235	\$21, 341, 118 5, 712, 805 2, 035, 638 1, 097, 868

<sup>&</sup>lt;sup>1</sup> Oregon State Unemployment Compensation Commission data.

During 1955 the program of the Defense Minerals Exploration Administration (DMEA) continued to encourage the systematic investigation of strategic and critical mineral occurrences.

TABLE 5.—Defense Minerals Exploration Administration contracts active during 1955

			С	ontract	
County and contractor	Property	Commodity	Date	Total amount	Govern- ment par- ticipation, percent
CROOK John McManmon	Pinkey No. 1 and No. 2	Mercury	Oct. 7, 1954	\$9, 433	7
DOUGLAS  Bonanza Oil & Mine Corp.	Bonanza	do	June 15, 1955	94, 100	75

# REVIEW BY MINERAL COMMODITIES

#### METALS

Aluminum.—Construction of Oregon's second primary aluminumreduction plant was in prospect, with the announcement in September that the Harvey Aluminum Co. had signed a contract with the General Services Administration (GSA) that called for an early start on constructing the plant and for producing and selling 270,000 tons of aluminum by June 30, 1963. Execution of the contract was made possible after the company signed a separate contract with the Bonneville Power Administration (BPA) for powerlines and power necessary for operating the plant. This agreement provided for the Harvey Company to advance \$2,038,000, or the necessary amount of materials and equipment in lieu of cash, for constructing transmission lines from the Big Eddy switching station to the company site near The Dalles. The powerline was to be constructed by BPA, which would retain ownership, and the company was to meet line losses and pay a monthly charge for operation and maintenance. The company previously had received authorization for 40,000 kilowatts of firm power and 80,000 kilowatts of interruptible power under a 20-year contract with Bonneville. Capacity of the \$65 million plant was to be more than 100 million pounds annually.

At Springfield, experimental production of aluminum-silicon alloy by direct smelting of aluminum-bearing materials continued at the National Metallurgical Corp. plant. Initial operations at the plant were begun early in 1954. In addition to the experimentally pro-

duced aluminum-silicon alloy, silicon metal was produced.

The hills near Salem in Marion County were the object of investigation in connection with their aluminous lateritic deposits. Aluminium Laboratories, Ltd., a Canadian firm, conducted the exploration during the summer, using drill rigs owned by Salem Sand & Gravel Co. The deposits were investigated by the Oregon State Department of Geology and Mineral Industries in 1953 and 1954, and reports on the progress of the work were published.<sup>3</sup>

Production of aluminum metal from imported alumina was continued at the Reynolds Metals Co. reduction plant at Troutdale.

Chromium.—Output of chromite ore and concentrate in 1955 totaled 5,341 short tons, gross weight, a decline of nearly 20 percent from the

<sup>&</sup>lt;sup>3</sup> Corcoran, R. E., Investigation of Salem Hills, Oreg., Bauxite Deposits, a Progress Report: Oregon Dept. of Geol. and Min. Ind., The Ore.-Bin, vol. 16, No. 9, September 1954, pp. 55-60. Corcoran, R. E. and Libbey, F. W., Investigation of Salem Hills Bauxite Deposits, Second Progress Report: Oregon Dept. of Geol. and Min. Ind., The Ore.-Bin, vol. 17, No. 4, April 1955, pp. 23-29.

6,655 short tons produced in 1954. The tonnage produced was the lowest since 1951, when the Government Purchase Depot at Grants Pass was opened. Value of production declined only about 14 percent, indicating the proportionately higher grade of material received at the depot in 1955. Purchases by the Government through the depot at the close of 1955 totaled 101,634 long tons of a total of 200,000 tons authorized.

Josephine County continued to rank first in quantity and value of output; however, Curry County assumed second place as a result of a decline in Grant County to less than half its 1954 total. Major operators were Howard Beasley (Sourdough mine) and B. A. and R. E. McCaleb (McCaleb mine), Curry County; Neal Breedlove and Bandy Sintay (Haggard & New mine), Grant County; and Wm. S. Robertson (Oregon Chrome mine), Josephine County. Shipments from the Haggard & New mine (operated in 1954 by Burt Hayes) were made during the period April-June. Comstock Uranium-Tungsten Co., Inc., which had purchased the lease on the property, also bought the Burt Hayes mill in July; however, no subsequent production was reported for the company.

TABLE 6.—Shipments of chromite ore and concentrate in 1955

	Number of Value			Short tons, gross weight			
County	operations reported	1954	1955	45 percent or more Cr <sub>2</sub> O <sub>3</sub>	Less than 45 percent Cr <sub>2</sub> O <sub>3</sub>	Total	
Curry Douglas Grant Jackson Josephine Unassigned <sup>2</sup>	6 8 6 1 22 4	\$94, 619 19, 803 (1) 6, 134 257, 765 159, 607	\$99, 487 9, 758 64, 601 (1) 278, 118 11, 550	1, 056 59 682 (1) 1, 690 35	15 68  1, 594 142	1, 071 127 682 (¹) 3, 284 177	
Total	47	537, 928	463, 514	3, 522	1, 819	5, 341	

Included with unassigned to avoid disclosing individual company confidential data.
 In addition to data under footnote 1, includes value and production figures for operations for which county locations were not determined.

Production of chromite concentrate by the Mineral Sands Co. from beach deposits at Whisky Run near Bandon in Coos County was planned. The company constructed a processing plant that was to utilize an acid leach to lower the iron content of the black sands, making a grade of concentrate having a higher chromium-iron ratio that would be acceptable at the Grants Pass Purchasing Depot. Preliminary concentration of the sands was to be accomplished using electrostatic and electromagnetic separation methods. The company open-pit operation involved removing over 50 feet of overlying sands to disclose the chromite-bearing black sand once mined by underground methods for its gold content by Chinese laborers.

In the same area, near Coquille, Pacific Northwest Alloys, Inc., began treatment of low-grade chromite concentrate stockpiled by the Government during World War II. The company plant used an electrostatic and electromagnetic separation process to produce a clean chromite concentrate, which was shipped to the company plant at Mead, Wash., for use in making ferrochromium. The operations were being conducted under a Government contract.

Copper.—Copper ore produced in the State during the year contained 4 short tons of recoverable copper valued at \$2,984; output in 1954

was 5 short tons with a value of \$2,950. Most of the small tonnage resulted from a shipment of copper ore by Ray E. Summers from the Standard property in Quartzburg district, Grant County. Gold ore produced at the Buffalo mine, Granite district, Grant County, and the East Eagle mine, Eagle Creek district, Barrelle copper.

to the Tacoma smelter also contained recoverable copper.

Activity was reported at the Fall Creek mine in Josephine County by Fall Creek Mining Co., which leased the United Copper Gold Mines Co. property. Camp buildings, 2½ miles of road, and a low-water bridge across the Illinois River were built. Earliest production at the Fall Creek mine was in 1894, when a small smelter was erected. Later, ore was hauled by mules to Selma and then shipped to Grants Pass and Tacoma.

Gold.—After suspension of operations by Powder River Dredging Co. in 1954 at the Sumpter Valley placers in Baker County, production of gold dropped to a very low figure in Oregon. Output in 1955 totaled 1,708 ounces valued at \$59,780 compared with 6,520 ounces

valued at \$228,200 in 1954.

TABLE 7.—Mine production of gold and silver in 1955, by months, in fine ounces of recoverable metals

Month	Gold	Silver	Month	Gold	Silver
January February March April May June June	100 10 20 50 40 300 60	20 10 20 10 10 3, 200 20	August	370 140 218 318 82 1,708	1, 910 50 1, 304 2, 181 80 8, 815

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc, 1946-50 (average), 1951-55, and total, 1852-1955, in terms of recoverable metals <sup>1</sup>

(4004480),							
	Mines pro	oducing 2	Material sold or	Gold (lode a	and placer)	Silver (lode	and placer)
Year	Lode	Placer	treated 3 (short tons)	Fine ounces	Value	Fine ounces	Value
1946–50 (average) 1951	25 14 13 8 20 19	39 31 25 21 26 21	4, 023 1, 495 931 1, 215 2, 916 3, 835	15, 694 7, 927 5, 509 8, 488 6, 520 1, 708	\$549, 304 277, 445 192, 815 297, 080 228, 200 59, 780	15, 332 6, 218 4, 037 12, 259 14, 335 8, 815	\$13, 742 5, 628 3, 654 11, 095 12, 974 7, 978
1852-1955			(4)	5, 782, 578	130, 353, 273	5, 340, 711	4, 898, 876
	Copper		I	æad	Zinc		
	Short tons	Value	Short	Value	Short tons	Value	Total value
1946-50 (average) 1951 1952 1953 1954 1954	12 11 1 9 5	\$4, 960 5, 324 484 5, 166 2, 950 2, 984	10 2 1 5 5	\$2, 956 692 322 1, 310 1, 370 894	6 3 1	\$1, 539 1, 092 332	\$572, 501 290, 18 197, 60 314, 65 245, 49 71, 63
1852-1955	12, 428	4, 680, 003	812	95, 713	173	23, 194	140, 051, 05

<sup>1</sup> Includes recoverable metal content of gravel washed (placer operations), old tailings re-treated, 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.
Does not include gravel washed.
Figure not available.

TABLE 9.—Gold produced at placer mines, 1946-50 (average) and 1951-55, by classes of mines and methods of recovery

			Gold recovered				
Class and method	Mines produc-	Material treated (cubic		Va	lue		
	ing 1	yards)	Fine ounces	Total	Average per cubic yard		
Surface placers: Gravel mechanically handled: Bucketline dredges:							
1946-50 (average)	3	3, 804, 360	10, 655	\$372, 918	\$0.098		
1951		2 719 900	6 775	237, 125	. 087		
1952	l î	2, 719, 900 2, 548, 700	6, 775 4, 571	159, 985	.068		
1953	i	2, 176, 000	6, 935	242, 725	.112		
1954	1	1, 382, 000	4, 685	163, 975	. 119		
1955							
Dragline dredges: 2			ł				
1946-50 (average)	7	486, 930	2, 522	88, 284	. 181		
1951		6, 500	47	1,645	. 25		
1952	1	5,000	27	945	. 189		
1953 1954		3, 000	11	385	. 128		
1955		3,000	11	. 680	.12		
Nonfloating washing plants: 3							
1946-50 (average)	4	28, 220	247	8, 645	. 306		
1946-50 (average) 1951				0,010			
1952		(4)	5	175			
1953							
1954	2	2, 610	44	1, 540	. 590		
1955 5			22	770			
Gravel hydraulically handled: 1946-50 (average)	اما						
1946-50 (average)	16 11	82, 580	374	13, 090	. 159		
1951 1952	9	16, 550 27, 600	115 147	4, 025 5, 145	. 248 . 186		
1953	9	27, 500	209	7, 315	. 266		
1954	16	101, 300	170	5, 950	.058		
1955	ı š	24, 400	103	3, 605	. 148		
1955 Small-scale hand methods: §		2-, -00	-00	٠, ۵۵۵			
1946-50 (average)	8	11, 760	194	6, 783	. 577		
1951		9, 850	207	7, 245	. 736		
1952		15, 200	146	5, 110	. 336		
1953	10	9, 800	138	4, 830	. 493		
1954 7 1955	5 12	12, 400 8, 400	60 64	2, 100 2, 240	. 169 . 267		
Tindepersund placers (drift):	12	0, 400	04	2, 240	. 202		
Underground placers (drift): 1946-50 (average)	1	400	9	308	. 770		
1951	2	800	20	700	. 87		
1952							
1953	1	450	7	245	. 544		
1954	1	80	22	770	9. 625		
1955	1 1	150	14	490	3. 267		
County total min county							
Grand total placers:	39	4 414 950	14 020	401 110	. 111		
1946–50 (average) <sup>8</sup>	21	4, 414, 250 2, 753, 600	14, 032 7, 164	491, 113 250, 740	. 091		
1952	25	2, 755, 600	4, 896	171, 360	.066		
1953	21	2, 213, 750	7, 289	255, 115	. 118		
1954	26	1, 501, 390	4, 992	174, 720	.116		
1955	21	32, 950	203	7, 105	. 216		
		0-,000	1	*, +00	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		

<sup>1</sup> Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal

<sup>\*</sup>Includes all placer operations using dragline excavator for delivering gravel to floating washing plant,

Includes all placer operations using dragline excavator and washing plant, both on dry land; when washing plant is movable, outfit is termed "dry-land dredge,"

Data not available.

Data not available.
 Includes commercial gravel plant that produced gold from gravels. Byproduct gold is included with gold recovered, but material treated and average value per cubic vard refer only to straight gold dredging.
 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.
 Includes suction dredge, for which Bureau of Mines is not at liberty to disclose output.
 Includes 31 ounces of gold from suction dredges, valued at \$1,085.

TABLE 10.—Mine production of gold, silver, copper, and lead in 1955, 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 Douglas and Wheeler 2 Grant Jackson Josephine Total	6 5 7 1	7 3 6 5 21	299 42 1, 132 166 69 1, 708	\$10, 465 1, 470 39, 620 5, 810 2, 415	171 9 8, 604 29 2	\$155 8 7, 787 26 2 7, 978
County		Cor	per	Le	ead Total	
		Pounds	Value	Pounds	Value	value
Baker Douglas and Wheeler 2		700	\$261			\$10, 881 1, 478
Grant Jackson Josephine		7, 300	2, 723	6,000	\$894	51, 024 5, 836 2, 417
Total		8,000	2, 984	6, 000	894	71, 636

 <sup>1</sup> Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
 2 Combined to avoid disclosing individual output.

TABLE 11.—Mine production of gold, silver, copper, and lead in 1955, by classes of ore or other source materials, in terms of recoverable metals

				1.0		100
Source	Number of mines	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)
Lode ore: Dry gold Copper	16 2	3, 788 44	1, 491 11	8, 767 28	1, 600 6, 400	6, 000
Total	18	3, 832	1, 502	8, 795	8,000	6,000
Other lode material: Mill cleanings (gold) -	1	3	3			
Total lode material	19 21	3, 835 (¹)	1, 505 203	8, 795 20	8, 000	6, 000
Total, all sources	40	3, 835	1, 708	8, 815	8, 000	6, 000

<sup>1 32,950</sup> cubic yards.

TABLE 12.—Mine production of gold, silver, copper, and lead in 1955, by types of material processed and methods of recovery, in terms of recoverable metals

Type of material processed and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)
Lode: Amalgamation: Ore Mill cleanings	262 3	81		
Concentration, and smelting of concentrates Direct smelting	1, 109 131	8, 652 62	2, 300 5, 700	6, 000
Total lode	1, 505	8, 795	8, 000	6,000
Placer	203	20		
Grand total	1,708	8, 815	8, 000	6, 000

TABLE 13.—Mine production of gold, silver, copper, and lead in 1955, by counties and districts, in terms of recoverable metals

County and district	Mines produc- ing 1		Lode mate- rial	Gold (lode and	Silver (lode and	Copper	Lead	Total
	Lode	Placer	(short tons)	placer) <sup>2</sup> (fine ounces)	placer) 3 (fine ounces)	(pounds)	(pounds)	value
Baker County:								
Baker and Greenhorn 4	3	2	814	235	89			\$8, 306
Cracker Creek	2	(5)	1,082	39	74			1,432
Eagle Creek	1		25	4	8	700		408
Sumpter		3		5				175
Weatherby		2		16				560
Douglas County: (Riddle)		1						
and Wheeler County: (Spanish Gulch) 4		3		42	9	-	. 1	1,478
Grant County:		•		42	9			1,410
Canyon	2		23	6				210
Granite	ĩ		1,824	1, 117	8, 583	1,600	6,000	48, 354
Quartzburg	2		22	9	21	5,700		2, 460
ackson County:	,			-	1	1		
Ashland and Oregon 4		52		36				1, 267
Gold Hill and Green-	_	1						
back 4	3	5 2	16	63	11			2, 215
Upper Applegate	4	2	27	67	10			2, 354
osephine County: Galice and Greenback 4	1	52	2	57	2			1,997
Grants Pass, Illinois	1			. 37				1, 991
River, and Waldo 4		3		12				420
Total	19	21	3, 835	1,708	8, 815	8,000	6,000	71, 636

<sup>1</sup> Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal

right to property.

2 Source of gold: 1,505 ounces from lode mines and 203 ounces from placers.
3 Source of silver: 8,795 ounces from lode mines and 20 ounces from placers.
4 Combined to avoid disclosing individual company confidential data.

<sup>5</sup> Includes production from property not classed as a mine.

A large share of the metal produced in 1955 came from the Buffalo lode mine, Granite district, Grant County, operated by Boaz Mining Co. of Seattle. Most of the Buffalo ore was milled at the 50-tonper-day plant on the property; a small quantity was shipped crude to a smelter. Greenhorn Mountain Development Co. recovered a substantial quantity of gold by amalgamation from the Pyx mine on the Baker-Grant County line, Greenhorn district. 19 lode operations and 21 placers active in 1955, as compared with 20 and 26, respectively, in the previous year. Small gold mines were worked in Baker, Douglas, Grant, Jackson, Josephine, and Wheeler In addition, a commercial sand and gravel plant in southern Oregon recovered some gold, and prospectors produced a small quantity at locations not classed as mines.

Iron ore.—Iron ore (activated limonite) was produced by Orr Engineering & Chemical Co. for use as a desulfurizing agent by the Portland Gas & Coke Co. The material was derived from the

company mine and plant in Columbia County.

Lead.—Three tons of recoverable lead was obtained as a byproduct

from gold ore produced at the Buffalo mine, Grant County.

Manganese.—A small quantity of manganiferous ore was shipped by N. D. Madden & Co. from the Ranes mine in Baker County and by J. W. Pressler from an operation in Josephine County to the Government Purchase Depot at Butte, Mont., during the year. Shipments to the Government low-grade manganese stockpiles are not to be included in State production totals until the material is removed for commercial use.

Mercury.—Mercury output in the State during 1955 rose to 1.056 flasks, the largest quantity produced since 1951, when 1,177 flasks valued at \$247,323 was reported. Value of output in 1955, based on an average price at New York of \$290.35 per flask, was \$306,610. The average monthly price per flask varied from a high of \$322 in January and February to a low of \$254 in August. Prices at the close of the year were stable at about \$280.

Output of mercury was reported from 7 operations in the State, with the Bonanza Oil & Mine Corp. Bonanza mine in Douglas County and the Cordero Mining Co. Horse Heaven mine in Jefferson County contributing about 90 percent of the total. The Bonanza mine produced throughout the year, and the Horse Heaven mine reported initial production in May. The latter mine had been idle following a

fire in 1944 which forced cessation of operations.

Drilling at the Bretz mine in Malheur County during the summer was conducted by Shawano Development Corp., which indicated plans to erect a plant in the spring of 1956. The mine was a large producer during the early 1930's. Purchase of the Black Butte mine. Lane County, and plans for development of the property were announced late in the year by Mercury and Chemicals Corp. The mine was an important producer in the years prior to World War II; the last reported output was a small quantity from cleanup operations in 1951. At the Maud S. mine in Douglas County, B. A. Young and Steve Cooper reported construction of mill and camp facilities as well as considerable mine development in preparation for the commencement of operations in 1956.

Nickel.—The Hanna Coal & Ore Corp. open-pit operation near Riddle in Douglas County, the Nation's only nickel-ore mine, yielded 284,415 dry short tons of nickel ore averaging 1.47 percent nickel during 1955. The ore was treated at the Hanna Nickel Smelting Co. smelter at Riddle; the smelter consumed 300,288 dry short tons of nickel ore averaging 1.49 percent nickel. Ferronickel production, begun at the site in 1954, totaled 7,609 short tons and 7,772 short

tons containing 42.53 percent nickel were shipped.

The company reported that exploration drilling to delineate the deposit was completed in the southwestern portion of the ore body with drilling to an average depth of 50 feet on 200-foot centers. Development was started in this area between elevations 3.140 and 3,360, utilizing 2½-cubic-yard shovels and 22-ton trucks.

Silver.—Most of the State's total output of 8,815 ounces of silver valued at \$7,978 was produced at the Boaz Mining Co., Buffalo mine in Grant County. Small quantities of byproduct silver were recovered at many of the gold mining operations in the State.

Tungsten.—Small trial shipments of concentrate from prospects in Jackson County constituted the extent of tungsten activity during

the year.

Uranium.—Because of the public's great general interest in uranium, the biggest news of 1955 concerned with the mining industry in Oregon appeared to be the uranium-ore deposits discovered north of Lakeview in Lake County. The area was the scene of frenzied prospecting activity following the filing of the White King claim on July 14. In September, Thornburg Bros. Co. obtained leases on this property and the neighboring Lucky Lass claim and began an expanded development program under the name of the Lakeview Mining Co. Effective September 22, rates of \$8.95 a ton for uranium ore not exceeding \$25 per ton in value and \$10.30 a ton for \$25-\$50 ore were established by the Interstate Commerce Commission as the rail rate from Lakeview to the Vitro Uranium Co. processing plant near Salt Lake City, Utah. Subsequently, several carlots of ore averaging 0.3 to 0.5 percent uranium oxide were shipped.

The State's uranium fever was not confined to Lake County. Activity was noted at prospects in Crook, Deschutes, Harney, Hood

River, and Jackson Counties.

Zinc.—There was no mine production of zinc in 1955. Cargoes of zinc concentrate from overseas sources were received for the first time at the port of Portland during the year for transshipment by rail to the Sullivan Mining Co. electrolytic zinc plant, Kellogg, Idaho. The first shipment arrived in July from Peru and was unloaded with 1 of 2 newly installed giant Gantry cranes, each having capacity of 110 tons an hour. With completion of the new port facilities, the Portland harbor expected a steady increase in ore cargoes from

foreign sources.

Zirconium.—Production of zirconium and hafnium sponge and ingot metal at the Bureau of Mines Northwest Electrodevelopment Experiment Station at Albany, Linn County, was continued until June 30, when operations were terminated. Although the Bureau had been traditionally a research agency, commercial-scale production of zirconium was undertaken in the late 1940's to meet urgent national defense requirements. Owing to a favorable concentration of equipment and technical skills at the laboratory and the fact that industry was not prepared to meet the demand, the Bureau's Albany Station became the world's only large-scale producer of ductile zirconium metal. Within a relatively short time, industry, using methods and equipment pioneered by the Bureau, assumed the burden of production, and commercial-scale operations at the station were halted at the earliest practicable date consistent with national defense needs. Research into improved methods of production and new uses of these strategic metals continued at Albany.

#### NONMETALS 4

Cement.—There was an increase of less than 1 percent in the State production of cement by Oregon Portland Cement Co. plants at Oswego, Clackamas County, and at Lime, Baker County, and by the Ideal Cement Co., Pacific Division, plant at Gold Hill, Jackson

County.

Oregon Portland Cement Co., the largest producer, announced plans to double its output at a cost of more than \$3 million. Expansion at the Oswego plant was to involve construction of a new kiln 287 feet long, installation of new dust-control systems for the old as well as the new kiln, and construction of new rock handling and processing facilities. The company distribution center in the Albina district, Portland, also was to be expanded, and new equipment was to be installed at the rock quarry in Polk County. A new kiln was

<sup>4</sup> Norman S. Petersen, commodity-industry analyst, assisted in preparing this section.

planned for the cement plant at Lime in eastern Oregon to meet

needs for hydroelectric construction projects in that area.

There was a national uptrend in cement prices owing to shortages in many areas and increased production costs. In the Pacific Northwest, price increases at Portland, Seattle, and Spokane were announced during the year. A slight increase in cement and premixed concrete prices in the Portland area was reported in December. retail advance of 4 to 5 cents per 94-pound sack of cement from the prevailing level of \$1.25 at supplier's warehouse or \$1.35 delivered was to be effective early in January 1956. Premix concrete prices were to be increased 20 to 25 cents a cubic yard, which would be added to prevailing prices averaging \$10.75 for a 5-sack mix and \$11.75 for a 6-sack mix. The increase in prices was made because of an advance of 15 cents a barrel (4 sacks) by Oregon Portland Cement Co. Increased labor costs were believed to constitute the principal factor leading to the increase in the manufacturer's price.

A large tonnage of cement used in work on The Dalles Dam was imported from California. It was transported from Redwood City, Calif., to Portland by bulk-cargo vessels and moved by barge up the

Columbia River to The Dalles.

Clays and Shale.—Although the value of raw clays and shale mined was less than \$300,000, the material provided the basis for local industries with product values many times as great. Most of the clays mined were used in manufacturing varieties of building brick, including tapestry, common, Roman, Norman, flash, and building block and in making drain tile and sewer pipe. Output of clays for this purpose was slightly greater than in 1954. Shale was mined in Washington County and expanded at two plants in Portland for use as lightweight-concrete aggregate. The tonnage of this shale was less than in the previous year.

Clay and shale pits in Multnomah and Washington Counties supplied about 50 percent of the output. Other producing counties were Baker, Benton, Clackamas, Jackson, Klamath, Linn, Malheur,

Marion, Polk, Tillamook, Union, and Yamhill.

Clay produced at Lincoln, Calif., near Sacramento, was used to

supplement local clay at 1 plant in southern Oregon.

Diatomite.—Great Lakes Carbon Corp., Dicalite Division, mined diatomite (diatomaceous earth) by open-pit methods near Terrebonne, Deschutes County. Production was at a reduced rate compared with 1954, owing to a decline in demand. Wunder Earth, Inc., a newly formed company, was reported to have leased diatomite deposits near Harper, Malheur County. Great Lakes Carbon Corp. conducted test drilling on large diatomite deposits in the Otis Basin district, Harney County. Test holes 30 inches in diameter were sunk to permit direct observation and sampling by crew members.

Gem Stones.-No operations in the State could be classed as gem mining, although hobbyists and vacationers used hand-mining tools in digging thunder eggs, obsidian, and petrified wood in central Oregon. Other silicified materials, including agate, jasper, and opal, also were recovered in Oregon by collectors along the beaches or as float in dry stream beds and gravel bars in most parts of the State. Vein agate was produced in Crook County. Many gem hunters visited Oregon to look for gem stones as a hobby. Rough gem materials were sold to local gem and agate shops that work the crude material into jewelry, and some were sold to buyers in other parts of the United States.

Thunder eggs had been plentiful in central Oregon and could be picked up from the ground by collectors, but by 1955 surface deposits were largely depleted and many beds were closed to the public by owners, with the result that the hobbyists were paying a fee for digging for "eggs." At the Fulton agate beds, 28 miles north of Madras and owned by Glen Fulton, a charge of \$3 per day was made, for which each person was entitled to dig 30 pounds of thunder eggs. Most of the material was used as souvenirs, the stone being cut in two on a diamond saw and the halves polished. However, some thunder eggs contained agate of gem quality that brought prices ranging from \$50 to \$150 per slab (36 inch thick). In addition to the Fulton deposit, several other beds of thunder eggs in Jefferson, Crook, and Morrow Counties were open to the public.

The Mineralogist magazine, published monthly in Portland, contained information on gem materials and localities where they were

found.

Lime.—The Chemical Lime Co. began constructing a 2-kiln lime plant at Baker, Oreg., 8 miles from the high-grade limestone deposits on Marble Creek. It was designed for an annual capacity of 50,000 tons, with provisions for doubling the capacity if necessary.

Perlite.—No production of crude perlite was reported in 1955. Supreme Perlite Co., North Portland, continued to expand crude perlite obtained from Nevada. The expanded product was sold in the Pacific Northwest for such uses as plaster aggregate, manufacture of

fireproof paint, and insulation material at foundries.

Pumice.—Mine production of pumice for lightweight-concrete aggregate increased markedly in 1955. Pumice for this purpose was marketed in the Pacific Northwest and northern California. Central Oregon Pumice Co. and Lloyd A. Williamson, with operations near Bend, Deschutes County, produced the bulk of the output of prepared pumice. Harney Concrete Tile Co., Burns, Harney County, also was active. Cinder Hill Co., Redmond, Deschutes County, sold pit-run cinders and crushed scoria for use on highways, streets, driveways, and for railroad maintenance. Production totaled 17,333 cubic yards of cinders and 17,460 cubic yards of crushed scoria.

Sand and Gravel.—Gross output of 12 million tons of sand and gravel valued at \$11.8 million was distributed as follows: Commercial, 6.9 million tons (\$7.4 million), and Government-and-contractor, 5.1 million tons (\$4.4 million). Comparable figures for 1954 were commercial, 8.1 million tons (\$8.8 million), and Government-and-contractor, 5.1 million tons (\$5.4 million). The decline in value of the Government-and-contractor sand and gravel compared with 1954 was due mainly to the use of lower priced pit-run gravel by the United States Army Corps of Engineers for highway and railroad relocation

work at The Dalles Dam site.

Thirty-five counties reported production; counties having an output of more than 1 million tons were Clackamas, Lane, Multnomah, and Sherman.

TABLE 14.—Sand and gravel sold or used by producers, 1954-55, by classes of operations and uses

<u>-</u>		1954			1955		Perce	
	Short tons	Value	Average per ton	Short tons	Value	Average per ton	Ton- nage	Average value
COMMERCIAL OPERATIONS								
Sand and gravel:  Building Road material Railroad ballast Other 1	2, 614, 868 4, 588, 220 158, 578 716, 229	\$3, 035, 826 4, 990, 111 136, 860 616, 817	\$1.16 1.09 .86 .86	2, 883, 875 3, 201, 154 176, 979 597, 423	\$3, 284, 641 3, 512, 627 160, 500 473, 700	\$1.14 1.10 .91 .79	$^{+10}_{-30}$ $^{+12}_{-17}$	$     \begin{array}{r}       -2 \\       +1 \\       +6 \\       -8     \end{array} $
Total commercial sand and gravel	8, 077, 895	8, 779, 614	1.09	6, 859, 431	7, 431, 468	1.08	-15	1
GOVERNMENT-AND- CONTRACTOR OPERATIONS							٠.	
Sand and gravel: BuildingRoad material	538, 765 4, 540, 579	872, 758 4, 497, 008	1.62 .99	168, 993 4, 925, 454	95, 780 4, 305, 096	. 57 . 87	-69 +8	-65 -12
Total Government- and-contractor sand and gravel	5, 079, 344	5, 369, 766	1.06	5, 094, 447	4, 400, 876	. 86	+1	-19
TOTAL ALL OPERATIONS								
Sand and gravel: Building Road material Railroad ballast Other 1	3, 153, 633 9, 128, 799 158, 578 716, 229	3, 908, 584 9, 487, 119 136, 860 616, 817	1. 24 1. 04 . 86 . 86	3, 052, 868 8, 126, 608 176, 979 597, 423	3, 380, 421 7, 817, 723 160, 500 473, 700	1.11 .96 .91 .79	-3 -11 +12 -17	-10 -8 +6 -8
Grand total	13, 157, 239	14, 149, 380	1.08	11, 953, 878	11, 832, 344	. 99	-9	-8

Includes molding, engine and ballast sands and sand and gravel used for miscellaneous unspecified purposes.

Sodium Salts.—Alkali-lake soda deposits in Lake County were being developed by A. M. Matlock of Eugene. The deposits, which were concentrated in the potholes of eastern Lake County, contained natron, a hydrous sodium carbonate. A small quantity was mined

for test purposes during 1955.

Stone.—Gross output of stone was about 32 percent higher than in 1954. Total production of 7.7 million tons valued at \$9.4 million was divided between commercial, 3.3 million tons (\$4.3 million), and Government-and-contractor, 4.4 million tons (\$5.1 million). Comparable values for 1954 were commercial, 2.7 million tons (\$4.0 million), and Government-and-contractor, 3.2 million tons (\$4.6 million). Most of the increased output of crushed stone was used by the State highway department for its expanded road-building program and by the United States Army Corps of Engineers at The Dalles Dam. Thirty-four counties reported production. Of these, Baker, Coos, Jackson, Klamath, Lane, Lincoln, Multnomah, Sherman, Umatilla, Wasco, and Washington had outputs exceeding 200,000 tons. Northwestern Granite Co. operated its Haines quarry in Baker County part of the year and was the only producer of monumental

stone in the State. The stone was sold under the trade name "Haines Blue Granite." Output was considerably less than in 1954.

TABLE 15.—Stone sold or used by producers, 1954-55, by uses

	19	54	19	55
	Short tons	Value	Short tons	Value
Building (dimension stone) Concrete, road metal, and screening Riprap Railroad ballast Other 1 Total	3, 201 4, 523, 391 192, 741 60, 280 1, 092, 740 5, 872, 353	\$58, 949 6, 364, 725 184, 529 66, 070 1, 943, 522 8, 617, 795	4, 601 6, 117, 702 246, 082 540, 059 833, 493 7, 741, 937	\$44, 300 6, 991, 936 221, 465 565, 415 1, 594, 718 9, 417, 834

 $<sup>^{\</sup>rm 1}$  Used at metallurgical and chemical plants and sugar refineries and in manufacturing paper and cement and for other unspecified purposes.

Production of crushed limestone totaled 821,000 tons compared with 810,000 tons in 1954. Limestone for use in manufacturing cement was quarried by Oregon Portland Cement Co. at the Limerock quarry, Baker County, and the Dallas operation, Polk County; by National Industrial Products Corp., Durkee, Baker County; and by Ideal Cement Co. at the Marble Mountain quarry near Gold Hill,

Josephine County.

According to an article, 5 Morrison-Knudsen Co., through extensive diamond-drilling operations, located a deposit containing about 15 million tons of exceptionally high calcium limestone 3½ miles southeast of Durkee, Oreg. A subsidiary, National Industrial Limestone Corp., with headquarters in Boise, Idaho, was to operate the Durkee quarry. The new company would furnish crushed limestone for use at sugar refineries, papermills, and steel foundries. Polk County Lime Co., Dallas, and Greely Lime Co., quarry in Wallowa County, quarried agricultural limestone.

Bristol Silica Co. continued to be the only operation in the State producing silica for industrial purposes. The company mined and crushed quartzite near Rogue River, Jackson County. The bulk of the output was used in manufacturing silicon carbide, ferrosilicon, and silicon metal; the material also found use in making refractory silica brick and as a filter medium. Increased costs and a freight-car shortage were given as factors that affected trade during the year. Production of a slightly greater tonnage than in 1954 was reported by the company.

Bristol Silica Co. also produced crushed granite for use as chicken

grit.

Vermiculite.—Increased production at its exfoliating plant at Portland was reported by Vermiculite-Northwest, Inc., which obtained crude vermiculite from Libby, Mont. The processed product was sold for use in insulation and as concrete and plaster aggregate.

#### MINERAL FUELS

Carbon Dioxide.—The Gas-Ice Corp. operation that obtains carbon dioxide from mineral water was discussed in an article published during the year.6 The plant, southeast of Ashland, was the only facility in

<sup>&</sup>lt;sup>5</sup> Utley, Harry F., Big Oregon Deposit Yields High-Calcium Limestone for Industrial Uses: Pit and Quarry, vol. 47, No. 12, June 1955, pp. 130-131.

<sup>5</sup> Schafer, Max, Occurrence and Utilization of Carbon-Dioxide-Rich Water Near Ashland, Oregon: Oregon Dept. of Geol. and Min. Ind., The Ore.-Bin, vol. 17, No. 7, July 1955, pp. 47-52.

the State that produced natural carbon dioxide. This plant had 10 drilled wells 200 to 300 feet deep, each with a flow of about 1,000

gallons of water per hour.

According to the report, the ground-water temperature gradient was about 1° F. per 25 to 30 feet of depth or nearly 3 times the normal The source of heat was believed to be a cooling magma with faulting providing conduits for the heated water. The basis for this belief was the chemical composition of the water, which contained unusually high concentrations of lithium, carbonate, chlorine, and sulfur, which are characteristic of water from a volcanic environment. It was believed that meteoric water, having percolated down, contacted the cooling magma and dissolved certain constituents.

Coal.—Two mines produced a comparatively small tonnage of coal The Madrona mine, operated by the Lowes-Mandrones during 1955. Coal Mining Co., in Clackamas County and the South Slough mine, operated by Gibbs Coal Co., in Coos County were the only commercial producers in the State. A coal prospect near Powers, Coos

County, was developed by Roy Rannells.

In a publication 7 issued during the year the total tentative estimate of coal reserves for Oregon was set at 200 million tons; the estimate included all grades. Approximately 600 square miles, primarily in the southwestern part of the State, is underlain by known coalbearing formations. This area contains four coalfields, but only the Coos Bay field has produced coal of commercial value. Bay field also contains the largest and most accessible reserves, totaling The rank of its coal ranges from subbituminous to 65,863,000 tons. lignite, with heat values from 5,530 to 10,370 B. t. u. per pound on an "as-received basis." The coal has relatively high moisture content, an average 15 percent ash content, and a small quantity of sulfur.

Additional coal deposits are Eden Ridge field, Coos and Curry Counties; Rogue River field, Jackson County; Eckley area, Coos and Curry Counties; and John Day Basin area, parts of Grant, Wheeler, Gilliam, Morrow, and Umatilla Counties. Some coal of subbituminous rank is found in Clackamas, Clatsop, Columbia, Lincoln, Marion,

Multnomah, Tillamook, and Yamhill Counties.

Petroleum and Natural Gas.—Despite discouraging results during the previous 50 years, Oregon experienced intensive activity in oil exploration in 1955. A test well in Douglas County was abandoned after a depth of 3,693 feet was attained. Ten major oil companies made arrangements to lease over 2 million acres, with more leases in

During 1955 seven wells were being drilled. The Sinclair Oil & Gas Co. well near Mapleton, Lane County, initially was promising, but hope diminished for an oil strike. The company was to evaluate the feasibility of continuing drilling when a depth of 13,000 feet was This would be the deepest well drilled in Oregon. Miriam Oil Co. was granted a permit for test drilling in Polk County. Valuable information on subsurface geological formations was obtained. The only gas encountered, with one exception, was methane, which is derived from ancient decayed vegetation.

The Pacific Northwest Pipeline Corp. project was nearing completion, with 12 crews laying pipe at the rate of 10 to 12 miles per day. The natural-gas pipeline coming via Boise, Idaho, from fields in the

Mason, Ralph S., and Erwin, Margaret I., Coal Resources of Oregon: Geol. Survey Circ. 362, 1955, 7 pp.

southwest, would cross northeastern Oregon to Umatilla, follow the Columbia River to Portland, and cross to Vancouver, Wash. lateral would cross the Columbia River near Umatilla, and delivery south of Portland through the Willamette Valley would be through existing lines of the Portland Gas & Coke Co. Total cost of the project was estimated at \$250 million. Industrial and domestic expansion expenditures would add more millions. Initial delivery from the 1,446-mile pipeline was scheduled for August 1956. tion from the Canadian Government and the Congress assured huge available reserves by linking together with 1 pipeline system 2 rich gas-producing areas over 2,000 miles apart, the San Juan Basin in New Mexico and Colorado and fields in the Province of Alberta, According to one source, linkage of Dominion gas virtually doubled the capacity of Pacific Northwest Pipeline Corp. system at an additional cost of only 20 percent of the original facilities. Although the energy derived from natural gas will exceed that of all developed hydroelectric power in the Pacific Northwest, it was expected that natural gas will complement rather than replace electric power. materials derived from natural gas offered excellent potentials for future industrial expansion in petrochemicals and other related industries.

Portland Gas & Coke Co. started a \$20 million expansion program for servicing 81 communities. The company anticipated a fivefold increase in consumption in the period 1956–60. With the arrival of Canadian gas in 1957, the Portland Gas & Coke Co. would be able to draw on three sources—Canada, San Juan Basin, and manufactured gas from its plant, which was to be maintained on a standby basis.

# **REVIEW BY COUNTIES**<sup>8</sup>

Baker.—Gold and silver output dropped sharply with respect to the 1954 production, owing to discontinuance of operations by Powder River Dredging Co. in September 1954. This company had been a major producer in Baker County and the State. The ranking placer producers were J. W. Dawson (Hope-Greenhorn district) and John H. Wright (China Bar-Weatherby district); a number of other small placer mines and prospects were active in the county. In East Eagle district the East Eagle Mining Co. operated its lode mine during the greater part of 1955. Two tons of ore was processed at the mine 50-ton flotation plant; this quantity of ore yielded 4 ounces of gold, 8 ounces of silver, and 700 pounds of copper. East Eagle Mining Co. was the lone producer of copper in the county. Greenhorn Mountain Development Co. (Greenhorn district) operated the Pyx lode mine during part of 1955 and led the county in gold production; this included both placer and lode mining. C. R. Greer worked the Mayflower placer mine in Greenhorn district for a short In Baker district, Michael S. La Combe and T. D. Duncan worked the Shamrock open-pit mine for a short period, and the Evening Star lode mine was operated by C. R. Greer. The E & E mine in Cracker Creek district was not operated in 1955; however, H & R Metals Co. milled ore produced earlier, which contained a small quantity of recoverable gold and silver. In the same district a few ounces of gold and silver was produced at the Bald Mountain

<sup>&</sup>lt;sup>8</sup> John L. Beh and Michael A. Hoggan, commodity-industry analysts, assisted in preparing this section.

mine by Lloyd L. Anderson. Exploration work was done by N. D. Madden & Co. at the Ranes manganese mine; some manganese ore was shipped to the Government low-grade stockpile.

TABLE 16.—Value of mineral production in Oregon by counties, 1954-55

County	1954	1955	Minerals produced in 1955 in order of value
Baker	(1)	(1)	Cement, stone, sand and gravel, clays, gold, copper, silver.
Benton	\$209, 176	\$259, 622	Sand and gravel, stone, clays.
Clackamas	5, 312, 221	5, 466, 527	Cement, sand and gravel, stone, clays.
	124, 464	138. 233	Stone, sand and gravel.
Clatsop Columbia	205, 483	324, 334	Sand and gravel, stone, iron ore (limonite).
Coos	240, 848	661, 200	Stone, sand and gravel.
Crook		331, 561	Stone, sand and gravel, mercury.
Curry		100, 385	Chromite, sand and gravel.
Deschutes		976, 564	Diatomite, pumice, sand and gravel, stone.
Douglas	2, 087, 505	2, 859, 423	Nickel, sand and gravel, mercury, stone, chromite, gold, silver.
Gilliam		(1)	Stone.
Gilliam		164, 032	Chromite, sand and gravel, gold, silver, copper, lead.
Harney	22, 655	57, 640	Sand and gravel, pumice, stone.
Hood River	44, 700	111, 403	Stone, sand and gravel.
Jackson	2, 958, 186	3, 154, 159	Cement, stone, sand and gravel, clays, carbon dioxide, gold, tungsten, chromite, silver.
Jefferson	(1)	183, 867	Mercury, stone, sand and gravel.
Josephine	609, 936	890, 216	Sand and gravel, stone, chromite, gold, clays, silver.
Klamath	166, 393	484, 100	Stone, sand and gravel, clays.
Lake	115, 104	76, 580	Sand and gravel, stone.
Lane		2, 601, 105	Do.
Lincoln	371, 204	606, 830	Stone, sand and gravel.
Linn		585, 045	Sand and gravel, stone, clays.
Malheur		1,041,027	Stone, sand and gravel, mercury, clays.
Marion		529, 616	Sand and gravel, stone, clays.
Morrow	(1)	139, 137	Stone, sand and gravel.
Multnomah	2, 503, 456	2, 911, 222	Sand and gravel, stone, clays.
Polk	465, 782	275, 783	Stone, sand and gravel, clays.
Sherman	80, 235	1, 276, 500	Sand and gravel, stone.
Tillamook	204, 838	180, 606	Stone, sand and gravel, clays.
Umatilla	550, 737	622, 408	Stone, sand and gravel.
Union	178, 115	335, 802	Sand and gravel, stone, clays.
Wallowa	109,001	258, 008	Stone, sand and gravel.
Wasco	505, 634 753, 033	309, 307 1, 349, 758	Stone, sand and gravel, clays.
Washington		21, 106	Sand and gravel, gold, silver.
Wheeler	(1) 289, 123		Sand and gravel, gold, silver.
Yamhill Undistributed 2		3, 386, 592	Danu and glaver, Storie, Clays.
Ondistributed *	10, 042, 140	0, 000, 092	
Total	3 32, 268, 000	3 31, 736, 000	

<sup>1</sup> Included with "Undistributed" to avoid disclosing individual company confidential data. <sup>2</sup> Includes value of sand and gravel, stone, gem stones, and chromite production that cannot be assigned

to specific counties.

3 The total has been adjusted to eliminate duplication in value of clays and stone.

The most important nonmetals produced in the county were cement, stone, and sand and gravel. Plant and quarry operations were continued by Oregon Portland Cement Co. at Lime, and a new kiln was planned to meet demands for future construction of hydroelectric projects in the region. In addition to limestone, clay was mined by the company for utilization in its cement-making process. The Chemical Lime Co. at Baker began developing a limestone deposit on Marble Creek. High-grade limestone was recovered by National Industrial Products Corp. to supply the metallurgical, paper, and sugar-refining industries. The Northeastern Granite Co. quarried granite near Haines for monumental stone and was the only Oregon producer of this commodity. Only one firm—Logsdon Sand & Gravel Co.—reported production of building and paving sand and gravel; also, gravel and stone were processed for the State highway department by three contractors.

Benton.—Valued at some \$260,000, sand and gravel, crushed stone, and clay were the most important mineral commodities produced in the county. Output was credited to Builders Supply Co., Corvallis Sand & Gravel Co., Tri-County Rock Co., and Beaton Sand & Gravel Co. for their production of building and paving materials; to the United States Army Corps of Engineers which contracted for processing riprap; and to three firms under contract by the State to supply road-building gravels. Heavy clay products were manufactued by

Corvallis Brick & Tile Co. and Monroe Brick & Tile Co.

Clackamas.—Clackamas County was outstanding in production of nonmetals. Output of cement, sand and gravel, stone, clay, and coal totaled approximately \$5.5 million. The Oswego plant of Oregon Portland Cement Co., utilizing limestone from its Polk County pit, continued to be the largest producer of cement in the State and announced plans to double output in the future. Production of sand and gravel approached \$1.3 million, locating Clackamas County in the number three position for this commodity. Of the 11 firms reporting, the Portland Road & Driveway Co. and the Portland Gravel Co. produced over half the total. Road metal from crushed stone was processed by Weyerhaeuser Timber Co. Sand and gravel and stone were used by Federal, State, and county road-building agencies (Federal and State agencies obtained the materials through contracts). Hubbard Clay Works, Molalla Brick & Tile Co., and Needy Brick & Tile Co. produced heavy clay products; clay utilized in making cement was mined by the Oregon Portland Cement Co. A small quantity of coal was mined from the Madrona mine of Lowes-Mandrones Coal Mining Co.

Clatsop.—Building and paving materials and fill were produced from gravel excavated by Mountain Construction Co. of Seaside. Grimstead & Vandervelt, United Contractors, and Rogers Construction Co. prepared crushed road materials to supply the demands for State highway maintenance. The Rock Creek Crushed Rock Co., Astoria, reported output of crushed stone for concrete and road metal.

Columbia.—Orr Engineering & Chemical Co. of Scappoose shipped a quantity of activated limonite to the Portland Gas & Coke Co. for use as a desulfurizing agent in the production of manufactured gas.

Goodat Crushed Rock Co. produced crushed and broken basalt from its Rainier quarry. Sand and gravel was mined by Parker Schram Co. for road-building material and by Spokane, Portland & Seattle Railway Co. for railroad ballast, and C. C. Meisel produced sand and gravel for road-building materials for State highway work.

Coos.—Mineral Sands Co., formed by W. C. Wright Construction Co. of Lansing, Mich., erected a large chromite-processing plant 6 miles north of Bandon near Whiskey Run. The plant, reportedly a \$3 million structure, was expected to process black sands from ancient beach deposits and upgrade the chromium content to meet the minimum 42-percent Government purchase specification. The sands contain 2 to 20 percent chromic oxide. An acid leach was to be used to take out the high iron content of the sands in the form of ferrous sulfate liquor. Preliminary separation of the chromite mineral was to be accomplished by electrostatic and electromagnetic separation processes. Pacific Northwest Alloys, Inc., of Spokane, Wash., processed the Government chromite stockpile at Coquille in a 150-ton-per-day plant. The stockpile, estimated at 55,000 tons of chromite-

bearing sands containing 25 percent Cr<sub>2</sub>O<sub>5</sub>, was accumulated by a Government purchase program during World War II. Chromite separated from the sands was shipped to the company leased (Government-owned) Mead, Wash., plant for smelting. Prospecting for new

deposits was carried on by the company during the year.

Coos County, which ranked fifth in the value of stone production, also reported output of sand and gravel and coal. Both the Bandon Rock Co. and the Hillstrom Rock Quarry, Inc., mined and crushed basalt for concrete and road metal. E. E. Benham, Rogers & Kuni, and the McLeod Construction Co. recovered sand and gravel. Production of special locomotive sand was reported by H. A. Fierke. County highway crews processed sand and gravel and crushed stone for highway maintenance and riprap. Six contractors supplied the

needs of State highway crews.

Crook.—The county ranked third in mercury production in the State. Owen Pigmon (New Amity mine) and the Eickemeyer Bros. (Maury Mountain mine) were the leading quicksilver producers in the county. Other mercury producers were Selby L. Towner (Lost Cinnabar No. 1 mine) and the Winter Creek Mining Co. (Winter Creek mine). Early in the year Canyon Creek Mining Co., Prineville, leased the Herreshoff furnace on Ochoco Mining Co. property to test ore from the Mother Lode quicksilver mine, 30 miles south of Prineville, and in April the property was leased to Winter Creek Mining Co. Harley Dosser and Eldon McCoin filed four groups of uranium-discovery claims on the southwest slope of Powell Butte in western Crook County. State geologists confirmed the report that some radioactivity, possibly indicating the presence of uranium ores, had been found in the rocks of this formation. The Powell Buttes are recognized as a deeply eroded remnant of an ancient upland, a "steptoe," surrounded by more recent lavas. Five other claims were staked, but the uranium discovery resulted in no further rush for claims.

Cinder Hill Rock Co. of Prineville continued to market pit-run rock for riprap and crushed basalt for roadstone. Two companies, quarrying and crushing traprock for State and Federal road-building agencies, supplied a major portion of the gross tonnage. Building and paving materials from sand and gravel were produced by the Prineville Sand & Gravel Co. and the Knorr Sand & Gravel Co.

Curry.—The McCaleb Chrome mine (Selma district), owned and operated by B. A. McCaleb and Katie Kaiser, and the Sourdough mine (O'Brien district), operated by Howard Beasley, were the largest chromite producers in the county. The Wonder mine (Illinois River district) was leased for 60 days to Howard B. Graham by T. R. Holman, owner. T. R. Holman also worked the property. Other producers were W. D. Bowser, Bowser claims No. 1, 2, and 3 (Chetco mining district), and Ernest A. Foster, Pearsoll Peak mine (Illinois River district).

The State highway improvement program was supplied with gravel by Coastal Equipment Co. A small quantity of building and paving gravel was processed by Edington Sand & Gravel Co. and the City

Sand & Gravel Co. of Langlois and Gold Beach, respectively.

Deschutes.—Great Lakes Carbon Corp. (Dicalite Division) continued operation of its diatomite quarry and processing plant at Terrebonne and remained the only Oregon producer. Dollarwise,

diatomite was the most valuable mineral extracted in the county. Two Bend-area firms, Central Oregon Pumice Co. and Lloyd A. Williamson (Williamson Cascade Pumice quarry), produced the greater portion of the pumice mined in the State. Operations were suspended by Deschutes Concrete Products Co. of Tumalo. Production of volcanic cinder for railroad ballast, concrete, and road metal was reported by Cinder Hill Co. of Redmond. Paving and building sand and gravel were processed by Bend Aggregate & Paving Co., and gravel fill was produced by Great Northern Railway Co. Basalt was mined and crushed for the Bureau of Reclamation, and the State highway department was supplied with crushed stone and

paving gravel under various contracts.

Douglas.—The Riddle district was the only district in the county having gold and silver production during 1955; three placer operators reported the sale of precious metals originating from work done in 1955 or in previous years and mined from their properties. They were: J. H. Lantzer (Boulder placer), Leo D. Baker (Victory placer), and Don L. Sayer (Victory placer). The gold and silver were recovered by hydraulic mining methods and small-scale hand operations. Chromite ore was produced by eight mine operators. A total chromiteore tonnage amounting to 127 short tons was shipped by Leonard Davenport, operator of the Davis mine; L. E. Fitzpatrick, Linda Marie mine (Riddle district), D. R. Johnson and Glen Shippen, Rainy Day mine (Day's Creek district); Dorothy Kartes, Nickel Mountain mine (Riddle district); James E. Lewis (Myrtle Creek district); T. M. Petrie and G. T. Pointon, Yellow Jacket mine; R. C. Shipley, Hard Times mine (Riddle district); and Harry Shippen, Triple L mine (Myrtle Creek district). The Bonanza Oil & Mine Corp. Bonanza mine near Sutherlin continued as the leading mercury producer in The company carried out extensive exploration work on the State. the 830, 1,050, and 1,150 levels in the north ore body; a \$94,100 DMEA contract was active at the property. At the Maud S. mercury mine in Tiller district, considerable development work was done by B. A. Young and Steve Cooper. The operators reported construction of several buildings and of a 100- and a 400-ton bunker and installation of a conveyor-belt system, settling tanks, stacks, hoods, slag pit with tracks, a high-pressure burner and compressor, and fuel-oil tanks with capacity of about 8,000 gallons. Work at the mine included drifting and diamond drilling to enlarge known reserves. In 1955 the Hanna Coal & Ore Corp., the one producer of nickel ore in the Nation, produced, through development work on its property at the top of Nickel Mountain near Riddle, 284,415 dry short tons of nickel ore, which was conveyed by aerial tram to the smelter at the base of the mountain.

An output of sand and gravel valued at about \$939,000 placed Douglas County fourth in production of this commodity. Of the five companies reporting, Umpqua River Navigation Co. (Reedsport), Roseburg Sand & Gravel Co. (Roseburg), and the Whipple Logging Co. (Drain) were the major producers of paving materials and railroad ballast. The State highway department was supplied with roadbuilding gravels by six contractors. Value of stone production dropped sharply from 1954; J. D. Walling of Sutherlin was the only commercial producer. Crushed stone was prepared for the Bureau

of Public Roads by contractors and by county highway crews.

Gilliam.—The only report of mineral activity in the county was from the Gilliam County rock crusher. This operation crushed

basalt for concrete and roadstone.

Grant.—As a result of a substantial decline in output of chromite ore and concentrate, Grant County dropped to third ranking among the counties in value of chromite production. Six operators reported production of 682 short tons valued at \$64,601. Purchase from Burt Hayes of his lease on the Haggard & New chrome property, second largest producer in the State in 1954, by Comstock Uranium-Tungsten Co., Inc., was disclosed, and the company assumed control of the property in April. A program including expanded mining and milling facilities and exploration of the deposit was undertaken; work was begun on a development tunnel to open the ore body below the old workings. Discoveries of new chromite deposits, one mile west of the Kingsley mine (Dunn mine) and the other in the Pine Creek area (Red Hill mine), were revealed by Albert Dunn and Vernal Ulman, Shipments were made from both properties to the Government Purchase Depot at Grants Pass, with concentrate being prepared at the Tri-County Mining & Concentrating Co. custom mill. Arthur Neuman (John Day Mining Co.) began operations at the old open-pit Ward chromite mine and made a number of shipments. The company reported no production from the Dry Camp mine, formerly the county's largest producer. Other chromite producers were H. G. Jones (Jones mine) and Earl Lyman (Mottmine). Mining Co. Buffalo mine in Granite district was operated throughout the year and yielded the bulk of the State's output of gold and silver, as well as all of the lead and a part of the copper. A total of 152 tons of concentrate and a small quantity of crude ore were shipped to the Tacoma smelter. Ray E. Summers shipped crude ore to Tacoma from the Standard mine in Quartzburg district and supplied most of Small quantities of recoverable gold and the State's copper output. silver were contained in materials shipped by Henry Brown, Black Butte mine, Canyon district, and J. E. Haley, New Deal mine, Quartzburg district. C. M. Medina recovered a few ounces of gold in Canvon district.

From a fixed plant the John Day Gravel Co. prepared a small quantity of paving and building gravel. The State highway department

contracted its gravel supply from two firms.

Harney.—Development at the Pike Creek uranium prospect (Dewey M. Quier), in the eastern foothills of Steens Mountain, by Peter Relos & Associates of Portland showed more autunite (a hydrous calcium-uranium phosphate) than initial exposures. Plans were made to drive a tunnel along the contact zone to explore the deposit at depth.

Building sand and gravel was marketed by the Burns Sand & Gravel Co. For roadwork the State and United States Army Corps of Engineers were provided with gravel of local extraction by various firms. Pumice for lightweight aggregate and road metal was mined by the

Harney Concrete Tile Co. of Burns.

Hood River.—Stone was crushed by Francis Gatchel near Hood River and by the Hood River County Road Department for concrete and roadstone. Building sand and gravel was processed by Jerry's Sand & Gravel Co. at Cascade Locks.

Jackson.—Chromite production in the county was limited; the only activity reported was a shipment from the Red Mountain mine by

E. K. McTimmonds. A number of very small trial shipments of tungsten ore were reported from prospects in the county. Activity was noted by Ashland Mining Co. and Harvey Inlow at the Mattern mine, Gordon Hatch at the Lucky Strike mine, and Northwest Mining Co. at the Blue Star and Lucky Strike properties. Small quantities of gold and silver were recovered at the Smuggler (Ernest F. Kell) and Winkler (W. R. Winkler) properties in Gold Hill district; at the Warner property (E. N. Young and F. E. Gilhouse) in Greenback district; and at the Blow Snake (A. E. Collings), Mountain Lily (W. L. Lorsung), Steamboat-Fowler (Chester Kubli) and Sweepstake (John Rowden) properties in Upper Applegate district. Placer gold and silver were recovered in Ashland district (M. C. Lininger & Sons commercial gravel plant, and W. T. Grossman Bear Creek claim), in Gold Hill district (C. McDonald Evergreen placer, and Glenn V. De Janivier Hard Luck, Digger, and Squirrel claims), and in Upper Applegate district (J. J. Osenbrugge, and Paul Pearce Sterling placer).

Nonmetal commodities produced in the county were cement, stone, sand and gravel, quartzite, clay, and carbon dioxide. As in 1954, the county maintained second place in total value of nonmetallics. R. G. Lull quarried granite near Medford. Granite was quarried and crushed for chicken grit by Bristol Silica Co. at operations near Rogue River; the company also prepared quartzite. Ideal Cement Co. (Pacific Division) continued to produce cement at its Gold Hill plant from company-quarried Josephine County limestone and from local clays. Building and paving sand and gravel were mined and processed by M. C. Lininger & Sons and the Medford Concrete Construction Co., Inc., both of Medford. Gravel as well as stone was quarried by county crews for road-building and the D-H Paving Co. and Miller & Strong, Inc., supplied State highway construction projects with gravel. Carbon dioxide from mineralized waters was processed into dry ice by the Gas-Ice Corp. of Ashland. In Medford, the Southern Oregon Mineral Exchange reported considerable activity in the exchange of gem stones.

Jefferson.—The Cordero Mining Co. Horse Heaven mine, east of Ashwood, produced the second largest quantity of mercury in the State. The company reported production of 6,380 tons of ore averaging 0.25 percent mercury. The company placed in operation during the spring a 25-ton rotating furnace for roasting cinnabar ore. Activity at the mine was last reported during World War II after a fire in November 1944 destroyed the surface buildings and resulted in closing of the mine. The deposit was discovered by A. J. Champion in 1933 and by 1938, under the operation of Horse Heaven Mines, Inc., was the largest producer in Oregon and the second largest in the Nation.

Pacific States Cut Stone Co. of Madras quarried and dressed rhyolite dimension stone. Rogers Construction Co. and Babler Bros. supplied crushed basalt, and Warren-Northwest, Inc., furnished road gravel for State highway maintenance. Moss agate was found in the Madras area by H. H. Jenne of Bend.

Josephine.—Nearly one-third of the State's total placer-gold production and some silver were recovered by Quentin Stone (Last Chance-First Chance mine) and Frank Crawford (Rogueside mine), Galice district; George Knox (Jump-off-Joe), Grants Pass district; M. Canfield and Walter Painter (prospecting), Greenback district; Nancy

Wheeler, Illinois River district; and Gordon R. Leonard, Waldo district. Lode-mine gold recovery in the county was limited to a single Josephine County continued to rank first in quantity reporting mine. and value of chromite-ore production; over 60 percent of the total State output was derived from deposits in the county. Twenty-two mine operators produced 3,284 short tons valued at \$278,118. The Wm. S. Robertson Oregon Chrome mine (Selma district) was by far the largest producer in the county and in the State; the mine yielded over 2,400 short tons of ore and concentrate, which was shipped to the Government Purchase Depot at Grants Pass. A minor portion of the ore was milled by J. G. Gallaher and a smaller quantity by J. W. Pressler. The Sad Sack mine, operated by M. J. McShane and M. E. Adams, was the second largest operation in the county; about 160 tons of ore and concentrate was sold to the Grants Pass depot. Other properties from which chromite production was reported were the Friday, Sordy, Lucky Strike, Paradise, Nickel Ridge, Thompson Group, Deep Gorge, Chrome King, Houser and Burgess, Lucky Star, Black Prince, Lucky L & R, Twin Valley, Crown Chrome, Mockingbird, Shade, Red Dog, and Esterly.

The Marble Mountain quarry of Ideal Cement Co. (Pacific Division) continued to supply limestone used at the company plant at Gold Hill, Jackson County. The Rogue River Sand & Gravel Co., M & M Sand & Gravel Co., and Mark Axtell, all of Grants Pass, prepared building and paving materials from sand and gravel. Basalt for riprap and gravel for road building were utilized by the Bureau of Reclamation and the State highway department, respectively; the gravel was supplied under contract by C. R. O'Neil. In Grants Pass a small quantity of heavy clay products was fabricated at the Macfarlane

Brick Plant.

Klamath.—Traprock for railroad ballast was quarried and processed by Clifton & Applegate near Modoc Point and by Peter Kiewit Sons Co. near Klamath Falls. The State highway department obtained basalt and cinders from various subcontractors. Building and paving materials from sand and gravel were prepared by Farmers Sand & Gravel Co., O. A. McCord, and Shasta Sand & Gravel Co., all of Klamath Falls. In addition, Great Northern Railway Co. used a substantial quantity of ballast gravel. Utilizing clay from its Klamath pit, Klamath Falls Brick & Tile Co. manufactured structural

clay products.

Lake.—The discovery and staking of two important uranium deposits in Lake County in July touched off the most intensive uranium-prospecting rush seen in the State. The deposit at the White King mine was discovered by John Roush and Don Tracy, Lakeview, and the Lucky Lass mine, I mile northwest of the White King, was staked and developed by Bob Adams, Jr., & Associates of Lakeview. In September the claims were leased to Thornburg Bros. of Grand Junction, Colo., who formed the Lakeview Mining Co. and proceeded to drill and develop the claims. On October 4 the company reported shipment of four 50-ton carlots to the Vitro Uranium Co. processing plant, Salt Lake City, Utah. The ore assayed between 0.30 and 0.50 percent uranium. Some samples from the mines assayed as high as 1.4 percent uranium. The uranium occurred in a fault-type deposit of altered tuffaceous rock.

Paving sand and gravel was recovered by F. L. Sommers Co. and by Lakeview Sand & Gravel Co., respectively. The former was contracted to supply the State highway maintenance program. Stone, as well as sand and gravel, was extracted by county highway crews. Obsidian was collected at Glass Butte by Chet & Marge Springer of Bend. A. M. Matlock of Eugene reported that a small quantity of natron, a hydrous sodium carbonate, was recovered for test purposes during the year. The material was recovered by open-pit operations from potholes in the Alkali Lake soda deposits of eastern Lake County.

Lane.—During 1955 National Metallurgical Corp. operated its smelting plant at Springfield. Silicon metal was produced, and experimental work on production of aluminum-silicon alloy was con-

tinued.

Lane County was fourth in output valuation of nonmetallic minerals (\$2.6 million). In production value of sand and gravel, the county retained first position, with \$2,123,000. Paving and construction sand and gravel, as well as gravel for railroad ballast, were produced by 15 companies. Both State and county highway departments contracted with commercial sand and gravel producers for road-maintenance material; the county produced some through its own operation. Ten companies crushed basalt for paving, structural material, riprap, and railroad ballast. The Bureau of Public Roads and the State highway department obtained roadstone, and the United States Army Corps of Engineers procured crushed stone for riprap from various contractors. The Mapleton Rock Production Co. continued to process limestone for road metal and cement.

Lincoln.—Basalt was quarried and crushed into roadstone by Calkins Crushing Co., Oceanlake; L. R. Kauffman, Waldport; and Yaquina Head Quarries, Newport. The latter also marketed riprap from the same quarry. Gravel for paving purposes was produced by D. H. Morris at his Oceanlake plant. At its Logsden operation, the Siletz Sand & Gravel Co. processed paving and road gravel. Crews of Federal and State road-building agencies obtained sand and gravel

and stone from contractors.

Linn.—On June 30 production of zirconium and hafnium, two important metals used in nuclear reactors, ceased at the Bureau of Mines Northwest Electrodevelopment Experiment Station, Albany. This plant was the principal producer of these metals until 1954, when a commercial company in New York began production using the same process. The combined output of both plants resulted in a slight surplus, and the AEC decided to close the Bureau's operation.

Ten companies processed the bulk of the sand and gravel in the county. In addition, the Linn County Highway Department, through production of contractors, reported a substantial tonnage. From its stationary plant, the Brownsville Sand & Gravel Co. crushed basalt for roadstone. In addition to the output of various concerns which contracted to supply State highway crews and the United States Army Corps of Engineers with paving material and riprap, respectively, county crews processed riprap from basalt. Clay was mined by the Albany Brick & Tile Co. for heavy clay products. The Apex Agate Shop, Sutherlin, reported recovery of purple agate from Crawfordsville.

Malheur.—Don L. Toland recovered a quantity of mercury lost during previous operations near an old retort site at the Opalite mine. Extensive exploration was done by B. E. and R. L. Jordan at their quicksilver property on Hope Butte, near Bully Creek, 13 miles northwest of Vale. John Stringer, Nyssa, leased the property from the Jordans during the year, and later H. K. Riddle, Payette, Idaho, subleased the prospect and applied for a DMEA loan to continue development work. In May Shawano Development Corp., N. Y., took over the Bretz quicksilver mine, just north of McDermitt, Nev., from the United States Mercury Co., which had been leasing from the owner, John Ruiz, McDermitt, Nev. The Shawano Co. drilled during the summer and reportedly located a new ore body. Installation of a mill was planned.

This county ranked first in Oregon stone production in 1955. The entire output was crushed into roadstone by contractors for the State highway department. In addition, contractors provided road gravel for the State highway program. Oregon Clay Products, Inc., Vale, continued to manufacture heavy clay products. Near Harper, the Wunder Earth Co., Inc., leased lands controlling its diatomite prospect. No further activity was reported by Northwest Perlite Co. Assessment work on its gypsum claims was reported by Cimota

Enterprises, Inc.

Marion.—Aluminium Laboratories, Ltd., of Montreal, was reported to have conducted an exploration program on low-grade bauxite-bearing soils in the Salem Hills area during July and August. Four drill rigs from the Salem Sand and Gravel Co. were used for testing.

Six companies mined and processed gravel for building and paving purposes. County crews quarried riprap and rubble from basalt and sandstone, and at its Sublimity pit, the Tuff Stone Co., Inc., continued to process volcanic tuff into building stone. Several contractors provided a supply of riprap and building and paving materials from sand and gravel and crushed stone to the United States Army Corps of Engineers and county and State highway departments. The Donald Brick & Tile Co. of Donald manufactured building brick.

Morrow.—The J. F. Konen Construction Co. of Lewiston, Idaho, processed paving gravel at its portable plant. Both county and State road maintenance crews were supplied with paving and road material

by Babler Bros., Inc.

Multnomah.—The Reynolds Metals Co. reduction plant at Troutdale produced a quantity of aluminum metal from alumina shipped into the State. The Portland harbor became a terminal in July for zinc-concentrate shipments from Peru to Idaho smelters. New port facilities increased the speed of ore transfer from the ships to the dock-

side railroad gondola cars.

Multnomah County advanced to third place in total output value of minerals (\$2.9 million). The county retained first place in production valuation of sand and gravel (\$2,277,000) and ranked fourth in the value of stone produced (\$644,000). Clay, exfoliated vermiculite, expanded perlite, and soapstone also were processed in the county. Ten firms accounted for most of the sand and gravel produced in the county while county road-building crews and several contractors for the State supplied the remainder as well as the crushed-stone output. The Newport Construction Co. of Portland quarried and crushed traprock for building and paving purposes. Two other Portland

firms—Columbia Brick Works and Sylvan Brick Co.—manufactured heavy clay products. Perlite from Pioche, Nev., was expanded at the North Portland plant of Supreme Perlite Co. for utilization in plaster aggregate, fillers, and insulation. Crude soapstone from Washington was ground and processed for use in insecticides by Miller Products Co. and Stauffer Chemical Co., both of Portland. Crude vermiculite from Montana was processed at the Portland plant of Vermiculite-Northwest, Inc. The exfoliated product was marketed as insulation, for use in concrete and plaster, and for other miscel-

laneous purposes.

Polk.—Limestone was processed by Oregon Portland Cement Co. for the manufacture of cement and by Polk County Lime Co., Dallas, for agricultural purposes. Molding sand was produced by La Grande Industrial Supply Co. of Portland from raw materials extracted near Dallas. Paving gravel was mined by Dale Grossman, Independence. The City of Dallas, United States Army Corps of Engineers, and the State highway department procured sand and gravel as well as stone from contracting companies for projects within the county. Building brick and tile, manufactured from local clay, were marketed by Monmouth Brick & Tile Co., Monmouth.

Sherman.—In addition to stone crushed by the county road crews for highway maintenance, paving gravel was processed by Gibbons & Reed and R. A. Heintz for the United States Army Corps of Engineers. The county ranked fifth in output value of sand and gravel (\$917,000).

Tillamook.—Building and paving sand and gravel were mined and processed by the Dolan Construction Co., Tillamook. Various firms supplied the State highway department and the United States Army Corps of Engineers with gravel. In addition, quarrying basalt for riprap and road metal was reported by the county engineer. A small quantity of heavy clay products was produced by Tillamook Clay Works.

Umatilla.—Six companies reported output of sand and gravel for building purposes. Two of these firms also processed specialty sands—O. O. Felthouse of Hermiston produced railroad engine and stock-car sand, and the Umatilla Ready Mix Co., Umatilla, produced a quantity of blast sand. Under various contracts, gravel and stone were mined and processed for county and State highway maintenance, and county road crews supplemented production through their own operations. Crushed basalt was utilized by the Union Pacific Railroad for ballast.

Union.—From its mining operation near Island City, the La Grande Concrete Pipe Co. extracted sand and gravel for building and paving purposes. These commodities, as well as crushed stone, were produced for the State by contractors. In addition, the county highway department produced gravel and sandstone for its construction program. Building brick and tile were manufactured from local

clay by the La Grande Brick Co., La Grande.

Wallowa.—Limestone mined at the Greely Lime Co. Black Marble quarry near Enterprise was shipped to Portland and processed into calcium carbide. A small quantity was used for agricultural limestone. Building and paving sand and gravel were marketed by Stone's Sand & Gravel Co. of Enterprise, and two firms provided State highway crews with washed and pit-run gravel for road-building.

Vernie Jarl supplied the Bureau of Public Roads with crushed rock, and county road crews processed this commodity for the county

highway program.

Wasco.—Harvey Machine Co., Torrance, Calif., disclosed completion of financial arrangements for building its proposed \$65 million primary aluminum plant at The Dalles. GSA signed a contract with the company specifying the prompt beginning of construction of the plant and the production and sale of 270,000 tons of metal by June 30, 1963 (see Aluminum). Uranium exploration on the eastern slopes of Mount Hood, near Dufur, resulted in several uranium claims. Mel White & Associates of The Dalles first discovered the presence of radioactive materials near the end of the logging road leading to Flag Point Lookout, 21 miles west of Dufur. Prospectors were active in

the area by early fall.

Output and value of sand and gravel dropped sharply below the 1954 figure. This decline was due to the falloff in demand for these products by the United States Army Corps of Engineers at The Dalles Dam. Plaster and filter sands, as well as building and paving sand and gravel, were produced by The Dalles Concrete Products Co. The Dalles Sand Co. marketed construction sand and gravel. Two firms supplied the United States Army Corps of Engineers with sand and gravel and stone for paving and road metal, and county highway crews mined shale and sand and gravel for riprap and paving, respectively. Stone was crushed by C. M. Thomas, The Dalles, for road construction and by the Union Pacific Railroad for riprap. D. A. Temple mined volcanic tuff for dimension stone from the Rainbow Rock quarry near Maupin. Marketing of jasper, quartz, opal, and agate gem materials was reported by John Silvertooth of Antelope.

Washington.—This county was first in value of clay output and second in value of stone (\$875,000). The total output of the latter commodity was consumed by the county and State highway departments for road maintenance and construction. Sand and gravel for building and paving purposes was recovered by Tigard Sand & Gravel Co., Tigard, Vanaken Sand & Gravel Co., Forest Grove; and county road crews. The State highway department obtained paving material from four contractors. Expansion of shale for utilization as a lightweight aggregate, as well as for production of heavy clay products, was reported at the Banks plant of Northwest Aggregates, Inc., Portland. Shale from the Buxton pit supplied Smithwick Concrete Products Co., of the same city, with expandable materials for the manufacture of lightweight-concrete block. The O. K. Brickyard, Sherwood, and the Schools Tile Co., Hillsboro, fabricated brick and tile.

Wheeler.—E. O. Waterman worked the Waterman placer mine (Spanish Gulch district) with hydraulic giants and produced a small quantity of gold and silver.

The State highway department was supplied with road and paving materials, the only reported nonmetallic production in the county.

Yamhili.—The Grand Island Sand & Gravel Co. and the Willamette River Gravel Co., with plants in Dayton, prepared sand and gravel for building and paving purposes. In addition, four firms supplied the needs of State highway crews with these commodities. Basalt for

road metal and riprap was extracted by the Amity Sand & Gravel Co., Amity, and O. C. Yokum, McMinnville. The State highway department contracted with the Oregon Asphalt Co., Yamhill, to have it crush a small quantity of road materials for highway maintenance. The McMinnville Brick & Tile Co., McMinnville, and the Willamina Clay Products Co., Tigard, manufactured heavy clay products.



# The Mineral Industry of Pennsylvania

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Pennsylvania Bureau of Topographic and Geologic Survey.

By Robert D. Thomson 1 and Mary E. Otte 2



INERAL production in Pennsylvania totaled \$971 million (an increase of \$45 million (5 percent) over 1954) but was \$151 million less than in 1953. Of the 25 mineral commodities produced in 1955, 18 increased in value of output. Bituminous coal, anthracite, cement, stone, and petroleum, in order of decreasing value, were the most important economically.

TABLE 1.—Mineral production in Pennsylvania, 1954-55 1

	19	54	19	55
Mineral	Short tons (unless other- wise stated)	Value	Short tons (unless other- wise stated)	Value
Cement: Portland	3, 524, 398 29, 083, 477 72, 010, 101	\$117, 912, 299 10, 243, 485 247, 870, 023 378, 658, 531	45, 526, 877 2, 562, 701 4, 019, 909 26, 204, 554 85, 713, 456 478, 840	\$132, 965, 136 9, 003, 906 12, 413, 093 206, 096, 662 440, 451, 700 (3)
Gold (recoverable content of ores, etc.)  troy ounces  Iron ore (usable) long tons, gross weight.  Iron oxide pigment (crude) Lime (open-market)  Natural gas. million cubic feet.  Natural gas liquids:  Natural gasoline thousand gallons  LP-gases do Petroleum (crude) thousand 42-gallon barrels.  Sand and gravel.  Sericite schist.  Silver (recoverable content of ores, etc.)	1, 081, 583 145, 934 4, 830 1, 008	46, 095 (3) 13, 206, 310 43, 634, 000 320, 000 89, 000 141, 352 31, 150, 000 20, 595, 990 8, 541	1, 610 (3) 519 1, 424, 051 99, 172 4, 305 995	
Slate	194, 205 40, 521, 756 (3) (3)	7, 616 4, 419, 439 61, 193, 419 (3) (3) (3)	10, 379 186, 035 44, 437, 623 7, 738 990	9, 394 4, 421, 298 70, 056, 080 263, 370 21, 780 15, 819, 073
Total Pennsylvania 5		925, 545, 000		

Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
Pota not available.

<sup>3</sup> Figure withheld to avoid disclosing individual company confidential data.
4 Weight not recorded.

The total has been adjusted to eliminate duplication in the value of clays and stone.

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One or more mineral commodities were produced in every county. Major producing counties, in order of decreasing value, were: Washington, Luzerne, Northampton, Greene, Cambria, Allegheny, and Schuylkill. In 1954, Luzerne County had ranked first, followed by Washington, Schuylkill, Northampton, Greene, Cambria. Allegheny.

## EMPLOYMENT IN MINERAL INDUSTRIES

Employment.—Data released by the Bureau of Statistics, Department of Internal Affairs, Commonwealth of Pennsylvania, indicated that the 1,649 mineral-industry installations employed 87,959 persons in 1955. The Pennsylvania Bureau of Statistics reported total wages and salaries to be \$352,307,000 and capital investments at \$694,865,000.

TABLE 2.—Employment, wages, capital invested, value of production, and value added by manufacture of selected mineral industries in Pennsylvania, 1955 <sup>1</sup>

Commodity	Number of mines reporting	Total number of employees	Total wages and salaries (thousand dollars)	Capital invested (thousand dollars)
Clay	25	301	771	1, 704
Bituminous	933	49, 433	215, 174	431, 971
Anthracite	261	27, 440	92, 792	168, 316
Reclaimed from streams	13	140	499	6, 952
	9	452	1,906	4,012
Glass sand Sand and gravel	71	1, 390	6, 126	17, 228
Slate:			i .	
Roofing	7	392	1, 190	501
Miscellaneous	. 12	451	1, 588	1,647
Stone:				
Cut	29	427	1, 290	1, 258
Crushed	101	2, 913	11, 323	27, 954
Marble and granite	124	928	3, 184	3, 252
Miscellaneous	21	1, 761	7, 722	14, 125
Miscellaneous 2	43	1, 931	8, 742	15, 945
Total	1, 649	87, 959	352, 307	694, 865

Bureau of Statistics, Department of Internal Affairs, Commonwealth of Pennsylvania.
 Includes iron ore, ganister rock, and mines and quarries unclassified.

TABLE 3.—Employment and total wages and salaries for selected mineral industries in Pennsylvania, 1951-55 1

					_		
	Total wages and salaries (thousand dollars)	177	215, 174 92, 792	1, 906 6, 126	1, 190	1, 290 11, 322 3, 184 7, 722 8, 742	352, 307
1955	Total number of em- ployees	301	49, 433 27, 440	140 452 1, 390	392 451	427 2, 913 928 1, 761 1, 931	87, 959
	Number of mines reporting	25	933	13	12	101 124 124 134	1,649
	Total wages and salaries (thousand dollars)	363	197, 678 106, 817	1,815 5,051	1, 109	1, 087 8, 197 3, 028 6, 599 7, 284	341, 197
1954	Total number of em- ployees	163	55, 380 35, 496	181 504 1,024	379	2, 243 2, 243 941 1, 880 1, 779	100, 726
	Number of mines reporting	15	997	14 9 37	12	15 125 20 39	1, 595
	Total wages and salaries (thousand dollars)	555	283, 260 148, 312	2, 059 5, 385	1, 277	628 7, 252 2, 921 8, 702 7, 932	470, 522
1953	Total number of em- ployees	211	68, 054 46, 197	217 543 1, 124	391 472	2, 187 2, 187 928 2, 116 1, 889	124, 509
	Num- ber of mines report- ing	17	1,069	17	12	127 127 139 33	1,664
	Total wages and salaries (thousand dollars)	- 522	271, 642 197, 410	744 1, 673 5, 312	1, 529 1, 516	7, 508 2, 913 7, 487 7, 952	506, 849
1952	Total number of em- ployees	202	75, 620 56, 807	319 521 1, 190	483 503	2, 204 2, 204 2, 911 1, 866	142, 845
	Number of mines reporting	14	1,116 $254$	17 10 39	8 2	14 80 134 19 35	1,752
	Total wages and salaries (thousand dollars)	506	318, 892 211, 737	670 1, 795 4, 590	1, 545 1, 791	653 7, 447 2, 743 8, 074 7, 397	567, 840
1921	Total number of em- ployees	189	83, 470 61, 014	311 519 1, 153	542 588	208 2, 366 2, 130 1,833	155, 284
	Number of mines reporting	15	1, 174	16 10 14	9	16 83 135 19 34	1,813
	Commodity	Clay.	Bituminous	Streams	Roofing	Cutsched Marble and granite Miscellaneous	Total

! Bureau of Statistics, Department of Internal Affairs, Commonwealth of Pennsylvania. Includes Iron ore, ganister rock, and mines and quarries unclassified.

# REVIEW BY MINERAL COMMODITIES

## MINERAL FUELS

Coal.—Production of anthracite declined 10 percent compared with 1954, decreasing for the fifth consecutive year. The average value per net ton was \$7.86 compared with \$8.52 in 1954 and \$9.67 in 1953. Anthracite produced underground dropped from 58 to 55 percent of the total. Output from strip mines increased from 28 to 30 percent; production from culm banks and dredges remained steady at 12 and 3 percent, respectively. Of the total tonnage, 84 percent was shipped out of the producing areas; 14 percent was sold to local industry; and 2 percent was consumed as colliery fuel. Luzerne County led in production, supplying 37 percent of tonnage and 42 percent of value. Other productive counties were: Berks, Carbon, Columbia, Dauphin, Lancaster, Lackawanna, Lebanon, Northampton, Northumberland, Schuylkill, Snyder, and Sullivan.

Output of bituminous coal increased 19 percent over 1954, totaling 85.7 million short tons valued at \$440.5 million. Value averaged \$5.14 per ton, 12 cents lower than in 1954. Bituminous coal was produced from underground, strip, and auger mines; underground mines supplied 76 percent of the 1955 output. About 77 percent of the coal produced was undercut by machines, 20 percent was undercut by continuous mining machines, and the remainder was cut by hand or shot from the solid. Both electric and air drills were used to drill blastholes; electric drills furnished 95 percent of production for mines using power drills. Locomotives, rope hoists, shuttle cars, animals, and mother conveyors were used for underground haulage. Electric locomotives were the predominant type of haulage in 1955. In mining coal by strip methods, electric, diesel, and gasoline power shovels and draglines were used. A greater number of shovels and draglines with bucket capacity of less than 3 cubic yards was operated. Of the total

1955 bituminous-coal output, 68 percent was cleaned mechanically. Washington County led in production value, followed by Greene,

Cambria, and Allegheny Counties. Coke.—Coke production in 1955 increased 30 percent over 1954. totaling 20.8 million net tons, owing mainly to a greater demand for metallurgical coke. Pennsylvania led in quantity and value for both beehive and oven coke produced in the United States, supplying 26 percent of the output from slot-type ovens and 76 percent from beehive ovens. Fourteen plants, operating 4,149 ovens, carbonized 28,512,000 net tons of coal to produce 19,489,000 net tons of oven coke. A total of 2,125,000 net tons of coal was carbonized in 8,426 beehive ovens to produce 1,313,694 net tons of beehive coke. average value for oven coke at the ovens was \$14.96 compared with \$12.35 for beehive coke. Coke produced in Pennsylvania was shipped to blast-furnace, producer-gas, water-gas, and other industrial plants, and foundries and for residential heating. Blast furnaces consumed 96 percent of the coke.

Peat.—Pennsylvania ranked fifth among the 18 peat-producing States, producing 23,000 short tons valued at \$220,000. The 49-percent increase in tonnage and 55-percent rise in value over 1954 were due mainly to expanded markets in agriculture and horticulture.

TABLE 4.—Annual capacity of coke ovens, December 31, 1955, in net tons

			Ŋ.	Number and type of ovens	type of ove	sus		
<b>Name of company</b>	Name or location of plant	Beehive 1	1 94		Slot-	Slot-type		Annual coke ca-
		Machine drawn	Hand	Koppers	Koppers- Becker	Semet- Solvay	Wilputte	(suot
United States Steel Corp.	Allegheny County: Clairton			991	592		314	7 833 800
Fittsburgh Coke & Chemical CoJones & Laughlin Steel Corp	Neville Island Pittgburgh			300	140			1. 387, 000
Jones & Laughlin Steel Corp.	Beaver County: Aliquippa			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	352			2, 190, 000
United States Steel CorpBethlehem Steel Corp	Bucks County: Fairless Cambria County: Johnstown			100	113	100	174	877, 200 952, 100
Do Philadelphia Electric Co	Dauphin County: Steelton Delaware County: Cheston				130	00	101	768,000
Interlaké Iron Corp	Erie County: Brie				62		28	267, 500
Emerald Coal & Coke Co	Alica No. 1	400						346, 400
Speers Coal & Coke Co	Belle Vernon	888	14					25,000 25,000
Bortz Cole O	Daugherty, Sapper, Stanbaugh, and Central		32					198, 200 308, 700
Bridgeview Coal Co	Davidson Donald No. 2	240						22,500 150,000
Weirton Coal Co.	ratioank Isabella	138						42,000 120,000
Ruane Coal & Coke Co.	Laughead	09	8					36, 600 36, 000
Transfer States Steel Corp.	Leisenring No. 2	788 488						173, 700 267, 000
Eberly Coal & Coke Co	Lincoln Oliver No. 2	214	16					37, 500 120, 000
United States Steel Corp.	Phillips Puritan Nos. 1 & 2.	80						237, 300
Pennsylvania Coal CoFayette Fuel Co	Hoover Nos. 1 & 2.	120	78					156,000
John J. Bobak Tintted States Steel Corn	Searights Shoot No. 1	000	55					30,000
J. H. Hillman & Sons Co. Busin Goal & Gobe Co.	Tower Hill No. 2	254						219, 600
J. H. Hillman & Sous Co	Greene County: Poland	201					1 1	110,000 81,200
See footnote at end of table.							•	

TABLE 4.—Annual capacity of coke ovens, December 31, 1955, in net tons-Continued

	Annual coke ca- pacity (net	tons)	88 000 000 000 000 000 000 000 000 000
		Wilputte	
sus	type	Semet- Solvay	
type of ove	Slot-type	Koppers- Becker	25 25 25 25 25 25 25 25 25 25 25 25 25 2
Number and type of ovens		Koppers	110
Nu	ive 1	Hand drawn	155 20 20 36 110 30 30 30 17 17 17 17 17 17 18 24 24 24 24 25 36 36 36 36 36 36 36 36 36 36 36 36 36
	Beehive 1	Machine drawn	264 264 264 266 280 280 310 400 400 400 277 277 277
	Name or location of plant		Indiana County:  Coral Emest and Coral Emest and Coral Enterst and Coral Enterst and County: Swedeland Northampton County: Philadelphia Westmoreland County: Philadelphia Westmoreland County: Philadelphia Westmoreland County: Philadelphia Westmoreland County: Philadelphia Westmoreland County: Arona Atlantio No. 2 Beatty No. 2 and Whitney Calment Capentertown Duquesne Hester Humphrey Mammoth No. 1 Mammoth No. 1 Marguertie Monescer Featur Salem Standard Trauger Trauger Trauger  Go United Whyel
	Name of company		Yanity Bros. Coal Co.  Rochester & Pittsburgh Coal Co.  Luceme Coke Co.  Smith-Brown Go., Inc.  Alan Wood Steel Co.  Philadelphia Coke Co.  Ring Coal & Coke Co.  Ring Coal & Coke Co.  Bagle Coal Co.  Ring Roal & Coke Co.  Brinkerton Coke Co.  Brinkerton Coke Co.  Brinkerton Coke Co.  Brinkerton Coke Co.  Brinkerton Code Co.  Humphrey-Compalistille Coke Co.  Hamphrey-Compalistille Coke Co.  Hammoth Coal & Coke Co.  Mammoth Coal & Coke Co.  Horn Coal & Coke Co.  Ring Bros. Coal & Coke Co.  Pittsburgh Steel Co.  Pittsburgh Steel Co.  Pittsburgh Steel Co.  Pittsburgh Steel Co.  Pittsburgh Steel Co.  Pittsburgh Steel Co.  Pittsburgh Steel Co.  Pittsburgh Steel Co.  Pittsburgh Steel Co.  Humble Coal & Coke Co.  Humble Coal & Coke Co.  Humble Coal & Coke Co.  Humble Coal & Coke Co.  Hang Coal & Coke Co.  Hang Coal & Coke Co.

<sup>1</sup> Includes ovens reported in existence Dec. 31, 1955, whether idle or active. Does not include ovens known to have produced coke for which no report was submitted by operator.

Varieties of peat produced in 1955 were humus, moss, reed, and sedge. Peat was produced in Erie, Lawrence, Luzerne, and Mercer Counties,

with Luzerne leading in production.

Petroleum and Natural Gas.—Output of both petroleum and natural gas dropped in 1955. Petroleum decreased 6 percent in barrels and 3 percent in value. Natural gas showed a substantial drop of 47,000 million cubic feet and nearly \$14 million in 1955, a 32-percent drop compared with 1954.

The 717 wells completed in Pennsylvania in 1955 included 194 oil

wells, 291 gas wells, 149 service wells, and 83 dry wells.3

Footage totaled 1,817,000 feet, averaging 2,534 compared with 1,331 in 1954. Twenty-six wells were drilled to a depth of under 1,250 feet; 490 to 1,250–2,500 feet, 114 to 2,500–3,750 feet, 27 to 3,750–5,000 feet, 48 to 5,000–7,500 feet, 11 to 7,500–10,000 feet, and 1 to 10,000–12,500 feet. Of the 291 gas wells completed in 1955, 284 were field wells and 7 wildcat wells; these compare with 480 and 3, respectively, in 1954.

Proved recoverable reserves for crude oil in Pennsylvania were estimated to be 140 million barrels on January 1, 1956, and for natural

gas at 750 billion cubic feet.

Natural-gas liquids were produced as byproducts of natural gas.

### **METALS**

Iron ore.—Production of iron ore measured by shipments in Pennsylvania increased in 1955 compared with 1954. The entire output of ore came from the Cornwall mine and was shipped by rail to the Lebanon concentrator. The concentrator consists of four plants—mill, sinter, pellet, and flotation. Typical daily production, in tons, was ore 6,500, iron concentrate 3,600, copper concentrate 67, pyrite concentrate 79, sinter 1,600, pellets 1,300, and tailing 2,700. Cobalt also was obtained by treating the pyrite concentrate. The sinter and pellets were shipped to Steelton, Pa.; pyrite concentrate was shipped to Sparrows Point, Md.

Progress was made during the year in developing the Grace mine owned by Bethlehem-Cuba Iron Mines Co. and operated by Bethlehem Cornwall Corp. The mine, near Morgantown, Berks County, will be mined by panel caving; daily production was expected to reach

9,600 net tons.4

Initial development was confined primarily to 1 major job on each of 4 levels. Two shafts had been sunk—A, ore shaft to a depth of 2,208 feet, and B, man and material shaft to a depth of 3,079 feet. Initial development consisted of driving and concreting 6,000 feet of main haulage drift on the first level of A shaft, mining and constructing a power station on the second level, mining and concreting two main sumps for mine water on the third level, and mining and constructing a main pumproom on the fourth level.

Pig Iron and Ferrous Scrap.—Production of pig iron totaled 20,788,000 net tons—a 41-percent increase over 1954. A total of

<sup>3</sup> Oil and Gas Journal, Annual Review—Forecast Issue, vol. 54, No. 39, Jan. 30, 1956, pp. 146, 149, 151, 161, and 178.
4 Bingham, J. P., Bethlehem Cornwall Corp. Grace Mine Development: AIME Mining Branch Conference, Hershey, Pa., Nov. 8-10, 1956.

38,858,179 net tons of metalliferous materials, 17,711,000 tons of coke, and 8,496,000 tons of flux was consumed in processing the pig iron. Metalliferous materials consumed per ton of pig iron produced in 1955

totaled 1.869, a slight increase over 1954.

Uninterrupted and accelerated steel production resulted in an increased demand for ferrous materials. Consumption of pig iron and ferrous scrap increased 43 percent compared with 1954; ferrous materials in greater quantity were used in all types of furnaces. Open-hearth furnaces, the leading consumers of both pig iron and ferrous scrap, consumed 88 percent of the entire pig-iron output and 76 percent of the scrap used.

TABLE 5.—Consumption of pig iron and ferrous scrap in 1954-55 by type of furnace, in short tons

Type of furnace and raw material	1954	1955	Type of furnace and raw material	1954	1955
Open-hearth furnaces: Pig iron	12, 925, 526	18, 071, 822	Blast furnaces:		
Scrap	9, 430, 661	13, 929, 937	Pig iron		
Total pig iron and			Scrap	1, 099, 013	1, 450, 662
scrap	22, 356, 187	32, 001, 759	Total pig iron and scrap	1, 099, 013	1, 450, 662
Bessemer converters: Pig iron	529, 889	671 100		1,000,010	1, 400, 002
Scrap	84, 721	671, 189 125, 837	Ferroalloy furnaces: Pig iron		
Total pig iron and			Scrap	185	276
scrap	614, 610	797, 026	Total pig iron and scrap	185	050
Electric steel furnaces:	10,000	00 500	•	180	276
Pig iron Scrap	13, 299 1, 218, 634	20, 503 1, 752, 251	Miscellaneous uses: Pig iron	1 805, 782	1 1, 456, 223
Total pig iron and			Scrap	<sup>2</sup> 54, 338	2 85, 242
scrap	1, 231, 933	1, 772, 754	Total pig iron and	000 100	1 541 405
Cúpola furnaces: Pig iron	000 484	000 101		860, 120	1, 541, 465
Scrap	286, 471 642, 935	328, 134 754, 079	Total Pennsylvania: Pig iron	14, 601, 423	20, 600, 273
Total pig iron and			Scrap	12, 639, 748	18, 249, 389
scrap	929, 406	1, 082, 213	Total pig iron and	07 041 171	80 040 000
Air furnaces: Pig iron	40, 456	52, 402	scrap	27, 241, 171	38, 849, 662
Scrap	109, 261	151, 105	*		
Total pig iron and					
scrap	149, 717	203, 507			

Includes direct castings and small quantity used in crucible furnaces.
 Includes small quantity used in crucible furnaces.

### **NONMETALS**

Cement.—The cement industry shipped 48 million barrels valued at \$142 million and set a new record, quantity increased 12 percent and value 20 percent over 1954. Portland cement represented 95 percent of the total quantity and 94 percent of the total value in 1955. Data for shipments of masonry cement from plants in Pennsylvania is given separately for the first time in 1955, showing a total of 2.6 million barrels valued at \$9 million.

Cement plants produced in Allegheny, Berks, Butler, Lawrence, Lehigh, Montgomery, Northampton, and York Counties. The Lehigh and Northampton Counties area was the leading center of production; 16 plants supplied 68 percent of portland-cement shipments. Plants producing masonry cement were active in 1955 in Allegheny, Berks, Butler, Lawrence, Lehigh, Northampton, and York Counties. The Lehigh and Northampton area was the leading producing district; 13 companies produced masonry cement.

TABLE 6.—Finished portland cement produced, shipped, and in stock, 1946-50 (average) and 1951-55

			Ship	ped from mills	1	
Year	Active plants	Production (barrels)		Valu	le .	Stocks at mills on December
			Barrels	Total	Average per barrel	31 (barrels)
1946-50 (average)	24 24 24 24 24 24 24	35, 526, 261 41, 981, 431 39, 437, 971 42, 799, 409 42, 514, 803 46, 862, 575	35, 590, 801 41, 560, 431 40, 037, 761 42, 093, 765 43, 068, 234 45, 526, 877	\$74, 074, 997 107, 035, 506 103, 388, 586 114, 002, 846 117, 912, 299 132, 965, 136	\$2.08 2.58 2.58 2.71 2.74 2.92	2, 431, 005 2, 980, 404 2, 390, 588 3, 096, 231 2 2, 539, 940 3, 442, 601

<sup>&</sup>lt;sup>1</sup> For years previous to 1955, includes portland cement used in making masonry cement.
<sup>2</sup> Revised figure.

TABLE 7.—Shipments of portland cement, 1954-55, by counties

County	19	54	19	55
	Barrels 1	Value	Barrels	Value
Northampton Lehigh Allegheny	22, 485, 987 7, 712, 313	\$61, 507, 393 20, 519, 985	22, 874, 741 8, 005, 405	\$66, 864, 557 23, 098, 410
Lawrence Butler	8, 561, 019	23, 146, 906	9, 664, 645	27, 301, 954
Berks	4, 308, 915	12, 738, 015	4, 982, 086	15, 700, 215
Total	43, 068, 234	117, 912, 299	45, 526, 877	132, 965, 136

<sup>&</sup>lt;sup>1</sup> Includes portland cement used in making masonry cement.

Clays.—For the first time since 1951, production of clays in Pennsylvania increased, rising 14 percent in tonnage over 1954. This increase was due to the expanding production of fire clay and miscellaneous clay, which compensated for the decrease from 1953 to 1954. In 1955 Pennsylvania ranked second in tonnage of clay and third in value, representing 8 percent of the United States tonnage and 9 percent of the total value. Fire clay was the most important clay produced in 1955 in Pennsylvania, representing 54 percent of tonnage and 83 percent of total value.

Fire clay was used principally in manufacturing firebrick and block and heavy clay products; smaller quantities were used in producing other refractories and art pottery. Miscellaneous clay was used mostly in producing heavy clay products; smaller quantities were used in manufacturing portland cement, art pottery, refractories, linoleum and oilcloth, and tile and as a filler in paints. Kaolin was used in producing portland cement and firebrick and block; its use in producing cements was more important.

TABLE 8.—Clays sold or used by producers, 1946-50 (average), and 1951-55

	Kε	olin	Fire	clay	Miscellar	neous clay	To	tal
Year	Short	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946-50 (average)	48, 160 75, 415 (1) (1) (1) (1) 38, 823	\$182, 574 306, 045 (1) (1) (1) (2) 211, 230	1, 708, 899 2, 205, 794 1 1,992,099 1 1,703,280 1 1,901,644 2, 160, 465	\$6, 536, 729 11, 653, 734 1 10,726,085 1 8,001, 196 1 8, 602, 399 10, 300, 454	1, 625, 063 1, 949, 358 1, 739, 031 1, 872, 142 1, 622, 754 1, 820, 621	\$1, 340, 255 2, 127, 771 1, 913, 779 1, 986, 937 1, 641, 086 1, 901, 409	3, 382, 122 4, 230, 567 3, 731, 130 3, 575, 422 3, 524, 398 4, 019, 909	\$8, 059, 558 14, 087, 550 12, 639, 864 9, 988, 138 10, 243, 485 12, 413, 093

<sup>&</sup>lt;sup>1</sup> To avoid disclosing individual company confidential data, kaolin has been combined with fire clay.

TABLE 9.—Clays sold or used by producers in 1954-55, by kinds and uses, in short tons

	Fire	clay	Miscellaneous clay		
Uses	1954	1955	1954	1955	
Refractories:  Firebrick and block !	2 858, 165 29, 744 91, 426 (4) 64, 159	958, 026 29, 811 118, 086 38, 823 139, 604	1, 938 (³)	(3)	
Heavy clay products.  Paint fillers or extenders.  Cement Lightweight aggregate. Undistributed.	826, 231  5 31, 919	902, 563 	1, 438, 936 434 155, 363 6 26, 083	1, 503, 61 38 170, 47 117, 30 6 28, 84	
Total	1, 901, 644	2, 199, 288	1, 622, 754	1, 820, 62	

Includes high-alumina brick.

Includes hapten.
 Includes kaolin.
 Included with "Undistributed" to avoid disclosing individual company confidential data.
 Included with firebrick and block to avoid disclosing individual company confidential data.
 Includes kaolin and fire clays for art pottery and stoneware, high-alumina brick, and glass refractories.
 Includes miscellaneous clays for art pottery and stoneware, high-grade tile, foundries and steelwork, miscellaneous fillers, linoleum and oilcloth, and other uses.

TABLE 10.—Clays sold or used by producers in 1955, by counties

County	Short tons	Value	Types of clay
dams	64, 400	\$32, 900	Miscellaneous clay.
		270, 200	Do.
lleghenyrmstrong	231, 235	912, 787	Fire clay, miscellaneous clay
eaver	551, 218	1, 809, 823	Fire clay.
lair		132, 227	Do.
utler		48, 101	Do.
amhria		148, 973	Do.
ambria arbon	117, 308	19, 596	Miscellaneous clay.
hester	65, 520	81, 863	Do.
larion		435, 629	Fire clay.
learfield		3, 321, 921	Do.
linton		317, 555	Do.
olumbia		13, 977	Miscellaneous clay.
umberland	29, 521	176, 230	Kaolin.
ayette	143, 113	908, 572	Fire clay.
reene	4, 588	5, 735	Miscellaneous clay.
idiana		120, 176	Fire clay.
ilzerne		39, 103	Miscellaneous clay.
ycoming	380	760	Do.
Iontgomery		151,018	Fire clay.
Jashington		70, 997	Miscellaneous clay
Vashington Vestmoreland	34, 872	75, 508	Fire clay.
ndistributed 1	1, 598, 315	3, 319, 442	
Total	4, 019, 909	12, 413, 093	

<sup>&</sup>lt;sup>1</sup> Includes Berks, Bucks, Centre, Dauphin, Delaware, Elk, Huntingdon, Jefferson, Lancaster, Lawrence, McKean, Northumberland, Schuylkill, Snyder, Somerset, and York Counties, and a quantity unspecified by county.

Lime.—Output of lime in 1955 increased in both tonnage and value compared with 1954, owing mainly to increased demand for lime in chemical and industrial applications. Lime was produced in 16 counties; output in Centre, Lebanon, York, and Chester each totaled more than 100,000 short tons. Chemical, industrial, and refractory uses gained substantially; sales of both agricultural and building lime declined. Of the total sold or used, 78 percent was in the form of quicklime and dead-burned dolomite and 22 percent in hydrated form.

Mica.—Output of mica continued to increase in 1955. The General Mining Associates, a plant in York County, sole producer, marketed mica for use in paints, rubber, electrical insulators, and welding rods.

Pyrite.—Output of pyrite increased in 1955 in production and value compared with 1954. Bethlehem Steel Co. produced pyrite as a byproduct of the iron-mining operations at Cornwall, Lebanon County.

Pyrophyllite (Sericite Schist).—Mine production of sericite schist increased greatly in tonnage and value compared with 1954. Output came from the Summit Mining Corp. open-pit mine in Adams County. In a new plant completed June 1955, the company processed crude material for use in insecticides, asphalt, and filler in joint-filler cement.

Sand and Gravel.—Sand and gravel decreased 6 percent in quantity sold or used.

Total value decreased only slightly in 1955. Sand was sold for ten major uses. Building sand, fire or furnace sand, and sand for miscellaneous uses increased in quantity sold or used; sand for glass, molding, paving, engine, and filter decreased; sand for grinding, polishing, and blast remained approximately the same as for 1954. Gravel was used for four applications; consumption of building, railroad ballast and miscellaneous gravel increased in tonnage. Value of commercial sand production increased over 1954; value of gravel

TABLE 11.—Lime sold by producers, 1946-50 (average) and 1951-55 by uses

Year	Agric	gricultural	Bul	Bullding	Chemical ar	Ohemical and industrial	Refr	Refractory	Tc	Total
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
946-50 (average) 981 982 983 984 984	139, 921 134, 559 131, 007 116, 863 129, 146 118, 274	\$1, 438, 473 1, 532, 813 1, 463, 596 1, 367, 594 1, 537, 849 1, 430, 454	101, 434 126, 048 123, 049 114, 839 120, 661 118, 727	\$1,348,465 1,740,850 1,676,387 1,676,387 1,697,895 1,629,627	1 778, 886 741, 673 768, 319 865, 747 816, 044 1, 083, 043	1 \$7, 674, 552 8, 551, 011 8, 228, 875 9, 766, 852 9, 776, 513 13, 178, 613	178, 820 180, 606 237, 851 15, 732 104, 007	\$2,435,380 2,473,755 3,300,281 217,047 1,493,101	1, 020, 241 1, 181, 100 1, 202, 981 1, 335, 300 1, 081, 583 1, 424, 051	\$10, 461, 490 14, 260, 054 13, 842, 213 16, 010, 114 13, 206, 310 17, 631, 795

<sup>1</sup> Refractory lime included with chemical and industrial.

TABLE 12.—Lime sold or used by producers, 1954-55, by counties

County	195	54	1955		
Commit	Short tons	Value	Short tons	Value	
Armstrong Bedford Centre Franklin Lebanon Lycoming Mifflin Montgomery Northumberland Snyder Somerset Undistributed 2	1, 159 487, 735 (1) 194, 664 (1) 5, 565 72, 661 (1) 3, 360 1, 321 315, 118	\$15, 124 (1) 5, 573, 465 (1) 2, 040, 179 (1) 47, 000 1, 139, 504 (1) 21, 949 5, 284 4, 363, 805	788 3, 991 (1) 2, 513 244, 111 800 (1) 74, 079 74, 079 2, 593 1, 563 1, 093, 063	\$8, 846 57, 170 (1) 21, 987 2, 749, 585 6, 400 (1) 1, 150, 083 4, 276 18, 593 9, 378 13, 605, 477	
Total	1, 081, 583	13, 206, 310	1, 424, 051	17, 631, 79	

¹ Included with "Undistributed" to avoid disclosing individual company confidential data.
² Includes tonnage and value for counties that must be concealed as indicated by footnote 1 and the following counties: Butler, Chester, Fulton (1954), Lancaster, Montour (1954), and York.

TABLE 13.—Sand and gravel sold or used by producers, 1954-55, by uses

Use	19	54	195	55
Use	Short tons	Value	Short tons	Value
Sand: Molding and fire or furnace Building Paying	3, 598, 674	\$982, 139 4, 715, 867 2, 852, 955	521, 044 3, 823, 809 2, 073, 476	\$1, 233, 081 5, 094, 580 2, 850, 744
EngineFilterOther 2	(1)	398, 243 (1) 3, 086, 096 12, 035, 300	127, 148 420 1, 001, 339 7, 547, 236	302, 837 1, 260 3, 111, 164 12, 593, 666
Total commercial sand Gravel: Building Paving Raitroad ballast Other	3, 512, 042 2, 507, 562	4, 870, 243 3, 433, 275 (¹) 85, 378	3, 659, 166 1, 823, 028 79, 988 131, 663	5, 093, 197 2, 529, 653 51, 981 200, 942
Total commercial gravel		8, 388, 896	5, 693, 845	7, 875, 773
Total commercial sand and gravelGOVERNMENT-AND-CONTRACTOR OPERATIONS	13, 401, 243	20, 424, 196	13, 241, 081	20, 469, 439
Gravel: Paving Other	552, 193 3 265, 008	100, 364 3 71, 430	71, 890	42, 408
Total Government-and-contractor sand and gravel	817, 201	171, 794	71, 890	42, 408
Grand total	14, 218, 444	20, 595, 990	13, 312, 971	20, 511, 847

decreased. Government-and-contractor production of sand and gravel decreased considerably compared with the preceding year. In 1954 both sand and gravel were produced for use by Government agencies; in 1955 only gravel was produced, mainly for use as paving material. Commercial production of sand and gravel was reported in 40 counties. Bucks, Lycoming, and Westmoreland Counties were

<sup>!</sup> Included with "Other" to avoid disclosing individual company confidential data.

2 Includes grinding and polishing, blast, glass, other uses, and ground sand.

3 Includes building gravel, paving sand, and a portion of paving gravel, to avoid disclosing individual company confidential data.

the chief producing areas for commercial sand and gravel. Sand and gravel for use by Government agencies was produced in both Huntingdon and Mercer Counties.

TABLE 14.—Sand and gravel sold or used by producers, 1954-55, by counties

County	19	054	195	5
	Short tons	Value	Short tons	Value
Beaver Bedford Bucks Butler Carbon Crawford Dauphin Elk Erie. Fayette Forest Franklin Luzerne Lycoming Mercer. Monroe Montgomery. Northampton Philladelphia Schuyklill Somerset York. Undistributed 2	224, 929 513, 868 232, 826 (1) (1) (1) 392, 347 (1) (1)	\$1, 170, 481 (1) 8, 103, 521 476, 048 181, 507 154, 401 251, 927 (1) (1) (1) (1) (1) (1) (1) (1)	472, 848 9, 644 5, 173, 952 104, 987 267, 971 117, 249 97, 192 40, 235 172, 070 260, 000 61, 035 163, 955 362, 561 383, 023 223, 973 38, 512 10, 000 165, 723 2, 292 65, 561 3, 799, 815	\$699, 133 22, 953 7, 529, 929 138, 982 392, 907 126, 768 95, 032 24, 338 208, 769 656, 000 79, 805 224, 300 428, 530 608, 260 360, 864 54, 433 25, 060 336, 157 339, 747 339, 747 339, 747 349, 7665, 6694 104, 689 7, 665, 689
Total	14, 218, 444	20, 595, 990	13, 312, 971	20, 511, 847

<sup>&</sup>lt;sup>1</sup> Included with "Undistributed" to avoid disclosing individual company confidential data.

<sup>2</sup> Includes tonnage and value for counties that must be concealed as indicated by footnote 1 and the following counties: Allegheny, Armstrong, Bedford, Berks, Blair, Bradford, Cameron (1954), Clearfield, Columbia, Cumberland, Huntingdon, Lancaster, Lawrence, McKean, Mifflin, Montour (1954), Northumberland, Pike (1954), Venango, Warren, Wayne, Westmoreland (1955), and Wyoming.

Slate.—The Pennsylvania slate industry continued to decline in quantity of products sold, but increased slightly in value. Larger quantities of slate were marketed as flagging, grave vaults, and electrical slate than in 1954. Sales of slate for use as flour granules, roofing, blackboards, billiard-table tops, and school slates and in structural and sanitary applications, all decreased, compared with 1954. Quarries were operated in Lehigh, Northampton, and York Counties; Northampton County furnished 75 percent of production value in 1955. Of the 17 operators active in producing slate in 1955, 15 were in Northampton County, 1 in Lehigh, and 1 in York.

TABLE 15.—Slate sold by producers, 1946-50 (average) and 1951-55, by uses

	Num-	Roo	fing	Mill	stock		
Year	ber of oper- ators	Squares (100 square feet)	Value	Square feet	Value	Other uses (value)	Total value
1946-50 (average) 1951	24 25 18 18 17 17	123, 796 134, 180 93, 200 86, 116 77, 819 72, 638	\$2, 140, 351 2, 681, 072 1, 866, 479 1, 688, 167 1, 487, 870 1, 458, 594	2, 266, 370 2, 589, 090 2, 078, 020 2, 363, 266 2, 505, 839 2, 495, 467	\$1, 111, 104 1, 416, 657 1, 227, 471 1, 452, 320 1, 616, 981 1, 722, 889	\$1, 346, 896 1, 591, 141 1, 393, 698 1, 279, 125 1, 314, 588 1, 239, 815	\$4, 598, 351 5, 688, 870 4, 487, 648 4, 419, 612 4, 419, 439 4, 421, 298

Stone.—Production of stone increased 10 percent in tonnage and 14 percent in value compared with 1954. Sandstone, granite, basalt, limestone, and miscellaneous stone were produced in 45 of the 67 counties. Of the total value, sandstone represented 6, basalt 10,

and limestone 84 percent.

Sandstone was marketed as both dimension and crushed stone. Dimension sandstone was prepared as rough construction, rubble, rough architectural, dressed stone, and flagging. Crushed sandstone was used as riprap, road material, and railroad ballast. The ganister was used by refractory plants in the State in manufacturing silica brick and furnace or converter linings.

Only dimension granite was produced; it was utilized mainly as dressed monumental stone and as building stone in rough construction.

Dimension basalt was produced from quarries in Chester and Montgomery Counties. Crushed basalt from Berks, Bucks, Chester, Delaware, and Montgomery Counties was used principally as road

material and railroad ballast.

Output of dimension limestone in Bucks, Chester, Lancaster, and Somerset Counties was utilized for rough construction and rubble. Crushed limestone, employed as riprap, fluxing agent, concrete aggregate, and railroad ballast and for agricultural purposes, was produced in 35 counties. Government-and-contractor limestone was produced in Lycoming County for use as road material.

Quantities of dimension and crushed miscellaneous stones were

used as building, flagging, and road materials.

Sulfur.—Output of byproduct sulfur decreased both in quantity and value compared with 1954. The Sinclair Refining Co. Marcus Hook refinery in Delaware County, only sulfur plant in Pennsylvania, produced brimstone by the Claus process.

TABLE 16.—Stone sold or used by producers, 1954-55, by uses

	the second second second				
Use	19	054	19	1955	
	Short tons	Value	Short tons	Value	
Dimension stone: Building stone	153, 774 (1) 5, 496	\$798, 270 (1) 122, 902	224, 232 378 13, 711	\$912, 635 55, 325 292, 859	
Total dimension stone	² 159, 270	2 921, 172	238, 321	1, 260, 819	
Crushed and broken stone: Riprap Crushed stone Furnace flux (limestone) Refractory Agricultural Other uses		(1) 23, 924, 243 10, 857, 065 2, 247, 516 2, 787, 111 20, 430, 392	85, 752 15, 575, 172 9, 950, 775 334, 908 712, 029 17, 540, 666	144, 754 23, 314, 077 16, 714, 426 2, 019, 891 2, 300, 887 24, 301, 226	
Total crushed and broken stone Undistributed	40, 357, 603 4, 883	60, 246, 327 25, 920	44, 199, 302	68, 795, 261	
Grand total	40, 521, 756	61, 193, 419	44, 437, 623	70, 056, 080	

Included with "Undistributed" to avoid disclosing individual company confidential data.
 To avoid disclosing confidential information, certain totals are incomplete.

TABLE 17.—Stone sold or used, 1954-55, by counties

County	19	54	195	1955	
	Short tons	Value	Short tons	Value	
Allegheny	2, 384	\$16,687	(1)	(1)	
Bedford	(1)	(1)	23, 865	\$62,390	
Berks	2, 696, 525	2, 675, 091	2, 414, 747	3, 146, 268	
Blair	739, 439	1, 380, 314	536, 805	1, 068, 85	
Bucks	596, 794			1, 269, 31	
		1, 159, 742	697, 483		
Butler	(1)	(1)	2, 452, 797	4, 443, 73	
Cambria			5,000	13, 75	
Centre	1,740,967	3, 139, 442	2, 223, 352	3, 786, 95	
Chester	1, 881, 649	2, 651, 785	1, 389, 214	2, 171, 53	
Clinton	200, 661	283, 625	151, 958	213, 49	
Cumberland	(1)	(1)	531, 810	914, 67	
Dauphin	1,001,069	1, 620, 432	1, 342, 482	2, 149, 42	
Delaware	751, 939	1, 195, 829	(1)	(1)	
Fayette	(1)	(1)	324, 181	769, 75	
Franklin	507, 778	782,062	380, 997	605, 03	
Fulton	(1)	(1)	65, 428	85, 92	
Huntingdon	422, 953	1, 249, 564	349, 045	1, 304, 60	
Indiana	3, 174	13, 954	2, 200	9, 90	
Juniata	117, 394	157, 563	89, 616	286, 50	
Lancaster	1, 447, 783	2, 404, 485		2, 747, 20	
	2, 865, 643	4, 489, 297	1,717,028		
Lawrence			3, 273, 959	5, 338, 03	
Lebanon	2, 120, 169	3, 504, 360	2, 445, 651	3, 859, 37	
Lehigh	2, 424, 223	2, 377, 604	2, 760, 563	3, 014, 84	
Lycoming	339, 272	585, 135	315, 936	558, 83	
Mifflin	708, 959	1, 011, 575	(1)	(1)	
Montgomery	3, 310, 373	5, 315, 096	5, 168, 336	8, 219, 10	
Montour	(1)	(1)	393, 350	536, 82	
Northampton	7, 092, 538	7, 032, 948	6, 880, 654	6, 891, 76	
Northumberland	114,000	201,650	(1)	(1)	
Perrv	72, 118	114, 668	17. 917	32, 44	
Potter	(1)	(1)	7, 438	171, 76	
Schuylkill	23, 553	167, 848	11, 376	17,06	
Snyder	82, 488	181, 511	79, 703	131, 86	
Susquehanna		227, 988	3, 414	59. 23	
		358, 100	181, 900	308. 65	
Union Washington		300,100	4. 884	34, 15	
Wayne		2 000 700	116, 515	186, 424	
York	2, 156, 892	3, 822, 708	2, 348, 211	4, 159, 413	
Undistributed 2	6, 806, 787	13, 072, 356	5, 729, 808	11, 486, 96	
Total	40 591 756	61 102 410	44 497 699	70 056 08	
10631	40, 521, 756	61, 193, 419	44, 437, 623	70, 056, 08	

Included with "Undistributed" to avoid disclosing individual company confidential data.
 Includes tonnage and value for counties as indicated by footnote 1 and the following counties: Adams, Armstrong, Greene (1954), Lackawanna (1954), Luzerne, Mercer, Monroe, Philadelphia (1955), Somerset, and Westmoreland.

Tripoli.—Tripoli (rottenstone) was the only abrasive material produced in Pennsylvania in 1955. Rottenstone produced by one company from mines in Lycoming County, increased in both tonnage and value. It was marketed as an abrasive for buffing compounds, metal polishes, cleansing compounds, and fillers.

## **REVIEW BY COUNTIES**

Adams.—Bethlehem Limestone Co., formerly known as Bethlehem Quarry Co., quarry and crusher near Hanover produced limestone for use as blast-furnace flux, road material, railroad ballast, soil conditioner, and stone sand. A quantity of the crushed limestone was sold under contract to Government agencies. The Funkhouser Co. produced roofing granules and stone flour from an open quarry and underground mine at Charmian.

The Summit Mining Corp. open-pit mine near Bendersville produced sericite schist for use as asphalt filler, insecticides, and filler in joint-filler cement. This company completed constructing its grind-

ing plant in June 1955 and claimed to be the first operator of a Hardinge disc mill in the States.

Alwine Brick Co., New Oxford, and Gettysburg Drain Tile Works, Gettysburg, produced miscellaneous clay for making heavy clay

products at open-pit mines.

Allegheny.—Ten leading producers of bituminous coal in Allegheny County in 1955 were: Harmar Coal Co., Republic Steel Corp., Renton Coal Co., Pittsburgh Coal Co., Duquesne Light Co., Allegheny Pittsburgh Coal Co., Greensburg-Connellsville Coal & Coke, Butler Consolidated Coal Co., William Aloe Coal Co., and Charles E. Campbell. Bituminous coal was produced from both underground

and strip mines.

Pittsburgh Coke & Chemical Co., Green Bag Cement Division, at a cement plant at Neville Island produced types I and II (general-use and moderate-heat), portland-pozzolan and waterproof-portland cement and a quantity of masonry cement. The cement was produced by the wet process. The Universal Atlas Cement Co., subsidiary of United States Steel Corp., cement plant at Universal produced air-entrained and non-air-entrained types I-II and portland slag, non-air-entrained type III (high-early strength), and Atlas Mortar cement. All the cement was produced by the dry process.

Sand & Gravel, Inc., Pittsburgh, and Dravo Corp., Keystone Division, Coraopolis, produced and sold washed sand and gravel from dredges for construction and paving uses. Molding sand was produced by James H. McCrady, Jr., Cheswick, and Sidwell Loam Sand Co., Pittsburgh. A quantity of building sand and gravel was produced under contract for Pittsburgh & Lake Erie Railroad from

deposits in Allegheny County.

Six companies produced miscellaneous clay from open-pit mines for use in manufacturing heavy clay products, including building brick and tile, paving brick, draintile and sewer pipe. The active companies in 1955 were: Milliken Brick Co., Inc., Wilkinsburg; Van Ormer Brick Co., Inc., Pitcairn; Glassmere Brick & Tile Co. and McFetridge Building Brick Co., Creighton; Bridgeville Brick Co., Bridgeville; and M. Lanz Brick & Tile Co., Pittsburgh.

Francis Matesia recovered dimension sandstone for use in building

retaining walls from a quarry near Bridgeville.

Pennsylvania Salt Manufacturing Co. at a mine near Natrona produced and marketed crude iron oxide pigments of the Vandyke

brown variety for use as paint pigments.

Panacalite Perlite Co., Pittsburgh, expanded perlite from crude material mined in western United States, for use in manufacturing lightweight plaster aggregate. Perlite Manufacturing Co., Carnegie, also expanded perlite for plaster aggregate, concrete aggregate, and industrial and miscellaneous uses.

Armstrong.—Ten of the leading bituminous-coal producers in Armstrong County were: Maral Co., Mech Mining Co., Allegany River Mining Co., Leechburg Mining Co., Joe F. Sherman Co., Kittanning Brick Co., Harl E. Bowser, J. Russell Cavener, Powell Coal Co., and Taylor Bros. Bituminous coal mined in Armstrong County was produced by underground, strip, and auger methods.

TABLE 18.—Value of mineral production in Pennsylvania, 1954-55, by counties 12

County	1954	1955	Minerals produced in 1955 in order of value
AdamsAllegheny	(3) \$47, 237, 526	(3) \$58, 081, 078	Stone, sericite schist, clays.
			Coal, cement, sand and gravel, clays, stone, crude iron oxide pigments.
Armstrong	12, 887, 775 4, 127, 840	10, 197, 169 4, 225, 167	Coal, stone, clays, sand and gravel, lime. Clays, coal, sand and gravel.
Beaver Bedford Berks	(3)	551, 195	Coal, stone, lime, sand and gravel.
Berks	8, 338, 143	551, 195 8, 913, 688	Cement, stone, oystershell, coal, clays, sand and gravel.
Blair Bradford	2, 243, 120	2, 143, 001	Stone, coal, clays, sand and gravel.
Bucks	9, 283, 263	8, 821, 242	Sand and gravel, coal. Sand and gravel, stone, clays.
Butler	9, 283, 263 12, 402, 225	15, 737, 558	Coal, cement, stone, lime, sand and gravel, clays. Coal, clays, stone, crude iron oxide pigments.
Butler Cambria Cameron	54, 433, 637 (3)	15, 737, 558 63, 592, 999 335, 560 14, 576, 629 14, 266, 587 3, 439, 493	Coal, clays, stone, crude iron oxide pigments.
Carbon	12, 058, 552 10, 371, 114	14, 576, 629	Coal, sand and gravel, clays. Lime, coal, stone, clays.
Centre	10, 371, 114	14, 266, 587	Lime, coal, stone, clays.
Chester	3, 956, 879 6, 884, 248	8, 578, 848	Stone, lime, clays. Coal, clays.
Clarion Clearfield	(3)	(3)	Coal, clays, sand and gravel.
Clinton. Columbia	2, 796, 862	2, 635, 528	Coal, clays, stone. Coal, sand and gravel, clays.
Crawford	181, 507	6, 648, 621 126, 768	Sand and gravel.
Crawford Cumberland	(3)	(3)	Sand and gravel. Stone, sand and gravel.
Dauphin Delaware	4 1, 949, 554 1, 498, 374	4 3, 038, 855	Stone, coal, sand and gravel, clays, lime. Stone, sulfur, clays.
Elk	(3)	(3) (3)	Coal, clays, sand and gravel. Sand and gravel, peat.
Erie Fayette	(3)	(3)	Sand and gravel, peat.
Forest	41, 568, 911	41, 341, 340 79, 805 844, 648	Coal, clays, stone, sand and gravel. Sand and gravel.
Forest Franklin Fulton	871, 121	844, 648	Stone, sand and gravel, lime.
Greene	(3) (3)	(3) 65, 628, 367	Coal, stone. Coal, clays.
Huntingdon	4, 503, 817	4, 315, 318	Sand and gravel, stone, coal, clays
Indiana Jefferson	(3) (3)	4, 315, 318 28, 480, 723	Coal, clays, stone.
Jenerson Juniata	157, 563	(3) 286, 502	Coal, clays. Stone.
Juniata Lackawanna	(3)	286, 502 22, 017, 503	Coal.
LancasterLawrence	3, 839, 258 5 14, 381, 946	5, 323, 416 17, 474, 987	Stone, lime, coal, sand and gravel, clays. Cement, stone, coal, clays, sand and gravel, peat.
Lebanon	16, 548, 941	20, 917, 678	Tron ore, conner, lime, stone, cobalt, pyrites, gold
Lehigh	21, 016, 605	26, 604, 947	silver, coal. Cement, stone, oystershell, slate.
Luzerne Lycoming McKean	21, 016, 605 98, 487, 838	26, 604, 947 87, 818, 001 1, 428, 150 599, 095	Coal, stone, sand and gravel, peat, clays. Sand and gravel, stone, coal, tripoli, lime, clays. Coal, clays, sand and gravel.
McKeen	1, 379, 065	1, 428, 150	Sand and gravel, stone, coal, tripoli, lime, clays.
Mercer Mifflin	(3)	2, 859, 077	Coal, sand and gravel, stone, peat.
Mifflin	1, 949, 753	(3) (3)	Stone, sand and gravel, lime. Stone, sand and gravel.
Monroe Montgomery	9, 282, 824	14, 501, 384	Stone, cement, lime, clays, sand and gravel.
Montour Northampton Northumberland	(3)	536, 821 73, 568, 907	Stone.
Northumberland	65, 782, 967 30, 730, 257	73, 568, 907 21, 418, 663	Cement, slate, stone, sand and gravel, coal. Coal, stone, clays, lime, sand and gravel.
Perry	114, 668	32, 447 368, 747	Stone.
Porry. Philadelphia Pike Potter Schuykill Snyder Somerset.	(3)	368, 747	Sand and gravel, oystershell.
Potter	(3)	171, 761	Stone.
Schuylkill	69, 458, 677 348, 321	171, 761 53, 565, 714 262, 133	Coal, sand and gravel, clays, stone.
Somerset	348, 321 12, 584, 984	15, 326, 200	Stone, coal, clays, lime. Coal, stone, clays, lime, sand and gravel.
Dum van	132, 841	63, 426	Coal.
Susquehanna	227, 988 354, 608	59, 238 421, 032	Stone. Coal.
Tioga_ Union	358, 100	308, 650	Stone.
Venango Warren	(3)	(3)	Coal, sand and gravel. Sand and gravel.
Washington	78, 505, 987	94, 690, 663	Coal, clays, stone.
Wayne Westmoreland Wyoming York	(3)	(3) 20, 377, 543	Stone, sand and gravel.
W voming	16, 164, 974 (3)	(3)	Coal, sand and gravel, stone, clays. Sand and gravel.
York	9, 403, 485	11, 201, 555	Cement, stone, lime, slate. sand and gravel, clays mica.
Undistributed	236, 738, 741	112, 259, 690	mica.
3			

<sup>1</sup> Excludes value of production for LP-gases, natural gas, natural gasoline, and petroleum by counties, but value is included with "Undistributed."

2 Excludes value of clays and stone used in the manufacture of lime and cement.

3 Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

4 Excludes value of lime which is included in Lebanon County

5 Revised figure.

The Kaylor underground mine near East Brady, operated by Michigan Limestone Division, United States Steel Corp., yielded limestone for use as flux, road material, agricultural purposes, and cement production. A small quantity was sold to Government agencies as highway material. The C. D. McCanna, Kittanning underground mine and the Craig Claypool, Manor Township, open quarry produced limestone to be crushed for use in manufacturing lime.

Worthington Ceramics Co., Worthington, sold the entire output of plastic fire clay from an open-pit mine for making heavy clay products. Continental Clay Products Co., Kittanning, reported production of plastic fire clay from an underground mine for use in manufacturing heavy clay products and sold a small quantity for mortar. Kittanning Refractories, Inc. and Haws Refractories Co. (Kittanning) Kittanning Brick Co. (Adrian), Freeport Brick Co. (Freeport), Harbison-Walker Refractories Co. (Pittsburgh) and Graff-Kittanning Clay Prod. Co. (Worthington) produced plastic fire clay used in manufacturing heavy clay products and refractory firebrick and block.

Allegheny Sand & Loam Co., Leechburg recovered unwashed sand, usable as fire or furnace sand. Glacial Sand & Gravel Co., Cowans-ville, produced and prepared sand and gravel for construction and paving uses and a quantity of gravel for railroad ballast. Lee Don, Inc., Harmarville, produced sand and gravel for paving use.

Craig Claypool, C. D. McCanna Lime Plant, and Walter Hershberger, all near Kittanning, produced and marketed hydrated lime

for use in agriculture.

Beaver.—Thirteen companies produced clay in Beaver County in 1955. Eastvale Clay Products Co., Beaver Falls, used a large quantity of plastic fire clay from an underground mine for manufacturing heavy clay products and sold a small quantity for manufacturing refractories for the glass and steel industries. New Brighton Clay Products Co. used miscellaneous clay from an open-pit mine near New Brighton for heavy clay products. The Negley Fire Clay Co. (New Galilee), Pen-Hio Clay Co. (Cannelton), Sunnyside Coal Mining Co. (Darlington), Davis Coal Co. (Beaver County, west of Negley, Ohio), and Ralph A. Veon, Inc. (Darlington and New Galilee) mined fire clay of the plastic variety from open pits and marketed the output for use in manufacturing fire brick and block, foundries, and heavy clay products. In addition, Ralph A. Veon, Inc., mined and sold fire clay of the burley variety. Friedl-Elverson Pottery Co., New Brighton, produced miscellaneous and fire clays from an open pit for use in manufacturing art pottery, flowerpots, and glaze slip. Fire clay of the plastic variety mined by Metropolitan Brick, Inc., from an open pit near Darlington and from underground mines by Standard Clay Mfg. Co. (Fallston), McLain Fire Brick Co. (Division of H. K. Porter Co., Inc., Beaver), and Colonial Clay Products Co. (West Bridgewater) was used mainly for producing heavy clay products and refractories. New Castle Refractories mined stoneware clay from an underground mine near New Galilee for use locally in manufacturing pouring channels.

Ten leading producers of bituminous coal in Beaver County were: Sunnyside Coal Mining Co., Colonial Gas Coal Co., Tasa Coal Co.,

North Sewickley Coal Co., West Freedom Mining Co., Dow-Lin Coal Co., Keystone Valley Coal Co., C. J. Lundy, Courtney Coal Co., and The Negley Fire Clay Co. Bituminous coal produced in this county

was mined from underground, strip, and auger mines.

Structural sand and gravel output was reported by Beaver Sand Co., Beaver. Shippingport Sand & Gravel Co., produced structural and paving sand and gravel from a dredge near Shippingport. Ellwood Stone Co., Ellwood City, prepared sand for grinding and polishing, blast sand, fire or furnace, and engine sand.

Bedford.—The quantity and value of minerals in Bedford County decreased, compared with 1954. Bituminous coal, stone, lime, and

sand and gravel were produced.

Ten leading producers of bituminous coal were: Rockhill Coal Co., C. E. Clark Contracting Co., Martin, McIntyre & McKnight, Tenley Co., Duvall & White Coal Co., Colledge Coal Co., Ark Coal Co., Harriett Coal Co., O. J. Shaw, and L. D. L. Coal Co. Bituminous coal was mined from underground and strip mines in Bedford County.

Output of limestone from Gravel Pit Kilns quarry near Hyndman, operated by J. Mason Kerr, was utilized for burnt lime. Leap Ganister Rock Co. produced ganister rock for various uses from an open

quarry near Madley.

New Enterprise Stone & Lime Co., Inc., produced and sold hydrated lime for agricultural use and for use in manufacturing silica brick at its Anschom plant, New Enterprise. Gravel Pit Kilns quarry near Hyndman also produced and sold quicklime for agricultural purposes. Feight Bros., Everett, produced and sold building sand.

Berks.—Allentown Portland Cement Co. at its Evansville and Oley quarries produced cement rock and crushed limestone for use at its Evansville plant for manufacturing portland and masonry cement.

Berks Products Corp., Reading, crushed limestone for use as road material and railroad ballast; E. J. Breneman, Inc., Sinking Spring, crushed limestone for road material. Both companies sold crushed limestone to Government agencies. At the Hinterleiter quarry near Kutztown, Eastern Lime Corp. crushed limestone for paving and agricultural purposes. Diabase traprock (for use as riprap, road material, and railroad ballast) was quarried by John T. Dyer Quarry Co. at Monocacy and Birdsboro. Stowe Trap Rock Co., Douglasville, produced basalt for use as road material and railroad ballast and also supplied Government agencies under contract.

Glen-Gery Shale Brick Corp., Wyomissing and Shoemakersville, produced miscellaneous clay from open-pit mines for use in manufac-

turing heavy clay products.

John H. Gring produced building sand and gravel and paving gravel from a pit and fixed plant near Sinking Spring; Schildt Bros., Temple, produced building sand and gravel.

Reading Poultry Food Co. at Reading crushed oystershell for use

as mineral food and poultry grit.

A small tonnage of anthracite was produced from dredge operations.

Blair.—Limestone, used mainly for road material, was mined from quarries operated by Chimney Rocks Lime & Stone Co., Hollidaysburg; Eldorado Stone Co., Altoona; and New Enterprise Stone & Lime Co., Inc., Roaring Spring and Hollidaysburg. A small quantity of limestone was marketed for producing lime and to nearby Govern-

ment agencies for road material. Sproul Lime & Stone Co. crushed limestone from a quarry at Claysburg for agricultural use. Basalt Trap Rock Co. (Williamsburg), General Refractories Co. (Claysburg), and J. L. Hartman Co. (Sproul) produced quartzite for use in making silica brick and as railroad ballast and a small quantity of riprap.

In Blair County, 5 companies produced bituminous coal; 2 companies working underground mines were Argyle Coal Co. and Stone Bridge Coal Co.; 3 companies operating strip mines were Cavalier

Coal Co., Inc., Lawrence Sherbine, and Burkhart Coal Co.

Harbison-Walker Refractories Co. produced plastic fire clay from an open pit near Oreminea for use in manufacturing firebrick and block; Woodbury Clay Co., Williamsburg, sold plastic fire clay for mortar. Grannas Bros. sold kaolin from the No. 1 mine near Williamsburg for use in producing firebrick and block.

Structural sand was recovered from pits by Frankstown Sand Sup-

ply, Frankstown, and George G. Trude, Hollidaysburg.

Bradford.—Karl B. Shiner, Towanda, produced paving sand and gravel and a quantity of gravel for miscellaneous uses.

Paul Percival, the only producer of bituminous coal in Bradford

County, reported a small tonnage from a strip mine.

Bucks.—Bucks County continued to lead in sand and gravel production in the State, but output decreased in quantity and value compared with 1954. Other minerals produced were stone and clays.

Building and paving sand and gravel was produced by Durnan & Good, Upper Black Eddy; Amico Sand & Gravel Co., Fallsington; Warner Co., Van Sciver and Dredge Franklin plants, Tullytown; and Amico Sand & Gravel Co., Tullytown (formerly Tullytown Sand & Gravel Co.). Amico Sand & Gravel Co. marketed its entire produc-At their respective pits and fixed plants near New Hope, A. L. Lewis and Silvi Sand & Gravel Co., Tullytown, which sold its entire output, processed building sand and gravel. Unwashed molding sand was recovered from a bank by Brennan Sand Co., Tullytown; Riegelsville Sand & Gravel Co., Riegelsville, recovered paving sand and

gravel.

Bituminous Service Co., Buckingham, and New Hope Crushed Stone & Lime Co., New Hope, quarried and crushed limestone for road material. New Hope Crushed Stone & Lime Co. also sold a small quantity to Government projects. At the Karpinski open quarry near Langhorne, Edward Karpinski produced dimension limestone as rubble stone. General Crushed Stone Co. produced crushed basalt at the Rock Hill quarry and crusher near Quakertown for use as road material and railroad ballast and marketed a quantity to Government agencies. David D. Derstine, Telford, crushed basalt for road material. At an open quarry near Parkland, J. Magazino & Son produced dimension quartzite for structural building and broken stone for road material. From an open quarry near Coopersburg, Coopersburg Granite Co. produced dimension granite, usable for architectural use and as monuments, which was marketed under the trade name America's Premier Blue-Black granite. C. Bucciarelli & Sons produced miscellaneous building stone and crushed stone for use as road material at the Edison quarry, Edison. Rushland quarry, Rushland, crushed miscellaneous stone utilized for road material;

George Wiley, Point Pleasant, and Samuel M. Yoder Estate, Blooming

Glen, crushed miscellaneous stone (bluestone).

Quakertown Brick & Tile Co., Quakertown, produced a quantity of miscellaneous clay for use in manufacturing heavy clay products.

Hyzer & Lewellen exfoliated vermiculite at a plant near South-

ampton, for use in producing refractory and insulating cement.

Butler.—Ten companies producing the largest tonnage of bituminous coal in Butler County were: Tri-County Fuel Co., Allison Engineering Co., Sunbeam Coal Co., Portersville Coal Co., West Freedom Mining Co., Grove City Construction Co., Chutz Bros., Lucas Mining Corp., Theodore DeMarsh, and Kenry Coal Co. Coal was mined by underground, strip, and auger mining methods.

Penn-Dixie Cement Corp., West Winfield, mined limestone underground for manufacturing cement at its No. 9 plant. Portland cement of types I-II (general use and moderate heat), type III (high-early strength) non-air-entrained, and mortar cement were produced by the

Michigan Limestone Division, United States Steel Corp., Boyers, produced limestone from an underground mine for use as blast-furnace flux, road material, railroad ballast, and in cement manufacture. The Grove City Limestone Co. open quarry and crusher at Branchton crushed limestone for road construction and agricultural purposes. In addition, both companies sold a quantity as roadstone to Govern-

The Mercer Lime & Stone Co. lime plant near Branchton produced quicklime for use in open-hearth and electric furnaces and hydrated lime for agricultural use, sewage treatment, and water purification.

H. W. Cooper processed paving sand and gravel from a pit and fixed plant near Slippery Rock. The Harold M. Martsolf plant processed bank-run sand near Slippery Rock for use as paving material.

Plastic fire clay was produced by a company near Claytonia; other fire clay came from the Chutz Bros., Slippery Rock, open pits for use in manufacturing refractories. Miscellaneous clay was mined by Scott Borland from an open pit near Mars for use in manufacturing heavy clay products.

Cambria.—Cambria County ranked second in the State in bituminous-coal production. Clays, stone, and crude iron oxide pigments,

in order of decreasing value, were produced.

Leading producers of bituminous coal were: The Berwind-White Coal Mining Co., Bethlehem Limestone Co., Bethlehem Mines Corp., Ebensburg Coal Co., Barnes & Tucker Co., Sterling Coal Co., Johnstown Coal & Coke Co., Rich Hill Coal Mining Corp., Vinton Coal & Coke Co., and Springfield Coal Corp. Bituminous coal was recovered

from underground, strip, and auger mines. Hiram Swank's Sons, Inc., South Fork, and Harbison-Walker Refractories Co., Blandburg, produced fire clay from underground mines for use in manufacturing refractories. The underground mine of Patton Clay Mfg. Co. near Patton yielded fire clay. Triangle Clay Products Co. produced miscellaneous clay at its open pit near Johnstown for use in manufacturing heavy clay products. Nicosia Stone Quarry near Johnstown crushed sandstone for use in producing silica brick.

The Nicosia Stone Quarry, Johnstown, open quarry and crusher produced stone for miscellaneous uses.

Crude iron oxide pigments of the yellow-sulfur mud variety were produced at Mine 31 near Twin Rocks by Lanzendorfer Trucking Co. and marketed as paint pigment.

Cameron.—John E. Rydesky and S. Brake Slyder produced bituminous coal, the only mineral output in Cameron County in 1955,

from strip mines.

Carbon.—Leading producers of anthracite in Carbon County were: Panther Valley Coal Co., Valley Stripping Corp., Coaldale Mining Co., Inc., Glen Alden Corp., Jackson Coal Co., J. G. Connell Coal Co., Wat-Rap Coal Co., Spearhead Mining Co., Gravine Coal Co., and A. R. Chamberlain Coal Co. Anthracite was recovered from underground mines, strip pits, and culm banks.

Alliance Sand Co., Inc., processed sand for building, fire or furnace, and engine sand at a quarry and plant near Palmerton. Paving sand was produced by Butz Lumber Co. from a quarry near Palmerton. Wagner Sand Co. produced a quantity of paving sand and gravel

from a quarry east of Hazleton in Carbon County.

Three companies produced shale as a byproduct of anthracite mining and sold the material to Lehigh Materials Co. for manufacturing lightweight aggregate.

Centre.—Centre County led in lime production in the State and increased greatly in tonnage and value compared with 1954. Other mineral commodities produced were bituminous coal, stone, and clays.

Three companies reported lime production: Standard Lime & Cement Co., Pleasant Gap, produced hydrated lime; National Gypsum Co. and Warner Co., Bellefonte, both produced quicklime and hydrated lime. The lime was sold for use principally in open-hearth

and electric furnaces and in paper manufacture.

Ten leading producers of bituminous coal in Centre County were: Robert Bailey, Elliot Coal Mining Co., Inc., R. S. Carlin, Inc., Cherry Run Coal Mining Co., Inc., H. & R. Coal Co., River Hill Coal Co., C. J. Semple, Rougeux, Trimpey & Rougeux, Pennbrook Contracting Co., and Koshko Bros. Coal Co. Output of bituminous coal came principally from strip mines; some production came from underground mines.

Six companies crushed limestone in Centre County in 1955, 2 from underground mines and 4 from open quarries. Standard Lime & Cement Co., Pleasant Gap, mined limestone underground for use as open-hearth flux, road material, stone sand, and in manufacturing Warner Co., Bellefonte, produced limestone for road construction, agricultural purposes, and for manufacturing glass, rubber, and miscellaneous fillers and lime. Output of limestone from the open quarries of National Gypsum Co. (Bellefonte), Neidigh Bros. Limestone Co. (State College), Valley View Lime Co. (Marion Township), and Whiterock Quarries (Pleasant Gap) was used and sold mainly for road construction and blast-furnace and open-hearth flux. McFeely Brick Co. produced quartzite at Port Matilda for transportation to its silica-brick manufacturing plant in Latrobe.

Fire clay of the flint variety used for manufacturing firebrick and block was mined by General Refractories Co. from an underground mine near Orviston and by J. H. France Refractories Co. from an open-pit mine near Snow Shoe. J. H. France Refractories Co. pro-

duced and sold plastic fire clay for refractory uses.

Chester.-W. E. Johnson, Inc., produced dimension limestone for rough construction purposes from a quarry near Paoli and also crushed limestone at a nearby plant for use as road material and marketed it for Government projects. Limestone for use as road material, blastfurnace flux, and asphalt was recovered from a quarry and crushed at the local plant by Valley Forge Stone Co., Malvern. A quantity of this material was sold for roadstone to Government agencies. Warner Co., at the Cedar Hollow quarry near Devault, crushed limestone for use in blast-furnace flux, refractories, road material, agricultural purposes, chemical uses, and lime manufacture. Dimension basalt, rough, dressed, and rubble as building stone, was recovered from the French Creek Granite Co. quarry near St. Peters. V. DiFrancesco & Sons near Devault and Keystone Trappe Rock Co. near Glenmoore quarried basalt mainly for use as road material and railroad ballast and sold some material to local Government agencies. The Avon-Grove quarry near Avondale, operated by Abram T. Minor, and Albert Rotunno's quarry near West Grove yielded dimension sandstone as construction material, rubble, rough architectural, and flagging, and a small quantity of crushed sandstone as roadstone.

Warner Co., at the Cedar Hollow plant near Devault, produced and sold quicklime for use in agricultural purposes, mason's building lime,

sewage and tradewaste treatment, tanneries, and water purification.

McAvoy Vitrified Brick Co., Phoenixville, mined miscellaneous clays used to manufacture building brick, and Philip D. Cope, Lincoln

University, for use in producing flowerpots.

Clarion. Bituminous coal and clays, the only minerals produced in 1955 in Clarion County, increased greatly in value compared with

1954.

Ten leading producers of bituminous coal in Clarion County in 1955 were: H. N. McNutt Coal Co., Mays Coal Co., W. P. Stahlman, Zacherl Coal Co., G. A. Stiles Co., Wingert Contracting Co., Inc., Mac Coal Co., Allison Engineering Co., C. & K. Coal Co., and Harold Most bituminous coal was mined from strip operations;

a small tonnage was recovered from underground mines.

McLain Fire Brick Co., Division of H. K. Porter Co., Inc., St. Charles, produced plastic fire clay; Climax Fire Brick Co., New Bethlehem, reported plastic and flint fire clay for manufacturing fire brick and block. New Bethlehem Tile Co., New Bethlehem, produced miscellaneous clay and plastic fire clay from an open pit for use in manufacturing heavy clay products. Frank B. Pope Co. produced plastic and flint fire clays from open-pit and underground mines near New Bethlehem for mortar manufacture. Lucinda Clay Co., J. F. Eiswerth Estate, and William Judy & Sons, all near Lucinda, produced and marketed flint fire clay for manufacturing firebrick and William Judy & Sons shipped clay to its Ohio refractories.

Clearfield.—Leading producers of bituminous coal in Clearfield County were: Bradford Coal Co., Shawville Coal Co., Lingle Coal Co., Benjamin Coal Co., Diamond T Mining Corp., R. S. Carlin, Inc., Waroquier Coal Co., Putnam & Greene, Inc., Robert Bailey, and

Woolridge Coal Co. Coal was produced principally from strip mines,

followed by underground and auger mines.

The principal output of 12 companies producing clay was fire clay. Clearfield County was the leading producer of fire clay in 1955 in Pennsylvania. Fire clays of the flint and plastic variety were recovered from open-pit and underground mines by North American Refractories, Grampian and Curwensville; Blair Clay Products Co. and Clearfield Clay Products Co., Curwensville; Laclede-Christy Co. of Pennsylvania, Clearfield and Osceola Mills; General Refractories Co., Clearfield; Harbison-Walker Refractories Co., near Clearfield; and Hiram Swank's Sons, Inc., Boardman. Production by these seven companies was used in manufacturing refractories. Williamsgrove Clay Products Co., Bigler, and Robinson Clay Product Co. of Pennsylvania, Clearfield, mined flint fire clay and miscellaneous clay from open pits for use in producing heavy clay products. The open-pit mines of Artie K. Baughman (Bigler), T. & P. Clay Co. (West Decatur), and W. K. Turner & Sons (Wallaceton) produced plastic fire clay, other fire clay, and plastic and flint fire clays, respectively which were sold to the open market for refractory use.

Bells Landing Sand & Gravel, Bells Landing, and Mervyl & Kathryn Yeager, Clearfield, quarried and processed building sand and gravel. Harbison-Walker Refractories Co. exfoliated vermiculite at one of its brick plants at Clearfield and utilized the material in manufac-

turing its refractory products.

Clinton.—Ten companies produced bituminous coal in Clinton County in 1955: Parsons Bros., John E. Teeter, C. V. Fink & Son, Pennbrook Contracting Corp., Anna Holmes, Joseph Antosh, Harry J. Batschelet Estate, Veres Bros., Frank Winkelman, and Fred Sorgen. Strip mining was the principal means of producing coal, followed by

underground and auger mining.

Kelsey Mining Co., Lock Haven, mined and sold diaspore fire clay from an open-pit mine, for use in manufacturing high-alumina brick. North American Refractories Co. mined plastic fire clay from an underground mine near Lock Haven and flint clay from an open-pit mine near Renovo and used the output for manufacturing firebrick, block, and mortar. General Refractories Co mined fire clay of the flint variety underground near Beech Creek for its use in manufacturing firebrick and block. Mill Hall Clay Products, Inc., mined miscellaneous clay from an open pit near Castanea for use in manufacturing heavy clay products.

The only producer of stone in Clinton County was Lycoming Silica Sand Co. Stone was mined at the Salona quarry, Salona, and crushed at a local plant for road material and railroad ballast. A quantity of the material was sold to a Government agency as road

material

Columbia.—Anthracite, sand and gravel, and clays produced in Columbia County in 1955 increased in both tonnage and value

compared with 1954.

Ten leading producers of anthracite in Columbia County in 1955 were: Raven Run Coal Co., Susquehanna Collieries Division of M. A. Hanna Co., Coates Coal Co., Sanchez Construction Co., Martinez & Broderick, Philadelphia & Reading Corp., Hazlebrook Coal Co., Sullivan Trail Coal Co., Pine Ridge Mining Co., and Centralia Mining Co. Anthracite produced in this county was mined from

underground mines, strip pits, and banks.

Building sand and gravel and a quantity of sand for paving use were processed by Bloomsburg Sand & Gravel Co. from a quarry and fixed plant near Bloomsburg.

Miscellaneous clay was mined by Lloyd E. Eister from an open pit near Briar Creek and marketed for manufacturing heavy clay products. Alliance Clay Product Co., Mifflinville, mined miscellaneous clay from an open pit for use in manufacturing heavy clay products.

Crawford,—Sand and gravel processed for use as building material was recovered by Meadville Supply Co., Saegertown, and Hasbrouck Sand & Gravel, Titusville. Sand & Gravel Supply, Conneaut Lake, and Fairfield Sand & Gravel Co., Cochranton, produced and processed bank-run sand and gravel for building and paving uses. Dunn processed bank-run sand and gravel from a pit near Cochranton for use in ready-mix concrete and bituminous paving mix. A quantity of sand was sold to the Pennsylvania Department of Highways.

Cumberland.—Stone, sand and gravel, and clays were produced in Cumberland County in 1955. This county was the principal

source of kaolin in Pennsylvania.

Three quarries crushed and sold limestone as road material: Hempt Bros., Camp Hill; R. W. Smith & Son, Bowmansdale; and Valley Quarries, Inc., Shippensburg. Locust Point Stone Quarries at the Locust Point quarry near Mechanicsburg crushed limestone for road construction and agricultural purposes.

C. L. Goodhart, Walnut Bottom (Southampton Township), mined and processed building sand and paving gravel, and Raymond Bender & Son, Mount Holly Springs, building sand. The Hempt Bros., Camp Hill, pit and plant, produced sand as paving material.

Philadelphia Clay Co. produced and sold kaolin from an open pit near Mount Holly Springs for use in producing hydraulic cement.

Dauphin.—Bethlehem Limestone Co. at the Steelton quarry, Steelton, crushed limestone for use in blast-furnace flux, refractories, road material, and railroad ballast. Hoffman Bros. & Wilson, Inc., crushed limestone for road material from the Elder quarry near Harrisburg. Both companies sold a quantity of crushed limestone under contract to Government agencies. H. E. Millard Lime & Stone Co. at an underground mine west of Palmyra as Dauphin County produced crushed limestone for use as blast-furnace flux, road material, railroad ballast, cement, and soil conditioners. Quantities also were used at the company Swatara plant in producing quicklime and hydrated lime.

Six companies produced anthracite from strip pits, deep mines, and banks. Producers of anthracite were: Upper Dauphin Co., Wiconisco Washery, K. D. & T. Coal Co., Spring Glen Coal Co., Dayton

Breaker, and Howard Koppenhaver.

Sand and gravel for paving use was produced by Highspire Sand & Gravel Co., Ltd., from a pit and preparation plant near Highspire. Pennsylvania Supply Co., Harrisburg, produced and sold paving sand to a local Government agency. F. H. Downey, Inc., produced a small quantity of building sand by dredging near Harrisburg.

Bethlehem Limestone Co., Steelton, produced miscellaneous clay from open pits for manufacturing refractories and covering underground pipelines; output from the Glen-Gery Shale Brick Corp., Harrisburg, and Middletown, pits was used in manufacturing heavy

clay products.

Delaware.—General Crushed Stone Co., Glen Mills, and V. Di-Francesco, Llanerch, crushed basalt for use as road material and railroad ballast. Both companies sold material under contract to Government agencies. Media Quarry Co., Media, produced dimension sandstone for construction use. Lima Building Stone Quarry, Inc., Lima, recovered dimension granite for use in construction work.

Sinclair Refining Co. at its Marcus Hook Refinery produced brimstone as a byproduct in liquid purification of gas by the Claus-type

The output of miscellaneous clay from Philadelphia Brick Co. (only producer of clay) open pit in Darby Township was used in manufacturing building brick.

Perlite Products, Inc., expanded perlite at a plant near Primos, for use in plaster and concrete aggregate, refractories, and horti-

cultural mixtures.

Elk.—Leading producers of bituminous coal in Elk County were: P & N Coal Co., Inc., Blue Valley Coal Co., Perry & Van Slander, New Shawmut Mining Co., Glen Fisher Coal Co., Pete Micale Coal Co., Wabash Ridge Corp., Walburn Coal Co., Brandy Camp Coal Co., and Ralph W. De Lullo. Coal was produced from strip, underground, and auger mines, in order of output.

William J. Meyer recovered plastic fire clay from open pits near St. Marys for use in manufacturing firebrick and block; output from the St. Marys Sewer Pipe Co. pits was used in manufacturing

heavy clay products.
United States Department of Agriculture, Forest Service, Allegheny National Forest, produced a small quantity of road gravel and purchased a quantity produced under contract for use in Elk County.

Erie.—Nickel Plate Sand & Gravel Co. mined and processed paving sand and gravel, and gravel for building and miscellaneous uses from a pit and plant near Fairview. North Girard Concrete Works, Lake City, recovered sand and gravel for use in manufacturing readymixed concrete for driveways. Peerless Mineral Products Co. at a quarry and plant near Springfield produced molding sand. Gravel for miscellaneous uses was recovered from a pit and plant near Erie and marketed by Wagner Concrete Building Products. City Engineer of Erie purchased a quantity of sand for asphalt paving.

Corry Bog, Inc., produced reed (or sedge) and humus peat from a

bog near Corry.

Fayette.—Leading producers of bituminous coal in Fayette County in 1955 were: United States Steel Corp., Weirton Coal Co., Republic Steel Corp., Eastern Gas & Fuel Associates, Davidson-Connellsville Coal & Coke Co., Farm Coal Co., Bridgeview Coal Co., William Piccolomini, Swaney & Swaney, and Saberdash Coal & Coke Co. Most bituminous coal was produced from underground mines; a small tonnage came from strip mines.

Harbison-Walker Refractories Co. recovered flint fire clay from the Smith open pit near Ohiopyle for use in manufacturing heavy clay products. Big Savage Refractories Corp. mined plastic clay at its open pit near Ohiopyle and marketed a small quantity for use in manufacturing refractories. Layton Fire Brick Co., Layton, produced miscellaneous clay from underground and open-pit mines for use in manufacturing heavy clay products. Robert N. Matthews, Uniontown, produced and marketed plastic and flint fire clays for manufacturing

refractories

The Vesco Corp. (only producer of limestone in Fayette County) quarry near Lake Lynn produced crushed and broken limestone for road material, agricultural purposes, and rock dust for coal mines. Crushed sandstone usable for road material was produced from a quarry and crusher by Connellsville Bluestone Co., Scottdale; General Refractories Co. produced crushed sandstone from the Childs quarry near Layton for manufacturing silica brick. Miscellaneous dimension stone for use as flagging stone was quarried by Lynn's Quarry, Belle Vernon

The McClain Sand Co., Inc., Point Marion, river dredge and preparation plant produced sand and gravel for building, paving, and mis-

cellaneous uses, and for use in coal preparation.

Forest.—Mineral production in Forest County consisted of paving and building sand and gravel dredged and processed by Tionesta Sand & Gravel, Inc., near Tionesta. A quantity of the washed material was sold to the Pennsylvania Department of Highways. United States Department of Agriculture, Forest Service, Allegheny National Forest, produced a small quantity of paving gravel and purchased a quantity produced under contract for its own use in Forest County.

Franklin.—Six companies crushed limestone at quarries in Franklin County primarily for road material and agricultural purposes. The producers of limestone were: Binkley Bros. (who sold out to New Enterprise Lime & Stone Co., Inc., during the early part of the year), Dry Run; Fry Coal & Stone Co., Williamson and Zullinger; Stewart & Gaston, Shippensburg; Valley Quarries, Inc., Chambersburg; and Baer & Martin, Orrstown.

Near Fayetteville, Mount Cydonia Sand Co., Inc., produced sand for molding purposes at an open pit and preparation plant; Caledonia

Sand Co. mined and prepared sand for building purposes.

Frank L. Heinbaugh marketed the output of quicklime from the Blue Spring Lime plant near Mercersburg solely for use as agricultural lime.

Fulton.—The only producer of bituminous coal in Fulton County

in 1955 was Rockhill Coal Co. at a strip mine.

H. B. Mellott Estate, Inc., quarried limestone for use as road material at the Charleton quarry, Warfordsburg, and the Morton quarry and crushed at a plant near Big Cove Tannery.

Greene.—Greene County ranked second as a source of bituminous coal in the State in 1955. Miscellaneous clay also was produced.

Chief producers of bituminous coal in Greene County were: United States Steel Corp., Emerald Coal & Coke Co., Duquesne Light Co., Buckeye Coal Co., Crucible Steel Co., Mather Collieries, Jones & Laughlin Steel Corp., Rosedale Coal Co., Molnar Bros. Coal Co., and Jimmie's Coal Co. Underground mines yielded most of the coal produced; a small tonnage was produced from strip mines.

Greene County Brick & Stone Co., Waynesburg, mined a small quantity of miscellaneous clay from an open pit for use in producing

heavy clay products.

Huntingdon.—Huntingdon County ranked second in sand and gravel production in the State. Other minerals produced were stone,

bituminous coal, and clays.

Alexandria Fire Clay Co., Alexandria, produced and sold unwashed sand at an open pit and plant for fire or furnace sand and miscellaneous uses. Warrior Ridge Sand Co. produced a small quantity of building sand at a site near the crest of Warrior Ridge. Pennsylvania Glass Sand Corp. at a quarry and crusher at Mapleton Depot produced and prepared sand for use as glass, molding, engine, and miscellaneous sand. In addition, sand was ground principally for use as abrasives,

filler, pottery, porcelain, tile, and miscellaneous uses.

New Enterprise Stone & Lime Co., Inc., McConnelstown, Tyrone Lime & Stone Co., and Warner Co., east of Tyrone in Huntingdon County produced and sold crushed and broken limestone for use as road material. Tyrone Lime & Stone Co. also produced and sold limestone for agricultural purposes, rock dust, and stone sand. Warner Co. sold limestone for riprap and railroad ballast. North American Refractories Co., Three Springs, and Harbison-Walker Refractories Co., Mount Union, produced ganister rock for use in manufacturing silica brick.

In Huntingdon County in 1955, 7 companies produced bituminous coal; 4 strip-mine companies were Rockhill Coal Co., Miller Contracting Co., C. E. & C. K. Crotsley, and C. E. Clark; 3 operators of underground mines were Ralph L. Clark & Sons, Chamberlain Bros. Coal

Co., and Ramper & Mort.

Alexandria Fire Clay Co., Alexandria, mined plastic fire clay from open-pit mines and marketed the clay for manufacturing mortar; the output of Harbison-Walker Refractories Co., Shirleysburg, was

used for manufacturing glass refractories.

Indiana.—Bituminous coal was produced in Indiana County in 1955 from underground, strip, and auger mines. Leading producers were: Rochester & Pittsburgh Coal Co., Imperial Coal Co., Pennsylvania Electric Co., Pine Township Coal Co., Crichton Coal & Coke Co., Clearfield Bituminous Coal Corp., Jarvis & Kepple Coal Co., Conrad Coal Co., W. J. Lyda Coal Co., and E. & S. Coal Co. Hiram Swank's Sons, Inc. (the only producer of clay in Indiana

County), produced plastic fire clay from the Swank No. 6 under-

ground mine near Clymer for use in refractories manufacture.

Smicksburg Lime, the only producer of limestone in Indiana County in 1955, sold its entire output from an underground mine near West Mahoning for agricultural purposes.

Jefferson.—Production of both Jefferson County mineral commodities-bituminous coal and clays-increased slightly in value

compared with 1954.

Bituminous coal was produced from underground, strip, and auger Leading producers of bituminous coal were Northwestern Mining & Exchange Co., Minns Coal Co., W. P. Stahlman, Callahan Coal Co., Knisely Coal Co., Everett Moore Coal Co., Pulford Coal Co., C. E. Lauver & Sons, Compton Coal Co., and Kann & Gutsie Coál Co.

Henry O'Neill & Co. underground mine near Brookville yielded flint clay for use in manufacturing firebrick and block and mortar. Plastic fire clay and miscellaneous clays were produced from an open pit and an underground mine by The Brockway Clay Co., Brockway, and the Hanley Co. underground mine near Summerville for use in

manufacturing heavy clay products.

Juniata.—W. N. Quigley, Mifflintown, and Juniata Limestone Co., McAlisterville, produced crushed and broken limestone for road construction and sold a quantity of the material to Government agencies. National Refractories Co., Inc., produced ganister rock for use in silica brick at the Van Dyke plant near Thompsontown.

Lackawanna.—Anthracite was the only mineral commodity produced in Lackawanna County in 1955. Leading producers were: Hudson Coal Co., Moffat Coal Co., Village Slope Coal Co., Turnpike Coal Co., Gillen Coal Co., Northwest Coal Co., Lackawanna Mining & Construction Co., Halsey Contracting Co., Perry Construction Co., Anthracite was produced from underand Pioneer Excavating Co.

ground mines, strip pits, and culm banks.

Lancaster.—In Lancaster County in 1955, 13 companies quarried limestone; 2 produced both dimension and crushed limestone; and 12 crushed limestone. Dimension stone was produced by J. C. Showalter, Blue Ball, and L. F. Zook & Sons, Bareville, for rough structural use. Crushed limestone was produced by Morgantown Stone Co., D. M. Stoltzfus & Son, Talmage; J. E. Baker Co., Bainbridge; Binkley & Ober, East Petersburg; Binkley Bros., Inc., Lititz; David M. Burkholder, Martindale; J. Miller Eshleman, Landisville; Heisey Bros., Landis Stone Meal Co., Rheems; A. G. Kurtz & Sons, Inc., Denver; Ivan M. Martin, Inc., Blue Ball; D. M. Stoltzfus & Son, Quarryville and Peach Bottom. These companies produced and sold limestone mainly for highway construction, agricultural purposes, and lime and cement manufacture.

Amos K. Stoltzfus produced and marketed quicklime and hydrated lime for agricultural use at the Maxwells Hill plant 2 miles west of Morgantown in Lancaster County. The J. E. Baker Co. plant near Bainbridge, used limestone produced at the Billmeyer quarry to manufacture dead-burned dolomite from quicklime for use as refractory

Anthracite was produced in Lancaster County from dredge

operations.

A. T. Harris Sand Co., Salisbury Township, produced and prepared sand as fire or furnace sand. Milton Grove Sand Corp., Milton Grove, and J. C. Budding Co., Lancaster, produced and processed a small quantity of sand for paving material, which was sold to a local Government agency.

Glen-Gery Shale Brick Corp. from an open-pit mine near Ephrata and Lancaster Brick Co. near Lancaster produced miscellaneous clay for use in manufacturing heavy clay products. Whitaker Clay Co., Narvon, produced and marketed plastic fire clay and miscellaneous

clay from an open pit for manufacturing refractories.

Lawrence.—Production at the Bessemer Limestone & Cement Co. cement plant at Bessemer consisted of air-entrained types I-II (general use and moderate heat), also non-air-entrained types I-II, type III (high-early-strength), and portland puzzolan. A quantity of mortar cement was also prepared and marketed under the trade name of Bessemer Mortar. Production at the Medusa Portland Cement Co. plant at Wampum consisted of types I-II, type III, a quantity of

waterproof-portland cement, and masonry cement.

Bessemer Limestone & Cement Co., Bessemer, quarried and crushed limestone for flux, foundry, road material, and cement manufacture. Crushed limestone, usable for flux, open-hearth plants, road construction, and cement manufacture, was quarried by Michigan Limestone Division, United States Steel Corp., Hillsville. New Castle Lime & Stone Co., Mahoning Township, mined and crushed limestone at its local plant for use as road material and for agricultural purposes. Medusa Portland Cement Co., Wampum, crushed limestone for cement production.

Leading producers of bituminous coal in Lawrence County were: The Buckeye Coal Co., A. W. Latze Contracting Co., Lake Eric Coal Co., Corry Excavating & Mining Co., Butler Equipment Co., Ambrosia Coal & Construction Co., The Marshall Mining Co., J. H. Filby Coal Co., Dodds Coal Co., and McQuiston Coal Co. Strip mining furnished the largest tonnage of bituminous coal produced;

a small tonnage was mined underground.

Metropolitan Brick, Inc., Bessemer, and Fenati Brick Co., Inc., New Castle, mined plastic fire clay and miscellaneous clay from openpit mines for use in producing heavy clay products. Keystone Sand & Gravel Co., New Castle, produced and marketed loam clay from an open-pit mine for manufacturing foundries and steelworks.

Mahoning Valley Sand Co. near West Pittsburg (Taylor Township) and Superior Sand & Supply Co. near Eastbrook mined and

processed sand and gravel for use as building material.

D. M. Boyd and Moore's Peat Humus Co. produced humus peat

from bogs south of Leesburg in Lawrence County.

Zonolite Co. exfoliated vermiculite at a plant near Ellwood City. Lebanon.—Lebanon County was the only metal-producing county in Pennsylvania in 1955. Iron ore (usable), copper, lime, stone, cobalt, pyrites, gold, silver, and anthracite, in order of decreasing value, were produced.

Bethlehem Cornwall Corp., subsidiary of Bethlehem Steel Co., operated the Cornwall iron-ore mine and the Lebanon concentrator plant. This mine was the only metal-producing mine in Pennsylvania in 1955. Gold, silver, cobalt, copper, and pyrites were recovered as byproducts.

H. E. Millard Lime & Stone Co. produced and marketed both quicklime and hydrated lime at its Annville and Palmyra plants principally for mason's building lime, agricultural, open-hearth and electric

furnaces, and water purification and softening.

Limestone sold mainly for use in highway construction was produced by Becker Bros., Annville; Pennsylvania Aggregates, Inc., Cornwall; and Fiala Crushed Stone Corp., Annville, which also produced a quantity of limestone for blast-furnace flux and dolomite limestone for manufacturing cement. Calcite Quarry Corp. quarry and crusher near Lebanon produced limestone sold or used for flux, open-hearth plants, copper smelters, foundries, and road material, as well as a small quantity for railroad ballast. North American Refractories Co., Womelsdorf, transported crushed sandstone by aerial tram from its open quarry to the plant for silica-brick production. H. E. Millard Lime & Stone Co. operated a quarry and crusher at Annville

and a plant at Palmyra to produce crushed limestone usable for furnace flux, road material, railroad ballast, agricultural purposes, miscellaneous filler, and cement and lime manufacture. This company also sold a small quantity of road material to Government agencies.

A small quantity of anthracite was produced from dredge operations

in Lebanon County in 1955.

Lehigh.—Four companies manufactured cement from cement rock and crushed limestone: Giant Portland Cement Co., Reliance plant, Egypt; Lehigh Portland Cement Co., Fogelsville plant and No. 2 plant, Ormrod; The Whitehall Cement Manufacturing Co. plant at Cementon; and Coplay Cement Manufacturing Co. Mill C plant, Coplay. Coplay Cement Manufacturing Co., operated two quarries and an underground mine but discontinued work at the underground mine owing to floods in August 1955. Production of the four companies consisted principally of portland cement of the types I-II (general use and moderate heat), air-entrained and non-air-entrained, type III (high-early-strength), and a small quantity of masonry or mortar cements.

Lehigh Stone Co. produced and marketed crushed limestone for

use in road construction at a quarry and crusher near Ormrod.

Penn Big Bed Slate Co., Inc., the only producer of slate in Lehigh County in 1955, quarried near Slatington. Output of slate was sold for a variety of uses, mainly for standard roofing, structural and sanitary uses, blackboards, and bulletin boards.

Robert A. Reichard, Inc., crushed and marketed oystershell for

use as poultry grit from its crushing plant at Allentown.

Pennsylvania Perlite Corp. expanded perlite at a plant near Allen-

Luzerne.—Luzerne County ranked second in value of mineral

production in the State and as a coal-producing county. Ten of the leading producers of anthracite in Luzerne County were: Glen Alden Corp., Lehigh Valley Coal Co., Harry E. Coal Co., Jeddo-Highland Coal Co., Susquehanna Collieries Division of M. A. Hanna Co., Number Fourteen Coal Co., Payne Coal Co., Capone Coal Co., Heidelberg Coal Co., and Kehoe-Berge Coal Co. Anthracite was

mined from deep mines, strip pits, and culm and silt banks.

Coon Certified Concrete produced crushed sandstone for use as road material and a small quantity of dimension stone for rough construction at the North Mountain quarry near Sweet Valley. General Crushed Stone Co., White Haven, crushed sandstone usable for road material and railroad ballast. Both companies sold a quantity of the material to Government agencies. Hayes Bros. Stone Co., White Haven, quarried quartzite for rough construction, architectural, and flagging purposes.

Five companies produced both sand and gravel principally for building and paving uses: Airport Sand & Gravel Co., West Wyoming; American Asphalt Paving Co., Chase (Jackson Township); Honey Hole Sand & Stone Co., Hazleton; Glendale Sand & Stone Co., Avoca; and Frank B. Sgarlat Estate, Kingston. A quantity of this material was also marketed to Government agencies for use on highways. Herman Cunfer sold unwashed sand for miscellaneous uses

direct from an open pit near Drums.

Blue Ridge Soil Pep Co., Inc., recovered humus peat, and Pennsylvania Peat Moss, Inc., produced moss and humus peat from bogs near White Haven.

Hazleton Brick Co., Hazleton, only producer of clay in Luzerne County, produced miscellaneous clay from an open pit for use at its

local plant for manufacturing building brick.

Lycoming.—Sand and gravel was mined and processed principally for structural and paving uses by Lycoming Silica Sand Co. and J. A. Eck & Sons, Inc., both near Montoursville. In addition, Lycoming Silica Sand Co. produced sand and gravel for miscellaneous uses and marketed a quantity of paving sand and gravel to the Pennsyl-

vania Department of Highways.

Muncy Lime Products crushed limestone for agricultural purposes and the manufacture of lime at the Chippewa quarry near Muncy. Lycoming Silica Sand Co. from the Lime Bluffs quarry and crusher near Muncy, and Pine Creek Lime & Stone Co., Jersey Shore crushed limestone for use as road material. Pine Creek Lime & Stone Co. also crushed limestone for agricultural uses. A quantity of agricultural and road materials was sold under contract to Government agencies. Washington Township Bureau of Roads, Elimsport, crushed limestone for general maintenance and township roads. John T. Morgan produced a small quantity of sandstone as flagging stone at a quarry near Slate Run.

Four companies produced bituminous coal in Lycoming County in Fisher & Smith operated a strip mine; Dan and Glen Thomas, O. R. Carson, and Kaznowski & Kaznowski mined underground.

Penn Paint Filler Co. near Antes Fort produced and prepared rottenstone by crushing, drying, and pulverizing. This material was sold for use as abrasives and filler. The quarry and plant of Keystone Filler & Mfg. Co. near Muncy was temporarily shut down during 1955.

A small quantity of quicklime was produced and sold for use as agricultural lime by Muncy Lime Products at its Chippewa plant

near Muncy.

Keystone Filler & Mfg. Co., Muncy, produced miscellaneous clay

for use in paints from an open-pit mine.

McKean.—Three companies—P & K, Inc., Kaul Clay Products Co., and Bowland Contractors—produced bituminous coal in McKean

County by strip-mine methods.

Plastic fire clay was produced by Kaul Clay Products Co. from the Clermont open-pit mine for use at a local plant in manufacturing heavy clay products. Kness Bros., Mount Jewett, operated an openpit mine, and marketed the clay for use in manufacturing refractories.

C. L. McGavern, Jr., Eldred, produced unwashed sand for use as molding sand. Forest Service, Allegheny National Forest produced a small quantity of gravel for paving use and also purchased a quantity

under contract.

Mercer.—Leading producers of bituminous coal were: Bowie Coal Co., The Buckeye Coal Co., Earl M. Reed Coal Co., Estate of George Bobo, Coyer Coal Mines, Fisher Mining Co., Center Coal Co., Plotts & Boyd Coal Co., Mercer Coal Producing Co., and Smith Contracting Co. Most bituminous coal came from strip operations; a small tonnage was mined underground.

Sand and gravel for structural purposes was mined and processed by Transfer Sand & Gravel near Transfer and Seidle Sand & Gravel, The latter company also produced a large quantity of sand

and gravel for paving material.

Dimension sandstone for use as rough construction stone was obtained from the Rock Kastle quarry north of Volant in Mercer County by Welty M. Smeltzer. White Rock Silica Sand Co. crushed sandstone at the White Rock quarry and crusher at Greenville mainly for use as furnace or converter lining, road material, filler, and foundry stone.

Arthur Minshull produced humus peat from a bog near Jackson

Mifflin.—Bethlehem Limestone Co. crushed a substantial quantity of limestone at the Naginey quarry and crusher for fluxing and road material and a small quantity for use as stone sand and miscellaneous uses. It sold a quantity of road material to Government agencies. The Hawstone quarry, Hawstone, operated by Haws Refractories Co., yielded ganister rock utilized by the company for manufacturing silica brick.

James R. Kline's Sons operated a dredge near Lewistown, producing sand for paving and structural uses. Miller Silica Sand Co. operated a pit and preparation plant near Burnham for sand and gravel usable for molding, building, and engine sand. Pennsylvania Glass Sand Corp., McVeytown, produced sand for use as glass, molding, grinding

and polishing, and engine sand.

Lewistown Lime Co., Reedsville, only producer of lime in Mifflin County, produced and sold quicklime for agricultural use and hydraulic lime for chemical and other industrial uses.

Monroe.—Mineral production in Monroe County in 1955 consisted

of stone and sand and gravel.

Thomas P. Rogers, Stroudsburg, quarried and crushed limestone

for use as road material.

Building sand and gravel for use as road material was quarried by Steward White & Clyde White, Stroudsburg. Coolbaugh Sand & Stone, Inc., Tobyhanna (Coolbaugh Township), produced sand and gravel for structural and paving purposes. This company marketed the entire sand and gravel output; a quantity was sold to the Commerce of Pennsylvania for road repairs.

Montgomery.—Stone production in Montgomery County was the largest in the State in 1955 and increased greatly in value compared with 1954. Other mineral commodities produced were cement, lime,

clays, and sand and gravel.

Limestone for use as road material was produced from a quarry and crushed by Bradford Hills Quarry, Inc., Norristown, and Glasgow Quarry, Inc., Conshohocken. Stowe Trap Rock Co., Oreland, crushed limestone as riprap, road material, and railroad ballast. Bethlehem Limestone Co., Bridgeport, and G. & W. H. Corson, Inc., Bethlehem Limestone Co., Bridgeport, and G. & W. H. Corson, Inc., Plymouth Meeting, produced crushed and broken limestone mainly for use as blast-furnace flux, road material, railroad ballast, stone sand, agricultural purposes, and in lime manufacture. Montgomery Stone Co. produced dimension basalt, rough and dressed, as construction material and crushed and broken basalt as road material at a

quarry near Montgomeryville. R. K. Kibblehouse produced basalt as road material. William Bambi & Sons, Inc., Norristown, produced dimension sandstone for use as building stone. Irving B. Gill, Collegeville, produced crushed sandstone for use as road material and sold a quantity to a Government agency. Ganister, crushed for use as furnace and converter lining, was produced by Firestone Products Co., Inc., from a quarry at Glenside. Marcolina Bros., Inc., utilized its production of dimension granite from a quarry near Wyndmoor for rough construction purposes. Mica schist, usable mainly as building stone, was produced by A. Manero & Sons, Edge Hill.

Allentown Portland Cement Co. manufactured cement from limestone produced at its No. 2 plant at West Conshohocken. Portland cement of the types I-II (general use and moderate heat), airentrained, and a small quantity of masonry cement was produced.

G. & W. H. Corson, Inc., produced and marketed quicklime and hydrated lime at Corson's Lime plant near Plymouth Meeting, for use as agricultural lime, refractory material, and mason's building

Miscellaneous clay for use in manufacturing heavy clay products was recovered from open-pit mines by Norristown Brick Co., Norristown; Robinson Clay Product Co., Pottstown; and Lansdale Brick Products Co., Lansdale. In addition, Robinson Clay Product Co. produced plastic fire clay for use in manufacturing heavy clay prod-Keller-Whilldin Pottery Co. produced red shale from an open pit for manufacturing flowerpots at its plant in North Wales.

William Bambi & Sons, Inc., Norristown, mined and processed bank-run sand for use as building sand.

Refractory & Insulation Corp. expanded perlite at its plant near

Port Kennedy.

Keasbey & Mattison Co., Ambler, and Philip Carey Manufacturing Co., Norristown, produced magnesium carbonate, magnesium oxide, and magnesia insulation from dolomite.

Montour.—Stone was the only mineral produced in Montour County in 1955; it decreased slightly in value compared with 1954. Two producers crushed limestone solely for use as road material. Narehood Bros., Inc., quarried limestone near Milton. Mausdale Quarry Co. operated the Grovania quarry and crusher near Danville, selling its entire output to Government agencies.

Northampton.—Northampton County led all counties in the State in 1955 in the cement and slate production. Other minerals produced, in order of decreasing value, were stone, sand and gravel, and anthra-

cite.

Ten companies produced cement in Northampton County. Seven companies manufactured cement from their own production of limestone from mines in Northampton County: Alpha Portland Cement Co., Martins Creek; Penn-Dixie Cement Corp., plant No. 5 at Bath and plant No. 6 at Penn Allen; Lone Star Cement Corp., Nazareth; Lehigh Portland Cement Co., Sandts Eddy; Hercules Cement Corp., Stockertown; Dragon Cement Co., Inc., Northampton; and Keystone Portland Cement Co., Bath. National Portland Cement Co. (Bethlehem), Nazareth Cement Co. (Nazareth) and Universal Atlas Cement Co. (Northampton) also produced cement. Production of cement

consisted principally of portland cement types I-II (general use and moderate heat), type III (high-early-strength), air-entrained, non-air-entrained, and a small quantity of masonry or mortar cements.

Northampton County led in slate production in the State and increased slightly in value compared with 1954. The 12 companies producing from quarries and mills were: Albion Vein Slate Co. and David Stoddard & Sons, Inc., Plainfield Township; American Bangor Slate Co., Inc., and Bangor Roofing Slate, Inc., Bangor; Capitol Slate Co., Inc., East Bangor; Chapman Slate Corp., Bath; Anthony Dally & Sons, Inc., Doney Slate Co., Parsons Bros. Slate Co., Parsons Manufacturing Co., and Stephens-Jackson Co., Pen Argyl; and General Slate Co., Windgap. Slate was marketed for various uses, including roofing, flagging, structural and sanitary products, blackboards, billiard-table tops, flour for filler, and electrical slate.

Bethlehem Steel Co., Bethlehem, produced limestone for use as road material, stone sand, and railroad ballast; Trumbower Co., Inc., Nazareth, produced limestone for use as road material.

sold a quantity to Government agencies.

W. J. Lowe & Sons (Bangor) produced sand and gravel for paving material, and Portland Sand & Gravel Co. (Portland) produced for structural and paving uses at open pits and fixed plants. Both sold to Government agencies for road construction. Sand, usable for concrete and plaster, was produced under contract for Lehigh & New England Railroad Co.

A small tonnage of anthracite was produced in Northampton County

from dredge operations.

Northumberland.—Ten companies producing the largest tonnage of anthracite in Northumberland County were: Philadelphia & Reading Corp., Susquehanna Collieries Division of M. A. Hanna Co., Stevens Coal Co., Raven Run Coal Co., North Line Coal Co., Boslego Coal Co., C. & J. Coal Co., Cole & Keiser, West Cameron Coal Co., Inc., and Springfield Coal Co. The anthracite was produced by companies operating deep mines, strip pits and culm banks.

Crushed limestone for use as road material and agricultural purposes was produced by Eugene Meckley from a quarry and crusher at Herndon. Susquehanna Quarry Co. recovered traprock from a quarry near Dalmatia and operated crushing plants in Emmaus and White Haven. Stone was sold for use as riprap, road material, and railroad ballast; a quantity also was sold to Government agencies.

Watsontown Brick Co. and Glen-Gery Shale Brick Corp. produced miscellaneous clay from open pits near Watsontown for use in manufacturing heavy clay products at local company plants. Shale, recovered by Watsontown Mineral Products Co. from an open pit near Watsontown, was used at the company local plant for manufacturing linoleum, oilcloth, and phonograph records.

Clyde Starook produced burnt lime for agricultural purposes from

a lime plant near Sunbury.

Wilsons Sand Plant, Montandon, produced a quantity of sand for paving material.

Perry.—Binkley Bros., Inc., produced and marketed limestone usable as road material from a quarry and crusher at Newport.

Philadelphia.—Dredging operations along the Delaware River near Philadelphia yielded sand and gravel processed for use as building material by The Liberty Corp. The district engineer, Philadelphia, reported no production of sand and gravel, but purchased for use as paving material a large tonnage produced under contract from outof-State producers.

Joseph Bauder & Sons, Philadelphia, crushed and sold oystershell

to feed dealers for use as poultry grit.

Atlantic Refining Co. recovered hydrogen sulfide as a byproduct in the liquid purification of gas.

Potter.—The only mineral produced in Potter County in 1955 was

stone, which increased in value compared with 1954.

Dimension sandstone, usable for architectural and flagging purposes, was quarried by Penn Kress Flagstone Co., Inc., Austin. Oswayo Flag Stone Co., Oswayo, recovered miscellaneous stone for

use as flagging stone.

Schuylkill.—Leading producers of anthracite in Schuylkill County in 1955 were: Philadelphia & Reading Corp., Gilberton Coal Co., St. Clair Coal Co., Coaldale Mining Co., Inc., Locust Creek Coal Co., Mammoth Coal Co., Stevens Coal Co., Indian Head Coal Co., and Valley Stripping Co. Anthracite was recovered from underground mines, strip pits, and culm and silt banks.

Refractory Sand Co., Inc., near Andreas mined and processed sand

for paving, road sand, and miscellaneous uses.

Auburn Brick Co. produced miscellaneous clay from an open-pit mine near Auburn for use in manufacturing heavy clay products.

Andreas Quarry Co. quarry at Andreas crushed limestone at a local plant for use as road material. Harbison-Walker Refractories Co., Andreas, quarried ganister for use in manufacturing silica brick.

Snyder.—National Limestone Quarry operated a quarry and crusher for the J. C. Stahl Estate near Middleburg, producing crushed limestone for use as road material; a quantity of the product was sold to local Government agencies. Limestone for use in manufacturing lime was recovered from a quarry near Mount Pleasant Mills by Carton Comfort.

Anthracite was produced from dredge operations in 1955 in Snyder

County.

Two producers of miscellaneous clay from open-pit mines in Snyder County, Glen-Gery Shale Brick Corp., Beavertown, and Paxton Brick Co., Paxtonville, used the clay to produce heavy clay products.

Quicklime was produced and marketed for agricultural purposes by

Carton Comfort at Mount Pleasant Mills.

Somerset.—Ten leading producers of bituminous coal in Somerset County were Reitz Coal Co., Bird Coal Co., W. A. Merrill Sons & Co., Loyal Hanna Coal & Coke Co., Cambria Fuel Co., Decker Construction Co., Alumbaugh Coal Co., Wilbur Coal Mining Co., Bahorick Coal Co., and Coal Junction Coal Co. The greatest tonnage of bituminous coal came from underground mines, followed by strip pits and auger mines.

Keystone Lime Co. recovered and sold dimension limestone at an underground mine, quarry, and crusher near Springs for use as rough construction material. A. C. Lottig crushed limestone from an underground mine near Meyersdale, for use in lime manufacture, and New Enterprise Stone & Lime Co., Inc., at a quarry near Somerset, produced crushed stone for use as road material, and marketed a quantity to Government agencies. Sandstone for use in producing con-

crete block was crushed by Friedens Block Co., Somerset.

Plastic fire clay was produced by W. S. Compton Brick Co. from a combination underground and open-pit mine near Salisbury; Otto Brick & Tile Works from an open pit near Springs; and H. Swank's Sons, Inc., from Swank No. 23 underground mine near Hollsopple. The plastic clay was used at the companies local plants for manufacturing heavy clay products. General Refractories Co. produced flint fire clay from an underground mine for manufacturing refractories. A. C. Lottig produced a quantity of hydrated lime for agricultural

use at the Lottig Lime quarry and plant, Meyersdale.

Quantities of sand and gravel for building use were produced by M. S. Mays & Son near Berlin (Brothers Valley Township); Boswell Sand Co. near Jenners (Boswell Borough) produced sand for paving Robert D. Shaulis, Boswell, and Friedens Block Co., Somerset, reported sand for building material.

Sullivan.—Mildred Coal Co. and Bliss Coal Co. produced anthra-

cite from stripping operations.

Susquehanna.—Stone, the only mineral produced in Susquehanna

County in 1955, decreased in value compared with 1954.

Dimension sandstone for use as rough construction and flagging stone was produced by H. V. Hartley, Lenoxville; Edwin J. Evans, Lenox Township; Gordon E. Jackson, New Milford; and Lee A. Wilbur, Kingsley. Lee A. Wilbur produced stone of the bluestone variety.

Tioga.—Nine companies produced bituminous coal from underground and strip mines: Jones & Brague Mining Co., Fall Brook Coal Mining Co., Martin & Lawson, E. M. Hart & Son, Stempeck Coal Co., Joseph & James Williams, Sterling Coal Co., John R. Birguson,

and Walter Hunter.

Union.—Crushed limestone for use as road material and for agricultural purposes was produced from a quarry by Faylor Lime & Stone Co., Winfield. A quantity of the material was sold to a nearby

Government agency.

Venango.—Seven companies produced bituminous coal in Venango County in 1955. Tasa Coal Co., W. G. Brown Coal Co., F. R. Zuck, Boyles Coal & Supply Co., C & M Contracting Co., Bowie Coal Co., and Earl M. Reed Construction Co. all produced bituminous coal

from strip mines.

Industrial Silica Corp. produced molding sand at a pit and preparation plant near Utica. Rybak-Kraft, Inc., produced structural sand and paving gravel from a pit and plant near Cooperstown (Jackson Township). Oil City Sand & Gravel Co. produced bank-run sand and gravel for structural and paving uses at a dredge near Oil City. This company also sold gravel to the Pennsylvania Department of Highways for road construction.

Warren.—Robert Schatzle produced building sand and gravel from an open pit near Warren. General Concrete Products mined and processed structural and paving sand and gravel from an open pit and preparation plant near Warren. This company also sold a quantity of the paving material to the Pennsylvania Department of Highways. United States Department of Agriculture, Forest Service, Allegheny National Forest produced a small quantity of gravel for

road use and purchased a quantity produced under contract.

Washington. Washington County led in value of minerals produced in 1955. Production of bituminous coal in Washington County greatly exceeded output in all other counties in the State and increased greatly in tonnage and value compared with 1954. Bituminous coal in Washington County was mined from both underground and strip mines; 10 leading producers were: Jones & Laughlin Steel Corp., Mathies Coal Co., Bethlehem Steel Co., Pittsburgh Coal Co., Republic Steel Corp., United States Steel Corp., Harmon Creek Coal Corp., Ontario Mining Co., National Steel Corp., and Pennview Construction Co.

Miscellaneous clay for use in manufacturing heavy clay products was mined from open pits by Monongahela Clay Products Co., Monongahela; Donley Brick Co., and Westmoreland Clay Products

Co., Washington.

Output of dimension sandstone from a quarry by Malli Mines, Finleyville, was utilized mainly for dry-wall and patio construction. Wayne.—The only stone producer in Wayne County in 1955 was Wayne Concrete & Sand Works, which crushed sandstone from a quarry and crusher near Lake Ariel for use as road material. quantity of the sandstone was marketed to Government agencies.

Structural and paving sand and building gravel were mined from a pit and prepared at a fixed plant near Lake Ariel by Wayne Concrete & Sand Works. Charles Caputo, Honesdale, produced a quan-

tity of unscreened gravel for use as fill.

Westmoreland.—Leading producers of bituminous coal in Westmoreland County in 1955 were: Republic Steel Corp., Allegheny Pittsburgh Coal Co., Westmoreland Coal Co., Jamison Coal & Coke Co., Delmont Fuel Co., Seanor Mining Co., Marco Coal Co., Eagle Coal Co., Loyalhanna Fuel Co., and Dragon & Son. Most bituminous-coal production came from underground mines; a small quantity came from strip and auger mines.

J. K. Davison & Bro. produced sand and gravel usable as structural and paving material and a small quantity of molding sand at a dredge along the Allegheny River near Brackenridge. A large quantity of this material was sold to the Commonwealth of Pennsylvania for paving maintenance. The company plant was shut down temporarily

during the year for major improvements.

Dimension sandstone was produced primarily for use as rough construction and flagging stone by: Ray Branthoover and J. C. Beaumont, north of Belle Vernon in Westmoreland County, and J. G. Robinson, Inc. Eidemiller Enterprises, Inc., produced and marketed sandstone of the bluestone variety as road material at the Blue

Stone quarry near Whitney.
Westmoreland Clay Products Co., Youngwood, recovered miscellaneous clay from an open pit to produce heavy clay products. Fire clay of the plastic variety was produced from an open-pit mine near Youngwood by Regional Refractories, Inc., for use in manufacturing refractories. Smith Bros. & Co. mined filint fire clay from an open pit near Derry and marketed the clay for use in manufacturing refractories.

Wyoming.—Wyoming Sand & Stone Co. produced sand and gravel for building and paving uses and a small quantity of engine sand at a pit and preparation plant near Falls. The entire output of material was sold under contract to Government agencies. East Falls Sand

& Gravel near Falls produced sand and gravel for paving uses.

York.—Production at the Medusa Portland Cement Co. cement plant at York consisted of types I-II, general use and moderate heat, type III (high-early-strength), waterproof white and gray portland cement, and a quantity of masonry cements marketed under the trade names of Brikset and Stoneset.

Stone & Lime Co. and Lincoln Stone, Inc., Thomasville. Some of the crushed limestone was marketed to Government agencies.

National Gypsum Co. produced quicklime and hydraulic lime at a lime plant at York principally for use in agricultural lime, silica brick manufacture, insecticides, paper, and water purification and softening. J. E. Baker Co. produced dead-burned dolomite for use

as refractory material at its York plant near Botts.

The Funkhouser Co. quarried and crushed slate for use as flour and

granules at Delta.

Sand, produced principally for structural use and a small quantity as paving and fire or furnace sand, was quarried from a pit and processed at a fixed plant near York by Neuman Sand & Supply Co. Glen-Gery Shale Brick Corp., Spring Garden Division, and York Colonial Division, York, produced miscellaneous clay from open pits for year at least plants for manufacturing beauty clay and the same states.

pits for use at local plants for manufacturing heavy clay products.

General Mining Associates produced mica from an open-pit mine

near York for use in paint, rubber (mold lubricant), electric insulation, and welding rods.

# The Mineral Industry of the Commonwealth of Puerto Rico, the Panama Canal Zone, and the Virgin Islands

The Puerto Rico portion of this chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Mineralogy and Geology Section, Commonwealth of Puerto Rico.

By W. G. Diamond <sup>1</sup> and Mort D. Turner <sup>2</sup>



### **PUERTO RICO**

UERTO RICO'S mineral industry set a record high in 1955 with production valued at \$14.9 million. The previous record was \$13.6 million in 1952.

## **REVIEW BY MINERAL COMMODITIES**

Field investigations in 1955 by the Puerto Rico Division of Mineralogy and Geology and the cooperating party of the Federal Geological Survey included studies of nickel- and cobalt-bearing laterite, magnetite iron ores, magnetite-bearing beach sands, a variety of copper deposits, and several industrial-mineral deposits. No metals have been mined in Puerto Rico since the Juncos iron mine closed in 1953.

Caribbean Refining Co. went on stream with Puerto Rico's first petroleum refinery, a 13,500-barrel-per-day plant at San Juan. island's second refinery, owned by Commonwealth Oil Refining Co., Inc., was due to go on stream in 1956. It is at Guayanilla Bay and will yield 23,520 barrels per day. Latin American crude was processed at the San Juan refinery and was to be processed at the Guayanilla Bay refinery.3

Cement.—The cement industry was the largest contributor to the total mineral production of Puerto Rico. A major part of the cement production was consumed locally, but substantial amounts were shipped to the United States. The plant of the Ponce Cement Corp. was undergoing extensive expansion that will be completed in 1956. Included is a 500-foot kiln with a capacity of 4,300 barrels daily, 2 grinding mills, and 1 cooler.4

Clays.—Besides the clay consumed in manufacturing cement, a large quantity was used by one plant near Carolina in San Juan District in manufacturing heavy clay products. Much smaller quantities are used by a few handicraft-type pottery concerns in various parts of the island.

<sup>1</sup> Commodity-Industry economist, Region IV, Bureau of Mines, Bartlesville, Okla.
2 Chief geologist, Mineralogy and Geology Section, Economic Development Administration, Commonwealth of Puerto Rico.
3 Oil and Gas Journal, vol. 54, No. 87, Dec. 31, 1956, p. 153.
4 Pit and Quarry, vol. 48, No. 7, January 1956, p. 157.

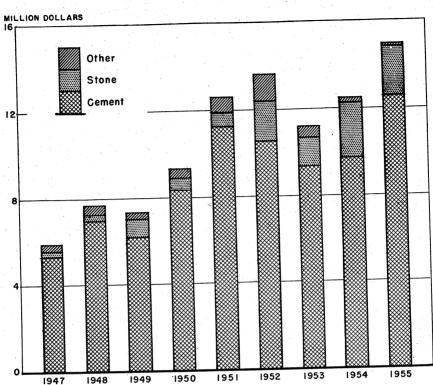


FIGURE 1.—Total value of mineral production in Puerto Rico, 1947-55.

TABLE 1.—Mineral production in possessions of the United States, 1954-55, by individual minerals <sup>1</sup>

	195	54	1955		
Possession and mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	
Canal Zone: Sand and gravelStone (crushed)	187, 446	\$245, 170 245, 000	35, 910 169, 485	\$47, 229 239, 280 287, 000	
Total Canal Zone	2 600 107	9, 663, 445	4, 116, 739	12, 506, 784	
Cement	3, 682, 187 8, 384 8, 758 374, 690 2 1, 751, 996	198, 452 98, 110 833, 654 2 2, 492, 827	10, 392 10, 496 433, 017 1, 783, 910	254, 121 112, 399 678, 761 2, 515, 760	
Stone Value of items that cannot be disclosed: Certain non- metals		154, 331		121, 75	
Total Puerto Rico Virgin Islands: Stone (crushed)	3, 939	3 12,381,000 17,134		3 14, 917, 00 4, 90	

<sup>&</sup>lt;sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption

by producers).

2 Excludes certain stone, value for which is included with "Items than cannot be disclosed."

The total has been adjusted to eliminate duplicating value of clays and stone.

TABLE 2.—Average unit value of mineral commodities produced in the Canal Zone, Puerto Rico, and the Virgin Islands, 1951–55 <sup>1</sup>

1.77 \$1.35 .94 1.11	short ton \$2.02 \$1.77 \$1.35 \$1.	
	nshort_ton_ \$2.02 \$1.77 \$1.35 \$1.3	
		\$2,02
	dodo	1. 32
	neddo	1.10
2.63 2.56	376-pound barrel 2.62 2.63 2.56 2.6 long ton 5.74 5.75 5.75	3.04
	long ton 5.74 5.75 5.75	0.02
		24, 45
.01 1.10	1.00 1.10 2.0	1.72
55	dodo1.47   1.55	1
		-
.00	1.00	-
.74 1.90	endo 2.13   2.74   1.90   21.3	2 1. 37
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	4 DIORON	
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. 33   1.70		
	neous ornshed and broken	
00 400		5, 60
-	neous, crushed and broken	2. 33     1. 70     2. 42       1. 09     1. 09       4. 02     4. 25     4. 35

<sup>1</sup> For greater detail on prices, by grades and markets, see vol. I, Minerals Yearbook, 1955.

2 Includes limestone used for cement and lime.

TABLE 3.—Portland-cement shipments from mills in Puerto Rico, 1939-55

Year	376-pound barrels	Value	Year	376-pound barrels	Value
1939-50 1951 1952	16, 689, 028 4, 297, 583 3, 994, 483	\$41, 710, 927 11, 252, 350 10, 517, 894	1953 1954 1955 Total <sup>1</sup>	3, 841, 135 3, 682, 187 4, 116, 739 36, 421, 155	\$9, 335, 421 9, 663, 445 12, 506, 784 94, 986, 821

<sup>&</sup>lt;sup>1</sup> Total cement shipments through 1955.

Lime.—Lime, principally for use by local cane-sugar plants, was burned at several kilns throughout the island from very pure Quaternary and Tertiary limestones. Lime was produced in Humacao and Mayaguez Districts.

Salt.—Salt was produced in Mayaguez District in 1955 by the evaporation of sea water.

Sand and Gravel.—Large quantities of sand and gravel were produced from rivers and beaches in all parts of Puerto Rico for use in construction, primarily concrete aggregate. There was smaller but important production of high-silica sand for use by the local glass and ceramic whiteware industries, as well as for aggregate in white plaster. The silica sand occurs as blanket deposits averaging about 4 feet in thickness and covering large areas on the north coastal plain of the island.

Stone.—Crushed limestone was produced in each of the seven districts in 1955 and used principally for aggregate. Dimension limestone was quarried in 6 of the 7 Districts and used in rough construction and as rubble.

TABLE 4.—Stone sold or used by producers in Puerto Rico, 1951-55

		ension stone	Crushed limestone		Other stone 1		Total	
Year	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1951 1952 1953 1954 1955	13, 377 13, 684 16, 552 99, 889 86, 077	\$64, 913 21, 866 33, 733 211, 476 187, 842	244, 844 605, 830 631, 848 4 1, 639, 684 4 1, 697, 833	\$521, 048 1, 659, 910 1, 203, 503 4 2, 252, 812 4 2, 327, 918	25, 476 69, 806 (3) 12, 423	\$27, 790 125, 612 (3) 28, 539	283, 697 2 689, 320 2 648, 400 2 4 1, 751, 996 4 1, 783, 910	\$613, 751 2 1, 807, 388 2 1, 237, 236 2 4 2, 492, 827 4 2, 515, 760

<sup>1</sup> Includes basalt, granite, sandstone, miscellaneous stone, <sup>2</sup> Excludes crushed basalt (1952), crushed granite and miscellaneous stone (1953), and crushed sandstone (1964).

Figure withheld to avoid disclosing individual company confidential data.

Includes limestone for cement and lime.

TABLE 5.—Value of mineral production in Puerto Rico, by Districts, 1954-55

District	1954	1955	Minerals produced in 1955 in order of value
Aguadilla Arecibo Guayama Humacao Mayagues Ponce San Juan Undistributed Total	\$1, 218, 727 53, 926 142, 860 185, 068 405, 583 5, 442, 261 4, 923, 323 9, 482 12, 381, 000	\$125, 632 68, 613 142, 559 412, 163 497, 275 7, 908, 072 5, 453, 189 309, 232 14, 917, 000	Stone, sand and gravel.  Do. Do. Lime, sand and gravel, stone. Stone, salt. sand and gravel, lime. Cement, sand and gravel, stone. Cement. stone, clay, sand and gravel. Sand and gravel.

#### **REVIEW BY DISTRICTS**

Aguadilla.—Limestone was quarried and crushed for use as road metal and concrete aggregate by General Builders & Suppliers, Antonio Santos, Luis Viera, and Victoria Medina. General Builders & Suppliers also produced undressed dimension limestone and paving sand and gravel. Building sand was obtained from deposits in Aguadilla District by F. J. Rosello.

Arecibo.—Limestone was crushed and used for concrete and roadmetal purposes by Severo O'Neil and as agricultural limestone by the Puerto Rico Department of Agriculture. Puerto Rico Department of Public Works and Rosario Rosario obtained paving sand and gravel from local deposits.

Guayama.—Cantera Sanchez, Inc., quarried dimension limestone for rough construction purposes. Crushed limestone was produced by Francisco Navarro for concrete and road-metal purposes and by the Puerto Rico Department of Agriculture for use as agricultural limestone. Sand and gravel for building purposes was produced by Jose A. Lopez and Planta de Grava del Turabo. Puerto Rico Department of

Public Works produced paving gravel.

Humacao.—Planta de Cal "Hicaco," obtained limestone from local deposits for use in manufacturing lime. Fajardo Sugar Co., Ramon Rivera Figueroa, and the Puerto Rico Department of Public Works produced crushed limestone used mainly for concrete, road-metal, and railroad-ballast purposes. Rough construction dimension limestone was quarried by Mateo Perez Sanjurjo. Paving sand and gravel was procured from deposits in the district by the Puerto Rico Department of Public Works and Marcial Solfs.

Mayaguez.—Liborio Lopez Sanchez produced dimension limestone for use as rubble, crushed limestone for concrete and road metal, and glass, paving and other sands from deposits in Mayaguez District. South Puerto Rico Sugar Co. quarried limestone in dimension and crushed form and also manufactured lime. Undressed dimension limestone was quarried by Cantera Bernat and the Mayaguez Ready Mix Concrete Co. Leading crushed-limestone producers included Maximo Bernat, Julio Agrait quarry, Jose Becerra, Ovidio Marty Pabon, and Eugenio Natali. Conrado Forestier produced paving sand. Salt was produced from sea water by Puerto Rico Salt Works, Inc. (three operations), Carlos M. Ramirez Acosta, and Salina del Papayo, Inc.

Ponce.—Cement was produced at Ponce by the Ponce Cement Corp. Building and paving sand and gravel were obtained from local deposits by Ponce Aggregates Co., Ismael Torruellas, Jose A. Vallejo, Amparo Ortiz, and the Puerto Rico Department of Public Works. Dimension and crushed limestone was produced by Ismael Torruellas. Cement Products Corp., Antonio Padilla, and Jose A. Vallejo quarried and crushed limestone for concrete and road metal.

San Juan.—Portland cement was produced by the Puerto Rico Cement Corp. at its Guaynabo plant. Limestone was quarried and crushed, mainly for concrete and road metal, by Ramos Hermanos, Inc., Cantanen Hnos., Compania de Ing y Contratistas, J. Ortiz Toro, Severo O'Neil, and Ramon Lopez Rodriguez, who also produced undressed dimension limestone. Shale for use in manufacturing heavy clay products was obtained from deposits in San Juan District by Puerto Rico Clay Products, Inc. Puerto Rico Department of Public Works produced paving gravel.

## PANAMA CANAL ZONE

Sand and gravel and stone production comprises the mineral industry of the Canal Zone. Total value of mineral production in 1955 was greater than in 1954, due mainly to the fact that no sand and gravel was reported in 1954.

### **REVIEW BY MINERAL COMMODITIES**

Basalt.—The Panama Canal Co. quarried and crushed basalt for concrete and road metal.

Sand and Gravel.—Building sand was obtained from local deposits by the Panama Sand Co.

Stone.-Miscellaneous stone was quarried and crushed by the United States Army—Caribbean for concrete, road metal, and riprap.

TABLE 6.—Crushed basalt and miscellaneous stone sold or used by producers in the Canal Zone, 1947-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1947-50 (average)	110, 550	\$166, 700	1953	171, 908	\$231, 752
1951.	55, 500	112, 000	1954	187, 446	245, 170
1952.	86, 000	152, 000	1955	169, 485	239, 280

TABLE 7.—Sand and gravel sold or used by producers in the Canal Zone, 1947-50 (average) and 1951-55

Year	Short tons	Value Year		Short tons	Value	
1947-50 (average)	40. 200	\$55, 800	1953	85, 914	\$95, 500	
1951 1952	32, 000 56, 600	26, 000 53, 000	1954	35, 910	47, 229	

## VIRGIN ISLANDS

Stone was produced in the Virgin Islands in 1955. 1955 production was less than 1954.

### REVIEW BY MINERAL COMMODITIES

Basalt.—Basalt was quarried and crushed by the Virgin Islands Corp. on St. Croix Island and used for concrete and road metal.

TABLE 8.—Crushed miscellaneous stone sold or used by producers in St. Croix Island, Virgin Islands, 1948-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1948-50 (average)	6, 947	\$11, 333	1953	10, 789	\$45, 853
1951	5, 700	24, 200	1954	13, 939	17, 134
1952	3, 800	16, 150	1955	1875	4, 900

All basalt.

# The Mineral Industry of Rhode Island

By Alvin Kaufman 1 and C. Geraldine Cleary 2



THE INCREASED tempo of building and road construction in Rhode Island in 1955 resulted in a 26-percent rise in mineral-output value compared with 1954. Sand and gravel remained the principal mineral product of the State. This commodity comprised 82 percent of the State mineral-output value compared with 67 percent in 1954. Active mineral operations rose to 25 in 1955 compared with 23 the previous year. Providence County was once again the principal mineral-producing area. The mines and quarries of this county supplied 63 percent of the State mineral value.

TABLE 1.—Value of mineral production in Rhode Island, 1954-55, by counties 1

County	1954	1955	Minerals produced in 1955 in order of value		
Kent	(2) (2) - \$766, 760 - 307, 160 - 386, 736	\$499, 761 (2) 1, 152, 137 (2) 182, 586	Sand and gravel. Sand and gravel, stone. Sand and gravel, stone, graphite. Sand and gravel.		
Total	1, 461, 000	1, 834, 000			

No production was reported from Bristol County.
 Value included with "Undistributed."

## REVIEW BY MINERAL COMMODITIES

#### **NONMETALS**

Graphite.—Graphite Mines, Inc., continued producing natural amorphous graphite in 1955 from a former meta-anthracite mine near Cranston.

Sand and Gravel.—Value of sand and gravel production in Rhode Island rose 53 percent in 1955 compared with 1954, primarily because of increased road-construction activity. The number reporting to the Bureau of Mines increased from 17 in 1954 to 20 in 1955. Producers in all counties except Bristol reported output. Providence County remained the leading sand and gravel producing area; pits in this county comprised 63 percent of the State output. The major

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producers active in Rhode Island in 1955 were M. A. Gammino Construction Co., Providence County, and Rhode Island Sand & Gravel Co., Inc., Kent County. Structural and paving sand and gravel

remained the major use.

Stone.—Value of stone output decreased 30 percent in 1955 compared with the previous year. This drop was due, principally, to abandonment of two granite quarries in Washington County. Limestone, granite, and miscellaneous stone were produced from three quarries in Newport and Providence Counties. Dimension stone was not produced in the State in 1955.

### REVIEW BY COUNTIES

Kent.—Sand and gravel, principally for structural and paving purposes, was the only mineral commodity produced in Kent County in 1955. Producers were Barber Sand & Gravel Co., Coventry; Rhode Island Sand & Gravel Co., Inc., Warwick; Luigi Vallone, Inc., Warwick; and Whitehead Bros. Co., Washington.

Newport.—Peckham Bros. Co., Inc., produced conglomerate from a stone quarry near Middletown in Newport County in 1955. Callan Construction Corp. produced gravel from a fixed preparation plant near Portsmouth. This plant did not operate full time during the

year.

Providence.—Graphite, sand and gravel, and stone were produced in Providence County in 1955. A. Cardi Construction Co., Inc., and Del Bonis Sand & Gravel Co., Inc. (Cranston), Courtois Sand & Gravel Co. (Central Falls), John J. McHale & Sons, Inc. (Pawtucket), M. A. Gammino (Providence), Tasca Sand & Gravel Co. (Smithfield), Town Line Sand & Gravel Co. (Slatersville), and Valley Cement Block Co. (Lakewood) produced sand and gravel in Providence County in 1955. The Valley Cement Block Co. was closed during the winter. Limestone for agricultural purposes was yielded by the Conklin quarry of Conklin Limestone Co., Inc., near Lincoln. Fanning & Doorley Construction Co., Berkeley, produced crushed granite for concrete and roadstone. The company anticipated that this quarry, closed during the latter part of 1955, would not be reopened before April 1956. Stone for concrete and roadstone was produced near Providence under contract to the State of Rhode Island. M. A. Gammino Construction Co. announced that the Lincoln quarry had been abandoned in 1955. Graphite Mines, Inc., continued to operate its natural amorphous graphite mine near Cranston in 1955.

Washington.—Sand and gravel was the only mineral commodity produced in Washington County in 1955. Inactive in 1955, Smith Granite Works and Sullivan Granite Co., producers of dimension

granite, did not expect to resume quarrying near Westerly.

J. Romanella & Sons and H. J. Turrisi Construction Co. (Westerly), Louis B. Schaeffer and South County Sand & Gravel Co. (both near Peace Dale), and Elisha Taylor (West Kingston) produced building and paving sand and gravel in 1955.

# 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, United States Department of the Interior, and the Geological Survey of South Carolina.

By Avery H. Reed, Jr. 1 and Laurence L. Smith 2



N 1955 THE VALUE of mineral production in South Carolina passed \$20 million, reaching the highest point in the history of the State with 14 percent above the previous peak year 1953. All commodities advanced in value except dimension granite. In tonnage produced clay and dimension granite were down 4 and 26 percent, The percentages gained in value (in parentheses) over 1954 were kaolin (16), miscellaneous clay (18), cement (13), barite

(13), kyanite (77), vermiculite (9), and sand and gravel (5).

Marine Minerals, Inc., Aiken County, began dredging sands for recovering heavy minerals—ilmenite, rutile, zircon, and monazite.

At the end of the year no shipments had been reported.

TABLE 1.—Mineral production in South Carolina, 1954-55 1

	19	954	1955	
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays Sand and gravel Stone Undistributed: Barite, cement, kyanite, dimension granite (1954), mica, and vermiculite	1, 136, 019 2, 813, 750 2, 861, 953	\$4, 702, 027 2, 550, 260 2 4, 233, 270 6, 373, 880	1, 086, 492 3, 126, 952 3, 455, 388	\$5, 463, 179 2, 677, 054 4, 920, 697 7, 399, 847
Total South Carolina		17, 744, 000		<sup>8</sup> 20, 197, 000

Production as measured by mine or plant shipments, sales, or marketable production (including consumption by producers).
 Excludes dimension granite.
 The total has been adjusted to eliminate duplication in the value of clay used for cement.

Commodity-industry analyst, Region V, Bureau of Mines, Knoxville, Tenn.
 State geologist, South Carolina Geological Survey, Columbia, S. O.

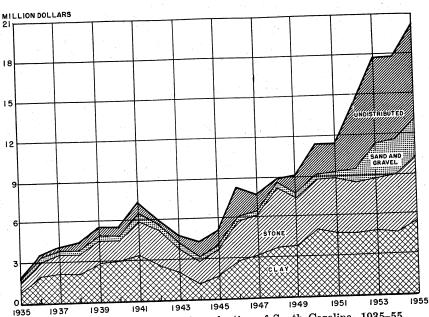


FIGURE 1.—Total value of mineral production of South Carolina, 1935-55.

TABLE 2.—Average unit value of mineral commodities produced in South Carolina, 1951-55 1

Commodity	1951	1952	1953	1954	1955
Bariteshort ton Cement376-pound barrel	\$7. 28 2. 77	\$7.00 2.75	\$6.00 2.80	\$6.00 2.82	\$5.93 2.85
Clays:         short ton           Fire	2. 61 12. 71 1. 00 37. 00 . 45 . 43 12. 82 3. 25	2. 42 12. 64 . 93 40. 00 . 70 . 86 12. 57	2. 90 12. 87 . 84 40. 00 1. 16 . 57 13. 08	2 12. 32 2 . 83 38. 25 1. 30 . 61 13. 05	12. 18 1. 13 45. 00 1. 23 . 52 12. 92 1. 76
Granite (crushed)short ton_ Limestone (crushed)do Miscellaneous stone (crushed)do	1. 28 1. 49 . 65	1.31 1.59 .65	1. 35 1. 54	2.00	1. 5

For greater detail on prices and markets, see vol. I, Minerals Yearbook, 1955.
 Revised figure.

# REVIEW BY MINERAL COMMODITIES NONMETALS

Barite.—Production of barite by Industrial Minerals, Inc., in Cherokee County continued and increased to the highest point in the State history.

Clays.—Clay production, including that used in cement manufacture, declined 4 percent in tonnage but increased 16 percent in total value. Value rose because the tonnage of higher valued kaolin was increased and the volume of lower priced miscellaneous clay (exclusive of clay used for cement manufacture) was reduced.

Kaolin production increased 17 percent in quantity and 16 percent in total value. The same operators and mines, as in 1954, were pro-

ducing in 1955.

Miscellaneous clay, including clay used in manufacturing cement, declined 13 percent in tonnage but increased 18 percent in total value, a 28-percent increase in unit value. Except for three small plants, the same operators reported as in 1954.

TABLE 3.—Clays sold or used by producers, 1946-50 (average) and 1951-55, by kinds

	Fire clay		Kaolin		Miscellaneous clay		Total	
Year	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946-50 (average)	(1) (2) 7, 547 15, 208	(1) (2) \$18, 250 44, 075	289, 592 322, 208 322, 778 327, 594 4 327, 259 383, 402	\$3, 321, 546 4, 095, 912 4, 079, 112 4, 213, 431 4, 030, 377 4, 668, 598	(1) 619, 272 616, 953 621, 554 4 808, 760 703, 090	(1) \$620, 022 577, 899 544, 415 4 671, 650 794, 581	(1) * 941, 480 947, 278 964, 356 1, 136, 019 1, 086, 492	(1) 3 \$4, 715, 93- 4, 675, 26- 4, 801, 92- 4, 702, 02- 5, 463, 179

1 Data not available.

Figure withheld to avoid disclosure of individual company operations.

Excludes fire clay.

\* Excludes fire cia \* Revised figure.

Kyanite.—Compared with 1954, kyanite production rose 53 percent in tonnage and 77 percent in total value—an increase of 15 percent in unit value.

Mica.—Mica producers increased from 4 in 1954 to 11, from 7 counties, in 1955. In 1954 and 1955 Anderson, Greenville, and Oconee Counties and in addition in 1955, Abbeville, Lancaster, Saluda, and Spartanburg Counties, reported production. Sheet-mica production doubled that of 1954. One producer reported a small quantity of scrap mica in 1954. Of 2 producers, 1 dominated production in 1955.

Sand and Gravel.—Sand and gravel output for sale or use by producers in 1955 attained a new alltime high for the State. Tonnage exceeded that of 1954 by 11 percent and total value by 5 percent—a drop of 4 percent in unit value. The 1955 production exceeded output for 1953, the previous high, by 5 percent in tonnage and 4 percent in total value, with unit value the same.

Twenty-three operators produced from 15 counties in 1955, 3 companies began production, and 4 of the 1954 producers did not report, leaving a net loss of 1 operator. Greenwood County dropped from the

list, but Marion County was added.

Two producers from 15 counties reported Government-and-contractor output, and additional tonnage was not credited to any county. Production of both commercial sand and gravel increased above 1954. Although Government-and-contractor sand production was lower, its total value was somewhat higher than gravel. The Bureau of Forestry, U. S. Department of Agriculture, produced 7,000 tons of paving sand

valued at \$1,250 (the same as in 1954), without credit to any particular county.

TABLE 4.—Sand and gravel sold or used by producers, 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	446, 361	\$206, 579	1953	2, 975, 608	\$2, 564, 484
1951	320, 195	139, 258	1954	2, 813, 750	2, 550, 260
1952	1, 048, 099	892, 312	1955	3, 126, 952	2, 677, 054

Stone.—Both tonnage and value of dimension-granite production were slightly lower than in 1954. Crushed-granite tonnage and value, however, gained substantially over 1954.

Because a former operator resumed quarrying, crushed-limestone output increased eightfold in tonnage and value.

TABLE 5.—Crushed stone sold or used by producers, 1946-50 (average) and 1951-55

Year	Granite		Limestone		Miscellaneous stone		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946-50 (average)	1, 998, 604 2, 528, 473 2, 648, 284 2, 660, 989 2, 812, 196 3, 146, 989	\$2, 578, 624 3, 242, 140 3, 456, 684 3, 587, 827 3, 863, 270 4, 172, 329	(1) 300, 150 266, 095 252, 871 38, 000 (1)	(1) \$447, 815 424, 195 388, 543 76, 000 (1)	(1) 245 460 (1)	(1) \$159 299	(1) 2, 828, 868 2, 914, 839 2, 913, 860 2, 861, 953 (1)	(1) \$3, 690, 11- 3, 881, 17: 3, 976, 37: 4, 233, 27: (1)

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosure of individual company operations.

Vermiculite.—Vermiculite was mined by 5 producers from 3 counties compared with 4 in 2 counties in 1954. One 1954 operator ceased operations, but two new ones reported in 1955. Laurens and Spartanburg Counties produced in both years; Union County was listed in 1955. Total production increased 10 percent over 1954 in tonnage and 9 percent over in total value, a slight drop in unit value.

#### METALS

Production of metals or metallic ores was not reported from the State in 1955.

Monazite and Titanium Minerals.—Marine Minerals, Inc., began dredging on Horse Creek, Aiken County, but no shipments of concentrates had been reported at the end of the year.

### **REVIEW BY COUNTIES**

Of the 46 counties in South Carolina, the 14 having no mineral production in 1955 included: Allendale, Barnwell, Beaufort, Berkeley, Clarendon, Colleton, Darlington, Dillon, Edgefield, Georgetown, Hampton, McCormick, Newberry, and Williamsburg.

Of the remaining 32, 5 counties—Calhoun, Chester, Kershaw, Lee, and Orangeburg—mined only paving sand used by South Carolina State Highway Department.

TABLE 6.—Value of mineral production in South Carolina, 1954-55, by counties 1

County	1954	1955	Minerals produced in 1955, in order of value		
Abbeville Alken Alken Anderson Bamberg Calhoun Charleston Cherokee Chester Che	(3) (2) (2) (3) (4) (4) (5) (7) (8) (1) (1) (2) (2) (2) (3) (4) (5) (7) (7) (7) (8) (9) (1) (1) (1) (1) (1) (2) (2) (3) (4) (4) (5) (6) (7) (7) (8) (8) (8) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9	(3) (429 (2) 55 (2) 580 (2) (2) (2) (2) (2) (2) (2) (2) (2) (2)	Mica. Kaolin, sand and gravel, miscellaneous clay. Mica. Sand and gravel. Do. Do. Limestone, sand and gravel, barite. Sand and gravel. Do. Cement, miscellaneous clay, limestone, sand and gravel. Granite, miscellaneous clay. Sand and gravel. Sand and gravel, mica. Miscellaneous clay. Sand and gravel. Do. Do. Mica, miscellaneous clay. Vermiculite. Sand and gravel. Granite, sand and gravel. Granite, sand and gravel. Sand and gravel. Granite, sand and gravel. Sand and gravel, miscellaneous clay. Sand and gravel, miscellaneous clay. Sand and gravel, mica. Sand and gravel, mica. Sand and gravel, mica. Granite, miscellaneous clay, sand and gravel. Granite, miscellaneous clay, sand and		
Saluda Spartanburg Sumter Union York Undistributed	(2) (2) (2) (2)	(2) (2) (2) (2) (2) (2) 15, 494, 396	gravel, kaolin. Mica. Granite, vermiculite, mica, sand and gravel. Gravel, sand and gravel. Vermiculite, sand and gravel. Kyanite, sand and gravel.		
Total	17, 744, 000	20, 197, 000			

<sup>&</sup>lt;sup>1</sup> The following counties are not listed, because no production was reported: Allendale, Barnwell, Beaufort, Berkeley, Clarendon, Colleton, Darlington, Dillon, Edgefield, Georgetown, Hampton, McCormick, Newberry, and Williamsburg.

<sup>2</sup> Value included with "Undistributed."

TABLE 7.—Government-and-contractor paving sand produced by the South Carolina State Highway Department, by counties

County	Short tons	Value	County	Short tons	Value
Aiken Calhoun Cherokee Chester Chester Chesteried Greenville Kershaw Lee. Lexington	2,000 110 1,035 1,450 3,214 3,096 1,500 830 60	\$900 55 732 580 707 2, 167 45 25 3	Oconee	11, 700 925 1, 215 1, 200 125 1, 125 29, 585	\$1,755 925 607 60 63 28 \$8,652

Abbeville.—Thomas Bros. and Harold B. King mined sheet mica. Aiken.—Marine Minerals, Inc., completed plans for dredging monazite, ilmenite, rutile, and zircon, but had not reported shipments of concentrate at the end of the year.

Mines and operators producing kaolin in 1955 did not change from those reporting in 1954. County production exceeded that of 1954 by 16 percent in tonnage and 15 percent in total value.

Georgia-Carolina Brick Co. produced 31 percent more clay for manufacturing heavy clay products than in 1954.

Augusta Sand & Gravel Co. increased its production of sand and gravel over 1954 by 12 percent, but total value declined 16 percent. The material produced was marketed as paving and engine sand and building gravel.

TABLE 8.—Clays sold or used by producers in Aiken County, 1950-55

Year	Short tons	Value	Year	Short tons	Value
1950	373, 794	\$4, 491, 157	1953	367, 087	\$4, 248, 976
1951	349, 708	4, 100, 912	1954	339, 490	4, 000, 576
1952	349, 212	4, 062, 248	1955	398, 341	4, 622, 279

Anderson.-Frank Holland (Holland mine), Albert Ellis (Cely mine), and L. H. Scroggins (Gillard mine) produced and sold several hundred pounds of sheet mica.

Bamberg.—Colleton Sand & Silica Co. mined and marketed building sand, producing at virtually the same rate and value as in

Charleston.—Edisto Sand & Gravel Co. and Sandrying Co. furnished building sand and silica filler, respectively, as in 1954. County production tonnage was roughly 50 percent above 1954.

Cherokee.—Industrial Minerals, Inc., produced barite and increased

tonnage 15 percent above 1954.

Campbell Limestone Co. resumed quarrying crushed limestone for concrete, road metal, and agricultural markets.

Jobe Sand Co., confining its activities to producing engine sand,

increased the supply considerably over 1954.

Chesterfield.—W. R. Bonsal Co. increased production of building sand and gravel and paving gravel in comparison with 1954.

Pageland Sand Co. began producing paving sand.

Dorchester.—Carolina Giant Cement Co.'s cement production exceeded the previous peak year, 1954, by 12 percent in tonnage and 13 percent in total value.

Salisbury Brick Corp. increased miscellaneous clay production from 33,000 tons in 1954 to 37,000 in 1955. This output was valued at \$22,000 and was used in manufacturing heavy clay products. Carolina Giant Cement Co. mined clay for use in making cement.

Carolina Cement & Lime Co. produced crushed limestone for agricultural markets but at a reduced rate compared with 1954. Baileys Sand Pit reported the same tonnage of building sand as in

1954 but at greatly reduced value.

Fairfield.—Richland Shale Products Co. mined shale for its own use at the same rate as in the previous year but at somewhat increased total value.

Palmetto Quarries Co. (Blair quarry) increased the volume of crushed-granite production compared with 1954, with a rise in average unit value. The 1955 output was marketed for railroad ballast and stone sand.

Rion Crushed Stone Corp. produced crushed granite for concrete

and road metal.

Winnsboro Granite Co. produced monumental granite.

Florence.—Coastal Sand Co. mined and prepared structural and paving sand at the same rate and value as in 1954.

Thomas Wall Sand Co. began producing building sand.

Greenville.—Paris Mountain Mining Co. (Bolin mine) mined sheet mica. James F. Zupan and E. C. Cooper marketed the county output of building sand, with an 18-percent increase in tonnage and value over 1954.

Greenwood.—Southern Brick Co. and Angus Brick & Tile Co. mined miscellaneous clay for their own use and increased combined production from 84,000 short tons in 1954 to 100,000 in 1955. Total value, however, dropped from \$63,000 in 1954 to \$27,000 in 1955.

TABLE 9.—Miscellaneous clay sold or used by producers in Greenwood County, 1950-55

Year	Short tons	Value	Year	Short tons	Value
1950	81, 500	\$61, 125	1953	65, 000	\$49,662
1951	81, 500	81, 500	1954	84, 000	63,000
1952	69, 275	52, 956	1955	100, 000	27,000

Coile Free Screened Creek Sand Co. and Eddie Moss, producers of building sand in 1954, did not operate in 1955.

Horry.—E. P. Pitts, sole producer of glass sand in the State, in-

creased output slightly over 1954.

Jasper.—Savannah & Atlanta Railroad did not produce engine sand in 1955 although it mined a small tonnage in 1954. Deerfield Sand Co. produced building and paving sand at the same rate and value as in 1954.

Lancaster.—Ashe Brick Co. mined its own clay for heavy clay products at the same production rate as in 1954 but at a 10-percent

increase in unit value.

Mineral Mining Corp. (Kershaw mine) mined mica schist to recover

scrap mica, which it marketed for various fillers.

Laurens.—Zonolite Co., leading producer of vermiculite in the State, produced slightly more than in 1954.

Alabama Vermiculite Co. increased its output in 1955, and J. T.

Patterson produced a small quantity.

Lexington.—Weston & Brooker Quarry Co. (Cayce quarry) substantially increased its crushed-granite production for concrete aggre-

gate, road metal, railroad ballast, and stone sand over 1954.

Commercial-sand production was reported by the same five operators as in 1954. Ninety percent of this output was marketed as building sand, and the rest distributed for paving, blast, fire or furnace, engine, filter, fertilizer filler, and other uses. Production of sand was 633,000 tons valued at \$257,000, compared with 577,000 tons valued at \$276,000, a drop of 7 cents a ton from 1954.

TABLE 10.—Sand sold or used by producers in Lexington County, 1950-55

Year	Short tons	Value	Year	Short tons	Value
1950	229, 068	\$112, 747	1953	632, 497	\$295, 528
1951	265, 852	116, 039		576, 970	276, 129
1952	240, 322	132, 431		633, 468	256, 747

Marion.—J. D. Murchison was the only producer of miscellaneous

clay in 1955; output was considerably below 1954.

Sandy Bluff Sand Co. reported initial production of 9,000 tons of molding sand valued at \$7,000—the first reported production of molding sand as such in the State.

Marlboro.—Palmetto Brick Co. and Cheraw Brick Works mined miscellaneous clay for heavy clay products; the combined production was 20 percent above 1954 in tonnage and 70 percent in total value.

Becker County Sand & Gravel Co. increased its production of sand and gravel 70 percent in tonnage and 58 percent in total value over 1954. Material was marketed as building and paving sand and gravel and gravel for railroad ballast.

Oconee.—Benny Mason mined 87 pounds of sheet mica valued at

\$1,067 from the Shirley and Jamison mines.

Pickens.—Campbell Limestone Co. increased production of crushed granite from its Beverly quarry 19 percent in volume compared with 1954 but at a small reduction in average value a ton. Stone was marketed as concrete aggregate, road metal, and riprap.

Richland.—Palmetto Quarries Co. operated its Palmetto quarry. Granite, crushed in 1955 for concrete aggregate, road metal, and railroad ballast, dropped substantially in value and was slightly below

1954 tonnage.

The same four operators as in 1954 mined miscellaneous clay for heavy clay products. The combined production in 1955 was 102,000 tons valued at \$151,000, compared with 104,000 tons valued at \$126,000 in 1954.

Columbia Pipe Co. mined a small tonnage and Carolina Ceramics, Inc., began producing a considerable tonnage of refractory kaolin.

Harrison Sand Co. produced building sand, and Strickland Sand Co. mined sand for building, paving markets, and fill material. Combined production increased considerably, but total value roughly equaled 1954.

Saluda.—Kings Mountain Mining Co., Inc., began producing a

substantial tonnage of scrap mica.

Spartanburg.—Campbell Limestone Co. increased the production of crushed granite from its Pacolet quarry by 11 percent compared with 1954 but at a lower value per ton. The material was marketed as concrete aggregate, road metal, railroad ballast, stone sand, and riprap.

American Vermiculite Co. Woodruff mine increased its production

of vermiculite over 1954.

Guy Waters (McAbee mine) and Fred Young (Easler mine) both

began producing a small quantity of sheet mica.

Sumter.—Becker County Sand & Gravel Co. production of sand and gravel for building, paving, and railroad ballast rose 12 percent compared with 1954.

Union.—C. H. Whitner was credited with a small initial production

of vermiculite in 1955.

York.—Commercialores Inc. mined kyanite and produced more than 50 percent in volume and in value above 1954; there was a substantial increase in unit value as well.

## The Mineral Industry of South Dakota

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

By D. H. Mullen 1



COUTH DAKOTA mineral production in 1955, exclusive of uranium, was valued at \$40.5 million, an increase of 7 percent over 1954. It continued a steady upward trend for the fourth consecutive The gain in 1955 can be attributed entirely to the value of the nonmetals—cement, clays, gypsum, lime, sand and gravel, and stone. The value of gold production decreased 2 percent, and silver increased 2 percent. As a group, the value of the metals, of which gold and silver represented 99 percent, was 47 percent of the State total. This was the first year of normal operation since records have been kept (excluding the period from June 8, 1943, to July 1, 1945, when Order L-208 of the War Production Board was in effect in South Dakota) that the value of the metals produced has been less than 50 percent of the State's total mineral production. The steady increase in the pro-

TABLE 1.—Mineral production in South Dakota, 1954-55 1

	19	54	19	55
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrategross weight_ Coal (lignite) Columbium-tantalum concentrate	25, 447 (2) (3) (541, 445 8, 518 4 2, 040 16, 299 1, 510 7	\$139, 663 43, 260 (2) 45, 000 18, 950, 575 11, 073 (2) 65, 222 26, 943 350 7, 840, 350 7, 840, 350 4, 928, 855 500 6, 121, 186	294 25, 782 5, 638 42, 164 (Y) 529, 865 12, 592 2, 048 4, 854 1, 322 13, 537, 801 154, 092 2, 262, 246	\$157, 048 90, 240 9, 584 267, 286 7, 400 18, 545, 275 16, 369 (3) 21, 383 26, 853 10, 096, 828 139, 461 5, 679, 444
Total South Dakota 7		37, 874, 000		40, 526, 000

<sup>&</sup>lt;sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Value of uranium ore is excluded.

Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

Weight not recorded.

Revised figure.
Less than 1/2 ton.
Data not available for 1955.

<sup>7</sup> The total has been adjusted to eliminate duplication in the value of raw materials used in manufacturing cement.

<sup>1</sup> Commodity-industry analyst, Region III, Bureau of Mines, Denver, Colo.

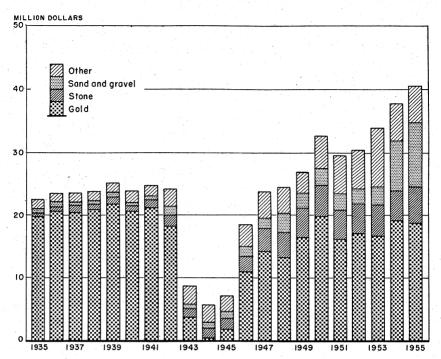


FIGURE 1.—Value of gold, dimension and crushed stone, sand and gravel, and total value of mineral production in South Dakota, 1935-55.

duction of cement, sand and gravel, and stone and advances in unit values of nonmetals resulted in metals being displaced as the leading commodity group in 1955. Production of gold and silver was maintained at near capacity at the two producing mines. A Mineral Atlas 2 of mines and mineral deposits in Custer, Fall River, and a part of Pennington Counties was published. This completed the Mineral Atlas of the Black Hills.

TABLE 2.—Average unit value of selected mineral commodities in South Dakota, 1954-55 1

Commodity	1954	1955	Commodity	1954	1955
Berylshort ton_ Columbium-tantalum concentratepound_ Gold 2troy ounce_	\$414. 430 1. 700 35. 000	\$534.170 1.700 35.000	Mica:pound Scrapshort ton Sand and graveldo_ Silver 3troy ounce_ Stoneshort ton	\$4.002 17.843 .529 .905+ 3.052	\$4. 405 20. 312 . 746 . 905+ 2. 511

<sup>1</sup> Prices are based on average value f. o. b. mines or mills reported by the producers except as otherwise noted.
2 Price under authority of Gold Reserve Act of Jan. 31, 1934.
3 Treasury buying price of newly mined silver July 1, 1946 to date—\$0.9050505,(\$0.905 used in 1947 for calculation and the contraction of the

lating purposes).

<sup>&</sup>lt;sup>2</sup> Bureau of Mines Staff, Region V, Mining Division, Rapid City, S. Dak., Black Hills Mineral Atlas, Part 2: Bureau of Mines Inf. Circ. 7707, 1955, 208 pp.

# REVIEW BY MINERAL COMMODITIES METALS

Beryllium.—Beryllium-concentrate (beryl) production, about equally divided between Custer and Pennington Counties, was reported by 73 companies, individuals, and combinations of individuals. Custer County had the greatest number (50) of operators. The output was sold to the General Services Administration (GSA) Purchasing Depot at Custer (67 percent); to Gladys W. McKinley, Custer (29 percent); and to Beryl Ores Co., Arvada, Colo. (4 percent). Beryl, produced as a coproduct with feldspar and mica, declined 13 percent in quantity from 1954 and paralleled the decline in the production of those commodities. The average price was higher and the value of production increased 12 percent over 1954.

The Bureau of Mines Experiment Station at Rapid City continued to study methods of separating beryl, columbite-tantalite, and mica from pegmatite rock. A report <sup>3</sup> describing the flotation of beryl was

published.

Columbium-Tantalum.—The production of columbite-tantalite concentrate declined sharply in 1955. Government purchase of concentrate under the stockpiling program was terminated subsequent to filling of the quantity limitation established by the Congress. Production in 1955 from Pennington and Custer Counties was 5,638 pounds, a 78-percent decline from 25,447 pounds in 1954. Pennington County, with 3 operators, produced 84 percent of the total, and Custer County, with 10 operators, produced the remainder. All production was sold to the GSA Purchasing Depot at Custer.

Gold and Silver.—Gold and silver produced by Homestake Mining Co. and Bald Mountain Mining Co. in Lawrence County composed 99 percent of the value of metal output in the State. Gold production decreased 2 percent and silver increased 2 percent compared



FIGURE 2.—Total value of mine production of gold and silver in South Dakota in 1905-55.

<sup>&</sup>lt;sup>3</sup> Runke, S. M., Petroleum Sulfonate Flotation of Beryl: Bureau of Mines Rept. of Investigations 5067, 1954, 19 pp.

with 1954. Homestake Mining Co. milled ores of slightly lower gold content, and Bald Mountain Mining Co. milled ores of slightly higher silver content than in preceding years. Homestake Mining Co. retained its position as the leading gold producer in the United States, and Lawrence County continued to be the leading gold-producing area.

Iron Ore.—Iron ore from deposits near Nemo in Lawrence County was produced for use in manufacturing cement. Production of ore (containing approximately 35 to 40 percent iron) in 1955 totaled 2,048 long tons, a slight increase over 1954.

TABLE 3.—Mine production of gold and silver in 1955, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)	Month	Gold (fine ounces)	Silver (fine ounces)
January	41, 880 39, 879 42, 750 43, 371 45, 140 46, 707	12, 400 10, 930 10, 726 11, 867 11, 670 16, 795	August	44, 233 45, 196 43, 840 44, 562 46, 277	13, 082 12, 767 12, 374 13, 465 13, 095
July	46, 030	14, 921	Total	529, 865	154, 092

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc, 1946-50 (average), 1951-55, and total 1876-1955, in terms of recoverable metals <sup>1</sup>

	Mines p	roducing	Material sold or	Gold (lode	and placer)	Silver (lode	and placer)	
Year	Lode	Placer	treated 2 (short tons)	Fine ounces	Value	Fine ounces	Value	
1946-50 (average)	4 5 6 4 2 2	(3)	1, 087, 660 1, 166, 380 1, 324, 817 1, 479, 802 1, 600, 784 1, 665, 341	425, 987 \$14, 909, 559 458, 101 16, 033, 535 482, 534 16, 888, 690 534, 987 18, 724, 545 541, 445 18, 950, 575 529, 865 18, 545, 275		108, 945 139, 590 132, 102 138, 642 151, 407 154, 092	\$96, 913 126, 336 119, 559 125, 478 137, 031 139, 461	
1876–1955			(4)	25, 410, 923	670, 979, 514	10, 861, 667	7, 962, 272	
	Copper		Le	ad	Zi	Zine		
Year	Short tons	Value	Short tons	Value	Short tons	Value	Total value	
1946-50 (average) 1951 1952 1953 1954			6 2 2 10	\$1, 859 692 644 <b>2,</b> 620		\$2,462	\$15, 010, 793 16, 160, 563 17, 008, 893 18, 852, 643 19, 087, 606 18, 684, 736	
1876-1955	106	\$36, 466	497	71, 752	265	56, 406	679, 106, 410	

<sup>&</sup>lt;sup>1</sup> 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.

<sup>Does not include gravel washed.
Less than 1.
Figure not available.</sup> 

TABLE 5.—Gold and silver bullion produced at mills by amalgamation, 1946-50 (average) and 1951-55

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)
1946-50 (average)	983, 280	282, 523	70, 855	1953	1, 368, 059	365, 442	74, 608
1951	1, 046, 305	317, 593	62, 685	1954	1, 485, 226	363, 831	80, 168
1952	1, 209, 926	328, 844	64, 584	1955	1, 550, 116	379, 249	76, 312

TABLE 6.—Gold and silver bullion produced at mills by cyanidation, 1946-50 (average) and 1951-55

	Materia	l treated (sho	Gold in bullion	Silver in bullion	
Year	Crude ore	Sands and slimes	Total	(fine ounces)	(fine ounces)
1946-50 (average) 1951 1952 1963 1964 1955	103, 334 120, 051 114, 863 111, 676 115, 558 115, 225	981, 169 1, 045, 384 1, 209, 884 1, 368, 059 1, 485, 226 1, 550, 116	1, 084, 503 1, 165, 435 1, 324, 747 1, 479, 735 1, 600, 784 1, 665, 341	143, 436 140, 493 153, 690 169, 542 177, 614 150, 616	37, 756 76, 436 67, 183 63, 434 71, 239 77, 780

Uranium.—Exploration and development of uranium deposits in Fall River County continued. American Smelting and Refining Co. operated the buying station at Edgemont as agents for the Atomic Energy Commission (AEC) for the entire year. Ore for stockpiling was received from approximately 35 producers. AEC approved a concentrate purchase contract with Mines Development, Inc., and plans were completed for constructing a 300-ton-per-day processing plant at Edgemont.

The AEC Suboffice, Raw Materials Division, at Hot Springs was moved to the campus of the South Dakota School of Mines and Technology at Rapid City. The office continued its detailed study of uranium-bearing areas in North and South Dakota, Wyoming, and Montana. The airborne radioactivity survey of the White River Badlands in Pennington County was followed by a more detailed

study of a selected area near Scenic and a report published.4

Exploratory drilling in Fall River and Harding Counties consisted of diamond drilling, 5 percent (72 percent cored); rotary, 22 (13 cored); wagon, 2; churn, 64; and auger, 7. Total footage was 88,512 feet. Development and exploration work consisted of 1,870 feet of adits, drifts, and crosscuts, 3 miles of road construction, and removal of about 180,000 cubic yards of material in trenching and in stripping opencut operations. Nearly all operations have been opencut; however, as overburden became excessive, some operators began, and others are preparing to begin, underground openings. All production in 1955 was from the Edgemont area in Fall River County. Production figures are not available.

<sup>&</sup>lt;sup>4</sup> Moore, George W., and Murray, Levish, Uranium-Bearing Sandstone in the White River Badlands, Pennington County, S. Dak.: Geol. Survey Circ. 359, 1955, 7 pp.

### **NONMETALS**

Cement.—South Dakota Cement Plant at Rapid City, Pennington County, operated the entire year producing general-use and moderate-heat (types I and II), high-early-strength (type III), high-sulfate-resistance (type V), and masonry cements. A portion of the general-use and moderate-heat cements was air-entrained. Masonry cement was manufactured from a base of portland-cement clinker. Shipments of portland and masonry cements in 1955 increased 15 percent over 1954. A major portion of the cement (72 percent) was shipped to South Dakota points. Substantial quantities were shipped to North Dakota, Nebraska, and Wyoming, and smaller shipments were made to Iowa, Illinois, Colorado, Minnesota, Montana, and Canada. The average price of portland cement in both 1954 and 1955 was \$2.84 per barrel.

Clays.—Clay from the Fuson formation was mined near Belle Fourche in Butte County for manufacturing building brick, drain tile, and other heavy clay products. Bentonite from deposits in Wyoming and South Dakota was processed at two plants in Belle Fourche. A major portion of the raw material was from Wyoming. Principal uses were for foundries, drilling mud, filtering, insecticides, and concrete admixture. Shale from the Pierre formation was mined in Pennington County near Rapid City for portland-cement manufacture and for lightweight aggregate. Production in 1955 was 15 percent greater

than in 1954; value increased 4 percent.

Feldspar.—Feldspar from numerous pegmatite deposits was produced by 43 operators in Custer County and 16 in Pennington County. Six operators, producing over 1,000 long tons each, supplied 64 percent of the total. Abingdon Potteries, Inc., operated several mines near Pringle and shipped its entire production to its grinding plant at Abingdon, Ill. Consolidated Feldspar Department of International Minerals & Chemical Corp. operated mines in Custer and Pennington Counties and also purchased the material produced by independent operators; all was ground at company-owned grinding plants at Custer and Keystone. The ground product, shipped either bagged or in bulk, was used in manufacturing glass, pottery, enamel, brick and tile, and soaps and abrasives. Production of crude feldspar in 1955 was slightly below that in 1954.

Gem Stones.—Various types of agate, agatized and petrified wood, and garnets occurring in Custer, Pennington, and Meade Counties were collected for sale as specimens or to processors for polishing. The Fairburn agates, found near Fairburn in Custer County on the southeastern edge of the Black Hills, are quite spectacular and have been sold for \$5 to \$200 each, depending on the size and quality. Production of gem stones was reported from Custer and Pennington Counties and consisted of rose quartz, various types of agates, and

garnets. The total value was \$7,400.

Gypsum.—The South Dakota Cement Commission mined gypsum from deposits in the Spearfish formation near Rapid City for use as an additive in manufacturing portland and masonry cements. Production in 1955 increased 48 percent over 1954.

Lime.—Quicklime was produced at a plant at Pringle, Custer County. The entire output was used within the State for metal-

lurgical purposes. Production in 1955 increased 11 percent over 1954. Lithium.—Lithium minerals (spodumene, amblygonite, and lepidolite) were produced in Pennington and Custer Counties. was shipped to plants in Minnesota and New Jersey for manufacturing lithium compounds; the amblygonite was shipped to Germany and the lepidolite stockpiled.

Mica.—Sheet, hand-cobbed, and scrap micas were produced from pegmatite deposits in Custer and Pennington Counties. Sheet and hand-cobbed micas were sold to the GSA Purchasing Depot at Custer. Scrap mica was sold to grinders in Illinois, North Carolina, and The quantity of hand-cobbed mica offered to GSA de-Colorado. clined sharply from 1954, decreasing 69 percent. The quantity of sheet mica of all grades recovered from the hand-cobbed mica was 7.16 percent, a slight decrease from the 7.7 percent recovered in 1954. The quantity of scrap mica produced was 12 percent below that of 1954.

Regulations 5 governing the method of payment for hand-cobbed mica were amended. The amendment retained the method of calculating the value of acceptable sheet mica provided in Revision 3 of May 1954 but removed the limitation of \$600 per ton, as previously established, and increased the charge for rifting and trimming. The purpose was to induce producers to prepare their mica so that a greater proportion of high-quality product could be recovered. the accompanying table percentage yields of Good-Stained, Stained, and total sheet mica have been calculated and compared with minimum GSA specifications.

TABLE 7.—Mica sold or used by producers, 1951-55

Sheet mica: Uncut larger than punch and circle: Pounds.   1 490   1 921   2 332   2 22   2 34   2 34   3			•	,		
Sheet mica:   Uncut larger than punch and circle:   Pounds		1951	1952	1953	1954	1955
Uncut larger than punch and circle:	Hand-cobbed mica, total: Pounds		84, 846	227, 847	207, 221	64, 673
Pounds	Sheet mica:					
Value \$6,580 \$8,983 \$3,056 \$1,98 From hand-cobbed mica: \$13.43 \$9.75 \$9.20 \$8.9 Pounds. \$13.43 \$9.75 \$9.20 \$8.9 Pounds. \$25,454 \$68,369 \$62,166 \$19,40 \$6.67 \$6.67 \$3.89 \$4.10 Pounds. \$25,454 \$68,369 \$62,166 \$19,40 \$6.67 \$6.67 \$6.67 \$3.89 \$4.10 Pounds. \$11,174 \$16,299 \$4.85 \$4.10 Pounds. \$25,454 \$69,20 \$4.00 \$4.10 Pounds. \$32,034 \$77,552 \$65,222 \$21,385 \$65,202 \$21,385 \$65,202 \$21,385 \$65,202 \$21,385 \$65,202 \$21,385 \$65,202 \$21,305 \$25,405 \$25	Uncut larger than punch and circle:	1			1	
A verage per pound	Volue	.	1 490	1 921	2 332	2 221
From hand-cobbed mica:		·		\$8, 983		\$1,980
Pounds	From hand-cohbed mice		\$13.43	\$9.75		\$8.96
Value       \$25, 454       \$68, 369       \$62, 166       \$19, 40         A verage per pound       \$6, 67       \$3.89       \$4.1         Total:       4, 308       11, 174       16, 299       4, 85         Value       \$32, 034       \$77, 552       \$65, 222       \$21, 38         A verage per pound       \$7.44       \$6.92       \$4.00       \$4.4         Scrap mica, total:       \$1, 687       1, 510       \$1, 32         Value       \$2, 292       915       1, 687       1, 510       \$2, 685         Value       \$42, 714       \$24, 148       \$27, 388       \$26, 943       \$26, 85         Total sheet and scrap mica:       \$18.64       \$26.39       \$16.23       \$17.84       \$20.31         Short tons.       \$2, 600       \$20.31       \$26, 855       \$20.31	Pounds					
Total:  Pounds  Value  A verage per pound  Pounds  Value  A verage per pound  Scrap mica, total:  Short tons  Value  Short tons  Value  Short tons  Value  Short tons  Value  A verage per pound  Short tons  2, 292  42, 714  \$24, 148  \$27, 388  \$26, 943  \$26, 85  \$20. 31  Total sheet and scrap mica:  Short tons  Short tons  Short tons  Short tons  Short tons  A verage per ton  \$18. 64  \$20. 39  \$17. 84	value			10, 253		4 4, 633
Total:	Average per pound					
Pounds			φο. σι	φυ. υ	\$3. 89	\$4.19
Average per pound \$32, 034 \$77, 552 \$65, 222 \$21, 38 Scrap mica, total: Short tons. 2, 292 915 1, 687 1, 510 \$32, 034 \$4. 4  Average per ton. \$42, 714 \$24, 148 \$27, 388 \$26, 943 \$26, 85  Total sheet and scrap mica: Short tons.	Total:	İ	1	i		
Average per pound \$32, 034 \$77, 552 \$65, 222 \$21, 38 Scrap mica, total: Short tons. 2, 292 915 1, 687 1, 510 \$32, 034 \$4. 4  Average per ton. \$42, 714 \$24, 148 \$27, 388 \$26, 943 \$26, 85  Total sheet and scrap mica: Short tons.	Volue		4, 308	11, 174	16, 299	4.854
Scrap mica, total: Short tons.  Value						\$21, 383
Short tons.   2, 292   915   1, 687   1, 510   1, 322     Value	ar orage per pound		\$7.44	\$6.92	\$4.00	\$4.41
Value \$42,714 \$24,148 \$27,388 \$26,943 \$26,855 \$26,945 \$26,855 \$26,945 \$26,855 \$26,945 \$26,855 \$26,945	Scrap mica, total:					
Value \$42,714 \$24,148 \$27,388 \$26,943 \$26,855 \$26,945 \$26,855 \$26,945 \$26,855 \$26,945 \$26,855 \$26,945	Short tons	2 292	015	1 607	1 510	1 000
Total sheet and scrap mica:  Short tons	V 81Ue	\$42, 714				
Total sheet and scrap mica:	Average per ton	\$18.64				\$20, 800 \$20, 21
Short tons	Total sheet and seron miss.				<del></del>	Ψ20. 31
Volume 1 518   1 518	Short tong					
	Value			1, 693	1,518	1, 324
value\$42,714   \$56,182   \$104,740   \$92,165   \$48,236		\$42, 714	\$50, 182	\$104, 740	\$92, 165	<b>\$48, 236</b>

<sup>1</sup> Major part of this production sold to GSA as full-trimmed sheet.
2 Sold to GSA.
3 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.
4 Sold to GSA. Heavy-Stained and Better recovered from total hand-cobbed mica purchased by GSA.

General Services Administration, Mica Regulation: Purchase Programs for Domestic Mica: Title 32-A-National Defense Appendix, Chap. 14, Revision 3, May 26, 1954; amendment 2, Feb. 10, 1955.

The data as presented below show that, although the production decreased sharply in 1955, the percentage recovery of Good-Stainedand Better-quality mica more than doubled that in 1954.

Production of hand-cobbed mica and yield of sheet mica, 1954-55

	Production of hand- cobbed mica	Total	block	Stained a qual	nd Better ities	Good- Stained and Better qualities	Percent of Stained and Better
Year	Pounds	Pounds	Percent recovery	Pounds	Percent total block	Pounds	qualities
1954 1955	207, 221 64, 673	15, 967 4, 633	7. 71 7. 16	8, 858 2, 115	55. 48 45. 65	477 259	5. 38 12. 25

Sand and Gravel.—Production of sand and gravel in 1955 deceased 9 percent compared with 1954. Commercial sand and gravel, reported by operators in 34 counties, increased considerably over 1954. Government-and-contractor production, reported in 42 counties, deceased 19 percent from 1954. Paving and road construction consumed 91 percent of the States sand and gravel production; of this, 85 percent was produced by Government agencies or contractors. Production figures are not strictly comparable on a year-to-year basis, since some Government agencies, particularly State highway departments and to a small extent county highway departments, report production by contractors in the year in which the contract is completed, which may be other than the year of production. Also, purchases of sand and gravel by Government agencies from commercial producers varies considerably from year to year, depending on the type of contract and the availability of sand-and-gravel deposits to contractors in a particular area.

The leading commercial producers in 1955 were W. E. Bartholow & Son Construction Co., Ed Birdsall Sand Co., Concrete Materials Co., Eagle Sand & Gravel Co., Geo. Garvin, Mannerud Bros., Geo. Michael, Steve R. Oberg Construction Co., A. W. Schnuerle Construction Co., and Floyd Stapp Construction Co. Leading producers for Government-and-contractor operations were Ed Cox & Son, G. H.

Lindekugel & Sons, Dean R. Rounds, and Weelborg Bros.

Stone.—Seven companies operated 8 quarries in Grant County and produced dimension granite for building and monuments; 3 of these companies finished the rough stone at plants in Minnesota. A small quantity of dressed granite was produced in Hughes County. duction of dimension granite was 3 percent greater than in 1954.

Crushed limestone produced in Lawrence and Pennington Counties was used for riprap, concrete aggregate, roadstone, sugar refining,

and the manufacture of cement.

Crushed miscellaneous stone was produced by county highway departments and other Government agencies for riprap and road construction in Butte, Davison, Kingsbury, Meade, and Pennington Counties. The South Dakota State Highway Commission produced crushed stone in various counties for road construction. Total stone production increased 40 percent in quantity and 15 percent in value over 1954.

TABLE 8.—Sand and gravel sold or used by producers, 1954-55, by classes of operation and uses

		1954			1955	
Class of operation and use		Valu	е		Value	
Class of operation and use	Short tons	Total	Average per ton	Short tons	Total	Aver- age per ton
COMMERCIAL OPERATIONS						
Sand: Building Paving Filter	425, 250 124, 074 (1)	\$370, 569 107, 105 (¹)	\$0.87 .86	487, 503 490, 734	\$432, 592 131, 859	\$0.89 .27
Gravel: Building Paving Railroad ballast Other	86, 529 839, 139 (1)	97, 382 304, 509 (¹)	1.13 .36 (¹)	336, 276 1, 349, 441 (1) (1)	213, 458 570, 083 (¹)	. 63 . 42 (1) (1)
Undistributed 1	51, 833	27, 323	. 53	86, 279	33, 262	. 39
Total commercial sand and gravel	1, 526, 825	906, 888	. 59	2, 750, 233	1, 381, 254	. 50
GOVERNMENT-AND-CONTEACTOR OPERATIONS Sand:						
Building Paving Gravel:	<sup>(1)</sup> 2 1, 730, 631	(1) 1, 728, 926	1.00	270 535, 124	600 633, 598	2. 22 1. 18
Building Paving Undistributed <sup>1</sup>	<sup>(1)</sup> 211, 522, 810 38, 962	5, 200, 809 8, 770	(¹) .45 .10	364, 435 9, 887, 739	60, 408 8, 020, 968	. 17 . 81
Total Government-and-contrac- tor sand and gravel	213, 292, 403	6, 933, 505	. 52	10, 787. 568	8. 715, 574	. 81
Grand total	<sup>2</sup> 14. 819, 228	7, 840, 393	. 53	13, 537, 801	10. 096, 828	. 75

<sup>1</sup> Figures that may not be shown separately are combined as "Undistributed."
2 Revised figure.

#### MINERAL FUELS

Coal (Lignite).—Lignite was produced by two operators from strip mines in Dewey County. Small mines in Dewey, Clay, Corson, and other northwestern counties produced lignite for local consumption. Production in 1955, from mines producing over 1,000 tons, was 25,782 tons valued at \$90,240.

Natural Gas.—Natural gas was produced from shallow wells in the glacial drift near Pierre in Hughes County. The gas was used locally for domestic heating and cooking. Production has ranged from 5 to 7 million cubic feet a year. No report for 1955 was available.

Petroleum.—Petroleum was produced from two wells in the Buffalo field in Harding County; a second field was discovered in August when L. A. Helms completed the No. 1 Coffing well in Custer County. Sixteen wildcat wells, one of which was the discovery well in Custer County, were completed during the year compared with 22 in 1954.

Drilling statistics, 1955, wildcat completions by county (Oil and Gas Journal):

		County		Oil	Dry	Total 1	Footage
Custer Fall River			 	1	3 3	4 3	9, 767 7, 780 5, 558
Haakon Harding Pennington			 		1 4 2	1 4 2	5, 555 28, 827 5, 803 6, 752
Stanley Total	•		 	1	15	2 16	64, 484

<sup>&</sup>lt;sup>1</sup> No gas completions in 1955.

In addition, Continental Oil Co., Pure Oil Co., and Herndon Drilling Co. completed 24 slim test holes, drilled to evaluate large areas

in the Williston-Basin portion of the State.

Results of this drilling were not released; however, slight indications of oil were reported in holes drilled in Dewey and Meade Counties. Seven holes were completed in Custer County, 4 in Dewey County, 2 in Fall River County, 7 in Meade County, 3 in Pennington County, and 1 in Ziebach County.

Geophysical (seismograph) work also declined during the year. Nine companies completed 128 crew weeks of work compared to 236 crew weeks in 1954. Principal activities were in Harding, Butte, Ziebach, Fall River, Jackson, Stanley, Perkins, and Washabaugh Counties by Shell Oil Co., Amerada Petroleum Co., and Atlantic

Oil Co.

Leasing activity in the northwestern counties declined following the failure of exploratory drilling in 1955 and previous years. Some activity was evident in the southwestern part of the State in Fall River and Custer Counties along the Black Hills uplift. The activity followed a trend established during the past 2 years for exploration along the Chadron arch through central Nebraska.

### **REVIEW BY COUNTIES**

Brookings.—The county was the second largest source of sand and gravel in the State. Mannerud Bros. produced paving gravel and Grant VandenBerg produced building sand and gravel. The county

highway department produced paving gravel.

Butte.—Shale was mined from the Fuson formation near Belle Fourche by the Black Hills Clay Products Co. for the manufacture of building brick, drain tile, and other heavy clay products. Eastern Clay Products Department of International Minerals & Chemical Corp. and American Colloid Co. operated mills at Belle Fourche for processing bentonite. A major portion of the crude bentonite was from deposits in Wyoming; the remainder being from pits near Belle Fourche. J. B. O'Connor produced building sand and gravel and paving gravel. The county highway department produced crushed stone and gravel for road construction. Shell Oil Co. and Superior Oil Co completed 21 crew weeks of geophysical (seismograph) work during the year.

Codington.—Codington County ranked fifth in the production of sand and gravel. Hallett Construction Co., Zeller Concrete Materials Co., American Sand & Gravel, Inc., and Elmer C. Zwieg produced building and paving sand and gravel. The county highway department produced paving gravel.

TABLE 9.—Value of mineral production in South Dakota, 1954-55, by counties 1 2

County	1954	1955	Minerals produced in 1955 in order of value
Aurora	\$30, 347	(3)	Sand and gravel.
Beadle	106, 246	\$46,629	Do.
Bonne Homme	477, 164	18, 100	Do.
Brookings	121, 887	122, 783	Do.
Brown	264, 130	30, 084	Do.
Butte		1, 340, 389	Clays, stone, sand and gravel.
Campbell	6, 329	1, 540, 568	Olays, stolle, sailt allt graver.
Charles Mix		6, 499	Sand and gravel.
Clark		14, 997	Do.
Clay		12,629	Do.
Codington	166, 450	199, 632	Do.
Corson		1,800	Do.
Custer	4, 800 429, 294		Feldspar, beryl, lime, mica, gem stones, colum
		337, 888	bium-tantalum.
Davison	8,603	32, 961	Sand and gravel, stone.
Day	90, 481	22, 538	Sand and gravel.
Deuel	11,658	11, 326	Do.
Dewey	(3)	90, 240	Coal.
Douglas	14, 458	15, 505	Sand and gravel.
Edmunds		7, 938	Do.
Fall River	29, 612	(3)	Do.
Grant	2, 311, 091	2, 405, 455	Stone, sand and gravel.
Gregory	33, 493	20, 165	Sand and gravel.
Haakon	4, 729	8,000	Do.
Hamlin	20, 315	83, 539	Do.
Hand	1, 130	350	Do.
Hanson		359, 566	Stone.
Harding	(3)	(3)	Petroleum.
Hughes		(3)	Stone.
Hutchinson		26, 499	Sand and gravel.
Hyde	3, 922	894	Do.
Jackson	23,000	1,719	Do.
Jerauld	9, 692	(3)	Do.
Kingsbury	(3)	45, 093	Sand and gravel, stone.
Lake	44, 772	76, 985	Sand and gravel.
Lawrence	19, 206, 286	18, 741, 872	Gold, silver, stone, iron ore, sand and gravel.
Lincoln	41,010	82, 588	Sand and gravel.
Lyman		27, 187	Do.
Marshall	5, 228	6, 565	Do.
McCook	280, 665	21, 880	Do.
McPherson	2, 825	1, 189	Do.
Meade	3, 820	44, 055	Stone, sand and gravel.
Mellette	1,770		
Miner	550	3, 666	Sand and gravel.
Minnehaha	(3)	(3)	Stone, sand and gravel.
Moody	88, 844	17, 422	Sand and gravel.
Pennington	6, 537, 872	6, 838, 936	Cement, stone, sand and gravel, clays, beryl, feldspar, mica, gypsum, columbium-tan-
			talum, gem stones.
Perkins	18, 660	21, 188 41, 830	Sand and gravel.
Roberts	(5)	41,830	Do.
Spink	20, 496	14,007	Do.
Stanley		39, 500	Do.
Sully	10, 777	20,600	Do.
Turner	50, 637	39, 938	Do.
Union	24, 414	24, 595	Do.
Walworth	33, 700	24, 250	Do.
Yankton	7,000		
Undistributed	6, 119, 079	9, 820, 131	
	37, 874, 000	40, 526, 000	

¹ The following counties are not listed because no production was reported: Bennett, Brule, Buffalo, Faulk, Jones, Potter, Sandborn, Shannon, Todd, Tripp, Washabaugh, Ziebach.
² Values of some beryl (1955), gem stones (1954), natural gas (1954), some sand and gravel, some stone (1955), and vanadium (1954) that cannot be assigned to specific counties are excluded from county totals and included with "Undistributed." Excludes value of uranium ore.
² Figure withheld to avoid disclosing individual company confidential data; value included with "Undistributed."
⁴ The total has been called a "total beat has a called a "total has been called a "

<sup>&</sup>lt;sup>4</sup> The total has been adjusted to eliminate duplication in the value of raw materials used in manufacturing

Custer.—Minerals produced in 1955 were derived almost entirely from the numerous pegmatite deposits in the county. Beryl, columbite-tantalite, feldspar, mica, lithium minerals, quartz, and some gem stones occur as major and minor constituents of the pegmatites and were coproducts or byproducts, depending on the concentration of the various minerals in individual deposits. Some operators produced only 1 mineral; others produced 2 to 4 minerals from the same deposit. Feldspar was the major pegmatite mineral produced and led all other minerals in the county in value of production; 43 companies, individuals, and combinations of individuals reported production. Abingdon Potteries, Inc., operated its mines near Pringle and purchased a small quantity from an independent producer. Consolidated Feldspar Department of International Minerals & Chemical Corp., the largest producer, operated several mines and purchased the production of independent operators. All production and purchases were ground at its plant at Custer. Beryl, second in value of mineral production in the county, was produced by 50 operators. George C. Bland, the largest producer, operated the Beecher, Beecher No. 3, Someday, Bull Moose lode, and Lincoln Fracture mines.

Consolidated Feldspar Department of International Minerals &

Consolidated Feldspar Department of International Minerals & Chemical Corp. produced beryl at the Mountain lode, Tin Mountain lode, and Triangle A pegmatites. Kenneth Spring operated the Springs Homestead. John Roseberry produced from the Elk Mountain lode and Elk Ridge lode, and Jim Koch operated the Hi Climb. Seventy-two percent of the production was sold to GSA at Custer. Gladys W. McKinley, Custer, purchased the remainder. Hand-cobbed and scrap mica produced from pegmatite deposits declined sharply from 1954. George C. Bland produced hand-cobbed and scrap mica at the Ann and Beecher No. 3 mines. Other major producers were Otis Palmer, Robert Davis, Russell Wineteer, Leonard Wood, Dale Brown, and Carl Roseberry. Hand-cobbed mica was sold to GSA at Custer for processing. Scrap mica was purchased by Gladys W. McKinley for sale to grinding plants and by Consolidated Feldspar Department of International Minerals & Chemical Corp.

for shipment to its grinding plant at Pueblo, Colo.

Columbite-tantalite was produced by 10 operators at 13 deposits. The quantity declined 96 percent from that in 1954. The principal producer was Mineral Mills, Inc., operating the Old Mike. The entire production was sold to GSA at Custer. Lithium minerals—amblygonite and spodumene—were produced by three operators: The amblygonite was sold to the Black Hills Keystone Corp. at Keystone and the spodumene to Maywood Chemical Works at Maywood, N. J.

Rose quartz and several varieties of agate were collected by Robert B. Berry Co., The Black Hills Mineral Society, A. L. Krueger, and Scott's Rose Quartz Co. "The Wilkins" collected a number of Fairburn agates. Black Hills Lime Co. produced quicklime at its plant at Pringle. The entire production was used for metallurgical purposes.

L. A. Helms completed the No. 1 Coffing well in August at 1,393 feet in the First Leo sandstone. Initial flow was 80 barrels a day of 30° gravity oil. The discovery, on the Barker dome 18 miles north of Edgemont, was the second producing oilfield in the State. Shell Oil Co. drilled three wells during the year. The wells ranged in depth

from 2,602 to 2,890 feet and were bottomed in the Dakota and Morrison sandstones; all were dry and were abandoned. The company also completed some geophysical (seismograph) work. Pure Oil Co. drilled 7 slim test holes ranging from 800 to 1,800 feet in depth; they were stopped in the Muddy sandstone. Total footage drilled was 8,000 feet.

Dewey.—Dewey County Coal Co., Firesteel, and Baker Coal Co., Isabel, produced coal (lignite) from strip mines. Output in 1955 increased slightly over 1954. Other operators producing less than 1,000 tons a year produced lignite for local consumption. Herndon Drilling Co. completed four slim test holes to the Mission Canyon and Red

River formations. Total footage drilled was 18,588 feet.

Fall River.—Development of uranium deposits continued. buying station at Edgemont, operated by American Smelting and Refining Co. for the AEC, purchased ore the entire year. included some ores produced in Wyoming. Mines Development, Inc., was awarded a contract for purchasing uranium concentrate by AEC and began constructing a 300-ton-per-day concentrator at Edgement in August. The mill, the eleventh in the United States and the first outside the Colorado Plateau area, was designed to use a sulfuric-acid leach and the resin-in-pulp ion-exchange process to recover the uranium. Operation of the plant was expected to begin in 1956. Edgemont Mining & Uranium Co., the largest producer, operated the Gould, Freezeout, Taylor, Lundberg, Virginia C, and Crandell properties and continued exploring the deposits by churn drilling and trenching. Sodak Uranium & Mining Co. operated the Matias Peak and Trade Dollar groups and other claims in the district. Black Hills Uranium Co. operated its claims in Red and Craven Canyons. Pictograph Mining & Uranium Co., Inc., operated the Marty lease, Maryjac group, Pat lease, Pictograph claim, and Runge leases, and conducted an extensive exploration program of rotary drilling. nium Research & Development Co. explored the Tepee claims by rotary drilling. Diamond Oils, Inc., drilled the Radon & U. P. groups, and Lorenz Bros. explored the Damsite group by wagon drilling.

Pure Oil Co. drilled two slim test holes. They were completed at 1,700 and 1,800 feet in the Muddy sandstone. Results were not reported. Shell Oil Co. completed 12 crew weeks of geophysical (seis-

mograph) work.

Building and paving sand and gravel were produced by Batie Gravel Co., Fall River Sand & Gravel Co., Reitz & Critz Sand Co.,

and the Bureau of Reclamation.

Grant.—Dimension granite for architectural and monumental use was produced from quarries at Milbank and Big Stone City. The stone, reddish-brown and mahogany in color, was used extensively for interior and exterior building facings and for monuments. Consolidated Quarries, Inc., produced rough stone at its Dakota Mahogany quarry at Milbank. The stone was finished at Sauk Rapids, Minn. Melrose Granite Co. produced Melrose Russet at its quarry near Big Stone City. The rough stone was finished at St. Cloud, Minn., for use in monuments. Steiner-Rausch operated the American Beauty Mahogany quarry at Milbank. Robert Hunter operated a

quarry at Milbank. The rough stone was finished for use in monuments. Dakota Granite Co. operated its Dakota No. 1 and American Rose No. 2 quarries at Milbank. Rough and finished monumental stone was sold. Delano Granite Works, Inc., operated the Imperial Mahogany quarry at Milbank; rough stone was finished at Delano, Minn., for monuments. North Star Granite Corp. operated its quarry at Milbank and finished the rough stone at St. Cloud, Minn. Walter Lindberg produced paving sand and the county highway department produced paving gravel.

Haakon.—E. E. Pohle Enterprises, Inc., drilled a wildcat well to

Haakon.—E. E. Pohle Enterprises, Inc., drilled a wildcat well to the Winnipeg sandstone at a depth of 5,556 feet, where it was abandoned. Shell Oil Co. completed six crew weeks of geophysical (seismograph) work. George Michael produced paving sand.

Harding.—Petroleum was produced at the Buffalo field. Because of transportation difficulties production was less than 1954. Wildcat wells were drilled by Amerada Petroleum Co., Richfield Oil Co., Shell Oil Co. and Carter Oil Co., and Hunt Oil Co. The wells, ranging from 3,640 feet to 9,050 feet in depth, were dry and were abandoned. Geophysical (seismograph) work was continued by Amerada Petroleum Co., Hunt Oil Co., Mobil Producing Co., Sun Oil Co., and Skelly Oil Co. A total of 27 crew weeks were completed.

Oil Co., and Skelly Oil Co. A total of 27 crew weeks were completed.

Limited exploratory drilling was completed on uraniferous lignite deposits. Bryco Mining Co. did auger drilling on the Mary Jane and Buckham groups. Fred Loflin auger drilled the Hinds and Moonshine groups. Peter Kiewit Construction Co. explored the Kelly-DeSort lease, Patterson and Ward groups and the Le Mar lease by rotary and auger drilling. Results were not announced.

lease by rotary and auger drilling. Results were not announced.

Hughes.—S. T. Jacobs produced a small quantity of dressed granite for monuments. Atlantic Oil Co. completed nine crew weeks of geophysical (seismograph) work.

Jackson.—Shell Oil Co. completed 11 crew weeks of geophysical (seismograph) work. The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. produced gravel for road ballast.

Lawrence.—Mineral production in Lawrence County, valued at \$18.7 million (a decline of 2 percent from 1954), represented 46 percent of the total production in South Dakota. Gold production decreased 2 percent and silver production rose 2 percent. The quantity of iron ore mined increased slightly. The production of crushed limestone and sand and gravel was lower.

Homestake Mining Co. operated its mine and mill at Lead the entire year. The quantity of ore milled gained 4 percent but because of a lower grade material milled, the quantity of gold and silver recovered declined 2 and 10 percent, respectively. The following information and data are from the 78th Annual Report of Homestake Mining Co. for the year ending December 31, 1955.

### \* \* \*

In spite of an increase of around 4 percent in quantity of ore milled at the Homestake Mine and continued improvement in metallurgical recovery of gold, the value of bullion produced in 1955 was some \$354,000 less than in 1954, which is to be attributed entirely to the lower grade of ore mined in accordance with a systematic program of stoping. Mining and milling costs per ton were reduced during the year which is something of an achievement in view of the continued increase in prices of nearly all supplies consumed in the operations.

Ore reserves reported as of January 1, 1956 are 898,000 tons less than the comparable figure for the previous year, indicating that the quantity of ore mined during the year (1,550,000 tons) was offset by the addition of 652,000 tons largely through extensions of ore revealed as the mining operations advanced. The tonnage reported in the reserves (16,689,000) includes only the ore that can be measured with reasonable accuracy between exposures in mine openings or revealed by diamond drilling at sufficiently close intervals for reasonable projections. The orebodies outlined on the 5,000 level give assurance that ore persists, but no tonnage for ore below this depth is included in the formally estimated reserves.

\* \* \*

Tons milled in 1955 were 1,550,116, an increase of 64,890 tons over 1954. Bullion production was \$18,055,257.58, a decrease of \$354,352.77 from 1954. Recovered value per ton was \$11.65. Extraction was 97.08 percent. Recovered value in 1954 was \$12.40; extraction was 96.66 percent.

Although mining was programmed for the year to yield ore of average grade of reserves, the head value that was realized was slightly lower than this figure. This resulted largely from obtaining larger tonnage than expected in certain lower grade stopes, which delayed the mining of some scheduled sections of higher grade.

Mining costs in 1955 were 16.3 cents per ton lower than in 1954. Milling costs were 4.4 cents less than in 1954. Administrative and general costs, however, rose 22.1 cents per ton, due to a new employee group insurance plan and to a larger contribution to the pension fund. All costs before depreciation and Federal income tax were 1.4 cents per ton greater than in 1954. Tons per manshift for the entire payroll rose from 2.90 in 1954 to 3.04 in 1955.

The developed ore reserve (including broken ore) as of January 1, 1956 was 16,689,400 tons, a decrease of 897,800 tons from January 1, 1955. Average grade of the reserves declined slightly.

Excellent progress on the deep level program was made in 1955. The Yates shaft was completed to the 5050 level and pocket installation was about two-thirds complete. Number Four Winze was at the 5150 level at the close of the year. Crosscutting on the 5300 and 5600 levels to potential ore areas is expected to start near the end of the year.

The decrease in ore reserves was 652,000 tons less than tonnage milled. It will be well into 1957 before enough development footage can be driven to give any significant information on lower level results.

In the Mill, classification changes started in 1954 were completed. A fourth ball mill unit was partially installed in December and will be in operation in February. This new unit will permit treatment of larger tonnage when labor supply is adequate and will compensate for down time for lining and repairs on the other three units.

After thorough study, a long range lower level ventilation program was approved. Proper solution of this problem necessitated a new air shaft from the surface to the 5000 level and the enlarging of present exhaust capacity. The surface site and access roads were completed in the summer and fall of 1955. Access drifts on the 2000, 2900 and 3800 levels were also started. Actual sinking will begin near the end of 1956. This whole program is well ahead of the schedule established at the time of approval.

In the Mine, replacement of old locomotives and mine cars with heavier and more efficient equipment continues. During 1956 the car replacement program will be completed. Locomotive replacement will require several years more.



The Bald Mountain Mining Co. operated the Portland-Dakota-Clinton-Decorah group of mines and the 370-ton all-slime cyanide mill at Trojan. Production of crude ore decreased less than 1 percent. The recovery of gold decreased 10 percent, and the recovery of silver increased 41 percent.

TABLE 10.—Ore milled, receipts, and dividends, Homestake mine, 1951-55 1

Year	Ore milled (short	Receipts for produc	bullion t	Dividends
1 651	tons)	Total	Per ton	
1951 1952 1953 1954 1955	1, 046, 203 1, 209, 884 1, 368, 059 1, 485, 226 1, 550, 116	\$15, 486, 682, 10 16, 379, 986, 02 18, 251, 984, 24 18, 409, 610, 35 18, 055, 257, 58	\$14. 8028 13. 5385 13. 3415 12. 3951 11. 6477	\$4, 319, 952 3, 717, 168 4, 018, 560 4, 018, 560 4, 018, 560

<sup>1</sup> From 1876 to 1955, inclusive, this mine yielded bullion and concentrates that brought a net return of \$599,960,719 and paid \$190,795,114 in dividends.

Nemo Ore Co. produced iron ore from an opencut mine near Nemo. The entire production was used in the manufacture of portland cement by South Dakota Cement Plant at Rapid City. The ore was hematitic and contained from 35 to 40 percent iron. Cole Construction Co. produced crushed limestone for riprap, road construction, and sugar refining. The county highway department produced paying gravel.

Meade.—Pure Oil Co., Herndon Drilling Co., and Continental Oil Co. drilled 7 slim test holes to depths ranging from 1,300 to 6,250 feet. They were completed in the Muddy sandstone and the Red River formation. Results of the drilling were not announced. Paving gravel was produced for the county highway department; Daane Bros. Construction Co. produced road gravel. Henry Hanson and Conlon Exploration Co. completed a limited amount of diamond drilling

for uranium on the Lamberton property.

Minnehaha.—Concrete Materials Co. produced crushed sandstone for refractory use, for road construction, and for filters. L. G. Everist, Inc., produced crushed sandstone for riprap, road construction, railroad ballast, filters, the manufacture of ferrosilicon, and for foundries. The county ranked first in the production of sand and gravel. Building and paving sand and gravel were produced by Concrete Materials Co., Eagle Sand & Gravel Co., Steve Oberg, Weelborg Bros., and Frank E. Lacy. Paving gravel was produced for the State highway commission.

Pennington.—The value of mineral production in 1954 was \$6.8 million, a 5-percent increase over 1955. Gains were recorded in the value of beryl, cement, clays, columbite-tantalite, gypsum, mica, and crushed stone. A sharp decrease was recorded in the production of sand and gravel used principally for road construction. This was compensated for largely by crushed stone, the quantity and value of

which more than doubled those in 1954.

Beryl production was reported by 23 operators. Consolidated Feldspar Department of International Minerals & Chemical Corp., the largest producer, operated the Hugo, Barker, and White Cap mines. Other major producers were Black Hills Keystone Corp., operating the Bob Ingersoll; Keystone Feldspar and Chemical Corp., operating the Peerless; Harold Hall, operating the Hardesty and other deposits; and Dale McDermond, at the White Cap. GSA at Custer purchased 62 percent of the production; Gladys W. McKinley, Custer, 30 percent; and Beryl Ores, Arvada, Colo., 8 percent.

The South Dakota Cement Plant at Rapid City, owned by the State of South Dakota and operated by the South Dakota State Cement Commission, produced general-use and moderate-heat (types I and II), high-early-strength (type III), high-sulfate-resistance (type V) portland cements and masonry cement. A portion of the general-use and moderate-heat cement was air-entrained. Portland-cement clinker was used as a base for the masonry cement. Finished-cement storage capacity was increased 150,000 barrels. Shipments of portland and masonry cement increased 15 percent over 1954. The cement commission produces the limestone, shale, and sand used from deposits near Rapid City. Gypsum was produced under contract from State-owned land, and the iron ore was purchased from Nemo Ore Co., which operated a mine in Lawrence County.

Light Aggregates, Inc., Rapid City, produced shale from the Pierre formation and operated its bloating plant at Rapid City to produce lightweight aggregate. The aggregate was used principally in manu-

facturing concrete building blocks.

Feldspar, produced by 16 operators from the pegmatite deposits near Keystone, decreased slightly from 1954. Consolidated Feldspar Department of International Minerals & Chemical Corp. produced crude feldspar from several properties and operated its grinding plant at Keystone. The ground product was used for pottery, enamel, brick and tile, other ceramic products, and soaps and abrasives. The entire production by independent producers was sold to Consolidated

Feldspar Department. Maywood Chemical Works operated the Etta mine, producing spodumene, which was shipped to its processing plant at Maywood, N. J. Lithium Corp. of America, Inc., resumed activity in March at the Mateen mine and flotation mill at Hill City that had been shut down since July 1954 because of a water shortage. Operation continued for a short time; then the mine and mill were again shut down. At the end of the year the corporation announced that South Dakota operations would be maintained on a standby basis as spodumene, adequate to meet demands, could be obtained from other sources. Black Hills Keystone Corp. produced amblygonite and lepidolite at the Bob Ingersoll mine near Keystone and purchased amblygonite from producers in Custer County. The amblygonite was shipped to Germany and the lepidolite stockpiled. Uranium & Allied Minerals, Inc., produced lithium ores at the Edison mine and at the Dyke Lode and operated the Holy Terror mill at Keystone. Concentrates were sold to processors. National Processing Products Co., Rapid City, acquired the idle plant of United States Gypsum Co. at Piedmont in Meade County and installed equipment to concentrate lithium ore and produce lithium compounds. Crude ore was from the Hunter-Louise mine south of Hill City and from independent producers. Operations were not too successful, although a small quantity of lithium hydroxide was produced. Midwest Lithium Corp., organized in the latter part of 1955, acquired the properties of National Processing Co., and began a program for remodeling the plant at Piedmont and expanding operations.

Columbite-tantalite concentrates were produced by George C. Bland from various mines, by Uranium & Allied Minerals, Inc., at the Dyke Lode, and by J. D. Long at the Big Chief and Townsite mines.

Production in 1955 was 91 percent greater than in 1954. The entire production was purchased by GSA at Custer.

Scrap mica was produced by 12 operators; 2 operators also produced hand-cobbed mica; 1 operator produced only hand-cobbed mica. Principal producers of scrap mica were Consolidated Feldspar Department of International Minerals & Chemical Corp. and Keystone Feldspar & Chemical Co. Production was sold to grinders in Illinois, North Carolina, and Colorado. Uranium & Allied Minerals, Inc., was the principal producer of hand-cobbed mica, all of which was sold to GSA at Custer for processing.

Ed Birdsall Sand Co. produced sand and gravel for building, paving, and railroad ballast. Building and paving gravels were produced

for the Bureau of Reclamation.

Crushed granite was produced by Northwestern Engineering Co. for road construction. L. G. Everist, Hills Materials Co., and Pete Lien & Sons produced crushed limestone for riprap and road construc-Pennington County Highway Department produced crushed stone for road construction. Crushed stone was produced for the following agencies: State Highway Commission, used for road construction; Federal Bureau of Reclamation, used at Pactola Dam; and United States Corps of Engineers, used as riprap in Wyoming. Crushed quartz was produced by Black Hills Keystone Corp. for use as roofing material. A. L. Krueger produced garnets and agatized wood. Fure Oil Co. drilled 3 slim test holes; all (about 2,000 feet in depth) were completed in the Muddy sandstone. Six crew weeks of geophysical (seismograph) work were completed by Amerada Petroleum Co., Atlantic Öil Co., and Shell Oil Co.

Ziebach.—Herndon Drilling Co. completed a slim test hole in the Red River formation at a depth of 5,970 feet. Amerada Petroleum Co., Atlantic Oil Co., and Pure Oil Co. completed 20 crew weeks of

geophysical (seismograph) work.

## The Mineral Industry of Tennessee

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Tennessee Division of Geology.

By Avery H. Reed, Jr., and William D. Hardeman, Jr.2



RECORD production of copper, zinc, and cement and increased production of coal highlighted the mineral industry of Tennessee in 1955. The stone industry maintained its high rate of production. Phosphate-rock output decreased 10 percent below 1954. Among the States, Tennessee ranked first in pyrite and second in phosphate rock.

The total value of mineral production increased 13 percent over 1954

and 22 percent over 1953 and established a new annual record.

Leading industries were coal mining, cement manufacture, stone quarrying, zinc and copper production, and phosphate-rock mining and processing. Pig iron and coke were produced at Rockwood, Chattanooga, and Nashville. Leading companies were Tennessee

TABLE 1.—Mineral production in Tennessee, 1954-551

	19	054	19	55
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement, portand	(2) 1, 015, 256 6, 428, 831 9, 087 218 80, 372 11, 823 89 1, 633, 226 5, 155, 185	25, 477, 006 5, 361, 861 7, 630 968, 078 919, 949 10, 000 11, 743, 012 6, 141, 139 54, 990	103, 267 15, 895 39 1, 465, 902 5, 136, 543 66, 619 3 14, 381, 481 40, 216	28, 746, 574 7, 393, 569 7, 735 1, 102, 005 1, 280, 102 5, 000
Total Tennessee 4		105, 686, 000		119, 316, 000

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers)

4 The total has been adjusted to eliminate duplications in the value of clays and stone.

by producers).

Not can vassed separately, included with portland cement.

Final figure, supersedes figure given in commodity chapter. Excludes crushed granite and crushed sandstone.

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<sup>2</sup> State geologist, Division of Geology, Department of Conservation, Nashville, Tenn.

TABLE 2.—Average unit values of mineral commodities produced in Tennessee, 1946–50 (average) and 1951–55  $^{\rm 1}$ 

Commodity	1946-50 (aver- age)	1951	1952	1953	1954	1955
Barite (crude)short ton	(2)	\$12.82	\$12.95	\$14. 55	\$16. 31	\$16. 20
Cement, portland376-pound barrelmasonrydo	\$1.99 (3)	2. 40 (3)	2.40 (3)	2. 51 (3)	2. 61 (3)	2. 64 3. 14
Q1					()	0.11
Ballshort ton	11. 27	9. 18	12.98	12. 52	12.84	13. 13
Firedo Fuller's earthdo	5. 83	9. 51	9. 57	11. 36	11. 36	11. 36
Fuller's earthdo	13. 57	14. 19	13. 81	13. 82	16. 33	14.00
Miscellaneousdo	. 75	1.00	1.00	. 96	. 85	. 34
Coaldo	5.00	4. 99	4.85	4.60	3.96	4.08
Copperpound_ Granite, crushedshort ton	. 195	. 242	. 242	. 287	. 295	. 373
Granite, crushedshort ton				1. 20	1. 25	1.00
Iron orelong ton		3. 97	5. 91	6. 47	5. 77	5. 78
Leadpoundshort ton	. 140	. 173	. 161	. 131		
Limestone:	8.84	10.08	10.03	10. 29	12.04	10. 67
Crusheddododo	1. 22	1. 27	1. 25	1. 24	1. 23	
Dimensiondo		1. 21	1. 25	.79	. 94	1. 18 . 82
Manganese oredo	(2) (2)		(3)	76. 91	77. 81	80. 53
Marble:	. (-)		(9)	10. 91	11.81	80.00
Crusheddo	5. 13	6.78	7, 50	5, 57	10.15	12.76
Dimensiondo	86. 78	90.10	90.13	110. 51	110.36	105. 99
Natural gasthousand cubic feet	.09	. 09	. 10	. 12	(2)	(2)
Phosphate rock (sold or used)long ton	6.19	7. 47	7. 49	7, 55	7. 19	7.18
Sandshort ton_	(2)	1. 37	1. 25	1. 26	1.35	1.30
Graveldo	(2)	. 89	.81	.89	1.07	1.01
Sandstone:	•					02
Crusheddodo	(2)			5.84	14, 36	3.68
Dimensiondo	(2)	19. 10	18. 10	21. 82	24. 38	21, 90
Stone, miscellaneous, crusheddo			1.50			
Zincpound_	. 119	. 182	. 166	. 115	. 108	. 123

For greater detail on prices by grades and markets, see vol. I, Minerals Yearbook, 1955.
 Figure withheld to avoid disclosing individual company confidential data.
 Not canvassed separately.

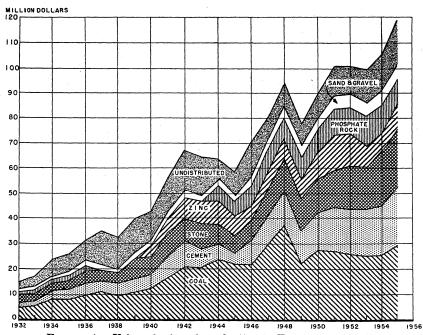


FIGURE 1.—Value of mineral production in Tennessee, 1932-55.

Copper Co., producing gold, silver, copper, zinc, and pyrite; Penn-Dixie Cement Corp., operating 2 cement plants, 2 limestone quarries, and 1 clay mine; American Zinc Co. of Tennessee, producing zinc and limestone; Volunteer Portland Cement Co., operating a cement plant and an associated limestone quarry and clay mine; and Marquette Cement Mfg. Co., operating 2 cement plants, 2 limestone quarries, 1 clay mine, and 1 sand and gravel mine.

Defense Minerals Exploration Administration (DMEA) activity consisted of continuation of a project by American Zinc Co. of Tennessee for zinc exploration in Jefferson County. The contract, which was initiated in 1954, amounted to \$1,017,000, with Government

participation 50 percent.

### REVIEW BY MINERAL COMMODITIES

### **METALS**

Copper.—Tennessee Copper Co. was the only copper producer in the State, recovering copper concentrate from sulfide ores mined in Polk County; production increased 9 percent over 1954 to the highest level since 1930.

Gold.—Tennessee Copper Co. recovered gold as a byproduct from

smelting copper and zinc concentrates.

Iron Ore.—Consolidated High Grade Ore Co. and Monroe Mining Co. mined brown iron ore in Monroe County; the ore was concentrated by log washing and sold to iron and steel plants at Rockwood. Rockwood Mining Co. mined red iron ore in Roane County for sale to iron and steel plants. Total production of iron ore increased considerably over 1954.

Manganese Ore.—Metallurgical grade (plus-35-percent Mn) manganese ore was mined by 12 producers in Carter, Johnson, Monroe, and Unicoi Counties. Largest producers were Tennessee Manganese Co., with mines in Unicoi County; Colitz Mining Co., with operations in Johnson County; and Virginia Iron, Coal & Coke Co., with mines in Carter County. Shipments expanded 34 percent over 1954, owing mainly to opening of the new Colitz mine by the Colitz Mining Co. All shipments of ore went to GSA stockpiles.

TABLE 3.—Production of manganese ore, 1946-50 (average) and 1951-55 (35 per cent or more Mn)

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average) 1951 1952	77 126	(1)	1953 1954 1955	2, 625 11, 823 15, 895	\$201, 898 919, 949 1, 280, 102

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosing individual company confidential data.

Silver.—Tennessee Copper Co. recovered silver as a byproduct from smelting copper and zinc concentrates produced in Polk County. Production increased 10 percent over 1954.

Zinc.—American Zinc Co. of Tennessee and Tennessee Coal & Iron Division, United States Steel Corp., recovered zinc from zinc ores mined in Jefferson and Knox Counties, and Tennessee Copper

roduction of recoverable gold, silver, copper, lead, and zinc, 1946-50 (average), 1951-55, and total 1850-1955	1	value	502 \$10,529,268 506 17,517,206 640 13,77,054 950 13,415,709 345 11,974,826 17,354,685 376,819,000
ind total	Złnc	Value	\$7,766, 14,064, 12,622, 8,846, 6,550, 9,893, (1)
1951–55, 8	īZ	Short	30, 093 38, 639 38, 020 38, 465 30, 326 40, 216 1 1, 162, 000
verage)	Lead	Value	\$29, 062 4, 844 5, 796 2, 358
46-50 (a	Le	Short	103 14 18 9 9
nd zinc, 19	Copper	Value	\$2, 688, 282 3, 481, 396 3, 688, 080 4, 493, 846 5, 361, 861 7, 393, 569 (1)
, lead, al		Short	6, 769 7, 069 7, 620 7, 829 9, 987 9, 911 454, 000
, copper	ų	Value	\$39, 227 22, 590 52, 103 62, 390 64, 390 60, 294 (1)
gold, silver	Silver	Fine	43, 729 24, 960 67, 569 68, 935 60, 759 66, 619 3, 517, 800
verable	Gold	Value	\$6, 195 3, 780 8, 435 10, 255 7, 630 7, 735 (1)
n of reco	ğ	Fine	117 108 241 293 218 221 22, 800
TABLE 4.—Mine productio		Year	1946-50 (average) 1961- 1962- 1963- 1964- 1865- 1860-1955 (total)

1 Included with "Total value."

Co. recovered zinc from copper-zinc ore mined in Polk County. New Jersey Zinc Co. was developing new zinc mines in Hancock and Jefferson Counties. Production expanded 33 percent over 1954, reflecting increased prices for zinc.

### **NONMETALS**

Barite.—B. C. Wood, and L. A. Wood, Inc., mined crude barite in Loudon and Monroe Counties. Part of the barite was sold crude, and part was crushed or ground for well drilling, glass, rubber, and other uses.

Cement.—Portland cement was produced by 4 companies, with plants in 6 counties. The leading producer was Penn-Dixie Cement Corp., with plants in Marion and Sullivan Counties. Shipments increased 6 percent over 1954 and established a new annual record. Masonry cement was produced by 4 companies in 5 counties; the leading producer was Marquette Cement Mfg. Co., with plants in Davidson and Franklin Counties. Total shipments were 795,000 376-pound barrels valued at \$2,497,000.

TABLE 5.—Finished portland cement produced, shipped, and in stock, 1946-50 (average) and 1951-55, in 376-pound barrels

Year	Production,	Shipment	Stocks at	
	barrels ,	Barrels	Value	mills on Dec. 31
1946-50 (average)	6, 121, 668 7, 221, 968 7, 439, 873 7, 474, 604 7, 523, 507 8, 109, 659	6, 180, 999 7, 162, 841 7, 428, 604 7, 276, 964 7, 569, 279 8, 016, 859	\$12, 322, 191 17, 203, 080 17, 834, 060 18, 283, 366 19, 734, 262 21, 175, 825	309, 138 377, 021 388, 290 585, 930 540, 158 361, 838

Clays.—Ball clay was mined by 6 companies in 3 counties. The leading producer was H. C. Spinks Clay Co., with mines in Henry and Weakley Counties. Production expanded 30 percent over 1954, owing mainly to increased demand for whiteware, and established a new annual record. The clay was used for whiteware, high-grade tile, art pottery, kiln furniture, firebrick and block, heavy clay products, enameling, and other uses.

Fire clay was mined by W. S. Dickey Clay Mfg. Co. in Rhea County, for heavy clay products. Production declined 70 percent below 1954, owing to the closing of the B. Mifflin-Hood Co. plant in Hamilton County.

Fuller's earth was mined by Southern Clay Co., Inc., and by Tennessee Absorbent Clay Co. in Henry County, for absorbent uses. Production increased 23 percent above 1954.

Miscellaneous clay was mined by 15 companies in 10 counties. The leading producer was General Shale Products Corp., with operations in Knox, Sullivan, and Washington Counties. Production increased 18 percent over 1954 and established a new annual record. The clay was used for cement, heavy clay products, and lightweight aggregate.

TABLE 6.—Clays sold or used by producers, 1946-50 (average) and 1951-55

	Bal	l clay	Fire	clay	Fuller's	s earth	Miscella	neous clay	То	tal
Year	Short	Value	Short	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946-50 (average)_ 1951 1952 1953 1954	153, 685 194, 191 163, 862 165, 822 194, 072 254, 034	2, 127, 274 2, 075, 882 2, 491, 229	23, 759 21, 290 (2) 15, 437	203, 845 (2) 175, 364	25, 974 30, 961 27, 532	(1) (1) \$358, 752 427, 933 449, 480 473, 074	(2) 778, 215	11, 287, 844 829, 272 (2) 664, 879	1, 160, 571 1, 042, 239 1, 037, 450 1, 015, 256	3, 478, 622 3, 780, 952

<sup>&</sup>lt;sup>1</sup> Fuller's earth included with miscellaneous clay. <sup>2</sup> Figure withheld to avoid disclosing individual company confidential data.

Lime.—Three companies produced quicklime and hydrated lime in Knox County for building, agricultural, chemical and industrial uses. The leading producer was Standard Lime & Cement Co.

Perlite.—A plant in Nashville, using crude perlite from deposits in Western States, produced expanded perlite for use mainly as a lightweight aggregate, replacing heavier materials in plaster and con-

Phosphate Rock.—Twenty companies mined phosphate rock in 6 Largest producers were Monsanto Chemical Co., with mines in Giles, Maury and Williamson Counties: International Minerals & Chemical Corp., with mines in Giles and Maury Counties; and Virginia-Carolina Chemical Corp., with operations in Maury County. Marketable production decreased 10 percent below 1954, the record year.

TABLE 7.-Marketable production of phosphate rock, 1946-50 (average) and

Year	Long tons	Value 1	Year	Long tons	Value 1
1946-50 (average) <sup>2</sup>	1, 436, 224	\$8, 910, 334	1953	1, 518, 912	\$11, 305, 098
1951	1, 424, 516	10, 798, 406	1954	1, 633, 226	11, 743, 012
1952	1, 444, 737	11, 306, 438	1955	1, 465, 902	10, 526, 404

Estimated from value of sold or used.
 Includes small quantity of apatite from Virginia, 1946-47.

TABLE 8.—Phosphate rock sold or used by producers, 1954-55, by uses

Use	198	54	1955		
USC	Long tons	Value 1	Long tons	Value 1	
Elemental phosphorus Direct application to soil Triple superphosphate Other fertilizers Ordinary superphosphate Fertilizer filler Stock and poultry feed Other uses	1, 333, 158 166, 829 40, 832 45, 942 77, 113 13, 764 18, 617 4, 317	\$9, 500, 011 1, 262, 054 216, 410 243, 126 568, 660 60, 264 134, 410 27, 379	1, 220, 473 144, 076 (2) 99, 000 3 209, 628 21, 028 5, 190	\$9, 975, 737 779, 450 (2) 535, 590 3 1, 132, 118 113, 761 42, 400	
Total	1, 700, 572	12, 012, 314	1, 699, 395	12, 579, 050	

Estimated from company reports.
 Figure withheld to avoid disclosing individual company confidential data. Included with "Ordinary superphosphate."

Includes triple superphosphate.

Pyrite.—Among the States, Tennessee ranked first in the production of pyrite. Tennessee Copper Co. recovered pyrite concentrate from sulfide ore mined in Polk County. Production increased 7 percent over 1954 to the highest level since 1900. The concentrate was roasted, and the recovered gases were used in manufacturing sulfuric acid. The iron oxide was sintered for use by iron and steel plants.

Sand and Gravel.—Forty companies mined sand and gravel at 43 mines in 22 counties. Leading producers were Cumberland River Sand & Gravel Co., operating in Davidson County; Memphis Stone & Gravel Co., with operations in Shelby County; Dixie Sand & Gravel Corp., operating in Hamilton County; and Knoxville Sangravl Materials Co., with operations in Knox County. These companies operate plants at Nashville, Memphis, Chattanooga, and Knoxville, respectively—Tennessee's four largest cities. Production was about the same as in 1954, but total value decreased 5 percent.

TABLE 9.—Sand and gravel sold or used by producers, 1946-50 (average) and 1951-55

Year	Sa	nd	Gr	avel	Total		
	Short tons	Value	Short tons	Value	Short tons	Value	
1946-50 (average)	(1) 2, 191, 729 2, 531, 528 2, 603, 874 2, 191, 599 2, 159, 480	(1) \$3, 002, 191 3, 156, 770 3, 288, 086 2, 962, 012 2, 816, 761	(1) 2, 453, 312 2, 641, 873 2, 627, 455 2, 963, 586 2, 977, 063	(1) \$2, 184, 426 2, 146, 551 2, 341, 601 3, 179, 127 2, 997, 355	3, 985, 745 4, 645, 041 5, 173, 401 5, 231, 329 5, 155, 185 5, 136, 543	\$4, 010, 314 5, 186, 617 5, 303, 321 5, 629, 687 6, 141, 139 5, 814, 116	

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosing individual company confidential data.

TABLE 10.—Sand and gravel sold or used by producers, 1954-55, by uses

Use	19	954	1955		
	Short tons	Value	Short tons	Value	
Sand: Structural Paving Molding Glass Furnace Railroad ballast Other Gravel: Paving Structural Railraod ballast Other Total	1, 000, 757 843, 991 287, 094 28, 675 4, 120 66, 962 1, 364, 753 1, 156, 893 1, 938 5, 155, 185	\$1, 327, 130 787, 407 651, 280 78, 026 10, 280 107, 889 1, 142, 316 1, 585, 434 (2) 451, 377 6, 141, 139	1, 160, 689 700, 475 224, 855 (1) (1) 722 (1) 1, 579, 634 1, 013, 903 (1) 260, 000 5, 136, 543	\$1, 465, 103 605, 993 572, 474 (1) (2) 903 (1) 1, 605, 717 1, 022, 102 (1) 260, 000 5, 814, 116	

Figure withheld to avoid disclosing individual company confidential data. Included with total.
 Figure withheld to avoid disclosure of individual company confidential data. Included with "Other" gravel.

Stone.—Blue Ridge Stone Co. crushed granite in Carter County for concrete and roads.

Crushed limestone was produced by 75 operators at 103 quarries in 53 counties. The largest producers were Franklin Limestone Co., with operations in Davidson, Humphreys, and Williamson Counties;

Lambert Bros., Inc., operating in Davidson, De Kalb, Hawkins, Knox, Loudon, and Sevier Counties; and Penn-Dixie Cement Corp., with operations in Marion and Sullivan Counties. Production increased 3 percent over 1954 and established a new annual record.

Davidson County Highway Department quarried a small quantity

of dimension limestone for building stone.

Crushed marble was produced by 4 companies at 8 quarries in Blount and Knox Counties. The leading producer was John J. Craig Co., with operations in Blount County. Production decreased 9 percent below 1954.

Dimension marble was produced by 6 companies at 13 quarries in 4 counties. The leading producer was John J. Craig Co. Production

increased 22 percent above 1954.

Crushed sandstone was produced by 4 operators in 3 counties. The leading producer was Ayers Mineral Co., operating a quarry in Henderson County. Production increased considerably over 1954.

Dimension sandstone was quarried by 10 operators in 4 counties. The leading producer was Crab Orchard Stone Co., Inc., operating in Cumberland County. Production increased 15 percent over 1954.

TABLE 11.—Crushed and broken stone sold or used by producers, 1946-50 (average) and 1951-55

	Limestone		Marble		Sandstone		Total	
Year	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946-50 (average) 1	7, 007, 364 8, 778, 055 10, 250, 723 10, 373, 162 13, 878, 172 4 14,253, 887	\$8, 624, 390 11, 176, 605 12, 790, 302 12, 870, 198 17, 090, 152 4 16,823, 504	21, 018 21, 444 15, 381 31, 142 17, 620 16, 034	\$99, 002 145, 438 115, 424 173, 398 178, 789 204, 532	(2) 	\$7, 132 64, 544 (2)	\$ 7, 028, 382 8, 799, 499 10, 266, 104 3 10,405, 904 \$ 13,900, 288 3 414,269,921	3 \$8, 723, 392 11, 322, 043 12, 905, 726 3 13, 050, 728 3 17, 333, 485 417, 028, 036

Except limestone for cement or lime.
 Figure withheld to avoid disclosing individual company confidential data.
 Incomplete total; excludes sandsone, 1946-49 and 1955, and granite, 1953 and 1955.
 Final figure. Supersedes figure given in commodity chapter.

TABLE 12.—Crushed limestone sold or used by producers, 1954-55, by uses

		19	54	1955		
	Use	Short tons	Value	Short tons	Value	
Cement and lime Agriculture Railroad ballast Fluxing stone Glass manufacture Riprap Paper Asphalt filler Whitting Mineral food		2, 213, 013 698, 057 543, 602 34, 150 23, 278 31, 965 7, 817 135, 439 (1) 19, 200	\$12, 468, 238 2, 374, 532 918, 947 508, 364 48, 124 43, 581 25, 259 9, 446 170, 195 (1) 77, 000	10, 265, 850 2, 362, 990 671, 570 588, 207 72, 249 38, 485 25, 858 (1) 13, 573 (1) 7, 000	\$12, 219, 237 2, 526, 031 919, 397 579, 584 97, 238 75, 338 19, 108 (1) 32, 865 (1) 10, 500	
Rock dust for coal mi	ines	(1)	(1) 446, 466	500 207, 605	2, 500 341, 706	
		12 979 179	17, 090, 152	2 14, 253, 887	2 16, 823, 504	

 <sup>1</sup> Figure withheld to avoid disclosing individual company confidential data. Included with other uses.
 2 Final figure. Supersedes figure given in commodity chapter.

TABLE 13.—Dimension stone sold or used by producers, 1946-50 (average) and 1951-55

	Limestone		Marble		Sandstone		Total	
Year	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946-50 (average)	(1) 1, 082 3, 226 2, 214 4, 292 1, 632	(1) \$835 5, 926 1, 739 4, 015 1, 332	27, 752 38, 215 42, 940 24, 826 27, 611 33, 763	\$2, 383, 530 3, 443, 110 3, 870, 006 2, 743, 733 3, 047, 135 3, 578, 493	(1) (1) 46, 769 52, 785 65, 996 76, 165	(1) (1) \$846, 684 1, 151, 853 1, 608, 881 1, 668, 176	(1) (1) 92, 935 79, 825 97, 899 111, 560	(1) (1) \$4, 722, 61 3, 897, 32 4, 660, 03 5, 248, 00

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosing individual company confidential data.

TABLE 14.—Dimension marble sold or used by producers, 1954-55, by uses

Use	19	54	1955	
	Cubic feet	Value	Cubic feet	Value
Building stone: Exterior, rough Interior, cut, dressed Interior, rough Interior, sawed, dressed Exterior, sawed, dressed Exterior, sawed, dressed Cut, dressed Cut, dressed Cut, dressed Other uses	113, 196 108, 161 (1) 28, 603 31, 436 (1)	\$456, 365 2, 002, 341 (1) 237, 486 211, 728 (1) 139, 215	108, 169 106, 562 61, 112 56, 909 (1) (1) (1) (1) 64, 461	\$344, 846 2, 131, 252 128, 961 488, 619 (1) (1) (1) (1) 484, 815
Total	324, 840	3, 047, 135	397, 213	3, 578, 493

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosing individual company confidential data. Included with "Other uses."

#### MINERAL FUELS

Coal.—Coal was mined at 504 mines in 18 counties, of which Marion, Campbell, and Anderson were the largest producers. Leading companies were Clinchfield Coal Corp. (Meadow Creek mine), Tennessee Products & Chemical Corp. (Reels Cove mine), and Wind Rock Coal & Coke Co. (Dean mine). More details of coal production will be found in volume II of the Minerals Yearbook, 1955.

TABLE 15.-Production of coal, 1946-50 (average) and 1951-55

Year	Short tons	Value
1946-50 (average)	5, 520, 387 5, 400, 946 5, 264, 954 5, 466, 569	\$27, 576, 957 26, 956, 174 25, 559, 740 25, 151, 682
1954 1955	6, 428, 831 7, 052, 844	25, 477, 006 28, 746, 574
Total production, earliest records to date	358, 997, 000	(1)

<sup>1</sup> Data not available.

Natural Gas.—Marketed production of natural gas decreased 56 percent below 1954.

Petroleum.—A small quantity of crude petroleum was produced.

### REVIEW BY COUNTIES

Anderson.—Coal production was 736,000 tons valued at \$3,280,000, compared with 458,000 tons valued at \$2,120,000 in 1954; 21 mines were active, of which Wind Rock Coal & Coke Co. (Dean mine), Southern Collieries, Inc. (Southern Collieries mine), and Mahan-Ellison Coal Corp. (Morco colliery) were the leading producers. Anderson County Highway Department (Dail No. 2 and Taylor No. 1 quarries) and Ralph Rogers & Co., Inc., crushed limestone for concrete and roads; production declined 42 percent below 1954. Lake City Lightweight Aggregate Co. mined 38,700 tons of miscellaneous clay for expanding into lightweight aggregate at its plant in Lake City.

Bedford.—Bedford County Highway Department and Shelbyville

Limestone Co. crushed limestone for concrete and roads and for

agriculture.

TABLE 16.—Value of mineral production in Tennessee, 1954-55, by counties 12

County	1954	1955	Minerals produced in 1955 in order of value 2
Anderson	(3)	(3)	Coal, limestone, miscellaneous clay.
Bedford	\$299,049	\$147.017	Limestone.
Benton	518, 719	679, 789	Sand and gravel.
Bledsoe	69, 090	104, 397	Coal.
Blount	(3)	(3)	Marble, limestone.
Bradley	90, 720	(3)	Limestone.
Campbell	3, 808, 803	<b>5,</b> 126, 655	Coal, sand and gravel.
Cannon	(3)	34, 500	Limestone.
Carroll	(3)	(3)	Ball clay.
Carter	8	475, 607	Limestone, manganese ore, granite.
Claiborne		1, 803, 086	Coal.
Clainoriie	1, 002, 300	24, 325	Limestone, sandstone.
Cocke	1 8	(3)	Limestone.
Coffee		2, 223, 519	Sandstone, coal, limestone.
Cumberland		6, 060, 067	Cement, limestone, sand and gravel, mis
Davidson	1 1	0,000,007	cellaneous clay, phosphate rock. Sand and gravel.
Decatur		(9)	Limestone.
De Kalb		84, 057	
Dickson		(3)	Do.
Fayette	. 7	176, 260	Sand and gravel.
Fentress		552,006	Coal, limestone, sandstone.
Franklin	(3)	(3)	Cement, limestone, sand and gravel, mis
Giles	. (3)	1, 223, 200	Phosphate rock, limestone, sand and gravel.
Grainger	49, 176	34, 395	Marble.
Greene		437, 167	Limestone, sand and gravel.
Greene	1,860,688	1,041,436	Coal.
Grundy		6, 233, 618	Cement, limestone, sand and gravel, coa
Hamilton	. (3)	0, 200, 010	miscellaneous clay.
TT	7, 200		None.
Hancock		35, 750	Sand and gravel.
Hardeman		199, 166	Limestone.
Hawkins	654, 682		Sand and gravel.
Haywood	12, 708	9,055	Sandstone.
Henderson	.  (3)		
Henry	(3)	(3)	Ball clay, fuller's earth.
Hickman	-[. (§)	544, 879	Phosphate rock.
Humphreys		(3)	Limestone, sand and gravel.
Jefferson		(3)	Zinc, limestone.
Johnson	_ (3)	903, 805	Manganese ore, limestone.
Knox	1	14, 503, 649	Cement, limestone, zinc, marble, lime, san and gravel, miscellaneous clay.
Lauderdale	4, 179	6, 168	Sand and gravel.
Lincoln.	(3)	(3)	Limestone.
Loudon		126, 848	Barite, sand and gravel, limestone, mis
Macon	. (3)	65, 895	Limestone.
Marion	1 %	(3)	Coal, cement, limestone.
Marion	(3)	(3)	Limestone.
Marshall		6, 472, 069	Phosphate rock, limestone.
Maury		220,000	Limestone.
McMinn		28, 055	
McNairy	.  (3)	20, 000	I DAIN AND ELAYEL

See footnotes at end of table.

TABLE 16.—Value of mineral production in Tennessee, 1954-55, by counties 12—Continued

County	1954	1955	Minerals produced in 1955 in order of value 2
Meigs	(3) (3)	\$157, 500	Limestone.
Monroe	(3)	511, 324	Barite, limestone, iron ore, manganese ore
Montgomery	(3)	(3)	Limestone.
MorganObion	(3)	1, 662, 517	Coal, sandstone.
Obion	\$46, 497	40,730	Sand and gravel.
Overton		220, 211	Coal, limestone.
Perry	(3)	(3)	Phosphate rock, limestone.
Pickett Polk		15,840	Coal.
Polk	(3)	(3)	Copper, pyrite, zinc, silver, gold, limestone
Putnam	(3)	(3)	Coal, limestone.
Rhea	376, 481	273, 412	Coal, fire clay, miscellaneous clay.
Roane	(3)	680, 533	Limestone, iron ore, sandstone.
Robertson	356, 322	(3)	Limestone.
Rutherford	(3)	165, 100	Do.
Scott	1, 793, 556	2. 062, 354	Coal.
Sequatchie	910, 272	1, 086, 121	Coal, limestone.
Sevier	(3)	329, 992	Limestone.
Shelby Smith	(3)	(3)	Sand and gravel, miscellaneous clay.
Smith	(3)	35,084	Limestone.
Stewart		9,050	Do.
Sullivan	(3)	(3)	Cement, limestone, miscellaneous clay, sand and gravel.
Sumner	(3)	286, 075	Limestone.
Tipton		(3)	Sand and gravel.
Unicoi	(3)	940, 623	Manganese ore, sand and gravel, limestone.
Union	(3)	(3)	Marble, limestone.
Van Buren	133, 142	389, 359	Coal.
Warren	(3)	257, 700	Limestone.
Washington		(3)	Miscellaneous clay.
Wayne	(3) (3) (3) (2)	(3) 14,700	Sand and gravel.
Weakley	(8)	(3)	Ball clay.
White	(3)	263, 699	Limestone, coal.
Williamson	(3)	(2)	Phosphate rock, limestone.
Wilson	(3)	3	Limestone.
Undistributed 4	80, 401, 206	60, 337, 636	21110010101
Total	105, 686, 000	119, 316, 000	

<sup>1</sup> The following counties are not listed because no production was reported: Cheatham, Chester, Clay, Crockett, Dyer, Gibson, Hamblen, Hardin, Houston, Jackson, Lake, Lawrence, Lewis, Madison, Moore, and Trousdale.

2 Petroleum and natural gas not listed by counties as data are not available; value included with "Undistributed".

4 Includes value of petroleum and natural gas, and values indicated by footnote 3.

TABLE 17.—Crushed limestone sold or used by producers in Bedford County, 1948-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1948-50 (average)	12, 335	\$11,068	1953	47, 905	\$38, 324
1951	41, 870	20,104	1954	264, 483	299, 049
1952	48, 000	38,400	1955	141, 802	147, 017

Benton.—Camden Gravel Co., Hardy Sand Co. (Hardy and Silica mines), Hicks Sand Co., Kimballs Mineral Supplies, Inc., Porter-Warner Industries, Inc., and Tri-State Sand Co. mined molding sand and paving gravel.

tributed." <sup>3</sup> Figure withheld to avoid disclosing individual company confidential data. Included with "Undistributed."

TABLE 18.—Sand and gravel sold or used by producers in Benton County, 1948-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1948-50 (average)	439, 906	\$534, 693	1953	(1)	\$490, 348
1951	357, 986	561, 738	1954	280, 312	518, 719
1952	357, 901	564, 976	1955	344, 136	679, 789

<sup>1</sup> Figure withheld to avoid disclosing individual company confidential data.

Bledsoe.—Coal production was 34,200 tons valued at \$104,400 compared with 18,800 tons valued at \$69,100 in 1954; nine mines were active, of which Dodson Coal Co. (No. 1 mine) was the leading

producer.

Blount.—Sam Lambert & Sons crushed limestone for concrete and roads and for agriculture; production was 228,000 tons valued at \$321,000, compared with 150,000 tons valued at \$211,800 in 1954. John J. Craig Co. (Crisp, Hamil, Lee, and Marmor quarries) and Endsley Marble Co., Inc., crushed marble for terrazzo; production increased 7 percent over 1954. John J. Craig Co., Endsley Marble Co., Inc., and Gray Knox Marble Co. (Brown and French Pink quarries) quarried dimension marble for rough building stone, dressed building stone, and cut dressed monumental stone; production increased 16 percent over 1954.

Bradley.—Bradley County Highway Department (Rubin Moore quarry) and Bradley Limestone Co. (Welch quarry) crushed lime-

stone for concrete and roads and for agriculture.

Campbell.—Coal production was 1,011,000 tons valued at \$5,050,000, compared with 757,000 tons valued at \$3,740,000 in 1954; 66 mines were active, of which New Jellico Coal Co. (Blue Rose mine), Block Coal & Coke Corp. (Hickey mine), and Stoney Fork Coal Corp. (Clinchmore mine) were the largest producers. Silica Sand Co. Inc. mined 47,200 tons of structural and grinding sand.

Cannon.—S. N. McPherson (Norvell quarry) crushed 31,000 tons

of limestone for concrete and roads.

Carroll.—Kentucky-Tennessee Clay Co. mined ball clay for white-ware, high-grade tile, kiln furniture, and fire brick and block; pro-

duction expanded 28 percent.

Carter.—Blue Ridge Stone Co. crushed granite for concrete and roads. Watauga Stone Co. crushed 302,000 tons of limestone for concrete and roads, railroad ballast, and agriculture. Virginia Iron Coal & Coke Co. (Stoney Creek mine) mined Metallurgical-grade manganese ore.

Claiborne.—Coal production was 396,000 tons valued at \$1,803,000, compared with 357,000 tons valued at \$1,503,000 in 1954; 33 mines were active, of which Blue Diamond Coal Co. (Eagan mine), Dippel & Dippel Coal Co. (Dippel strip mine), and Arnold Coal Co. (Arnold

No. 1 strip mine) were the largest producers.

Cocke.—Cocke County Highway Department (Briar Thicket and Burnett quarries) crushed 25,500 tons of limestone for concrete and roads. Haskill Finchum crushed a small quantity of sandstone for concrete and roads.

Coffee.—Ralph Rogers & Co. Inc. (Coffee quarry) crushed limestone for concrete and roads; production was considerably more than in 1954.

Cumberland.—Coal production was 111,500 tons valued at \$471,000, compared with 101,900 tons valued at \$375,000 in 1954; 18 mines were active, of which C & F Coal Co. (No. strip mine), Carl Wenzel Coal Co. (Jewett strip mine), and Ben Donelson Coal Co. (Goodstock strip mine) were the largest producers. Cumberland County Highway Department and Southern States Lime Manufacturing Co. (Crab Orchard quarry) crushed 217,000 tons of limestone for fluxing stone, concrete and roads, railroad ballast, agriculture, glass, paper, mineral food, and other uses. Tennessee Stone Co. Inc. (McGuire quarry) and Turner Bros. Stone Co., Inc., crushed sandstone for refractory uses; production increased 8 percent over 1954. Crab Orchard Stone Co., Inc. (Peck quarry), Crossville Stone Co., Hembree Stone Co., Dock Hinch, Jr., Knoxville Building Stone Co., Monday & Manning, James E. Roberts, Tennessee Stone Co. Inc., and Turner Bros. Stone Co., Inc., quarried 64,100 tons of dimension sandstone for rough architectural and dressed building stone and for flagging.

Davidson.—Marquette Cement Mfg. Co. operated the Nashville mill throughout the year, producing masonry and portland cements; shipments of portland cement decreased 1 percent below 1954. Davidson County Highway Department, Eller & Olson Crushed Stone Co., Inc., Franklin Limestone Co. (Danley and Old Hickory quarries), and Lambert Bros., Inc. (Hermitage quarry), crushed 1,810,000 tons of limestone for riprap, fluxing stone, concrete and roads, railroad ballast, agriculture, asphalt filler, and rock dust for coal mines. Cumberland River Sand & Gravel Co., Dixon & Smith, and T. L. Herbert & Sons, mined structural and paving sand and gravel; production increased 20 percent over 1954. W. G. Bush & Co., Inc., mined 110,000 tons of miscellaneous clay for heavy clay products. Harsh Phosphate Co. and Robin-Jones Phosphate Co. mined phosphate rock for fertilizer filler and for pig-iron blast furnaces; marketable production decreased 2 percent below 1954. Tennessee Products & Chemical Corp. (Nashville plant) produced expanded perlite from crude material mined in other States. Davidson County Highway Department quarried 1,632 tons of dimension limestone for building stone.

Decatur.—Tinker Sand & Gravel Co. (Perryville mine) mined structural sand and gravel; production was considerably more than in 1954.

De Kalb.—De Kalb County Highway Department (Sligo quarry), and Lambert Bros., Inc., crushed 80,600 tons of limestone for concrete and roads.

Dickson.—Duke Lime & Stone Co. crushed limestone for concrete and roads, agriculture, and other uses; production expanded 38 percent over 1954.

Fayette.—Fayette County Highway Department and James W. Jones mined 190,200 tons of structural and paving sand and structural gravel.

Fentress.—Coal production was 68,900 tons valued at \$243,000, compared with 62,500 tons valued at \$225,000 in 1954; 24 mines were

active, of which Claude Ledbetter Coal Co. (No. 1 mine) was the leading producer. Frogge & Williams, Inc. (Wright quarry), crushed 123,400 tons of limestone for concrete and roads and for agriculture. Clarkrange Stone Co. quarried dimension sandstone for rough archi-

tectural and dressed building stone and for flagging.

Franklin.- Marquette Cement Mfg. Co. operated the Cowan mill throughout the year, producing masonry and portland cements; shipments of portland cement were about the same as in 1954. Cowan Stone Co. (Anderson and Cowan quarries), Franklin County Highway Department (Bostick quarry), and Marquette Cement Mfg. Co. crushed 630,000 tons of limestone for fluxing stone, concrete and roads, railroad ballast, agriculture, cement, glass, and other uses. Estill Springs Sand-Gravel Co. and Sewannee Silica Sand Co. mined glass, molding, structural, paving, blast, furnace, engine, and filter sands and structural gravel; production expanded 25 percent. Marquette Cement Mfg. Co. mined miscellaneous clay for use in cement; production increased 3 percent.

Giles.—International Minerals & Chemical Corp. (Wales mine) and Monsanto Chemical Co. mined and prepared phosphate rock for direct application to the soil, stock and poultry feed, elemental phosphorus, and pig-iron blast furnaces; marketable production declined 57 percent below 1954. Cedar Grove Lime Co. crushed 150,000 tons of limestone for concrete and roads. Giles County Highway Department mined 140,000 tons of paving gravel.

Grainger.—Imperial Black Marble Co. quarried 852 tons of dimen-

sion marble for interior rough building stone.

Greene.—Agricultural Lime Co., Inc., Greene County Highway Department (Ratcliffe quarry), and Malone Bros. crushed 160,700 tons of limestone for concrete and roads and for agriculture. Sand and gravel production was resumed by three new operators; Malone Bros., Nolichuckey Sand Co., and John Paul Russell mined structural and paving sand and gravel.

Grundy.—Coal production was 297,000 tons valued at \$1,041,000, compared with 488,000 tons valued at \$1,861,000 in 1954; 20 mines were active, of which A. L. Henderson Coal Co. (Palmer No. 3 mine)

was the leading producer.

Hamilton.—Signal Mountain Portland Cement Division of General Portland Cement Co. operated the Signal Mountain mill throughout the year, producing masonry and portland cements; shipments of portland cement decreased 3 percent below 1954. Chattanooga Rock Products Co. and Signal Mountain Portland Cement Division crushed limestone for concrete and roads, railroad ballast, agriculture, and cement; production decreased 5 percent below 1954. Dixie Sand & Gravel Co. mined structural and paving sand and gravel; production increased 5 percent over 1954. Coal production was 132,200 tons valued at \$480,000, compared with 85,500 tons valued at \$301,000 in 1954; 23 mines were active, of which Walden Ridge Coal Co. (No. 1 strip mine) was the leading producer. Key-James Brick Co., B. Mifflin-Hood Co., and Signal Mountain Portland Cement Division mined miscellaneous clay for cement and heavy clay products.

Hancock.—New Jersey Zinc Co. was developing a new zinc mine near Flat Gap and planned to construct a new 2,000-ton-per-day flotation mill.

Hardeman.—Saulsbury Sand Co. and Tri-State Sand Co. mined

38,800 tons of structural sand.

Hawkins.—Hawkins County Highway Department and Lambert Bros., Inc. (McCloud quarry), crushed 151,200 tons of limestone for concrete and roads.

Haywood.—Haywood County Highway Department mined 122,200

tons of structural gravel.

Henderson.—Ayers Mineral Co. crushed sandstone for foundry uses. Henry.—Dixie Brick & Tile Co. (Puryear mine), Kentucky-Tennessee Clay Co., and H. C. Spinks Clay Co. (Como, Henry, and Puryear mines) mined ball clay for highgrade tile, whiteware, kiln furniture, fire brick and block, and heavy clay products; production expanded 32 percent over 1954. Southern Clay Co., Inc. (Porters Creek mine) and Tennessee Absorbent Clay Co. (Paris mine) mined 33,800 tons of fuller's earth for absorbent uses.

Hickman.—M. C. Boyle Phosphate Co. (Dean's Switch mine), Highland Mining Co., Hunt McClanahan, W. P. McClanahan & Co., and Owens Agricultural Phosphate Co. mined and prepared 77,800 tons of marketable phosphate rock for direct application to the soil,

elemental phosphorus, and pig-iron blast furnaces.

Humphreys.—Franklin Limestone Co. (Rock Hill quarry) crushed limestone for riprap, concrete and roads, railroad ballast, and agriculture; production decreased 1 percent below 1954. Sangravl Co., Inc., mined structural and paving sands and structural, paving, and railroad-ballast gravels; production decreased 10 percent below 1954.

Jefferson.—American Zinc Co. of Tennessee (Athletic, Grasselli, North Friends Station, and Young mines) and Tennessee Coal & Iron Division of United States Steel Corp. (Zinc Mines Works) recovered zinc from zinc ore; production expanded 72 percent over 1954, owing to opening of the new Young mine and reopening of the Grasselli mine; during the year the New Jersey Zinc Co. was developing a new mine at Jefferson City and began to construct a new 1,000-ton-per-day flotation mill; exploration and development work by the 3 operating companies (exclusive of DMEA projects) included 369 feet of shaft sinking, 11,997 feet of drifting, 16,133 feet of diamond drilling, 1,739 feet of churn drilling, and 285 feet of long-hole drilling; American Zinc Co. of Tennessee continued a DMEA project for zinc ore; the contract amounted to \$1,017,000, of which the Government share was 50 percent. American Zinc Co. of Tennessee and Tennessee Coal & Iron Division recovered crushed limestone as a byproduct of zinc mining for concrete and roads, railroad ballast, agriculture, and other uses; production increased 27 percent over 1954 owing to increased zinc production.

Johnson.—B & T Mining Co., Michael J. Colitz, Colitz Mining Co., Estelle Mining Co. (Laurel Bloomery mine), Stewart & Seeman (York mine), Lon Tester, Valley Mining Co., Ltd. (Buckles, Dry Run, and King mines), and H. I. Weiner mined Metallurgical-grade manganese ore for sale to GSA; production increased 15 percent

over 1954, owing mainly to opening of the new Colitz mine. May-mead Lime Co. curshed limestone for concrete and roads, agriculture,

and fertilizer filler; production increased 4 percent over 1954.

Knox.-Volunteer Portland Cement Co. operated the Knoxville mill throughout the year, producing portland and masonry cements; shipments of portland cement increased 9 percent over 1954. can Zinc Co. of Tennessee recovered crushed limestone as a byproduct from zinc mining; American Limestone Co. (Holston and Midway quarries), Burkhart quarry Supplies, Inc., Oliver King Sand-Lime Co., Inc., Knox County Highway Department (Biagotti, Freeway, Kennedy, Neuberts, and Tecoa quarries), Lambert Bros., Inc. (Knoxville quarry), Standard Lime & Cement Co., Volunteer Portland Cement Co., and Williams Lime Mfg. Co. produced crushed limestone; the stone produced by these companies was used for concrete and roads, railroad ballast, agriculture, cement, lime, paper, and other uses. American Zinc Co. of Tennessee (Mascot No. 2 mine) recovered zinc from zinc ore; production decreased 3 percent. Exploration and development work by the company included 1,808 feet of drifting, 8,123 feet of diamond drilling, and 2,047 feet of long-hole drilling. Appalachian Marble Co. (Appalachian and Bond Pink quarries), Knoxville Crushed Stone Co., and Tennessee Marble Co. (Eagle quarry) crushed marble for terrazzo and other uses; production was about the same as in 1954. Appalachian Marble Co., Gray Knox Marble Co. (Gray Knox quarry), and Tennessee Marble Co. quarried dimension marble for interior rough building stone, interior dressed building stone, rough monumental stone, and cut, dressed monumental stone; production increased 19 percent owing mainly to expansion by Tennessee Marble Co., which was purchased during the year by Georgia Marble Co. Knoxville Lime Mfg. Co., Standard Lime & Stone Co., and Williams Lime Mfg. Co. produced lime for building, agricultural, chemical, and industrial uses. Knoxville Sangravl Materials Co. and Oliver King Sand-Lime Co. mined structural, paving, grinding, engine, and railroad-ballast sands and structural and paving gravels; production decreased 18 percent below 1954. Cherokee Shale Brick Co., General Shale Products Corp., Shalite Corp. and Volunteer Portland Cement Co. mined 180,900 tons of miscellaneous clay for cement, lightweight aggregate, and heavy clay products.

TABLE 19.—Crushed limestone sold or used by producers in Knox County, 1948-1950 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1948-50 (average) 1	145, 258	\$1, 954, 548	1953 <sup>1</sup>	1, 291, 678	\$1, 801, 016
1951 1	(2)	1, 830, 596	1954	1, 997, 365	2, 382, 607
1952 1	1, 725, 685	2, 251, 609	1955	2, 224, 048	2, 544, 588

Except stone used for cement or lime.
 Figure withheld to avoid disclosing individual company confidential data.

Lauderdale.—Lauderdale County Highway Department mined

55,500 tons of paving gravel.

Lincoln.—Clark & Stephenson (Fayetteville quarry) crushed limestone for concrete and roads and for agriculture; production declined

45 percent below 1954, owing to the closing of the Foster & Wright

quarry.

Loudon.—B. C. Wood (Roy and Sandy mines) mined crude barite. Brooks Sand & Gravel Co. mined 33,000 tons of structural sand and paving gravel. Lambert Bros., Inc. (Greenback quarry), crushed 9,290 tons of limestone for concrete and roads. Old Hickory Brick Co. (Maryville mine) mined 20,000 tons of miscellaneous clay for heavy clay products.

Macon.—Dixon & Stubblefield (Langford quarry) crushed 56,300

tons of limestone for concrete and roads.

Marion.—Coal production was 2,000,000 tons valued at \$8,070,000, compared with 1,834,000 tons valued at \$6,810,000 in 1954; 135 mines were active, of which Tennessee Products & Chemical Corp. (Reels Cove and Daus Mountain mines) and A. L. Henderson (Pocket mine) were the largest producers. Penn-Dixie Cement Corp. operated the Richard City mill throughout the year; shipments of portland cement increased 16 percent over 1954. Campbell Lime & Stone Co. (Ketchall quarry) and Penn-Dixie Cement Corp. crushed limestone for concrete and roads, agriculture, and cement; production increased 7 percent over 1954.

Marshall.—Lewisburg Limestone Co. crushed limestone for concrete and road metal and for agriculture; production increased 4 percent

over 1954.

Maury.—Armour Fertilizer Works (McKennon mine), Hall & England, International Minerals & Chemical Corp. (Mount Pleasant mine), Kimbro & Edwards, Mine Equipment Co., Monsanto Chemical Co., Marvin Pitts, J. T. Prince, Tennessee Valley Authority, Victor Chemical Works, and Virginia-Carolina Chemical Corp. (Arrow mine) mined 963,000 tons of marketable phosphate rock for ordinary superphosphate, pig-iron blast furance, elemental phosphorus, triple-superphosphate, direct application to the soil, fertilizer filler and other fertilizers, and stock and poultry feed. Columbia Rock Products Corp. (Theta Pike quarry) crushed 180,600 tons of limestone for concrete and roads, agriculture, and other uses.

McMinn.—McMinn County Highway Department (Athens quarry) and Floyd D. Webb crushed 193,100 tons of limestone for concrete

and roads and for agriculture.

McNairy.—Worsham Bros. mined 40,800 tons of structural and

paving sand and gravel.

Meigs.—Gil Crouch (Carter quarry) and Posey & Caldwell crushed 110,000 tons of limestone for riprap, concrete and roads, agriculture,

and asphalt filler.

Monroe.—L. A. Wood (Stephens & Ballard mine) mined crude barite for well drilling, glass, rubber, paint, and other uses. Creighead Limestone Co. and Monroe County Highway Department (Tallent quarry) crushed 161,200 tons of limestone for concrete and roads. Consolidated High Grade Ore Co. (Heiskell mine) and Monroe Mining Co. (Wilson mine) mined brown iron ore for blast-furance use; production was considerably more than in 1954. Consolidated High Grade Ore. Co. shipped a small quantity of Metallurgical-grade manganese ore.

Montgomery.—Clarksville Stone Co. and Simpson Stone Co. crushed limestone for concrete and roads and for agriculture; production

decreased 1 percent below 1954.

Morgan.—Coal production was 451,000 tons valued at \$1,588,000; 27 mines were active, of which Cofer & Tedder Coal Co. (No. 2 strip mine), Lueking Bros. (No. 1 and No. 2 strip mines), and Tom Allen (Tom Allen strip mine) were the largest producers. Jones Stone Co. quarried 4,640 tons of dimension sandstone for rough architectural building stone.

Obion.—Obion County Highway Department mined 110,000 tons

of paving gravel.

Overton.—Coal production was 61,700 tons valued at \$213,000, compared with 24,400 tons valued at \$83,700 in 1954; 16 mines were active, of which H. Gentry Copeland (Smith & Norrod mine) was the leading producer. Farmers Stone Co. crushed 5,760 tons of limestone for concrete and roads.

Perry.—Parish & Parish and Perry County Phosphate Co. mined phosphate rock for sale to other phosphate-rock companies; marketable production decreased 9 percent below 1954. Charlie Elkins crushed 58,300 tons of limestone for concrete and roads, and for

agriculture.

Pickett.—Catron & Troxell (No. 2 mine) mined 3,600 tons of coal

valued at \$15,840.

Polk.—Tennessee Copper Co., the leading mineral-producing company in the State, operated the Boyd, Burra, Calloway, Eureka, and Mary mines, producing mixed sulfide ore; the ore was concentrated in two flotation mills, yielding copper concentrate, pyrite concentrate, and zinc concentrate. Gold and silver were recovered as byproducts from smelting the copper and zinc concentrate. The pyrite concentrate was roasted, yielding liquid sulfur dioxide, which was mainly used in manufacturing sulfuric acid; and iron oxide, which was sintered for use by iron and steel plants. Production of recoverable copper was 9,911 tons. Production of pyrite increased 7 percent over 1954. Production of recoverable zinc decreased 2 percent below 1954. Silver recovery was 66,600 troy ounces, and gold recovery was 221 troy ounces. Exploration work by the company included 20,600 feet of drifting and 16,100 feet of diamond drilling. Polk County Highway Department crushed 2,160 tons of limestone for concrete and roads.

Putnam.—Coal production was 666,000 tons valued at \$2,680,000, compared with 794,000 tons valued at \$3,140,000 in 1954; active producers were Clinchfield Coal Corp. (Meadow Creek mine), Fentress Coal & Coke Co. (No. 7 mine), and Meadow Creek Coal Co. Inc. (ABC mine). Algood Limestone Co. crushed limestone for concrete

and roads and for agriculture.

Rhea.—Coal production was 54,100 tons valued at \$211,000, compared with 45,400 tons valued at \$180,000 in 1954; 5 mines were active, of which Bumbee Coal Co. (Bumbee mine) and Richard Kirkwood Fuel Co. (No. 1 mine) were the largest producers. W. S. Dickey Clay Mfg. Co. mined 4,600 tons of fire clay and 29,400 tons of miscellaneous clay for heavy clay products.

Roane.—A. B. Long Construction Co. (Swan Pond quarry) and Rockwood Slag Products Co. crushed 285,000 tons of limestone for riprap, concrete and roads, and agriculture. Rockwood Mining Co.

(New Chamberlain mine) mined red iron ore for blast-furnace use; production increased considerably over 1954. Henry & Price Stone Co. quarried dimension sandstone for flagging.

Robertson.—Porter Brown Limestone Co. crushed limestone for

concrete and roads and for agriculture.

Rutherford.—Bilbrey Rock Co. crushed 150,000 tons of limestone

for concrete and roads, lime, and other uses.

Scott.—Coal production was 640,000 tons valued at \$2,060,000. compared with 537,000 tons valued at \$1,794,000 in 1954; 34 mines were active, of which Straight Fork Coal Co. (Straight Fork mine), J. D. Pemberton Coal Co. (Pemberton Strip mine), and Ace Mining

Co. (West No. 1 strip mine) were the largest producers.

Sequatchie.—Coal production was 270,000 tons valued at \$989,000. compared with 242,000 tons valued at \$812,000 in 1954; 52 mines were active, of which Testa Bros., Inc. (No. 1 strip mine), Nick Istock Coal Co. (No. 2 strip mine), and Big Rock Coal Co. (D-9 mine) were the largest producers. Dunlap Stone Co. crushed 68,400 tons of limestone for concrete and roads and for agriculture.

Sevier.—Lambert Bros., Inc. (Sevier quarry) crushed 234,000 tons

of limestone for concrete and roads.

Shelby.—Banks Bros., Inc., Cordova Sand & Gravel Co., R. P. Harris Gravel Co., Hollywood Sand & Gravel Co., Inc., Marquette Cement Mfg. Co., Memphis Stone & Gravel Co., and Tennessee Gravel Co. mined 1,516,000 tons of structural, paving, and other sand and gravel. John A. Denie's Sons Co. and Moss Lightweight Aggregate Co. gate Co. mined miscellaneous clay for lightweight aggregate and heavy clay products.

Smith.—Oldham Limestone Co. crushed 31,900 tons of limestone

for concrete and roads and for lime.

Stewart.—W. L. Talley crushed 5,900 tons of limitstone for concrete

and roads, agriculture, and other uses.

Sullivan.—Penn-Dixie Cement Corp. operated the Kingsport mill throughout the year, producing masonry and portland cement; shipments of portland cement increased 12 percent over 1954. Penn-Dixie Cement Corp., Standard Crushed Stone Co. (New Kingsport quarry), and Sullivan County Highway Department (Boozy Creek, Orebank, Rock Springs, and Walnut Hill quarries) crushed 866,000 tons of limestone for cement and for concrete and roads. General Shale Products Corp. (Kingsport mine) and Penn-Dixie Cement Corp. mined miscellaneous clay for cement and heavy clay products; production decreased 10 percent below 1954. Afton Good mined 1,215 tons of structural sand.

Sumner.—C. A. Langford, Pilot Knob Limestone Co., and Ralph Rogers & Co., Inc., crushed 230,000 tons of limestone for concrete and roads and for railroad ballast.

Tipton.—Owens Sand & Gravel Co. and Smiley Sand & Gravel Co.

mined structural and paving sand and gravel.

Unicoi.—Edward Lewis and Tennessee Manganese Co. mined Metallurgical-grade manganese ore; production expanded 45 percent over 1954. Brooks Sand & Gravel Co. mined 211,000 tons of structural and paving sands and paving and railroad-ballast gravels. Standard Crushed Stone Co. (Okalona quarry) crushed 190,300 tons of limestone for concrete and roads.

Union.—Tennessee Marble Co. (Luttrell quarry) quarried dimension marble for interior dressed building stone, rough monumental stone, and cut, dressed monumental stone; production expanded 37 percent over 1954. Union County Highway Department crushed 10,400 tons of limestone for concrete and roads.

Van Buren.—Coal production was 102,400 tons valued at \$389,000, compared with 28,600 tons valued at \$104,700 in 1954; 13 mines were active, of which Henry Bros. Coal Co. (No. 1 strip mine), B. & H. Coal Co. (Spencer No. 1 and No. 2 strip mines), and Cecil Hitchcock Coal

Co. (Hitchcock mine) were the largest producers.

Warren.-Warren Limestone Co. crushed 211,000 tons of limestone

for concrete and roads and for agriculture.

Washington.—General Shale Products Corp. (Johnson City mine) mined miscellaneous clay for heavy clay products; production increased 8 percent over 1954.

Wayne.—Clifton Towing Co. (Baker mine) mined 14,700 tons of

structural sand and gravel.

Weakley.—Bell Clay Co. (Collins mine), Cooley Clay Co. (Greenfield mine), Kentucky-Tennessee Clay Co., H. C. Spinks Clay Co., and United Clay Mines Corp. (No. 6 mine) mined ball clay for art pottery, whiteware, high-grade tile, kiln furniture, fire brick and block, enameling, and other uses; production expanded 31 percent over 1954.

White.—Sparta Limestone Co., Thompson-Weinman & Co., and White County Highway Department crushed limestone for concrete and roads, agriculture, and whiting; production declined 46 percent below 1954, owing mainly to decreased production by Sparta Limestone Co. Coal production was 16,010 tons valued at \$54,000, compared with 14,150 tons valued at \$55,300 in 1954; 4 mines were active, of which John T. Harris Coal Co. (No. 3 strip mine) and Lester Brown Coal Co. (String No. 3 mine) were the largest producers.

Williamson.-Monsanto Chemical Co. mined phosphate rock for elemental phosphorus; marketable production decreased 10 percent below 1954. Franklin Limestone Co. and Williamson County Highway Department crushed 304,000 tons of limestone for concrete and

roads and for railroad ballast.

Wilson.—Lebanon Limestone Co. and Marquette Cement Mfg. Co. (Martha quarry) crushed limestone for cement and for concrete and roads.

# The Mineral Industry of Texas

This chapter was prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the University of Texas, Bureau of Economic Geology.

By F. F. Netzeband<sup>1</sup> and John T. Lonsdale<sup>2</sup>



ONSISTENT high level demands for raw and processed materials by manufacturing, construction, and defense industries in 1955 permitted the mineral industries of Texas to achieve an unprecedented value record of slightly under \$4 billion.

TABLE 1.—Mineral production in Texas, 1954-55 1

		1954		1955
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement:  Masonry	21, 928, 170 2, 400, 924 (1, 218, 048 110, 588, 471 914, 949 547, 436 4, 551, 232 2, 732, 100 2, 983, 962 2, 306 974, 275 2, 864, 312 26, 315, 635 (1) 625, 840, 338 3, 474, 477 107, 232 19, 362	7, 002, 024 100, 000 2, 773, 220	817, 253 24, 038, 427 3, 096, 959 1 1, 349, 434 139, 397, 000 875, 443 584, 855 4, 730, 798 2, 987, 808 3, 450, 430 1, 053, 297 3, 583, 242 31, 518, 123 46, 718 27, 321, 444 3, 766, 882 114, 989 35, 064	64, 820, 374 8 5, 099, 922 746 115, 000
indicated by footnote 4		52, 527, 152 3, 730, 705, 000		50, 069, <b>384</b> 3, 993, 310, 000

<sup>&</sup>lt;sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by Producers, and the producers of the producers of the producers.

Included with portland cement; not tabulated separately for 1954.

Excludes certain clay, value for which is included with "Items that cannot be disclosed."

Weight not recorded.

Weight not recorded.

Commodity-industry analyst, Region IV, Bureau of Mines, Bartlesville, Okla.
 Director, Bureau of Economic Geology, The University of Texas, Austin, Tex.

Revised figure.
7 The total has been adjusted to eliminate duplicating clays and stone.

New records were established in nearly every phase of the State's mineral economy, exploration, production, consumption, employment, and wages. The mineral industries were more productive at a more uniform rate and employed more workers at higher wage rates in 1955 than in any previous year.

Each of the 254 counties in Texas continued to benefit from mineralindustry activities, either from direct production, from the refining or processing of the crude material, from worker income, from suppliers of material and equipment, from royalties and rentals of lease mineral

rights, or from the financing of mineral operations.

Water, one of the State's most important mineral resources, continued to present a serious problem during the year. Adequate supply and quality of water were given serious study, as drought conditions continued for the fourth consecutive year. Water pollution was likewise posing serious problems in certain areas, being accentuated in some instances because of the drought conditions.

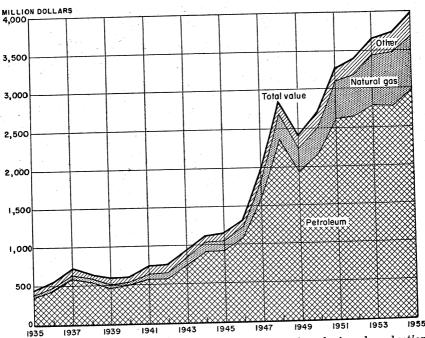


Figure 1.—Value of petroleum, natural gas, and total value of mineral production in Texas, 1935-55.

Employment.—Employment improved steadily in the mineral industries throughout 1955, reaching a new record in August, then declining slightly for the remainder of the year. Total employment in the mining, crude-petroleum, natural-gas, metal, and coal industries averaged 125,500 workers, compared with 122,600 workers in 1954, according to the Texas Employment Commission. Workers in the allied industries of petroleum refining, petrochemicals, smelting, stone, and clay increased this total by 133,900 workers. Unemployment in Texas declined in 1955 to an average of 113,600 workers from the

1954 average of 128,500 workers, with virtually all industries sharing

TABLE 2.—Average value of selected mineral commodities produced in Texas, 1951 - 55

	1001-	50			
Commodity	1951	1952	1953	1954	1955
Cement	\$2.42 .242 2.63	\$2. 42 242	\$2.53 .287	\$2. 58 . 295	\$2. 70 . 373
Lime short ton pound	12. 80 9. 05 . 245	2. 63 13. 10 9. 31 . 245	2. 68 13. 40 9. 21 . 266	3. 10 16. 90 9. 90 . 270	3. 13 16. 30 9. 49
Natural gasthousand cubic feet Natural-gas liquids: Natural gasoline and cycle products	210. 13 . 054	199. 10 . 062	193. 03 . 076	264.39 .085	. 295 290, 35 . 080
LP-gases gallon do do detroleum 42-gallon barrel	.076 .035 2.58	.073 .036 2.58	.073 .039 2.73	. 073 . 032 2. 84	.069 .032 2.84
ilver 4troy ounce	1.67 1.01 .905+	1. 67 1. 04 . 905+	1. 76 1. 05 . 905+	3. 25 1. 03 . 905+	3. 59 1. 05 . 905
Limestone: Crushedshort ton Dimensiondo Miscellaneous: Crusheddo	. 93 31. 36 . 56	1. 14 13. 45 . 58	. 95 33. 84 . 54	1.03 22.54 .86	1.08 31.02 .97
Crusheddo Dimensiondo	. 73 19. 09	. 74 17. 40	. 54 12. 76	. 74 8. 45	1.00 7.22

Yearly average weighted price of all grades of primary metal sold by producers.
 A verage quoted price at New York.
 Treasury buying price for newly mined silver; 1951-55—\$0.9050505.

Workers in the mineral industries received the highest incomes on record in 1955, amounting to \$632 million for mining, crude petroleum, and natural gas and \$627 million for workers in the smelting, petroleum, refining, and chemical industries.

Labor relations were more harmonious in 1955 than in prior years; no large or extended work stoppages occurred during the year. Workers involved in disputes in 1955 averaged 1,100 monthly compared with 1,300 in 1954 and 3,700 in 1953.

TABLE 3.—Average employment, weekly hours worked, and weekly earnings of mineral industry workers, 1954-55 1

				,			
	Employment			ly hours orked	Weekly	Weekly earnings	
	1954	1955	1954	1955	1954	1955	
Nonmanufacturing: Mining: Crude petroleum and natural gas Metal, coal, other mining Subtotals and averages Manufacturing: Stone, clay, and glass Primary metals Chemicals and allied products Petroleum and coal Subtotals and averages Grand total	115, 000 7, 600 122, 600 15, 500 24, 400 40, 500 47, 600 128, 000	117, 700 7, 800 125, 500 17, 000 25, 900 43, 400 47, 600 133, 900 259, 400	44. 3 40. 2 44. 3 43. 4 40. 7 42. 8 40. 2	44. 1 39. 9 44. 1 44. 1 41. 2 42. 5 40. 4	\$97. 02 82. 01 95. 69 65. 10 82. 21 84. 74 95. 27 85. 80	\$98. 3: 85. 3: 96. 86 69. 68 86. 52 89. 68 99. 38 89. 98	

<sup>&</sup>lt;sup>1</sup> Texas Employment Commission, in cooperation with U. S. Bureau of Labor Statistics, February 1956, 6 pp.

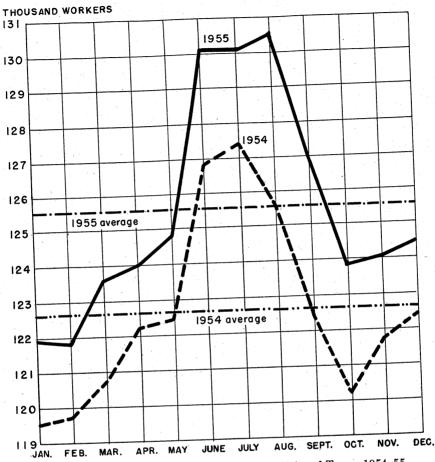


FIGURE 2.—Employment in the mineral industries of Texas, 1954–55.

Note.—Chart data furnished by Texas Employment Commission in cooperation with the U. S. Bureau of Labor Statistics.

## REVIEW BY MINERAL COMMODITIES

#### MINERAL FUELS

Texas, with a total land area of 169 million acres, had an estimated 49 percent of the area under lease or productive of oil and gas in 1955. This included an estimated 3.9 million acres productive of oil and/or gas, with an additional 78 million acres under lease but not producing in 1955. Texas not only continued to be the Nation's leading source of liquid mineral fuels, with an alltime record value of \$3.7 billion in 1955, but also contained 51 percent of the Nation's proved reserves.

During the year, 23,540 wells were completed in the State, which accounted for a total footage of nearly 86 million feet and an average well depth of 4,303 feet. This drilling activity led to discovery of

415 new oilfields and 89 new gasfields and additions of 974 million barrels to proved crude-oil reserves, 297 million barrels to proved natural-gas-liquid reserves, and 8.1 trillion cubic feet to proved natural-gas reserves. Three significant facts were revealed by analyses of the oil industry's drilling campaigns and new oil reserves found. One fact is that the industry has maintained a fairly constant ratio of proved reserves to demand (as expressed by petroleum production). Another is the rapidly rising costs of drilling a well and finding 1 barrel of new oil. The third fact is the diminishing reserves found per dollar spent on exploration.

In 1955, 158,598 wells were producing oil—an increase of 9,456 wells over 1954. Offshore exploration, which began with passage of the Tidelands Act by the Congress in 1953, gained considerable momentum in 1955, with the drilling of 13 wells. Two of these were completed as oil wells and 6 as gas wells, and 5 were dry holes. Lack of any gathering system precluded marketing of any of this new oil and gas production; plans for construction of submarine pipelines

to service these wells were being formulated.

Asphalt (Native).—An accelerated highway construction program in 1955 by both State and county units permitted larger outputs by

the two producers in Uvalde County.

Carbon Black.—Increased demand for rubber products, both natural and synthetic, caused a marked increase in carbon-black production in Texas in 1955. Natural gas as the raw material in manufacturing carbon black continued to be replaced by heavier petroleum oils. The old, less efficient, furnace-type plant, with its familiar black plume, continued to be replaced with the more efficient and less obnoxious channel-type plant. This replacement resulted in recovery of 3.21 pounds of carbon black per thousand cubic feet of gas in 1955 compared with 2.85 pounds per thousand cubic feet in 1954. Natural gas was the source of 51 percent of the carbon black produced in Texas in 1955 compared with 56 percent in 1954.

Helium.—With a record 122 million cubic feet of helium being produced at the Government-operated Exell plant in Moore County and the Amarillo plant in Potter County, demand still outstripped supply, as 139 million cubic feet valued at \$2.3 million was shipped from Texas. Plans have been formulated to expand the capacity of the Exell plant owing to growing demand for helium. Government agencies (Army, Navy, Air Force, Weather Bureau, and the Atomic Energy Commission) continued to be the principal users of the gas; however, increased civilian demand for industrial and medical purposes accentuated the short-supply problem.

TABLE 4.—Helium production, 1954-55, by counties

	195	<b>54</b>	1955		
County	Production (cubic feet)	Value	Production (cubic feet)	Value	
MoorePotter	73, 176, 600 36, 768, 751	\$1, 245, 508 617, 396	89, 336, 700 32, 491, 167	\$1, 449, 756 534, 090	
Total	109, 945, 351	1, 862, 904	121, 827, 867	1, 983, 846	

Lignite.—Surface mining of Texas lignite continued in 1955.

Natural Gas.—Demand for natural gas increased substantially as residential consumers in the Nation increased nearly 8 percent during the year, commercial consumers better than 8 percent, and industrial consumers nearly 13 percent, according to a survey by the American The rapidly expanding petrochemical industry Gas Association. likewise was an important consumer of natural gas, both as feed stock and as fuel.

Marketed production of natural gas in Texas established a new record of 4,730,798 million cubic feet valued at \$378 million. wells comprised 71 percent of this production and oil-well gas the remainder. During the year 2,236,540 million cubic feet of gas was consumed in Texas, 2,564,598 million cubic feet was exported from the State, and 103,934 million cubic feet was imported. Texas industries consumed most of the gas used in the State (36 percent) followed by field use (34 percent), refineries (15 percent), manufacture of carbon black (7 percent), residential use (6 percent), and commercial use (2 percent). Use of natural gas for electrical power continued to gain, representing nearly 63 percent of the energy in 1955 compared with 41 percent in 1940 and 36 percent in 1930. Gas production originated from an average of 11,400 wells in 1955 compared with an average of 10,700 in 1954.

TABLE 5.—Marketed production of natural gas, 1946-50 (average) and 1951-551

Year	Million cubic feet	Value (thousand dollars)	Value per thousand cubic feet (cents)	Year	Million cubic feet	Value (thousand dollars)	Value per thousand cubic feet (cents)
1946-50 (average)_	2, 354, 820	99, 250	4. 2	1953	4, 383, 158	333, 120	7. 6
1951	3, 781, 136	204, 181	5. 4	1954	4, 551, 232	386, 855	8. 5
1952	4, 147, 805	257, 164	6. 2	1955	4, 730, 798	378, 464	8. 0

<sup>1</sup> Comprises gas either sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas pipelines.

TABLE 6.—Gross withdrawals and disposition of natural gas, 1951-55, in million cubic feet

Gross	withdrawals	1			Disposition	
Year	From gas wells	From oil wells	Total	Marketed production?	Repressur- ing	Vented and wasted 3
1951 1952 1953 1954 1955	3, 518, 500 3, 779, 100 3, 835, 000 4, 020, 000 4, 100, 000	1, 411, 600 1, 507, 700 1, 624, 000 1, 600, 000 1, 736, 000	4, 930, 100 5, 286, 800 5, 459, 000 5, 620, 000 5, 836, 000	3, 781, 136 4, 147, 805 4, 383, 158 4, 551, 232 4, 730, 798	856, 930 784, 892 779, 054 840, 070 834, 677	292, 034 354, 103 296, 788 228, 698 270, 525

 <sup>&</sup>lt;sup>1</sup> Marketed production plus quantities used in repressuring, vented, and wasted.
 <sup>2</sup> Comprises gas sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas in pipelines.
 <sup>3</sup> Includes direct waste on producing properties and residue blown to air. (Partly estimated.)

Estimated proved recoverable reserves of natural gas increased from 105,129,062 million cubic feet at the end of 1954 to 108,287,548 million

cubic feet in December 1955, according to the Committee on Natural-Gas Reserves of the American Gas Association. These reserves were enhanced through the initial gas-condensate discovery well of Magnolia Petroleum Co. in the Tidelands area, 10 miles southwest of Sabine Pass. This discovery well, completed February 10, 1955, was followed in April by a Pure Oil Co. discovery 12 miles southeast of Galveston. Of the 13 wells drilled in the Tidelands in 1955, 2 were oil discoveries, 6 gas discoveries, and 5 dry holes. These discovery wells indicated substantial gas reserves under the Gulf of Mexico. The ratio of proved reserves to consumption has dropped significantly in the past 10 years. In 1946 the State's ratio of proved natural-gas reserves to consumption was 49:1; in 1955 it was 23:1.

Natural-Gas Liquid.—The 1955 output of 6,438 billion gallons of natural-gas liquids valued at \$317 million established a new alltime record for Texas. Principal industrial consumers of these gases were the booming petrochemical industry and the synthetic rubber industry; industrial uses in general likewise composed a significant portion. Demand from domestic and commercial users showed little change

over 1954.

TABLE 7.—Production of natural-gas liquids, 1946-50 (average) and 1951-55

	Natural gasoline and cycle products		LP-g	ases	Total	
Year	Thousand gallons	Value (thou- sand dollars)	Thousand gallons	Value (thou- sand dollars)	Thousand gallons	Value (thou- sand dollars)
1946-50 (average)	1, 876, 746 2, 516, 094 2, 589, 594 2, 750, 370 2, 732, 100 2, 987, 808	126, 824 189, 973 188, 500 200, 479 200, 559 206, 506	1, 147, 223 2, 042, 208 2, 456, 874 2, 777, 880 2, 983, 962 3, 450, 430	40, 205 71, 943 88, 635 109, 131 95, 913 110, 414	3, 023, 969 4, 558, 302 5, 046, 468 5, 528, 250 5, 716, 062 6, 438, 238	167, 029 261, 916 277, 135 309, 610 296, 472 316, 920

The State had 202 natural-gasoline plants and 31 cycling plants. Nine new gasoline plants were put in operation in 1955. The more important ones were the Cabeza Creek plant of the United Gas Pipeline Co. in Karnes County, the Perkins No. 10 plant of Texas Hydrocarbon Co. in Coke County, the Lehman plant of the Llano Grande Corp. in Cochran County, and the Headlee plant of the Texas Gulf Producing Co. in Ector County. Operations were discontinued at seven smaller gasoline plants and at the large Shamrock plant of Columbia Gasoline Corp. in Wheeler County. The two new cycling plants were the Southampton plant of Sinclair Oil & Gas Co. in Hardin County and the Julian Pasture plant of Humble Oil & Refining Co. in Kenedy County.

Proved recoverable reserves of natural-gas liquids increased to more than 3,045 million barrels from 1954 estimates and amounted to 56 percent of the Nation's total reserves, according to the Committee on Natural-Gas-Liquid Reserves of the American Gas Association.

Petroleum.—Texas continued its leadership in crude petroleum reserves, facilities, and activities in 1955. It had a major share of the Nation's petroleum reserves, produced the greatest volume of oil, processed the largest volume of crude oil at its refineries, provided a major source of feed stock to the petrochemical industry, and operated more drilling rigs and invested more capital in improving its oil reserves than any other State in the Nation. The Texas oil industry was in a particularly strong position in 1955, as national demand for crude and refined products continued to rise. positive demand, coupled with improved prices, stimulated activity in the exploratory, producing, and refining departments of the in-Crude-petroleum production rose from 974 thousand barrels in 1954 to a record 1,053 thousand barrels in 1955, even though the Railroad Commission's number of allowable producing days remained unchanged from the previous year at 194. This reflected improved productivity capacity.

In 1955, 23,540 wells were completed in Texas, an increase of 3,417 over 1954 completions, according to the Railroad Commission of Texas. Wildcat wells represented 4,486 of these completions; development wells 19,054. At the end of 1955 there were 158,598 producing wells in Texas compared with 149,142 wells at the close of 1954. Offshore production, though not contributing to the 1955 output, should supply significant volumes to the State's crude-oil potential.

TABLE 8.—Production of crude petroleum, 1946-50 (average) and 1951-55

4	Thousand	Val	ue		Thousand	Val	16
Year	42-gallon barrels	At wells (thousand dollars)	Average per barrel	Year	42-gallon barrels	At wells (thousand dollars)	Average per barrel
1946-50 (average) 1951 1952	811, 726 1, 010, 270 1, 022, 139	1, 820, 928 2, 610, 790 2, 641, 860	\$2. 24 2. 58 2. 58	1953 1954 1955	1, 019, 164 974, 275 1, 053, 297	2, 777, 900 2, 768, 490 2, 989, 330	\$2. 73 2. 84 2. 84

TABLE 9.—Production and indicated demand of crude petroleum in 1955, by months

Month	Production (thousand 42-gallon barrels)	Indicated demand (thousand 42-gallon barrels)	Month	Production (thousand 42-gallon barrels)	Indicated demand (thousand 42-gallon barrels)
January	92, 105 83, 060 92, 861 89, 788 87, 836 81, 752 84, 314	90, 570 84, 076 89, 147 80, 822 87, 404 82, 618 88, 907	August	84, 393 83, 510 89, 529 89, 656 94, 493	89, 812 83, 218 86, 387 89, 294 92, 457 1, 044, 712

TABLE 10.—Production of crude petroleum, 1951-55, by districts and fields
(Thousand barrels)

District and field <sup>1</sup>	1951	1952	1953	1954	1955
If Coast:					
	1, 073 7, 727 2, 038	1,004	1, 282	1, 161	1, 12
Anahuac	7, 727	7,032	6, 453 1, 862	5, 240 1, 805	5, 27
Amelia Anahuac Barbers Hill Beaumont-West Bloomington Rolling Chocolate-Bayou Conroe Damon Mound Dickinson-Gillock Davarsdala	2,038	2, 132	1,862	1,805	1, 90
Beaumont-west	662	986	1, 148	1, 035 1, 341	95 1, 33
Dolling	1, 934 1, 110	1, 756 1, 524	1, 535 1, 959	1,763	1, 69
Chocolate-Bayou	5, 166	5, 028	4, 531	4, 952	4, 60
Conroe	14,081	12, 813	11, 937	10, 081	10. 37
Damon Mound	147	369	605	1, 153	10, 37 1, 09
Dickinson-Gillock	4,090	4, 105	4, 235	4,030	3, 98
Dyersdale	1,449	1,340	1, 183	975	84
Dyersdale Esperson Fair banks Falls City	1, 496	1,474	1, 365	1, 284 1, 426	1, 18
Fall Odiks	1, 403 1, 341	1, 383 1, 232	1, 585 1, 059	898	1, 42 90
		1, 780	1, 760	1, 380	1, 2
Fannette Francitas Friendswood Gohkle, Helen Goose Creek Greta	280	656	962	1, 172	1, 5
Friendswood	14, 989	13, 729	12, 398	10 279	10, 62
Gohkle, Helen	955	2. 180	2, 512 2, 692 2, 871	2, 478 2, 715 2, 370	2, 30
Goose Creek	2,873	3, 148	2, 692	2, 715	3,00
Greta	3, 512	3, 269 1	2, 871	2, 370	2, 39
Hankamer	835	1, 136	1,072	1, 110	1, 2
Hastings	16, 536	14, 767	13, 644	11,570	11, 6
High Island	1,671	1, 491	1, 361	1,064	1.00
Hankamer Hastings Heyser High Island Houston-North-South Hull Liberty-South Livingston Lolita Lovills Lake Manyel	2, 384 1, 192	2, 291 1, 255 2 3, 388	2, 605 1, 286	2, 819 1, 377	3, 14 1, 34
Hull	4, 612	2 3 388	2, 660	4, 411	4, 0
Humble	1, 246	1,036	958	1,067	1, 1
Liberty-South	1, 665	1, 626	2, 011	2, 348	2, 6
Livingston	1,395	1, 208	1, 154	1,086	1, 1
Lolita	1,803	1, 589	1, 476	1, 247	1, 3
Lovells Lake	1,418	1, 217	978	863	8
Manvel	2, 393	2, 166	2,058	1, 735	1, 70
Markham	1, 333	1, 585	1, 691	1,548	1, 4
McFaddin		1, 368	1, 275	1,076	1, 3
Old Ocean Oyster Bayou Pierce Junction	6, 247 3, 519	6, 268 3, 368	5, 954	4, 994 3, 104	5, 3' 3, 0
Pierce Tunction	3, 519 1, 782	1, 591	3, 219 1, 349	1,036	1, 2
Placedo		1, 997	2, 210	1, 951	1, 8
Placedo Port Neches. Raceoon Bend. Refugio-Fox Saratoga. Silsbee. Sour Laka	1,621	1, 847	1, 846	1, 687	1, 4
Raccoon Bend	1,874	1, 966	2, 225	2, 068 2, 330	2, 0
Refugio-Fox	2,708	2,655	2,419	2, 330	2.4
Saratoga	673	758	675	1,417	1,9
Silsbee	1, 364	1, 465	1, 398	1,248	1, 3
Stowell	2,009	1,804	1, 576	1, 451	1, 4
Stowell	2, 336	2, 360	1, 936	1, 645 933	1, 7
Sugarland Sugar Valley Thompson	1, 380 1, 943	1, 294 1, 468	1, 193 1, 364	1, 143	1, 1
Thompson	12, 840	11, 846	10, 563	9, 099	8, 9
Tomball	2 444	2.204 1	2.005	1, 888	2, 1
Tomball Village Mills West Columbia	2, 444 3, 300	3, 216	2, 095 3, 494	2,871	2, 5
West Columbia.	2, 331	2, 297	2, 252	2, 344	2, 4
West Ranch Withers-Magnet	7,525	6, 844	6, 652	5, 427	5, 6
Withers-Magnet	4, 345 68, 990	4, 018	3, 933	3, 467	3, 2
Other Gulf Coast 3	68, 990	69, 268	73, 120	62, 098	78, 2
Total	239, 407	231, 597	227, 636	203, 159	221, 3
st Texas:					
East Texas proper	100, 695	96, 526	90, 743	81, 364	80, 2
Cuyuga	1, 568	1, 373	1, 258	1,082	1,0
East Texas proper	465	1,040	1, 186	1,099	1,0
Tong Toka	13, 638	16, 261	18, 417	16, 589 959	16, 8 9
Long Lake	1, 619 2, 355 1, 874	1, 476 2, 309	18, 417 1, 236 2, 191	2, 481	2, 5
Pawitt Ranch	1 874	2, 309 1, 637	2, 191	1, 209	2, 3 1, 1
Pickton	2,027	1, 383	1, 444 1, 788	1, 477	1, 4
( lizitmon	3,078	2, 848	2, 941	2, 230	2, 1
Talco	6, 692	6, 440	5, 876	4, 928	4, 9
Van	9, 698	11, 349	10, 650	8, 850	8,8
Van Waskom	896	1, 131	1, 398	1,049	1, 1
Woodlawn Other East Texas		91	411	1,045	. 9
Other East Texas	17, 641	15, 573	13, 359	14, 321	22, 2
Total	162, 246	159, 437	152, 898	138, 683	145, 6

See footnotes at end of table.

TABLE 10.—Production of crude petroleum, 1951–55, by districts and fields—Con.

(Thousand barrels)

District and field 1	1951	1952	1953	1954	1955
Central Texas:					
Big Foot	- 456	793	1, 792	2, 413	2, 45
Charlotte	2, 434 2, 830	1, 778 2, 943	1, 536	1, 760 3, 442	2, 152 3, 483
Luling	1, 951	2, 385	3, 210 2, 410	2, 433	2, 55
Darst Creek Luling Other Central Texas	3,846	4, 148	4, 733	5, 110	7, 648
Total	11, 517	12, 047	13, 681	15, 158	18, 297
North Texas 4 5	87, 985	96, 513	111, 269	114, 979	129, 701
Panhandle 6	31, 287	29, 272	28, 080	30, 903	33, 400
South Texas:	2, 232	1 045	1 700	1 500	1, 389
Aqua Dulce	1,016	1, 945 1, 066	1,736 1,200 2,718	1, 500 1, 286	900
Flour Bluff Fulton Beach	1,819	1, 945	2,718	2, 985	2, 70
(farcia	_ 1.321 [	1, 294	1 223 1	1.057	1,008
Hoffman	_ 2.154	1, 983	1,841	1,500	1,500
Kelsey London Gin	3, 017	3, 059	3. 243	3, 173	3,609
London Gin	1, 330	1, 192	1, 106	955	1, 101
Midway Mustang Island Portilla Saxet-Saxet Frio Stratton	1,582	1, 298	982	928	1,070
Mustang Island	1, 332	2, 154 (2)	2, 878 4, 373	2, 697 3, 506	2, 768 3, 719
Covet Covet Frie	(2)	980	998	830	75
Stratton	3, 680	3, 344	2,990	2, 403	2, 40
Sun.		1, 405	1,618	1.752	1, 360
Taft	_   1.491	1, 477	1, 491	1, 580	1, 353
White Point	_ 3, 391	3, 312	3, 319	2, 973	3, 260
Willamer-West	2, 205	3, 152	2, 920	2, 434	2, 480
Other South Texas	- 67, 510	65, 367	60, 022	56, 724	58, 870
Total	96, 549	94, 973	94, 658	88, 283	90, 246
West TexasAbell	2, 042 1, 863	(7) 1, 264	(7) 1, 439	( <sup>7</sup> ) 1, 227	1, 497
Adair	1 863	2, 676	2, 915	2, 390	2, 487
Andector	1, 863 7, 156		6, 691	5, 580	5, 692
Anton-Trich-Anton		2,743	2, 914	2, 586	2, 930
Benedum Big Lake Block 31 Bronte	2,553	4,046	3, 444	2, 853	2, 645
Big Lake	- 999	984	1,018	1,014	921
Block 31	- 8	3, 489	5, 204 (8)	5, 182 906	5, 191 1, 107
Cedar Lake	1,964	(8) 1, 810	1,702	1, 544	1, 10
Condell		8, 118	8, 171	6, 558	6, 507
Cowden	10, 542	9, 844	9, 219	8, 595	10,000
Cree-Sykes.	1,555	2, 456	9, 219 2, 303	1, 429	1, 230
Diamond M	9, 175	13, 398	10, 592	8, 920	9, 300
Dougraide	1 8.310 [	7, 311	8, 259	6, 728	5, 944
Elkhorn Embar	1, 268	837 1, 062	1, 579 1, 080	1, 739 1, 002	1, 210 1, 25
Emma	(1, 200	(8)	(8)	(8)	2, 118
Fort Chadborne	3,868	419	5, 183	5, 275 1, 325	4, 51
Fort Stockton	_ (8)	923	1, 237	1, 325	1, 29
Foster	5, 457	4, 758	4, 326	3, 714	4,610
Fuhrman	1,580	1, 451	1,497	1,671	2, 65
Fullerton	10, 855	8, 748	7, 862	6, 513	6, 97
Garza Goldsmith Good Harper	3, 716	3, 186 18, 699	3, 124 18, 663	2,899	2, 62 16, 21
Good	21, 221 2, 209	1,812	1,637	14, 577 1, 290	1, 44
Harner	(8)	(8)	(8)	(8)	1, 47
Hendrick	1.161	`í. 161	1, 225	`1, 409	1.30
Hendrick Howard-Glasscock	5, 853	5, 618	6, 657	7, 488	7, 36
Hulldale-Hulldale-Penn	_( (8)	1, 392	1, 903	1, 528	1,82
	2, 787	3, 506	4, 425	5, 445	7, 69
Jordan	4. 573	4, 228	4, 131	3, 620	3, 48
Jameson Jordan Kelly Snyder Kermit Keystone Lea Levelland Luther	_ 28, 020	27, 004	25, 549 (8)	17,035	22, 30 2, 83
Kermit.	(8) 13, 031	(8) 11, 220	10, 990	1, 972 13, 210	2, 83 8, 84
T an	- (8)	(8)	(8)	(8)	1, 36
Levelland	(8)	11, 783	11,410	9, 992	9, 50
Luther	[8]	(8)	(8)	(8)	1, 13
Mahaa	864	771	824	944	1,01
Magutex	3, 384	(8) 2, 888	(8) 2, 643	974	1, 99
Magutex Martin	3, 384		2, 643	2,026	2, 05
McCamey McElroy	3, 431	3, 079	2, 825	2, 497	2,00
McElroy Means Midland Farms	8, 447 1, 674	7, 431	7, 250	6,718	6, 82
		1,626	1, 523	1, 336	2,990

See footnotes at end of table.

TABLE 10.—Production of crude petroleum, 1951-55, by districts and fields—Con. (Thousand barrels)

District and field <sup>1</sup>	1951	1952	1953	1954	1955
West Texas—Continued					
Pegasus	3,998	4, 365	5,706	5, 778	5, 481
PegasusPenwell	837	793	978	1, 426	1,612
Prentice	(8)	(8)	(8)	4, 187	5, 529
PrenticeReinecke	3, 101	2, 923	2,748	1,642	1, 572
Russell		(8)	(8)	3, 474	5, 541
Salt Creek	2,402	2, 688	3, 309		4, 180
Sand Hills		4, 099	4, 065		5, 074
Seminole		5, 610	6, 673	5, 459	5, 547
Shafter Lake		2, 814	3, 044	3, 343	3, 799
Sharon Ridge		1, 324	1, 174	1, 253	1, 348
Slaughter		13, 669	13, 591	11, 370	11, 151
SlaughterSpraberry Trend	1,077	30, 040	17, 015	39, 968	22, 155
Three Bar	2,000	1, 499	1,577	2, 201	1, 214
		3, 329	2, 997	2, 492	2, 502
Todd Triple N	(8)	(8)	(8)	1, 046	1, 254
TXI.	14, 673	12,075	16, 476	8, 277	6, 146
University	(8)	(8)	(8)	2, 615	2, 163
TXL University Vealmoor-East	4, 241	5, 015	5,008	3, 603	3, 440
Woddell	1, 296	1, 113	1,912	1, 151	1, 349
Waddell Ward-Estes	6, 794	10, 397	8, 921	7, 433	8, 713
Wasson	22, 465	19, 941	19, 160	15, 422	15, 752
Welch		(8)	1,074	1, 032	1, 392
Wellman	897	1, 862	2,077	966	1, 163
Wilshire		3, 832	4,620	3, 384	2, 953
World			1, 519	1, 376	1, 441
Yarbrough				2, 023	2, 202
Yates			12, 271	9, 903	9, 878
Other West Texas	11,102	12,000	12, 211	0,000	85, 111
Other West I cass					00, 111
Total					414, 701
Grand total	1,010,270	1, 022, 139	1, 019, 164	974, 275	1, 053, 297

University Block 9 and University-Waddell.

Proved crude-oil reserves of Texas declined at the end of 1955 compared with 1954, notwithstanding the record drilling program of the oil industry. This decline confirmed the oil industry's pressing problem of replacing the ever-growing output with new oil. contained nearly 50 percent of the Nation's proved crude-petroleum reserves, with an estimated 14,933 million barrels, according to the Committee on Crude-Oil Reserves of the American Petroleum Institute. Extensions and revisions added 810 million barrels to proved reserves, and new discoveries added 164 million barrels. significant was the steady decline of proved reserves per producing well from the record high of 104,226 barrels per well in 1951 to a 20-year low of 94,465 barrels per well in 1955.

Indicated demand for Texas crude in 1955 was 1,045 million barrels compared with 986 million barrels in 1954; daily average demand in 1955 was 2.9 million barrels compared with 2.7 million barrels in 1954. According to the Railroad Commission of Texas, stocks of crude oil in December 1955 were 107 million barrels, of which 16.9 million barrels was at refineries, 57.4 million barrels at tank farms and terminals, 19.3 million barrels in pipelines, and 13.6 million barrels in lease tanks.

<sup>1</sup> Texas Railroad Commission districts.
2 Included in "Other."
3 A new field was created out of a portion of Hull and included in "Other Gulf Coast."
4 Includes the fields in and between Hardeman, Wilbarger, Wichita, Clay, Montague, and Cook Counties on the north and San Saba, Lampasas, and Coryell Counties on the south.
5 Includes crude oil consumed on leases and net change in stocks held on leases for East (exclusive of East Texas proper), Central, North, and South Texas.
6 Carson, Gray, Hutchinson, Moore, Sherman, and Wheeler Counties.
7 From Oil and Gas Journal.
8 Not available.
9 University Block 9 and University-Waddell.

TABLE 11.—Total well completions in 1955, by counties

County	Prov	red field	wells	Exp	loratory	wells		Total		Grand
50amo	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	total
Anderson	42	1	16	3 22	1	30	45	2	46	_93
AndrewsAngelina	680	1 1	37	22		44 1	702	1	81	784
Aransas	12	12	12	1	2	11	13	14	23 412	3 50 799
Archer	366		380	21		32	387		412	799
Atascosa	288 16	2	58 4	20 1	1	60	308 17	3	118 8	426 28
Austin Bandera	10					4	1,		î	1
Bastrop	7		8	1		18	8		26	34
Baylor	82 51	22	107	5 10	10	18	87	32	125	212 148
BeeBell	91	22	27		10	28	61	04	55 2	140
Bexar	44		17	1		2 24	45		41	2 86 2 94
Blanco						2 15			2	2
Borden Bosque	65		9	5		15	70		24 2	94
Bowie						2 5			. 5	2 5 187
Brazoria	76	10	48	3	3	47	79	13	95	187
BrewsterBrooks	22	1	13	6	1	1 9	28	2	1 22	
Brown	80	3	63	1		19	81	3	22 82	52 166
Burleson				1 1		2	ī		2	3
Burnet	100					20	197		1	1 268
Caldwell	192 20	6	51 8	5	4	20 22	26	10	71 30	66
Callahan	362		249	6 31	1	173	393	1	422	816
Cameron					1	6		1	6	7
Camp	110		4			2	110	2	6 2	10 114
Carson	41	2 1 7 3	3	3		6	44	í	9	54
Chambers	28	7	17	4	2	33	32	9	- 50	91
Cherokee	50	3	21	. 1	. 3	51	51	6	72	129
Childress	195		128	16		2 48	211		176	387
Cochran	36		2	10		1	37		3	40
Coke	164		4	6		40	37 170		44	214
Coleman	116	9	159	14		79 1	130	9	238 1	377 1
Collingsworth		7	1			i		7	. 2	9
Colorado	5	13	1 7		8	16	5	21	23 16	40
Comanche	6	6	5		8 2 1	11 17	6	8	16	30
Concho	167	2 2	105	1 16		42	1 183	8 3 2 1 12	19 147	30 23 332
Crane	354		14	19	1 2	12	373 167	ī	147 26 74	400
Crockett	158	10	34	9	2	40		12	74	253 2 4
CrosbyCulberson				1		1 4	1		1 4	4
Dallam					1	7		1	- 7	8 1
Dallas						1	<u>-</u>		1	1
Dawson Denton	56		1 9	3		18 5	59 4		19 14	78 18
De Witt	47	2	10		2	18	7	4	28	39
Dickens			1 11			1			2	78 18 39 2 62
Dimmit Duval	24 90	2 21	87	2 11	1	22 54	26 101	3 22	33	264
Eastland	77	8	68	7	i	27	84	9	141 95	188
Ector	77 355		17	18		10	373		27 1 3	188 400
Edwards						1 3			1	1 3
EllisEl Paso						3 1			1	ĭ
Erath			2		1	4		1	1 6	7
Falls						4 2 3			4	3 1 7 4 2 12 201
FanninFayette	5		4			3	5		4 2 7	12
Fisher	110		25	22		44	132		69	201
Floyd			- <b></b>			2	- <b>-</b>		2	2
FoardFort Bend	6 13	4	7	3 2	3	14 28	9 15	7	2 21 41	2 30 63
Franklin		1	13 2			2 2 8	lI	i	4 17	5 25
Freestone	3	5	9			8	3	1 5 1	17	25
Frio	92	1	8	8	<u>i</u> -	25 27	100	1	33	134 185
Gaines Galveston	130 34	2	16 11	11	1	8	141 38	3	33 43 19	60
~~44 T WWWH	138		1 55	, ž	^	26	146		48	194
Garza			, 22							
Garza Glasscock Goliad	66 29	19	22 3 23 11	8 2 8 1	3	6 17	68 37	22	48 9 40	77 99

TABLE 11.—Total well completions in 1955, by counties—Continued

County	Prov	ved field	wells	Exp	loratory	wells		Total		Grand
	011	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	total
Gray Grayson	164 192	28 4	6 40	1 38 3 2		7 64	165	28	13	20 338
Gregg	4	12	7	3	1	i 4	230	13	104 11	338
Guadalupe	271		7 54	2		37	273		11 91	31 364
Hale Hall						$\frac{1}{2}$			1	1
Hansford	16	36	6	1	13	13	17	49	2 19	1 2 85 6 163
Hardeman	112	3	25	1 3		5 20	115	3	5 45	163
Harris	137	3 15	55	3 13	14	67	150	29 52	122	301
Harrison	61 1	51	15	3	. 1	7 9	64 2	52 4	22	138
Haskell	48		1 29	10		37 1	58	*	122 22 10 66	16 124
Hays Hemphill			1	1		1 2	1		2 2	3 3
Henderson	11		. 8 20	2		26	13			47
Hidalgo	10	48	20	2	19	26 13	11	67	34 33 8 9	47 111
Hill Hockley	22		1 2	1		7	23	<b> </b>	8	8 32
Hopkins			2 3 1			2 12			5	52
Houston Howard	261	5	1 43	3		12	5	5	5 13 57	5 23 321
Hudspeth	201			3		14	264		57 1	1
Hunt			1			9			1 10	10 521
Hutchinson Irion	488	18	12	5	1	2 13	488 9	19 1	14 13	521 23
Jack	184	1 28	106	5 12	2	48	196	30	154	380
Jackson Jasper	43	22	30	4	- 5	48 38 12	47	27	68 12	142
Jeff Davis		1.		1		12	1	1	12	14
Jefferson	24	14	15 19		4	28	24	18	43	85
Jim Hogg Jim Wells	38 19	20	19 31	4 8	2	27	42 27	1 22	46	89 103
Johnson		20	1			20		22	46 54 3 162	
Jones	101	1	82 82	19		80	120		162	282
Karnes Kaufman	16 1	1	13 5	3 1		22	19 2	1	35 27	55
Kendall						1 28 27 23 2 80 22 22 22 3 10			3	3 282 55 29 3 16
Kenedy Kent	2 37	3	6	$\frac{1}{2}$			3 39	3	10	16
Kerr	l					14 3	39		20 3 10	59 3 20
King	. 8		4	2 3		3 6 2	10 13		10	20
Kleberg Knox	10	6	9	3	1	. 14	13	7	6 23 2 3	26 26 2 22 22 85 19
Lamar						2 3			2	20
Lamb La Salle	19 50	1	24			3	19		3	22
Lavaca	4	4	2	3	1	10 5	50 7	1 5	34 7	85 19
Lee			1			. 3			4	. 4
LeonLiberty	123	. 4	5 46	8	1	3 12	1 131	5 6	8	14 201
Limestone	31	5 3	3 43	2	1 2 3	16	4 39	5 12	19	28
Live Oak Loving	31 19	9	43	2 8 1	3	34		12	77	128
Lubbock	4		8 1			8	20 4		2	36 6
Lynn	4		1 2	1		5 3 18 16 34 8 1 6 3 5 3 1 36	5		4 8 64 19 77 16 2 8 3 7	28 128 36 6 13 3
Madison Marion	24		2			3	24		3	3
Martin				1		3	î		3	4
Mason Matagorda	27	10	94	5		1			1 1	107 8 10 11
Mayerick	41	10	24 2	1	5	36 5	32 1	15	60 7	107
McCulloch	1		2			5 7 9	1		9	10
McLennan McMullen	2	4	26	1		9 31	2 29	8	9	11
Medina	28 8		2	1	*	8	29 9	0	57 10	94 19
Menard			1			8			6 1	6
Midland Milam	174 44	1	13 18	10		15 18	184 44	1	28 36	212 81
Mills						1			1	1
Mitchell Montague	222 160		10	2		17	224	2	27	251
Montgomery	29	2 3 12	35 19	22 3	5	27 48	182 32	8	62 67	246 107
Moore		12		3			1	12		. 13
Motley Nacogdoches			<u>1</u>			4 11			4	4 12
Navarro	615	2	58	1		41	616	2	12 99	717
Newton	9	1	10		1	10	9	$\tilde{2}$	99 20	31

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TABLE 11.—Total well completions in 1955, by counties—Continued

County	Prov	red field	wells	Exp	loratory	wells		Total		Grand
	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	total
Nolan Nueces	165 49	1 16	28 44	21 12	2	48 17	186 61	1 18	76 61	263 140
Ochiltree	2	10		3	5	17	5	5	9	140
Orange Palo Pinto	42	4	8	3	Ĭ	9	45	5	17	67
Palo Pinto	13	1	22	2	11	28	15	1	50	66
Panola Parker	44	40	24 1	3 3 2 6 2	1	8	50 4	41 3	24 9	118 16
Pecos	126	12	24	8	1	36	134	13	60	207
Polk	1	1 24	1		. 1	2	1	2	3	
Potter Randall		24	5			2 2		24	7 2	31
Reagan	203	3	3	8	1	10	211	4	13	228
Red River			ĭ	ĭ		8 20	1		- 9	10
Reeves	13	2	1			20	13	2	21	36
Refugio Roberts	58 5	10	9	3 2	3	22 4	61	12 3	31 8	104
Robertson			4		0	5		3	5	18
Runnels	98	1	50	28		66	126	1	116	243
Rusk	. 7	13	. 10			. 11	7.	13	21	41
Sabine						1			1	1
San Augustine San Jacinto		1				1 9		1	. 9	10
San Patricio	62	11	43	14	10	30	76	21	73	170
San Saba						3			3	170 3 47
Schleicher	19	1	6	1	1	19	20	2	25	47
ScurryShackelford	165 257	5	15 138	9 10	2	22 36	174 267	7	37 174	211 448
Shelby	20.		3	1		6	i		9	10
Sherman		22	3 2	l	1			23	2	1 25
Smith	7		4	2	2	21	9	2	25	36
StarrStephens	58 125	22 8	44 50	6 20	3 2	20 33	64 145	25 10	64 83	153 238
Sterling	45		11	3		17	48	10	28	76
Stonewall	143		33	24		40	167		73	240
Sutton	1	5	3		1	8	1	6	11	18
Swisher Tarrant						$\frac{1}{2}$	:		$\frac{1}{2}$	$\begin{array}{c c} 1 \\ 2 \end{array}$
Taylor	112	1	58	33		. 99	145	1	157	303
Terry	68		9	4		16	72		25	97
Throckmorton Titus	55		34	9		35 1	64		69 1	133 1
Tom Green	53		12	8	2	49	61	2	61	124
Travis	14		10	.1		14	15		24	39
Trinity						2			2	_2
Tyler Upshur	3	2	1		1	4	3	3	5	11
Upton	148		9	8		8 13	156		22	178 1
Uvalde						1			1	1
Val Verde Van Zandt	35	1	10		1	4 13		2	4	6
Van zandt	19	25	12 20	4	2	15	35 23	27	25 35	85
Walker						3			3	3
Waller	3	2	2			6	3	2	8	60 85 3 13 238
Ward Washington	190	2	24	11	1	10	201	3	34 3	238
Webb	31		17	2	3	31	33	3	48	84
Wharton	26	16	32	ĩ	7	28	27	23	60	110
Wheeler	29	1	5			1	. 29	. 1	6	36
Wichita Wilbarger	421 236		234 165	9 16		11	430		245	675 467
Willacy	15	1	103	3		50 3	252 18	1	215 5	24
Williamson			5			10			15	15
Wilson	115	1	44	12		63 7	127	1	107	235
Winkler Wise	82 51	9 26	22	4 18	1 4	7 11	86 69	10 30	29	125 110
Wood	10	20	4	10	4	16	10	30	11 20	30
Yoakum	87		1	5		34	92		35	127
	416	. 3	264	31		77	447	3	341	791
Young										
Zapata	42	4	14	1	1	35	43	5	49	
Young Zapata Zavala		4	14 2	1	1	35 12	43	5 1	49 14	97 15

 $<sup>^{\</sup>rm 1}$  Includes tideland area exploratory wells as follows: 2 oil, 6 gas, and 5 dry.

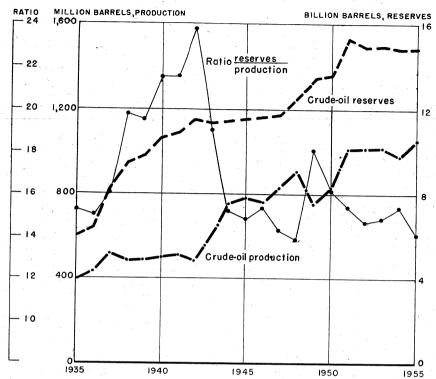


FIGURE 3.—Ratio of proved crude reserves to production, 1935-55.

TABLE 12.—Sales of petroleum products, 1951-55
(Thousand barrels)

(	a surrois,				
Product	1951	1952	1953	1954	1955
Gasoline Kerosine Renge oil <sup>1</sup> Distillate fuel oil. Residual fuel oil <sup>2</sup>	83, 668 3, 181 2, 826 16, 183 49, 750	93, 663 2, 921 2, 386 19, 022 44, 631	109, 848 2, 638 2, 205 19, 046 40, 981	106, 245 2, 383 1, 963 18, 913 35, 436	105, 672 2, 309 1, 941 20, 728 37, 512

<sup>1</sup> Includes kerosine sold as range oil. <sup>2</sup> Excludes crude oil used as residual fuel oil as follows: 1951-714, 1952-1,877, 1953-997, 1954-876, 1955-596.

About 28 percent of the Nation's refining capacity was in Texas, and nearly 25 percent of this capacity was concentrated in the Gulf Coast region. The refining industry of Texas continued its huge expansion program begun in the postwar years. The major part of this expansion and capital investment involved changes in refinery processing rather than basic crude-oil capacities. Most of the improvement involved expansion catalytic cracking, reforming, and related operations to provide higher octane gasolines. The spectacular demand increase of feed stock for the growing petrochemical industries within the State likewise influenced refinery expansion.

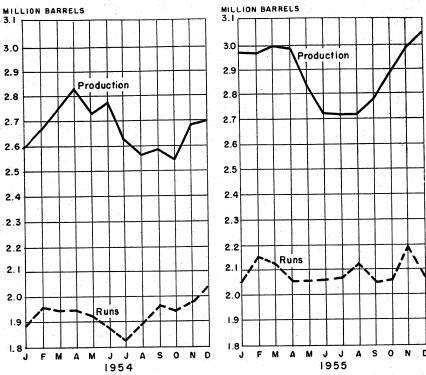


FIGURE 4.—Daily average crude oil production and runs to stills in Texas, 1954-55.

TABLE 13.—Runs to stills and output of refineries, in 1955, by months
(Thousand barrels)

-				Output					
Month	Crude	Products	Rerun	Gasoline	Kerosine	Fue	l oil	Jet	Miscel-
Monda	Orday					Distillate	Residual	fuel	laneous
January February March April May June July August Cotober November December	63, 521 60, 238 65, 934 61, 547 63, 722 61, 751 64, 000 65, 730 61, 353 63, 718 65, 726 67, 156	4, 654 4, 053 4, 376 4, 253 4, 461 4, 380 4, 358 4, 493 4, 798 5, 092 4, 886 4, 916	1 -426 -251 -1, 315 -318 -350 -532 -298 -894 -84 -84 -831 218	30, 860 28, 727 31, 552 30, 347 32, 297 30, 661 32, 301 33, 141 31, 224 32, 840 32, 838 33, 686	4, 941 3, 975 4, 072 3, 699 3, 487 2, 997 3, 090 3, 423 3, 047 3, 770 4, 413 4, 913	16, 661 16, 194 17, 202 13, 757 14, 036 14, 479 14, 231 15, 128 14, 920 15, 513 16, 853 16, 313	7, 945 7, 329 8, 267 7, 716 8, 597 7, 850 8, 599 7, 206 7, 206 7, 871 8, 224 8, 792	1, 275 1, 210 1, 778 1, 299 1, 294 1, 576 1, 626 1, 670 1, 524 1, 320 1, 187 1, 176	6, 49- 6, 43- 7, 18- 7, 66- 8, 15- 8, 21- 8, 06- 7, 97- 7, 93- 7, 41- 7, 26- 7, 41-
Total	764, 396	54, 720	-5,080	380, 474	45, 827	184, 287	96, 896	16, 935	89, 61

TABLE 14.—Stocks of crude petroleum at refineries, in pipelines, tank farms, and gathering systems in 1955, by months

#### (Thousand barrels)

Month	Refineries	Tank farms and pipelines	Lease tanks	Total
January February March April May June July Adgust September October November December	16, 202 15, 599 15, 901 16, 706 17, 018 17, 261 15, 932 15, 236 16, 414 16, 414 15, 176	72, 016 71, 996 73, 934 79, 027 80, 143 78, 672 77, 525 73, 753 76, 445 76, 882 78, 283	6, 525 6, 535 6, 480 6, 605 6, 545 6, 445 6, 455 6, 220 6, 770 6, 720 6, 625 6, 375	94, 743 94, 130 96, 315 102, 338 103, 706 102, 378 99, 912 95, 209 96, 229 98, 480 98, 683 99, 590

TABLE 15.—Stocks of refined products at refineries, in 1955, by months
(Thousand barrels)

Month	Gasoline 1	Kerosine Fuel oil Jet fuel				Natural	Miscel-
January	00.110		Distillate	Residual		gasoline	laneous
February March April May June July August	30, 116	2, 687	10, 336	5, 595	1, 116	466	20, 369
	32, 581	1, 882	7, 582	5, 963	880	467	20, 655
	32, 256	2, 148	7, 554	5, 374	1, 075	491	20, 583
	30, 594	2, 804	9, 153	5, 257	1, 119	484	20, 977
	29, 519	3, 704	10, 994	5, 702	939	538	20, 625
	26, 903	4, 617	14, 555	5, 901	1, 084	559	21, 105
	26, 419	4, 605	16, 294	6, 861	940	544	21, 136
	26, 156	4, 330	18, 245	8, 575	1, 181	456	21, 775
September October November December	25, 438	4, 006	18, 701	8, 391	1, 063	419	22, 124
	25, 635	4, 009	19, 859	8, 088	836	338	22, 244
	26, 387	4, 021	20, 177	8, 747	843	384	23, 414
	29, 015	3, 543	16, 562	8, 238	1, 061	441	23, 136

<sup>&</sup>lt;sup>1</sup> Includes naphtha.

#### METALS

Output of most metals in Texas increased in 1955 owing to the strong demand for consumer goods and to the buildup of inventories by manufactures and retailers. All crude materials processed at Texas smelters and refineries, except sea water for magnesium, iron ore for blast furnaces, mercury, and a small quantity of copper and silver, were from other States or imported. Metals (including their compounds), processed in the 16 metallurgical plants included aluminum, antimony, copper, iron and steel, lead, lithium (hydroxide), magnesium (both metal and chemicals), tin, and zinc. Minor and precious metals recovered as byproducts of smelting and refining were cadmium, gold, and silver. An important addition to the Texas mineral industry was the \$6.5 million lithium hydroxide plant of American Lithium Chemicals, Inc., at San Antonio, which was placed in operation late in the year. Lepidolite (lithium ore) from the Bikita area, Southern Rhodesia, was shipped to Texas Gulf ports and thence to San Antonio by rail. The bulk of this output was to be acquired by the Government for nuclear energy purposes.

Aluminum.—Texas was the second-ranking aluminum-producing State in the Nation, with a total rated annual capacity of 275,000 tons of primary metal, not including 75,000 tons in new production facilities under construction.<sup>3</sup> Alumina electrolytically reduced to aluminum in Texas was produced in Texas and other States from both domestic

and imported bauxite.

The Aluminum Company of America added two new potlines to its Rockdale reduction works, with a combined capacity of 50,000 tons, and 1 potline at its Point Comfort reduction works, with a capacity of 25,000 tons. Cost of these new facilities exceeded \$35 million, with full production anticipated early in 1956. Facilities to increase the power output for the San Patricio reduction works of Reynolds Metals Co. were under construction during the year. Alumina output of the company's La Quinta plant was 70,000 tons greater than in 1954.

Two increases in domestic aluminum price were made during the year, in January and in August. At year end the base price of primary aluminum pig was 22.5 cents per pound and of primary ingot 24.4

cents per pound.

Antimony.—Primary antimony was produced at the Laredo, Tex., smelter of the National Lead Co. from Mexico ores. The 1955 output was somewhat less than in 1954 and considerably under the 1952 production. The metal price rose from a low of 28.5 cents per pound at the beginning of the year to a high of 33 cents a pound at the close, averaging 30.18 cents as demand strengthened throughout the year owing to requirements of antimonial lead for batteries in the automotive industry. Total employment at the smelter improved during the year.

Cadmium.—Cadmium was recovered as a byproduct of zinc smelting at the Corpus Christi plant of American Smelting & Refining Co.

Copper.—A small quantity of copper and silver was recovered at the El Paso copper smelter from ores of development projects in Hudspeth County. The copper smelter and refinery in Texas operated at capacity as metal demand exceeded supply; this supply situation was aggravated by production losses from extended strikes during midyear 1955. The El Paso copper smelter of American Smelting & Refining Co., with a rated annual capacity of 350,000 tons of material, was idle for more than 1 month during July and August due to a major work stoppage. Similar curtailment occurred at the Nichols electrolytic refinery of Phelps Dodge Corp. With domestic demand far outstripping supply, the United States Department of Commerce banned virtually all exports of refined copper from domestic ores early in the year. The price of electrolytic copper delivered in the United States was 30 cents a pound in early January and increased to 43 cents a pound in August, where it remained at the year's end.

Iron and Steel.—Iron ore was produced from pits in Cass, Cherokee, and Morris Counties. With distinct shortages developing during the year for oilfield equipment, Texas' two blast furnaces operated at over their rated capacity throughout the year. The two producers expanded sintering, bedding, and steelmaking facilities. The Daingerfield plant of Lone Star Steel Co. had a \$7.5 million expansion program underway, and Sheffield Steel Co. added equipment and improved

processes to increase its steel output.

<sup>3</sup> American Bureau of Metal Statistics, Yearbook: 1955, p. 101.

TABLE 16.—Mine production of gold, silver, copper, lead, and zinc, 1946-50 (average), 1951-55, and total 1885-1955, in terms of recoverable metals <sup>1</sup>

	Ore	C	old.	Si	Copper		
Year	Short tons	Fine ounces	Value	Fine ounces	Value	Short tons	Value
1946-50 (average) 1951 <sup>2</sup> 1952 1953	3, 236 750 1, 270	40 32 39	\$1, 400 1, 120 1, 365	14, 336 1, 381 4, 672	\$12, 141 1, 250 4, 228	12 1 18	\$4, 752 483 8, 712
1954 1955	(3) (3)			93 124	84 113	1	746
1885-1955	(3)	8, 552	233, 265	33, 303, 390	23, 446, 761	1, 384	402, 774

Year	Le	ad	Zi	Total	
	Short tons	Value	Short tons	Value	value
1946–50 (average) 1951 <sup>2</sup> 1952 1953	111 43 56	\$34, 022 14, 878 18, 032	13 24 3	\$3, 212 8, 736 996	\$55, 527 26, 467 33, 333
1954 1955					84 859
1885-1955 8	5, 443	692, 471	837	132, 283	24, 907, 554

1 Includes recoverable metal content of ore shipped during the calendar year indicated.
2 Does not include zinc and lead recovered by the slag-furning plant at El Paso smelter from old accumulated slag resulting from operations in previous years.

Lead.—Base bullion was produced at the El Paso smelter of American Smelting & Refining Co. from domestic and foreign ores. Lead scrap was processed and refined at 3 secondary-lead smelters in Houston, 3 in Dallas, and 1 in Fort Worth. This secondary material was used principally for babbitt, solder, type metal and battery plates, and filler.

The 1955 consumption of lead and lead products was 11 percent greater than in 1954. Most consuming markets were outside of Texas, although chemical uses, including tetraethyl lead, had a significant intrastate market. The average quoted price for common grades of lead, New York base, was 15.14 cents per pound in 1955 compared with a 1954 average of 14.94 cents a pound. Lead opened in 1955 at 15.00 cents and closed at 16.00 cents.

Magnesium.—Dow Chemical Co. recovered magnesium from sea water by the electrolytic method at its Freeport plant and at the Government-owned Velasco plant; the latter plant operated under a lease agreement with the Government. The 1955 production of magnesium in Texas declined for the second consecutive year, notwithstanding a marked increase in demand from 1954. Wrought and cast structural products consumed a significant part of the primary magnesium in 1955. Use of magnesium as a reducing agent in the production of titanium and zirconium and as an alloy for aluminum increased notably in the last 2 years. The price of magnesium opened 1955 at 27 cents per pound, the same as it was throughout 1954. then rose to 28.5 cents per pound on March 21 and to 32.5 cents per pound on August 16, at which price it closed the year.

Manganese.—Manganese ore imported from foreign sources was concentrated and processed at the Houston plant of the Tenn-Tex Alloy & Chemical Corp. in 1955 for use as an alloy agent in the

State's expanding steel industry.

Mercury.—With demand and price of mercury rising in 1955, exploration and development of mercury deposits in the Terlingua District of Texas were reactivated during the year by several producers. Lone Star Mercury, Inc., reopened the Maggie mine, an old producer, with development projects both on the surface and Terlingua Mercury Corp. conducted exploration and underground. development projects in the Fresno mine at the Campo de los Angeles lease. Both high- and low-grade ores were recovered from the development activities. Both companies erected retort furnaces to process the ore. Lone Star Mercury, Inc., and Big Bend Mining Co. The average price of mercury was diamond-drilled several leases. a record \$290.35 a flask in 1955; it ranged from a high of \$323 to \$325 a flask in March to a low \$253 to \$255 in August and closed the year at \$280 to \$284 a flask. Principal uses of mercury during the year were in electrical apparatus, agricultural insecticides and fungicides, and industrial and control instruments. A substantial quantity of mercury was required in installing a chlorine and caustic soda plant using mercury cells.

Silver.—A small quantity of silver was recovered from the smelting of lead-copper ores obtained from prospects in southwestern Texas

counties.

Tin.—The Longhorn tin smelter in Texas City, operated by the Tin Processing Corp. under an operating agreement with the Federal Facilities Corporation, continued as the only source of primary refined tin in the Western Hemisphere. The 1955 smelter output was less than 1954 partly because the plant was idle for almost 3 weeks commencing June 21 due to a labor strike. The smelter production averaged about 100 tons of refined metal a day, the entire output of

which was consigned to the Government stockpile.

Uranium.—Uranium prospecting in Texas continued during the year. Discoveries in rocks of many ages in widely separated areas were reported. However, the most important discoveries, and those that may prove economic, centered in Duval, Karnes, and Gonzales Counties southeast of San Antonio. The largest deposits are in Karnes County and consist of secondary uranium minerals disseminated in tuffaceous sandstone. Several companies conducted extensive surface drilling. Ore-grade discoveries were made and exploration continued at year end in the hope of developing enough tonnage to warrant mill construction or a purchasing depot.

Zinc.—A significant zinc-smelting industry with an annual rate of capacity of 180,000 tons of metal, not including a slag-fuming plant, operated in Texas in 1955. Horizontal-retort smelters were operated at Amarillo by the American Smelting & Refining Co. and at Dumas by the American Zinc Co. of Illinois. American Smelting & Refining Co. operated an electrolytic zinc plant at Corpus Christi. Ore processed at the primary plants originated in other Western States and foreign countries. All plants operated at near capacity as domestic metal consumption reached a record high of 1.1 million tons compared

with the 1954 consumption of 884,000 tons. Galvanizing and die casting continued to be the principal uses of zinc, consuming nearly 80 percent of the primary zinc consumed in 1955. The 1955 average zinc price was 12.30 cents per pound compared with the 1954 average of 10.69 cents; the price opened at 11.50 cents per pound and rose steadily to a closing price of 13.00 cents at the end of the year.

#### **NONMETALS**

With few exceptions, the 1955 production of nonmetals in Texas exceeded the 1954 output as industrial activity in the State continued to new records. Increased demand from industry and agriculture and discoveries of new sulfur deposits in both Texas and Louisiana were responsible for the expanded 1955 output of sulfur. Production of construction materials (cement, clay, gypsum, lime, sand and gravel, and stone) followed closely the increased construction activity within the State. Residential construction accounted for most of the rise during the first half of the year, whereas industrial, commercial, and public works were the principal factors during the second half. Major markets for nonmetallic minerals were located within the

Abrasives.—Abrasives in the form of grinding pebbles were re-

covered from Travis County deposits by the Dezendorf Marble Co.

Barite.—Although no deposits of barite were known in Texas, several companies ground and processed barite from other States and imported material. The oil and gas industry continued to be the major consumer of ground barite used in heavy drilling mud. Bariteprocessing plants were in Cameron, Harris, and Nueces Counties. Additional markets for barium compounds were the leather industry, which used barium chloride as a case-hardening agent; the brick industry, to prevent scum forming on the surface of the brick; and the glass and ceramic industries, which used barium carbonate as an ingredient.

Bromine.—Bromine was recovered from sea water at the Freeport, Tex., plant of Ethyl Dow Chemical Co. The bromine content of sea water averages about 60 to 70 parts per million. The bulk of the Texas output was consumed as ethylene dibromide, an additive to tetraethyl lead. A significant portion of the production was consumed by the oil-refining industry within the State, while the remainder was shipped to other States. Minor quantities of bromine were used in manufacturing organic and inorganic chemicals and

photographic materials.

Cement.—Near-capacity operation of Texas cement plants prevailed throughout most of 1955, as demand for building materials The 1955 output was nearly 10 percent greater than that in 1954. Temporary shortages for cement developed in several localities within the State. Expansion and improvement programs of Texas cement plants reported to Pit and Quarry and the Bureau of Business Research of the University of Texas follow. A new expansion program was begun at the Dallas plant of General Portland Cement Co. New facilities included a 425-foot kiln with additional grinding and other processing facilities, which would double the plant's rated capacity of 1.25 million barrels. The Ideal Cement Co.

was expanding its Houston plant with addition of a 450-foot kiln and related facilities to increase the annual production of cement from the present 1.3 million barrels to 2.775 million. New capacity production was expected by July 1956. Longhorn Portland Cement Co. raised its San Antonio plant capacity 700,000 barrels to 2.5 million barrels, with installation of a new kiln, a cooler, and a grinding Expansion programs to be completed in 1956 were begun at the Dallas and Houston plants of Lone Star Cement Corp. The Dallas plant—the first of Lone Star's extended system—has been in continuous production for over half a century; it was to be expanded by installation of 2 additional kilns with the necessary auxiliary facilities, increasing its rated capacity 1.4 million barrels to a total of 3.7 million barrels. To supplement the raw-material deposits a 746-acre tract 4½ miles from the Dallas plant was acquired, estimated to contain enough limestone for the manufacture of 300 million barrels of cement. At the company Houston plant a third large kiln, with additional auxiliary equipment, was to be built. These new installations will increase plant capacity 1.1 million barrels. The Texas Portland Cement Co., a newcomer to the Texas cement industry, began clearing a site 6 miles north of Orange, Tex., for construction of a new \$3 million cement plant. Production was expected to begin early in 1957.

TABLE 17.—Portland cement produced and shipped, 1946-50 (average), and 1951-55
(376-pound barrels)

		1	Shipments	
Year	Production (barrels)		Valu	е
Teal	(barreis)	Barrels	Total	Average per barrel
1946-50 (average) 1951 1952 1953 1994 1955	13, 795, 240 18, 132, 373 19, 997, 983 19, 253, 677 21, 541, 325 24, 241, 443	13, 831, 174 17, 642, 654 19, 849, 455 19, 140, 193 21, 928, 170 24, 038, 427	\$29, 499, 711 42, 648, 536 48, 042, 901 48, 497, 762 56, 674, 124 64, 820, 374	\$2. 13 2. 43 2. 44 2. 53 2. 53 2. 70

Clays.—Output of Texas clays continued to rise as demand for building products remained high owing to the building boom in 1955. Four types of clay were produced in Texas—bentonite, fuller's earth, fire clay, and miscellaneous clay. Miscellaneous clay, which includes shale, composed over 80 percent of the output, with brick and cement industries consuming the bulk of it. Although shale deposits are extensive and widely distributed over the State, only those near the larger centers of population had economic value. Fire clay was used principally in manufacturing heavy clay products and some low-temperature refractory bricks and shapes. Bentonitic clays were used principally as filtering and decolorizing agents for vegetable, mineral,

and animal oils and as additives to heavy drilling mud. Other uses included insecticides, fungicides, and as fillers for asphalt; minor quantities were used in cement and refractories. Fuller's earth was used as a filtering and decolorizing agent and as a filler.

TABLE 18.—Clays sold and used by producers, 1946-50 (average) and 1951-55, by kinds

	Ben	tonite	Fir	e clay		Full	er's earth
Year	Short tons	Value	Short tons	Va	lue	Short tons	Value
1946-50 (average)	38, 425 31, 386 47, 887 105, 744	\$248, 969 212, 670 584, 938 670, 300 1, 299, 380 1, 461, 873	246, 482 320, 238 358, 466 356, 211 347, 247 437, 595	76 1,06 91 2,18	8, 924 4, 228 4, 005 5, 575 7, 866 8, 664	103, 823 142, 273 105, 565 106, 437 62, 788 (¹)	1, 952, 304 1, 030, 005 1, 277, 670
Year		Miscell	laneous cla	ıy		Tot	al
		Short tons	Val	lue	Sho	rt tons	Value
1946-50 (average) 1951 1952 1963		1, 309, 33 1, 716, 11 1, 573, 60 1, 860, 44 1, 885, 14	7 2,01 3 1,79 0 1,81	50, 858 15, 763 91, 234 15, 429 24, 643	2, 2, 2,	684, 096 217, 053 069, 020 370, 975 400, 924	\$3, 290, 008 4, 944, 965 4, 470, 182 4, 678, 974 7, 002, 024

2, 504, 236

2, 569, 385

2 3, 096, 959

3 5, 099, 922

The brick, tile, ceramic, and lightweight-aggregate industries of Texas expanded and modernized plants, in line with improved markets. A new \$400 thousand brick plant, with an estimated capacity of 1.3 million brick equivalents monthly, was built by the Athens Brick Co., Inc., at Athens. The addition of new equipment and a plant-modernization program at the Builders Brick & Stone Co. plant at Lolita was completed. The brick plant, long idle, was purchased by the owners of the Laredo Brick Co. Payne Brick Co. erected a new plant near Elgin with a rated capacity of 40 thousand brick per day. Other brick and ceramic companies expanding or improving their plant facilities included the Hondo plant of Universal-Rundle Corp., the Mineral Wells plant of Texas Vitrified Pipe Co., the Elgin plant of the Elgin-Butler Brick Co., the Henderson plant of the Henderson Clay Products Co., the Ranger lightweight-aggregate plant of the Feather Lite Corp., the Gilmer plant of Gilmer Potteries, Inc., and the Kilgore plant of Kilgore Ceramics.

Feldspar.—Feldspar was mined and processed by the Dezendorf

Marble Co. as a roofing material.

Gem Stones.—Gem stones collected, bartered, and polished by hobbyists and dealers in 1955 were valued at an estimated \$115,000. A wide variety of stones, including agate, petrified wood, garnet, topaz, opal, amethyst, and obsidian, was reported from counties in central, south, and west Texas.

<sup>&</sup>lt;sup>1</sup> Figures withheld to avoid disclosing individual company confidential data.
<sup>2</sup> Incomplete total; excludes fuller's earth.

Graphite.—Graphite was mined and processed by the Southwestern Graphite Co. at its Burnet County pit and plant during 1955.

Gypsum.—Demand for gypsum building materials was so great during 1955 that local shortages of these products developed in several metropolitan areas. The accelerated construction activity resulted in an 11-percent increase in crude-gypsum output to a record 1.3 million tons. The bulk of this crude production was used in manufacturing wallboard, lathe, and building plasters. Production was reported from four counties—Fisher, Hardeman, Hudspeth, and Nolan.

TABLE 19.—Gypsum mined and calcined gypsum produced, 1946-50 (average) and 1951-55

	Crude gypsum mined			Calcined gypsum produced			
Year	Short	Value		Short	Value		
	tons	Total	Average per ton	tons	Total	Average per ton	
1946-50 (average) 1951 1952 1953 1954 1955	883, 303 1, 136, 824 1, 021, 161 1, 067, 854 1, 218, 048 1, 349, 434	\$2, 145, 038 2, 987, 890 2, 682, 019 2, 860, 633 3, 773, 230 4, 219, 652	\$2. 43 2. 63 2. 63 2. 68 3. 10 3. 13	60, 192 793, 562 707, 654 730, 083 1820, 778 927, 890	\$4, 091, 858 6, 509, 550 5, 960, 375 7, 020, 270 1 8, 776, 259 10, 590, 741	\$6. 81 8. 20 8. 42 9. 50 1 10. 72 11. 41	

<sup>1</sup> Revised figure.

Lime.—The 7-percent increase in Texas lime output during 1955 stemmed from demands of the growing chemical and building industries. The bulk of the lime was consumed by industries within the State, only minor quantities being shipped to surrounding States. Production was reported from seven counties—Comal, El Paso, Harris, Johnson, Nueces, Travis, and Williamson. Lime producers in Harris and Nueces Counties used oystershell as the raw material, while producers in the inland counties used limestone.

TABLE 20.—Lime (quick and hydrated) sold by producers, 1946-50 (average) and 1951-55

	Quicklime (short tons)	Hydrated lime (short tons)	Total	
Year			Short tons	Value
1946-50 (average) 1951 1952 1963 1954 1955	113, 171 212, 784 209, 904 256, 000 306, 433 307, 322	49, 883 67, 173 71, 700 219, 569 241, 003 277, 533	163, 054 279, 957 281, 604 475, 569 547, 436 584, 855	\$1, 544, 973 2, 532, 387 2, 622, 975 4, 380, 831 5, 421, 732 5, 549, 309

Magnesium Compounds.—The Dow Chemical Co. produced compounds of magnesium from sea water at its Freeport plant during 1955.

Perlite (Expanded).—Although no deposits of perlite are known in Texas, the crude material from other Western States was expanded at 6 plants in 4 counties. The bulk of the expanded material was

used as a lightweight aggregate in concrete and building plasters; smaller quantities were used for insulating purposes.

Pumice (Volcanic Ash).—Pumice, used principally as an aggregate in lightweight concrete and for acoustic plaster, was produced in Dickens, Scurry, and Starr Counties. Other uses included cleaning and scouring compounds.

Salt.—The growing demand of the expanding chemical industry resulted in a 25-percent increase in salt production to a record 3.6 million tons in 1955. The immense reserve in the salt domes of Texas was an important favorable factor for locating and expanding the chemical industries in the State. The bulk of Texas production was recovered from these domes as brine. Most of the output was consumed within the State in manufacturing chlorine, hydrochloric acid, chlorine bleaches, and other chlorine and sodium chemicals.

TABLE 21.—Salt sold or used by producers, 1946-50 (average) and 1951-55

Year	<b>87</b>	Value				Value	
Tear	Short tons	Total	Average per ton	Year	Short tons	Total	Average per ton
1946-50 (average) 1951 1952	1, 427, 526 2, 401, 063 2, 640, 209	\$2, 085, 139 4, 000, 100 4, 402, 032	\$1.46 1.67 1.67	1953 1954 1955	2, 864, 312	\$5, 010, 624 9, 310, 339 12, 867, 094	\$1. 76 3. 25 3. 59

Sand and Gravel.—With residential, industrial, commercial, and highway construction activity increasing moderately over that in 1954, sand and gravel production in Texas increased 20 percent to a record 31.5 million tons in 1955.

Commercial sand and gravel composed nearly 79 percent of the 1955 output and 93 percent of the value, with Government-and-contractor operators the remainder. Principal uses for sand and gravel were for building, paving, and road purposes. Nearly 84 percent (21 million tons) of the 1955 output was washed, screened, or otherwise prepared. The value of the washed and prepared material averaged \$1.10 per ton in 1955 compared with \$1.12 in 1954. Unprepared or pit-run material was valued at \$0.39 per ton in 1955

TABLE 22.—Sand and gravel sold or used by producers, 1946-50 (average) and 1951-55

	Commercial operations		Government-and- contractor operation		Total sand and gravel		
Year	Year Short tons Value		<b>6</b> 7			Value	
	Value	Short tons	Value	Short tons	Total	Average per ton	
1946–50 (average) 1951 1952 1953 1953 1954 1955	12, 873, 110 14, 657, 441 15, 998, 314 11, 866, 963 23, 136, 286 24, 973, 270	\$11, 727, 120 14, 775, 101 16, 602, 593 12, 426, 922 23, 892, 530 26, 303, 453	1, 625, 897 3, 831, 022 2, 663, 089 3, 234, 263 3, 179, 349 6, 544, 853	\$395, 525 876, 430 672, 662 418, 639 948, 281 2, 176, 897	14, 499, 007 18, 488, 463 18, 661, 403 15, 101, 226 26, 315, 635 31, 518, 123	\$12, 122, 645 15, 651, 531 17, 275, 255 12, 845, 561 24, 840, 811 28, 480, 350	\$0. 8 . 8. . 9: . 84 . 94 . 90

TABLE 23.—Uses of sand and gravel produced in 1955

		Valu	e			Value	-
Use	Short tons	Total	Aver- age per ton	Use	Short tons	Total	Average per ton
Sand: Engine sand Molding sand Paving sand Railroad-ballast sand Structural sand. Other sand Undistributed 1 Total	52, 266 59, 615 5, 485, 430 54, 879 5, 105, 976 350, 067 333, 448 11, 441, 681	364, 941 1, 126, 358	2.06 .66 .80 1.01 1.04	Railroad-ballast gravel Structural gravel Other gravel Total	569, 713 5, 897, 032 1, 622, 828	7, 355, 909	. 50 1.24 . 40

<sup>1</sup> Includes glass sand, blast sand, and filter sand.

The Texas Highway Departcompared with \$0.53 per ton in 1954. ment was responsible for most of the Government-and-contractor production.

Sodium Sulfate.—Sodium sulfate was obtained from well brines in Ward County by the Ozark-Mahoning Co. The brines were processed into salt cake at a plant near Monahans.

Stone.—The Texas stone industry was taxed to its capacity at times to meet the growing demands of construction activities during the A record output of 27.3 million tons was 6 percent greater than the record 1954 output and was the sixth largest commodity in value in the State's impressive mineral production. Output included

TABLE 24.—Stone sold or used by producers, 1951-55

		Limestone		Sandstone		Oystershell	
Year	Short tons	Value	Short tons	Value	Short tons	Value	
1951 1952 1953 1954 1955		5, 928, 140 5, 343, 324 6, 251, 667 13, 482, 633 14, 102, 882	\$6, 464, 008 6, 634, 047 6, 404, 938 14, 385, 288 16, 080, 861	376, 957 879, 561 (2) (2) 1, 322, 724	\$276, 847 667, 671 (2) (2) 1, 328, 537	(1) (1) (1) 10, 314, 050 11, 084, 797	(1) (1) (1) \$12, 193, 31( 14, 763, 23)

	Miscell	aneous	Total		
Year	Short tons	Value	Short tons	Value	
1951	1, 035, 297 1, 265, 484 2, 022, 271 1, 297, 563 724, 216	\$581, 767 739, 670 1, 090, 319 1, 111, 646 699, 916	* 7, 351, 069 4 7, 604, 468 5 9, 095, 109 2 25, 840, 338 7 27, 321, 444	\$ \$7, 626, 122 4 8, 664, 633 5 8, 550, 320 3 6 29, 343, 684 7 33, 543, 782	

1 Data not available.
2 Bureau of Mines not at liberty to publish; included in total.
3 Excludes certain stone; Bureau of Mines not at liberty to publish.
4 Includes 116,099 tons of granite marble and basalt valued at \$623,245.
5 Includes granite and marble.
6 Revised figure.
7 Includes granite marble.

7 Includes granite, marble, and basalt.

basalt and other igneous rocks, limestone, sandstone, marble, granite, and oystershell. Limestone, including that portion used for cement and lime, composed 52 percent of the output, with oystershell (some of which was likewise used for cement and lime), 41 percent of the output. The remainder was divided among marble, granite, sandstone, and miscellaneous stone. Commercial operations furnished 84 percent of the total output, with Government-and-contractor operations, principally those of the Texas Highway Department, re-

sponsible for the noncommercial production.

Sulfur.—Texas continued as the Nation's major source of sulfur. with a record 3.9 million tons in 1955, an increase over the previous record of 3.6 million tons in 1954. This increased output represented response to increased demands from the heavy chemical industries, increased industrial activity, and development of new, large sulfur deposits. Frasch mines supplied 3.8 million tons of the total; 115,000 tons was recovered in purifying natural gas. With the prospect of future high-level demand, two of the State's major sulfur producers— Texas Gulf Sulphur Co. and Freeport Sulphur Co.—paid over \$9 million for lease rights in the Tidelands area. Production was reported from five counties: Brazoria, Fort Bend, Jefferson, Liberty, The Hoskins Mound sulfur deposit of Freeport Sulphur Co., the oldest Frasch mine in the country with a total production record of nearly 11 million tons, was closed in May 1955 owing to depletion of reserves.

TABLE 25.—Sulfur produced and shipped from Frasch mines, 1946-50 (average) and 1951-55

	.001 00			
			Shipments	
Year	Production (long_tons)	Tomata	Valu	16
		Long tons	Total	Average per ton
1946–50 (average)	3, 592, 845 3, 966, 956 3, 784, 595 3, 514, 797 3, 505, 087 3, 657, 717	3, 810, 799 3, 835, 280 3, 691, 724 3, 614, 838 3, 474, 477 3, 766, 882	\$67, 918, 501 81, 900, 000 78, 910, 000 97, 601, 000 92, 791, 821 105, 128, 170	\$17. 82 21. 35 21. 37 27. 00 26. 71 27. 91

Talc and Soapstone.—Talc and soapstone, used principally for insecticides and roofing granules and in the ceramic and rubber industries, was produced in two counties in 1955. Output was over 80 percent greater than that in 1954.

Vermiculite (Exfoliated).—Exfoliated vermiculite, the crude prod-duct of which was from other States, was expanded at plants in three counties and used principally as a lightweight aggregate for

plaster, for insulation, and as a soil conditioner.

Water.—The water supply problem of Texas, which had been acute in some areas, was aggravated further by the continued drought over most of the State during 1955. Use of culinary water was restricted in some cities and many smaller towns as reservoir supplies diminished under increased demand and unusually high summer temperatures. Increased demand from industry, from homes, and for irrigation purposes had taxed the State's available water supplies

to the utmost. Federal, State, and local agencies were laying plans to add to the reservoir capacities, particularly in large inland urban centers.

### REVIEW BY COUNTIES

Mineral production was reported from 233 of the 254 Texas counties in 1955. This mineral distribution included liquid mineral fuels from 199 counties scattered over most of the State, solid fuels from 2 counties in the central part of the State, nonmetallic minerals from 149 counties, and metallic minerals from 5 counties.

TABLE 26.—Value of mineral production in Texas, 1954-55, by counties 1

County	1954	1955	Minerals produced in 1955 in order of value
	242 000 451	\$16, 646, 924	Petroleum, natural gas, natural-gas liquids.
Anderson	\$12, 330, 451	150,040,524	Do.
Andrews	138, 794, 777	156, 800, 567	Clare potroleum
Angelina	478, 390		
Aransas	12, 046, 620	11, 498, 065	Petroleum, natural gas, sneh. Petroleum, natural gas, natural-gas liquids, sand
Archer	26, 129, 660	26, 000, 945	Petroleum, material gas, marting
ALCHO!	. 41.		and gravel. Petroleum, natural-gas liquids, sand and gravel,
A tascosa	12, 384, 139	18, 189, 867	
A da soom			Petroleum, natural gas, sand and gravel.
Austin	8, 141, 013	7, 905, 645	
Bailey	300		Petroleum, clays, sand and gravel, natural gas.
Bastrop	1, 346, 076	849, 207	
Baylor	3, 181, 308	3, 718, 265	Petroleum, sand and graver, hadden gas.
Bee	14, 497, 177	22, 220, 902	Petroleum, sand and graver, natural gas. Petroleum, natural-gas liquids, natural gas.
Dee	388, 564	690, 849	Sand and gravel, stone. Cement, stone, clays, sand and gravel, petroleum,
Bell	12, 601, 366	14, 851, 845	Cement, stone, clays, sand and graver, performance
Bexar	12, 001, 000		natural gas.
73	25, 875		
Blanco	17, 199, 607	18, 700, 086	Petroleum, natural gas.
Borden	4, 153	18, 400	Sand and gravel.
Bosque	339, 232	321, 308	Sand and gravel, petroleum, natural gas. Sand and gravel, petroleum, natural gas. mag-
Bowie	159, 405, 500	212, 432, 604	
Brazoria	109, 400, 000	212, 102, 002	
	. 1		magnesium compounds, sand and gravel.
	00 040	20, 720	
Brazos	20, 842	217, 178	Clays, sand and gravel, stone, mercury.
Brewster	61, 310	179, 935	
Briscoe	98, 034	17, 289, 453	m . i motumol god naturalegas illillus.
Brooks	20, 247, 991	0 042 001	Petroleum, natural gas, natural gas, clays, sand and
Brown	2, 537, 325	2, 243, 821	gravel.
		4 7700	Detugloum
Burleson	4, 695	4, 738 1, 405, 314	Stone, graphite, sand and gravel.
Burnet	2, 521, 726	1, 405, 314	Petroleum, natural gas.
Caldwell	7, 724, 899	8, 599, 443	Petroleum, natural gas. Natural gas, petroleum, natural-gas liquids, shell,
Calhoun	9, 342, 380	11, 792, 721	Natural gas, perioleum, natural gas
Camoun			sand and gravel.
Callahan	6, 078, 756	9, 172, 876	Petroleum, natural gas.
Cameron	338		
Camp	699, 161	793, 104	Do. Natural gas, petroleum, natural-gas liquids. natura
Carson	25, 341, 041	20, 534, 245	Natural gas, petroleum, natural-gas liquids, natura
Cass	2, 444, 256	3, 460, 155	Petroleum, iron ore, natural-gas liquids, natural
Cass	2, 111, 200		gas.
Cl bana	62, 877, 694	65, 332, 364	gas. Petroleum, natural gas, natural-gas liquids, shell
Chambers	02, 011, 001	,	
GIIron	2, 658, 363	6, 407, 493	Petroleum, iron ore, clays, natural gas.
Cherokee	11, 258	-,,	
Childress	16, 042, 060	18, 543, 119	Petroleum, natural gas, natural-gas liquids.
Clay	23, 177, 956	23, 784, 397	
Cochran	20, 177, 500	50, 243, 984	Petroleum, natural-gas liquids, natural gas, sand
Coke	41, 672, 588	00, 210, 001	
	10 474 496	10, 934, 664	Petroleum, natural gas, sand and gravel, clays
Coleman	10, 474, 436	10, 301, 001	natural-gas liquids.
	<b>≠ 900</b>	90, 581	Stone
Collin	7, 389	157, 613	
Collingsworth	159, 432		
Colorado	16, 889, 386	23, 476, 410	l potroloum stone
		0 007 004	
Comal	2, 525, 749	2, 807, 084	Petroleum, natural gas.
Comanche	626, 388	470, 383	
Concho	100, 125	74, 922	Do. Petroleum, natural-gas liquids, natural gas. san
Cooke	22, 357, 769	23, 865, 255	Petroleum, matural-gas inquitos, matural gas,
	1,,	1	and gravel.
	1		
CoryellCottle	81,000	122, 334 42, 866	

See footnotes at end of table.

TABLE 26.—Value of mineral production in Texas, 1954-55, by counties 1—Con.

Crosby	County	1954	1955	Minerals produced in 1955 in order of value
Crocket.   25, 358, 283   25, 407, 583   Crollberson   10, 774   10   10   10, 774   10   10   10   10   10   10   10   1	Crane	\$60, 178, 909	\$67, 178, 247	
Dawson	Crockett	25, 358, 238		Petroleum, natural gas, natural-gas liquids.
Dawson	Culberson	10, 774	61 600	Sand and gravel netural gen
Dickens   103, 355   93, 755   Petroleum, natural-gas liquids, satural gas, stor sand and gravel. Petroleum, natural gas, clays natural gas, stor sand and gravel. Petroleum, natural gas, clays, natural-gas liquids, satural-gas liquids, sa	Dallas	17, 400, 819	21, 158, 769	Cement, sand and gravel, clays, stone
Dickens   103, 355   93, 755   Petroleum, natural-gas liquids, satural gas, stor sand and gravel. Petroleum, natural gas, clays natural gas, stor sand and gravel. Petroleum, natural gas, clays, natural-gas liquids, satural-gas liquids, sa		7, 804, 847	9, 048, 960	Petroleum, stone, natural gas.
Dickens	Denton	1, 479, 731	1, 243, 348	Sand and gravel, petroleum, clays.
Dimmit	De Witt.	11, 276, 297	12, 797, 666	Petroleum, natural-gas liquids, natural gas, stone.
Drimit	Dickens	103, 355	93, 755	Petroleum, stone, pumicite, sand and gravel.
Ector	Dimmit	164, 326	422, 858	Petroleum.
Ector	Duval	38, 870, 310	42 100 186	Petroleum natural cas natural cas liquida calt
Edwards. \$ 3,437	Eastland	6, 282, 481	3, 667, 177	Petroleum, natural gas, clays, natural-gas liquids, sant.  and and gravel
Petroleum   Petroleum   Petroleum   Sand and gravel   December				Petroleum, natural-gas liquids, natural gas, re- covered sulfur, stone.
El Paso	Edwards	8,843	2, 940	l Petroleum.
Falls	El Paso	209, 127	175, 008	Clays, stone, petroleum, sand and gravel.
Fanis	Erath	164 670 1	0, 520, 308	Cement, stone, sand and gravel, lime, clays, silver.
Fayette. 2, 266, 051 2, 094, 204 Pisher. 16, 043, 575 17, 177, 319 Pisher. 16, 043, 575 17, 177, 319 Pisher. 16, 043, 575 17, 177, 319 Pisher. 16, 043, 575 17, 177, 319 Pisher. 16, 043, 575 17, 177, 319 Pisher. 16, 043, 575 17, 177, 319 Pisher. 16, 043, 575 17, 177, 319 Pisher. 16, 043, 575 17, 177, 319 Pisher. 16, 043, 301, 309 48, 666, 901 Pisher. 16, 043, 301, 309 48, 666, 901 Pisher. 16, 043, 301, 309 48, 666, 901 Pisher. 16, 043, 301, 309 48, 666, 901 Pisher. 16, 043, 301, 309 48, 666, 901 Pisher. 16, 043, 301, 309 48, 666, 901 Pisher. 17, 301, 301, 301, 301, 301, 301, 301, 301	Falls	35, 317	67, 858	Sand and gravel natroloum
Floyd	Fannin		27, 260	Sand and gravel
Floyd	Fayette	2, 266, 051	2, 094, 204	Petroleum, clays, sand and gravel, stone.
Floyd	Fisher	16, 043, 575	17, 177, 319	Petroleum, gypsum, natural gas, natural-gas
Foord   234, 311   355, 972   Petroleum, stone, natural gas, sand and gravel.	Floyd	24 495	20 002	liquids.
Franklin	Foard	234, 311	355 079	Patroleum stone natural gas and and gravel
Franklin	Fort Bend	49, 330, 309	48, 696, 901	Petroleum, sulfur, natural gas, salu and gravel.
Petroleum, natural gas.   Petroleum, natur		the second of	10, 000, 001	gravel.
Petroleum, natural gas, natural-gas liquids,   Petroleum, natural gas, natural-gas liquids,   Petroleum, natural gas, natural-gas liquids,   Petroleum, natural gas, natural-gas liquids,   Petroleum, natural gas, natural-gas liquids,   Petroleum, natural gas, natural-gas liquids,   Petroleum, natural gas, natural-gas liquids,   Petroleum, natural gas, natural-gas liquids,   Petroleum, natural gas, natural-gas liquids,   Petroleum, natural gas, natural-gas liquids,   Petroleum, natural gas, natural-gas liquids,   Petroleum, natural gas, natural-gas liquids,   Petroleum, natural gas, natural-gas liquids,   Petroleum, natural gas,   Pet	Franklin	13, 072, 254	14, 004, 164	Petroleum, natural gas.
Gaines. 56, 503, 778	Frie	1, 684, 328	1, 693, 738	Natural gas, petroleum, clays, sand and gravel.
Garza   12, 282, 586   131, 415   70, 993   70, 994   70, 994   70, 994   70, 994   70, 994   70, 994   70, 994   70, 994   70, 995	Gaines	10, 514, 401 56, 602, 770	10, 607, 104	Petroleum, natural gas.
Gallespie 131, 415 70. 934 14. 898, 393 Goliad 11, 945, 304 11, 945, 304 Golad 11, 945, 304 14. 898, 393 Goliad 11, 945, 304 11, 945, 304 Grayson 22, 482, 264 27, 819, 337 Greg 156, 284, 720 116, 520 99, 152 Gradalupe 11, 067, 671 14ale 6, 651, 294 7, 201, 2490 Hanll 22, 129 41, 800 Hall 22, 129 Hardin 32, 2925, 282 Harris 107, 292, 344 Harrison 15, 230, 362 Harrison 15, 230, 362 Harrison 15, 230, 362 Harrison 15, 230, 362 Harrison 15, 230, 362 Harrison 15, 230, 362 Harrison 15, 230, 362 Harrison 15, 230, 362 Harrison 15, 230, 362 Harrison 15, 230, 362 Harrison 15, 230, 362 Harrison 15, 230, 362 Harrison 16, 24, 74, 74, 74, 74, 74, 74, 74, 74, 74, 7	Galveston	28 362 908 1	34 800 196	Petroleum, natural gas, natural-gas liquids.
11, 095, 304   11, 412, 699   266, 229   27, 819, 337   27, 819,		12, 282, 856	14 741 965	Petroleum, sand and gravel natural gas
11, 095, 304   11, 412, 699   266, 229   27, 819, 337   27, 819,	Gillespie	131, 415	70, 093	Sand and gravel, talc. soapstone.
Petroleum, natural gas, natural-gas liquids, san and gravel.	Glasscock	18, 470, 994	14, 898, 398	Petroleum, natural gas.
Petroleum, natural gas, natural-gas liquids, san and gravel.	Congolos	11, 095, 304	11, 412, 699	
Grege         156, 294, 720         27, 819, 337         Petroleum, natural gas, sand and gravel.           Grimes         116, 520         99, 152         180, 766, 676         Petroleum, natural gas, natural-gas liquids.           Guadalupe         11, 067, 671         12, 212, 863         Petroleum, natural gas, natural-gas liquids.           Hale         6, 651, 294         7, 214, 690         Petroleum, natural gas.           Hamilton         169, 490         143, 133           Harsis         5, 474, 722         2, 549, 814           Hardin         32, 925, 282         40, 286, 232           Harris         107, 292, 344         119, 532, 422           Harris         107, 292, 344         119, 532, 422           Harris         15, 230, 362         17, 426, 803           Hartley         2, 546, 568         2, 563, 980           Haskell         9, 367, 438           Hays         1, 416, 012           Hemphill         728           Hockley         48, 778, 448           Hockley         48, 778, 448           Hood         3, 887           Howard         40, 016, 236           Houston         4, 068, 479           Howard         463, 308           Houston	Gray	51, 736, 582	47, 901, 490	Petroleum, natural gas, natural-gas liquids, sand
Hall	Grayson	22, 482, 264	27, 819, 337	Petroleum, natural gas, sand and graval
Hall	Gregg	156, 284, 720	150, 706, 676	Petroleum, natural gas, natural-gas liquids
Hall	Grimes	116, 520	99, 152	Petroleum, natural gas.
Sand and gravel.   Sand and gravel.   Petroleum.   Natural gas, sand and gravel.   Petroleum.   Natural gas, sand and gravel.   Petroleum.   Natural gas, sand and gravel.   Petroleum.	Hele	11, 067, 671	12, 212, 863	Petroleum, clays, natural gas.
Hardeman   312, 692   40, 286, 232   Hardin   32, 925, 282   40, 286, 232   Petroleum, natural-gas liquids, natural gas, sand gravel.	Hall	2 120	7, 214, 690	Petroleum, natural gas.
Hardeman   312, 692   40, 286, 232   Hardin   32, 925, 282   40, 286, 232   Petroleum, natural-gas liquids, natural gas, sand gravel.	Hamilton	169, 490	143, 133	Natural gas sand and gravel netroleum
Hardeman   312, 692   40, 286, 232   Hardin   32, 925, 282   40, 286, 232   Petroleum, natural-gas liquids, natural gas, sand gravel.	Hansford	5, 474, 722	2, 549, 814	Natural gas, petroleum, natural-gas liquids.
Harris   107, 292, 344   119, 532, 422   219, 532, 422   119	Hardeman	812, 692	816, 374	Gypsum, petroleum.
Petroleum, ement, natural-gas liquids, natural gravel, stone.		32, 925, 282	40, 286, 232	Petroleum, natural-gas liquids, natural gas, sand
Harrison 15, 230, 362 17, 426, 803	Harris	107, 292, 344	119, 532, 422	Petroleum, cement, natural-gas liquids, natural gas, lime, salt, sulfur, clays, shell, sand and
Haskell		15, 230, 362	17, 426, 803	Natural gas, natural-gas liquids, netroleum, clave
Hemphill	Hartley	2, 546, 868	2, 563, 980	Natural gas, petroleum.
Accepted   Accepted	Haskell	9, 367, 438	9 609 570	Petroleum, natural gas, sand and gravel.
Natural gas, natural-gas liquids, petroleum, stone sand and gravel, clays.	Hays	1, 416, 012	155, 000	Sand and gravel.
Natural gas, natural-gas liquids, petroleum, stone sand and gravel, clays.	Henderson	5 990 004	20, 797	Sand and gravel, petroleum.
Stone, sand and gravel.   Petroleum, natural-gas liquids, natural gas, recovered sulfur.   Sand and gravel.   Petroleum, natural-gas liquids, natural gas, recovered sulfur.   Sand and gravel.   Sand and gravel.   Sand and gravel.   Petroleum, natural-gas liquids, natural gas, sand and gravel.   Petroleum, natural-gas liquids, natural gas, sand gravel, clays.   Petroleum, natural gas, natural-gas liquids, sand and gravel.   Petroleum, natural gas, sand gravel.   Petroleum, natural gas, sand gravel.   Petroleum, natural gas, sand gravel.   Petroleum, natural-gas liquids, natural gas, sand gravel.   Petroleum, natural-gas liquids, natural gas, sand gravel.   Petroleum, natural-gas liquids, natural gas, sand gravel.   Petroleum, natural-gas liquids, natural gas, sand gravel.   Petroleum, natural-gas liquids, natural gas, sand gravel.   Petroleum, natural-gas liquids, natural gas, sand gravel.   Petroleum, natural-gas liquids, natural gas, sand gravel.   Petroleum, natural-gas liquids, natural gas, sand gravel.   Petroleum, natural-gas liquids, natural gas, sand gravel.   Petroleum, natural-gas liquids, natural gas, sand gravel.   Petroleum, natural-gas liquids, natural gas, sand gravel.   Petroleum, natural-gas liquids, natural gas, sand gravel.   Petroleum, natural-gas liquids, natural gas, sand gravel.   Petroleum, natural-gas liquids, natural-gas liquids, natural-gas liquids, natural-gas liquids, petroleum, natural-gas liquids, natural-gas liquids, petroleum, natural-gas liquids, petroleum, natural-gas liquids, petroleum, natural-gas liquids, petroleum, natural-gas liquids, natural-gas liquids, petroleum, natural-gas liquids, petroleum, natural-gas liquids, petroleum, natural-gas liquids, petroleum, natural-gas liquids, petroleum, natural-gas liquids, petroleum, natural-gas liquids, petroleum, natural-gas liquids, petrole	Hidalgo	9, 129, 796	8, 171, 072	Natural gas, natural-gas liquids, natural gas, clays.
10, 294	Hockley	48, 778, 448	55, 556 48, 660, 419	Stone, sand and gravel.
Houston	Hood Hopkins	3, 887 7, 974, 559	10, 294 7, 939, 340	Sand and gravel.  Petroleum, natural-gas liquids, natural gas, sand
Hudspeth	Houston	4, 068, 479 40, 016, 236	3, 778, 007 43, 966, 241	Petroleum, natural gas, natural-gas liquids. Petroleum, natural gas, natural-gas liquids, sand
Hunt	Hudspeth	463 908	702 005	and gravel.
114 termison 97, 338, 943 48, 223, 566 Natural-gas liquids, petroleum, natural gas, sand	Hunt	3, 200, 221	69, 629	Petroleum.
i and graver.	Hutchinson	97, 338, 943	48, 223, 566	Natural-gas liquids, petroleum, natural gas, sand and gravel.

See footnotes at end of table. 457678—58——66

TABLE 26.—Value of mineral production in Texas, 1954-55, by counties 1—Con.

Irion Jackson Jasper Jeff Davis Jefferson Jim Hogg Jim Wells Johnson Jones Karnes Kaufman Kendall Kendely	\$167, 864 20, 854, 754 36, 436, 039 1, 016, 715 13, 500 42, 978, 747 4, 924, 651 53, 807, 066 625, 581 23, 147, 333 6, 884, 438	\$142, 223 23, 193, 962 45, 935, 015 843, 206 50, 803, 661 4, 221, 292 53, 769, 804 817, 524	Petroleum, natural gas. Petroleum, natural gas, stone, natural-gas liquids sand and gravel. Petroleum, natural-gas liquids, natural gas, san and gravel. Petroleum, natural gas, clays. Petroleum, sulfur, natural-gas liquids, natural gas shell, sand and gravel, clays.
Jasper Jeff Davis Jefferson Jim Hogg Jim Wells Johnson Jones Karnes Kaufman Kendall	1, 016, 715 13, 500 42, 978, 747 4, 924, 651 53, 807, 066 625, 581 23, 147, 333	843, 206 50, 803, 661 4, 221, 292 53, 769, 804 817, 524	Petroleum, natural-gas liquids, natural gas, san and gravel. Petroleum, natural gas, clays.  Petroleum, sulfur, natural-gas liquids, natural gas shell, sand and gravel, clays.
Jeff Davis Jefferson Jim Hogg Jim Wells Johnson Jones Karnes Kaufman Kendall Kenedy	13, 500 42, 978, 747 4, 924, 651 53, 807, 066 625, 581 23, 147, 333	50, 803, 661 4, 221, 292 53, 769, 804 817, 524	Petroleum, natural gas, clays.  Petroleum, sulfur, natural-gas liquids, natural gas shell, sand and gravel, clays.
Jefferson  Jim Hogg  Jim Wells  Johnson  Jones  Karnes  Kaufman  Kendall  Kenedy	4, 924, 651 53, 807, 066 625, 581 23, 147, 333	4, 221, 292 53, 769, 804 817, 524	sneil, sand and gravel, clays.
Jim Wells	625, 581 23, 147, 333	53, 769, 804 817, 524	Shell, sand and gravel, clays.
Jim Wells	625, 581 23, 147, 333	817, 524	Petroleum, natural gas.
Karnes Kaufman Kendall Konedy	23, 147, 333	99 592 579	Petroleum, natural gas, natural-gas liquids.
Karnes Kaufman Kendall	6 884 438	23, 536, 573	Lime, stone, sand and gravel. Petroleum, sand and gravel, stone, natural gas
Kaufman Kendall Kenedy		14, 210, 249	natural-gas liquids. Petroleum, natural-gas liquids, natural gas.
Kendall Kenedy	6, 884, 438 3, 861, 919	14, 210, 249 4, 189, 699	Petroleum, stone, natural gas.
Keneay	840  -	992, 524	Petroleum, natural gas, natural-gas liquids.
Kent	744, 190 19, 027, 674	21, 990, 350	Petroleum, natural gas.
Kerr	5,000	0.000	Defreilanza
k imble	8,922	8, 229 3, 486, 922	Petroleum, natural gas.
Klehero	3, 370, 160 8, 147, 489 3, 120, 703	15, 606, 209	Petroleum natural-gas liquids, natural gas.
King Kleberg Knox	3, 120, 703	3, 121, 266	Petroleum, natural gas, sand and gravel.
Lamar	14, 034	14, 050	Sand and gravel.
Lamb	213, 663	622, 544	Petroleum, natural gas. Sand and gravel.
Lampasas	274 650	622, 544 33, 750 440, 573	Petroleum, natural gas.
Lamb Lampasas La Salle Lavaca	274, 650 5, 779, 285	19, 827, 600	Natural-gas liquids, natural gas, stone, petroleun
	1	2 506	sand and gravel. Petroleum.
Lee	28, 894	2 270 290	Natural gas, petroleum.
LeonLiberty	28, 894 2, 290, 750 47, 890, 800	3, 596 2, 270, 290 55, 437, 563	Natural gas, petroleum. Petroleum, natural gas, natural-gas
Limestone	1, 649, 990	1, 752, 662	liquids, sand and gravel. Petroleum, natural gas, stone, sand and gravel.
Limestone Live Oak	7, 064, 908	12, 176, 607	Natural-gas liquids, natural gas, petroleum, san
Tlong	76 435	80.944	and gravel. Stone, feldspar.
Llano Loving Lubbock Lynn	76, 435 4, 731, 083 1, 363, 819 325, 608	80, 944 4, 891, 630	Petroleum, natural gas.
Lubbock	1, 363, 819	2, 179, 522	Petroleum, sand and gravel, natural gas.
Lynn	325, 608	252, 145	Petroleum, natural gas. Natural gas, petroleum.
Madison	752, 801 4, 140, 906	728, 657 4, 802, 880	Petroleum, natural gas, natural-gas liquids.
Marion	2, 168, 271	1, 722, 597	Petroleum, natural gas.
Mason	2, 168, 271 18, 678 28, 965, 368		limila abol
Mason	28, 965, 368	36, 249, 860	Petroleum, natural gas, natural-gas liquids, shell sand and gravel.
Maverick	10, 026	36, 449	Petroleum, natural gas.
McCulloch	8, 305	4,054	Petroleum, sand and gravel.
McLennan	3, 378, 441	3, 718, 400 3, 679, 018	Cement, sand and gravel, stone, petroleum. Petroleum, natural gas.
McMullen Medina	3, 378, 441 3, 210, 726 71, 960	85, 103	Petroleum, clays.
Menard	972	494	Petroleum.
Midland	48, 921, 234	52, 336, 111	Petroleum, natural gas, natural-gas liquids, ston
Milam	3, 225, 576 3, 427, 286	2, 934, 401 5, 190, 486	Petroleum, natural gas, sand and gravel. Petroleum, sand and gravel, natural gas.
Mitchell Montague	26, 621, 841	25, 520, 805	Petroleum, natural gas, natural-gas liquids, sai
Montgomery	39, 280, 953	43, 881, 953	and gravel. Petroleum, natural-gas liquids, natural gas, sar
Moore	36, 968, 968	31, 435, 256	and gravel. Natural gas, helium, natural-gas liquids, recovere
	4, 832, 234	4, 996, 349	sulfur, petroleum. Iron ore.
Morris Motley	4, 852, 254 3, 023	10, 600	Sand and gravel
Nacogdoches	1, 655, 984 j	1 509 081	Natural gas, clays, petroleum, sand and gravel.
Navarro	6, 509, 520	8, 358, 816	Petroleum, clays, sand and gravel, natural gas.
Newton	3, 217, 475 20, 856, 572	8, 358, 816 3, 430, 627 27, 294, 207	Petroleum, natural gas.  Petroleum, cement, gypsum, natural gas, ston
Nolan	77, 179, 837	80, 120, 762	Petroleum, cement, gypsum, natural gas, stor sand and gravel, natural-gas liquids. Petroleum, natural-gas liquids, natural gas, cemer
Nueces			lime, shell, sand and gravel.
Ochiltree	105, 786	105, 030 490, 452	Petroleum, natural gas. Sand and gravel, natural gas.
Oldham Orange	372, 437 16, 686, 199	16, 928, 948	i Patroloum natural cas
Palo Pinto	1, 548, 165	1, 152, 062	Petroleum, natural gas, natural-gas liquids, clay sand and gravel, stone.

See footnotes at end of table.

TABLE 26.—Value of mineral production in Texas, 1954-55, by counties 1—Con.

County	1954	1955	Minerals produced in 1955 in order of value
Panola Parker	\$57, 499, 040 1, 396, 178	\$55, 562, 256 356, 274	Petroleum, clays, natural-gas liquids, sand and
Pecos	50, 769, 689	51, 429, 607	Petroleum, natural gas, sand and gravel, natural-
Polk Potter	6, 209, 202 7, 494, 994	6, 414, 505 6, 416, 052	gas liquids, stone. Petroleum, natural gas, sand and gravel, stone. Natural gas, helium, sand and gravel, natural-gas liquids.
Presidio	90	65, 041	Mercury, silver.
Reagan Real	36, 984, 985 11, 542	48, 147, 569	Petroleum, natural-gas liquids, natural gas.
Red River	19, 533 1, 303, 208	7, 441	Petroleum.
Reeves	1, 303, 208	1, 504, 528	Petroleum, stone, sand and gravel, natural gas natural-gas liquids.
Refugio	62, 929, 197	70, 378, 573	Petroleum, natural gas, natural-gas liquids.
Robertson	4, 352, 622 605, 248 39, 298	70, 378, 573 4, 772, 828	Petroleum, natural gas, sand and gravel. Sand and gravel, petroleum, natural gas.
Rockwall	39, 298	hh4 hX2	I Sand and graval natroloum natural coc
Runnale	19, 057, 156	332, 664 21, 071, 577 88, 750, 559	Petroleum, natural-gas liquids, natural gas, stone.
Rusk San Jacinto	92, 279, 407	88, 750, 559	Petroleum, natural gas, natural-gas liquids, clays. Petroleum, natural gas, sand and gravel.
San Patricio	2, 522, 430 54, 821, 362	2, 477, 240 53, 375, 158	Petroleum, natural gas, sand and gravel.
		00, 010, 108	Petroleum, natural gas, natural-gas liquids, sand and gravel.
Schleicher	9, 331, 414 119, 774, 621	9, 499, 146 118, 265, 860	Petroleum, natural gas.
Scurry	119, 774, 621	118, 265, 860	Petroleum, natural gas, natural-gas liquids, sand
Shackelford	7, 533, 400	8, 333, 299	and gravel, pumicite. Petroleum, natural gas, sand and gravel.
Shelby	1, 837, 140	1, 821, 079	Natural gas, petroleum.
Sherman Smith	7, 533, 400 1, 837, 140 10, 010, 291 8, 253, 826	9, 952, 932 5, 714, 787	Do.
	0, 200, 020		Petroleum, natural-gas liquids, natural gas, sand and gravel, clays.
Somervell Starr	24, 580, 252	6, 351 24, 806, 075	Sand and gravel.  Petroleum, natural gas, natural-gas liquids, pumicite.
Stephens	12, 251, 100 1, 746, 340 23, 169, 450	9, 146, 053	Petroleum, natural gas, natural-gas liquids.
Sterling Stonewall	1,746,340	9, 146, 053 2, 215, 216 27, 351, 645	Petroleum, stone, natural gas.
Dionewan		27, 351, 645	Petroleum, sand and gravel, natural gas, natural- gas liquids.
Sutton	441, 751	420, 236	Natural gas, petroleum. Cement, sand and gravel, stone. Petroleum sand and gravel, slove, petroleum.
Tarrant	7, 791, 932	420, 236 8, 302, 797 5, 587, 017	Cement, sand and gravel, stone.
Taylor	52,076	0, 087, 017	Petroleum, sand and gravel, clays, natural gas.
Terry	441, 751 7, 791, 932 5, 172, 185 52, 076 16, 707, 524 9, 307, 590 11, 840, 719 4, 305, 501	20, 609, 212 10, 661, 888	Petroleum, natural gas, stone.
Throckmorton	9, 307, 590	10, 661, 888	Petroleum, natural gas, sand and gravel.
Titus Tom Green	4, 305, 501	5, 222, 155	Petroleum, natural gas. Do.
TravisTrinity	4, 305, 501 3, 022, 926 31, 549	12, 174, 184 5, 222, 155 2, 557, 187 14, 200	Stone, lime, sand and gravel, petroleum, abrasives,
Trinity	31, 549	14, 200	Natural gas.
Upshur	2, 611, 511 9, 682, 643	4, 058, 061 9, 525, 988 59, 365, 727	Petroleum, natural-gas liquids, natural gas.
Upton	58, 301, 367 2, 160, 014	59, 365, 727	Petroleum, natural gas, sand and gravel. Petroleum, natural-gas liquids, natural gas.
Tyler Upshur Upshur Uvalde Val Verde Van Zandt	2, 160, 014 600	2, 413, 212	Asphalt, basalt, sand and gravel.
Van Zandt	29, 086, 384	29, 160, 347	Petroleum, salt, natural gas, natural-gas liquids.
V 1000110	29, 086, 384 29, 326, 148 527, 957	29, 160, 347 29, 807, 847 218, 100	Petroleum, natural gas, sand and gravel, stone.
Walker Waller	527, 957 1, 141, 989	218, 100	Clays, petroleum. Petroleum, natural-gas liquids, natural gas, sand
Ward		32, 243, 754	and gravel.
	31, 900, 765	35, 766, 344	Petroleum, natural gas, natural salines, natural-gas liquids, sand and gravel, stone.
Washington	936, 189 6, 175, 823	903, 526 6, 232, 826 94, 913, 298	Petroleum, natural gas.
Webb Wharton	80, 775, 009	94, 913, 298	Petroleum, natural gas, sand and gravel, clays. Sulfur, petroleum, natural gas, natural-gas liquids.
Wheeler	0.040.00#		Sulfur, petroleum, natural gas, natural-gas liquids, sand and gravel.
Wheeler Wichita	6, 649, 805 38, 179, 664	4, 849, 496 31, 874, 269	Petroleum, natural-gas liquids, natural gas. Petroleum, natural gas, natural-gas liquids, sand and gravel.
Wilbarger	11, 954, 146	13, 918, 589	Petroleum, natural-gas liquids, natural gas, sand and gravel.
Willacy Williamson	8, 249, 828 982, 527	8, 475, 954	Petroleum, natural gas.
Wilson	4, 146, 556	976, 145 1, 488, 118	Stone, lime, petroleum, sand and gravel, natural gas. Petroleum, clays, natural gas.
Winkler	4, 146, 556 46, 687, 215	1, 488, 118 48, 663, 274	Petroleum, natural gas, natural-gas liquids, recovered sulfur
Wise	4, 430, 791	4, 286, 523	recovered sulfur Petroleum, stone, natural gas, natural-gas liquids, clays, sand and gravel.

See footnotes at end of table.

TABLE 26.—Value of mineral production in Texas, 1954-55, by counties 1—Con.

County	1954	1955	Minerals produced in 1955 in order of value		
Wood Yoakum Young	\$68, 720, 913 56, 232, 197 18, 484, 405	\$68, 624, 818 57, 636, 817 20, 393, 474	Petroleum, natural gas, natural-gas liquids. Petroleum, natural gas, natural-gas liquids, salt. Petroleum, natural-gas liquids, natural gas, sand and gravel.		
ZapataZavalaUndistributed 2	2, 578, 887 133, 590 936, 406	3, 115, 679 89, 068 2, 277, 616	Petroleum, natural gas. Natural gas, petroleum.		
Total 3	3, 732, 791, 000	3, 993, 310, 000			

<sup>1</sup> The following counties are not listed because no production was reported: Armstrong, Bandera, Castro, Dallam, Deaf Smith, Delta, Kinney, Lipscomb, Mills, Parmer, Rains, Randall, Sabine, San Augustine, San Saba, and Swisher.

San Saba, and Swisher.

Includes stone, sand and gravel, shell, and gem stones that cannot be assigned to specific counties.

The total has been adjusted to eliminate duplication in the value of clays and stone.

Anderson.—Anderson County oil and gas output increased significantly in 1955, and was the site of continuing petroleum exploration. Of 93 wells completed during the year, 34 were exploratory wells that resulted in discovery of the Slocum oilfield, 2 new oil pays, and 1 gascondensate well; 59 were development wells. Exploratory drilling totaled 170,077 feet. Natural-gas liquids were recovered at the Ware cycling plant of Sylvian S. Price and the Cayuga, Long Lake, and Royall-Cone cycling plants of Tidewater Associated Oil Co. The Neches field in Anderson and Cherokee Counties reported 56 oil-well completions in the Woodbine and 21 in the Sub-Clarksville formations. Petroleum production amounted to 4.0 million barrels; 34.3 billion cubic feet of natural gas was marketed.

Andrews.—This county ranked second in Texas in petroleum production. Natural-gas liquids were recovered by six gasoline plants. Petroleum produced during the year totaled 53.6 million barrels from 124 oilfields, 16 of which yielded over 1 million barrels each; natural-gas production totaled 71.1 billion cubic feet. The oil and gas industry maintained an active exploratory campaign during the year. Of 784 wells completed, 718 were development wells, and 66 were exploratory wells. Exploratory drilling totaled 573,592 feet and resulted in discovery of 4 oilfields, 11 new oil pays, and 7 oil extension wells.

Angelina.—Fuller's earth, bentonitic clays, and crude petroleum were produced. Exploratory drilling totaled 8,966 feet. The fuller's earth and bentonite were from open pits near Rockland and Zavalla. Production of 4,000 barrels of crude oil from the Genter field was reported. One exploratory well was drilled but proved nonproductive.

Aransas.—In Aransas County 3.7 million barrels of petroleum was produced from 62 oilfields; 13.6 billion cubic feet of natural gas was also produced in 1955. United Carbon Co. recovered carbon black at its Kosmos "A" plant. Shell was dredged from Copano Bay by Heldenfels Bros. for use in concrete. Exploratory drilling totaled 121,750 feet and resulted in discovery of 1 new oil pay and 2 new gas pays.

Archer.—The oil and gas industry produced 9 million barrels of petroleum from 115 oilfields (2 of which produced 1 million or more barrels each;) and 5.6 billion cubic feet of natural gas. Paving gravel was produced under contract for District 3 of the Texas Highway Department. Natural-gas liquids were recovered at the Chalk Hill

gasoline plant of The Texas Co. and at the Holliday gasoline plant of Warren Petroleum Corp. An intensive drilling campaign resulted in completing 799 wells, 746 of which were development wells and 53 exploratory wells. Exploratory drilling, totaling 256,929 feet, resulted in 19 oil discoveries, 5 new oil pays, and 3 oil extensions.

Atascosa.—Atascosa County produced principally oil and gas. addition, glass sand, building sand, and specialty sands were prepared by the Espey Silica Sand Co. and the West Land Silica Sand Co. Natural-gas liquids were recovered at the Jourdanton gasoline plant of Humble Oil & Refining Co. Production of 5.1 million barrels of petroleum from 50 oilfields, 1 of which produced over 1 million barrels, and 7.2 billion cubic feet of natural gas during 1955 was reported. Extensive drilling activities in this county resulted in 426 completions, of which 346 were development wells and 80 exploratory wells. Exploratory drilling amounted to 312,786 feet and resulted in discovery of 7 oilfields, 6 new oil pays, and 8 oil extension wells.

Austin.—In Austin County paving sand was produced by the Texas Highway Department in 1955, and petroleum and natural-gas output valued at nearly \$8 million was reported. Exploratory drilling, totaling 46,198 feet, resulted in discovery of 1 gas-condensate field

and 1 oil extension well.

Bastrop.—Paving gravel was produced under contract for the Texas Highway Department. Two large modern brick plants—the Elgin Standard Mfg. Brick Co. and the Elgin Brick Co.—mined plastic fire clay from open pits for use in manufacturing building and face brick and tile. Production of 154,000 barrels of petroleum from 8 oilfields and of 173 million cubic feet of natural gas was reported in The oil and gas industry completed 34 wells, which included 15 development wells and 19 exploratory wells. Exploratory drilling totaling 49,016 feet resulted in discovery of 1 oilfield.

Baylor.—Gravel for paving and road surfacing was produced under contract for the Texas Highway Department. Petroleum and natural gas valued at nearly \$4 million were reported from the county in 1955. During the year 212 wells were completed; of these, 189 were development wells and 23 exploratory wells. Exploratory drilling totaled 94,528 feet and resulted in the discovery of 4 oilfields.

Bee.—The Pettus refinery of Danaho Refining Co. operated at near capacity throughout the year. Petroleum production was 2.4 million barrels from 56 oilfields; natural-gas production totaled 48.3 billion cubic feet. Natural-gas liquids were recovered at the plant of Gasoline Production Corp. Exploratory drilling, totaling 256,188 feet, resulted in discovery of 1 oilfield, 6 gasfields, 10 new oil pays, and 3 new gas

Bexar.—Limestone was quarried from open pits by the Texas Highway Department and by Colglazier-Hoff Inc., McDonough Bros., and Olmos Rock Products Co. The principal uses were as aggregate for concrete, road surfacing, riprap, railroad ballast, agricultural limestone, and chemicals. Limestone also was quarried by the Long Horn Portland Cement Co. and the San Antonio Cement Co. for use in manufacturing cement. Sand and gravel for building and paving purposes was processed by seven commercial companies and the city of San Antonio. Plastic fire clay and miscellaneous clay were mined from open pits by the Alamo Clay Products Co., Southern Co., Featherlite Co. of San Antonio, and Barron Industries. These clays were used in manufacturing brick and tile and sewer pipe and as a light-weight aggregate. The expansion program of the Longhorn Portland Cement Co. included a third new kiln, cooler, mill, and related facilities to increase the plant's output by 700,000 barrels annually. Four oil refineries with a combined crude capacity of 7,500 barrels daily operated in and near San Antonio. Production of 386,000 barrels of petroleum from 10 oilfields was reported in 1955. Well completions totaled 86—61 were development wells and 25 were exploratory wells. Exploratory drilling totaled 49,542 feet, but accounted for only 1 extension oil well.

Borden.—6.4 million barrels of crude oil in all 20 oilfields produced; 3 of them exceeded over 1 million barrels each in output in 1955. Natural-gas production was 6.7 billion cubic feet. Exploratory drilling, totaling 159,914 feet, resulted in discovery of 4 oilfields and 1 new oil pay in the Lucy Clearfork field. The county also has stone deposits and underground salt deposits containing magnesium chloride

and sodium sulfate.

Bowie.—Production of 2.6 million cubic feet of natural gas and 25,000 barrels of petroleum was reported in 1955. Exploratory drilling, totaling 31,601 feet, resulted in 5 dry holes. Building and paving

sand and gravel were produced by Gifford-Hill & Co., Inc.

Brazoria.—Brazoria County was Texas' leading mineral producer in value (\$212 million) and the sixth ranking oil producer (26.6 million barrels). During the year 326.4 billion cubic feet of natural gas was produced. Drilling of 53 exploratory wells resulted in discovery of 1 gas pay, 2 gas-condensate fields, 1 oilfield, 1 oil pay, and 1 oil extension well. Natural-gas liquids were recovered at four gasoline plants—the Bayou plant of Phillips Petroleum Co., the Pledger plant of Southern Production Co., Inc., and the Hastings and Old Ocean plants of Stanolind Oil & Gas Co. Ethyl-Dow Chemical Co. continued to recover bromine from sea water for use in manufacturing ethylene dibromide. Magnesium chloride, used in producing magnesium metal at the Freeport and Velasco plants of Dow Chemical Co., was recovered from sea water. Sulfur was mined by the Frasch process from the Hoskins mound by Freeport Sulphur Co., from the Clemons dome by Jefferson Lake Sulphur Co., and from the Damon mound by Standard Sulphur. The Hoskins mound operation was shut down, as reserves were depleted. Salt, used in manufacturing chemicals and chlorine, was obtained by Dow Chemical Co. from wells as brine. Sand and gravel for paving purposes was produced by the Texas Highway Department. Commercial production of polyethylene was begun at the new \$18 million Freeport plant of Dow Chemical Co. The company likewise was completing new facilities for an additional 60 million pounds per year of ethylene glycol and ethylene oxide. The Sweeny oil refinery of Phillips Petroleum Co. operated at near capacity throughout the year.

Brewster.—Mercury was recovered from ores produced in the Terlingua mining district for the first time in several years. The Texas Highway Department contracted for production of sand and gravel and quarried and crushed limestone for paving and road surfacing. Gem stones, principally agate, were found by numerous collectors

and hobbyists. Carbonaceous shale, used as a soil conditioner and agricultural mineral supplement, was produced by Manning Minerals & Soyl-Aid, Inc. An exploratory well drilled to a depth of 8,455 feet proved dry on completion.

Briscoe.—Fuller's earth, used as a filtering and decolorizing medium for mineral oils, was mined and processed by Silverton Clay Products Co. Limestone was quarried and crushed by the Texas Highway

Department.

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Brooks.—Production of 5.2 million barrels of petroleum from 52 oilfields and 25.1 billion cubic feet of natural gas was reported in 1955. Natural-gas liquids were recovered from natural gas in the county. Exploratory drilling, totaling 103,627 feet, resulted in discovery of

1 oilfield, 1 gasfield, and 5 new oil pays.

Brown.—Limestone was quarried and crushed from open pits by G. C. McBride for riprap, aggregate, concrete road paving, and railroad ballast. Building and paving sand and gravel were produced by Ross & Sons Construction Co. Miscellaneous clay for manufacturing building brick and tile were mined from open pits by Texas Brick Co. Output of 590 thousand barrels of petroleum from 6 oilfields and 1.8 billion cubic feet of natural gas was reported in 1955. Completion of 166 wells included 146 development wells and 20 exploratory wells. Exploratory drilling totaling 28,887 feet proved only 1 oil extension well.

Burnet.—Graphite was mined and processed by the Southwestern Graphite Co. Gravel was produced by the Texas Crushed Stone Co. for use as railroad ballast. Limestone was quarried and crushed by Houston Clinton & Co. for riprap, metallurgical flux, railroad ballast, and concrete and road surfacing. Crushed and dimension granite was prepared by the Texas Granite Corp. The crushed material was used principally as riprap; dimension granite was used for rough construction and dressed building stone.

Caldwell.—Crude-oil production amounted to 3 million barrels from 16 oilfields, 1 of which produced over 1 million barrels. Of 268 wells completed, 243 were development wells and 25 exploratory wells. Exploration drilling totaled 65,482 feet and resulted in discovery of 2 oilfields, 1 new oil pay in the McBride field, and 2 oil extension wells.

Calhoun.—Output of petroleum totaled 1.8 million barrels from 23 oilfields; natural-gas production amounted to 53.4 billion cubic feet. Natural-gas liquids were recovered at the Heyser gasoline plant of Humble Oil & Refining Co. Paving sand was produced under contract for the Texas Highway Department. Smith Bros. Dredging Co. dredged shell for use in concrete from bays along the county coast. Aluminum-smelting capacity of the Point Comfort, Tex., works of Aluminum Company of America was expanded by 25,000 tons with the addition of another potline. This raised the total annual capacity to 120,000 tons of metal. Exploratory drilling totaled 264,242 feet and resulted in the discovery of 2 oilfields, 3 gasfields, 4 new oil pays, and 1 new gas pay.

Callahan.—The oil and gas industry produced 3.2 million barrels of petroleum from 74 oilfields, plus 165 million cubic feet of natural gas. An extensive drilling campaign in 1955 resulted in the completion of 816 wells, 611 of which were development and 205 exploratory wells.

Exploratory drilling totaled 524,450 feet and resulted in the discovery of 9 oilfields, 8 oil pays, and 14 oil extension wells. Petroleum was

refined at the Premier Oil & Refining Co. plant at Baird.

Cameron.—The Port Isabell refinery of Taylor-Mayfair and the Brownsville refineries of McBride Refining Co. and Port Fuel Co. operated at near capacity throughout 1955. The synthetic plant and the chemical plant of Stanolind Oil & Gas Co. at Brownsville began production late in the year. The synthetic products plant will yield gasoline, diesel oil, and fuel oil, in addition to about 180 million pounds of chemical products, which are to be processed further at the chemical plant close by. Chemicals manufactured will be alcohols, aldehydes, and certain organic acids used as synthetic textiles, plastics, or solids. A small quantity of natural gas was produced during 1955. Exploratory drilling totaling 70,837 feet resulted in discovery of the Vista Del Mar gasfield.

Camp.—About 279,000 barrels of crude oil and 11 million cubic feet of natural gas were produced during the year. Exploratory drill-

ing totaled 17,261 feet and resulted in 2 dry holes.

Carson.—Petroleum production amounting to 3.4 million barrels from 2 oilfields and natural-gas output of 147.8 billion cubic feet were reported from Carson County in 1955. Natural-gas liquids were recovered from the Cargray gasoline plant of Dorchester Corp., the Bryan No. 17 gasoline plant of Shell Oil Co., and the Schafer gasoline plant of Skelly Oil Co. Cabot Carbon Co. recovered carbon black at its Schafer channel plant. Drilling activities resulted in completion of 114 wells, of which 113 were development wells. One exploratory well at a depth of 5,950 feet was dry.

Cass.—Iron ore mined from open pits by Sheffield Steel Co. was trucked to the company Houston mill for upgrading before use in the blast furnace. Natural-gas liquids were recovered at the Lodi gasoline plant of Breckenridge Gasoline Co. Petroleum output of 689,000 barrels and natural-gas production of 6.4 billion cubic feet were reported; 53,898 feet of exploratory wells was drilled during

the vear.

Chambers.—The oil and gas industry produced 16.9 million barrels of crude oil from 35 oilfields (3 of which yielded over 1 million barrels each) and 92.8 billion cubic feet of natural gas. Natural-gas liquids were recovered at the Anahuac gasoline plant of Humble Oil & Refining Co. Exploratory drilling of 39 wells totaled 349,491 feet and resulted in discovery of 1 oilfield, 1 gas-condensate field, 1 oil pay, a gas pay in the Barbers field, and 2 oil extension wells. Salt in brine was produced by the Diamond Alkali Co. for use in manufacturing chemicals. Oystershell was dredged from Trinity and Galveston Bays by W. D. Haden Co. and Horton-Horton for use in concrete and as poultry grit. A 2,500-barrel-per-day platformer was put on stream at the Winnie plant of the Texas Gas Corp.

Cherokee.—Iron ore was mined by open-pit methods by the Sheffield Steel Co., where it was upgraded in the new company beneficiation plant at Houston. Clay used for heavy clay products and building brick was mined from pits near Troup. In 1955, 1.9 million barrels of crude oil and 194 million cubic feet of natural gas valued at \$5.4 million were produced. Exploratory drilling totaled

294,138 feet and resulted in discovery of 1 oilfield, 2 gasfields, and

1 gas pay.

Clay.—The oil and gas industry produced 6.5 million barrels of crude oil from 83 oilfields (2 of which yielded over 1 million barrels of crude each) and 544 million cubic feet of natural gas. Natural-gas liquids were recovered at the Ringgold gasoline plant of Otha H. Grimes. Exploratory drilling totaled 340,114 feet and resulted in discovery of 14 oilfields, 1 new oil pay, and 1 extension oil well.

Cochran.—In 1955, 8.2 million barrels of crude oil from 9 oilfields

and 9.6 billion cubic feet of natural gas were produced in the county. Natural-gas liquids were recovered at the Lehman gasoline plant of Llano Grande Corp. Thirty-eight development wells and 2 exploratory wells were completed. Exploratory drilling totaled 17,067 feet

and resulted in discovery of 1 oilfield.

Coke.—Production of 15.9 million barrels of crude oil from 42 oilfields and 24 billion cubic feet of natural gas was reported in 1955. Natural-gas liquids were recovered at the Jameson gasoline plant of Sun Oil Co. and Perkins No. 10 plant of Texas Hydrocarbon Co. Exploratory drilling amounted to 275,565 feet and resulted in discovery of 5 oilfields and 1 oil pay. Building and paving sand and gravel were produced by Robert Lee Sand & Gravel Co. and C. Mont-

gomery Sand & Gravel Co.

Coleman.—Glass and specialty sands were mined by the Santa Anna Silica Sand Co., Inc., from silica-sand deposits in the Santa Anna Mountains for use in manufacturing glass and specialty products. Miscellaneous clay was mined and processed by Martin Brick Co. for manufacturing brick, tile, and heavy clay products. Four gasoline plants recovered natural-gas liquids in 1955. Production of 3.6 million barrels of crude oil from 99 oilfields and 6 billion cubic feet of natural gas was reported in 1955. Of the 377 wells completed during the year, 284 were development wells and 93 exploratory wells. Exploratory drilling totaled 259,333 feet and resulted in discovery of 6 oilfields, 3 oil pays, and 5 oil extension wells.

Collingsworth.—Production of 900 barrels of crude oil from the

Collingsworth County oilfield and 3.1 billion cubic feet of natural gas

was reported in 1955.

Colorado.—The oil and gas industry produced 375,000 barrels of crude oil from 20 oilfields and 55.8 billion cubic feet of natural gas in Exploratory drilling aggregated 213,776 feet and resulted in discovery of 2 gasfields, a gas-condensate field, 3 gas-condensate extension wells, and 1 gas pay. Building and paving sand and gravel were produced by Horton-Horton, Barker Bros. & Co., Inc., Texas Construction Materials Co., Thorstenberg & Tamborello, and the Texas Highway Department. The Texas Highway Department likewise quarried and crushed sandstone for paving purposes. Natural-gas liquidal wave recovered at the Chapterwille gaseline plant of Tannessee. liquids were recovered at the Chesterville gasoline plant of Tennessee Production Co. and the Sheridan cycling plant of Shell Oil Co.

Comal.—Lime for building and chemical purposes was manufactured from limestone during 1955. Limestone was mined and crushed at open pits for use as riprap, metallurgical flux, aggregate in concrete, road surfacing, and railroad ballast by Servtex Materials Co. and United States Gypsum Co. Building and paving sand and gravel were

produced from open pits by Erhardt Kraft. The capacity of the lime plant of the United States Gypsum Co. at New Braunfels will increase

over 60 percent with addition of new production facilities.

Comanche.—Production of 147,000 barrels of petroleum from 7 oilfields and 881 million cubic feet of natural gas was reported in 1955. Six development oil wells, 6 gas wells, and 5 dry holes were drilled during the year. Exploratory drilling totaled 33,685 feet and resulted in discovery of the Sidney gasfield and 1 gas extension well.

Concho.—Exploratory drilling totaled 66,068 feet (an average 3,477 feet per well) and resulted in discovery of 1 oilfield and 1 gasfield. Petroleum production amounted to 15,000 barrels from 6 oilfields; 388

million cubic feet of natural gas was also produced.

Cooke.—Paving gravel was produced under contract for the Texas Highway Department. The Gainesville refinery of The Tydal Co. operated throughout 1955. Natural-gas liquids were recovered at the Sivells Bend gasoline plant of Standard Oil Co. of Texas and the Walnut Bend gasoline plant of Texas Natural Gasoline Corp. oil and gas industry produced 8.2 million barrels of petroleum from 78 oilfields (2 of which yielded over 1 million barrels each) and 2.6 billion cubic feet of natural gas in 1955. Exploratory drilling, totaling 236,857 feet, resulted in 18 oilfield discoveries and 2 new oil pays.

Coryell.—Dimension limestone for dressed building stone was quarried and prepared by Mid-Tex Stone Co. Crushed limestone for building and paving and road surfacing purposes was quarried and prepared by the Texas Highway Department. No other mineral output was reported from Coryell County in 1955.

Crane.—Output of 22.5 million barrels of petroleum made Crane County the ninth ranking oil producer in Texas. Natural-gas production amounted to 34.1 billion cubic feet. Natural-gas liquids were recovered at the Wadell gasoline plant of Gulf Oil Co. and at the Crane plant of Phillips Petroleum Co. Both plants likewise recovered sulfur from sour gas by the modified Claus process. Limestone was quarried and crushed for paving and road surfacing by District 6 of the Texas Highway Department. Of the 400 wells completed, 368 were development wells and 32 exploratory wells. Exploratory drilling totaled 191,385 feet and resulted in discovery of 7 oilfields, 12 oil pays, and 1 gas pay.

Crockett.—Natural-gas liquids were recovered at the Todd Ranch gasoline plant of Continental Oil Co. In 1955 natural-gas production totaled 20.5 billion cubic feet; petroleum production amounted to 8.6 million barrels from 51 oilfields. The oil and gas industry completed 253 wells, 202 of which were development wells and 51 exploratory wells. Exploratory drilling totaled 222,732 feet and resulted in discovery of 7 oilfields, 2 gasfields, 1 oil pay, and 1 oil extension well.

Culberson.—Paving gravel was produced under contract for the

Texas Highway Department. A small quantity of natural gas was produced during the year. Considerable quantities of gem stones were recovered by collectors and hobbyists. Four exploratory wells, totaling 12,623 feet, were drilled during the year; all were dry.

Dallas.—Dallas County in north central Texas ranked second in

the State in population, industry, and commerce. Total mineral production was valued at nearly \$20 million compared with \$17.4

million in 1954. Portland cement was produced at plants 1 and 2 of General Portland Cement Co. and the Dallas plant of Lone Star Cement Corp. Both companies announced plans to expand their facilities, as demand for cement continued at record highs throughout the year. Lone Star Cement Corp. will boost the capacity of its Dallas plant 1.4 million barrels to a total of 3.7 million. The Trinity Division of General Portland Cement Co. will add 1.25 million barrels capacity to its Dallas plant. Each company mined a significant quantity of limestone and shale for use in manufacturing its cement. Clays employed in manufacturing building brick and heavy clay products were mined by the Ferris Brick Co. Building and paving sand and gravel were produced by 16 operators in Dallas County. The larger producers in the county were: The Southwest Construction Materials Co., Gifford-Hill Co., Inc., Lagow Gravel Co., and the Redding Gravel Co. Within the county were 2 companies that expanded crude perlite imported from other States and 1 company that expanded vermiculite. The expanded perlite was used principally as a lightweight aggregate in plaster and cement, and the exfoliated vermiculite was for insulating purposes.

Dawson.—Crushed limestone for concrete and road surfacing was produced by Lone Star Materials, Inc. Output of 3.1 million barrels of petroleum from 21 fields and 172 million cubic feet of natural gas was reported during the year. There were 78 well completions, of which 57 were development wells and 21 exploratory wells. Exploration drilling totaled 162,539 feet, resulting in discovery of 3 new oilfields.

Denton.—Building and paving sand and gravel were produced by four companies. Paving sand was produced under contract and by crews of the Texas Highway Department. Plastic fire clay used in manufacturing building brick and heavy clay products was quarried in the county. Petroleum production amounted to 189,000 barrels from 5 fields. Exploratory drilling totaled 20,882 feet; all wells were dry.

De Witt.—Natural-gas liquids were recovered at the Gohlke gasoline plant of Shell Oil Co. and the Nordheim cycling plant of Wescol Oil & Gas Co. Crushed limestone, sandstone, and sand were produced for paving and road surfacing by the Texas Highway Department. Production of 3.1 million barrels of petroleum from 19 oilfields (1 of which supplied over 1 million barrels of crude) and 22.5 billion cubic feet of natural gas was reported in the county during 1955. Exploration drilling totaled 157,067 feet, with 20 completions, resulting in discovery of 1 gasfield and 1 new gas pay.

Dickens.—The Caprock Chemical Co. processed pumicite at its mill near McAdoo. Limestone was quarried and crushed for paving and road surfacing by District 25 of the Texas Highway Department; it also produced paving sand under contract. Petroleum output amounted to 18,000 barrels from 1 oilfield; and production of 4 million cubic feet of natural gas was reported during the year. Only one exploratory well was drilled; it was dry.

Dimmit.—Petroleum produced from 12 oilfields amounted to 149,000 barrels. Exploratory drilling totaled 92,064 feet and resulted

in discovery of Asherton and Rock Creek West oilfields and 1 unnamed gasfield.

Donley .- Paving gravel was produced under contract for the

Texas Highway Department.

Duval.—Salt in brine was obtained from wells by Columbia Southern Chemical Corp. for use in its chemical plant. Natural-gas liquids were recovered at 2 gasoline and 2 cycling plants. Crude-oil output amounted to 12.4 million barrels from 119 oilfields, 3 of which produced over 1 million barrels of crude each; natural-gas production was 43.1 billion cubic feet. Exploratory drilling totaled 281,637 feet for 66 completions, resulting in discovery of 6 new oilfields.

Eastland.—Exploratory drilling of 35 wells resulted in discovery of 2 new oilfields, I new oil pay, I new gas pay, and 4 oil extensions. One million barrels of crude oil and 11.1 billion cubic feet of natural gas were produced during the year. Natural-gas liquids were recovered from five gasoline plants within the county. Miscellaneous clay used for building brick and tile and as lightweight aggregate was produced by N. D. Gallagher Clay Products Corp., Texas Lightweight Aggregate Co., and American Aggregate Co. Building and paving sand and gravel were produced by Hart Bros. Sand & Gravel Co.

Ector.—The county ranked first in Texas in the value of minerals produced and first in petroleum, with an output of 54.3 million barrels Natural-gas production amounted to 133.6 billion from 80 oilfields. Natural-gas liquids were recovered from seven gasoline Byproduct sulfur was recovered by the Odessa Natural Gas Co., Phillips Chemical Co., Stanolind Oil & Gas Co., California Spray Chemical Corp., and J. L. Parker. Carbon black was recovered at the Odessa A, B, and C plants of Sid W. Richardson Carbon Co. Odessa gasoline plant of Texas Gulf Producing Co. was expanded to produce 140,000 gallons of liquid hydrocarbons a day. Production from this \$1.25 million expansion program should begin early in 1956. A new \$250,000 gasoline plant of Empire Oil Co., with a capacity of 2,000 gallons of liquid hydrocarbons a day, was placed on stream late The plant, with initial processing capacity of in September of 1955. 4 million cubic feet of natural gas a day, could readily be expanded to a 10-million-cubic-feet-a-day capacity. Crushed limestone was quarried by Permian Sand & Gravel Co. and the Texas Highway Depart-The oil and gas industry completed 400 wells, 372 of which were development and 28 exploratory wells. Exploratory drilling of 28 wells resulted in discovery of 9 new oilfields, 8 new oil pays, and 1 oil extension.

Edwards.—Crude-oil production from 3 oilfields amounted to 1,000

barrels during the year.

Ellis.—Crushed limestone and sand and gravel for paving and road surfacing were produced by the Texas Highway Department. Clay for manufacuring building brick and heavy clay products was mined from open pits by the Acme Brick Co., the Ferris Brick Co., and the Barron Brick Co. Output of 4,000 barrels of crude oil was reported Three exploratory wells were completed for a total depth of in 1955. 3,250 feet; all were dry.

El Paso.—The principal mineral establishments are 2 oil refineries, 1 lime plant, 1 cement plant, 1 brick plant, 1 copper and lead smelter, and 1 copper refinery. El Paso Building Material Co. manufactured

lime for building plasters and for chemical and industrial uses. Crude oil was processed at the 38,000-barrel refinery of Standard Oil of Texas and the 13,000-barrel refinery of The Texas Co. Standard Oil Co. of Texas expanded its El Paso refinery with a 4,300-barrel-a-day catalytic reformer, which would process heavy gasoline fractions derived from West Texas crude oils. The project cost an estimated Copper and lead ores and concentrates from Western States and Mexico were processed at the El Paso smelter of American Smelting & Refining Co. Blister copper was refined at the electrolytic copper refinery of Phelps Dodge Corp.; fire-refined copper was likewise produced at the plant. The capacity of this refinery was increased 4,000 tons a month to an annual capacity of 288,000 tons of copper metal. Portland and masonry cements were produced at the El Paso plant of Southwestern Portland Cement Co. Building brick, tile, and heavy clay products were manufactured from miscellaneous clay mined from open pits by the El Paso Brick Co. Crushed limestone used for concrete and road surfacing, riprap, and metallurgical flux and in the manufacture of cement and lime was quarried and prepared by A. Courchesne, Inc., by Hugh McMillan, Standard Aggregate Co., Vowell Material Co., Southwestern Portland Cement Co., and the El Paso Building Material Co. Dimension limestone for rough construction and flagging was quarried and prepared by the Standard Aggregate Co. Building and paving sand and gravel were prepared by Bowden Sand & Gravel Co., A. Courchesne, Inc., and El Paso Sand Products Co. Smaller quantities of specialty sands, such as blast sand, engine sand, and railroad ballast, were also prepared.

Erath.—Production of 29,000 barrels of crude oil and 746 million cubic feet of natural gas was reported in 1955. Exploratory drilling of 5 wells resulted in discovery of 1 gasfield. Paving gravel was prepared under contract and by the Texas Highway Department.

Falls.—The Texas Highway Department obtained gravel for paving purposes on contract. Crude oil—10,000 barrels—was produced from

3 fields. Four exploratory wells were completed; all were dry.

Fannin.—Paving gravel was produced by the Texas Highway Department during 1955. The Humble Oil Co. made a magnetometer survey of the entire county, and Amerada Oil Co. conducted a seismograph survey in the southeast corner of the county. Two exploratory

wells were completed; both were dry.

Fayette.—Building and paving sands were produced by Thorstenberg & Tamborello and by the Texas Highway Department. The Texas Highway Department crushed sandstone for paving purposes. Fuller's earth and bentonitic clays were produced by the Baroid Sales Division of National Lead Co., Flatonia Fuller's Earth Co., and Milwhite Co., Inc. Most of the bentonite was used for drilling mud; other uses included filtering and decolorizing mediums for mineral oils and greases and as a filler for insecticides. The fuller's earth was used as an absorbent for insecticides. Crude-oil output was 346,000 barrels. Three exploratory wells were drilled; all were dry.

Fisher.—The oil and gas industry obtained 5.4 million barrels of crude oil from 63 oilfields (2 of which produced over 1 million barrels of crude) and 3.2 billion cubic feet of natural gas. Natural-gas liquids were recovered at the Velta gasoline plant of Texas Pacific

Coal & Oil Co. Gypsum was quarried and used to manufacture building plaster, wallboard, and sheeting by Celotex Corp. and National Gypsum Co. Exploratory drilling of 66 wells resulted in discovery of 13 new oilfields, 5 new oil pays, and 3 oil extensions.

Floyd.—Building and paving sands were produced by the Quitaque Sand & Gravel Co., and paving gravel was produced by W. F. McElreath. Output of nearly 7,000 barrels of oil and 3 million cubic feet of natural gas was reported in 1955. Exploratory drilling resulted in two dry holes.

Foard.—Gravel and crushed miscellaneous stone for paving and road surfacing were produced by the Texas Highway Department. Crude oil amounting to 105,000 barrels and 127 million cubic feet of natural gas were produced. Exploratory drilling of 17 wells resulted

in discovery of 3 oilfields.

Fort Bend.—Sulfur valued at over \$11 million was mined by the Frasch process from the Orchard dome by Duval Texas Sulphur & Potash Co., and from the Nash dome by Freeport Sulphur Co., from Long Point dome by Jefferson Lake Sulphur Co., and by Texas Gulf Sulphur. Paving sand and gravel was produced by the Texas Highway Department and the Fort Bend County Highway Department. Miscellaneous clay, used principally as lightweight aggregate, was produced during the year. The oil and gas industry reported 12.1 million barrels of crude oil and 31.9 billion cubic feet of natural gas. Exploratory drilling of 33 wells resulted in discovery of 1 oilfield, 1 new gas pay, 1 oil extension, 1 gas extension, and 1 condensate extension.

Franklin.—Production of 4.9 million barrels of crude oil and 640 million cubic feet of natural gas was reported. Two exploratory wells

were dry.

Freestone.—Eight exploration wells were completed as dry holes. Paving gravel was produced by the Texas Highway Department. Clay used in manufacturing building brick and heavy clay products was mined. Four oilfields supplied the 257,000-barrel crude-oil output during 1955. Natural-gas production totaled 9.7 billion cubic feet.

Frio.—3.7 million barrels of crude oil and 1.4 billion cubic feet of natural gas were produced during 1955. Exploratory drilling of 33 wells resulted in discovery of the Stacy oilfield, 2 new oil pays, and 5

oil extensions.

Gaines.—Natural-gas liquids were recovered at the Seminole gasoline plant of Phillips Petroleum Co. and the West Seminole plant of Cities Service Oil Co. Carbon black was recovered from sour natural gas at the Seminole No. 66 plant of Columbian Carbon Co. Production of 22.2 million barrels of crude oil and 19.2 billion cubic feet of natural gas was reported in 1955. Exploration drilling of 39 wells resulted in discovery of 10 new oilfields, 1 new oil pay, and 1 gas extension.

Galveston.—Tin amounting to 22,329 short tons was recovered from Bolivian ores and concentrates at the Government-owned Longhorn tin smelter at Texas City. A 3-week strike at the tin smelter resulted in the loss of approximately 1,600 tons of tin production. Shell, used principally as an aggregate in concrete and in the manufacture of

lime, cement, and chemicals, was dredged from Galveston Bay by Parker Bros. Co. Beach sand employed for paving was recovered by the city engineer of Galveston. Galveston County had 4 refineries, with a daily crude capacity of 255,000 barrels. The oil and gas industry produced 10 million barrels of crude and 10.2 billion cubic feet of natural gas. The 160,000-barrel Pan American Refining Corp. plant was the fourth largest refinery in Texas. Exploration drilling of 13 wells resulted in discovery of 2 new oil pays, 1 new gas pay, and 2 oil extensions.

Garza.—Crude oil, natural gas, and sand and gravel were produced. Building sand and gravel was processed by C. I. Green Sand & Gravel Co. The oil and gas industry produced 5.2 million barrels of crude oil and 36 million cubic feet of natural gas during the year. Exploration drilling of 34 wells resulted in discovery of 5 new oilfields and 3

new oil pays.

Gillespie.—Building and paving sand and gravel were produced by Alvin Usener and by Weirich Bros. Soapstone was mined from open pits near Willow City and processed at the Llano County mill of South-

western Talc Corp.

Glasscock.—The oil and gas industry produced 4.4 million barrels of crude oil and 23.5 billion cubic feet of natural gas. There were 77 wells completed, of which 69 were development and 8 exploratory. Exploratory drilling of 8 wells resulted in discovery of 1 oilfield and 1 oil extension.

Goliad.—Production of 2.6 million barrels of crude oil and 59 billion cubic feet of natural gas was reported from Goliad County during the year. Exploratory drilling, with 28 completions, resulted in discovery of 4 new oilfields, 2 new gasfields, 4 new oil pays, and 1 new gas pay.

Gonzales.—Crushed sandstone and paving gravel for paving and road surfacing were prepared by the Texas Highway Department. Building and paving sand and gravel were prepared by Gonzales Gravel & Sand Co. Crude-oil production amounted to 73,000 barrels. Exploratory drilling of 23 wells resulted in discovery of 1 oilfield.

Gray.—Production of 13.4 million barrels of crude oil and 114.7 billion cubic feet of natural gas was reported from Gray County in 1955. Carbon black was recovered by Coltexo Corp. and Peerless Carbon Black Co. Natural-gas liquids were recovered at seven gasoline plants in the county. Paving sand and gravel was produced under contract for the Texas Highway Department. Exploratory drilling of 8 wells resulted in discovery of 2 oilfields and 1 oil extension.

Grayson.—Building and paving sand and gravel were produced by Wray Wible. In 1955, 6.6 billion cubic feet of natural gas and 9.5 million barrels of oil were produced. Exploration drilling of 102

wells resulted in discovery of 16 oilfields and 21 new oil pays.

Gregg.—Gregg County ranks first in the value of minerals produced (\$150.7 million). It ranked third in Texas as a crude-oil producer, reporting 50.7 million barrels in 1955. Natural-gas production totaled 52.3 billion cubic feet. Natural-gas liquids valued at over \$1 million were recovered from six gasoline plants in Gregg county. Exploratory drilling of 8 wells resulted in 3 oil discoveries and 1 gas discovery. There were 4 oil refineries in the county with a daily crude capacity of nearly 39,000 barrels.

Grimes.—In 1955, production of 16,000 barrels of crude oil and 496 million cubic feet of natural gas was reported.

Guadalupe.—The Fraser Brick Co. mined miscellaneous clay from open pits for use in manufacturing building brick and tile. Crude-oil production totaled 4.3 million barrels, and natural-gas output was 100 million cubic feet. Exploratory drilling of 39 wells resulted in discovery of 1 new oil pay in the Lavernia field and 1 oil extension.

Hale.—In 1955, 2.5 million barrels of crude oil and 193 million cubic

feet of natural gas were produced.

Hamilton.—During the year, 1.3 billion cubic feet of natural gas and 400,000 barrels of crude oil were produced. Paving gravel was produced under contract by the Texas Highway Department.

ing and paving sand and gravel were quarried by O. F. Striplin.

Hansford.—Production of 312,000 barrels of crude oil and 19.2 billion cubic feet of natural gas was reported from Hansford County. Natural-gas liquids were recovered from the Hansford and the Sherman gasoline plants of Phillips Petroleum Co. Exploratory drilling of 27 wells resulted in discovery of 7 new gasfields, 1 new oilfield, 4 gas extensions, and 1 oil extension.

Hardeman.—Crude gypsum was mined and calcined in the mill near Acme by Certain-Teed Products Corp. Crude-oil output from 2 oilfields totaled 2,000 barrels. Exploratory drilling of 6 wells

resulted in discovery of 1 oilfield.

Hardin.—Production of crude oil, natural gas, natural-gas liquids, and sand and gravel valued at over \$40 million was reported from Hardin County in 1955. Specialty sands were produced by Barry & Exploratory drilling of 23 wells resulted in 3 oil discoveries. The Sinclair Oil & Gas Co. began operation of its gasoline plant near Silsbee; the plant will process 20 million cubic feet of gas and distillate

daily.

Harris.—Texas' first-ranking county in population, manufacturing, and industry was third in total mineral production (\$119.5 million). Its growing industries included gasoline and cycling plants, 3 cement plants, 7 refineries, a carbon-black plant, an iron and steel plant, 3 lime plants, and numerous manufacturing, chemical, and petrochemical plants. The refinery industry in Harris County, with a daily crude capacity of 670,300 barrels, was second only to that in the Beaumont-Port Arthur area. The phenomenal growth of the chemical and petrochemical industries in the Houston area was due in large measure to availability of large reserves of natural gas, shell, salt, sulfur, and oil—all adjacent to coastal and deep-water transportation. Analysis indicates that most of the nonmetallic mineral production of the county was consumed by local industries. Sulfur was recovered in purifying natural gas at gasoline plants of the Consolidated Chemical Industries and of the Shell Chemical Corp. for use in the chemical industry and in manufacturing sulfuric acid for industrial purposes. Shell was recovered by Shell Builders, Inc., and used in manufacturing lime and cement and for other purposes. Lime was manufactured by Nyotex Chemical, Inc., by Champion Paper & Fiber Co., and by Sheffield Steel Co. Most of this lime was consumed for chemical, industrial, and metallurgical purposes. Building and paving sands were produced by the Texas Highway Department and by five commercial producers—Albers Banks &

Co., Horton-Horton, Johnson & Johnson, Parker Bros. & Co., Inc., and Taylor Sand & Gravel Co. Smaller quantities were used as specialty sands, such as molding and engine sands. Miscellaneous clay for building brick and heavy clay products was mined from open pits by the Acme Brick Co., Cedar Bayou Brick & Tile Co., J. M. Cordell & Sons, and the Houston Brick & Tile Co. Three cement plants with annual rated capacities exceeding 7 million barrels operated at full capacity throughout 1955. The industry continued to expand its production facilities, as strong demand persisted. Cement Co. added a 450-foot kiln, with additional related facilities, to increase its plant's annual output to 2.775 million barrels. Lone Star Cement Corp. likewise increased its Houston-plant capacity by 1.1 million barrels with installation of a third kiln and additional raw and finishing mills, clay handling and storage equipment, and a slurry The integrated iron and steel plant of the Sheffield Steel Co. operated over rated capacity, as growing demand for oil-country goods continued unabated throughout 1955. Rock salt was mined by the United Salt Corp. near Hockley, and the Texas Brine Corp. recovered salt in brine from wells. Natural-gas liquids were produced at 3 gasoline plants—the Clear Lake and Tomball plants of Humble Oil & Refining Co. and the Fairbanks plant of Warren Petroleum Corp.—and 2 cycling plants—the North Houston plant of Distillate Production Corp. and the Ehrhardt plant of H. M. Howell. Oil and gas operations yielded 25.9 million barrels of crude oil and 51 billion cubic feet of natural gas. Exploratory drilling of 94 wells resulted in 13 oil and 14 gas discoveries.

Harrison.—Production of crude oil, natural gas, natural-gas liquids, clay, sand and gravel were reported from Harrison County in 1955. Crude-oil production of 1.4 million barrels, and output of 76.7 billion cubic feet of natural gas were reported. Exploratory drilling of 11 wells resulted in 3 oil discoveries and 1 gas discovery. There were five gasoline plants in the county, which recovered natural-gas liquids valued at more than \$5 million. The Harrison County Road and Bridge Department produced paving gravel. Miscellaneous clay used for building brick and heavy clay products was produced by the Marshall Brick Co., the Acme Brick Co., and Marshall Pottery.

Hartley.—Production of 14,000 barrels of crude oil and 35.8 billion cubic feet of natural gas was reported in Hartley County. Exploratory drilling of 10 wells resulted in 1 oil extension of the Rehm oilfield.

Hemphill.—Paving gravel was produced under contract for District 4 of the Texas Highway Department. Exploratory drilling totaling 38,423 feet resulted in discovery of the Canadian oilfield—Hemphill County's first oil production.

Haskell.—Production of 145 million cubic feet of natural gas and 3.4 million barrels of crude oil was reported in 1955. Exploratory drilling of 47 wells resulted in discovery of 9 new oil fields, 1 new oil pay, and 1 oil extension. Gravel for building purposes was prepared by W. W. Kittley.

Hays.—The Hays County Gravel Co. prepared sand and gravel

for building and paving purposes.

Henderson.—Fire clay used for stoneware, refractory shapes, and face brick was mined from open pits by the Athens Tile & Pottery

Co., Harbison-Walker Refractories Co., and the Texas Clay Products Co. A new \$400,000 brick plant of the Athens Brick Co., Inc., with a rated capacity of 1.3 million brick equivalents per month, began production during the year. Natural-gas liquids were recovered at the Trinidad gasoline plant of the Lone Star Gas Co. and the Opelika cycling plant of the Lone Star Producing Co. Exploratory drilling of 28 wells resulted in 2 oil discoveries. In 1955, 3.7 billion cubic feet of natural gas and 1.1 million barrels of crude oil were produced.

Hidalgo.—There are two oil refineries in the county—the La Blanca refinery of McBride Refining Co. and McAllen refinery of Rado Refining Co. Natural-gas liquids were recovered at the Taylor-Mayfair cycling plant of Taylor Oil & Gas Co. Building and paving sands and gravels and specialty sands were produced by Crow Gravel Co., Fordyce Gravel Co., and J. C. Martin. Miscellaneous clay for building brick and heavy clay products was mined from open pits by the Valley Brick & Tile Co. Crushed miscellaneous stone for concrete and road surfacing was prepared by Dr. Beck. Production of 780,000 barrels of crude oil and 44 billion cubic feet of natural gas was reported in 1955. Exploratory drilling of 33 wells resulted in discovery of 9 new gasfields, 1 new oil pay, 7 new gas pays, and 3 gas extensions.

Hill.—Crushed limestone and gravel used for paving purposes were produced by the Texas Highway Department. Seven exploration

holes were drilled; all were dry.

Hockley.—Natural-gas liquids were recovered at the Ropes gasoline plant of Honolulu Oil Corp. and the Levelland and Slaughter gasoline plants of Stanolind Oil & Gas Co. Sulfur was obtained from sour gases at the Slaughter plant. Crude-oil output amounted to 15.2 million barrels, and natural-gas production was 32.4 billion cubic feet. Exploratory drilling of 8 wells resulted in 1 oil discovery.

Hopkins.—Paving gravel was produced by the Texas Highway Department. Plastic fire clay, used for refractory bricks and shapes, was mined from open pits by the A. P. Green Co. Natural-gas liquids were recovered at the Pickton gasoline plant of Humble Oil & Refining Co. Production of 2.4 million barrels of crude oil and 13 billion cubic feet of natural gas was reported in 1955. Two exploratory holes were drilled; both were dry.

Houston.—Natural-gas liquids were recovered at the Geier-Jackson cycling plant of Geier-Jackson, Inc. Crude-oil production of 667,000 barrels and a natural-gas output of 10.1 billion cubic feet were reported in 1955. Twelve exploratory wells were drilled; all were dry.

Howard.—Building and paving sand and gravel were produced by Clyde McMahon Sand & Gravel Co. and by West Texas Sand & Gravel Co. Production of 15.1 million barrels of crude oil and 5.1 billion cubic feet of natural gas was reported. Natural-gas liquids were recovered at the East Vealmoor gasoline plant of Reef Fields Gasoline Corp. Exploratory drilling of 17 wells resulted in the discovery of 3 oilfields. A 3,868-barrel-a-day reformer was added to the 28,500 barrel crude refinery of Cosden Petroleum Corp. at Big Spring. This unit will produce 98 F-1 clear octane for use in upgrading gasoline. A 1,600-barrel-a-day unifining unit was added to the refinery to desulfurize part of the feed stock for the platformer and to furnish part of the feed stock for the reformer.

Hudspeth.—Talc and soapstone were mined from open pits by Southwestern Talc Corp. and Lone Star Mining Co. Gypsum was mined from pits for use in cement and building plaster by the Southwestern Portland Cement Co. and Casner Gypsum Co. Paving sand and gravel was prepared under contract for the Texas Highway Department. Miscellaneous crushed stone used principally for railroad ballast and riprap was produced by Gifford-Hill & Co., Inc. A variety of gem stones was recovered by collectors and hobbyists. Small values of copper, lead, and silver were reported recovered from prospect projects in the county.

Hunt.—Crude oil amounting to 25,000 barrels from 2 oil fields was produced in 1955. Nine exploratory wells were completed; all were dry.

Hutchinson.—Paving gravel was produced under contract for the Texas Highway Department. Carbon black was recovered at the Borger channel and furnace plants of J. M. Huber Corp. and the Stinnett channel plant of United Carbon Co. Phillips Petroleum Co. operated the oil refinery at Phillips. Production of 13.8 million barrels of crude oil and 120.5 billion cubic feet of natural gas was reported during 1955. An active drilling campaign by the oil and gas industry in 1955 resulted in 521 completions. Only 3 exploratory wells were drilled, resulting in 1 gas discovery.

Irion.—Crude-oil output amounted to 50,000 barrels from 7 oil-fields; 7 million cubic feet of natural gas was also produced. Exploratory drilling of 18 wells resulted in discovery of 5 new oilfields.

Jack.—Crushed limestone for paving and road surfacing purposes was produced by the Texas Highway Department. Oil refineries of the M. & M. Oil Co. at Jacksboro and the Bryson Pipe Line & Refining Co. at Bryson processed some of the crude oil produced in the county. Natural-gas liquids were recovered from natural gas of the Alco-Caddo field at the Black Hawk gasoline plant of Black Hawk Gasoline Corp. Output of 18.7 billion cubic feet of natural gas and 7.6 million barrels of crude oil was reported in the county in 1955. The oil and gas industry maintained an active drilling campaign, resulting in 380 well completions, of which 318 were development wells and 62 exploratory wells. Exploratory drilling of 62 wells resulted in discovery of 9 oilfields, 3 new oil pays, and 2 new gas pays.

Jackson.—Building Brick & Stone Co. acquired and modernized the idle brick plant of Laredo Brick Co. at Lolita, with production expected in 1956. Paving sand was produced by the Texas Highway Department. Production of 12.3 million barrels of crude oil and 47.6 billion cubic feet of natural gas was reported in 1955. Natural-gas liquids were recovered at the Vanderbilt gasoline plant of Magnolia Petroleum Co. and the Francitas No. 1 cycling plant of Francitas Gas Co. Exploration drilling of 47 wells resulted in 4 oil and 5 gas dis-

coveries.

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Jasper.—The oil and gas industry produced 259,000 barrels of crude oil from 7 oilfields and 876 million cubic feet of natural gas. Exploratory drilling of 13 wells resulted in 1 oil discovery. Miscellaneous clay was mined from open pits by the Pal-Port Clay Products Corp. The Fort Worth Sand & Gravel Co. acquired and remodeled a sand and gravel plant at Quigley, at a cost of \$175,000. A concrete plant with a daily capacity of 600 yards of ready-mixed concrete is adjacent to the sand plant. Capacity production was expected by early 1956.

Jeff Davis.—In 1955 the only mineral income was from gem stones collected by hobbyists and tourists. One exploratory well was drilled

to 10,950 feet and abandoned as a dry hole.

Jefferson.—Crude refinery capacity totaled 848,000 barrels daily. Gulf Oil Co. became the Nation's largest producer of ethylene, with completion of its second plant at the Port Arthur refinery. Annual capacity of the new plant, totaling 220 million pounds, would add about 10 percent to the Nation's capacity. Feed stock will consist of cracked refinery gases. Natural-gas liquids were recovered at the Texas Gas Corp. plant, which processed natural gas from the Stowell field. Drilling activity slackened in Jefferson County in 1955, as 85 wells were completed. Exploratory drilling of 32 wells inland totaled 299,771 feet or 9,368 feet per well and resulted in 4 gas discoveries. Geophysical prospecting offshore in the Gulf of Mexico totaled 140 crew weeks, 18 of which were by gravity-meter crews and 122 by seismograph crews. Building sand and gravel was produced by C. A. Mc-Kinley Sons, Inc. Beaumont Brick Co., Inc., mined miscellaneous clay from open pits for use in manufacturing building brick and heavy clay products. Sulfur was mined from Spindletop dome by Texas Gulf Sulphur Co. by the Frasch method. Sulfur was also recovered from cracked refinery gases at the Port Arthur refinery of Gulf Oil Corp. Shell was dredged in the Texas side of Sabine Lake by W. T. Burton for use as an aggregate in concrete. Exploration drilling offshore in the Gulf of Mexico totaled 127,113 feet and resulted in 2 oil discoveries, 1 gas discovery, 4 new gas pays, and 1 gas extension. Well depths varied from 7,600 to 13,400. Majority of the completions were in the Miocene formation with 3 in the Frio formation.

Jim Hogg.—In 1955, 1.5 million barrels of crude oil and 1.2 billion cubic feet of natural gas were produced in Jim Hogg County. Exploratory drilling totaled 115,164 feet from 31 completions, resulting in

discovery of 4 new oilfields.

Jim Wells.—During 1955, 15.3 million barrels of crude oil and 80.7 billion cubic feet of natural gas were produced. Natural-gas liquids were recovered at the La Gloria cycling plant of the La Gloria Oil & Gas Co. and the Seeligson plant of Magnolia Petroleum Co. Exploratory drilling of 33 wells, totaling 184,025 feet, resulted in discovery of 4 new oilfields.

Johnson.—Lime used for building, chemical, and industrial purposes was manufactured by the Texas Lime Co. Building and paving sand and gravel were prepared by Lain Gravel Co., Inc., and the The oil industry drilled 2 wells totaling Texas Highway Department.

12,530 feet; both were dry on completion.

Jones.—The oil and gas industry completed 282 wells during 1955, 183 of which were development wells and 99 exploratory wells. Exploratory drilling of 99 wells resulted in discovery of 7 new oilfields, 9 new oil pays, and 3 oil extensions. In 1955, 7.8 million barrels of crude oil and 4.8 billion cubic feet of natural gas were produced. Natural-gas liquids were recovered at the Wimberly No. 1 gasoline plant of Texas Natural Gasoline Corp. Petroleum Products Co. operated its oil refinery at Lueders. Dimension limestone was quarried and prepared for rough architectural and dressed building stone by Lueders Limestone Co. and West Texas Stone Co.; the Lueders Co. likewise crushed some of its limestone for use as riprap. Building sand and gravel was prepared by R. E. Janes Gravel Co., Inc.

Karnes.—Natural-gas output amounted to 5.8 billion cubic feet, and 2.6 million barrels of crude oil was produced. Natural-gas liquids were recovered at the Cabeza Creek and Karnes City gasoline plants of United Gas Pipeline Co. Exploratory drilling totaled 149,845 feet, with 25 completions, resulting in discovery of 3 oilfields.

Kaufman.—Oil, gas, and stone were produced in 1955. Crude oil amounting to 1.3 million barrels and 68 million cubic feet of natural gas were reported in 1955. Limestone was quarried and crushed for paving and road surfacing by the Texas Highway Department. Exploratory drilling of 23 wells totaled 98,296 feet and resulted in 1 oil discovery.

Kenedy.—Natural-gas liquids were recovered at the Julian-Pasture cycling plant of Humble Oil & Refining Co. Three oilfields yielded 220,000 barrels of crude oil. Natural-gas production totaled 2.4 billion cubic feet. Exploratory drilling totaled 116,982 feet, with 11 completions, resulting in 1 new oil pay in the Candelaria field.

completions, resulting in 1 new oil pay in the Candelaria field.

Kent.—The oil and gas industry produced 7.7 million barrels of crude oil and 2.1 billion cubic feet of natural gas. Exploratory drilling of 16 wells totaled 107,637 feet and resulted in discovery of 2 oilfields.

King.—Production of 1.2 million barrels of crude oil and 220

King.—Production of 1.2 million barrels of crude oil and 220 million cubic feet of natural gas was reported in 1955. Exploratory drilling of 8 wells totaled 48,179 feet, resulting in discovery of 2 oilfields.

Kleberg.—Output of nearly 4 million barrels of crude oil and 443 million cubic feet of natural gas was reported in 1955. Exploratory drilling of 6 wells totaled 57,378 feet, resulting in discovery of 1 oilfield, 2 new oil pays, and 1 new gas pay.

Knox.—Paving gravel was produced for the Texas Highway Department under contract. Production of 1.1 million barrels of crude oil and 175 million cubic feet of natural gas was reported in Knox County. Fourteen exploratory wells were completed for a total of 71,608 feet; all were dry.

Lamb.—Production of crude oil totaling 219,000 barrels and a small quantity of natural gas was reported from Lamb County in 1955. There were 22 well completions, 19 of which were development and 3 exploratory wells. Three exploratory wells were completed that totaled 23,541 feet; all were dry.

La Salle.—Production of 128,000 barrels of crude oil and 283 million cubic feet of natural gas was reported from La Salle County in 1955. Geophysical prospecting totaled 59 crew weeks. Exploratory drilling of 10 wells totaled 61,511 feet; all were dry.

Lavaca.—The Texas Highway Department produced paving gravel and crushed sandstone. Natural-gas liquids were recovered at the Wilcox gasoline plant of Goliad Corp. and the Provident City gasoline plant of Shell Oil Co., Inc. Crude-oil output amounted to 298,000 barrels, and natural-gas production totaled 39.2 billion cubic feet. Nine exploratory wells were completed, totaling 66,265 feet, resulting in 3 oil discoveries and 1 gas discovery.

Leon.—Crude-oil production amounted to 188,000 barrels, and natural-gas production was 15.3 billion cubic feet. Exploratory

drilling of 4 wells totaled 27,673 feet or 6,918 feet per well, resulting

in 1 gas discovery.

Liberty.—Exploratory drilling of 27 wells, totaling 232,058 feet, resulted in discovery of 2 oil fields, 2 new oil pays, 4 oil extensions, and 1 gas extension. The production of 14.9 million barrels of crude oil and 19 billion cubic feet of natural gas was reported. Natural-gas liquids were recovered at the Hull gasoline plant of West Gasoline Co. Sulfur was mined by the Frasch process from the Moss Bluff dome by Texas Gulf Sulphur Co. Paving sand and gravel and specialty sands were produced by the Texas Construction Materials Co.

Limestone.—Clay used for building brick and heavy clay products was produced by the Barron Brick Co. Crushed limestone for concrete and road surfacing was produced by the Texas Highway Department. Output of 352,000 barrels of crude oil and 6.2 billion cubic feet of natural gas was reported in 1955. Exploratory drilling of 20 wells aggregated 72,942 feet, or 3,647 feet per well, resulting in

2 oil and 2 gas discoveries.

Live Oak.—Exploratory drilling of 45 wells, totaling 221,111 feet, resulted in discovery of 4 new oilfields, 1 new gasfield, 3 new oil pays, and 2 new gas pays. Crude-oil production of 1.4 million barrels and 55.8 billion cubic feet of natural gas were reported in 1955. An oil refinery at Three Rivers was operated by the Three Rivers Refining Co. Natural-gas liquids were recovered at the Kittie gasoline plant of the Goliad Corp. Paving gravel was prepared by Commercial Materials, Inc.

Llano.—A graphitic schist was quarried and ground by the Graphilter Corp. for use as a filtering medium. Feldspar was mined from open pits by Mrs. Tillie Badu Moss. Talc from Hudspeth County and soapstone from Gillespie County were ground at the

plant of the Southwestern Talc Corp.

Loving.—Oil production amounted to 1.7 million barrels and natural-gas production to 2 billion cubic feet. Exploratory drilling of 9 wells, totaling 43,372 feet, resulted in discovery of 1 oilfield.

Lubbock.—Crude-oil production amounted to 546,000 barrels, with natural-gas output at 3 million cubic feet. One dry exploratory well was drilled. Building sand and gravel was produced by Caprock Sand & Gravel Co. and F. M. Chancey Sand & Gravel Co.

Lynn.—Crude-oil production totaled 89,000 barrels, while naturalgas output totaled 1 million cubic feet. Exploratory drilling of 7 wells (40,837 feet for an average depth of 5,834 feet) resulted in 1 oil

discovery.

Madison.—Crude petroleum produced from 2 fields amounted to 23,000 barrels; natural-gas production was 5.9 billion cubic feet. Exploratory drilling, totaling 28,890 feet, resulted in 3 dry holes.

Marion.—Natural-gas liquids were recovered at the Jefferson and

the Smithland gasoline plants of Arkansas-Louisiana Gas Co. Crude-petroleum output was 1.1 million barrels from 7 oilfields, and

natural-gas production was 11.8 billion cubic feet.

Martin.—The oil and gas industry produced 604,000 barrels of crude oil from 8 oilfields and 92 million cubic feet of natural gas. Exploratory drilling, totaling 24,299 feet, resulted in discovery of the Breedlove

North oilfield.

Matagorda.—Paving sand was produced by District 12 of the Texas Highway Department. Shell for use as aggregate in concrete was dredged from Matagorda Bay by Matagorda Shell Co. City refinery of Matagorda Corp. operated throughout 1955. ural-gas liquids were recovered at the Markham gasoline plant of The Ohio Oil Co. and the Blessing cycling plant of the American Liberty Production of 5.7 million barrels of crude oil from 23 oilfields and of 98.4 billion cubic feet of natural gas was reported in 1955. There were 107 well completions in 1955, of which 46 were exploratory and 61 development wells. Exploratory drilling totaling 429,909 feet resulted in discovery of the College Port North oilfield and the North Tidehaven and the McCroskey gasfields.

Maverick.—Crude petroleum amounting to 9,000 barrels was produced from the Sacatosa field. Natural-gas production was 223 million cubic feet. Exploratory drilling, totaling 19,509 feet for 6 com-

pletions, resulted in discovery of the Sacatosa oilfield.

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McLennan.—Portland cement was produced from limestone quarried from open pits by the Universal Atlas Cement Co. at its Waco cement plant. Dimension limestone used for rough architectural and dressed building stone was produced by the Tonk Quarry. Gravel for paving purposes was produced by District 9 of the Texas Highway Department, and sand and gravel for building and paving purposes were produced by the Central Gravel Co., by Kleberg Sand & Gravel Co., and by Edwin D. Neeley. During 1955, 6,000 barrels of crude petroleum was produced from the South Bosque field. The oil industry completed 9 exploratory wells with an aggregate footage of 10,377 feet; all wells proved to be dry.

McMullen.—Natural gas totaling 12.1 billion cubic feet and crude oil totaling 909,000 barrels from 17 oilfields were produced in Mc-Mullen County in 1955. Of 94 well completions in 1955, 58 were development and 36 exploratory wells. Exploratory drilling totaled 145,997 feet and resulted in discovery of the Syndicate, SE Dilworth, O'Possum Creek, and the S. Tilden gasfields and the T-E-A oilfield

Medina.—Miscellaneous clay was mined by the D'Hanis Brick & Tile Co. from open pits for use in building brick, tile, and heavy clay products. Production of 24,000 barrels of crude oil from 4 oilfields was reported in 1955. Exploratory drilling by the oil industry, totaling 13,963 feet, resulted in discovery of the Coal Mine oilfield.

Midland.—During the year 15.3 million barrels of crude petroleum from 35 oilfields and 66.8 billion cubic feet of natural gas were pro-Of 212 well completions, 187 were development wells and 25 exploratory wells. Exploratory drilling, totaling 183,600 feet, resulted in discovery of the Ruth Scharbauer oilfield and 9 new oil pays. Natural-gas liquids were recovered at three gasoline plants in Midland Limestone was quarried and crushed for paving and road surfacing purposes by District 6 of the Texas Highway Department and the Midland County Highway Department.

Milam.—The Rockdale reduction works of the Aluminum Company of America expanded its production with 2 new potlines to increase annual plant capacity by 50,000 tons of primary aluminum. output of 72,000 barrels of crude oil from 1 oilfield and 79 million cubic feet of natural gas was reported. Of 81 wells completed by the oil and gas industry, 63 were development and 18 exploratory. Development drilling resulted in 44 oil wells, 1 gas well, and 18 dry holes.

All exploratory wells (totaling 50,269 feet) were unsuccessful.

Mitchell.—Building and paving sand and gravel were produced from open pits by the Colorado Sand & Gravel Co. At Colorado City, Col-Tex Refining Co. manufactured petroleum at its refinery with a daily capacity of 12,000 barrels of crude oil. During 1955, 57 million cubic feet of natural gas and 1.8 million barrels of crude oil were produced from 16 oilfields. The oil and gas industry completed 251 wells, 232 of which were development and 19 exploratory. Exploratory drilling, totaling 99,695 feet, resulted in discovery of Ellwood oilfield and 1 new oil pay in the Dockery oilfield.

Montague.—Building sand was prepared by the Watson Sand & Gravel Co. Natural-gas liquids were recovered at the Bowie gasoline plant of Bowie Gasoline Co. In all, 8.7 million barrels of crude petroleum from 222 oilfields and 12.6 billion cubic feet of natural gas were produced in Montague County. Exploratory and development drilling was active during the year, with 246 wells completed; of these, 49 were exploratory and 197 development wells. Exploratory drilling, totaling 295,729 feet, resulted in discovery of 10 new oilfields, 10 new

oil pays, and 2 oil extensions.

Montgomery.—Natural-gas liquids were recovered at gasoline plants of Humble Oil & Refining Co. and the Midland Gasoline Co. at Conroe and the Lake Creek cycling plant of the Superior Oil Co. Paving gravel was produced by District 12 of the Texas Highway Department. Carbon black was recovered at the Conroe No. 63 furnace plant of Columbian Carbon Co. The oil and gas industry produced 12.1 million barrels of crude petroleum from 17 oilfields and 28.3 billion cubic feet of natural gas. Exploratory drilling, totaling 373,486 feet, resulted in discovery of the Springer gasfield, a new oil pay in the Springer field, a new gas pay in the East Bender field, 2

oil extensions, and 3 gas extensions.

Moore.—Zinc metal was recovered from ores and concentrates of Western States and foreign countries at the Machovec retort smelter of American Zinc Co. of Illinois. Sulfur was recovered from purification of natural gas at the McKee plant of Shamrock Oil & Gas Corp. Helium was recovered at the Government-operated Exell plant from natural gas produced in the county. Shamrock Oil & Gas Corp. operated its Sunray oil refinery throughout the year. Carbon black was produced at the Continental furnace plant of the Continental Carbon Co. Natural-gas liquids were recovered at 7 gasoline plants. Production of 109,000 barrels of crude oil from 2 oilfields and 393.9 billion cubic feet of natural gas was reported. The single exploratory well, drilled to 3,510 feet, resulted in discovery of a new cilfield.

Morris.—Iron ore was produced from open pits by the Lone Star Steel Co. in 1955. This ore supplemented imported iron ore used in

the company iron and steel plant at Daingerfield.

Motley.—Paving sand and gravel was produced by the Harris Sand Co. and by a producer under contract for District 25 of the Texas Highway Department. Four exploratory oil and gas wells, with a total footage of 26,564 feet, were dry. No oil and gas were reported from the county in 1955.

Nacogdoches.—Gravel for paving purposes was produced by the United States Forestry Service. Miscellaneous clay used for build-

ing and face brick was mined from open pits by the Acme Brick Co. Nine thousand barrels of crude oil was produced from 2 oilfields. Natural-gas production amounted to 11.5 billion cubic feet. Exploratory drilling by the oil and gas industry totaled 43,427 feet, varying from 628 feet for the shallowest hole to 10,057 feet for the deepest.

Navarro.—District 18 of the Texas Highway Department produced paving gravel during 1955. Miscellaneous clay was produced during the year from open pits by the Whiteselle Brick-Lumber Co. Crudeoil production amounted to 2.9 million barrels from 10 oilfields, and natural-gas production totaled 160 million cubic feet. drilling campaign was conducted by the oil industry, resulting in 717 well completions, 42 of which were exploratory. Exploratory drilling, aggregating 79,770 feet, resulted in discovery of the Great Western oilfield.

Newton.—The oil and gas industry completed 31 wells; 11 exploratory wells resulted in 1 gas extension. Production of 956,000 barrels of crude petroleum from 12 oilfields and 6.4 billion cubic feet of natural

gas was reported from the county in 1955.

Nolan.—The oil and gas industry produced 2.5 billion cubic feet of natural gas and 5.9 million barrels of crude oil from 64 oilfields during 1955. Natural-gas liquids were recovered at the White Flat gasoline plant of Honolulu Oil Corp. and the Rowan & Hope field plant. Portland and masonry cements were produced at the Mary Neal plant of Lone Star Cement Corp. The company quarried and crushed limestone from open pits near the plant for use in manufacturing its Gypsum was quarried from open pits and processed at a mill at Sweetwater. Building and paving sand and gravel were prepared by the Hillsdale Gravel Co. from open pits southwest of Sweetwater. Of 263 wells completed in 1955, 194 were development and 69 exploratory wells. Exploratory drilling, totaling 464,146 feet for an average of 6,727 feet per well, resulted in discovery of 10 new oil-

fields, 10 new oil pays, and 1 oil extension.

Nueces.—Shell was dredged from Nueces and Corpus Christi Bays by Corpus Christi Shell Co., Inc., General Dredging Corp., Heldenfels Bros., and Matagorda Shell Co. Principal uses of shell were in manufacturing cement for concrete and lime and in manufacturing chemicals. Lime was produced from shell by Columbia Southern Chemical Corp. for chemical and industrial uses. Cement was made from shell by the Halliburton Portland Cement Co. Building and paving sand and gravel were prepared by Heldenfels Bros. from pits near Calallen. A major expansion program was underway at the Corpus Christi refinery of Suntide Refining Co., which would raise its daily capacity to 65,000 barrels of crude and make it the largest independent refinery in the Nation. There are 7 other refineries in Nueces County, 6 in Corpus Christi and 1 in Banquett. Special High-Grade zinc metal was recovered from zinc concentrates imported from Western States and foreign countries at the electrolytic zinc smelter of American Smelting & Refining Co. With expansion of the fuming plant, annual capacity of the smelter was increased to 100,000 tons of metal. Natural-gas liquids were recovered at 7 gasoline and 6 cycling plants in the county. In all, 16.3 million barrels of crude oil from 120 oilfields and 159.5 billion cubic feet of natural gas were produced during

Of 140 oil- and gas-well completions, 109 were development and 31 exploratory wells. Exploratory drilling, totaling 223,297 feet, resulted in discovery of 4 oilfields, 1 gasfield, 7 new oil pays, and 2

new gas-sand pays.

Ochiltree.—Output from 5 oilfields amounted to 21,000 barrels; 355 million cubic feet of natural gas was reported produced in the county in 1955. Drilling activity led to completion of 2 development and 17 exploratory wells. Exploratory drilling, totaling 151,190 feet, resulted in discovery of 4 gasfields, the North Farnsworth oilfield, and 1 extension well.

Oldham.—In 1955, 455 million cubic feet of natural gas was produced. No oil and gas exploratory drilling was reported during the Western Aggregates, Inc., and Western Sand & Gravel Co.

produced building and paving sand and gravel.

Orange.—The oil and gas industry produced 4 million barrels of crude petroleum from 11 oilfields, 1 of which yielded over 1 million Natural-gas production totaled 60.1 billion cubic feet. Clearance of a site for a new \$3 million cement plant 6 miles north of Orange was begun by the Texas Portland Cement Co. Exploratory drilling by the oil and gas industry, totaling 114,805 feet, resulted

in 3 oil extensions and 1 gas extension.

Palo Pinto.—The oil and gas industry produced 1.5 billion cubic feet of natural gas and 252,000 barrels of crude oil from 12 oilfields during 1955. Natural-gas liquids were recovered at the Gordon gasoline plant of Lone Star Gas Co. Of 66 well completions, 36 were development and 30 exploratory wells. Exploratory drilling, totaling 72,986 feet for an average of 2,433 feet per well, resulted in discovery of the Weldon oilfield and 1 oil extension. Crushed limestone and paving gravel were mined and prepared by District 2 of the Texas Highway Department for use in paving and road surfacing. Building and paving sand and gravel were prepared by Mineral Wells Sand & Gravel Co. Miscellaneous clay used for manufacturing lightweight aggregate was produced by the Featherlite Corp. Building brick and tile and heavy clay products were made by Texeramics Co. and Texas Vitrified Pipe Co. from miscellaneous clay mined from open pits.

Panola.—Natural-gas liquids were recovered by 5 gasoline plants and the Carthage cycling plant of Lone Star Producing Co. Production of 642,000 barrels of crude petroleum from 12 oilfields and 428.5 billion cubic feet of natural gas was reported in 1955. Exploratory drilling, totaling 52,085 feet, resulted in discovery of 3 new oil pays each in the Bethany and Carthage fields and 1 new gas pay in the Waskom

field.

Parker.—Crude-oil production in 1955 was 54,000 barrels from 7 oilfields; natural-gas production was 203 million cubic feet. Naturalgas liquids were recovered at the Springtown gasoline plant of Lone Star Gas Co. Exploratory drilling by the oil and gas industry, totaling 46,069 feet for an average of 4,188 feet per well, resulted in discovery of the Moody oilfield, a new oil pay, and a gas extension well. Miscellaneous clay was mined and prepared for use in manufacturing building and face brick and building tile by Acme Brick Co. and Mineral Wells Clay Products Co. Paving gravel was prepared under contract and by crews of District 2 of the Texas Highway DepartDimension sandstone for rough building stone was quarried

and prepared by Ben Roy Gholson.

Pecos.—Building sand and building and paving gravel were reported produced in the county in 1955. Limestone was quarried and crushed by District 6 of the Texas Highway Department for use in paving and road surfacing. The refinery of R. J. Reischman at Fort Stockton operated with a daily capacity of 500 barrels of crude petroleum. Natural-gas liquids were recovered at the Santa Rosa No. 3 gasoline plant of Pecos County. Production of 17.3 million barrels of crude petroleum and 26.1 billion cubic feet of natural gas was reported in 1955. Of 207 wells completed by the oil and gas industry, 162 were development and 45 exploratory wells. Development drilling proved 126 oil wells, 12 gas wells, and 24 dry holes. Exploratory drilling, totaling 184,419 feet for an average of 4,100 feet per well, resulted in discovery of the Sheffield, Pecos-Shearer West, Pecos-Shearer, and the Girventex oilfields, 1 new gasfield, 2 new oil pays, and 2 oil extensions.

Polk.—Production of 2.1 million barrels of crude petroleum from 14 oilfields and 5.7 billion cubic feet of natural gas was reported in The oil and gas industry completed six wells during the year. The 3 exploratory wells, with a total footage of 17,676 feet, resulted in 1 new gas pay in the Livingston field. Production of petroleum and natural gas valued at more than \$6 million was reported in the county in 1955. Crushed miscellaneous stone for paving and road surfacing was produced by the Polk County Highway Department. Specialty sands were produced by the Texas Construction Materials

Potter.—Natural gas marketed in 1955 amounted to 74.1 billion cubic feet. Natural-gas liquids were recovered at the Fain and Turkey Creek gasoline plants of the Amarillo Oil Co. Helium was recovered from natural gas at the Government-operated Amarillo The Amarillo refinery of The Texas Co. operated at near capacity in 1955. Building and paving sand and gravel were produced by the Panhandle Gravel Co. and by Texas Sand & Gravel Co., Ltd. Zinc ores and concentrates from Western States and Mexico were processed at the horizontal-retort smelter of American Smelting & Refining Co.

Presidio.—Mercury was recovered from ores of development projects in the famous Terlingua mercury district. Famous oil producers included the Maggie, Mariposa, Fresno, California Mountain, and Contrabando Dome. A considerable amount of gem stones is consistently found in the county by collectors and tourists. monest among these are agate, opal, agatized and fossilized wood,

fluorite, chalcedony, and jasper.

Reagan.—Natural-gas liquids were recovered at the Texon gasoline plant of Texon Gas, Inc., the Midkiff gasoline plant of El Paso Natural Gas Co., and the Barnhart gasoline plant of Barnhart Hydrocarbon Corp. Production of 12.5 million barrels of crude oil from 20 oilfields and 36.7 billion cubic feet of natural gas was reported The oil and gas industry completed 228 wells, 209 of which were development and 19 exploratory. Development drilling proved 203 oil wells and 3 gas wells; 3 holes were dry. Exploratory drilling by the oil and gas industry, totaling 140,226 feet for an average of

7,380 feet per well, resulted in discovery of 6 new oilfields, 2 new oil

pays, and 1 new gas pay.

Reeves.-Production of 365,000 barrels of crude petroleum from 6 oilfields and 1.5 billion cubic feet of natural gas was reported in Natural-gas liquids were recovered at the Orla gasoline plant of Pecos Petroleum Co. Building and paving sand and gravel were produced by Panhandle Gravel and Texas Sand & Gravel Co., Ltd. Crushed limestone for paving and road surfacing was quarried and prepared from pits by District 6 of the Texas Highway Department. Of 36 well completions, 16 were development and 20 exploratory wells. All exploratory wells, totaling 82,151 feet, were unsuccessful.

Refugio.—Twenty million barrels of crude petroleum from 53 oilfields and 128.6 billion cubic feet of natural gas were produced in 1955. Natural-gas liquids were recovered at the Tom O'Connor gasoline plant of Humble Oil & Refining Co. and the Wyrick and Hughes gasoline plant. Exploratory drilling, totaling 182,497 feet, resulted in discovery of the West Greta oilfield, West Woodsboro

gasfield, 2 new oil pays, and 1 new gas pay.

Roberts.—Paving gravel was produced under contract for District 4 of the Texas Highway Department. Production of 1.6 million barrels of petroleum from 3 oilfields and 4.2 billion cubic feet of natural gas was reported. Of 18 well completions, 9 were development and 9 exploratory. Exploratory drilling totaled 33,392 feet and resulted in discovery of the Quinduno oilfield, an unnamed gasfield, and 1 gas extension.

Robertson.—Building and paving sand and gravel were produced by the Gifford-Hill & Co., Inc. The Calvert field yielded the 21,000 barrels of crude petroleum recovered in the county during the year. Natural-gas production amounted to 124 million cubic feet. exploratory wells were completed during the year; all were dry holes.

Runnels.—The oil and gas industry produced 14.2 billion cubic feet of natural gas and 6.4 million barrels of crude oil from 125 oilfields during the year. Natural-gas liquids were recovered at three gasoline plants. Of 243 oil- and gas-well completions, 149 were development wells and 94 exploratory wells. Exploration drilling, totaling 367,625 feet for an average of 3,911 feet per well, resulted in discovery of

9 new oilfields, 13 new oil pays, and 5 oil extensions.

Rusk.—Rusk county is the fifth ranking oil producer in Texas, with output from the fabulous East Texas field covering the west central and northwest parts of the county. Crude petroleum produced amounted to 30 million barrels from 10 oilfields. Natural-gas production was 18.8 billion cubic feet. Plastic fire clay was produced by Henderson Clay Products Co. and miscellaneous clay by J. M. Cordell & Sons and the Major Brick Co. Natural-gas liquids were All exploratory recovered from five gasoline plants in the county. wells, which aggregated 51,063 feet, were dry holes.

San Jacinto.—Crude petroleum and natural gas valued at more than \$2 million were produced during 1955. Exploratory drilling, totaling 71,204 feet, resulted in 9 dry holes. One successful gas-Building sand and gravel was development well was completed.

produced by Thorstenberg & Tamborello.

San Patricio.—The oil and gas industry produced 17.1 million barrels of crude oil from 110 oilfields; 3 of these fields produced over

1 million barrels each. Natural-gas production was 46.3 billion cubic feet. Natural-gas liquids valued at \$1.2 million were recovered at the Plymouth & Rooke cycling plant of Plymouth Oil Co. and at the No. 20 gasoline plant of Sinclair Oil & Gas Co. Paving sand and gravel was prepared by Fordyce Gravel Co. Of 170 oil and gas wells completed, 116 were development and 54 were exploratory wells. Exploration resulted in 3 oil- and 4 gas-discovery wells, 12 new oil pays, 5 new gas pays, and 1 gas extension well. Alumina used in producing primary aluminum metal was processed from bauxite ores imported from Jamaica at the La Quinta plant of Reynolds Metals Co. Most of the alumina was used at the company San Patricio reduction works. Sizable quantities of alumina were shipped also to the Columbia Falls, Mont., reduction plant of Anaconda Aluminum Co.

Schleicher.—Output of 3.3 million barrels of crude oil from 15 oilfields and 1.5 billion cubic feet of natural gas was reported in 1955. Of 47 well completions, 26 were development and 21 exploratory wells. Exploratory drilling, totaling 127,064 feet (an average of 6,058 feet per well), resulted in discovery of the O'Harrow gasfield

and 1 new oil pay.

Scurry.—Mineral production in 1955 was comprised of natural-gas liquids, sand and gravel, and pumicite, in addition to oil and gas. Scurry County was the State's fourth largest oil producer, with 40 million barrels from 43 oilfields. Natural-gas production totaled 46.2 billion cubic feet. Natural-gas liquids were recovered at four gasoline plants within the county. Building and paving sand and gravel were produced by Ira Sand & Gravel Co. Pumicite (volcanic ash) was prepared by Kelley Products Co. Of 211 oil- and gas-well completions, 180 were development and 31 exploratory wells. Development drilling resulted in 165 oil wells and 15 dry holes. Exploratory drilling, totaling 189,330 feet (an average of 3,837 feet per well), resulted in discovery of 9 new oilfields and 1 new oil pay.

Shackelford.—Production of 2.9 million barrels of crude oil from 62 oilfields and 5.5 billion cubic feet of natural gas was reported during the year. Natural-gas liquids were recovered at the Ibex gasoline plant of Ibex Co. and No. 1 plant of Marshal R. Young. Building and paving gravels were produced by Taylor Bros. The oil and gas industry completed 448 wells, of which 400 were development and 48 exploratory. Development drilling proved 257 oil and 5 gas wells; 138 wells were dry. Exploratory drilling, totaling 197,685 feet for an average of 4,118 feet per well, resulted in discovery of 6 new oilfields,

2 new oil pays, 1 new gas pay, and 2 gas extensions.

Shelby.—Four oilfields supplied the 8,000 barrels of crude oil produced in Shelby County; 16.8 million cubic feet of natural gas was also produced. Exploratory drilling totaled 37,061 feet, resulting in 1 new oil pay in the Shelbyville field.

Sherman.—Production of 18,000 barrels of petroleum from 3 oil-fields and 152.8 billion cubic feet of natural gas was reported in 1955. The industry completed 25 wells, consisting of 24 development wells and 1 exploratory well. The 3,700-feet-deep exploratory well was dry upon completion.

Smith.—The oil and gas industry produced 1.4 million barrels of crude oil from 15 oilfields and 9.1 billion cubic feet of natural gas.

Exploratory drilling, totaling 133,009 feet, resulted in discovery of the Good Omen-Woodbine North oilfield, an unnamed gasfield, a new oil pay in the Good Omen-Pettit field, and 1 gas extension. Natural-gas liquids were recovered at the Chapel Hill cycling plant of Lone Star Producing Co. and the Chapel Hill gasoline plant of Etexas Producers Gas Co. Molding sand was produced by Barnett-Ellis from open pits. Two refineries—the 22,500-barrel-per-day refinery of McMurrey Refining Co. at Tyler and the 5,000-barrel-per-day plant of Premier Oil & Refining Co. at Arp—operated at near capacity throughout 1955.

Starr.—Pumicite was mined from pits near Rio Grande City. Natural-gas liquids were recovered at the Rincon plant of Continental Oil Co. and the Sun plant of Sun Oil Co. Crude-oil output amounted to 7.8 million barrels from 79 oilfields, 3 of which produced over 1 million barrels each. About 15.2 billion cubic feet of natural gas also was produced. Exploratory drilling, totaling 118,143 feet, resulted in discovery of the Braulia and Reyna oilfields, the Herschap and West

Garcia gasfields, 4 new oil pays, and 1 new gas pay.

Stephens.—The oil and gas industry completed 238 wells, 183 of which were development and 55 exploratory wells. Development drilling proved 125 oil and 8 gas wells; 50 wells were dry. Exploratory drilling, totaling 207,376 feet for an average of 3,770 feet per well, resulted in discovery of 10 new oilfields, 6 new oil pays, 1 new gas pay, 4 oil extensions, and 2 gas extensions. Natural-gas liquids were recovered at four gasoline plants.

Sterling.—Limestone was quarried and crushed by District 7 of the Texas Highway Department for paving and road surfacing. Crude oil totaling 745,000 barrels from 11 oilfields and 13 million cubic feet of natural gas were reported during the year. Exploratory drilling, totaling 104,878 feet for an average of 5,244 feet per well, resulted in discovery of the West Jameson and the Southwest Jameson oilfields

and 1 new oil pay.

Stonewall.—Rapid oil development was experienced in 1952 and 1953. Of 240 well completions, 176 were development and 64 exploration wells. Exploratory drilling (totaling 361,732 feet for an average of 5,652 feet per well), resulted in discovery of 13 new oilfields, 6 new oil pays and 5 oil extensions. Crude production amounted to 9.5 million barrels from 69 oilfields, 4 of which produced over 1 million barrels each. Natural-gas production totaled 3.2 billion cubic feet. Natural-gas liquids were recovered at the Stonewall gasoline plant of Stonewall Gas Products Co., Inc. Building and paving sand and gravel were processed by Hamlin Sand & Gravel Co., Inc.

Sutton.—Fifteen thousand barrels of crude petroleum from 4 oil-fields and 3.7 billion cubic feet of natural gas were produced. Of 18 oil- and gas-well completions, 9 were exploratory and 9 development wells. Exploratory drilling, totaling 52,190 feet (an average of 5,750 feet per well), resulted in 1 gas extension to the South Sonora gasfield.

Tarrant.—Premier Petroleum Co. operated its 8,000-barrel-of-crudeper-day refinery at Fort Worth. The Fort Worth plant of Trinity Division of General Portland Cement Co. operated at over rated capacity, as demand for portland and masonry cements continued strong throughout 1955. The company mined and crushed limestone from pits near the plant for use in manufacturing cement. Building and paving sand and gravel were prepared by 12 commercial firms and District 2 of the Texas Highway Department in Fort Worth. Dimension limestone was quarried and prepared by Carruthers Cutstone Co. for dressed building stone. Two exploratory wells were drilled to a

total of 9,295 feet; both holes proved dry upon completion.

Taylor.—Miscellaneous clay used in manufacturing building brick and tile was mined from open pits by the Abilene Brick Co. Building and paving sand and gravel were prepared by Atlas Sand & Gravel Co. and Caton Sand & Gravel Co. The oil and gas industry completed 303 wells, of which 171 were development and 132 exploratory wells. Exploratory drilling, totaling 454,558 feet for an average of 3,443 feet per well, resulted in discovery of 20 new oil-fields, 5 new oil pays, and 8 oil extensions. The 6,500-barrel refinery of Onyx Refining Co., at Abilene, operated throughout 1955. Production of 137 million cubic feet of natural gas and 1.9 million barrels of crude oil from 87 oilfields was reported during the year.

Terry.—Mineral output in 1955 included 7.3 million barrels of crude oil from 18 oilfields, 688 million cubic feet of natural gas, carbon black from sour gas, and crushed limestone. Limestone was quarried and crushed for paving and road surfacing by the Terry County Highway Department. Carbon black was recovered from sour gas at the Seagraves No. 64 furnace plant of Columbian Carbon Co. Exploratory drilling (totaling 196,148 feet for an average of 9,807 feet per well), resulted in discovery of the Corrigan-North and the

Coroco Southeast oilfields and 2 new oil pays.

Throckmorton.—Paving gravel was produced by crews of District 3 of the Texas Highway Department. There were 109 oilfields in the county, which yielded 3.7 million barrels of crude petroleum. Natural-gas production amounted to 475 million cubic feet. The oil and gas industry completed 133 wells, of which 89 were development and 44 exploratory wells. Exploratory drilling, totaling 194,130 feet, resulted in discovery of 9 productive oil wells and 1 oil extension.

Titus.—The oil and gas industry produced 4.3 million barrels of crude oil from 2 oilfields in the county and 11 million cubic feet of natural gas in 1955. The 16,000-barrel refinery of American Liberty

Oil Co. operated throughout 1955.

Tom Green.—Production of 1.8 million barrels of crude oil from 32 oilfields and 94 million cubic feet of natural gas was reported. Of 124 oil- and gas-well completions, 65 were development and 59 exploratory wells. Development drilling resulted in 53 oil wells and 12 dry holes. Exploratory drilling, totaling 326,920 feet for an average of 5,518 feet per well, resulted in discovery of 6 new oilfields, a dual

oil and gas field, 1 new gasfield, and 2 new oil pays.

Travis.—Building gravel was recovered from pits near Austin by the R. E. Janes Gravel Co. Paving gravel also was prepared by crews of the city of Austin. Grinding pebbles were recovered and prepared from pits near Austin by the Dezendorf Marble Co. Lime used for agriculture, building, chemical, and industrial purposes was manufactured from limestone quarried near McNeal, by the Austin White Lime Co. "Marble"—actually a hard, crystalline limestone—was quarried and crushed for use as terrazzo from pits near Austin by the Dezendorf Marble Co. Limestone was quarried and crushed from pits near Austin by the Austin White Lime Co. and Texas

Crushed Stone Co. Principal uses were in manufacturing lime, as a metallurgical flux, as agricultural lime, for railroad ballast, and for use in concrete and road surfacing. Dimension limestone for use as rough architectural and sawed and cut building stone and for flagging was prepared by the Austin Stone Industries and the Texas Quarries, Inc. Production of 31,000 barrels of crude oil from 3 oilfields was reported. Exploratory drilling totaled 16,247 feet and resulted in discovery of the New Sweden oilfield.

Tyler.—Natural-gas liquids were recovered at Joe's Lake gasoline plant of Sinclair Oil & Gas Co. Crude oil and natural gas valued at \$2.6 million were produced in 1955. There were 11 oil- and gaswell completions in 1955, of which 5 were exploratory and 6 development wells. Exploration drilling totaled 39,265 feet and resulted in

1 gas-condensate extension in the Southwest Pavey field.

Upshur.—Crude oil, natural gas, and sand and gravel valued at \$9.5 million were reported from Upshur County in 1955. Building, paving, and molding sands were produced by the Big Sandy Sand & Gravel Co. Plant expansions and equipment of Gilmer Potteries, Inc., permitted addition of more pottery and bathroom accessories to the list of company products. The oil and gas industry produced 3.3 million barrels of crude petroleum and 1.3 billion cubic feet of natural gas. Eight exploratory wells with a total footage of 36,640 feet were dry.

Upton.—Natural-gas liquids were recovered at four gasoline plants in the county. Production of 15.8 million barrels of crude oil from 44 oilfields and 52.4 billion cubic feet of natural gas was reported. Of 178 well completions, 157 were development and 21 exploratory wells. Development drilling resulted in 148 oil wells and 9 dry holes. Exploration drilling, totaling 168,451 feet for an average of 8,009 feet per well, resulted in discovery of 5 new oilfields and 3 new oil pays.

Uvalde.—Basalt was quarried and crushed for concrete and road surfacing by Southwest Stone Co. Building and paving sand and gravel were prepared from pits by the D.N.D. Gravel Co. Native asphalt was quarried and prepared by Uvalde Rock Asphalt Co. and White's Uvalde Mines. One exploratory oil well was drilled to a depth of 1,812 feet to the Edwards formation. This well proved dry upon completion.

Van Zandt.—Crude oil, natural gas, natural-gas liquids, and salt valued at nearly \$29 million were produced in Van Zandt County in 1955. Salt was recovered both from wells and from an underground mine during the year. The Van gasoline plant of The Pure Oil Co. recovered natural-gas liquids. Exploratory drilling aggregated 59,190

feet for 13 completions, all of which proved dry.

Victoria.—Building and paving sand and gravel were produced by the Fordyce Gravel Co. and Heldenfels Bros. Paving sand and gravel, crushed limestone, and sandstone were produced under contract for District 13 of the Texas Highway Department. Crude-oil output totaled 7.4 million barrels from 47 oilfields, 2 of which produced over 1 million barrels of crude each. Natural-gas production amounted to 95.1 billion cubic feet. There were 85 well completions in 1955, of which 64 were development and 21 exploration wells. Exploratory drilling aggregated 141,579 feet, resulting in discovery of the North

Koontz oilfield, East Colletteville, the Richard Adcock and East

Keeran gasfields, 1 new oil pay, and 1 new gas pay.

Walker.—Bentonitic clay was produced from open pits by the Milwhite Co., Inc. A small quantity of crude oil was produced from the Sam Houston field in 1955. Three exploratory wells totaling 23,637 feet proved dry upon completion. No development wells were drilled.

Waller.—Paving gravel was produced by crews and contractors of District 12 of the Texas Highway Department. Natural-gas liquids were recovered at the Katy cycling plant of Humble Oil & Refining Co. Crude oil and natural gas also were produced in the county. Exploratory drilling totaled 44,360 feet for an average of 7,393 feet per well. All six exploratory wells proved dry upon completion. The oil and gas industry produced 436,000 barrels of crude oil and 1.5 billion cubic feet of natural gas in 1955.

Ward.—Salt cake (sodium sulfate) was produced from dry lake deposits near Soda Lake by Ozark Mahoning Co. Building and paving sand and gravel were produced by Permian Sand & Gravel Co., Inc. Limestone was quarried and crushed from open pits by District 6 of the Texas Highway Department. The 4,000-barrel-per-day crude-oil refinery of the Wickett Refinery Co. at Wickett operated throughout the year. Natural-gas liquids were recovered at the Monahans plant of Gulf Oil Corp., the Sealy-Smith plant of El Paso Natrual Gas Co., and the Estes gasoline plant of Cabot Carbon Co. Crude-oil output amounted to 11.5 million barrels from 33 oilfields, and natural-gas production was 26.8 billion cubic feet in 1955. Of 238 oil- and gas-well completions, 216 were development and 22 exploratory wells. Development drilling resulted in 190 oil wells, 2 gas wells, and 24 dry holes. Exploratory drilling, totaling 108,581 feet and averaging 4,932 feet per well, resulted in discovery of 5 new oilfields, 4 new oil pays, 1 new gas pay, and 1 oil extension.

Washington.—Production of 318,000 barrels of crude oil and 46

million cubic feet of natural gas was reported. All three exploratory wells drilled and completed in Washington County, with a total foot-

age of 16,136 feet, were dry.

Webb.—Paving sand and gravel was produced under contract and by the crew of the Texas Highway Department. Crude-oil output amounted to 2.2 million barrels from 42 oilfields, including 1 new discovery field. Natural-gas production totaled 103 million cubic Antimony metal was recovered from Mexican ores at the Laredo smelter of National Lead Co. Miscellaneous clay was mined from open pits by the Laredo Brick & Tile Co. for use in manufacturing building brick and tile. Exploration drilling totaled 139,486 feet, resulting in discovery of the Santo Nino oilfield, the Cabezon and Harry gasfields, 1 new oil pay, and 1 new gas pay.

Wharton.—Sulfur was mined by the Frasch method at Bowling Dome by Texas Gulf Sulphur Co. Paving sand was produced by contractors for District 13 of the Texas Highway Department. Natural-gas liquids were recovered at the West Bernard gasoline plant of Tidewater Associated Oil Co. Crude oil and natural gas valued at more than \$28 million were produced in 1955. Exploratory drilling (totaling 226,295 feet in 36 wells), resulted in discovery of the

Bemus, the Bonus, and the Louise East gasfields and 1 gasfield not named, 1 new oil pay in the North Louise field, and 3 gas extensions. Development-well completions totaled 74, of which 26 proved oil and

16 gas; 32 were dry.

Wheeler.—The oil and gas industry completed 36 wells in 1955, of which 35 were development wells and 1 an exploratory 3,510 foot dry hole. Natural-gas liquids were recovered at the McLean-28 gasoline plant of Warren Petroleum Corp. Production of 1.3 million barrels of crude oil from 2 oilfields and 17.1 billion cubic feet of natural gas was reported in 1955. United Carbon Co., Inc., recovered carbon black from sour gas at its Norric furnace plant. Crushed miscellaneous stone (caliche) for paving and road surfacing purposes was produced

by District 25 of the Texas Highway Department.

Wichita.—Building and paving sand and gravel were produced by the Foley Sand & Gravel, Gravel Inc., and Northwest Materials Co. Oil refineries were operated during the year by Continental Oil Co. at Wichita Falls and Williams Petroleum Co. at Burkburnett. Naturalgas liquids were recovered at the K. M. A. plant of Continental Oil Co., the Mankins plant of Redco Corp., Burkburnett plants of Magnolia Petroleum Co., and the Electra plant of The Texas Co. Production of 10.9 million barrels of crude oil from 43 oilfields and 9.7 billion cubic feet of natural gas was reported from Wichita County in 1955. Drilling projects of the oil and gas industry were extremely active during 1955, resulting in 675 well completions. Of these completions, 655 were development and 20 exploratory wells. Development drilling resulted in 421 proved oil wells, but 234 wells were dry. Exploratory drilling in the county, totaling 52,728 feet, resulted in discovery of 7 new oilfields and 2 oil extensions.

Wilbarger.—The oil and gas industry completed 467 wells in Wilbarger County, 401 of which were development and 66 exploratory wells. Exploratory drilling totaling 228,101 feet resulted in the discovery of 16 new oilfields; 50 attempts were dry holes. Development drilling proved 236 oil wells, and 165 wells were dry holes. Paving gravel was produced under contract for District 3 of the Texas Highway Department. Natural-gas liquids were recovered at the Electra gasoline plant of Magnolia Petroleum Co. and the Rock Crossing gasoline plant of the W. T. Waggoner estate. Crude-oil output of 4.9 million barrels was reported from 104 oilfields in 1955. Natural-gas

production totaled 1.1 billion cubic feet.

Willacy.—Production of 2.8 million barrels of crude petroleum from 16 oilfields and 3.8 billion cubic feet of natural gas was reported. Three oil fields produced over 1 million barrels each. Of the 24 oil and gas wells completed during the year, 18 were development and 6 exploration wells. Exploration drilling totaled 54,628 feet, resulting

in discovery of the Chess oilfield and 2 new oil pays.

Williamson.—Production of 49,000 barrels of crude oil from 5 fields was reported during the year. The oil industry drilled 15,309 feet in completing 10 exploratory wells, all of which were dry. Limestone was quarried and crushed by the Leander Limestone Co., Round Rock White Lime Co., Superior Stone Products, Inc., and Texas Carbonate Co. Principal uses were in manufacturing lime, for whiting, as a fertilizer filler, for concrete and road surfacing, and for refractory

linings. Dimension limestone used for rough architectural, and for cut building stone was quarried and prepared by the Texas Quarries, Inc.

Wilson.—There were 508,000 barrels of crude oil from 15 oilfields and 45 million cubic feet of natural gas produced during the year. The oil and gas industry drilled 235 wells, of which 160 were completed as development and 75 as exploratory wells. Exploration drilling, totaling 175,839 feet, resulted in discovery of the Foerster, Linne, Bowman, and the Bowman-Queen City oilfields, 2 new oil pays, and 6 oil extensions. Fire clay and miscellaneous clay used for building and face brick and building tile were mined from open pits during the year by W. S. Dickey Clay Manufacturing Co.

Winkler.—Production of 15.7 million barrels of crude oil from 34 oilfields and 64.1 billion cubic feet of natural gas was reported. Natural-gas liquids and sulfur from natural gas were recovered at the Keystone plant of Sid Richardson Gasoline Co. Carbon black was recovered from sour gas at the Kermit channel plant of Cabot Carbon Co. There were 125 oil-well completions, of which 113 were development and 12 exploratory wells. Exploration drilling, totaling 121,052 feet and averaging 10,088 feet per well, resulted in 4 new oil pays

and 1 new gas pay.

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Wise.—Crushed limestone used principally for concrete, road surfacing, and metallurgical flux was produced by the Southwest Stone Co. and Wesco Stone Co. Other uses included riprap, agricultural lime, whiting, and mineral supplement. Building and paving sand and gravel were produced by E. G. John. Miscellaneous clay for building brick and heavy clay products was mined from open pits by the Acme Brick Co. Production of 704,000 barrels of crude petroleum from 42 oilfields and 7.6 billion cubic feet of natural gas was reported from Wise County in 1955. Exploratory drilling totaling 171,532 feet resulted in 8 discovery oil wells, 4 discovery gas wells, and 10 new oil pays. There were 110 well completions, of which 33 were exploratory and 77 development wells. Development drilling proved 51 oil and 26 gas wells.

Wood.—Crude oil, natural gas, and natural-gas liquids valued at more than \$68 million were produced in Wood County during 1955. Natural-gas liquids were recovered at the Caska gasoline plant of the Caska Corp. and at the Hawkins gasoline plant of Natural Gasoline Corp. The 3,500-barrel Winnsboro refinery of American Liberty Oil Co. operated throughout 1955. Sixteen oil and gas exploratory com-

pletions, with a total footage of 89,112 feet, were dry holes.

Yoakum.—Salt was produced from wells near Denver City by the Frontier Chemical Co. Natural-gas liquids were recovered at the Wasson gasoline plant of Shell Oil Co. Production of 19.4 million barrels of crude oil from 22 oilfields and 37.4 billion cubic feet of natural gas was reported in 1955. Of all Texas counties in 1955, geophysical prospecting was most active in Yoakum County. Seismic crews spent 3,576 crew weeks during the year. Exploratory drilling totaled 278,120 feet; well depths ranged from 144 feet to a maximum of 13,461. The five new oilfields discovered during the year were Brahaney, West San Andres, Chembliss San Andres Platang, Section 83 Penn field, and Janice San Andres.

Young.—The Graham oil refinery of G. & B. Oil Co. operated throughout 1955. Natural-gas liquids were recovered at four gasoline plants—the Lebus plant of Lebus Bros., the South Bend and Peters plants of Nash Gasoline Co., and the Turner & Wess plant of Turner & Wess. Paving gravel was produced under contract for District 3 of the Texas Highway Department. Production of 7 million barrels of crude oil from 173 oilfields and 4.9 billion cubic feet of natural gas was reported. Drilling programs by the oil and gas industry were very active, resulting in 791 well completions. Development drilling totaled 683 wells, of which 416 found oil and 3 gas; 264 holes were dry. Exploratory drilling completions totaled 108, aggregating 410,643 feet, and resulted in 31 discovery or new pay wells.

Zapata.—Crude-oil output in 1955 amounted to 1.1 million barrels from 16 oilfields; 2.5 billion cubic feet of natural gas was also produced. Exploratory drilling by the oil and gas industry, totaling 104,415 feet, resulted in discovery of the Davy Crockett oilfield and

the Falcon gasfield; 35 holes were dry.

Zavala.—Eight thousand barrels of crude oil from the Del Monte oilfield and 1.6 billion cubic feet of natural gas were produced during 1955. The oil and gas industry completed 15 wells, of which 2 were development and 13 exploratory wells. Exploratory drilling totaling 49,602 feet, resulted in discovery of 1 oilfield not yet named.

## The Mineral Industry of Utah

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

By Frank J. Kelly, William H. Kerns, Breck Parker, and Alfred L. Ransome 2



INERAL production in Utah, exclusive of uranium and shipments of manganese ore to the Government Purchase Depots, rose to a total \$331.9 million in 1955, a new alltime record and a 30-percent gain over 1954. This marked advance reflected directly the increased production of copper coupled with a higher average price during the year. Other trends of mining operations in Utah apparent during 1955 included increased output of each of the mineral fuels (gilsonite, coal, petroleum, natural gas, and natural gasoline) and carbon dioxide; all metals except manganese, molybdenum, and tungsten; and each of 13 nonmetals except potash, pumice, and sand and gravel. Molybdenum, an important byproduct of copper mining, as well as pumice, increased in value, even though production was less than in 1954. In contrast, the value of clays was less in 1955 for a slightly greater output compared with 1954.

Of the total value in 1955, copper contributed 52, coal 12, iron ore 7, gold 5, molybdenum 5, lead 5, zinc 3, and other minerals—mainly cement, silver, and petroleum—11 percent. As a group, metals supplied 79 percent of the total value in 1955 compared with 78 percent in 1954. Mineral fuels composed 15 and nonmetals 6 percent in 1955, compared with 15 and 7 percent, respectively, in the previous year.

In 1955, as in 1954, Utah was the only producer of gilsonite in the United States and ranked second to Arizona in production of copper, to Colorado in production of molybdenum, and to South Dakota with

respect to gold.

It was reported <sup>3</sup> that 14 thousand persons (yearly average) were employed in the mining industry in Utah during 1955 (13,000 in 1954). Of this total, 9.4 thousand were employed in metal mining, 3.0 thousand in coal mining, and 1.6 thousand in nonmetallic and other mining and quarrying; in 1954 comparable figures were 8.3, 3.2, and 1.5, respectively.

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 Chief, Division of Mineral Industries, Region III, Bureau of Mines, Denver, Colo.
 U. S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings, Annual Supplement Issue: Vol. 3, No. 12, June 1957, 135 pp.

TABLE 1.-Mineral production in Utah, 1954-55 1

	1954		1955	
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Asphalt and related bitumens: Gilsonite	5,007,952 211,835 4,403 403,401 3,040,646 44,972 30,428 25 97 16,024 1,905 3,588 166,506 5,327,969 6,179,243 1,127,461 84 575,884 34,031	\$2, 724, 023 29, 761, 341 124, 982, 650 82, 353  14, 119, 035 19, 277, 434 12, 322, 328 431, 828 (3) (3) 2, 259, 000 4, 480, 000 3, 788 1, 020, 061 3, 592, 286 5, 592, 527 1, 545, 841 308, 634 (3) 7, 350, 696	3, 847, 402 50, 452 38, 710 	24, 687, 485 15, 034, 696 582, 760 2, 386, 000 5, 140, 000 20, 011 1, 339, 085 3, 309, 280 5, 657, 077 2, 650, 480 224, 742
Total Utah 4		4 255, 495, 000		331, 929, 000

Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Value of low-grade manganese ore shipped to General Services Administration Purchase Depots and uranium ore is excluded.
 Weight not recorded.
 Figure withheld to avoid disclosing individual company confidential data.
 Revised figure.
 The total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing cement and lime.

TABLE 2.—Average prices of selected mineral commodities in Utah, 1954-55 1

Commodity	1954	1955	Commodity	1954	1955
Coal short ton Copper 2 pound Fluorspar short ton Gilsonite do Gold 3 troy ounce Iron ore (usable) long ton Lead 2 pound Lime short ton Natural gas thousand cubic feet	\$5, 943 . 295 18, 704 35, 869 35, 000 6, 340 . 137 14, 192 . 141	\$6. 355 . 373 20. 625 37. 639 35. 000 6. 417 . 149 15. 055	Petroleum (crude) 4  Pumice short ton Salt (common) do Sand and gravel do Silver 4 troy ounce Stone short ton Tungsten short-ton unit Zinc 2 pound	\$2.352 1.056 6.126 .674 .905+ 1.371 61.346 .108	\$2, 308 9, 805 6, 842 642 905+ 1, 376 58, 028 123

<sup>1</sup> Prices are based on average value f. o. b. mines or mills reported by the producers, except as otherwise

cement and lime.

## DEFENSE MINERALS EXPLORATION PROJECTS

The Government, through the Defense Minerals Exploration Administration (DMEA), continued to aid in financing exploration in search of strategic and critical minerals.

TABLE 3.—DMEA contracts executed in 1955

·			Contract		
County and contractor	Property	Com- modity	Date	Total amount	Gov- ern- ment partici- pation, percent
Emery					
Ryan & Maynard	Ryan claims_ Dede, Pewee, and Simon J_ Jack Rabbit claims_ Ouray Ventures property	Uranium do dodo	July 1 Apr. 28 Sept. 19 Sept. 6	\$34, 824 37, 743 57, 552 31, 824	75 65 75 75
Chatu Uranium Mining Co Climax Uranium Co. <sup>1</sup>	Seven Mile property Bonanza, La Sal, J. W. L. groups.	do	Aug. 23 June 14	19, 480 34, 693	75 75
Great Frontier Mining Corp Klondike Uranium, Inc Mid-Continent Uranium Corp.	Yellow Bird claims Klondike et al. claims Pond and Shuubert groups	do	Sept. 15	21, 138 19, 132 48, 420	75 75 75
Salt Lake					
United States Smelting Refining and Mining Co.	U.S. and Lark mine	Lead-zinc_	Aug. 15	301, 930	50
San Juan			1.0		
Amuranium Corp	Happy Day and Apache groups.	Uranium	Jan. 24	147, 650	75
Continental Uranium, Inc	Utah State Board Lease	do	May 20	46, 330	75
Hecla Mining Co La Salle Mining Co Silver Pick Uranium, Inc Uranium King Corp Utah Premier Uranium Co Walter Duncan Mining Co Tooele	Hecla and Hot Rock project_ Cottonwood section Buckskin and Stain groups_ Cove group	do do	Dec. 12 Oct. 20 Sept. 22	81, 680 18, 734 16, 304 18, 700 25, 400 76, 088	75 75 75 75 75 75
McFarland & Hullinger	Ophir mine	Lead-zinc_	Sept. 15	104, 700	50
Washington	•			. ,	
Utah Uranium, Inc	Bloomington claim	Uranium	Mar. 7	7, 290	75
Total				1, 149, 612	

<sup>&</sup>lt;sup>1</sup> Property in Mesa County, Colo., and Grand County, Utah. Value of contract has been split 50-50.

## **REVIEW BY MINERAL COMMODITIES**

## **METALS**

Arsenic.—A small quantity of arsenic was recovered in Utah in 1955 as a byproduct of lead smelting at the Midvale plant of the

United States Smelting Refining and Mining Co.

Cobalt.—The Chemical Construction Corp., designer and builder of the Calera Mining Co. cobalt refinery at Garfield, operated the plant throughout most of the year and overcame most of the mechanical difficulties that had kept production below scheduled capacity. Of the many metals, ceramics and other materials tested to resist corrosion, temperature, pressure, and abrasive problems in the plant, titanium was found to be the best. Ore was mined and milled at Calera's Blackbird mine at Cobalt, Idaho. The concentrate was

shipped to the refinery at Garfield, Utah, where cobalt granules were

produced by a new process.

Copper.—Despite a reduction in output resulting from a 6-week strike at Utah's major copper producer, Kennecott Copper Corp. Utah Copper open-pit mine at Bingham, production of recoverable copper in the State in 1955 increased 10 percent in quantity and 39 percent in value, compared with 1954. Utah remained the second largest copper producer in the United States, following Arizona. The value of copper production of the State in 1955. total value of all mineral production in the State in 1955.

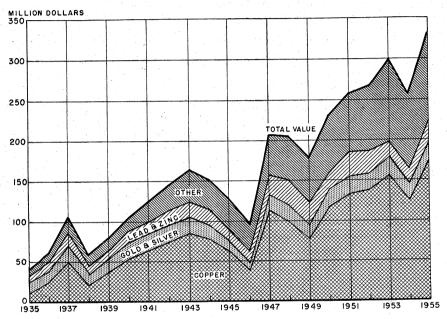


FIGURE 1.—Value of gold, silver, copper, lead, and zinc, and total value of all minerals in Utah, 1935-55.

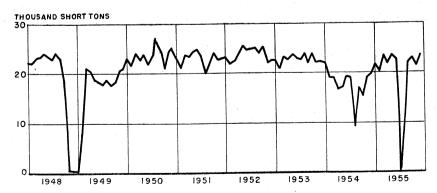


FIGURE 2.—Mine production of copper in Utah, 1948-55, by months, in terms of recoverable metals.

In terms of value of copper output, the U.S. and Lark mine of the United States Smelting Refining and Mining Co., also at Bingham, was the second largest copper producer (following the Utah Copper mine) in Utah in 1955. At this mine, copper was recovered as a byproduct of the smelting of lead, zinc, and iron concentrates from lead-zinc ore mined, from the direct smelting of lead, lead-zinc, and silver ores, and as a primary product from copper precipitate. Another lead-zinc mine, Mayflower, Galena, and Star Units of New Park Mining Co. in the Blue Ledge district of Wasatch County, ranked third in copper output.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc, 1946-50 (average), 1951-55, and total 1864-1955, in terms of recoverable metals <sup>1</sup>

Year		s pro- eing	Material sold or treated <sup>2</sup>	Gold (lode	and placer)	Silver (lode	and placer)
	Lode	Placer	(short tons)	Fine ounces	Value	Fine ounces	Value
1946-50 (average) 1951 1952 1953 1954 1955	100 82 63 55 54 63	1	24, 643, 957 31, 356, 837 32, 875, 034 30, 682, 662 24, 846, 805 28, 598, 662	348, 045 432, 216 435, 507 483, 430 403, 401 441, 206	\$12, 181, 582 15, 127, 560 15, 242, 745 16, 920, 050 14, 119, 035 15, 442, 210	6, 750, 500 7, 310, 665 7, 194, 109 6, 725, 807 6, 179, 243 6, 250, 565	\$6, 029, 525 6, 616, 521 6, 511, 032 6, 087, 195 5, 592, 527 5, 657, 077
1864–1955			<sup>3</sup> 827, 936, 781	14, 400, 431	404, 240, 125	782, 466, 957	581, 370, 032

	c	opper	· I	ead	1	Zinc	
Year	Short tons	Value	Short tons	Value	Short tons	Value	Total value
1946-50 (average) 1951 1952 1953 1954 1955	216, 740 271, 086 282, 894 269, 496 211, 835 232, 949	\$88, 223, 505 131, 205, 624 136, 920, 696 154, 690, 704 124, 982, 650 173, 779, 954	46, 837 50, 451 50, 210 41, 522 44, 972 50, 452	\$13, 978, 437 17, 456, 046 16, 167, 620 10, 878, 764 12, 322, 328 15, 034, 696	37, 161 34, 317 32, 947 29, 184 34, 031 43, 556	\$9, 518, 233 12, 491, 388 10, 938, 404 6, 712, 320 7, 350, 696 10, 714, 776	\$129, 931, 282 182, 897, 139 185, 780, 497 195, 289, 033 164, 367, 236 220, 628, 713
1864-1955	7, 138, 116	2, 498, 059, 625	4, 860, 120	624, 314, 214	1, 314, 557	226, 867, 443	4, 334, 851, 439

<sup>&</sup>lt;sup>1</sup> 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 calender year indicated.

<sup>2</sup> Does not include gravel washed or tonnage of precipitates shipped.

<sup>3</sup> Figures estimated for certain years before 1901.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in 1955, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)		Lead (short tons)	Zinc (short tons)
January February March April May June July August September October November	42, 043 39, 403 47, 098 46, 745, 185 45, 185 39, 828 2, 523 22, 250 37, 771 39, 014 38, 190 41, 156	545, 339 534, 338 620, 231 550, 276 585, 309 567, 861 229, 687 350, 686 570, 374 565, 432 553, 467 577, 565	21, 567 20, 200 23, 394 21, 782 23, 521 122, 587 140 9, 893 22, 066 23, 095 21, 353 23, 351	4, 145 3, 744 4, 466 3, 642 3, 790 4, 331 3, 788 3, 981 4, 546 4, 744 4, 595 4, 680	3, 402 3, 063 3, 764 3, 457 3, 992 3, 672 3, 726 3, 566 3, 968 3, 823 3, 772
Total	441, 206	6, 250, 565	232, 949	50, 452	43, 556

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TABLE 6.—Mine productic	on of g	luction of gold, silver, copper, lead, and zinc in 1955,	er, cop	per, leac	l, and zi	nc in 19	55, by co	by counties and	l districts, in terms	, in teri		coverabl	of recoverable metals
	Mines pro-	Material sold or	Ď	Gold	Silver	70r	Copper	per	Lead	70	Zino	9	
County and district	duc- ing 1 (lode)	treated 2 (short tons)	Fine	Value	Fine	Value	Pounds	Value	Pounds	Value	Pounds	Value	Total value
Beaver County: Beaver Lake Lincoln Rocky	- F	59 22 542	21.80	\$70 280	25 26 26	\$19 64 838	2,000 1,800 30,200	\$746 671 11, 265					\$765 805 12, 383
Total	4	623	2	350	1,018	921	34,000	12, 682					13, 953
Box Elder County: Asibrook Box Elder Lucin		249	7	70	36 17 413	33 15 374	400	7, 311	6,000	\$894	2,000	\$246	33 164 8, 895
Total	8	260	8	70	466	422	20,000	7, 460	6,000	894	2, 000	246	9, 092
Emery County: San Rafael	1	9			210	190							190
Juab County: Detroit (Drum Mountain) Mount Nebo (Mons) Tintic *	12	23 2,000 102,758	2,118	245 70 74, 130	45 975 498, 878	41 882 451, 510	1, 500	560	126, 900 9, 301, 100	1, 385, 864	7, 996, 000	983, 508	846 19, 860 2, 962, 338
Total	. 14	104, 781	2, 127	74, 445	499, 898	452, 433	182, 000	67,886	9, 428, 000	1, 404, 772	7, 996, 000	983, 508	2, 983, 044
Millard County: Cricket Mountain Gordon (Dog Valley)	1	15			24 168				100 2, 900	1, 177	4,000	492	37 1, 821
Total	3	49	-		192	174			8,000	1, 192	4,000	492	1,858
Plute County: Mount BaldyOhio	1 2	397 345	71	2, 765	11, 009	9,964	10, 600	3, 954 522	14,000	2, 086			18,769
Total	3	742	96	3, 360	12, 958	11, 728	12,000	4, 476	14,000	2, 086			21, 650
Salt Lake County: Big Cottonwood, Little Cottonwood, and Smelter 4 West Mountain (Bingham)	614	49, 108 28, 087, 094	405	21 735 735 74 14, 181, 790	14, 505 4, 409, 373	13, 128 3, 990, 705	23, 000 464, 031, 000	8, 579 173, 083, 563	1, 419, 500 63, 424, 500	211, 506 9, 450, 250	6, 370, 000 43, 728, 000	783, 510 5, 378, 544	1, 017, 458 206, 084, 852
Total	9	28, 136, 202	405, 215 14, 182,	14, 182, 525	4, 423, 878	4, 003, 833	464, 054, 000	173, 092, 142	64, 844, 000	9, 661, 756	50, 098, 000	6, 162, 054	207, 102, 310

2, 417	36 643, 403	25 1, 853 123 4, 968 976 643, 116 508 753, 908 354 322, 651	986 1, 726, 485	5, 407	6, 144	253, 205	34 7, 734, 418	130, 387	130, 544	776 220, 628, 713 696 164, 367, 236
	16, 236	185, 112, 240,	538,			4, 920	3, 008, 334			10, 714, 7 7, 350, 6
	132, 000	200 1, 512, 000 914, 700 1, 954, 100	4, 382, 000			40,000	24, 458, 000			87, 112, 000 68, 062, 000
	149, 596	447 134 335, 861 478, 916 72, 682	888, 040			109, 068	2, 816, 696	596	596	15, 034, 696 12, 322, 328
	1,004,000	3,000 2,254,100 3,214,200 487,800	5, 960, 000			732, 000	18, 904, 000	4,000	4,000	100, 904, 000 89, 944, 000
	84, 298	1, 194 4, 364 53, 078 15, 964 3, 730	78, 330	5, 259 709	5, 968	17, 158	280, 496	149 128, 909	129, 058	173, 779, 954 124, 982, 650
	226, 000	3, 200 11, 700 142, 300 42, 800 10, 000	210,000	14, 100	16,000	46,000	752,000	400 345, 600	346,000	465, 898, 000 423, 670, 000
1, 752	308, 538	152 127 65,890 116,140 5,150	187, 459	113	141	102, 599	586, 347	532	540	5, 657, 077 5, 592, 527
1, 936	340, 907	168 72, 803 128, 324 5, 690	207, 125	125	156	113, 363	647, 861	988	597	6, 250, 565 6, 179, 243
665	84, 735	35 2,310 30,380 735	33, 670	35	35	19, 460	1, 042, 545	350	350	15, 442, 210 14, 119, 035
19	2, 421	66 868 21	962	1	1	556	29, 787	10	10	441, 206 15, 403, 401 14,
22	122, 140	25 248 17, 768 16, 878 20, 362	54, 281	182	249	12, 176	165, 367	1,756	1, 764	63 28, 598, 662 54 24, 846, 805
1	4	41.00	11	12	က	9	2	11	2	82
Sevier County: Henry	Summit County: Uintah	Tooele County: Bue Bell and Clifton 4. Dugway. Erickson and Opbir 4. Rush Valley. Smelter.	Total	Untah County: Carbonate Uteland Knoll	Total	Utah County: Tintic 8	Wasatch County: Blue Ledge	Washington County: Harrisburg Tutsagubet	Total	Total: 1955

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Operations pertaining to production from old mill cleanings, old smelter cleanings, and talling dumps not counted as a producing mine.
 Does not include tonings of precliptates shipped.
 Firthte district ites in both Juab and Utah Counties.
 Bureau of Mines not at liberty to show production figures separately by districts.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1955, by classes of ore or other source materials, in terms of recoverable metals

Source	Num- ber of mines 1	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore: Dry gold Dry gold-silver Dry silver	2 15 19	639 33, 321 93, 848	78 1, 215 2, 643	672 104, 290 463, 819	900 86, 600 390, 100	17, 800 322, 300 1, 666, 500	2, 000
Total	35	127, 808	3, 936	568, 781	477, 600	2, 006, 600	2, 000
Copper Copper-lead-zinc Lead Lead-zinc	12 2 18 16	27, 742, 337 353 13, 600 604, 531	396, 567 2 510 39, 471	2, 924, 184 647 71, 620 2, 567, 192	449, 236, 080 7, 800 60, 670 3, 112, 500	50 7, 150 3, 082, 300 93, 905, 100	4, 700 88, 900 78, 751, 200
Total	36	28, 360, 821	436, 550	5, 563, 643	452, 417, 050	96, 994, 600	78, 844, 800
Other "lode" material: Mill cleanings (lead- zinc). Old tailings (silver) Copper precipitates Old slag 3		66 41, 401 8, 330 68, 566	5 684 31	2, 379 106, 180 9, 582	900 94, 700 12, 834, 500 73, 250	51, 700 557, 800 1, 293, 300	10, 300 5, 300 8, 249, 600
Total		118, 363	720	118, 141	13, 003, 350	1, 902, 800	8, 265, 200
Total "lode" ma- terial	63	28, 606, 992	441, 206	6, 250, 565	465, 898, 000	100, 904, 000	87, 112, 000

<sup>1</sup> Detail will not add to totals because some mines produce more than 1 class of material. 2 Copper, 765 tons; lead, 1,277 tons; zinc, 66,524 tons.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery and types of material processed, in terms of recoverable metals

Method of recovery and type of material processed	Material treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode: Concentration, and smelting						
of concentrates 1	28, 346, 943	436, 000	5, 488, 251	451, 988, 400	93, 906, 150	78, 686, 500
Direct smelting: OreOld tailingsCopper precipitates 2	141, 686 41, 401 8, 330	4, 486 684	644, 173 106, 180	906, 250 94, 700 12, 834, 500	5, 095, 050 557, 800	160, 300 5, 300
Old slag and mill clean- ings	68, 632	36	11, 961	74, 150	1, 345, 000	8, 259, 900
Total	260, 049	5, 206	762, 314	13, 909, 600	6, 997, 850	8, 425, 500
Grand total	28, 606, 992	441, 206	6, 250, 565	465, 898, 000	100, 904, 000	87, 112, 000

<sup>&</sup>lt;sup>1</sup> Ore only; no old tailings, etc., processed by this method in 1955.
<sup>2</sup> All from Salt Lake County.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery and classes of material processed, in terms of recoverable metals

## A. For ore treated at mills

	Ore	Co	ncentrate s	hipped to sr	nelters and r	ecoverable m	etals
	treated (short tons)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zine (pounds)
		В	COUNT	TES			
Juab Millard Salt Lake	70, 080 16 28, 076, 650	16, 011 5 859, 931	735 404, 526	286, 204 140 4, 342, 592	86, 800 450, 965, 500	7, 637, 900 3, 400 61, 748, 000	7, 934, 000 1, 700 43, 739, 100
Summit	954 33, 530 346 165, 367	8, 010 86 43, 092	928 928 3 29, 787	10, 581 198, 499 2, 374 647, 861	900 182, 800 400 752, 000	169, 000 5, 370, 850 73, 000 18, 904, 000	112, 700 2, 411, 300 29, 700 24, 458, 000
Total: 1955 1954	28, 346, 943 24, 620, 983	927, 349 835, 157	436, 000 396, 928	5, 488, 251 5, 167, 817	451, 988, 400 406, 133, 900	93, 906, 150 81, 833, 800	78, 686, 500 65, 904, 300
	В	Y CLASS	ES OF OF	RE TREAT	ED		
Copper	27, 740, 600 353 2, 000	754, 259 23 128	396, 541	2, 922, 994 647 975	448, 871, 900 7, 800	7, 150 126, 900 93, 772, 100	4,700
Total 1955	603, 990 28, 346, 943	927, 349	39, 455 436, 000	2, 563, 635 5, 488, 251	3, 108, 700 451, 988, 400	93, 772, 100	78, 681, 800
			<u> </u>		D TO SME	<u> </u>	10,000,000
		ı	· · · · ·				<u> </u>
Copper-lead Copper-zinc Iron <sup>1</sup>		754, 259 13 4 21, 338	396, 541 2 4, 418	2, 922, 994 561 4 78, 534	448, 871, 900 4, 970 2, 330 69, 000	6, 940 10 609, 600	280 980 292, 100
LeadZinc		78, 837 72, 898	30, 861 4, 178	2, 093, 647 392, 511	1, 820, 550 1, 219, 650	87, 921, 770 5, 367, 830	1, 305, 100 77, 088, 040
Total 1955		927, 349	436, 000	5, 488, 251	451, 988, 400	93, 906, 150	78, 686, 500
	B. For	material	shipped	directly to	o smelters		<del></del>
		Material		Recov	erable metal	content	
	- 1	shipped (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
			BY COU	TIES			·
Beaver Box Elder Emery		623 260 6	10 2	1, 018 466 210	34, 000 20, 000	6, 000	2, 000
JuabMillard		34, 701 33	1, 392	213, 694 52	95, 200	1, 790, 100 4, 600	62, 000 2, 300
PiuteSalt LakeSevier		742 67, 882 22	96 689 19	12, 958 81, 286 1, 936	12, 000 213, 088, 500	14,000 3,096,000	6, 358, 900
Summit Tooele Uintah Utah		121, 186 20, 751 249 11, 830	2, 400 34 1 553	330, 326 8, 626 156 110, 989	225, 100 27, 200 16, 000	835, 000 589, 150 659, 000	19, 300 1, 970, 700 10, 300
Washington		1,764	10	110, 989 597	45, 600 346, 000	4,000	10, 300

See footnotes at end of table.

260, 049 236, 181 5, 206 6, 473 <sup>2</sup> 13, 909, 600 17, 536, 100 6, 997, 850 8, 110, **200**  8, 425, 500 2, 157, 700

Total: 1955

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery and classes of material processed, in terms of recoverable metals—Continued

B. For material shipped directly to smelters—Continued

	Material		Recove	erable metal	content	
	shipped (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
	BY CLAS	SES OF	MATERIA	L		
Dry gold: Crude ore	639 33, 321 93, 848 41, 401	78 1, 215 2, 643 684	672 104, 290 463, 819 106, 180	900 86, 600 390, 100 94, 700	17, 800 322, 300 1, 666, 500 557, 800	2, 000 5, 300
Copper: Crude orePrecipitatesOld slag	1, 737 8, 330 765	26 4	1, 190 287	364, 180 12, 834, 500 49, 450	50 4,000	
Lead: Crude ore Old slag Lead-zinc:	11, 600 1, 277	508 6	70, 645 983	60, 670 4, 600	2, 955, 400 38, 700	88, 90
Crude ore	541 66 66, 524	16 5 21	3, 557 2, 379 8, 312	3, 800 900 19, 200	133, 000 51, 700 1, 250, 600	69, 40 10, 30 8, 249, 60
Total 1955	260, 049	5, 206	762, 314	13, 909, 600	6, 997, 850	8, 425, 50

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery and classes of material processed, in terms of gross metal

	Quantity shipped		Gr	oss metal cor	ntent	
Class of material	or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCI	ENTRATI	SHIPPE	D TO SM	ELTERS		1.1
Copper_Copper-lead Copper-zinc Iron 1 Lead Zinc	13 4 21, 338	396, 541 2 4, 418 30, 861 4, 178	2, 922, 994 561 4 78, 534 2, 093, 647 392, 511	453, 178, 950 5, 839 2, 709 92, 362 2, 330, 338 1, 434, 818	7, 095 19 629, 912 91, 056, 994 5, 650, 426	377 999 865, 885 9, 542, 479 78, 902, 375
Total: 1955 1954	927, 349 835, 157	436, 000 396, 928	5, 167, 817	457, 045, 016 415, 090, 822	97, 344, 446 85, 046, 020	89, 312, 113 76, 272, 955
ORES, OLD TAILIN	GS, ETC.	, SHIPPE	D DIREC	TLY TO SI	MELTERS	
Dry gold Dry gold-silver Dry silver: Crude ore Old tailings	33, 321 93, 848	78 1, 215 2, 643 684	672 104, 290 463, 819 106, 180	931 88, 699 400, 023 96, 811	29, 600 498, 477 2, 725, 116 927, 681	32, 300 8, 662 6, 762
Copper: Crude ore	1, 737 8, 330	26	1, 190 287	372, 088 13, 030, 143 50, 764	89	
Lead: Crude ore Old slag Lead-zine:	11,600	508 6	70, 645 983	78, 530 6, 129	3, 073, 731 40, 348	270, 641
Crude ore		16 5 75	3, 557 2, 379 12, 165	4, 593 1, 127 241, 524	135, 411 52, 619 1, 380, 902	87, 508 13, 098 10, 218, 218
Total: 1955	260, 049 236, 181	5, 260 6, 537	766, 167 1, 017, 186		8, 870, 711 11, 136, 774	10, 637, 186 2, 481, 552

<sup>:</sup> From copper-lead-zinc and lead-zinc ores.

From copper-lead-zinc and lead-zinc ores.
 Includes copper recovered from smelting mine-water precipitates as follows: 1955—12,834,500 pounds;
 1954—15,906,900 pounds.

Gold.—Utah's gold output in 1955 was again second only to that of South Dakota. Production increased 9 percent compared with 1954 because of gains from the 3 leading gold producers, which supplied 98 percent of the total in 1955. Utah Copper (Kennecott Copper Corp.), Mayflower, Galena, and Star Units (New Park Mining Co.), and U. S. and Lark mine (United States Smelting Refining and Mining Co.), in that order, were the important gold producers in the State. All of the gold was recovered as a byproduct of treating ores of copper, lead, zinc, and silver.

Iron Ore.—Following a drop in 1954 (compared with 1953), iron-ore shipments in 1955 increased 27 percent above 1954. This resulted from a greater demand for pig iron and steel. The ore was mined by

4 companies from 6 mines in Iron County in 1955.

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Columbia Iron Mining Co., subsidiary of United States Steel Corp., was again the major iron-ore producer in Utah. The ore, hematite with a minor quantity of magnetite, came from the Desert Mound and Iron Mountain mines. The second largest iron-ore shipper was Colorado Fuel & Iron Corp., which mined magnetite iron ore from the Blowout and Comstock (Mountain Lion) deposits and shipped it to the company steel plant at Pueblo, Colo. Utah Construction Co. ranked third in iron shipments. The hematite iron ore from the Excelsior mine was shipped by the company to the Colorado Fuel & Iron Corp. Pueblo, Colo., steel plant.

The Consolidated Western Steel Division of the United States Steel Corp. completed an \$8.5 million expanded-steel-pipe plant begun in 1954 at the Geneva Works and produced its first carlot of pipe on April 21, 1955. Also in April, the Columbia-Geneva Steel Division of the United States Steel Corp. announced that Blaw-Knox Corp. of Pittsburgh, Pa., would construct and place in operation its estimated \$18 million anhydrous ammonia plant, which would utilize coke-oven gases from the Geneva Works to produce 70,000 tons of anhydrous ammonia and ammonium nitrate annually.

TABLE 11.—Shipments of iron ore from mines, total 1906-50 and 1951-55

Year	Long tons	Value	Year	Long tons	Value
1906–50	22, 517, 698	\$34, 211, 548	1953	4, 617, 288	\$26, 496, 950
	4, 637, 239	10, 141, 653	1954	3, 040, 646	19, 277, 434
	3, 990, 505	15, 025, 899	1955	3, 847, 402	24, 687, 485

Lead.—The 12-percent increase in the lead output in Utah in 1955, compared with 1954, resulted primarily from increased output from the United Park City Mines Co. group of mines and reopening of the Tooele smelter of the International Smelting and Refining Co. The United Park City group of mines, a consolidation of the Silver King and Park Utah properties in 1953, active only during the last part of 1954, was operated throughout 1955. The Tooele smelter and concentrator were closed in July of 1954, owing to lack of material for treatment. The concentrator was reactivated to mill ore from the United Park City mines during the last 4 months of 1954. In July 1955 enough ore and concentrate had been stockpiled to begin smelter operation and restore their jobs to 500 employees.

The U. S. and Lark mine at Bingham, operated by United States Smelting Refining and Mining Co., remained by far the largest lead producer in Utah. It was followed, in order of output, by United Park City Mines Co., Chief Consolidated Mining Co., and New Park Mining Co. mines. These 4 groups of mines produced 89 percent of the total

lead production in Utah in 1955.

Two DMEA contracts, in which Government participation was 50 percent for exploration projects at lead-zinc mines in Utah, were approved in 1955. The Government shared with McFarland & Hullinger on a \$104,700 project at the Ophir mine and with the United States Smelting Refining and Mining Co. in a \$301,930 project at the U. S. and Lark mine.

Manganese and Manganiferous Ores.—A total of 4,500 long dry tons of ore averaging 25.7 percent contained manganese valued at \$148,000 and 42 tons of ore averaging 39 percent contained manganese valued at \$3,100 was mined in Utah in 1955 and shipped to the Government depots at Butte, Mont., Wenden, Ariz., and Deming, N. Mex. The ore was marketed under the low-grade manganese-ore purchasing program but will not be credited as production in Bureau of Mines statistics until a useful product is shipped from the depots. The ore came from 9 mines in 6 counties. The two major producers were Black Boy, operated by L. J. Price, and Staats Manganese, operated by Fred Staats, both in Juab County.

Molybdenum.—All molybdenum produced in 1955 in Utah was recovered as a byproduct of copper ore from the Utah Copper mine of the Kennecott Copper Corp. Output in 1955 was slightly less than in 1954. Utah remained second to Colorado as the largest producer of

molybdenum in the United States in 1955.

Rare Earths.—The M & L Rare Earths Co. operated an experimental plant at Murray, Salt Lake County During the year a small quantity of bastnaesite ore was processed, and some rare-earth oxides were recovered. The finished product was sold to the Federal Bureau of Mines Rare and Precious Metals Experiment Station in Reno, Nev., for research work.

Selenium and Tellurium.—In 1955 some selenium and tellurium were produced as byproducts at the Garfield copper refinery operated

by Kennecott Copper Corp.

Silver.—Utah was second to Idaho in silver production during 1955. As in prior years, most of the silver was recovered as a byproduct of ores of copper, lead, and zinc. Despite major increases in the output of copper, lead, and zinc in 1955, silver output increased only 1 percent above 1954. Production of silver increased from the leading and next to leading producers, Utah Copper and U. S. and Lark mines, respectively, in Utah in 1955, compared with 1954. Silver recovered from Chief Consolidated Mining Co. and New Park Mining Co. mines, the third and fourth ranking silver producers, respectively, was substantially below the 1954 output. Because of a full year's operation at the United Park City Mines Co. mine, compared with 4 months in 1954, output was increased so that it became the fifth largest silver producer in Utah in 1955. Output from these 5 mines accounted for 87 percent of the total silver produced in the State in 1955.

Tungsten.—Output of tungsten in Utah dropped from 5,031 short-ton units of WO<sub>3</sub> in 1954 to 3,873 units in 1955. Recorded production came from 23 mines in 7 counties. Millard County, with 8 active

mines, was the largest tungsten producer, followed by Salt Lake and Tooele. The Treasure Mountain mine in Millard County, operated by the Treasure Mountain Mining Co., with an output of ore with a recoverable tungsten content valued at \$75,000, was the largest producer in Utah in 1955. A substantial quantity of tungsten was recovered by the H. M. & S. Milling Co. from re-treatment of old tailing. Custom tungsten-ore mills were operated in the State by Combined Metals Reduction Co., Salt Lake Tungsten Co., and Western Tungsten Milling Co.

The Salt Lake Tungsten Co. completed an expansion program at its

The Salt Lake Tungsten Co. completed an expansion program at its Salt Lake City refinery which included addition of an ammonium-paratungstate plant to produce a material easily convertible to powdered tungsten. The company method of treating low-grade

concentrate to produce synthetic scheelite was described.4

Uranium.—Exploration and development activities on the Utah portion of the Colorado Plateau continued at a high rate during 1955, and mine output increased substantially. Uranium-mill construction also drew considerable attention.

Exploration drilling totaled 1.7 million feet during the year and represented approximately half of the effort put forth to find and develop uranium ore bodies. San Juan and Emery County areas received most attention, and significant amounts of work also were

reported from Grand and Garfield Counties.

Although production data were still classified, the Big Indian, San Rafael, and White Canyon districts were the major producing areas. During 1955 the industry made an intensive effort to bring milling capacity up to mine capacity. The program of expansion of the Monticello mill was carried out. At Salt Lake City, Vitro Uranium Co. announced plans to increase mill capacity 70 percent. At Moab, construction began on a new mill to process some of the ore from the Big Indian district, and an Atomic Energy Commission (AEC) contract was negotiated for a mill at La Sal.

Eighteen DMEA contracts totaling \$743,000 were executed during the year for uranium exploration in Utah. Comparable data for 1954

were 2 contracts totaling \$26,800.

Vanadium.—The recoverable vanadium content of uranium-vanadium ores mined in Utah was 996,000 pounds. Recovery was

made at plants in Colorado and at Monticello, Utah.

Zinc.—Recoverable zinc output in Utah in 1955 increased 28 percent above 1954 in quantity and 46 percent in value. The top 4 lead producers in the State were also the 4 largest zinc producers. Five operations (in order of output), U. S. and Lark (United States Smelting Refining and Mining Co.), Ontario-Park Utah (United Park City Mines Co.), Mayflower, Galena, and Star units (New Park Mining Co.), and Chief No. 1 (Chief Consolidated Mining Co.) mines and the re-treatment of zinc slag dump material (United States Smelting Refining and Mining Co.), composed 94 percent of the total zinc output in Utah in 1955.

Cement.—The value of cement shipments in Utah constituted the most important source of income to the nonmetallic branch of the mineral industry, and cement ranked eighth among all mineral com-

<sup>4</sup> Burwell, Blair T., Synthetic Scheelite: Min. World, June 1955, vol. 17, No. 7, pp. 44-49.

modities in the State in terms of value. Plants operated by the Union Portland Cement Division, Ideal Cement Co., at Devils Slide and the Portland Cement Co. of Utah at Salt Lake City were the sources of all production and sales of types I, II, III, oil-well, water-proof, and masonry cements. Total sales were 19 percent over 1954. Limestone, clays, gypsum, and other raw materials used in manufacturing cement were mined locally, and increased consumption of these commodities was also reported. Both plants used the wet process; four kilns were in operation during the year. In addition to the cement consumed in Utah, shipments were made from Utah plants to Arizona, California, Colorado, Idaho, Illinois, Indiana, Iowa, Michigan, Missouri, Nebraska, New Mexico, Nevada, Oklahoma, Texas, and Wyoming.

Clays.—The demand for Utah clays for use in refining oil and manufacturing building brick and other structural-clay products continued to climb in 1955, and output was 16 percent over that in 1954. The most important mining operation was the Dragon halloysite mine at Eureka, Juab County. The mine was operated by the Filtrol Corp. of Los Angeles, Calif., which also operated a processing plant at Salt Lake City where halloysite was processed for use in catalytic cracking

units at petroleum refineries.

Four brick plants were operated in Utah during 1955—2 at Salt Lake City, 1 at Ogden, and 1 at Provo. Except for 35,000 tons of fire clay produced in Utah by Utah Fire Clay Co., Western Fire Clay Co., and R. D. Wadley Clay Co., the bulk of the State output of clays was of the miscellaneous variety. The second and third most important producers that also operated brick plants at Salt Lake City were the Interstate Brick Co., with miscellaneous clay mines in Morgan, Salt Lake, Tooele, and Utah Counties; and the Utah Fire Clay Co., which mined fire and miscellaneous clays in Summit, Tooele, and Utah Counties.

An average of 105 men was employed in clay mining in the State; these men worked 30 to 300 days, depending on the individual mining

operation.

Fuller's earth and bentonite continued to be produced in Sevier County by the Western Clay & Metals Co. After grinding at the company mill the fuller's earth was shipped to refineries for filtering mineral oils and greases, whereas the bentonite was used in foundries,

in concrete, rotary-drilling mud, and laundries.

Fluorspar.—Mine production of metallurgical-grade fluorspar in 1955 recovered slightly from the precipitous decline reported in 1954. Output rose from 4,400 tons in 1954 to 7,300 in 1955. However, this increase did not represent a strengthening of the industry owing to higher prices but rather indicated the erratic nature of fluorspar mining. Three mines were active during part of 1955. The Lost Sheep mine, operated by the Willden Bros., was the principal shipper and was followed closely by the Bell Hill mine, worked by the Bell Hill Mining Co. Chesley & Black operated the Fluorine Queen for a short period during 1955. These mines are near Delta, Juab County, and all output was shipped to steel plants.

Gem Stones.—In 1955 the Federal Bureau of Mines expanded its statistical canvass on gem and ornamental stones to include all collectors, mineralogical societies, and dealers. The value of production

in Utah was reported at \$6,000 and includes agate, obsidian, onyx, jasper, topaz, and petrified wood. Output was concentrated in San Juan and Grand Counties, but production was reported in 12 of

the 29 counties in the State.

Gypsum.—In 1955, as in 1954, all gypsum produced in Utah came from open pits near Sigurd, Sevier County, operated by United States Gypsum Corp. and Western Gypsum Co.; shipments in 1955 increased 11 percent over 1954. The crude gypsum was processed in plants at Sigurd for use in manufacturing Keene's cement, wallboard, plaster,

and other building materials.

Lime.—Lime was produced at three plants in 1955. Of the total production, 59 percent was quicklime produced at a plant at Magna. Salt Lake County, and used as a reagent in milling copper ore. remainder, quick and hydrated lime produced at plants in Tooele and Utah Counties, was used mainly as a reagent in milling base-metal ores. However, significant quantities were also used in making silica brick, as a fluxing agent, in petroleum refining, for gas and water

purification, and in processing phosphate rock and uranium.

Perlite.—Despite a slight increase in the quantity of crude perlite produced in 1955, output generally remained at relatively the same low level as that reported in past years. Utco Products Co. was the sole mine operator in the State, and all production came from a mine near Milford, Beaver County, and was expanded at its Salt Lake City plant. Combined Metals Reduction Co. also operated an expanding plant at Bauer during the first half of 1955. During the second half of the year the facility was leased by Acme Time Products Expanded perlite was produced from crude ore mined in Nevada and was used as a constituent in plaster and concrete aggregate

Phosphate Rock.—Phosphate-rock mining in Utah reached a new high during 1955, with an output increase of 44 percent over 1954. The San Francisco Chemical Co. continued to be the dominant producer and by the year end was the only phosphate-rock mining company active in the State. J. R. Simplot Co., which began mining in 1954, discontinued operations during the second half of 1955. Francisco Chemical Co. continued production of phosphate rock from its open-pit and underground properties near Montpelier, Idaho, Leefe, Wyo., and the Sioux mine in Rich County, Utah. San Francisco Chemical's Arickeree and Pawnee mines are at the north end of the Rich County district, whereas the Emma-Tuscarrora is toward the southern end. During 1955 the firm developed a fourth underground mine, the Cherokee, on the Bear Valley side of the Crawford Mountains. A 2,300-foot adit was being driven, with completion of drifting and the commencement of mining operations scheduled for early 1957.

This expansion program is keyed to the continued demand for phosphate for agricultural and metallurgical uses. In this connection, Western Phosphates, Inc., plans a \$2 million expansion program at its Garfield plant that will increase the production of ammoniated

phosphate and triple superphosphate 40 percent.

Potash.—Production and sales of potassium chloride (95-98 percent KCl) in 1955 declined considerably below 1954 owing to curtailment of productive activity during October, November, and Decem-This cutback resulted from a strike at the Wendover, Tooele County, plant of Bonneville, Ltd. However, by the year end the

plant was again in full production.

Output of alunite was reported by The Calunite Corp. at its White Horse mine near Marysvale, Piute County. The crude material was shipped to the company mill at Marysvale, where it was processed and reshipped to various fertilizer-mixing plants throughout the

country.

Pumice.—Output of pumice in Utah continued to decline in 1955; sales dropped from 3,600 tons in 1954 to 2,000 in 1955. William H. Prince & Sons Block Co. was the largest producer in terms of tonnages and used all its output in manufacturing concrete block. Harborlite Corp. was active at Faust, Tooele County, and shipped small quantities of crude pumice to its Chula Vista, Calif., plant for experimental purposes (filter aid). Some productive activity was reported for the first time by Utah Lavalite, Inc., at a property near Milford, Millard County. The crude material is not actually pumice but either a lava or a basic intrusive in and around the side of a volcanic crater. Mine output was shipped to Salt Lake City for processing and sold on the west coast for abrasive use.

Salt.—In the nonmetallic group salt ranked fifth in value, accounting for 7 percent of the total value of the group. Productive activity was concentrated in Salt Lake County, where the Morton Salt Co. operated its solar-evaporation facilities on the shores of Great Salt Lake. Tooele County was the second most important producing region, where the Deseret Salt Co. and Stansbury Salt Co., Inc., produced solar-evaporation salt. Sanpete and Sevier Counties also

reported production of rock salt.

As a result of increased demand for salt in the Rocky Mountain area, output in 1955 increased from 166,000 tons in 1954 to 196,000 tons in 1955—a gain of 18 percent. Sales of salt for livestock feed composed the bulk of shipments, but other important uses (aside from human consumption) were processing of metals, water softeners, ice manufacturing and cold storage, oil-well drilling, and meat packing.

Sand and Gravel.—Output of sand and gravel in Utah during 1955 declined to 5.2 million tons from 5.3 million tons in 1954—a 2-percent drop. Yearly totals for Government-and-contractor production will fluctuate because of the manner in which production data are reported by the Utah State Road Commission. When road contracts are let by this agency, the sand and gravel incidental to the roadwork is not reported until the contract is completed. Accordingly, if the contract is let in one year and not completed until the next, variations in output often result, and the number of contracts let and completed in the next calendar year will determine the degree of variation in annual production figures. Also, even though dollar expenditures for a highway program can be stable or increase from year to year, the type of activity—maintenance or construction—can affect the quantity of sand and gravel used.

Of the total output in 1955, 2.9 million tons valued at \$2.2 million was produced by individuals and firms for the local commercial market, and 2.3 million tons with a value of \$1.1 million was quarried by private contractors and Government maintenance and construc-

tion crews engaged in highway construction. The largest single consumer of sand and gravel was the Utah State Road Commission. Approximately 380 men were employed in quarrying and preparation activities by commercial producers and contractors working on highway contracts; the duration of employment ranged between 24 to 362 days, with the average 250 days. Demand for commercial sand and gravel was highest in the populated regions of the State. In terms of tonnages, Salt Lake County produced the most, with 2 million tons or 38 percent of the total output, followed by Cache and Utah Counties; in all, sand and gravel was produced in 22 of the 29 counties in Utah.

TABLE 12.—Production of sand and gravel, total 1908-50 and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1908-50	57, 867, 923 2, 971, 268 3, 260, 044		1953	4, 627, 808 5, 327, 969 5, 158, 265	\$3, 179, 690 3, 592, 286 3, 309, 280

Stone.—Production of stone in Utah in 1955 was 1.9 million tons valued at \$2.7 million, a 71-percent gain over 1954. This increase resulted from 408,000 tons of Government-and-contractor output of crushed miscellaneous stone and sandstone compared with none in 1954 and a 344,000-ton gain in limestone output. In terms of quantity, commercial crushed limestone was the most important stone, and output increased from 1.1 million tons in 1954 to 1.44 million tons in 1955. Crushed miscellaneous stone ranked second, with a combined commercial and Government-and-contractor production of 263,000 tons. Crushed sandstone at 215,000 tons and dimension sandstone at 3,000 tons were also reported.

The production of limestone in Utah is keyed to the consumption of this commodity as a fluxing medium and in manufacturing cement. In 1955 increased demand for limestone, particularly as flux, resulted in a large gain in production. Small increases were also recorded for limestone used in producing refractories, in manufacturing lime, and as rock dust for coal mines. The need for crushed miscellaneous stone and sandstone in highway construction depends on the location of the road, job specifications, and the availability of substitute materials. Therefore, the production of stone in 1955 as opposed to none in 1954 is not indicative of a trend or change in road-construction procedure.

The leading producers of limestone were the Columbia-Geneva Steel Division, United States Steel Corp.; Union Portland Cement Division, Ideal Cement Co.; Utah Lime & Stone Co.; Portland Cement Co. of Utah; and American Smelting and Refining Co. The latter company produced oolitic limesand from beach-sand deposits at Stansbury Island, Salt Lake County, for use as a flux.

The major producers of crushed sandstone were General Refractories Co. and Murray Refractories Co. in Juab County. These firms operated open pits as a source of silica for manufacturing refractory brick.

Talc.—A mill for processing crude talc was operated in 1955 at Ogden by Tri-State Minerals Co., a wholly-owned subsidiary of Southern California Minerals Co. The crude material was mined at the Treasure State and Smith-Dillon mines near Dillon, Mont., and shipped to Ogden. The ground talc was used mainly in manufacturing ceramics, paint, textiles, paper, and toilet preparations, in rice polishing, and in foundries.

Vermiculite.—Although no crude vermiculite was mined in Utah in 1955, there was a demand for this mineral commodity for insulation and concrete and plaster aggregate, and an exfoliated-vermiculite plant was operated at Salt Lake City by Vermiculite-Intermountain, Inc. The crude material was procured from mines near Libby, Mont.

### MINERAL FUELS

Asphalt and Related Bitumens.—Shipments of gilsonite during 1955 totaled 82,800 tons (9 percent over 1954) and were valued at \$3.1 million.

The American Gilsonite Co. announced plans to expand mine capacity at Bonanza, Uintah County, to build a pipeline to transport gilsonite in slurry to Fruita, Colo., and to construct a coking plant and refinery at Fruita to produce high-octane gasoline. By December, contracts had been let for constructing the coking plant and related facilities.

Carbon Dioxide.—Natural carbon dioxide gas was produced from the Farnham Dome field, Carbon County. Production rose 17 percent over 1954 and was accompanied by a 19-percent increase in value. Carbon dioxide was used by the Carbon Dioxice & Chemical Co. at Wellington in the manufacture of dry ice.

Coal.—Production of coal from 46 active underground mines in the State rose to 6.3 million tons in 1955. Coal was Utah's second most valuable mineral commodity in terms of annual dollar volume; copper ranked first and iron ore third. During 1955 the average number of men employed at the mines was 2,864.

TABLE 13.—Production of coal, 1954-55, by counties

(Exclusive of mines producing less than 1,000 tons)

	1954	ŧ .	1955		
County	Production (short tons)	Average value per ton <sup>1</sup>	Production (short tons)	Average value per ton <sup>1</sup>	
Carbon Emery Garfield Iron Kane Sevier Summit Uintah Other counties	3, 620, 663 1, 294, 106 (2) 33, 701 (2) (2) (2) (2) (2) 59, 482	\$6. 35 4. 89 (2) 4. 78 (2) (2) (2) (2) (2) (2) 4. 83	4, 694, 169 1, 492, 002 1, 664 31, 753 1, 742 54, 638 18, 506 1, 050	\$6. 87 4. 86 4. 81 4. 48 4. 82 4. 97 3. 84 6. 00	
Total	5, 007, 952	5. 94	6, 295, 524	6. 35	

<sup>1</sup> 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.)
2 Figure withheld to avoid disclosing individual company confidential data; included with "Other countries."

TABLE 14.—Leading coal mines in order of 1955 production

2—Columbia         Carbon         Do.           3—Sunnyside No. 1         do         Kaiser Steel           4—King No. 2         Emery and Carbon         United State           5—Sunnyside No. 2         Carbon         Kaiser Steel           6—Kenilworth         do         Independen           7—Spring Canyon No. 4         do         Spring Cany           8—Castle Gate No. 2         do         Independen           9—Sunnyside No. 3         do         Kaiser Steel	perator
10—Clear Creek No. 3       do       Independen         11—Wattis Nos. 1 and 3       do       Lion Coal C         12—Royal No. 2       do       Royal Coal         13—Knight Ideal       do       Knight Idea         14—Liberty Nos. 1 and 4       do       Liberty Fue         15—American       Emery       American F         16—Book Cliffs       do       Book Cliffs	es Fuel Co. Corp. t Coal & Coke Co. ron Coal Co. t Coal & Coke Co. Corp. t Coal & Coke Co. Corp. t Coal & Coke Co. t Co. l Co. l Co. uel Co. uel Co.

 Production of first 16 mines
 5, 652, 322

 Production of remaining 30 mines
 643, 20

 Total Utah production
 6, 295, 52

Utah coal delivered to coke-oven plants in Utah and California totaled 2.5 million tons or 40 percent of the State output. Demand for coking coal was one of the prime factors in determining fluctuations in Utah coal production in 1954-55. Consumption by 7 of the 8 thermal-electric plants in Utah amounted to 376,000 tons. Coal supplied 40 percent of the heat energy used by the 8 powerplants.

Helium.—Government helium reserves in Harley Dome field in Grand County and the Woodside field in Emery County have been shut in since their discovery in 1924 and 1925. Productive horizons at the Harley Dome field are the Morrison and Entrada formations. At the Woodside field the Coconino sandstone is known to be productive.

Natural Gas.—Marketed production of natural gas was 17.2 billion cubic feet in 1955, a 7-percent increase over 1954. All but a small portion of the gas was produced from the Clear Creek field in Carbon and Emery Counties and the Clay Basin field in Daggett County.

Natural-gas consumption continued to rise, totaling 48.9 billion cubic feet compared with 41.1 billion in 1954. Use by electric-power stations and residential heaters represented almost half of the total consumption and was responsible for three-quarters of total increase.

Construction of the Pacific Northwest Pipeline in Utah was largely completed by the end of 1955. Exploration for natural-gas reserves tributary to the pipeline continued, and the State recorded 8 new gas discoveries, 7 of which were in Grand and Uintah Counties. In addition to the recorded discoveries, considerable interest was aroused by initial test results of drilling in the Joe's Valley field, Sanpete County.

Natural Gasoline.—Natural gasoline was produced from the Clay Basin field, Daggett County, at a plant operated by Mountain Fuel Supply Co. Recorded output for 1955 returned to the 1953 rate

after a substantial drop during 1954.

Petroleum.—In 1955 production of crude petroleum exceeded 2 million barrels in volume and \$5 million in value for the first time in

State history. Essentially all of Utah's present petroleum production comes from fields discovered since 1948. During 1955 Grand and San Juan Counties were added to the list of producers.

Total drilling activity remained near that in the previous year, and five oil discoveries were recorded. Although not indicated by the drilling statistics, the Paradox Basin of San Juan County was the center of interest in oil exploration.

TABLE 15.—Production of crude petroleum, 1949-55, by counties, in 42-gallon barrels

County	1949	1950	1951	1952	1953	1954	1955
Duchesne Grand				50, 000	92,000	51,000	29, 000 6, 000
San Juan Uintah	637, 000	1, 228, 000	1, 305, 000	1, 687, 000	1, 715, 000	1, 854, 000	154, 000 2, 038, 000
Total	637, 000	1, 228, 000	1, 305, 000	1, 737, 000	1, 807, 000	1, 905, 000	2, 227, 000

TABLE 16.—Wildcat and development completions in 1955, by counties
[Oil and Gas Journal]

County	Oil	Gas	Dry	Total	Footage
Wildcat completions:					
Box Elder	1		1 7	1 8	1, 000 28, 300
Davis Duchesne		1	2 1	2 2	5,000 21,600
EmeryGrand	. 2	5	4 19	4 26	16, 800 74, 400
KaneSan Juan	. 1		1 11	$\begin{array}{c} 1 \\ 12 \end{array}$	9, 000 63, 200
Sanpete Tooele			1 2	$\frac{1}{2}$	7, 800 9, 000
UintahUtah		2	7 1	10 1	60, 300 4, 200
Wayne Total wildcats			1		7, 200
	5	8	58	71	307, 800
Development completions: Emery		1	1 8	2 9	13, 400
Grand San Juan Uintah	. 1		1	9 2 8	12, 700 11, 400
Total developments		$\frac{1}{2}$	10	21	51, 500
Total all drilling		10	68	92	89, 000 396, 800

Five refineries (in Salt Lake, Davis, and Uintah Counties) were operated during the year. At three of the plants, construction of new facilities and alterations were in progress. Capacity to process crude petroleum at the year end was 79,500 barrels per day, a 3-percent increase over 1954.

## **REVIEW BY COUNTIES**

Beaver.—The value of mineral output in Beaver County continued to decline in 1955, dropping to \$23,000 from \$28,500 in 1954. This 19-percent decrease resulted mainly from a lower output of copper, gold, silver, and tungsten. No lead was reported produced in 1955

compared with 15 tons in 1954. The value of perlite sold in 1955 increased. The collection of a small quantity of gem stones was also

reported.

The small quantities of gold, silver, and copper were recovered by direct-smelting ores produced from four active mines in the county in 1955. Old Hickory-Prosper, operated by North Star Metal Mines, Inc., and Montreal, operated by Ogden Mining & Milling Co., accounted for most of the output. North Star Metal Mines, Inc., also mined a small quantity of tungsten ore, which was treated by Salt Lake Tungsten Co. The concentrate was sold to the GSA.

Utco Products Co. continued to operate its perlite mine in Beaver County in 1955, and output was slightly larger than in 1954. The

finished product was used in plaster and concrete aggregate.

TABLE 17.—Value of mineral production in Utah, 1954-55, by counties 12

County	1954	1955	Minerals produced in 1955 in order of value
Beaver		\$23, 196	Copper, perlite, silver, gem stones, gold, tungsten.
Box Elder		180, 725	Sand and gravel, stone, tungsten, copper, lead silver, zinc, gold.
Cache	289, 923	385, 276	Stone, sand and gravel.
Carbon	1 23, 016, 211	32, 265, 893	Coal, carbon dioxide, sand and gravel
Daggett		8, 699	Sand and gravel.
Davis	317, 814	404, 804	Do.
Duchesne	124, 262	69, 479	Petroleum, sand and gravel.
Emery Garfield	6, 397, 253	7, 291, 266	Coal, sand and gravel, stone, silver, gem stones.
Grand	(3) 23, 039	57, 862 30, 531	Sand and gravel, stone, coal, gem stones.
Iron	19. 563, 121	24. 884. 180	Petroleum, sand and gravel, gem stones.
Tuab	4, 974, 395	4, 542, 011	Iron ore, coal, stone, sand and gravel, gem stones. Lead, clays, zinc, silver, fluorspar, stone, gold, copper, tungsten, sand and gravel, gem stones.
Kane	75, 876	8, 496	Coal, gem stones.
Millard	95, 073	124, 594	Tungsten, pumice, sand and gravel, lead, gem stones, zinc, silver.
Morgan		6, 245, 856	Cement, stone, clays.
Piute	7, 098	104, 900	Potash (K2O), silver, copper, gold, lead.
Rich	(3)	(3)	Phosphate rock.
Salt Lake	172, 655, 426	226, 644, 825	Copper, molybdenum, gold, lead, zinc, silver, cement, sand and gravel, salt, lime, stone, tungsten, clays.
san Juan	1, 370	368, 747	Petroleum, sand and gravel, gem stones.
sanpetesevier	44, 095	54, 059	Salt, stone, sand and gravel.
	, . ,	1, 289, 933	Gypsum, coal, clays, sand and gravel, salt, silver, gold, gem stones.
lummit	1, 566, 833	1, 220, 192	Sand and gravel, silver, lead, gold, copper, stone, coal, clays, zinc.
Cooele	4, 234, 666	3, 696, 655	Potash, lead, zinc, salt, stone, lime, silver, sand and gravel, copper, clays, tungsten, gold, pumice.
Jintah	4, 416, 086	4, 775, 601	Petroleum, stone, sand and gravel, coal, copper, silver, gold.
Jtah	1, 376, 351	1, 848, 726	Stone, sand and gravel, clays, lead, silver, lime, gold, copper, zinc, pumice.
Vasatch	3, 703, 658	7, 734, 544	Zinc, lead, gold, silver, copper, tungsten.
Vashington	84, 560	158, 746	Copper, sand and gravel, stone, lead, silver, gold,
Vayne	1, 222	150	gem stones. Gem stones.
Veber	307, 899	262, 370	Sand and gravel, clays, stone.
Veber Indistributed	4 6, 785, 622	8, 299, 122	Danie and Stavel, Clays, Swite.
Total 5		331, 929, 000	

¹ Value data of some gem stones (1955), gilsonite, natural gas, natural gasoline, vanadium, and some sand and gravel that cannot be assigned to specific counties are excluded from county totals and included with "Undistributed."

<sup>&</sup>lt;sup>2</sup> Value of low-grade manganese ore shipped to GSA Purchase Depots and uranium ore is excluded.
<sup>3</sup> Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
<sup>4</sup> Revised figure.

s State total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing cement and lime.

Box Elder.—Sand and gravel continued to be the major product of the mineral industry of the county in 1955, followed by crushed stone and tungsten. The value of mineral output for the county declined to \$181,000 in 1955 from \$265,000 in 1954, despite the production of copper, lead, zinc, gold, and silver compared with none in 1954. The major reason for this decline was a drop in the value of sand and gravel produced owing to fewer nearby highway projects. Of the 238,000 tons of sand and gravel produced in 1955, 102,000 tons was produced by construction and maintenance crews of the State road commission, county highway departments, and private contractors engaged in road projects. Commercial production was reported by the Fife Concrete Co., Allen C. Hunsaker, and Jensen Sand & Gravel Co.

Small shipments of silver ore were made from the Vipont and Sunset mines. The Copper Mountain mine near Lucin was operated by Frazier & Killion (partnership) from May 10 to November 10, 1955. Overburden was stripped from above the old workings to recover ore left by former operators. Forty tons of lead ore and 209 tons of copper ore containing a total of 2 fine ounces of gold, 413 ounces of silver, 20,415 pounds of copper, 6,881 pounds of lead, and 3,480 pounds of zinc were shipped to smelters from the mine.

Four operators mined tungsten ore from two mines, Lone Pine and Rocky Pass, in the county in 1955; output was 2½ times that in 1954.

The largest producer was John Boundy & Sons.

Cache.—Stone and sand and gravel were the only mineral commodities produced in Cache County in 1955. Crushed limestone quarried at the Providence pit of The Amalgamated Sugar Co. comprised the entire output of this type of stone; it was used solely in refining sugar. The Cache County Road Department reported producing 180,000 tons of crushed sandstone used for oil mat in road-surfacing projects. Because of demands for aggregate, 654,000 tons of sand and gravel was produced. The Cache County Highway Department reported 532,000 tons of sand and gravel produced by its maintenance and construction crews and the Utah State Road Commission and the city of Wellsville 2,000 tons. Contractors for the State road commission quarried 36,000 tons of sand and gravel in conjunction with road projects. Commercial output consisted of 84,000 tons of structural and paving sand and gravel.

Carbon.—Mineral products of Carbon County were, in order of

value, coal, natural gas, carbon dioxide, and sand and gravel.

Coal production returned to the 1953 rate after the serious decline during 1954. Output for the year totaled 4.7 million tons compared with 3.6 million in 1954 and 4.7 million in 1953. Major coal mines and operators are shown in the commodity review portion of this chapter.

Production of natural gas from the Clear Creek field of Carbon and Emery Counties was reported to be 13.5 billion cubic feet compared with 12.8 billion in 1954. Little further work was carried out in the field during 1955, following serious declines in reservoir pressure

during the previous year.

Carbon dioxide was produced from the Farnham dome for use in manufacturing dry ice. The field was discovered in 1924 and has been producing natural carbon dioxide gas since 1931. The gas was processed at the Wellington plant of Carbon Dioxice & Chemical Co.

In the Jack Canyon field, discovered in 1954, El Paso Natural Gas Co. was credited with discovering oil and gas in the Wasatch formation. The original producing horizon was the Green River formation.

Production of 3,000 tons of paving gravel was reported by the Utah State Road Commission. Output in 1955 dropped considerably below 1954 owing to a shift in the location of highway work.

Daggett.—The Clay Basin field was a source of natural gas and byproduct natural gasoline. Natural gas produced in 1955 totaled 3.2 billion cubic feet compared with 2.6 billion in 1954. The natural-gasoline plant was operated by Mountain Fuel Supply Co., which also transmitted gas to Salt Lake City. Sand and gravel was produced by maintenance and construction crews of the State road commission in conjunction with roadwork in this area.

Davis.—Refineries were operated at Woods Cross and North Salt Lake by Phillips Petroleum Co. and Western States Refining Co. Additional facilities were under construction at both plants as the year closed.

The demand for sand and gravel by the construction industry of Salt Lake and Davis Counties and the need for aggregate for road construction further stimulated production of this commodity, and output in 1955 reached 530,000 tons, a 9-percent increase over 1954. Nearly all (523,000 tons) was consumed by the building trade. The principal producers were White Hill Sand & Gravel Co., Lewis Foss Sand & Gravel, Clarence Waterfall Co., and Harry Sessions, Jr. Production of the remaining 7,000 tons, in the Government-and-contractor category, resulted from contracts let by the State road commission.

Duchesne.—Income from the sale of petroleum continued to be the mainstay of the mineral industry of the county. However, abandonment of the county oilfield, followed by the continued general decline in the output of petroleum, resulted in a 44-percent decline in the value of mineral production in this area. The Duchesne and Flat Mesa fields produced 20,000 and 7,000 barrels, respectively. A gas discovery was reported by the Carter Oil Co. in the Bluebell field. The productive horizon was the Green River formation. Construction and maintenance crews of the Utah State Road Commission produced 3,000 tons of paving gravel in connection with highway work in the county.

Emery.—In terms of value, coal was the most important mineral produced in Emery County in 1955. The county coal industry recovered slightly from the decline reported in 1954 as output in 1955 reached 1.5 million tons, a 15-percent gain.

Except for a small quantity of gem stones and silver, construction materials—sand and gravel and stone—accounted for the remaining value of mineral production. Production resulting from highway contracts let by the Federal Bureau of Public Roads and production by State road commission crews composed the bulk of the output. Contractors working for the Federal Bureau of Public Roads produced 19,000 tons of crushed miscellaneous stone for use as concrete aggregate.

Natural-gas production from the Clear Creek field is discussed under Carbon County. Although 6 wells were drilled in Emery County in 1955 (4 wildcat and 2 development), only 1—a development well in the Flat Canyon field drilled by Three States Natural

Gas Co.—was successful.

At the Delta uranium mine in the southern portion of the San Rafael Swell, drilling and underground development were continued in 1955, and full-scale production began in June. The Hidden Splendor Mining Co., operator of the mine, contracted with Vitro Uranium Co. to deliver 5,000 tons per month to the latter's Salt Lake City mill. Consolidated Uranium Mines, Inc., carried out an extensive drilling program and continued to produce ore from the Temple Mountain mine. The ore was shipped to Salt Lake City for milling. In the Green River district, located approximately 15 miles southwest of the town of Green River, uranium ore bodies occur in the Salt Wash member of the Morrison formation. Exploration drilling during 1954 and 1955 outlined numerous small ore bodies at depths up to 500 feet—considered the maximum economic mining depth based on the limited tonnage of individual ore bodies. Four Corners Uranium Corp., the most active company in the district, was reported to have discovered several ore bodies. Most of the corporation mining operations, in the Green River district as well as in other parts of the plateau, were carried out through contract and lease. Uranium Prospectors Co., Ltd., sunk a shaft to 300 feet on its Jack Rabbit claims and reportedly produced some ore. The company received a DMEA loan in September to carry out further drilling on the property.

Garfield.—Mineral production in Garfield County during 1955 was centered around the construction materials—sand and gravel and stone. Contracts let by the Federal Bureau of Public Roads resulted in production of 71,000 tons of sand and gravel and 71,000 tons of crushed miscellaneous stone, all of which were used by private contractors for road construction and maintenance. Coal was produced from the Alvey mine by Lovell M. Twitchell, and 300 pounds of onyx

was reported collected by the Fawcett Hobby Shop at Hatch.

Uranium exploration during 1955 was concentrated largely in the Circle Cliffs area, with scattered activity in and around the Henry Mountains. Additionally, the AEC carried out a drilling program in the northeastern portion of Circle Cliffs, but the isolated position of the area continued to hamper mining activities.

Grand.—In terms of value, sand and gravel was the most important commodity produced by the mineral industry of Grand County in

1955. Petroleum ranked second, followed by gem stones.

All sand and gravel production classified as commercial in 1955 resulted from quarrying and preparation activities of the Green River Sand & Gravel Co. and the L. J. B. Construction Co. Paving sand

and gravel was the only type of material reported.

Exploration drilling for the mineral fuels in Grand County during 1955 resulted in 2 oil discoveries (the Seiber Nose and Big Flat fields) and 5 gas discoveries. Perhaps the most notable of the gas discoveries was the San Arroyo field of Sinclair Oil & Gas Co., which flowed 18.5 million cubic feet of gas a day on initial testing. Grand County drilling was stimulated largely by proximity to the Pacific Northwest Pipeline, as in the previous year.

Gem and ornamental stones (including agate, jasper, and dinosaur bone) valued at \$280 were collected in the vicinity of Cisco, Green

River, Thompson, and Moab.

Uranium exploration and mining activities continued during the year, with much of the activity centered in the Thompson district. At Moab, Uranium Reduction Co. in midyear began constructing a mill to process ores from the Big Indian district. Uranium Reduction Co. was reportedly owned in part by Utex Exploration Co., Inc., Combined Metals Reduction Co., and American Zinc, Lead and Smelting Co. Foley Bros., Inc., was the prime contractor for constructing the mill.

Iron.—The overall mineral industry of the county (preponderantly iron-ore mining) in 1955 recovered from the significant decline in value of output reported in 1954. Output of iron ore reached 3.8 million tons valued at \$24.7 million in 1955, a 27-percent gain over 1954 that nearly reached the high reported for 1953. Coal, sand and gravel, stone, and gem stones were also produced in 1955, but the output of these commodities (except gem stones) declined considerably below the level established in 1954.

All iron-ore shipments from Utah in 1955 originated in Iron County. The value of these shipments was \$5.4 million above 1954 and composed 99 percent of the total value of the mineral output in the county in 1955. Of the total iron-ore shipments, 3,843,500 tons was used for making pig iron and steel and 3,900 tons in manufacturing

portland cement.

Columbia Iron Mining Co. produced iron ore from the Desert Mound and Iron Mountain mines. Colorado Fuel & Iron Corp. operated the Blowout and Comstock mines. Utah Construction Co. mined and shipped ore from the Excelsior deposit, and Helene E.

Beatty continued to operate the Great Western mine.

Coal was the second-ranking mineral commodity, in terms of value. Output in 1955 dropped to 32,000 tons compared with 34,000 tons in 1954; however, the magnitude of this decline represents only a slight variation and is not indicative of any significant change. Three mines—Koal Kreek, Webster, and Tucker—supplied all

production in the county.

The value of output of the nonmetals in Iron County dropped to \$54,000 in 1955 from \$125,000 in 1954. This decline resulted almost entirely from a cutback in the production of sand and gravel for highway construction. The stone segment of the mineral industry held it even during the year, with value of output reported at \$41,000. Willard B. Thompson continued to produce crushed sandstone used as roofing granules, and the Bear Valley Stone Corp. produced 800 tons of rough dimension building stone. Two hundred pounds of agates with a value of \$85 was collected in 1955.

Juab.—The total value of mineral production in Juab County declined from \$5 million in 1954 to \$4.5 million in 1955. This 9percent decrease was due primarily to a drop in the output of base metals resulting from a cutback in production at the Chief No. 1 mine of the Chief Consolidated Mining Co. A decrease in value of output was also noted for clays and sand and gravel. Slight increases in the production of fluorspar, stone, and tungsten were not sufficient

to offset these losses.

Most of the gold, silver, copper, lead, and zinc produced in Juab County in 1955 came from the Chief Consolidated Mining Co. Chief No. 1 mine, the third largest silver and lead producer and fourth largest zinc and gold producer in Utah in 1955. The company mined 64,200 tons of lead-zinc ore, which was treated at the United States Smelting Refining and Mining Co. Midvale custom mill. The ore yielded 6,117 tons of lead concentrate, 7,310 tons of zinc concentrate, and 1,718 tons of iron (pyrite) concentrate. In addition, 1,074 tons of lead ore and 18,124 tons of siliceous silver ore were mined and shipped to the Midvale and Tooele lead smelters and to the Garfield copper smelter, respectively. The concentrates produced from the ore and the ore shipped directly to the smelter contained a total of 1,612 fine ounces of gold, 397,819 ounces of silver, 53 tons of copper, 3,826 tons of lead, and 4,442 tons of zinc.

TABLE 18.—Mine production of gold, silver, copper, lead, and zinc in Tintic district, Juab and Utah Counties, 1946-50 (average), 1951-55, and total, 1869-1955, in terms of recoverable metals

the alter than 100 miles								· ·
Year	Mines pro- ducing	Material (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)	Total value
1946-50 (average) - 1951 1952 1953	20 15 15 14 17	165, 185 193, 123 124, 442 123, 301 151, 836	10, 520 4, 982 2, 942 3, 264 4, 098	931, 756 944, 818 666, 345 580, 209 932, 683	338 208 133 104 159	5, 914 5, 553 4, 279 3, 693 5, 926	4, 685 3, 410 2, 951 2, 433 4, 335	\$4, 288, 782 4, 292, 771 3, 127, 613 2, 226, 060 3, 641, 109
1955: Juab County Utah County	12 6	102, 758 12, 176	2, 118 556	498, 878 113, 363	90 23	4, 651 366	3, 998 20	2, 962, 338 253, 205
Total: 1955_	18	114, 934	2, 674	612, 241	. 113	5, 017	4, 018	3, 215, 543
1869-1955			2, 641, 135	267, 591, 083	123, 553	981, 729	71, 361	428, 448, 124
	1							

<sup>&</sup>lt;sup>1</sup> Figures estimated for certain years before 1901.

The Chief Consolidated Mining Co. reported that all operations below the normal water level at the Chief No. 1 mine were discontinued on August 1, 1955. During the year the company conducted an extensive exploration and development program at this mine, including 4,617 feet of drifts and 18,307 feet of diamond drilling. The company operated the American Star mine for part of the year. It also had a small output from the Eureka Hill mine, which was operated during February and April. The Eagle and Blue Bell Mining Co. property, 98 percent of which is owned by the company, was an active producer throughout the latter half of the year. In 1955 Plutus Mining Co., a 93-percent-owned subsidiary of the company, shipped lead and silver ore from the Plutus mine to the Midvale and Garfield smelters, respectively. Company exploration and development work at the mine included 105 feet of drifting and 2,029 feet of diamond drilling.

In addition to the 3 mines described, 11 other mines in Juab County produced varying quantities of gold, silver, copper, lead, and zinc. Of these, the Centennial-Beck-Victoria group of mines (operated by Brennan Hannifin in 1954 and the United States Smelting Refining and Mining Co. in 1955) and the Mona mine (operated by Temple Mountain Uranium Co. during the last 4 months of 1955) were the

largest producers.

A total of 4,300 long dry tons of ore averaging 25.7 percent manganese valued at \$143,000 from 3 mines in Juab County was shipped to the GSA Depots at Butte, Mont., and Wenden, Ariz. This will be credited as production when the ore is re-treated and a useful product shipped from the depots. L. J. Price (Black Boy mine) and Fred Staats (Staats Manganese mine) were the two largest manganese producers in the county and the State in 1955.

Value of tungsten output from operations in the county increased from \$5,000 in 1954 to \$13,000 in 1955. Elmer Jenkins was the largest

producer in 1955.

Clays, fluorspar, stone, sand and gravel, and gem stones comprised the nonmetals produced in Juab County in 1955. A drop in value of these minerals to \$1.5 million in 1955 from \$1.8 million in 1954 was due almost entirely to a decline in the output of clay and sand and Halloysite continued as the only type of clay mined in the county, and all output resulted from mining activities of the Filtrol Corp. at the Dragon mine. Fluorspar shipments were 7,300 tons in 1955 compared with 4,400 in 1954. All output, classified as metallurgical grade, was consumed in manufacturing steel. Bell Hill Mining Co. (Bell Hill mine), Willden Bros. (Lost Sheep mine), and Chesley & Black (Fluorine Queen) were the only mine operators reporting production.

Crushed sandstone continued to be an important part of the mineral output of the county, and output in 1955 rose to 31,000 tons compared with 22,000 tons in 1954. General Refractories Co. and Murray Refractories Co. operated quarries, and all production was consumed in manufacturing refractory brick. Construction and maintenance crews of the Utah State Road Commission produced

2,000 tons of paving gravel for road use.

Millard.—Value of tungsten output represented three-quarters of the total value of mineral production in Millard County in 1955. The Treasure Mountain Mining Co., the principal tungsten producer in the county and the State, completed a 100-ton-per-day gravityconcentration mill on the Treasure Mountain property at the close of the year. Seven other operations produced tungsten in the

county.

A small quantity of manganiferous ore was shipped by Willden Bros. from the Mizpah mine in Millard County to the GSA Depot at Butte, Mont., in 1955. Small quantities of silver, lead, and zinc were recovered from the Silica Plug dump, Almond, and Blue Bell group of mines. The value of sand and gravel output in the county rose to \$13,000 in 1955, owing entirely to the activities of the State road commission. Pumice was reported produced for the first time in a number of years by the Utah Lavalite, Inc., which operated an open pit near Milford. All output was used in manufacturing abrasives. Jasper and obsidian were the gem or ornamental stones collected in 1955; production was valued at \$540.

Morgan.—In terms of value cement was the most important commodity produced in Morgan County in 1955. The Union Portland Cement Division, Ideal Cement Co., operated its cement plant for 365 days and 51 men were employed. The company also operated a limestone pit, where 13 men were employed in quarrying and 4 men operated the crusher for 245 days. Clays was the third-ranking mineral in terms of value, and miscellaneous clay was mined from an open pit by the Interstate Brick Co. Four men were engaged in mining operations for 225 days, and the crude material was shipped

to the company brick plant at Salt Lake City.

Piute.—Alunite was the most important mineral produced by the county mining industry in 1955. The Calunite Corp. operated its White Horse mine near Marysvale; and the crude material was shipped to the company mill at Marysvale, where it was processed and reshipped to various fertilizer-mixing plants throughout the country.

Three mines—Deer Trail, Iris, and Copper Belt group—supplied the county gold, silver, copper, and lead output in 1955. The operation with the largest production (Arundel Mining Co.) shipped 397 tons of gold-silver ore containing 79 fine ounces of gold, 11,009 ounces of silver, 5 tons of copper, 11 tons of lead, and 16 tons of zinc from the Deer Trail mine to the Garfield smelter. The Iris mine was operated by Cedar Hills Mining Co. Rainbow Mines made one shipment of gold-silver ore from the Copper Belt group.

Lawrence W. Prisby shipped a small quantity of manganiferous

ore from the New Day mine to the GSA Depot at Deming, N. Mex. Uranium ores produced from the Marysvale district were shipped to

Salt Lake City for processing.

Rich.—The Rich County mining industry continued to center around phosphate rock in 1955. By the end of the year the San Francisco Chemical Co. was the only active operator, because J. R. Simplot discontinued mining at midyear. Mine production was 44 percent greater than in 1954, and the crude material was shipped to

the company-owned processing plant at Leefe, Wyo.

Salt Lake. Salt Lake County in 1955 continued to be one of the most important mining, milling, and smelting areas in the United The reason for this predominance is the existence of extensive base-metal-processing facilities and inclusion of the West Mountain (Bingham) district, one of the leading copper-, lead-, and molybdenum-producing areas in the United States. The total value of mineral production in 1955 rose to \$226.6 million, a 31-percent gain over 1954. Of the total value, copper represented 76 percent, molybdenum 7 percent, gold 6 percent, lead 4 percent, zinc 3 percent, and silver 2 percent. In the nonmetal group cement ranked first, followed by sand and gravel, salt, lime, stone, and clays.

In addition to mine production, refineries were operated by Salt Lake Refining Co. and Utah Oil Refining Co. at Salt Lake City. The 2 plants, largest in the State, had daily crude-oil capacities of 34,000 and 29,000 barrels, respectively, at the year end. Salt Lake Refining Co. added a catalytic cracking unit and facilities to produce jet fuels

and aviation gasoline.

The processing of uranium also played an important part in the mineral industry of the region. Vitro Uranium Co., a division of Vitro Corp. of America, operated its uranium-processing plant in Salt Lake City. Ore supplied to the plant was obtained primarily from the Marysvale, San Rafael (Delta and Temple Mountain mines), Green River, and Big Indian districts. The company announced that mill capacity would be expanded 70 percent.

TABLE 19.—Mine production of gold, silver, copper, lead, and zinc in West Mountain (Bingham) district, Salt Lake County, 1946-50 (average), 1951-55, and total, 1865-1955, in terms of recoverable metals

Year	Num- ber of mines	Material 1 (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)	Total value
1946-50 (average) - 1951	6 4 4 4 4 4	23, 915, 886 30, 863, 391 32, 484, 298 30, 298, 666 24, 431, 422 28, 087, 094	314, 469 407, 196 417, 607 450, 882 369, 760 405, 194	4, 164, 286 4, 923, 249 5, 338, 291 5, 027, 419 4, 109, 083 4, 409, 373	215, 076 270, 183 282, 098 268, 511 210, 643 232, 016	25, 850 29, 120 34, 328 29, 311 29, 671 31, 712	17, 709 18, 286 20, 395 19, 669 20, 489 21, 864	\$114, 646, 374 166, 208, 080 173, 807, 807 186, 659, 499 153, 495, 560 206, 084, 852
1865–1955		<sup>2</sup> 776, 475, 663	9, 326, 138	185, 723, 187	6, 897, 067	1, 833, 078	661, 354	3, 214, 485, 061

<sup>&</sup>lt;sup>1</sup> Does not include tonnage of precipitates shipped.
<sup>2</sup> Figures estimated for certain years before 1901.

Gold, silver, copper, lead, and zinc were produced from 6 mines in 3 districts—1 in the Big Cottonwood district, 1 in the Little Cottonwood district, and 4 in the West Mountain (Bingham) district in Salt Lake County in 1955. Utah Copper mine, operated by the Utah Copper Division of Kennecott Copper Corp., continued to be by far the largest gold, silver, and copper producer in the county and in the State. U. S. and Lark mine, operated by United States Smelting Refining and Mining Co., continued to be by far the largest lead and zinc producer in the county and the State. This mine also ranked second in silver and copper and third in gold output in the State. Four other mines—Silver King Western, Dwyer claims, Apex-Delaware group, and Butterfield—produced smaller quantities of gold, silver, copper, lead, and zinc. Substantial quantities of lead and zinc were recovered by two companies in the Smelter district that were not counted as producing mines in 1955. American Smelting and Refining Co. re-treated zinc slag from the old Murray-plant smelter site. United States Smelting Refining and Mining Co. retreated lead and zinc slag from the Midvale smelter.

In its annual report for 1955 the Kennecott Copper Corp. stated that 27.7 million tons of ore was mined and milled from the Utah Copper mine. Copper production from this ore was 230,837 tons. During the year 45.7 million tons of waste was removed. additional 125-ton electric locomotives were placed in service in 1955 to provide for an accelerated stripping program. Fifty 40-yardcapacity dump cars were ordered, 22 of which were received by the year end. Other new equipment designed to increase efficiency included five of the latest type electric power shovels, which have double the capacity of the old type replaced. Substantial saving in manpower and greater efficiency and safety in ore and waste haulage resulted from extension of the central control system installed during the year for handling the rail traffic in the pit. A construction program at the refinery to permit production of vertical cast shapes of large size and variety was completed. It will eliminate "back-haul" freight and surcharges to the corporation on the items produced for it at non-

company refineries in the East.

According to the United States Smelting Refining and Mining Co. annual report, the quantity of ore produced from the U. S. and Lark mine was about the same and the grade slightly higher in 1955 than

in 1954. Development work was somewhat less than last year, but the quantity of ore developed substantially offset tonnage of ore extracted. Operations continued on an alternate 5- and 6-day, 2-shift basis. The shortage of experienced miners continued. Except for the summer months, the general supply of labor was adequate, although turnover was high. Ventilation of the mine was improved further by installation of a 100,000-cubic-foot-per-minute fan and enlargement of aircourses. Engineering studies of equipment, materials, and methods were emphasized in the continued effort to improve operating efficiency.

The United States Smelting Refining and Mining Co. Midvale plant was operated without interruption throughout the year Smelting operations were on a 2-shift basis, with the flotation mill normally on 3 shifts. Improvements in equipment in both the smelter and the flotation mill resulted in further increases in metallurgical efficiency

and betterment of working conditions

Two tungsten mills, Salt Lake Tungsten Co. and H. M. & S. Milling Co. at Salt Lake City, were operated throughout the year on old

tailing and custom ores.

Although the value of nonmetals amounted to only \$4.1 million—2 percent of the total value of all mineral production in the county—continued operation of other branches of the mineral industry depended on the output of these commodities. Production of sand and gravel played an important part in both industrial and residential construction, despite a slight decline in output. Of the 2 million tons produced (valued at \$1.3 million) in 1955, 1.5 million was classed as commercial production sold on the local market, and 498,000 tons was produced and used in constructing and maintaining streets and highways.

Cement produced by the Portland Cement Co. of Utah was the second-ranking nonmetal, but 1955 output was 7 percent less in terms of quantity and 4 percent in value than in 1954. In addition to operation of the cement plant, the company also quarried crushed limestone

used in the manufacture of cement.

Production and sales of salt ranked third in the nonmetallic group, and value of output in 1955 increased 25 percent over 1954. The Morton Salt Co. operated its solar-evaporation plant at Saltair 270 days during the year, and 86 men were employed in harvesting salt.

All the county lime production was quicklime, produced at the Magna plant of Kennecott Copper Corp. as a reagent in milling copper ore. The crushed limestone used was quarried from pits operated by the Utah Lime & Stone Co. in Tooele County. In addition to the production of limestone as a source of lime, the American Smelting and Refining Co. produced a large quantity of oolitic limesand, which was employed as a flux at the Garfield copper smelter.

The only clay mining in the county was done by the Interstate Brick Co., which used the miscellaneous clay in manufacturing build-

ing brick and other structural-clay products.

Other nonmetallic-processing facilities in Salt Lake County that received raw material from other counties or States were the Utco Products Co. expanded-perlite plant and the exfoliated-vermiculite facility of Vermiculite-Intermountain, Inc.

San Juan.—In the Big Indian uranium district the Mi Vida mine of Utex Exploration Co., Inc., and the Big Buck mine of Standard Uranium Corp. were the major producers. Production from the Big Buck mine began in February. Homestake Mining Co. also produced substantial tonnages from the Little Beaver and La Sal mines. At the Rattlesnake mine Continental Uranium, Inc., added substantially to the company ore reserves as a result of drilling, and the decision was made to shift from underground to open-pit mining. was not expected to be completed until spring of 1956. The company also negotiated an AEC contract to construct a uranium mill at La Sal. The Hecla Mining Co. completed a 700-foot shaft at the Radon mine and began to produce ore. At Monticello the AEC uranium mill underwent modification to substantially increase its capacity to process ore. During 1955 the Happy Jack mine, largest in the White Canyon area, was placed on the market by the Bronson & Cooper Mining Co. White Canyon Mining Co. carried out development work on its properties on Deer Flat and expected to be in production early in 1956. In Red Canyon the Blue Lizard mine continued to produce. Utaco Uranium, Inc., was reported to have discovered and developed ore on its Allen No. 2 claim but was not in production by the end of the year.

San Juan entered the list of oil-producing counties, with 154,000 barrels of oil from the Desert Creek and Boundary Butte-North fields, which were discovered in 1954 and 1955, respectively. The Boundary Butte-North field was discovered in June by Shell Oil Co. Production

was from the Paradox formation.

In addition to uranium and petroleum, 3,500 tons of paving gravel was produced by construction crews of the State road commission,

and some agate and topaz were collected near Joy.

Sanpete.—Rock salt from the Royal Crystal Salt Co. open-pit mine operated by Albert Poulson at Axtell was the most important mineral commodity produced in Sanpete County in 1955. Shipments were made to Arizona, Colorado, Idaho, Montana, Nevada, Oregon, and Wyoming, in addition to being consumed in Utah. Other county production included 4,000 tons of crushed limestone used in refining sugar and 10,000 tons of sand and gravel used by the construction industry.

Interest developed in an uncompleted gas well drilled by Three States Natural Gas Co. in the Joe's Valley area. The well, although only partly penetrating the Ferron sandstone of the Mancos formation, recorded a daily gas flow of 15 million cubic feet. The well is 6 miles

north-northwest of the Flat Canyon field, Emery County.

Sevier.—The nonmetals in Sevier County continued to dominate mining activity in 1955 and represented 79 percent of the \$1.3 million value of all mineral production. In terms of value of individual mineral commodities, coal was second, and output in 1955 increased 25 percent over 1954. The Southern Utah Fuel Co., the only operator, employed an average of 12 men in mining and processing activ-A small quantity of gold and silver also was reported.

Gypsum was the most important mineral commodity in terms of value, and Sevier County accounted for the entire State output. United States Gypsum Co. and Western Gypsum Co. were the only

producers; all output came from mines near Sigurd.

Western Clay & Metals Co., the only clay producer in the region, produced 2,800 tons of fuller's earth and 2,500 tons of bentonite from its mine near Redmond. Three men worked 30 days at the mine,

and 3 men were employed 300 days at the mill.

Poulson Bros. Salt Čo. operated its rock-salt mine near Redmond, but output in 1955 dropped to 1,400 tons from 1,800 tons in 1954. Rock salt was shipped to feed dealers in Arizona, Colorado, Idaho, Montana, Nevada, Utah, and Wyoming. Small quantities of salt were also sold to State, county, and other Government agencies.

Elmo R. Herring produced the most gravel in the county during 1955; all was classified as commercial. Marwood J. Hales and Red-

mond Sand & Gravel Co. also reported some production.

Summit.—Total value of the mineral production of Summit County fell from \$1.6 million in 1954 to \$1.2 million in 1955 as a result of lower value of clays, lead, silver, and zinc. The value of gold, copper, coal, sand and gravel, and stone advanced but not enough to offset the

other decreases.

The value of the gold, silver, copper, lead, and zinc output composed half of the total value of all mineral production in the county in 1955. Tailing material was shipped to the American Smelting and Refining Co. Garfield smelter from the Atkinson and Grasselli (Pacific Bridge) dumps by the Wortley Bros. and McFarland & Hullinger. Lead-zinc ore was shipped to International Smelting and Refining Co. Midvale smelter from the J. I. C.-West Quincy mine by New Quincy Mining McFarland & Hullinger shipped gold-silver ore from the Ontario and Park Flag mine dumps. United Park City Mines Co. operated the Judge-Daly West-Silver King group of mines throughout the year. A total of 4,645 tons of silver tailing material was shipped to the Garfield smelter. In addition 954 tons of lead-zinc ore was mined and shipped to International Smelting and Refining Co. Tooele mill for concentration. Small quantities of gold, silver, copper, lead, and zinc were produced from material recovered from a cleanup of the Silver King mill by Silver King Lease (Hugh Hullinger) during 1955.

Construction materials (clays, sand and gravel, and stone) were again the only nonmetals reported by the mineral industry of Summit County in 1955. The Utah Fire Clay Co. operated an open pit near Henefer and produced 13,000 tons of miscellaneous clay for use in its

TABLE 20.—Mine production of gold, silver, copper, lead, and zinc in Park City region, Summit and Wasatch Counties, 1946-50 (average), 1951-55, and total, 1870-1955, in terms of recoverable metals

Year	Number of mines	Material (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)	Total value
1946–50 (average) - 1951 - 1952 - 1953 - 1954 - 1955 - 1870–1955	12 12 8 4 7	405, 724 230, 607 198, 804 193, 405 201, 761 287, 507	19, 333 18, 476 13, 827 27, 919 27, 900 32, 208	1, 216, 114 1, 131, 360 861, 563 802, 036 826, 270 988, 768	601 489	9, 630 11, 719 7, 494 4, 235 5, 432 9, 954 1, 282, 834	9, 187 10, 209 7, 746 4, 848 6, 650 12, 295 421, 714	\$7, 159, 871 9, 668, 591 6, 469, 147 4, 289, 278 5, 003, 674 8, 377, 821 431, 247, 518

<sup>&</sup>lt;sup>1</sup> Figures estimated for certain years before 1901.

Salt Lake City brick plant. Except for 1,200 tons of paving sand produced by Hillman Richins for commercial use, all of the 483,000 tons of sand and gravel produced in the county in 1955 resulted from activities of the State road commission and the county highway department and private contractors engaged by the road commission and the Federal Bureau of Public Roads. Dimension sandstone was quarried by Mountain Park Quarries, Inc., and used as rough construction building stone, and contractors for the Federal Bureau of Public Roads produced 25,000 tons of crushed miscellaneous stone.

Toole.—The 1955 income to the mineral industry of Toole County from the sale of mineral commodities dropped to \$3.7 million—a 12-percent decline from 1954. Of the 14 metal and nonmetal commodities produced, 7—gold, silver, copper, lead, zinc, clays, and potash—decreased significantly from the output reported in 1954. Only production of tungsten, lime, pumice, salt, stone, and sand and gravel increased.

Despite the overall drop in value of sales in Tooele County in 1955, nonmetals as a group maintained a position of relative importance to the value of all minerals sold in the region with a \$1.9 million product valuation—52 percent of the total value of all mineral output.

Potash was the most important commodity produced in the county, and potassium-bearing brines of the Salduro Marsh area of Bonneville salt flats continued to be the only source of potash. A strike at the Wendover plant of Bonneville, Ltd., resulted in curtailed production, and sales in 1955 were 28 percent below 1954. Coupled with an increase in the output of cement in the State and lime in Tooele County, production of limestone increased 19 percent over 1954. All came from the Utah Lime & Stone Co. quarry near Grantsville and was used mainly for producing lime. Sales also were reported for concrete aggregate, riprap, rock dust for coal mines, asphalt, and as a mineral food. The county salt production increased 31 percent over 1954. Shipments were made to Arizona, Colorado, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming. The salt was used for metallurgical purposes, cattle feed, water softening, meat packing, and canning.

Clay production dropped below 1954 owing to a reduction in the mining of miscellaneous clay by the Interstate Brick Co. and Utah Fire Clay Co. The county production of sand and gravel rose to 132,000 tons, owing largely to contracts let by the Utah State Road Commission. Commercial output for local use was reported by Cox & Coltharp Construction Co. and Elmo England. United States Smelting Refining and Mining Co. used limesand from Stansbury Island as a flux at its Midvale smelter.

The demand for lime, particularly for ore concentration and gas purification, provided a stimulus for greater production, and output from the dolomite plant of the Utah Lime & Stone Co. nearly tripled in 1955. Both quick and hydrated lime was produced, and shipments were made to Idaho, Montana, Nevada, and Utah. A small quantity of pumice was produced in the county by Harborlite Corp.

The total value of production of metals, including gold, silver, copper, lead, zinc, and tungsten, composed the remaining 48 percent of the total value of mineral production in the county in 1955. Value of output of each of these metals in 1955 was less than in 1954. Of

the 11 active mining operations in the county producing gold, silver, copper, lead, and zinc, 2 mines, Ophir Unit (United States Smelting Refining and Mining Co.) and Calumet Mining Operation (Combined Metals Reduction Co.) were the principal producers. International Smelting and Refining Co. reclaimed cold slag from its Tooele dump. This material was smelted at the company Tooele smelter. company treated other slag from this dump in its slag-treatment plant at Tooele.

Value of tungsten output in Tooele County in 1955—\$42,000 was virtually the same as in 1954. The tungsten came from five mining operations; Star Dust Mines, Inc. (Star Dust mine), was the largest tungsten producer, followed by Eugene W. Timm (Fraction Lode). United States Smelting Refining and Mining Co. Ophir Unit recovered some tungsten concentrate as a byproduct from milling

lead-zinc ore.

In September the coal-resin processing plant of Combined Metals Reduction Co. was destroyed by fire, with a resulting reported loss of \$300,000. The company announced that the plant would be rebuilt.

Uintah.—Although sand and gravel, stone, some gold and silver, copper, and coal were produced in the county during 1955, the value of crude petroleum composed 98 percent of the total value of all

The county sources of crude petroleum were the Ashley Creek, Red Wash, Roosevelt, Brennan Bottom, and Walker Hollow fields. The first 2 fields named supplied 1.7 million barrels of the total 2.0 million credited to the county. Eight oil wells and one gas well were completed successfully in the Red Wash field and led to discovery within the field of gas production from the Uinta formation. A gas discovery was also reported in the Chapita Wells area by Continental Oil Co. Only one refinery, operated by the Uinta Oil Refining Co. at Jensen, was active during 1955.

At Bonanza the American Gilsonite Co. (Barber Oil Co. and Standard Oil Co. of California) announced plans to enlarge mining facilities and to install a pipeline for transmitting gilsonite, in slurry,

to a proposed coking plant at Fruita, Colo.

All sand and gravel produced in 1955 resulted from quarrying activities of private contractors working on highway contracts for the Federal Bureau of Public Roads. In addition, contractors for the Bureau produced 73,000 tons of crushed miscellaneous stone.

Utah.—Limestone continued to be the most important mineral commodity produced in Utah County in 1955. The major portion of the output was used as a flux at the Columbia-Geneva steel plant of the United States Steel Corp. In addition to limestone as flux, significant quantities also were consumed in sugar refining, in concrete aggregate, and for railroad ballast. The Lakeside Lime & Stone Co. also reported limestone production for manufacturing lime and as a rock dust for coal mines.

Clay production in 1955 reached 79,000 tons, compared with 44,000 tons in 1954; of this quantity, fire clay comprised 35,000 tons and miscellaneous clay 44,000 tons; all was shipped to brick plants at Salt Lake City. The principal producers were Interstate Brick Co., Utah Fire Clay Co., and Western Fire Clay Co. Output of sand and gravel for highway construction and, more particularly,

building construction rose to 525,000 tons in 1955, a 39-percent gain. The leading producers were Thorn Ready-Mix Concrete Co., United Concrete Pipe Co., and Lee Sand & Gravel Co. Lakeside Lime & Stone Co. continued to operate its lime plant at Lehi; the bulk of the output was used as flux in steel plants, as a reagent in ore-concentration plants, and in petroleum refining. A brief strike during the year curtailed production slightly. In 1955 all pumice produced in the county came from the William H. Prince & Sons property at Cedar The crude material was trucked to the company plant at Salt Lake City, where it was used in manufacturing concrete blocks.

The gold, silver, copper, lead, and zinc output in the county in 1955 came from six mines in the Tintic district. Tintic Standard Mining Co. Iron Blossom and Tintic Standard mines were operated throughout the year by lessees—Duke Page, Joseph Brindzak & Luby Bogdan, and Ralph Hopes. Elmer Westerlund & Lawrence Walker operated the Colorado mine from May 15 to the end of the year under lease from the Colorado Consolidated Mines Co., a subsidiary of Tintic Standard Mining Co. The Sioux mine, owned by another subsidiary of Tintic Standard Mining Co.—Sioux Mines Co.—was operated by a lessee, Max Larsen, from August 1 to December 31, 1955. The Eureka Standard and Eureka Lilly mines were idle. Various block leasers mined ore from the Mountain View and Yankee mines, owned by Mountain View Mining Co. and Yankee Consolidated Mining Co., respectively, subsidiaries of International Smelting and Refining Co.

Wasatch.—The value of mineral production in Wasatch County in 1955 doubled that in 1954. This increase resulted from a threefold rise in value of lead and zinc output. The combined value of lead (\$2.8 million) and zinc (\$3.0 million) composed three-quarters of the total

value of county mineral production in 1955.

The increased output of lead and zinc was due primarily to a full year's operation of the United Park City Mines Co. Ontario-Park Utah mine, compared with a one-half-year (the latter half) operation in 1954. This mine was second only to the U.S. and Lark in value of lead and zinc production in Utah. The company mined 78,476 tons of lead-zinc ore and shipped it to the International Smelting and Refining Co. Tooele mill for concentration. The ore contained 2,859 fine ounces of gold, 334,971 ounces of silver, 87 tons of copper, 6,418 tons of lead, and 8,351 tons of zinc. Exploration and development work in the mine during the year included 10,679 feet of drifting and 22,728 feet of diamond drilling.

The New Park Mining Co. (Mayflower, Galena, and Star Units) was again among the leading metal producers in the State in 1955 and ranked second in value of gold output, third in copper and zinc, and fourth in silver and lead in Utah. In 1955 the company mined and shipped 86,891 tons of lead-zinc ore to the Combined Metals Reduction Co. custom-flotation mill at Bauer. This ore contained 31,166 fine ounces of gold, 381,961 ounces of silver, 528 tons of copper, 4,330 tons of lead, and 5,767 tons of zinc. The Mayflower shaft was sunk an additional 206 feet during the year to the 2,066-foot mark. This provided enough depth for the 1,880 and 2,000 levels. Other exploration and development work conducted at the mine included 2,710 feet of drifts, 1,646 feet of diamond drilling, and 2,400 feet of

raises. According to the company, negotiations conducted during the year resulted in a favorable new 3-year term milling contract with United States Smelting Refining and Mining Co. As added consideration for signing this agreement, the company obtained a lease and option on 250 acres of United States Smelting mining claims adjoining New Park property west of the Mayflower mine on the extension of mineralized fissures.

Washington.—Owing to a significant increase in the output of copper, lead, gold, and silver (accounting for 82 percent of the total value), the value of mineral production in Washington County in 1955 jumped to \$159,000, an 88-percent gain over 1954. The nonmetals group—including sand and gravel for highway construction, dimension sandstone for building construction, and gem or ornamental

stones—supplied the remainder of the total value.

Copper ore-991 tons containing 6 fine ounces of gold, 301 ounces of silver, and 151 tons of copper—was shipped from the Apex mine to the American Smelting and Refining Co. Garfield smelter by Emerald L. Cox in 1955. Silver Uranium Development Corp. conducted exploration work on the Blue Jay group from February 1 to May 1 and made one small shipment of copper ore to the Garfield smelter. A substantial quantity of copper was recovered from copper slag from the Apex smelter dump shipped to the Garfield smelter by several

individuals during 1955.

Weber.—Minerals produced in the county during 1955 included sand and gravel, clays, and stone. Of the 308,000 tons of sand and gravel quarried and prepared in 1955, 199,000 tons was produced by commercial operators and consumed locally by the construction industry. Road-construction activities of various Federal and State agencies consumed the remainder of the total output. The demand for building brick and other structural-clay products in the county resulted in an increased production of miscellaneous clay by the Harrisville Brick Co. The raw clay was consumed at the company Ogden brick plant. Contractors for the Federal Bureau of Public Roads produced 36,000 tons of crushed miscellaneous stone for highway work, and the Tri-State Minerals Co. operated its talc-grinding mill at Ogden on crude ore mined in Montana.

# The Mineral Industry of Vermont

By Robert W. Metcalf 1



ERMONT mineral-production value in 1955 again established a new record, rising to \$23.9 million, or 17 percent greater than in the former peak year 1954. Nonmetals supplied 86 percent of the total value, the balance consisting of the value of the output of copper, gold, and silver. Twelve minerals were produced, compared with 11 in other recent years. Each county contributed to the banner year.

The principal industry in Vermont in 1955, measured by value of output, was stone, which includes marble, granite, and limestone. Slate, asbestos, copper, and sand and gravel were the next most important minerals. As in 1954 the five leading counties, in order of value of mineral products, were Rutland, Washington, Lamoille, Orange, and Franklin.

TABLE 1.—Mineral production in Vermont, 1954-55 1

Mineral	Short tons		1	
	(unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays Copper (recoverable content of ores, etc.) Pem stones Cold (recoverable content of ores, etc.) Cold (recoverable	(2) 4, 352 185 20, 713 1, 481, 549 48, 572 436, 870 66, 195	\$2, 567, 680 6, 475 (2) 1, 110, 996 43, 960 8, 178, 389 198, 585 8, 400, 809	14, 200 4, 305 (3) 181 21, 852 1, 763, 229 50, 447 581, 749 (2)	\$14, 200 3, 211, 530 6, 335 (2) 1, 169, 031 45, 657 11, 061, 196 (2) 8, 399, 641

Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
 Figure withheld to avoid disclosure of individual company confidential data.

## **REVIEW BY MINERAL COMMODITIES**

### METALS

Copper.—Copper output in 1955 almost equaled that in 1954 and surpassed 1954 in value by 25 percent, because of the higher average value in 1955—\$0.373 per pound, compared with \$0.295 in 1954.

<sup>3</sup> Weight not recorded.
4 The total has been adjusted to eliminate duplication in the value of stone.

<sup>&</sup>lt;sup>1</sup> Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.

Appalachian Sulphides, Inc., South Strafford, continued to be the sole producer in the State, conducting both underground and open-pit

operations at Elizabeth, Orange County.

Gold and Silver.—Gold and Silver were produced as byproducts of smelting copper concentrate from Vermont copper ore. Recovery of silver increased 4 percent to 50,400 fine ounces, while gold decreased 2 percent compared with 1954.

TABLE 2.—Mine production of recoverable copper, gold, and silver, 1946-50 (average) and 1951-55, in terms of recoverable metals

	Copper		Gold		Silver	
Year	Short tons	Value	Fine ounces	Value	Fine ounces	Value
1946-50 (average)	2, 794 3, 774 3, 774 3, 947 4, 352 4, 305	\$1, 110, 401 1, 826, 616 1, 826, 616 2, 265, 578 2, 567, 680 3, 211, 530	127 156 162 171 185 181	\$4, 445 5, 460 5, 670 5, 985 6, 475 6, 335	27, 461 41, 300 45, 361 43, 128 48, 572 50, 447	\$24, 169 37, 379 41, 054 39, 033 43, 960 45, 657

#### **NONMETALS**

Asbestos.—The State of Vermont was the chief producer of asbestos in the United States in 1955. The Ruberoid Co. operated its Vermont Asbestos Mines Division quarry and mill in Lowell, about 14 miles north of Hyde Park, Lamoille County. Shipments of the chrysotile mined by the firm remained high in 1955, although slightly less than in 1954. The company marketed 17 grades of asbestos, varying in selling price between \$35 and \$504 per ton. Prices during 1955 changed little.

Clays.—Small tonnages of miscellaneous clay were dug for use in the making of brick and for mortar in Chittenden and Rutland Counties, respectively. No output was reported from Bennington County in

1955.

Lime.—The Vermont Associated Lime Industries, Inc., produced both hydrated and quicklime at plants in Addison and Chittenden Counties.

Pyrites.—Pyrrhotite concentrate was obtained from copper ore by Appalachian Sulphides, Inc., at its Elizabeth mine in Orange County. The quantity recovered was 5 percent higher in 1955 than in 1954.

Sand and Gravel.—Production of sand and gravel in 1955 rose 19 percent in quantity and 5 percent in value compared with 1954. Of the total tonnage, over 85 percent was utilized in the expanding highway-construction program. Output was reported from 29 commercial and 4 Government-and-contractor operators producing in all 14 counties, the largest of which, in order of decreasing value of tonnage, were Caledonia, Rutland, Chittenden, Washington, and Lamoille.

Slate.—Production and value of slate marketed in Vermont in 1955 were slightly less than in 1954, although the State maintained its rank as one of the leading slate producers in the United States. Slate for granules composed by far the greater tonnage and slate for roofing most of the remainder. Thirteen quarries were active in 1955, com-

pared with 16 in 1954. All production came from Rutland County. Stone.—The stone industry continued to be the largest mineral industry in Vermont in 1955, comprising 46 percent of the total value of mineral production. Output in 1955 rose 33 percent in tonnage and 35 percent in value, compared with 1954. Ten commercial and two Government-and-contractor operators produced limestone, marble, and granite. Eight marble quarries were active, 1 each in Franklin, Grand Isle, Washington, and Windsor Counties, and 4 in Rutland Granite was quarried at 1 location in Orange County and 5 in Washington County. Limestone was produced at 1 quarry each in Addison, Franklin, and Washington Counties, and 2 each in Chittenden and Rutland Counties.

The level of activity in the Barre granite district improved very

slightly, as shown in table 3.

TABLE 3.—Monumental granite in the Barre district, Vermont, 1953-55 [Barre Granite Association, Inc.]

	1953	1954	1955
Total quarry output, rough stock cubic feet Shipped out of Barre district in rough do.  Manufactured in Barre district do.  Light stock consumed in district do.  Dark stock consumed in district do.  Number of cutters in district.  Average daily wage.  Average number of days worked  Total payroll for year.  Estimated overhead.  Estimated value of light stock  Estimated value of dark stock.  Estimated polishing cost.  Estimated sawing cost.  Total value of granite.	976, 176 195, 235 780, 941 520, 627 260, 314 2, 422 \$15.00 240 \$8, 719, 200 4, 359, 600 2, 577, 105 1, 728, 482 1, 964, 554 1, 537, 477 20, 886, 418	800, 970 160, 194 640, 776 427, 184 2113, 592 2, 422 \$15, 12 240  \$8, 788, 627 4, 394, 313 2, 653, 881 1, 804, 852 1, 611, 952 1, 261, 527  20, 515, 152	808, 077 161, 618 646, 460 430, 974 215, 486 2, 400 \$15, 28 240 \$8, 801, 280 4, 400, 640 2, 779, 775 1, 734, 672 1, 272, 717 20, 261,801

Talc.—Production of talc in Vermont continued at an active pace. Mines were operated by Eastern Magnesia Talc Co., Inc., Burlington, in Lamoille and Washington Counties; Vermont Mineral Products, Inc., Chester, in Windsor County; and Vermont Talc Co., Chester, in Windham County. Toward the end of 1955, the plant of Vermont Mineral Products, Inc., near Reading was destroyed by fire and its stocks of talc purchased by Eastern Magnesia Talc Co., Inc., in early

## REVIEW BY COUNTIES

Addison.—Crushed limestone was produced by Vermont Associated Lime Industries, Inc., and marketed for agricultural purposes, concrete, and road metal. Hydrated lime also was produced by this firm, mostly for building and for insecticides and fungicides. The Cousino mine, operated by Peter Cousino near Bristol, produced unwashed and washed sand and gravel for the building- and highwayconstruction industries. The State highway department also produced sand and gravel for its own use.

Bennington.—Paving sand and gravel was produced by William E. Dailey, Jr., at a portable crushing plant near North Bennington. The State highway department and the United States Bureau of Forestry produced paving sand and gravel for use in building roads. The Bennington Brick Co. was flooded out by the hurricanes and did not resume activities during 1955.

TABLE 4.—Value of mineral production in Vermont, 1954-55, by counties

County	1954	1955	Minerals produced in 1955, in order of value
Addison	\$93, 750 (1) (1) (1) (2) (361, 886 (1) (5) (639 (1) (7, 350, 996 (1) (1) (7, 497 (12, 558, 659 (20, 483, 000	\$131, 218 69, 349 (1) 329, 644 (1) (1) (1) (1) (1) 9, 520, 069 (1) (1) 142, 413 13, 691, 105	Lime, stone, sand and gravel. Sand and gravel. Do. Sand and gravel, lime, stone, clays. Sand and gravel. Stone, sand and gravel. Do. Asbestos, tale, sand and gravel. Copper, stone, pyrites, silver, sand and gravel. gold. Sand and gravel. Stone, slate, sand and gravel, clays. Stone, sand and gravel, tale. Sand and gravel, tale. Sand and gravel, stone, tale.

<sup>1</sup> Figure withheld to avoid disclosure of individual company confidential data; included with "Undistributed." and in 1955 the value of gem stones for which no county of origin was indicated.

Caledonia.—In 1955 Caledonia County ranked first among Vermont counties in order of value of sand and gravel output. Washed sand and gravel was sold by the Caledonia Sand & Gravel Co. from a portable plant near Waterford for structural and highway construction. A. Booska Sand & Gravel Co. produced paving sand and gravel at a plant near Hinesburg. The State highway department also produced sand and gravel for road construction.

Chittenden.—Drury Brick Co., Inc., produced miscellaneous clay from an open-pit mine at Essex Junction and burned it into brick. Vermont Associated Lime Industries, Inc., produced crushed limestone for agricultural purposes and for the manufacture of lime in The city of Burlington quarried and crushed limecompany kilns.

stone for use as road metal.

George C. Stanley & Sons, Inc., produced building and road sand near Burlington. Vermont Paving Co., Inc., produced paving sand and gravel at Richmond, and Cass Corp. also produced sand and gravel near Essex Junction. Rutland Railway Corp. produced some engine sand from a pit at Colchester. Sand and gravel also was mined by the State highway department in Chittenden County.

Essex.—Sand and gravel produced by the State highway depart-

ment was used for local road building.

Franklin.—Washed building sand and gravel and engine sand were marketed by S. H. Evanson of Swanton. The State highway department produced sand and gravel for its own use. Crushed limestone was produced by Swanton Lime Works, Inc., at its plant in Swanton for a number of uses, including paving, agriculture, and flux. Vermont Marble Co. quarried marble at St. Albans.

Grand Isle.—Rough dimension blocks were quarried at the Isle La Mott operation of the Vermont Marble Co. and were processed for

building and monumental purposes. The State highway department

produced sand and gravel for roadbuilding purposes.

Lamoille.—Chrysotile asbestos was produced from open-pit operations of the Vermont Asbestos Mines of The Ruberoid Co., at Lowell, near Eden. The material was processed at the company plant near the mine and used in making a wide variety of asbestos products. Talc continued to be produced at the No. 4 mine of Eastern Magnesia Talc Co., Inc., which ground and marketed this commodity from its mill at Johnson. The product was consumed for many uses, including insecticides, paint, rubber, paper and asphalt filler, foundry facings, cosmetics, and other miscellaneous purposes.

Structural and paving gravel and building sand were produced by V. C. Farr from an open pit and screening plant near Morrisville. Albert Nadeau mined and processed washed paving sand and gravel at Johnson. Paving sand and gravel also was produced by the State

highway department.

Orange.—The major mineral product in Orange County was copper followed in order by stone, pyrites, silver, sand and gravel, and gold. Copper output was by Appalachian Sulphides, Inc., from the Elizabeth mine about 2 miles south of South Strafford. Work at the mine in 1955 included 1,132 feet of drifts, 17,443 feet of diamond drilling, and 1,540 feet of raising. Ore was treated at a 950-ton flotation mill. Gold, silver, and pyrite (pyrrhotite) concentrate were recovered as byproducts. The copper concentrate was shipped for smelting to the Laurel Hill, Long Island, N. Y., refinery of the Phleps Dodge Kefining Corp. and the pyrrhotite concentrate to a New Hampshire papermanufacturing company.

The J. K. Pirie Estate quarried light- and dark-gray granite block for monumental stone at Williamstown until June 1, when the quarry was sold to Rock of Ages Corp., Barre, a firm that continued to operate the quarry the balance of the year. Levi Lemieux produced paving sand and gravel from a pit at Williamstown; the State highway

department also produced sand and gravel for roadbuilding.

Orleans.—Harry Jipner of Irasburg produced paving gravel. H. G. Calkins mined and sold paving and structural sand and gravel from a new plant near Newport. Calkins formerly operated in Caledonia County. The State highway department mined paving sand and gravel.

Rutland.—Rutland County in 1955 was first in value of mineral production of Vermont counties. Minerals produced, in order of decreasing value, were stone (including limestone and marble), slate,

sand and gravel, and clay.
Slate was produced in 1955 only in Rutland County. companies operated 13 quarries. The chief firms were Central Commercial Co. (quarry and crusher at Castleton), Vermont Structural Slate Co. (Matthews, Eureka, and Parry quarries at Poultney and Fairhaven), Rising & Nelson Co., Inc. (quarries 11, 15, and 4 at Pawlet and Poultney), Covino Bros. Slate Co. (quarry 16 at Wells), Culvert Slate Co., Inc. (quarry at Poultney), and Taran Bros. (quarry at North Poultney). These 6 firms accounted for 96 percent of the tonnage and 96 percent of the value of slate output in Vermont in 1955. The principal outlets were as granules, roofing, structural and sanitary slate, and flagging.

Clark & Haynes operated a sand and gravel pit at East Poultney, producing paving sand and paving and building gravel. R. D. Barker produced structural sand and gravel from the West Street pit in Rutland, and Robert Green marketed paving sand and gravel and fill from a pit at Poultney. Vermont Marble Co. operated sand and gravel pits near Brandon. The United States Forest Service produced gravel for use in building roads. The State highway department produced sand and gravel for its own use. Rutland Fire Clay, Inc., mined clay near Rutland and marketed the material as refractory mortar.

Limestone was produced by Vermarco Lime Co. at West Rutland and by White Pigment Corp. near Florence. Vermarco Lime Co. sold crushed and broken stone for blast-furnace flux, railroad ballast, agricultural purposes, for use in sugar and paper mills, as a filler for various products, and for other uses. White Pigment Corp. sold prepared material for pigments and fillers and for other uses, such as

abrasives, leather finishing, and chemical purposes.

Green Mountain Marble Corp. operated two quarries and a mill in Rutland County in 1955. From the Mine quarry at West Rutland came rough blocks for both exterior and interior building purposes and for monumental uses. The Clarendon quarry at Clarendon produced rough block for monumental and other uses. Cut and dressed stone for exterior and interior building uses and monumental purposes, as well as some rough block for exterior building, was prepared at the company mill at West Rutland. Vermont Marble Co. remained the largest marble producer in the State. The output of its West Rutland quarry was marketed as rough and dressed building and monumental stone.

Washington.—Washington County ranked first in the State in the value of its stone production in 1955. The stone production was

chiefly granite and marble.

Rock of Ages Corp. produced rubble and rough monumental granite from its Rock of Ages, E. L. Smith, and Wetmore & Morse quarries near Graniteville and Websterville. Dressed stone was prepared at the mill at Graniteville. Among the projects in which this firm's granite were used were the following: The Captain Alden Partridge monument at Norwich University, Northfield, Vt.; the Springfield War Memorial, Springfield, Vt.; and Stations of the Cross memorials at St. Joseph and Holy Sepulchre Cemeteries, Chicago, Ill. Wells-Lawson Quarry Co., Inc., at its quarry at Websterville, produced dressed granite for monumental purposes and crushed stone for concrete and roadstone. Dressed granite for monumental use was produced from the Adamant quarry by Charles A. Pillette near Adamant Vermont Marble Co. operated its Roxbury quarry, producing interior building and monumental marble. The Vermont State Highway Department quarried limestone for use in road construction.

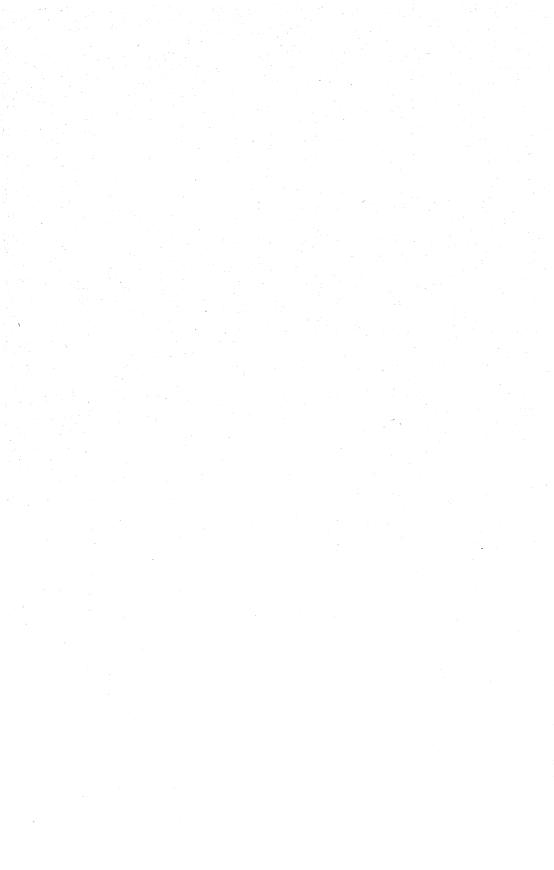
Eastern Magnesia Talc Co., Inc., produced talc from its underground No. 2 mine near Waterbury. This material was ground and sawed in its nearby mill. The ground product was utilized in a variety of applications, including fillers and components of many products. The sawed material was used in making marking crayons, which are produced at only 3 other mines in the United States—2 in

Georgia and 1 in North Carolina.

Paul Dutton, Northfield, produced building gravel. C. J. Lepage sold building and paving sand and gravel and W. D. Lovie, building and engine sand, both from pits near Barre. Building gravel and paving gravel were produced by Alfred W. Adams, of Montpelier, and J. F. Lamson, of Barre, respectively. Two small producers, identified only by their last names, Bresette and Fiddock, both presumably of Montpelier, produced sand for use by the city of Montpelier for ice control and for paving use. The city of Barre and the Vermont State Highway Department also produced sand and gravel for use in building roads.

Windham.—Talc mined by Vermont Talc Co. in Windham County was ground at the company mill near Chester, Windsor County. The ground tale was marketed for use in insecticides, for paint, paper, and rubber, for insulation of wire and cable, and for other miscellaneous uses. Brattleboro Sand & Gravel Co., Brattleboro, and Grafton L. Wilson, Jr., produced paving sand and gravel in 1955. Wardsboro Sand & Gravel Co. sold paving gravel from a pit near Jamaica. State highway department mined sand and gravel for road construc-

Windsor.—Talc was mined at the Reading open-pit mine by Vermont Mineral Products, Inc. This talc after crushing was sold for use in roofing materials. Eastern Magnesia Talc Co. purchased this operation near the close of 1955. Vermont Talc Co. operated its grinding mill at Chester. Vermont Marble Co. quarried marble. Sand and gravel was mined by Colonial Sand & Gravel, Inc., at Sharon, near White River Junction, and sold for paving purposes. Sand and gravel for paving was produced by the State highway department.



# The Mineral Industry of Virginia

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Department of Conservation and Development.

By Robert W. Metcalf 1



INERAL PRODUCTION in Virginia in 1955 rose to nearly \$173 million. This was 33 percent higher than in 1954 and 13 percent greater than in 1953. Expanded building programs, more intensive chemical and industrial activity, and the greatly increased demand for coal from abroad were the chief factors contributing to this increase. Large increases in value over 1954 were registered by coal, cement, slate, titanium concentrate, manganese, stone, and lime. Of the 26 minerals and mineral products comprising Virginia's mineral output in 1955, for only 6 was a lower value reported in 1955 than in 1954—lead, calcareous marl, natural gas, petroleum, sand and gravel, and soapstone. In order of value of products, the chief mineral commodities produced in the Commonwealth in 1955 were coal, stone, cement, sand and gravel, lime, zinc,

TABLE 1.—Mineral production in Virginia, 1954-551

Coal   Coal		1. 00 T			
Beryllium concentrate			1954		1955
Total Virginia   Tota	Mineral	(unless otherwise	Value	(unless otherwise	Value
Total Virginia 5 129, 603, 000 172, 541, 00	Coal— Gem stones Lead (recoverable content of ores, etc.)— Lime (open-market)— Manganese ore (35 percent or more Mn)—gross weight Marl, calcareous Natural gas Patroleum (crude)—thousand 42-gallon barrels Sand and gravel—silver (recoverable content of ores, etc.)—troy ounces Slate—Stone Zinc (recoverable content of ores, etc.)— Zinc (recoverable content of ores, etc.)—troy ounces Cinc (recoverable con	704, 843 16, 387, 292 44, 320 445, 158 22, 678 33, 174 1, 401 7, 115, 403 1, 773 17, 410 10, 893, 972	723, 292 72, 901, 277 1, 183, 680 4, 610, 645 1, 780, 934 21, 079 380, 000 (4) 8, 657, 871 1, 605 468, 911 18, 137, 501 3, 615, 408	935, 941 23, 507, 509 (3) 2, 997 494, 293 32, 654 (4) 968 4 6, 460, 886 1, 850 31, 536 11, 965, 890	873, 348 108, 173, 907 344 893, 106 5, 048, 697 2, 779, 337 (4) 259, 000
	Total Virginia 8		129, 603, 000		172, 541, 000

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption

y producers).

2 Less than 1 ton.

3 Weight not recorded.

4 Figure withheld to avoid disclosure of individual company confidential data.

5 Total has been adjusted to eliminate duplication in the value of clays and stone.

<sup>1</sup> Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.

manganese, salt, and gypsum. Coal led all other minerals in both quantity and value of output, totaling over 60 percent of the total value of all mineral production in Virginia and almost twice the

tonnage of stone, the next largest mineral produced.

The value of the fuels produced in the State rose to 63 percent of the total mineral output in Virginia in 1955, compared with 57 percent in the 2 previous years. The proportionate share of the value of all nonmetals dropped to 32 percent, while that of the metals increased to about 5 percent of the total value.

## REVIEW BY MINERAL COMMODITIES MINERAL FUELS

Coal.—Production of coal in Virginia rose substantially in 1955 to an alltime high of 23 million short tons, nearly 2 million tons greater than the former peak year 1952. The Commonwealth maintained its rank as the sixth in size of output of coal-producing States. Increased industrial activity and the strong export demand were potent factors in the 43-percent rise in output compared with 1954. value of coal production represented over 60 percent of the total value of all minerals produced in the State in 1955. This greatly increased output was derived from the State's abundant reserves of low and high volatile coals highly suitable for coking, steam, metallurgical, and domestic purposes. A small tonnage of semianthracite was mined in Montgomery County.

Bituminous coal mined in Virginia in 1955 was produced almost entirely in the southwestern part of the State. Buchanan, Wise, Dickenson, and Tazewell Counties contributed to the bulk of the output. Underground mining predominated, although a substantial tonnage was recovered by stripping operations, principally in Wise County. Sizable quantities were extracted also by auger mining,

especially in Buchanan County.

TABLE 2.—Production and value of bituminous coal, 1954-55, in short tons, by counties

		1954		1955			
County	Short tons	Value	Average value per ton 1	Short tons	Value	Average value pe ton 1	
Buchanan Dickenson Lee Montgomery Russell Scott Tazewell Wise Other counties	5, 393, 804 3, 110, 311 591, 171 (2) 690, 369 (2) 2, 696, 813 3, 879, 315 25, 509 16, 387, 292	13, 856, 553 16, 504, 863 114, 330	\$4. 18 4. 37 5. 30 4. 52 5. 14 4. 25 4. 48 4. 45	8, 913, 067 3, 890, 719 660, 395 (2) 1, 013, 633 (2) 2, 970, 212 6, 026, 003 33, 480 23, 507, 509	180, 445	5.	

<sup>1</sup> 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.)

2 Figure withheld to avoid disclosing individual company confidential data; included with "Other counties."

Petroleum and Natural Gas.—Both petroleum and natural-gas output in Virginia in 1955 decreased sharply compared with 1954. Petroleum output was confined to the Rose Hill field in Lee County. Natural gas was recovered in Buchanan, Dickenson, Russell, and Wise Counties and from the Early Grove field in Scott and Washington Counties. The United Producing Co., subsidiary of Union Carbon Co. in Buchanan County, produced the bulk of the natural gas recovered in the State. The Clinchfield Coal Corp. was the only other operator, completing small wells in Buchanan, Dickenson, Russell, and Wise Counties. It was reported that 19 rigs were in operation in the natural-gas-producing areas at the end of the year, and footage drilled totaled 92,792 feet.<sup>2</sup> There were 23 wells completed, of which 5 were plugged and abandoned. Eighteen were producing wells in 1955.

#### **METALS**

Beryllium Concentrate.—Beryllium concentrate (beryl) was produced in Virginia in 1955 by the Piedmont Mining Co. Output was from Powhatan County and was sold to the General Services Administration Materials Purchasing Depot at Spruce Pine, N. C.

Lead and Zinc.—Production of recoverable lead in Virginia in 1955 was substantially less than in 1954. Output of recoverable zinc, however, rose 10 percent in quantity and 25 percent in value over 1954. Production was the largest since 1944, while the value was slightly higher than in 1944.

TABLE 3.—Mine production of recoverable lead and zinc, 1946-50 (average) and 1951-55

	Le	Lead		Zine	
Year	Short tons	Value	Short tons	Value	
1946-50 (average)	3, 891 1, 508 3, 792 2, 788 4, 320 2, 997	\$1, 131, 897 521, 768 1, 221, 024 730, 456 1, 183, 680 893, 106	15, 027 7, 332 13, 409 16, 676 16, 738 18, 329	\$3, 839, 552 2, 668, 848 4, 451, 788 3, 835, 480 3, 615, 408 4, 508, 934	

Manganese.—The continued active Government stockpiling program resulted in a 44-percent increase in manganese output in 1955 compared with 1954, in which year production was 168 percent greater than in 1953. This greatly augmented Virginia supply of manganese consisted entirely of metallurgical-grade ore of 35 percent or more manganese content, and production in 1955 reached 32,654 short tons of natural manganese valued at \$2.8 million—56 percent higher in value than in 1954. All but a small tonnage sold commercially was purchased by the General Services Administration for addition to the stockpile. The more important active producers in 1955 were Virginia Ore Corp., Augusta County; Flat Top Mining Corp. and Southern Manganese Corp., Bland County; J. Gordon Gusler, Giles County; Manganese Mining & Contracting Corp.,

<sup>&</sup>lt;sup>2</sup> Department of Labor and Industry, Commonwealth of Virginia, Oil and Gas Development in Virginia during 1955: Labor and Industry in Virginia—58th Ann. Rept., 1956, pp. 93–95.

Marion Manganese Ore Co. (Union Manganese Co., in the first part of the year), Rural Retreat Manganese Ore Co. (Glade Mountain Co. in the first part of the year), Sidney Manganese Ore Co. (Sugar Grove Manganese Corp. in the first part of the year), and Umbarger Manganese Corp. (Union Manganese Mining Co. in the first part of the year), Smyth County; and Colitz Mining Co., Washington County. There was output in 1955 also from Appomattox and Giles Counties.

A brief history of manganese production and producing districts in Virginia, as well as locations of active mines and plants in mid-According to this study, producing areas were 1955, was published. in three more-or-less parallel belts running northeast to southwest, in the western part of the State—the Piedmont, the Blue Ridge, and Ridge and Valley districts. Terms of the Government stockpiling The report included an extensive bibliography program were given. and production data by months for 1954 and first 6 months of 1955, and by districts for the latter period.3

TABLE 4.—Manganese and manganiferous ores shipped from mines, 1946-50 (average) and 1951-55

	•				
Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	1 75	(2)	1953	8, 454 22, 678	\$635, 926 1, 780, 934
1951 1952	1,011	(2)	1955	32, 654	2, 779, 337

<sup>&</sup>lt;sup>1</sup> In addition, there was an average output of 2,007 tons of ferruginous manganese ore in the period 1946–50. <sup>2</sup> Figure withheld to avoid disclosing individual company confidential data.

Silver.—Silver was recovered as a byproduct of the beneficiation of zinc-lead ore mined by the New Jersey Zinc Co. at Austinville, Wythe County.

Titanium Concentrate.—All ilmenite mined in 1955 by the American Cyanamid Co. near Piney River, Amherst County, was consumed in the titanium-pigments plant that adjoins the mine. Ilmenite produc-

tion was higher in 1955 than in 1954.

Uranium.—No known uranium has been produced in the Common-Reports of field reconnaissance studies in Virginia and adjoining States, however, have indicated areas of significant radioactivity as revealed by scintillator and geiger counters. Interesting anomalies were discovered, particularly in the Price (Pocono) sand-stone in Bland, Pulaski, and Tazewell Counties, as well as in granite gneiss in Grayson County. Recommendations that the Price (Pocono) sandstone especially be investigated further were made by the Atomic Energy Commission.4 **NONMETALS** 

Aplite.—Aplite was produced in Virginia from a small area in the southern part of the State near Piney River in Amherst and Nelson Counties. Output was slightly higher in 1955 than in 1954. Two operators were active in the area—Dominion Minerals Div., Riverton

<sup>&</sup>lt;sup>3</sup>Gooch, Edwin O., Current Manganese Operations in Virginia: Virginia Minerals, (pub. by Virginia Div. of Minerals, Charlottesville, Va.), vol. 1, No. 5, October 1955, pp. 1–6.

<sup>4</sup>Snow, Marcellus H., Report of Adiometric Reconnaissance in Virginia, North Carolina, Eastern Tennessee, and Parts of South Carolina, Georgia, and Alabama: U. S. Atomic Energy Commission, Tech. Inf. Serv., Rep. RME–3107, Oak Ridge, Tenn., February 1955, 33 pp. Uranium in Virginia: Virginia Minerals, pub. by Virginia Div. of Geol., Charlottesville, Va., vol. 1, No. 3, July 1955, pp. 1–3.

Lime & Stone Co., Inc., with mine in Amherst County and mill across the line in Nelson County; and Consolidated Feldspar Dept., International Minerals & Chemical Corp., with both mine and mill in Nelson County. After grinding the aplite was utilized as a source of alumina in manufacturing glass, and a small tonnage in manu-

facturing building brick.

Cement.—Shipments of portland cement (including masonry cement) in 1955 in Virginia rose 17 percent in quantity and 27 percent in value compared with 1954. Hydraulic lime also was produced and shipped. Hydraulic lime was produced from local shales by Riverton Lime & Stone Co., Inc., at its six-pot-kiln plant at Riverton, Warren County. Firms producing portland cement were: Lone Star Cement Corp., with a wet-process mill at South Norfolk, Norfolk County, and a dry-process plant at Cloverdale, Botetourt County; and Lehigh Portland Cement Co. with a dry-process plant at Fordwick, Augusta County. Marl was used by the South Norfolk plant of the Lone Star Cement Corp., while the other two mills utilized limestone. Both of the producers of portland cement also pro-

duced and marketed masonry cement.

Clays.—Production of clays in Virginia in 1955 totaled 935,941 short tons valued at \$873,348, an increase of 33 percent in tonnage and 21 percent in value compared with 1954. These figures include the quantity of clay used in manufacturing cement. Clay consumed in making cement increased 14 percent compared with 1954. ported output consisted only of miscellaneous or common clay and shale, which was used in burning brick, tile, lightweight aggregate, and cement. The principal clay-producing firms in the State in 1955 were: United Brick Corp., Woodbridge Station, Albemarle County; Roanoke-Webster Brick Co., Roanoke; Virginia Lightweight Aggregate Corp., Webster, Botetourt County; Southside Brick Works, Inc., Richmond, Chesterfield County; Shenandoah Brick & Tile Co., Winchester, Frederick County; Redford Brick Co., Richmond, Henrico County; Woodbridge Clay Products Co., Woodbridge, Prince William County; and Locher Brick Co., Inc., Glasgow, Rockbridge The largest clay-mining counties, in order of production, were: Botetourt, Henrico, Frederick, Chesterfield, Albemarle, and Prince William.

TABLE 5.—Clays sold or used by producers, 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	501, 932	\$455, 221	1953	952, 266	\$927, 571
	775, 245	825, 097	1954	704, 843	723, 292
	940, 496	996, 351	1955	935, 941	873, 348

Feldspar.—Feldspar output in Virginia in 1955 was obtained from Bedford County, the only producing county in the State. Clinchfield Sand & Feldspar Corp. operated the Coles, Mitchell, and Peaksville mines in 1955, producing potash feldspar for ceramic use. These three mines were near Bedford. Production in 1955 increased substantially over that in 1954. A description of the geology of the Otter River area in Bedford County was published. The feldspar-

rich pegmatites in this region, formerly an important supplier of feldspar in Virginia, and the gneiss in this and adjacent areas, were listed as sources of possible commercial products.<sup>5</sup> The gneiss was considered to be suitable for dimension stone including flagstone.

Gypsum.—The United States Gypsum Co. in 1955 continued to mine gypsum at Plasterco, Washington County. The company also operated a mill and plasterboard plant at that location and a calcining plant at Norfolk. The latter plant used both domestic and imported material.

Iron Oxide Pigments.—Two companies produced finished iron oxide pigments in Virginia in 1955, as in 1954. Production was higher in 1955 than in 1954. The two operators were American Pigment Corp., with plants in Hiwassee and Pulaski, Pulaski County; and Blue Ridge Talc Co., Inc., near Henry, Franklin County. Output included mineral blacks and browns, red and yellow oxides, ochers, siennas, and umbers. Crude iron oxide pigments were mined by the American Pigment Corp., Pulaski. These Virginia materials, formerly classified as usable iron ore, in 1955 have been included under iron oxide pigments, particularly as the iron content of most, if not all, of the mined product is rather low to be considered as an iron ore. Sales were higher in 1955 than in 1954.

Kyanite.—Production of kyanite in 1955 was substantially greater than in 1954. Kyanite Mining Corp. continued to be the only producer during 1955. This firm operated a mine near Farmville on Baker Mountain, Prince Edward County. The product was mined as a disseminated ore from a biotite-feldspar schist and sold as a

kyanite concentrate.

Lime.—Virginia production of lime in 1955 rose 11 percent in quantity and 10 percent in value compared with 1954 and 4 percent higher in tonnage than the high level reached in 1953. Chemical and industrial lime comprised 94 percent of the tonnage and 92 percent of the value of lime produced in the State, owing to the high-quality limestone deposits available in the Shenandoah Valley and other areas west of the Blue Ridge. Good quality lime also was obtained from the soft limestones of the Coastal Plain. One plant in Isle of Wight County used oystershell as a raw material. Eleven plants, including the one using oystershell, manufactured lime in 1955. The chief producers were National Gypsum Co. and Standard Lime & Stone Co., both at Kimballton, Giles County; Strasburg Lime Co., Inc., and Dominion Limestone, Inc., both near Strasburg, Shenandoah County; and M. J. Grove Lime Co., Stephens City, Frederick County. Lime was also burned in sizable quantities in Montgomery, Norfolk, and Tazewell Counties.

Marl, Calcareous.—Production of calcareous marl decreased in 1955 compared with 1954. Output was confined to Clarke and Surry Counties. The Clarke County product was a travertine marl, while the Surry County marl was recovered from Coastal Plain deposits. Active producers in 1955 were A. C. Strother & Bro., and J. C. Digges & Sons, both near Berryville; and Paul Miller, near Claremount, Surry County. The last named crushed and ground his product and

<sup>&</sup>lt;sup>5</sup> Diggs, William E., Geology of the Otter River Area, Bedford County, Va.: Virginia Polytech. Inst., Eng. Exp. Sta. Ser. 101, Blacksburg, Va., 1955, 23 pp.

TABLE 6.—Lime (quick and hydrated) sold and used by producers, 1946-50 (average) and 1951-55, by types

Year	Agric	cultural	Bu	ilding		l and other ustries	Т	otal
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946-50 (average)	21, 115 22, 840 20, 151 19, 215 11, 146 26, 945	\$227, 181 285, 443 241, 139 243, 030 91, 616 333, 464	13,664 6,309 11,566 10,819 14,781 4,355	\$144, 334 81, 005 126, 428 117, 477 180, 802 52, 034	285, 651 423, 531 411, 128 447, 350 419, 231 462, 993	\$2, 398, 789 4, 185, 208 4, 081, 357 4, 586, 911 4, 338, 227 4, 663, 199	320, 430 452, 680 442, 845 477, 384 445, 158 494, 293	\$2, 770, 30-4, 551, 65-4, 448, 92-4, 947, 418-4, 610, 644-5, 048, 69

bagged it for sale, while the others marketed their marl as a crude unground product. The marl was used for agricultural purposes.

Mica.—Output of full-trim mica, including hand-cobbed material converted to full-trim, increased during 1955 compared with 1954. Scrap mica also was recovered in 1955. Principal producers in Virginia were from Powhatan County and included Piedmont Mining Co., Inc., with mines near Powhatan, and J. E. Wilson of Bakersville, N. C., operating the Johnny Young mine. Four other miners were reported to have sold small amounts of mica to the GSA Materials Purchasing Depot at Spruce Pine, N. C. This material was reported as mined in Virginia, with no county designated.

One firm in Virginia—Richmond Mica Corp.—ground purchased

One firm in Virginia—Richmond Mica Corp.—ground purchased scrap mica at a mill at Newport News, Warwick County. The ground mica was sold as mold lubricant in rubber manufacture, as an ingredient in paint, plastics, and wallpaper, and for miscellaneous purposes.

Perlite.—Expanded perlite was produced by Virginia Perlite Corp., Hopewell, Prince George County, for use mostly as plaster aggregate, with small amounts for concrete aggregate. Local building-supply dealers were the chief marketing outlet for this lightweight material. The crude perlite was shipped in from the Southwestern States. Output of expanded perlite was larger in 1955 due to increased demand from the building industries.

Pyrites.—Virginia produced a large quantity of pyrites in 1955 from the Gossan mine of the General Chemical Division, Allied Chemical & Dye Corp., in Carroll County. This firm was the only producer in the State and produced lump ore and fines or concentrate for consumption at its sulfuric acid plant at Pulaski. Output in

1955 increased 16 percent compared with 1954.

Salt.—The only producer of salt in Virginia in 1955 was the Mathieson Chemical Corp. at Saltville, Smyth County. Its output of chlorine, caustic soda, and soda ash came from artificial brines ob-

tained from underground rock salt deposits.

Sand and Gravel.—The production of sand and gravel in 1955 decreased 9 percent in quantity and 7 percent in value compared with the high output of 1954, but was still 22 percent higher in quantity than in 1953. Road building and other construction activities remained active factors in an expanding economy and tended to keep the demand for sand and gravel high. There were 37 commercial producers and 3 Government agencies in Virginia producing sand

and gravel for a variety of purposes in 1955. Of the total State output, 94 percent was used for structural and paving projects. Among special-purpose sands, Virginia Glass Sand Corp. in Frederick County near Gore and Locher Silica Corp. in Rockbridge County

near Goshen produced sizable quantities of glass sand.

The sand and gravel industry in Virginia largely is located in the Coastal Plain areas. Thus, the larger producing counties, in order of size of output were: Chesterfield, Fairfax, Henrico, Prince George, Princess Anne, and Spotsylvania. The principal producers, noted alphabetically by counties, were: Southern Materials Co., Inc., Chesterfield County; Modern Sand & Gravel Corp., Northern Virginia Construction Co., Inc., and Virginia Sand & Gravel Co., Inc., all in Fairfax County; Commonwealth Sand & Gravel Corp. and West Bros., both in Henrico County; Bryan Rock & Sand Co. and Arthur Hitch, in Prince George County; and Massaponax Sand & Gravel Corp., in Spotsylvania County.

TABLE 7.—Sand and gravel sold or used by producers, 1954-55, by classes of operations and uses

		1954			1955	
		Val	ue		Val	ue
	Short tons	Total	Average per ton	Short tons	Total	Average per ton
COMMERCIAL OPERATIONS						
Sand: Building. Paving. Other. Gravel: Building.	834, 517 1, 970, 389 168, 887 893, 014	\$917, 268 1, 623, 089 125, 133 1, 459, 936	\$1. 10 . 82 . 74 1. 64	1, 448, 193 1, 038, 633 37, 708 1, 590, 708	\$1, 589, 376 697, 280 38, 105 2, 617, 937	\$1. 10 . 67 1. 01 1. 68
Paving Other Undistributed 1	2, 575, 242 87, 895 271, 510	3, 765, 490 33, 180 580, 738	1. 46 . 38 2. 14	1, 834, 978 344, 225	2, 199, 932 825, 761	1. 20 2. 40
Total commercial sand and gravel operations	6, 801, 454	8, 504, 834	1. 25	6, 294, 445	7, 968, 391	1. 27
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand: Paving Gravel: Paving	89, 795 224, 154	24, 591 128, 446	. 27 . 57	52, 321 114, 120	21, 503 86, 210	. 41
Total Government-and-con- tractor sand and gravel	313, 949	153, 037	. 49	166, 441	107, 713	. 68
Grand total	7, 115, 403	8, 657, 871	1. 22	6, 460, 886	8, 076, 104	1. 2

 $<sup>^{\</sup>rm I}$  Includes glass, molding, engine, filter |(1955), and railroad ballast sands to avoid disclosing individual company confidential data.

Slate.—Stimulated by increased domestic and industrial building, the output of slate in 1955 increased 81 percent in tonnage and totaled 31,536 short tons valued at \$820,124. The chief uses—roofing and flagging—nearly doubled in quantity, and the other principal use—roofing granules—showed a substantial gain over 1954 levels. The slate generally is dark gray, with greenish or brownish tints. Blue Ridge Slate Corp. mined slate for roofing granules in Albemarle and Buckingham Counties. The other three slate producers in

Virginia-Arvonia Buckingham Slate Co., Inc., Williams Slate Co., Inc., and LeSueur Richmond Slate Corp.—quarried material in Buckingham County for roofing, flagging, and other purposes.

Soapstone.—The output of crude soapstone for grinding stock in Virginia was only slightly less in 1955 than in 1954. Major markets for the ground soapstone included roofing, foundry facings, rubber manufacture, and insecticides. Two companies were active in 1955—Blue Ridge Talc Co., Inc., at Henry, in Franklin County, and Alberene Stone Corp. of Virginia, near Schuyler, Nelson Countyboth of which ground their own crude soapstone.

Stone.—Other than coal, stone quarrying comprised by far the largest mineral industry in Virginia in both tonnage produced and in value of output. In 1955 the output rose 10 percent in both quantity and value compared with 1954 and totaled nearly 12 million tons of stone valued at almost \$20 million. Concrete aggregate and roadstone represented over half of the total stone produced in the State.

Production from Virginia quarries consisted of a wide variety of Included among these kinds of stone were limestone and dolomite, granite, diabase, quartzite, dimension soapstone, greenstone, and marble. A small tonnage of oystershell also was included in the 1955 stone compilations for the first time. The largest tonnage of any type of stone produced was for limestone and dolomite, which composed 81 percent of the total stone quarried. The principal uses were concrete aggregate and road metal, agricultural applications, and fluxes. There were 43 commercial stone operators with 46 quarries, with output from 22 of the 100 counties of the Commonwealth. Botetourt and Giles Counties had the largest output; and Lone Star Cement Corp. (Norfolk and Botetourt Counties), Blue Ridge Stone Co. (Botetourt County), Rockydale Quarries Corp.

TABLE 8.—Stone sold or used by producers, 1954-55, by kinds and uses

Kind and use	19	954	1955		
	Short tons	Value	Short tons	Value	
Dimension stone: Limestone, all uses. Sandstone, all uses. Crushed and broken stone:	1, 700	\$3,650	433	\$4, 465	
Granite: Granite: Concrete and road metal Railroad ballast Other uses Basalt and related rocks: Concrete and road metal Limestone: Riprap Fluxing stone Concrete and road metal Railroad ballast Agriculture Miscellaneous Miscellaneous stone: Concrete and road metal and riprap Undistributed \$	\$ 1, 519, 989  599, 464  698 483, 806 3, 768, 762 356, 748 753, 176 3, 195, 260  44, 346 149, 423	2, 083, 528 842, 091 698 773, 150 5, 000, 257 365, 412 1, 468, 803 4, 696, 813 92, 885 2, 810, 214	(1) 1, 352, 539 707, 302 404 547, 182 4, 519, 086 348, 871 585, 165 3, 711, 662 (2) 193, 246	(1) 1, 878, 536 1, 184, 604 404, 845, 515 6, 034, 403 408, 460 1, 134, 031 5, 728, 580 (*) 2, 650, 677	

<sup>&</sup>lt;sup>1</sup> Concrete and road metal and railroad ballast included with "Other uses" to avoid disclosing individual

company confidential data.

2 Included with "Undistributed" to avoid disclosing individual company confidential data.

3 Includes miscellaneous dimension stone, miscellaneous crushed and broken stone including concrete road metal and riprap (1954), and crushed and broken marble and crushed sandstone.

(Roanoke County), National Gypsum Co. (Giles County), and Liberty Limestone Corp. (Botetourt County) were among the largest

limestone operators.

Crushed and broken granite was quarried in 4 counties by 4 producers, for concrete and road metal and railroad ballast, chiefly from the Piedmont area. Sandstone (quartzite) was produced by one firm in Rockbridge County. Diabase, classified for statistical purposes as a basaltic rock, was quarried by 4 operators in 4 counties, mostly in the Triassic Basin of the Piedmont. Three companies produced "miscellaneous" stone, one marketing a dimension soapstone, another a dimension greenstone, and the third a crushed stone of type not reported. One quarry near Harrisonburg, Rockingham County, yielded marble that mostly was sold for terrazzo. Oystershell was produced in 1955 by four firms in Fairfax, Isle of Wight, and Norfolk Counties. This material was used as poultry grit, for agricultural purposes, for the manufacture of lime, and for road fill.

#### **REVIEW BY COUNTIES**

Accomack.—Building and paving sand and gravel were produced by Eastern Shore Sand & Gravel Co., Inc., Mappsville, from a pit

near Hallwood.

Albemarle.—Superior Stone Co. and Charlottesville Stone Corp., Charlottesville, operated quarries for producing crushed and broken granite and basalt, respectively. These were used for concrete aggregate, road material, screenings, and stone sand. The open-pit mine near Woodbridge Station owned by United Brick Corp. yielded clay, which was used for heavy clay products. Roofing granules were produced from slate recovered by Blue Ridge Slate Corp. at its quarry and crusher near Esmont. S. L. Williamson Co., Inc., Charlottesville, reported producing paving sand from a dredging operation.

Alleghany.—A small quantity of engine sand was produced in Alleghany County under contract for Norfolk & Western Railway Co.

TABLE 9.—Value of mineral production in Virginia, 1954-55, by counties 1 2

County	Val	ue	Minerals produced in 1955 in order		
	1954	1955	of value <sup>2</sup>		
Accomack Albemarle Alleghany Amelia Amherst Appomattox Augusta Bedford Bland Bland Botetourt Buchanan Buckingham Campbell Caroline Carroll. Charlotte Chesterfield	(3) (3) (3) (3) (8, 495, 333 22, 569, 222 425, 443 (3) (4)	\$20, 518 (3) 290 119 (3) (4) (3) (4) (4), 356, 855 758, 721 (3) (3) (4)	Sand and gravel. Stone, clays, slates, sand and gravel. Sand and gravel. Gem stones. Titanium concentrate, aplite, sand and gravel. Stone, manganese. Cement, stone, manganese, sand and gravel, clays. Feldspar. Manganese. Cement, stone, clays. Coal. Slate. Stone, sand and gravel. Pyrites. Sand and gravel, clays. Marl, calgareous. Marl, calgareous.		

See footnotes at end of table.

TABLE 9.—Value of mineral production in Virginia, 1954-55, by counties 12—Con.

1954   1955	County	Va	lue	Minerals produced in 1955 in order			
Dickenson   13, 602, 308   \$17, 927, 551   Coal.		1954	1955	of value <sup>2</sup>			
Dinwiddie	Culpeper		(3)				
Fairfax	Dickenson	13, 602, 308	\$17, 927, 551	Coal.			
Pranklin	Fairfax			Sand and gravel, stone (oystershell).			
1, 452, 475   1, 629, 027							
1		1 452 475		Stone, lime, sand and gravel, clays.			
Stone		4, 292, 676	5, 068, 991	Lime, stone, manganese.			
Treensyille   (1)		350,000					
See of Wight		(3)	(3)				
Sile of Wight		(3)					
Sand and gravel.   Coal, stone.   Sand and gravel.   Coal, stone.   Stone.   Coal, stone.		(3)		Stone.			
And and gravel.   Coal, stone.   C	Sie of wight		75, 637	Lime, oystersnen.			
200   3, 443, 788   4, 225, 610   364, 604	ames City	(9)		Sand and graval			
Outdown	and william	3 443 788	4 225 610				
Madison		(1)	364 604				
Madison Montgomery 4 209, 759 (3) (2) (2) (3) (4) (4) (4) (5) (5) (7) (7) (7) (7) (8) (7) (8) (8) (8) (8) (8) (8) (8) (8) (8) (8		38,000	001,001	200201			
Vansemond   (3)							
Norfolk		4 209, 759	623, 138				
Norfolk	Vansemond	(3)	(3)				
Do.   Do.   Stone, sand and gravel.   Stone   Stone, sand and gravel.   Stone   Stone, sand and gravel.   Stone		(3)	(3)	Stone, aplite, soapstone.			
Do.   Do.   Stone, sand and gravel.   Stone   Stone, sand and gravel.   Stone   Stone, sand and gravel.   Stone		(3)	(8)				
Citty vania   (3)		02 003					
Prince William (7,450 30,929 301,651 (3) Sand and gravel. Princes Anne 330,929 301,651 (3) Sand and gravel. Princes Anne 330,929 301,651 (3) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (5) Sand and gravel. Princes Anne 320,929 301,651 (5) Sand and gravel. Princes Anne 320,929 301,651 (5) Sand and gravel. Princes Anne 320,920 Stone, sand and gravel. Princes Anne 320,920 Sand and gra	Pittevlyonia	(3)	3				
Prince William (7,450 30,929 301,651 (3) Sand and gravel. Princes Anne 330,929 301,651 (3) Sand and gravel. Princes Anne 330,929 301,651 (3) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (4) Sand and gravel. Princes Anne 320,929 301,651 (5) Sand and gravel. Princes Anne 320,929 301,651 (5) Sand and gravel. Princes Anne 320,929 301,651 (5) Sand and gravel. Princes Anne 320,920 Stone, sand and gravel. Princes Anne 320,920 Sand and gra		(3)	(3)	Mica, beryllium concentrate,			
Prince William (7,450 30,929 301,651 201aski 501,435 (3) 301,651 (	rince Edward	(3)	(3)	Kyanite.			
Trinskr			(3)				
Trinskr			. (3)				
Stone, clays, sand and gravel.   Stone, sine, clays, sand and gravel.   Stone, sand and gravel, clays.   Stone, sand and gravel, c			301, 651	Sand and gravel.			
1, 220, 972   1, 220, 972   1, 220, 972   1, 220, 972   1, 220, 972   1, 220, 972   1, 220, 972   1, 220, 972   1, 220, 972   1, 220, 972   1, 220, 972   1, 220, 972   1, 220, 972   1, 220, 974   1, 220, 972   1, 220, 974   1, 220, 972   1, 220, 974				Stone clara cond and gravel			
Stoke   Stok			1 220 072	Stone cand and gravel clays			
College   Coll			574 581				
Do.   Do.   Do.   Stone, lime.   S			4, 889, 330				
Simpth		(3)	(3)	Do.			
potsylvania		1, 091, 340	799, 066	Stone, lime.			
Spotsylvania	Smyth	4, 574, 186	5, 172, 232	Salt, manganese, stone, sand an			
Surry	Inotarilyania	(3)	(3)	graver, clays.			
14, 527, 193	pousyivailla		(9)	Marl calcareous			
Warren. (3) (2) (2) (2) (3) (4) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4				Coal, stone, lime, clays.			
Washington       1, è23, 008       2, è75, 673       Gypsum, manganese, stone.         Wise       16, 540, 363       25, 552, 644       Coal, stone.         Wythe       5, 166, 767       (a)       Zinc, lead, stone, silver.         Undistributed 5       4 21, 306, 056       40, 430, 019       Zinc, lead, stone, silver.		(8)	(8)	Cement, stone.			
Westmoreland       (2)         Wise       16, 540, 363         Wythe       5, 166, 767         Undistributed 5       4 21, 306, 056         4 21, 306, 056       40, 430, 019             Sand and gravel.         Coal, stone.       Cinc, lead, stone, silver.	Washington	1, 623, 008	2, 275, 673	Gypsum, manganese, stone.			
Wythe	Westmoreland		(3)				
Indistributed 5 421, 306, 056 40, 430, 019	Vise	16, 540, 363	25, 552, 644				
	Wythe	5, 166, 767	(3)	Zinc, lead, stone, silver.			
(Pote) 6 4 190 602 000 172 541 000	Indistributed	* 21, 306, 056	40, 430, 019				
	Total 6	4 129, 603, 000	172, 541, 000				

<sup>&</sup>lt;sup>1</sup> The following counties are not listed because no production was reported: Arlington, Bath, Brunswick, Charles City, Craig, Cumberland, Essex, Floyd, Fluvanna, Gloucester, Grayson, Greene, Halifax, Hanover, Highland, King and Queen, King George, Lancaster, Lumenburg, Mathews, Mecklenburg, Middlesex, New Kent, Northampton, Northumberland, Page, Patrick, Rappahannock, Richmond, Southampton, Stafford, Sussex, Warwick, and York.

<sup>2</sup> Value of fuels, including petroleum and natural gas, is not listed by counties, as data are not available; value included with "Undistributed."

<sup>3</sup> Eignra withheld to consid disclesing individual company, confidential data.

Amelia.—Ben L. Cash, Albuquerque, N. Mex., purchased a quantity of amazonite, a semiprecious gem stone, recovered from the Rutherford mine near Amelia Courthouse. E. Kane White also recovered a small amount of amazonite from the Morefield mine near Amelia Courthouse.

<sup>\*\*</sup> Figure withheld to avoid disclosing individual company confidential data.

\* Revised figure.

\* Revised figure.

\* Includes value of part of manganese-ore output, mica, and gem stones, for which no distribution by counties was given in 1955, petroleum, natural gas, and values indicated by footnote 3.

\* The total has been adjusted to eliminate duplicating the value of clays and stone.

Amherst.—The only production of titanium concentrate (ilmenite) in Virginia in 1955 was in Amherst County. American Cyanamid Co. recovered this mineral at its operation near Piney River. Dominion Minerals Division of Riverton Lime & Stone Co., Inc., produced aplite for use by glass manufacturers. J. M. Smiley, Lynchburg, produced building sand from a dredging operation near Madison Heights.

Appomattox.—Production of crushed and broken limestone used for concrete, road material, and agricultural purposes was reported in Appomattox County by Appomattox Stone Corp. and the State of Virginia. Southeastern Manganese Co. was the only manganese producer in the county and operated its Nuttall mine near Lynchburg

throughout the year.

Augusta.—Mines and quarries of Augusta County in 1955 yielded sizable quantities of limestone, manganese, sand and gravel, and clay. Portland and masonry cements were also produced from crushed limestone at the Fordwick plant of Lehigh Portland Cement Co.

Producers of limestone other than Lehigh Portland Cement Co. were Belmont Traprock Co., Inc., and Augusta Stone Corp., both of Staunton; Virginia Department of Highways; and State of Virginia. This output was used as concrete aggregate and road material and for agricultural purposes. The Crimora mine of Virginia Ore Corp. produced manganese in 1955. F. R. Weeks, Raphine, produced building sand, and the Virginia Department of Highways produced paving gravel. North Mountain Brick Co., Inc., near Staunton mined miscellaneous clay and shale which were used in the manufacture of heavy clay products.

Bedford.—The only feldspar production in Virginia in 1955 was

Bedford.—The only feldspar production in Virginia in 1955 was in Bedford County. Clinchfield Sand & Feldspar Corp., operator of the Coles, Mitchell and Peaksville mines, all near Bedford, was the

sole producer.

Bland.—In 1955 Bland County ranked third in manganese production in the State. The three producers in the county were the Dismal Creek mine of Bluefield Mining Corp., Mechanicsburg; Stange mine, Flat Top Mining Corp., Bland; and Southern Manganese Corp., Bastian.

Botetourt.—Botetourt County ranked first in total value of cement, stone, and clay output in Virginia in 1955. Lone Star Cement Corp. operated its Cloverdale plant for producing portland and masonry cement. The combined output of James River Hydrate & Supply Co. (Buchanan), Blue Ridge Stone Corp., and Liberty Limestone Corp., operators of the Sherwood and Rocky Point quarries, was sufficient to make Botetourt County first among stone-producing counties. Crushed and broken limestone was utilized for a variety of uses, including concrete aggregate, road material, railroad ballast, agricultural purposes, blast-furnace flux, alkali, paper, rock dust for coal mines, mineral food, road base, cement, asphalt, fertilizer, and other fillers. Eagle Rock Lime Co., Eagle Rock, producer of limestone and lime, was idle during the year.

Miscellaneous clay, which was used in heavy clay products and for concrete and lightweight aggregate, was recovered at open-pit mines near Roanoke, owned by Roanoke-Webster Brick Co. and

Virginia Lightweight Aggregate Corp.

Buchanan.—Buchanan County continued as the leading bituminous-coal-producing county in Virginia in 1955, with an output of over 8 million tons of coal, 98 percent of which was mined from underground operations. The value of this production increased 79 percent over the value in 1954. There were over 550 producing mines in the county in 1955. The most prominent operators, in order of decreasing output, were Jewell Ridge Coal Corp., Sycamore Coal Corp., Lester Coal Co., Garden Smokeless Coal Corp., Buchanan County Coal Corp., Wellmore Coal Co., Lynn Camp Coal Corp., Crockett & McCoy Coal Co., Spur Coal Co., and Panther Red Ash Coal Corp. United Producing Co., subsidiary of Union Carbon Co., continued as the only producer of natural gas in Buchanan County.

Buckingham.—Roofing granules were produced from slate quarried by Blue Ridge Slate Corp. at its Dutch Gap Quarry. Other producers were Arvonia Buckingham Slate Co., Inc., and The Williams Slate Co., Arvonia; and LeSueur-Richmond Slate Corp., Ore Bank. The output of these quarries was utilized for roofing and flagging

purposes.

Campbell.—Virginia Greenstone Co., Inc., reported an output of rough and dressed building stone, in addition to flagging and crushed stone from a greenstone quarry near Lynchburg. The dressed building stone was utilized as laboratory table tops, sinks, and bakery hearths. Paving sand and gravel was produced by contractors for the Virginia Department of Highways.

Carroll.—The Gossan mine of General Chemical Division, Allied Chemical & Dye Corp., at Cliffview, near Galax, yielded a substantial tonnage of pyrites that were roasted at Pulaski to make sulfuric acid. The iron residues from the acid plant were shipped to iron blast

furnaces in the Birmingham, Ala., area.

Charlotte.—The Norfolk & Western Railway Co. reported a small

production of sand for unspecified uses in Charlotte County.

Chesterfield.—A substantial tonnage of building and paving sand and gravel was recovered from a dredging operation on the James River near Dutch Gap by Southern Materials Co., Inc. Southside Brick Works, Inc., reported an output of miscellaneous clay mined from an open pit near Richmond.

Clarke.—J. C. Digges & Sons and A. C. Strother & Bro. mined

calcareous marl for agricultural purposes near Berryville.

Culpeper.—Stone was quarried for concrete aggregate and road material by Culpeper Stone Co., Culpeper. Paving and other sand

was produced by Culpeper Sand Co., Culpeper.

Dickenson.—Dickenson County ranked third among Virginia's coal-producing counties, with a production of over 3 million tons. The bulk of this output was from underground mine operations. The leading producer in the county was Clinchfield Coal Corp., which had underground, strip, and auger operations. Other leading producers were Baker Coal Co., Cassell Coal Co., R & P Coal Co., Lambert Coal Co., Neece Creek Coal Co., Dotson Bros. Coal Co., R & N Coal Co., Stollard & Yates Coal Co., and Rasnick & Wise Coal Co. Clinchfield Coal Corp. produced natural gas in 1955 in Dickenson County. Six wells were completed, of which two were plugged and abandoned.

Fairfax.—Fairfax County continued as the second-ranking sandand-gravel producer among Virginia counties in 1955. The bulk of output was building sand and gravel, produced by Northern Virginia Construction Co., Inc., Modern Sand & Gravel Corp., Belvoir Sand & Gravel Corp., and Hill Top Sand & Gravel Co., Inc., all with offices in Alexandria. The deposit of Virginia Sand & Gravel Co., Inc., is now a part of the City of Alexandria. Paving gravel was also produced by Clem Road Gravel Co., Alexandria, Fairfax Quarries, Inc., and C. R. Vaughn. Fairfax Quarries, Inc., Manassas, also reported a production of crushed and broken basalt used as concrete aggregate and road material. Herbert Bryant, Inc., Alexandria, crushed oystershell for use mainly in manufacturing poultry grit.

Fauquier.—Basalt, limestone, and sandstone were quarried in Fauquier County by W. W. Sanders, Warrenton; Millbrook Quarries, Inc., Broad Run; and John Costello, The Plains, respectively. This output was used for concrete aggregate, road material, flagging, and

rough construction.

Franklin.—Soapstone was quarried near Henry from the King-Ramsey Quarry of Blue Ridge Talc Co., Inc. The output was ground for use mainly as foundry facing and insecticides filler. This company also processed finished iron oxide pigments, including natural red oxides, ochers, and manufactured brown and vellow oxides.

Frederick.—Frederick County in 1955 had production of stone, lime, clay, and sand and gravel. Limestone quarries were operated by M. J. Grove Lime Co., Stephens City and Middletown, and Stuart M. Perry, Inc., Winchester. This output was used for concrete aggregate, road material, blast-furnace flux, agricultural purposes, glass, and miscellaneous uses. M. J. Grove Lime Co. Stephens City plant also produced lime for building, agricultural, and chemical uses. Glass and building sands were recovered at a pit near Gore by Virginia Glass Sand Corp. From an open-pit mine near Winchester, Shenandoah Brick & Tile Co. produced miscellaneous clay used in manufacturing heavy clay products.

Giles.—In 1955 Giles County again ranked first among the limeproducing counties of Virginia. The Kimballton plants of National Gypsum Co. and Standard Lime & Cement Co. and the Ripplemead plant of Ripplemead Lime Co., Inc., were active during the year. The output was used for building, agricultural, and chemical purposes. In addition to their lime production, the above-mentioned companies, as well as Virginian Limestone Corp., Ripplemead, produced crushed limestone for concrete aggregate, road material, flux, railroad ballast,

agricultural purposes, and various other uses.

Manganese was produced in Giles County at the Old Stow and Giles mines, owned by J. Gordon Gusler and Giles County Mining & Manganese Co., respectively, both near Giles.

Goochland.—Crushed and broken granite for concrete aggregate

and road material was produced by Boscobel Granite Co.

Greensville.—Trego Stone Corp. produced a substantial tonnage of crushed and broken granite from a quarry near Emporia. output was used as concrete aggregate, road material, and railroad ballast.

<sup>6</sup> Although Alexandria is an independent city, for the purpose of this chapter it will be included in Fairfax

Henrico.—A substantial tonnage of building and paving sand and gravel, as well as molding sand, was produced in Henrico County in 1955. Producers were Commonwealth Sand & Gravel Corp., West Sand & Gravel Co., Inc., and A. L. Cavedo & Sons, Inc., all of The Henrico County Highway Department reported an output of paving sand and gravel for its own use. Redford Brick Co. and Daniels Brick & Tile Co., both of Richmond, operated open-pit mines for producing miscellaneous clay for use in manufacturing heavy clay products.

Henry.—The city of Martinsville reported the production of a limited quantity of crushed and broken granite for its own use as

concrete aggregate and road material.

Isle of Wight.—Agricultural lime was produced from oystershell at the Smithfield operation of Battery Park Fish & Oyster Co.

King William.—Paving gravel, produced by Fox Co., Aylett, was mined in King William County in 1955.

Lee.—Lee County ranked sixth among Virginia's eight coal-producing counties. Leading producers were Blue Diamond Coal Co., Peabody Coal Co., Benvier Coal Co., The Virginia-Lee Co., Inc., Laurel Branch Coal Co., Lewis Coal Co., Smith Coal Co., Dominion-Taggert Coal Co., and Éugene Robinette. Kentucky Virginia Stone Co., Gibson Station, and Woodway Quarries, Woodway, operated quarries for the production of crushed and broken limestone. Their combined output was used for riprap, concrete aggregate, road material, agricultural purposes, and rock dust for coal mines. A small output of petroleum was obtained from the Rose Hill field, the only

oil-producing area in Virginia. Loudoun.—A quarry near Leesburg owned by Arlington Stone Co.

produced basalt for concrete aggregate and road material.

Louisa.—The New Jersey Zinc Co. continued dewatering the Arminius mine at Mineral. Further information was obtained for

the scheduling of a development program for this project.

Madison.—"Pikes Peak" epidote and unakite, varieties of gem stone, were reported recovered from the Rose River mine near Syria. Some was purchased by Ben L. Cash, Albuquerque, N. Mex., while the remainder was mined by E. Kane White, Baltimore, Md.

Montgomery.—In Montgomery County limestone was first in value of production. Producers of crushed and broken limestone were Radford Limestone Co., Inc., Radford, and Montgomery Lime Co., Inc., Ellett. Their output was used for concrete aggregate, road stone, railroad ballast, agricultural purposes, and the manufacture of The city of Radford also produced crushed and broken limestone for its own use as concrete aggregate and road stone.

Semianthracite was recovered from two underground operations in the county. The county was the only semianthracite producer in Virginia. Miscellaneous clay for heavy clay products was mined at a new open pit by Old Virginia Brick Co., Inc., formerly Salem Brick The Ellett plant of Montgomery Lime Co., Inc., produced Co., Inc. a small quantity of lime, using raw material from its limestone quarry,

and sold its product for agricultural purposes.

Nansemond.—Miscellaneous clay used in manufacturing heavy clay products was recovered at a clay pit near Suffolk owned by Roanoke-Webster Brick Co., Inc.

Nelson.—Nelson County ranked second in value for the production of stone. The only stone producer was Alberene Stone Corp. of Virginia, operators of a soapstone quarry near Schuyler. The bulk of the output was used as dressed laboratory and architectural stone, while the rest was ground and used for roofing and rubber filler. Consolidated Feldspar Dept. of International Mineral & Chemical Corp. mined a quantity of aplite for use in glass manufacture. Both the above company and Dominion Minerals Division, Riverton Lime & Stone Co., Inc., operated grinding mills for aplite in Nelson County near Piney River.

Norfolk.—Portland and masonry cements were produced in Norfolk County by Lone Star Cement Corp. at its South Norfolk, plant utilizing mostly marl as a raw material. Reliance Fertilizer & Lime Corp., South Norfolk, produced agricultural lime. J. H. Miles, Co., Inc., and Ballard Fish & Oyster Co. reported an output of oystershell in Norfolk County in 1955. This output was used in the manufacture

of lime as concrete aggregate and as road fill.

Nottoway.—Burkeville Stone Co., Inc., quarried granite for use as

concrete aggregate and roadstone.

Orange. Stone for use as concrete aggregate and roadstone was

produced by Royal Stone Corp., Orange.

Pittsylvania.—The city of Danville reported production of crushed granite for local use as concrete aggregate and roadstone. Paving

sand was produced by Marshall Sand Co., Danville.

Powhatan.—Production of sheet mica in Virginia in 1955 was largely from Powhatan County. The origin of the balance, by counties, was unknown. Full-trim sheet was prepared from mica mined at the Baltzley No. 3 mine of Piedmont Mining Co., Inc., and the Johnny Young mine of J. E. Wilson. Piedmont Mining Co., Inc., also mined beryllium concentrates from the Baltzley No. 1, No. 2, and No. 3 mines near Powhatan.

Prince Edward.—Prince Edward was the only kyanite-producing county in Virginia in 1955. This output, which was used in refractories and ceramic industries, was obtained from the Baker Mountain mine of the Kyanite Mining Corp. near Farmville and shipped from

Cullen.

Prince George.—Virginia Perlite Corp. of Hopewell, only processor of perlite in Virginia, produced expanded perlite from raw materials mined in the Southwest States for use as plaster and concrete aggregate. Paving sand and gravel was produced by Arthur Hitch, Hopewell; and Bryan Rock & Sand Co. and Friend Sand & Gravel Co., Inc., both of Petersburg.

Prince William.—The only mineral commodity produced in Prince William County was miscellaneous clay used in manufacturing heavy clay products. This clay was recovered from an open pit of the

Woodbridge Clay Products Co., Woodbridge.

Princess Anne.—Tidewater Sand Co., Inc., E. V. Williams Co., Inc., Little Creek Sand & Gravel Corp., all of Norfolk, and J. C. Jones Co., Inc., Oceana, produced structural, engine, railroad ballast, and other sands in Princess Anne County.

<sup>7</sup> Although South Norfolk is an independent city, for the purpose of this chapter it will be included in Norfolk County.

Pulaski.—Crude iron oxide pigments including natural brown and yellow iron oxides were produced by American Pigment Corp., Hiwassee.

Roanoke.—Limestone and miscellaneous stone were produced in Roanoke County in 1955 by Rockydale Quarries Corp., Roanoke, and Virginia Department of Highways. The bulk of this output was used as concrete aggregate and roadstone and for agricultural purposes. Old Virginia Brick Co., Inc., formerly Salem Brick Co., Inc., operated an open-pit mine near Salem to recover miscellaneous clay used in heavy clay products. A quantity of building sand was produced by Marl & Stone Corp., Salem, and E. M. Kanade. Virginian Railway Co. of Norfolk reported a limited production of engine sand by contract work.

Rockbridge.—Charles W. Barger & Son, Lexington, and Lone Jack Limestone Co., Inc., Glasgow, quarried limestone for use as concrete aggregate, roadstone, and railroad ballast. A substantial tonnage of quartzite was quarried by Mathews-Curtis Co., Inc., near Greenlee, The bulk of this output was utilized in preparing ferrosilicon, in addition to use as railroad ballast. Locher Silica Corp., Glasgow, operated a pit near Goshen for the production of glass and building Locher Brick Co., Inc., Glasgow, operated on open-pit mine for producing miscellaneous clay.

Rockingham.—Mineral production in Rockingham County was limited to marble and limestone. Jamison Black Marble Co. of Roanoke, the only producer of marble in Virginia, quarried marble for use as terrazzo and other unspecified uses. C. S. Mundy quarries, Inc., R. Y. Frazier, and Fred K. Betts, III, all of Harrisonburg, produced crushed limestone for use as concrete aggregate, roadstone, and railroad ballast and for agricultural purposes and filter beds.

Russell.—The value of bituminous-coal production in Russell County increased 51 percent in 1955, with the output predominantly from underground mines. Leading producers were Clinchfield Coal Corp., Smith Coal Co., Turner Coal Co., Bostic Coal Co., Sword & Ball Mines, Parrott Coal Co., Wood Coal Co., Nash Coal Co., Cook & Ball, and Kilgore Coal Co. A substantial quantity of limestone was quarried in 1955 by Clinch River Quarries, St. Paul, to be used as concrete aggregate and roadstone.

Scott.—Small quantities of coal and limestone were produced in Scott County in 1955. The bulk of the coal was recovered from two underground mines while the rest came from a strip and an auger operation. Natural Tunnel Stone Co., Clinchport, produced crushed limestone for use as railroad ballast and in manufacturing concrete Some natural gas was produced from the Early Grove field in Scott County in 1955.

Shenandoah.—Limestone was produced in Shenandoah County in 1955 by Dominion Limestone, Inc., Shenandoah Lime & Stone Corp., and Strasburg Lime Co., Inc., all of Strasburg; and Toms Brook Lime & Stone Co., Toms Brook. The bulk of this production was used for blast-furnace and open-hearth flux, as well as concrete aggregate and roadstone, and for agricultural purposes, asphalt filler, and lime manufacture. Dominion Limestone, Inc., and Strasburg Lime Co.,

Inc., both near Strasburg, produced chemical and industrial lime, which was utilized as fluxing, tanning, and water-purification material.

Smyth.—The leading mineral, valuewise, in Smyth County in 1955 as salt. Artificial brines from rock salt were produced by Mathieson Chemical Corp. at its operation near Saltville. The brines were utilized for manufacturing chlorine, soda ash, and caustic soda. addition to producing salt, Mathieson Chemical Corp. mined limestone used in manufacturing alkali and as concrete aggregate and roadstone. Limestone was also quarried by E. P. Ellis Quarry for use as concrete aggregate and roadstone and lime manufacture. C. R. Snider & Sons and Sayers Sand Co., both of Marion, operated pits for producing building sand. Miscellaneous clay utilized in manufacturing heavy clay products was mined from an open pit by Appalachian Shale Products Co., Marion.

Smyth County in 1955 led the State in manganese production. The leading producer was Manganese Mining & Contracting Corp., operating the Glade Mountain mine near Rural Retreat. Other producers in the county were Eureka Mining Co., Rural Retreat Manganese Ore Co. (formerly operating as Glade Mountain Manganese Co.), O. E. Sayers, Sidney Manganese Corp. (formerly operating as Sugar Grove Manganese Corp.), Marion Manganese Ore Co. (formerly operating as Union Manganese Co.), and Umbarger Manganese Co.

(formerly operating as Union Manganese Mining Corp.).

Spotsylvania.—The mineral production of Spotsylvania County in 1955 was limited to the production of building sand and paving sand and gravel. Producers were Massaponax Sand & Gravel Corp., Fredericksburg, and J. E. Baker.

Surry.—A limited amount of calcareous marl for agricultural purposes was mined in Surry County in 1955 by Paul Miller, Clare-

mont.

Tazewell.—Tazewell County ranked fourth in coal produced in the State, with a 13-percent increase in value in 1955 compared with 1954. The bulk of the coal came from operations of Pocahontas Fuel Co., operator of the Amonate, Bishop, Boissevain, Jenkinjones, and Pocahontas underground mines. Other leading producers with underground operations were Jewell Ridge Coal Corp., Alfredton Coal Co., Bandy Bros. Coal Co., Kem Coal Co., Red Oak Coal Co., Shelton & Simmons Coal Co., Willie Lowe & Alfred Jewell, Dixon Red Ash Coal Co., and Whitewood Smokeless Coal Co. Pounding Mill Quarry Corp. (Pounding Mill), and Peery Lime, Inc. (North Tazewell), quarried limestone for use as blast-furnace flux, concrete aggregate, and railroad ballast and for agricultural purposes, road material, and rock dust for coal mines. Peery Lime Co. (North Tazewell) and Blue Grass Lime Co. (Tazewell) produced lime for building, agricultural, and chemical uses. Miscellaneous clay used in manufacturing heavy clay products was mined by General Shale Products Corp. at its pit near Richlands.

Warren.—Riverton Lime & Stone Co., Inc., continued to produce hydraulic lime at its Riverton plant. The plant consisted of six pot kilns and used Buckwheat and Pea coals for fuel. The company also quarried crushed limestone for concrete aggregate, road material, and

agricultural purposes.

Washington.—A substantial tonnage of gypsum was mined at the Plasterco mine of United States Gypsum Co., only producer in the county and State. Manganese was produced in Washington County by Colitz Mining Co., Inc., near Damascus. Lambert Bros., Inc., operators of a quarry near Bristol, produced crushed limestone used for concrete aggregate and road material.

Westmoreland.—Paving sand and gravel was produced in West-

moreland County by Brown Construction Co., Montross.

Wise.—Of the 8 coal-producing counties in Virginia, Wise County ranked second and had a 55-percent increase in value of production in 1955 over 1954. Underground mines yielded 90 percent of this output, while strip and auger mines yielded the rest. Leading coal producers in 1955, in order of decreasing output, were Stonega Coke & Coal Co., Clinchfield Coal Corp., Coal Processing Corp., Wise Coal & Coke Co., Birchfield Mining Co., Inc., Banner Fuel Corp., McAmis Bros. Contractors, Sunrise Coal Co., Dale Branch Coal Co., Inc., and C. & W. Coal Co.

South West Quarries, Inc., Big Stone Gap, operated a limestone quarry, the output of which was used in concrete aggregate and road material. A small quantity of natural gas also was produced in Wise

County in 1955.

Wythe.—Zinc, lead, and silver were recovered from the Austinville mine of New Jersey Zinc Co. This mine operated at capacity during the year, and mine development at both the Ivanhoe and Austinville mines made good progress.8 Completion of permanent pump installations at the Ivanhoe mine aided in driving the 13,000-foot tunnel to the Austinville mine. This tunnel was more than half completed at end of 1955. Concentrate was shipped from Austinville to the company smelters at Depue, Ill., and Palmerton, Pa.

New Jersey Zinc Co., Austinville, as well as Pendleton Construction Corp., produced limestone for use as concrete aggregate, road material, agricultural purposes, and fertilizer filler. The town of Wytheville also quarried limestone for its use as concrete aggregate and road

material.

<sup>&</sup>lt;sup>8</sup> New Jersey Zinc Co., Annual Report 1955: New York, N. Y., 1956, pp. 5-7.



# The Mineral Industry of Washington

This chapter has been prepared under a cooperative agreement for the collection o mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Washington Division of Mines and Geology.

By Kenneth D. Baber, Frank B. Fulkerson, and Albert J. Kauffman, Jr.2



THE MINERAL industry of Washington contributed to a general increase in economic activity in the State. Employment set new records, and an alltime high in average hourly earning rates in manufacturing was reached—\$2.21 per hour in December 1955.

Expansion programs in the mineral industry were among the largest of any manufacturing group. Two large oil refineries were completed, and construction of a third refinery, costing \$10 million, was begun at Tacoma by U. S. Oil & Refining Co. Also, it was reported that Standard Oil Co. of California and The Texas Co. were considering plans to construct major refineries in Washington.

Further growth in industrial chemicals was noted in 1955, and plant sites in Tacoma and Seattle were acquired by chemical companies

during the year.

The aluminum industry continued to expand; production and value increased about 5 and 13 percent, respectively. The great demand for aluminum products resulted in announced plans for multi-million-dollar expansions of existing plants and/or construction of new ones. The Anaconda Co., which was experimenting with an adaptation of the Christiansen process, involving acid leaching of calcined clays for alumina, tentatively selected the Spokane area of eastern Washington as a plant site because of its strategic location regarding natural gas and clay deposits. This plant would require an estimated 25 to 40 million cubic feet of natural gas per day. Suitable clay deposits were available in the Palouse area and in western Idaho. Clay deposits in Cowlitz County, southwest Washington, also were a possible potential source of alumina.

Value of mineral production increased nearly 26 percent, reversing the decline in 1954; the total exceeded \$67 million, an advance of over \$14 million. All major commodities except coal contributed to the general increase. Coal output, continuing its downward trend of the preceding few years, decreased 2 percent from 1954. The rate of decline, however, was less than that of the 10-percent drop between 1953 and 1954. Nonmetals accounted for most of the total valuation. The greatest gain was made by sand and gravel, with an increase of

35 percent in production and 42 percent in value.

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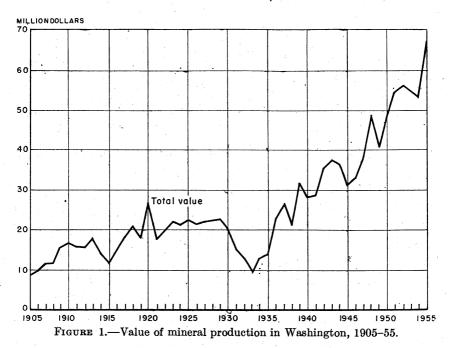


TABLE 1.—Mineral production in Washington, 1954-55 1

	10	954	1955	
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Barite. Clays. Coal. Copper (recoverable content of ores, etc.) Cppsomite. Epsomite. Gold (recoverable content of ores, etc.) Lead (recoverable content of ores, etc.) Peat Sand and gravel. Silver (recoverable content of ores, etc.) Tungsten concentrate	(2)	\$318, 500 4, 478, 127 2, 145, 240 (2) 2, 335, 900 20, 000 2, 723, 012 163, 058 13, 995, 014 283, 946 9, 526, 534 4, 817, 664 16, 903, 830 3 53, 300, 000	25 365, 331 609, 790 3, 958 22 100 74, 360 3, 500 10, 340 37, 640 21, 645, 161 436, 348 6, 593, 212 29, 536	\$250 411, 807 4, 263, 030 2, 952, 668 1, 706 5, 000 2, 602, 600 14, 000 3, 081, 320 113, 254 19, 350, 682 394, 917 10, 579, 631 45, 949 7, 265, 856

Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Some minerals that originate in Washington cannot be credited owing to lack of information (see p. 4, par. 5).
 Value included with "Undistributed."
 Total has been adjusted to eliminate duplication in the value of clays and stone.

Metals comprised 24 percent of the total value of minerals produced. Zinc, worth nearly \$7.3 million, was the leading metal and ranked fourth in the State among all mineral commodities. Lead placed

second among metals with \$3.1 million, closely followed by copper and gold. Production and value of zinc increased about 32 and 51

percent, respectively, over 1954.

Spokane and its adjacent area were undergoing a uranium boom. Deposits of commercial value were being developed and mined. The Washington State Division of Mines and Geology issued a release 3 that mentioned 4 separate areas where uranium mineralization was identified; only 1 or possibly 2 were considered of commercial importance: however, there were at least 6 other areas where radioactivity had been detected. Listed as the most favorable areas for prospecting were counties along the Canadian border and the Cascade Mountains south to Mount Rainier. A paper 4 summarized a detailed study of the geology of the Mount Spokane and Spokane Indian Reservation uranium districts.

Although there were no below-capacity operations in mineralprocessing industries in 1955 caused by electric power shortages, prospects of power curtailment during dry periods continued. It was anticipated that increasing population and industrial growth would create serious shortages by 1965, unless completion of new hydroelectric power facilities kept pace. The advent of natural gas would complement hydroelectric power and undoubtedly would attract new industries to the Pacific Northwest.

The trend toward increased river transportation of such bulk cargoes as cement and petroleum continued, with 280,000 tons shipped by barges during 1955. An official of the Inland Empire Waterways Association stated that prospects were favorable for shipments in

this manner to reach 7 million tons of assorted cargo annually.

Employment in the construction industry began to taper off about midyear, after layoffs at several large projects, including the Chief Joseph Dam, the Hanford Works of the Atomic Energy Commission, and the Shell Oil Co.'s Anacortes refinery. However, the outlook for construction was favorable due to new hydroelectric projects in the planning stage; work on natural-gas pipelines into Washington, completion of which would stimulate building; an accelerated highway construction program; and a high level of residential building.

In the 10-year period 1946-55, Washington's mineral production advanced from \$33 million to \$67 million. Output of nonmetal commodities was chiefly responsible for the gain, increasing in value from nearly \$21 million to over \$46 million. Metal commodities also increased substantially (\$6.9 million to \$16.3 million), while fuels production, after small initial gains that reached a maximum of \$7.9

million in 1948, declined from \$5.4 million to \$4.4 million.

Considering the four Pacific Northwest States-Idaho, Montana, Oregon, and Washington—as a unit, Washington's share of the total output value was down slightly from 22 percent in 1946 to 20 percent in 1955. The relative difference in the foundation on which the mineral industry in each of the States is based is shown by the fact that nonmetal production in Washington in 1955 constituted 69

State Division of Mines and Geology, Notes for Uranium Prospectors: March 1, 1949 (rev. March 24,

<sup>1955), 5</sup> pp.

4 Thurlow Ernest E., (chief, Salt Lake City Exploration Branch, Atomic Energy Commission), Uranium Deposits West of the Colorado Plateau: Paper presented before Rocky Mountain Minerals Conference, Salt Lake City, Utah, October 1955.

percent of the State total value compared with 92 percent for Oregon and only 21 and 12 percent, respectively, for Idaho and Montana.

The mining industry in Washington employed about 2,400 workers. Of the total, over 900 were employed at metal mines, 600 in bituminous coal mining, 300 at stone quarries, 300 at sand and gravel pits and dredges, and most of the remainder in producing clays for ceramics There was a considerable decrease in mining emand refractories. ployment compared with 1947, when the workers totaled 3,400. A decrease in coal mining was the main factor behind the decline. Mining wages during 1955 totaled \$11.7 million.

In the mineral-manufacturing industries (smelting, refining, and casting) employment expanded from an average of about 9,000 in 1947 to 13,700 in 1955. The 1955 breakdown of this group showed that 8 percent of the workers were engaged in smelting and refining nonferrous metals other than aluminum; 65 percent in smelting, rolling, drawing, and alloying aluminum; 16 percent at blast furnaces,

steelworks, and rolling mills; and the remaining 11 percent at found-

ries and miscellaneous primary-metal industries.

Figures also showed that in 1955 an average of 3,635 was employed in making stone, clay, and glass products, of which approximately 1,500 worked at concrete, gypsum, and plaster-products plants; 800 at cement plants; and 600 at structural-clay-products plants. Industrial inorganic chemicals, including the Hanford works, composed one of the largest mineral industries in the State and employed an average of about 10,000 persons. Owing to the opening of new petroleum refineries, employment in petroleum and coal products increased to more than 700 in 1955. Wages paid in the mineralmanufacturing industries totaled over \$150 million in 1955.

Estimated average earnings per week in December 1955 were \$98.52 in mining, \$93.50 in primary and secondary ferrous metals, \$100.05 in nonferrous metals, and \$106.90 in chemicals and allied Average weekly earnings in other industries included products. \$87.09 for all manufacturing, \$103.01 for contract construction, and

\$81.12 for communications and utilities.

In addition to the mineral values credited to Washington in table 1, some are not included due to lack of information. Many ores contain valuable minor constituents, such as arsenic, bismuth, cadmium, selenium, tellurium, gallium, and germanium. The quantities someselenium, tellurium, gallium, and germanium. times are unknown 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 refining such metals 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 obtain an accurate separation of domestic and foreign sources.

Another mineral product of value, the output of which usually

cannot be separated as to source, is byproduct sulfuric acid.

The value of uranium produced cannot be credited because such information was not available under regulations of the Atomic Energy Commission.

TABLE 2.—Average employment and wages paid in 1955 in selected industries covered by Washington Employment Security Act <sup>1</sup>

Industry	A verage employ- ment	Wages paid
MINING AND QUARRYING		
Metal mining:		
Copper ore	293	\$1,601,076
Lead and zinc ore	404	1, 991, 424
	188	961, 958
Metal not elsewhere classified	70	275, 788
	608	2, 834, 807
Jude Detroienin and nathral gas	72	375. 196
Nonmetanic mining and quarrying:		970, 180
Dimension-stone quarries	74	355, 128
Critice-scope dijarries other than limestone	109	517, 856
Crushed-limestone quarries	100	432, 828
	317	1, 649, 867
	151	665, 954
Nonmetallic minerals not elsewhere classified.	14	41, 447
Total mining and quarrying	2, 400	11, 703, 329
MINERAL MANUFACTURING		
tone, clay and glass products:		
Glass and glassware and glass products.	000	
Cement nydraniic	283	1, 396, 395
	792 624	3, 562, 804
TOUCHV and related products	21	2, 764, 518 62, 243
	1, 520	
	1, 520	6, 864, 614 140, 084
Miscellaneous nonmetallic-mineral products	351	
l de la companya del companya de la companya del companya de la co		1, 559, 733
Total stone, clay, and glass products	3, 635	16, 350, 391
melting, refining, and casting:		
Blast furnaces, steelworks, and rolling mills	2, 224	11, 319, 252
	1, 145	5, 346, 374
	1, 085	5, 194, 126
	8, 855	48, 142, 042
	266	1, 403, 570
Miscellaneous primary metal industries.	101	529, 818
Total smelting, refining, and casting	13, 676	71, 935, 182
ndustrial inorganic chemicals	0.701	70.040.033
ndustrial inorganic chemicalsroducts of petroleum and coal	9, 721	58, 049, 310
the state of the s	719	3, 954, 200
Total mineral manufacturing	27, 751	150, 289, 083
Total mining and quarrying and mineral manufacturing		

<sup>&</sup>lt;sup>1</sup> Compiled from Washington State Employment Security Department publications.

TABLE 3.—Estimated employment of wage and salary workers in mining and metals in 1947-55 <sup>1</sup>

	1947	1948	1949	1950	1051		l	l	<del></del>
	1017	1040	1949	1950	1951	1952	1953	1954	1955
Mining	3, 400 3, 000	3, 400 3, 200	3, 100 2, 600	2, 900 3, 800	3, 000 3, 000	2, 900 3, 200	2, 800 3, 400	2, 300 2, 900	2, 400 3, 400
	6,000	6, 800	6, 200	7, 800	7, 000	8, 800	9, 500	9, 300	10, 200

<sup>&</sup>lt;sup>1</sup> Compiled from Washington State Employment Security Department publications.

During 1955 the program of the Defense Minerals Exploration Administration (DMEA) continued to encourage systematic investigation of strategic and critical mineral occurrences. Financial assistance extended under Government contracts was repayable from

royalties on ore discovered and subsequently mined. The projects listed in table 4 were active under the program during part or all of 1955.

TABLE 4.—Defense Minerals Exploration Administration contracts active during 1955

			Contract				
County and contractor	Property	Commodity	Date	Total amount	Govern- ment partici- pation (percent)		
CHELAN							
Howe Sound Co	Holden	Copper	June 25, 1954	\$309, 990	50		
CLALLAM				<b>*</b> .			
Peacock and Peacock	Crescent	Manganese	Mar. 23, 1955	31, 000	75		
KING							
Western States Copper Corp	Rainey	Copper	Nov. 6, 1952	22, 300	50		
SKAGIT		1.0					
Twin Sisters Magnesium and Chrome Corp.	Alamether, Bego- nia and Shaft.	Chromium	May 26, 1955	24, 175	50		
SNOHOMISH							
Robert T. CurtissGranore Co	Mint Claims Sunset	Copperdo	Oct. 7, 1952 Feb. 20, 1953	17, 600 115, 000	50 50		
SPOKANE							
Dahl Uranium Mine, Inc	Dahl Uranium	Uranium	Aug. 22, 1955	4, 300	75		
STEVENS							
Chewelah Copper Co., Inc	Independence, et al.	Copper	June 27, 1955	63, 100			
Pacific Northwest Mining Co Scandia Mining Group	Lucile	Lead, zinc Zinc	Dec. 14, 1951 Aug. 15, 1952	29, 210 29, 260	50 50		

### REVIEW BY MINERAL COMMODITIES

#### **METALS**

Aluminum.—In 1955 output of aluminum from the five reduction plants in the State continued to increase. Production was nearly 453,000 short tons of metal valued at over \$197.5 million, a gain over 1954 of about 20 thousand short tons and \$22 million.

Those operating plants in the State were: Aluminum Company of America, at Vancouver and Wenatchee; Kaiser Aluminum & Chemical Corp., at Spokane and Tacoma; and Reynolds Metals Co., at Longview. The last year for which a decline in aluminum output was recorded was in 1952, when unfavorable hydropower-generating conditions prevailed during part of the year.

Several companies announced projected developments during the year. Revere Copper & Brass Co., Inc., revealed plans for a projected \$50 million reduction plant at Wenatchee having a 60,000-ton annual capacity.

Kaiser Aluminum & Chemical Corp. made public plans for large-scale expansion programs at several of its facilities. Included were

an increase in capacity at its Tacoma plant and installation of additional facilities at its Trentwood mill near Spokane. According to news reports, Reynolds Metals Co. planned to expand company operations in the Pacific Northwest by installing aluminum-fabrication facilities either at its Longview plant or its Troutdale, Oreg., plant.

During the year work was begun to increase primary aluminum-production capacity at Aluminum Company of America plants in the Pacific Northwest 11,000 tons per year. An expansion at the Wenatchee plant was underway to boost annual reduction capacity 8,500 tons to an installed capacity of 108,500 tons annually; at the Vancouver plant installed capacity was being increased 2,500 tons to 97,500 tons annually by modification and improved design of existing installations.

The year 1955 marked the 15th anniversary of aluminum-production operations in the Pacific Northwest; the first commercial primary aluminum made west of the Mississippi River was produced at the

Alcoa Vancouver plant September 23, 1940.

In connection with the piping of natural gas into the Pacific Northwest, The Anaconda Co., which began operation through a subsidiary of a new aluminum-reduction plant in Montana in 1954, disclosed long-range plans for building a plant in the Spokane area to produce alumina from domestic clays. Engineers of the company subsidiary, Anaconda Aluminum Co., reportedly were optimistic over developing an economically feasible process that depended upon ample supplies of natural gas and involved acid-leaching of calcined clays. Alumina for Anaconda's Montana reduction plant in 1955 was supplied by Reynolds Metals Co. under a long-term contract.

A report on clays in the Castle Rock area as a source of aluminum

was published.5

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Chromium.—A small quantity of chromite ore was shipped from the Chrome Cliff mine, Okanogan County, by Fred W. Wagener, Jr., to the Government Chrome Purchase Depot at Grants Pass, Oreg. Production of chromite ore in the State was last reported in 1942; total output from 1900 through 1955 was less than 300 short tons.

Copper.—Production of this metal increased 9 percent in 1955. Howe Sound Co. Holden mine in Chelan County continued to supply the bulk of the output. Copper concentrates were shipped also from the Rainey mine in King County by Western States Copper Co.; the Turk mine of Alpine Uranium Corp., Stevens County; the Eagle Mountain properties of Bonanza Lead, also in Stevens County; and Kromona Mines Corp. Kromona mine, Snohomish County.

Production at the Holden mine was maintained without interruption throughout 1955, in contrast to the previous year's operation, which was affected by a strike and, due to the isolated location of the mine, by the loss of additional time in reassembling personnel after the dispute ended. An exploration project with financial assistance from the DMEA was continued during 1955, with the objective of undercutting a surface showing of copper by drifting on the main haulage level of the mine.

<sup>&</sup>lt;sup>8</sup> Popoff, C. C., Cowlitz Clay Deposits Near Castle Rock, Wash.: Bureau of Mines Rept. of Investigations 5157, 1955, 60 pp.

Of the small operations the Rainey mine had been a minor producer for several years, while the Turk, Eagle Mountain, and Kromona properties represent development projects that had been started in the years just preceding 1955. Alpine Uranium Corp. of Salt Lake City acquired the old Turk and Deer Trail mines in 1954 and rehabilitated the Deer Trail mill. This operation was in the southwestern part of Stevens County near Fruitland. Smelter shipments in 1955 consisted of concentrate produced from dump ore from the Turk mine. Also in Stevens County, Bonanza Lead shipped copper concentrate from the Bonanza mill at Palmer Siding after taking over holdings on Eagle Mountain near Chewelah under a profit-sharing agreement. The concern formerly operated the Bonanza mine and other lead-producing properties in the county. Kromona Mines Corp. continued the exploration and development it began in 1952 at the Kromona copper-tungsten mine on the South Fork of the Sultan River in Snohomish County and milled ore in the 100-ton concentrator that the company completed late in 1953. The operation was shut down several months by heavy snowfall in the early part of the year.

Kennecott Copper Corp., through a subsidiary (Bear Creek Mining Co.), took preliminary steps toward establishing a copper-producing operation in Washington by taking a purchase option on claims in the Glacier Peak area of the Cascade Mountains in Snohomish County after conducting preliminary examinations in 1953 and 1954. Glacier Peak deposit was discovered in 1900, and exploratory drilling was done as early as 1917, but there has been no recorded production, from the area to date. Work in past years in this area, as well as in other parts of the Washington Cascades, was limited because of the extremely rugged terrain, the lack of access roads, and the severe winters with heavy snowfall. Bear Creek Mining Co. used a helicopter in the spring to take equipment and supplies to the camp, which was established at an elevation of 5,500 feet. In the summer the mine was accessible by packtrain over a 13-mile Forest Service trail. Another exploration project was undertaken in Snohomish County when Copper Mountain Mining Co. of Princeton, British Columbia, began work in the summer at the old Sunset mine on the north fork of the Skykomish River.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in 1955, by months, in terms of recoverable metals

31, 390 30, 370 33, 820 33, 360 33, 200	313 296 306 307 294	781 695 1, 112 1, 012 1, 008	2, 475 2, 170 2, 590 2, 243 2, 856
37, 350 30, 540 41, 330 38, 550 40, 350 43, 348 42, 740	356 321 412 332 332 337 352	1, 046 759 773 838 817 754 745	2, 50 2, 627 2, 618 2, 709 2, 54( 2, 337 2, 188 2, 183
20 10 70 60 60	20   37, 350 10   30, 540 70   41, 330 70   38, 550 60   40, 350 60   43, 348	20	20 37, 350 356 1, 040 100 30, 540 321 773 78 770 41, 330 412 773 770 38, 550 332 838 800 40, 350 332 817 754 800 42, 740 352 745

Copper concentrate produced at Washington mines was processed at the Tacoma smelter of American Smelting & Refining Co. smelter operated continuously in 1955, except in the period from July 3 to August 12, when the plant was closed by a strike. the material treated at the plant was from foreign sources.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc, 1946-50 (average), 1951-55, and total 1860-1955, in terms of recoverable metals 1

	Mines p	roducing	Material sold or	Gold (lode	and placer)	Silver (lode and placer)		
Year	Lode	Placer	treated 2 (short tons)	Fine ounces	Value	Fine ounces	Value	
1946-50 (average) _ 1951	25 29 28 33 24 16	4 1 1 2 6 1	960, 050 1, 304, 495 1, 402, 472 1, 706, 410 1, 552, 141 1, 712, 113	64, 064 67, 405 54, 776 62, 560 66, 740 74, 360	\$2, 242, 233 2, 359, 175 1, 917, 160 2, 189, 600 2, 335, 900 2, 602, 600	331, 106 334, 948 315, 645 321, 202 313, 735 436, 348	\$294, 53 303, 14 285, 67 290, 70 283, 94 394, 91	
1860-1955			(3)	2, 773, 662	75, 833, 493	15, 942, 827	11, 926, 879	
Year	Year		Le	ead	Zi	Total		
s	Short tons	Value	Short tons	Value	Short tons	Value	value	
1946-50 (average) 1951 1952 1953 1954 1955	4, 553 4, 089 4, 357 3, 740 3, 636 3, 958	\$1, 809, 644 1, 979, 076 2, 108, 788 2, 146, 760 2, 145, 240 2, 952, 668	6, 449 8, 002 11, 744 11, 064 9, 938 10, 340	\$1, 914, 227 2, 768, 692 3, 781, 568 2, 898, 768 2, 723, 012 3, 081, 320	12, 663 18, 189 20, 102 32, 786 22, 304 29, 536	\$3, 266, 858 6, 620, 796 6, 673, 864 7, 540, 780 4, 817, 664 7, 265, 856	\$9, 527, 494 14, 030, 884 14, 767, 055 15, 066, 612 12, 305, 762 16, 297, 361	
1860-1955	116, 943	39, 614, 513	156, 108	34, 320, 354	312, 717	68, 867, 624	230, 562, 863	

Includes recoverable metal content of gravel washed (placer operations), ore milled, and ore shipped to smelters during calendar year indicated.
 Does not include gravel washed.
 1860-1903, figure not available; 1904-55, 24,145,228 tons produced.

Ferroalloys.—Ferroalloy plants at Wenatchee (Chelan County), Tacoma (Pierce County), and Mead (Spokane County) were operated during the year by Keokuk Electro-Metals Co., Ohio Ferro-Alloys Corp., and Pacific Northwest Alloys, Inc., respectively. During 1955 Ohio Ferro-Alloys Corp. operated two electric smelting furnaces continuously at its Tacoma plant, producing silicon metal for the aluminum industry and ferrosilicon for the iron and steel industry. 95 percent of the company output was marketed on the west coast. Approximately 115 persons were employed at the Tacoma plant.

Gold.—Gold production increased nearly 12 percent in 1955. mines continued to supply most of the gold and silver output in the State. These were the Knob Hill mine of Knob Hill Mines, Inc., near Republic, Ferry County; Lovitt Mining Co. Gold King mine, 3 miles south of Wenatchee, Chelan County; and the Holden property of Howe Sound Co. in Chelan Lake district, Chelan County. Both the Knob Hill and Gold King were gold mines, with silver an important byproduct, while the Holden supplied copper ore containing zinc, gold, and silver.

TABLE 7.—Gold produced at placer mines, 1946-50 (average) and 1951-55, by methods of recovery

			Go	ld recover	ed
Method	Mines produc- ing	Material treated (cubic		Va	lue
	5	yards)	Fine ounces	Total	A verage per cubic yard
Nonfloating washing plants: 1 1946-50 (average)	1	6, 120 5, 100	22 13	\$756 455	\$0.124 .089
1953	2	3, 400 100	28 106 3	980 3, 710 105	1. 782 1. 091 1. 050
Small-scale hand methods: 1946-50 (average)	3	390	6	210	. 538
1962 1963 1964 1955	(2) 1	(3) 1, 150	3 1 12	105 35 4 <b>2</b> 0	1.750
Grand total, placers: 1946-50 (average) 4 1951 1962 1963 1964 1955	4 1 1 2 2 6	9, 210 5, 100 60 5 550 4, 550 100	47 13 3 29 118 3	1, 659 455 105 1, 015 4, 130 105	. 180 . 089 1. 750 5 1. 782 . 908 1. 050

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."
 From property not classed as a mine.
 Figure not available.
 Includes 99 ounces of gold from dragline dredges.
 Excludes small-scale hand methods.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1955, by counties, in terms of recoverable metals

	Т	Mines p	roduci	nœ	Gol	d (lode a	nd 1	nlacer) 1	Silv	zer
County	-  -				-					
		Lode		Placer		ounces		/alue	Fine ounces	Value
Benton. Chelan, Ferry, and King 2. Kittitas. Okanogan. Pend Oreille, Skagit, and Snohomish 2. Stevens.				1		3 74, 153 42 1 65 96		\$105 2, 595, 355 1, 470 35 2, 178 2, 275 2, 275 3, 360 43, 865		\$328, 978 18 1, 971 24, 250 39, 700
Total		16		1		74, 360	2,	602, 600	436, 348	394, 917
		Copper		Lead		Zine				
County	Shor		lue		ort ns	Value	3	Short tons	Value	Total value
Benton	3, 73	3 \$2,78	4, 818		<u>-</u>	\$2	298	201	\$49, 446	\$105 5, 758, 895 1, 488
Okanogan Pend Oreille, Skagit, and Snohomish 2 Stevens			746 3, 570 3, 534		28 099 212	8, 3 2, 413, 659,		10 11, 658 17, 667	2, 460 2, 867, 868 4, 346, 082	13, 556 5, 341, 465 5, 181, 852
Total	3, 95		2, 668	-	340	3, 081,	320	29, 536	7, 265, 856	16, 297, 361

Source of gold: 74,357 ounces from lode mines and 3 ounces from placers.
 Combined to avoid disclosing of individual company confidential data.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1955, by classes of ore or other source materials, 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)
Lode ore: Dry gold	3	121, 185	55, 947	296, 326			
zinc <sup>1</sup> Lead and lead-zinc <sup>1</sup> Zinc	5 7 1	409, 538 1, 180, 820 570	18, 375 35	92, 211 47, 771 40	7, 826, 400 89, 600	2,000 20,675,100 2,900	402, 000 58, 619, 900 50, 100
Total "lode material"Gravel (placer operations)	16	1, 712, 113 (²)	74, 357	436, 348	7, 916, 000	20, 680, 000	59, 072, 000
Total, all sources	17	1, 712, 113	74, 360	436, 348	7, 916, 000	20, 680, 000	59, 072, 000

<sup>1</sup> Combined to avoid disclosing individual company confidential data.

2 100 cubic yards.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1955, by methods of recovery and types of material processed, in terms of recoverable metals

Type of material processed and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zine (pounds)
Lode: Amalgamation Cyanidation. Concentration, and smelting of concentrates Direct smelting Total lode Placer.	7, 162 42, 689 24, 464 74, 357	88, 018 322, 987 25, 323 436, 348	7, 909, 500 6, 500 7, 916, 000	20, 678, 000 2, 000 20, 680, 000	59, 072, 000 59, 072, 00 <del>0</del>
Grand total	74, 360	436, 348	7, 916, 000	20, 680, 000	59, 072, 000

The Anna May property, the only active gold-lode mine in the State beside the Knob Hill and Gold King mines, reported a small production in Swauk district, Kittitas County; a placer operation at Blalock Island, Benton County, recovered a small quantity of gold; and basemetal ores produced from several mines in the State added a few ounces of gold to the total.

Iron.—A quantity of hematite iron ore was mined at the Kulzer property in Stevens County by C. C. Hill. It was shipped to the Ideal Cement Co. plant at Spokane for use in making special types of cement.

Lead.—A 2-year decline in lead production in the State was reversed as output gained 4 percent over 1954. Fires at two mines in the middle of the year prevented a greater increase in the production of the metal.

Four mines continued to produce nearly all of the State output. These properties, in order of output, were the Pend Oreille mine of Pend Oreille Mines & Metals Co. and the Grandview property operated by American Zinc, Lead & Smelting Co. under a profit-sharing agreement, Pend Oreille County, and in Stevens County, American Smelting & Refining Co. Van Stone mine, and the Deep Creek operation of Goldfield Consolidated Mines Co.

At the Grandview mine, a fire at the surface plant June 27 destroyed the compressor house and shop. Mining and milling operations resumed 3 weeks later after two portable diesel compressors were installed. In Stevens County the Deep Creek mine was shut down late in September because of a fire believed to have been caused by a short circuit on about the 250 level in the electric cable serving the water pumps. Six men working on the 750 level when the fire occurred escaped through an emergency exit. The underground workings had to be flooded to put out the fire, and the mine was idle from September 25 to October 14 while pumps and other damaged machinery were being replaced.

Not much activity was noted at the small lead mines in the State. Conconully Mines operated a mill at Omak and made several shipments of lead concentrate produced from ore from its Peacock property in the Conconully (Ruby) district of Okanogan County. In the Cascade district, Skagit County, two operators shipped some crude

ore from the Johnsburg mine.

In Stevens County, where several small mines generally had been worked each year, the Admiral mine and mill and the Lead Trust mine were the only operations for which production was reported. Both mines, which were under lease by A. C. Neiman, were in the

Northport district.

Silver.—Silver output gained 39 percent compared with 1954 owing mainly to an advance in the combined production from the 3 mines (Knob Hill, Gold King, and Holden), which accounted for a large share of the gold and silver recovered annually in Washington. The Pend Oreille and Van Stone lead-zinc mines in Pend Oreille and Stevens Counties, respectively, also were important factors in the

production of silver in the State.

Tungsten.—Output of tungsten ore and concentrate in the State in 1955 totaled 12 short tons, 60-percent WO<sub>3</sub> basis, valued at nearly \$46,000. Comparable figures for 1954 were 18 short tons with a value of about \$66,000. Nearly all the production came from mines in Stevens County; a small quantity was produced at the Kelly Camp mine in Ferry County by Kelly Camp Tungsten Co. In Stevens County, the Germania Consolidated mine was the largest producer. Ore was mined by Germania Consolidated Mines, Inc., and, under lease, by H. W. Traver and Henry Ewing and was milled in the company mill. Other producers in Stevens County were Addy Development Co. (Washington Metals and Addy mines), Deer Lake Tungsten Co. (Deer Lake and Little King mines), and Frank Eichelberger & Associates (Germania mine).

Uranium.—Following discovery of a uranium-ore deposit on the Spokane Indian Reservation in the summer of 1954 and subsequent shipment of ore from the deposit late in that year, individual prospectors, as wel as newly organized and established mining companies,

began an intensive search in favorable areas in the State.

At the Midnite mine in Stevens County, the site of the first discovery, drilling operations were conducted by Dawn Mining Co., a subsidiary of Newmont Mining Corp., after an operating agreement with the original company, Midnite Mines, Inc., was reached in April. The drilling program was designed to supplement earlier Atomic Energy Commission drilling to determine the geology of the

deposit. Several ore shipments were made from the property during

the year under an AEC "off-plateau" contract.

The discovery of autunite on the Dahl farm near Mount Spokane, northern Spokane County, late in 1954 led to the organization of Daybreak Uranium, Inc., which began developing the property under an operating agreement. Preliminary exploratory drilling was done by the AEC; by midsummer, ore had been shipped from the property under an initial 500-ton "off-plateau" contract with the Commission. The exposure of clusters of autunite crystals in workings at the deposit excited the interest of collectors of mineral specimens, and the company reportedly sold a number of them.

Many other companies were active at prospects in the Mount Spokane area and in Stevens County, as well as in Ferry, Grant, Lincoln, Pend Oreille, and Yakima Counties. Uranium ore-production statistics were classified by the AEC and therefore cannot be

published.

By the end of 1955 the outlook for establishing uranium-milling

facilities in the Spokane area appeared favorable.

Zinc.—Zinc output gained 32 percent as the result of increased yields from each of the four mines that supplied nearly all the lead and zinc production in the State. The Van Stone mine continued to be the leading property, followed by the Pend Oreille, Deep Creek, and Grandview operations. Of the four mines, the Van Stone, Grandview, and Deep Creek were predominantly zinc producers, while the Pend Oreille yielded approximately equal tonnages of lead and zinc. At the Holden mine (copper ore) in Chelan County, little zinc was recovered because at the 2,000-ton flotation mill the zinc plant was operated only a few days in the year.

#### NONMETALS 6

Abrasive Materials.—Mineral Products Corp. produced grinding pebbles from the Chewelah pit, Stevens County, and sold the output to Manufacturers Mineral Co., Seattle, for tube-mill grinding. Silica from Oregon was used by Carborundum Co., Vancouver, Clark County, in manufacturing silicon carbide for abrasive and refractory purposes. Due to a lack of demand, Walker Cut Stone Co., Inc., produced no pulpstones from the Wilkeson quarry, Pierce County. Part of the crushed sandstone output by Mineral Products Corp., Stevens County, was sold for use as abrasive material.

Stevens County, was sold for use as abrasive material.

Barite.—Manufacturers Mineral Co. was the sole producer of barite in the State. Mine output of 25 tons from its Madsen open pit, Stevens County, was ground at the company Seattle plant and sold

as a paint filler.

Cement.—Production and shipments of cement increased 8 and 10 percent, respectively, compared with 1954. Total value of shipments also gained 10 percent, indicating that the price level was unchanged, despite upward trends in demand and costs of production. Published reports late in the year disclosed that prices were to be increased slightly early in 1956.

Year-end stocks were moderately less than in the previous year. Production by the 6 plants in the State averaged approximately 97

<sup>&</sup>lt;sup>6</sup> Norman S. Petersen, commodity-industry analyst, Region I, Bureau of Mines, Albany, Oreg., assisted in the preparing of this section.

percent of the annual capacity. Superior Portland Cement Co., Inc., with plants at Concrete, Skagit County, and Seattle, King County, continued as the largest producer. The two other active plants in northwestern Washington were Olympic Portland Cement Co., Ltd., Bellingham, Whatcom County, and Northwestern Portland Cement Co., Grotto, King County. In eastern Washington, operations of Ideal Cement Co., Irvin, Spokane County, and Lehigh Portland Cement Co., Metaline Falls, Pend Oreille County, were active through-

out the year.

No important additions to mill equipment were reported by producers; however, Olympic Portland Cement Co., Ltd., began constructing a distributing plant in Seattle. Cement was to be shipped by water from Bellingham and stored in silos capable of holding 40,000 barrels. Western Washington cement producers shipped to Alaska and several foreign countries, and those in eastern Washington consigned shipments to points as far east as Illinois, where there was a cement shortage throughout the year. Cement imported from California was used in building The Dalles Dam on the Columbia River between Oregon and Washington.

Clays.—Clay production gained 40 percent. Increased output was attained in 10 of 11 counties from which production was reported during the year. Output of fire clay increased 29 percent in quantity

and 34 percent in value compared with 1954.

King and Spokane Counties, the first and second largest producing areas, respectively, supplied over 55 percent of the clays produced during 1955. Other producing counties, in order of production, were Pierce, Stevens, Whatcom, Snohomish, Lewis, Yakima, Skagit, Clark, and Chelan.

Production of fire clay for manufacturing firebrick and refractory materials was recorded in King and Spokane Counties. Clays for manufacturing building brick, draintile, sewer pipe, and for miscellaneous purposes came from 26 operations: 8 in King County, 6 in Spokane County, 3 in Stevens County, 2 in Clark County, and 1 each in Chelan, Lewis, Pierce, Skagit, Snohomish, Whatcom, and Yakima Counties.

Heavy clay products, such as face and common brick, partition tile, and draintile, were manufactured at 12 plants: 3 in King County, 2 in Clark County, and 1 each in Chelan, Lewis, Pierce, Skagit, Snohomish, Spokane, and Yakima Counties. In King and Spokane Counties firebrick and refractory products were manufactured, and two flowerpot-manufacturing plants were active in King County.

Diatomite.—Diatomite production increased 27 percent in quantity and value. Kenite Corp., the largest producer, operated its quarry and plant near Quincy, Grant County, throughout the year and marketed prepared diatomite for filtration and filler purposes. Progress was continued in stripping, quarrying, and mill revisions to insure a continuous and reliable operation. Western Ventures, Inc., worked its Squaw Creek deposits in Kittitas County and sold prepared, sacked diatomite for use as a filler in insecticides. Crude diatomite was passed through a cage mill and across a vibrating screen into a drier. The material then was milled lightly by a milling fan and sized by an air classifier before sacking for market.

Gem Stones.—Agate and petrified wood found by collectors in central Washington were the most important sources of gem materials in the State. The value of material collected was estimated at about \$65,000. No gem mines operated, but several properties owned by ranchers were open to collectors for a small fee. One of the largest producing areas of petrified wood was a field opened about 1950 on Rattlesnake Mountain, about 20 miles from Sunnyside, Yakima County. Other favored locations were about 90 miles south of Sunnyside near Roosevelt and on Saddle Mountain 60 miles north of Sunnyside. Saddle Mountain is a long ridge whose top is noted for opalized and agatized forms of petrified wood. A few miles north of Saddle Mountain is the famous Ginkgo State Park, where 86 giant petrified ginkgo logs are found partly exposed.

Gypsum.—Agro Minerals, Inc., continued to mine gypsite at Poison Lake near Tonasket, Okanogan County. The material was sold for use as land plaster. Columbia Gypsum Co., Ltd., installed calcining equipment at a plant in Spokane and planned a wallboard-and lath-manufacturing establishment. In 1955 the company imported crude gypsum from Canada and sold processed rock for port-

land-cement retarder and for agricultural use.

In Seattle, Kaiser Gypsum Co., Inc., completed the first year of operation at its new, large-scale facility manufacturing wallboard, lath, sheathing, and plasters. Oil was used as fuel in calcining the crude gypsum. Crude gypsum mined on San Marcos Island, Baja California, Mexico, was transported by company-owned vessel to Seattle.

Lime.—Production of lime by the sole producer, Roche Harbor Lime & Cement Co. (San Juan County), increased. A shaft kiln and continuous hydrator were operated. Output was chiefly quicklime for building, chemical, and other industrial uses; some hydrated lime

also was produced.

Magnesium Minerals.—Northwest Magnesite Co. quarried magnesite and produced refractory magnesia at a mine and plant in Stevens County. The operation was again the leading producer of natural magnesite in the United States. Output advanced substantially to meet increased demand from the steel industry.

Agro Minerals, Inc., produced epsom salt (magnesium sulfate) from its Poison Lake operation, Okanogan County, for use in the Pacific

Northwest as a fertilizer ingredient.

Olivine, another magnesium mineral, was mined in Skagit County by Northwest Olivine Co. Production was sold as roof chips and for

foundry purposes.

A dolomite deposit in Stevens County was described in a bulletin.7 A quarry and crushing and screening plant were opened at the deposit in April 1943 and were active until the end of 1944. According to the bulletin the dolomite deposit, an isolated hill trending northeast, is part of the Northport limestone. It is partly covered by glacial drift and is surrounded by glacial-lake sands, silts, and gravels. Dolomitization occurred during or shortly after deposition of the beds. Its composition is approximately 21.5 percent magnesium oxide and 30 percent calcium oxide, with impurities averaging less than 2 percent.

<sup>&</sup>lt;sup>7</sup> Deiss, Charles, Dolomite Deposit Near Marble, Stevens County, Wash.: Geol. Survey Bull. 1027-C, 1955, 141 pp.

Quartz, the primary impurity, is distributed throughout much of

the deposit.

Pumice.—Entiat Pumice Co. (formerly Bunney & Villela), Entiat, and Arne Sorlie, Lakeside, mined and prepared pumice in Chelan County. Production, which was used for lightweight-concrete aggregate, increased 19 percent in 1955.

Sand and Gravel.—Production of about 21.6 million tons of sand and gravel valued at nearly \$19.4 million represented a 35-percent increase over the 1954 production of 16 million tons valued at \$13.6 million. Production was reported from 36 of the 39 counties in the State.

TABLE 11.—Sand and gravel sold or used by producers, 1954-55, by classes of operation and uses

		1954			1955		Percent of change in—	
		Value			Value			Aver-
	Short tons	Total	Aver- age	Short tons	Total	Aver- age	nage	age value
COMMERCIAL OPERATIONS							1	
Sand: Building Molding Road material	2, 074, 404 3, 655 560, 355 90, 008	\$1, 957, 787 13, 234 423, 122 132, 121	\$0.94 3.62 .76 1.47	1, 785, 978 625, 932 101, 240	\$1, 814, 397 	\$1.02 .92 1.51	-14 +12 +10	+9 +21 +3
Other Total commercial sand_	2, 728, 422	2, 526, 264	. 93	2, 513, 150	2, 553, 106	1.02	-8	+10
Gravel: Building Road material Railroad ballast Other	3, 415, 190 3, 985, 095 431, 382 595, 995	3, 077, 110 3, 819, 553 288, 307 455, 058	.90 .96 .67 .76	2, 557, 567 3, 156, 416 628, 039 1, 095, 667	2, 445, 682 2, 874, 517 216, 404 535, 576	.96 .91 .34 .49	-25 -21 +46 +84	+7 -5 -49 -36
Total commercial gravel	8, 427, 662	7, 640, 028	. 91	7, 437, 689	6, 072, 179	. 82	-12	-10
Total commercial sand and gravel	11, 156, 084	10, 166, 292	. 91	9, 950, 839	8, 625, 285	. 87	-11	
GOVERNMENT-AND-CONTRAC- TOR OPERATIONS								
Sand and gravel:  Building  Road material	1, 191, 947 3, 696, 656	996, 433 2, 432, 289	. 84 . 66	4, 692, 626 7, 001, 696	4, 246, 947 6, 478, 450	. 91	+294 +89	+8 +41
Total sand and gravel.	4, 888, 603	3, 428, 722	. 70	11, 694, 322	10, 725, 397	. 92	+139	+31
TOTAL ALL OPERATIONS								
Sand: Building Molding Road material Other	3, 655 660, 243	2, 255, 823 13, 234 487, 921 132, 121	. 94 3. 62 . 74 1. 47	2, 366, 357 864, 434 101, 240	2, 691, 372 763, 778 161, 132	1. 14 . 88 1. 51	$ \begin{array}{c c} -2 \\ +31 \\ +10 \end{array} $	+21 +19 +3
Total sand		2, 889, 099	. 91	3, 332, 031	3, 616, 282	1.09	+5	+20
Gravel: Building Road material Railroad ballast Other	4, 276, 967 7, 581, 863 431, 382	3, 775, 507 6, 187, 043 288, 307 455, 058	. 88 . 82 . 67 . 76	6, 669, 814 9, 919, 610 628, 039 1, 095, 667	5, 815, 654 9, 166, 766 216, 404 535, 576	.87 .92 .34 .49	+57 +31 +46 +84	-1 +12 -49 -36
Total gravel	12, 886, 207	10, 705, 915	. 83	18, 313, 130	15, 734, 400	. 86	+42	+4
Total sand and gravel			. 85	21, 645, 161	19, 350, 682	. 89	+35	+5

The large increase in production of sand and gravel in 1955 was caused primarily by increased use of these materials by the United States Army Corps of Engineers at The Dalles Dam in Klickitat County and the Chief Joseph Dam in Douglas County. The Washington State Highway Department also reported an increased use of sand and gravel for road building and for maintenance. Based on tonnage, about 51 percent of the output was used for road building and maintenance material, 43 percent for building and construction purposes, and the remainder for railroad ballast and other miscellaneous uses. Small quantities of molding, glass, engine, and blast sands were produced during the year.

Stone.—The gross output and value of stone for all purposes increased 23 and 11 percent, respectively, compared with 1954. Total production of nearly 6.6 million tons valued at about \$10.6 million was divided between commercial, 3,937,000 tons (\$7,966,000), and Government-and-contractor, 2,656,000 tons (\$2,614,000). Comparable figures for 1954 were commercial, 3,824,000 tons (\$7,955,000), and Government-and-contractor, 1,543,000 tons (\$1,572,000). Increased demand for stone for road-building purposes by the State and county highway departments was the principal reason for greater output during the year. Stone production was reported from 36 of the 39 counties in the State.

Marble was quarried and crushed in Stevens County by Manufacturers Mineral Co. (June Echo, Parks Red, Valley White, and Cottman Black quarries) and Washington Non-Metallics, Inc. (Wa-No-Me quarries). Uses were found in the terrazzo, stucco, and roofing industries. Also in Stevens County, Mineral Products Co. produced crushed sandstone for abrasive and foundry purposes and for other industrial applications.

Building stone (sandstone) was produced by Walker Cut Stone, Inc., Pierce County, and Wilkeson Wenatchee Stone Co., Chelan County; the latter company discontinued quarrying operations June 25.

Production of quartz for industrial uses was confined to Spokane County, where Pacific Silica Co. worked the Latshaw quarry and crushing plant. The bulk of the output was consumed by a Tacoma firm in manufacturing silicon metal and ferrosilicon.

TABLE 12.—Stone sold or used by producers, 1954-55, by uses

Use	19	54	1955		
	Short tons	Value	Short tons	Value	
Agriculture (limestone) Building (dimension stone) Concrete, road metal, and screenings Riprap Railroad ballast Terrazzo chips Other **	33, 615 7, 141 3, 426, 735 324, 270 70, 842 (1) 1, 504, 287	\$134, 645 345, 393 4, 019, 662 364, 986 87, 861 (1) 4, 573, 987	(1) 6, 496 4, 329, 413 485, 743 (1) (1) 1, 771, 560	(1) \$231, 936 5, 201, 254 520, 061 (1) 4, 576, 380	
Total	5, 366, 890	9, 526, 534	6, 593, 212	10, 579, 631	

Included with "Other" to avoid disclosing of individual company confidential data.
 Used at metallurgical and chemical plants; sugar refineries; and in manufacturing paper, cement, mineral wool, poultry grit, and for other unspecified purposes.

Production of crushed limestone totaled over 1.4 million short tons valued at more than \$3.8 million, compared with about 1.5 million short tons with value of about \$4.6 million in 1954. The largest producers were the cement companies which quarried limestone as part of integrated operations. A new quarry above Lake Wenatchee in the Cascade Mountains of Chelan County was described in an article. The Northwestern Portland Cement Co. installation included crushing, conveying, and storage facilities. Limestone was trucked 20 miles from the quarry to a railroad siding and shipped 40 miles by rail to the company Grotto plant. Normal operations were to be carried out only 6 months a year owing to snow and other winter conditions in the area.

Papermills and farms in the State used large tonnages of limestone; other important consumers were limekilns and metallurgical works. Producers besides the cement firms included: San Juan County—Everett Lime Co. and Roche Harbor Lime & Cement Co.; Snohomish County—Miller Lime Co. and Morcrop Lime Co.; Stevens County—Peter Janni & Sons; and Whatcom County—Mitchell Bay Lime Co.

J. A. Jack & Sons operated a crushing plant at Seattle, obtaining

limestone from British Columbia.

Strontium.—Manufacturers Mineral Co. reported that the Sykes strontium mine on Fidalgo Island, Skagit County, was idle in 1955 but that a small tonnage of ore was shipped from stockpile during the year. The crude ore was used by chemical companies as a

purification material.

Talc (Soapstone).—Mine output of soapstone increased 52 percent, and the value of production gained 67 percent. All the material was mined in Skagit County. The principal producers continued to be the Skagit Talc Products mine near Marblemount and the Northwest Talc & Magnesium Co. Dad's Girl and Clear Lake mines. Northwest Olivine Co. operated claims near Mount Vernon, and Otto Binchus sold a small tonnage from his property in the Marblemount area. J. W. Pape located claims on Sibley Creek but was unable to begin production because of early snows in the fall. Nearly all the soapstone was used in manufacturing insecticides, and small quantities were used in fertilizer mixing and in making paint. Grinding plants using Washington soapstone were operated by Northwest Talc & Magnesium Co. and also by Manufacturers Mineral Co., Seattle, and Stauffer Chemical Co. and Miller Products Co., Portland, Oreg.

Vermiculite (Exfoliated).—Screened and cleaned crude vermiculite was obtained from Libby, Mont., by Vermiculite-Northwest, Inc., and was exfoliated at its Spokane plant. The expanded material was used as insulation material and as aggregate in concrete and plaster.

An increased demand was reported.

### MINERAL FUELS

Carbon Dioxide.—Production of natural carbon dioxide was slightly less than in 1954. This gas was produced from mineral waters in Klickitat County by Gas-Ice Corp., which operated a similar plant near Ashland, Oreg.

<sup>&</sup>lt;sup>8</sup> Lenhart, Walter B., From Aerial Tramway to Truck-Rail Haul With the Opening of New Quarry: Rock Products, September 1955, pp. 42-44, 47.

Coal.—Output of coal declined about 2 percent compared with 1954. This marked the seventh consecutive year that coal production has dropped in the State. Twelve mines, four fewer than in 1954, were active. Northwest Improvement Co. operated the only surface mine. Kittitas County, which had the three largest producing mines in the State, was again first among the counties in quantity of coal produced. The three largest producing mines were the Northwest Improvement Co. Ronald No. 3 and Roslyn No. 9 and the Roslyn Cascade Coal Co. No. 4.

B. & R. Coal Co. and Palmer Coking Coal Co., King County, made important contributions to the State total. Minor production was reported from Thurston, Lewis, and Pierce Counties. A change of ownership of the Stoker Coal Mining Co. occurred during October. The new owner, Tono Coal Mining Co., continued to produce coal

for the balance of the calendar year.

Peat.—Washington peat production declined 13 percent and the value decreased 26 percent. An increase of imports from British Columbia was a factor in the decline in State output, which contrasted with a 12-percent increase in quantity and 1-percent rise in value for the United States as a whole. Eighteen producers were active—9 in King County, 3 each in Snohomish and Thurston Counties, and 1 each in Kitsap, Pierce, and Spokane Counties. Peat was used mainly for soil improvement and to a smaller extent as a filler in mixed fertilizers and for other nonfuel purposes. Washington was the second largest producer of peat in the Nation but was not among the leaders in value of output because of higher prices in eastern peat-producing States.

Petroleum and Natural Gas.—Continued exploration for petroleum and natural gas in Washington was augmented by importation of a California drilling rig capable of boring to 5,000 feet. Shell Oil Co. contracted the rig for extensive exploratory drilling in Pacific County, starting first at Menlo. Richfield Oil Co., the only major oil firm drilling in 1955, was putting down a test well on Grays River, Pacific

County.

The construction of a natural-gas pipeline from New Mexico, Colorado, and Utah to supply the area promised to revolutionize the industrial potential of the Pacific Northwest. The heat-energy potential of the gas would equal the 1955 level of hydroelectric power produced in the Northwest, in addition to providing basic raw materials for various industries. However, it was not believed that the need for hydroelectric power would diminish with the coming of natural gas. On a population basis, the Northwest was to receive the largest initial supplies of natural gas ever provided a single area.

The 1,446-mile pipeline, extending from the San Juan Basin of the Southwest to Sumas, Wash., was well on its way to completion; de-

livery of natural gas was expected by August 1956.

Total cost of the project was estimated at \$250 million. The cost for 900 miles of pipeline in Washington was estimated at \$60 million, with an additional \$40 million or more expenditure anticipated by distributors. An extensive system of laterals was planned to serve nearly all sections of the State. One lateral was to extend from the main line on the Columbia River north through the Tri-City area north of Spokane. A second was to traverse the Yakima Valley north to

Wenatchee. The main line would continue north from the Columbia

River through the Puget Sound area to Bellingham.

Canadian permission to export natural gas to Washington and Federal Power Commission authorization to import Canadian gas combined the gas and oil resources of two major oil- and gas-producing areas. The Pacific Northwest Pipeline Corp. was to purchase up to 125 billion cubic feet per year of Canadian gas, at a rate fixed for a 20-year period, from Westcoast Transmission Co., Ltd.; expected delivery was planned for November 1957.

The State's industrial development was expanding in anticipation of potential markets. Stockholders approved a merger of Seattle Gas Co. with Washington Gas & Electric Co., largest utilities in the State. The consolidated firm would service the most heavily populated area within the State—from Everett south to Chehalis. Other major utilities were planning extensive expansions of facilities that

eventually would cost over \$40 million.

Washington's petroleum-refining industry was rapidly attaining major rank. Two refineries, at Anacortes and Ferndale, with capacities of 50,000 and 35,000 barrels per day, respectively, started operations during the year. In the summer, U. S. Oil Refining Co. began building a 15,000-barrel-per-day refinery at Tacoma; completion was scheduled for 1957. Standard Oil Co. of California and The Texas Co. announced plans for constructing refineries in the future.

The near advent of natural-gas supplies provided impetus for construction and expansion in other industries throughout the State, including those concerned with aluminum, forest products, chemicals,

apparel, paper cartons, and luggage.

# REVIEW BY COUNTIES AND DISTRICTS 9

Adams.—Pre-Mix Concrete, Inc. (formerly Othello Concrete Co.), and Frank G. Baulne, Inc., marketed building and paving sand and gravel; the latter firm also crushed traprock for concrete and roadstone. Contractors supplied the county highway department and the Washington State Highway Commission with construction and maintenance materials. Gravel was mined by county road crews.

Asotin.—County highway workers supplemented their own production with a small tonnage of paving gravel obtained under contract

for use in road maintenance.

Benton.—Traprock was crushed for roadstone by two operators. Three firms produced sand and gravel for building and paving. A. J. Cheff supplied the Bureau of Reclamation with structural materials, and county highway crews extracted gravel for roadwork. Joseph S. Gentzler of Pasco reported collection of opalized wood near Mabton.

Columbia River (Blalock Island) District.—Earl P. Matney of Paterson worked his placer claims for a total of 6 days in the summer and recovered a few ounces of gold. Considerable time was spent by the operator in perfecting a washing plant suitable for handling the sand and gravel in the area.

Chelan.—The Aluminum Company of America operated its aluminum-reduction plant at Wenatchee throughout 1955 (see Clark

<sup>&</sup>lt;sup>9</sup> John L. Beh, commodity-industry analyst, Region I, Bureau of Mines, Albany, Oreg., assisted in preparing this section.

TABLE 13.—Value of mineral production in Washington, 1954-55, by counties

County	1954	1955	Minerals produced in 1955, in order of value
Adams	\$57,380	\$130, 237	Stone, sand and gravel.
Asotin	98, 175	6, 105	Sand and gravel.
Benton	136, 249	150, 624	Sand and gravel stone gold
Chelan	4, 052, 862	5, 067, 980	Copper, gold, stone, sand and gravel, silver, zinc, pumice, clay, lead.
Clallam	(1)	252, 954	Sand and gravel, stone.
Clark	612, 488	543, 938	Stone, sand and gravel, clay,
Columbia	(1)	170, 291	Stone, sand and gravel.
Cowlitz		371, 988	Do.
Douglas		2, 072, 516	Sand and gravel, stone.
Ferry.	(1)	(1)	Gold, silver, sand and gravel, stone, tungsten.
Franklin	185, 034	668, 901	Sand and gravel, stone.
Garfield	(1)	7, 978	Stone.
GrantGrays Harbor		1, 989, 670	Sand and gravel, diatomite, stone.
Island	199, 298	256, 740	Sand and gravel, stone.
Jefferson	54, 311 189, 692	109, 459	Do.
King	7, 859, 935	9, 151, 081	Stone.
King	1,000,900	9, 151, 081	Cement, sand and gravel, coal, stone, clay, copper, silver, gold.
Kitsap	122, 344	133, 252	Sand and gravel, stone.
Kittitas	2, 672, 241	3, 454, 198	Coal, sand and gravel, diatomite, stone, gold.
221001000	2,012,211	0, 101, 100	silver.
Klickitat	1, 472, 188	2, 447, 733	Sand and gravel, stone, carbon dioxide.
Lewis	923, 830	991, 267	Sand and gravel, stone, coal, clay.
Lincoln	134, 443	121, 138	Sand and gravel, stone.
Mason	51, 520	(1)	Sand and gravei.
Okanogan	606, 802	238, 904	Sand and gravel, gypsum, lead, ensomite zine
Pacific	431, 892	151 911	silver, chromite, copper, gold.
Pend Oreille	8, 027, 779	151, 211 8, 646, 200	
I ond Olemonia	0,021,110	0, 040, 200	Zinc, cement, lead, stone, sand and gravel, silver, copper, gold.
Pierce	2, 338, 326	2, 502, 171	Sand and gravel, stone, clay, coal.
San Juan	(1)		Lime, stone, sand and gravel.
Skagit	(1)	(1)	Cement, stone, sand and gravel, talc, olivine.
and a Total Control of the Control o	.,,	1 1	clay, lead, silver, gold, pumice.
Skamania	95, 374	60, 643	Stone, sand, and gravel.
Snohomish	1, 300, 921	1, 359, 097	Sand and gravel, stone, clay, copper, gold,
			silver.
Spokane		5, 231, 813	Sand and gravel, cement, stone, clay.
Stevens	5, 016, 737	8, 164, 095	Zinc, magnesite, stone, lead, copper, sand and
			gravel, tungsten, silver, clay, gold, iron ore,
-			grinding pebbles, barite.
Thurston	(1)	387, 086	Stone, coal, sand, and gravel.
Wahkiakum		14, 300	Stone.
Walla Walla	178, 359	211, 210	Sand and gravel, stone.
Whatcom	(1)	(1)	Cement, stone, sand and gravel, clay, coal.
Whitman	185, 778	436, 227	Sand and gravel, stone.
Yakima Undistributed <sup>2</sup>	830, 019	759, 572	Sand and gravel, stone, clay.
Ondermaker	14, 450, 012	14, 587, 285	Sand and gravel, stone, peat, gem stones.
Total 3	53, 300, 000	67, 334, 000	
	-,,	, 552, 550	

<sup>1</sup> Included with "Undistributed" to avoid disclosing individual company confidential data.
<sup>2</sup> Includes value of sand and gravel, stone, peat, and gem stone production that cannot be assigned to specific counties, and value of minerals indicated in the table by footnote reference 1.

<sup>3</sup> Total has been adjusted to eliminate duplication in the value of clays and stone.

County for review of Alcoa operations in Washington). Keokuk

Electro-Metals Co. produced ferroalloys at Wenatchee.

Four commercial concerns and Great Northern Railway Co. produced sand and gravel for building and paving and for railroad ballast, respectively. Contractors provided the State highway commission with paving materials. Paving and road sand was mined by State road crews. Northwestern Portland Cement Co. supplied the requirements of its Grotto plant with limestone quarried at the Soda Springs pit.

Extraction of rough dimension sandstone for building purposes was reported by Wilkeson Wenatchee Stone Co. at its Dry Gulch operation. At cessation of operations in June, ownership of the quarry

was returned to Walker Cut Stone Co., Inc., lessor.

Pumice was prepared and marketed as concrete aggregate by Arne Sorlie and Entiat Pumice Co. (formerly Bunney & Villela). Heavy clay products were fabricated by the Wenatchee Brick & Tile Co.

Čhelan Lake District.—Howe Sound Co., Chelan Division, operated its Holden copper mine and 2,000-ton flotation mill throughout 1955. Ore production was less than in 1954, but copper output was greater due to a higher metal content. The mine also was an important producer of gold and silver in the State. Exploration and development included 10,497 feet of drifting and 8,226 feet of diamond drilling. Ore reserves declined in 1955, and exploration was to be increased in an effort to locate new ore. Rock bursts continued to be a major problem in mining operations and caused excessive dilution of the ore with waste rock.

Wenatchee River District.—The Gold King mine near Wenatchee was worked continuously by Lovitt Mining Co. and yielded more gold than in 1954. Ore was shipped crude to a smelter. Exploration and development included 1,040 feet of drifting, 1,064 feet of tunneling, and 23,360 feet of testhole drilling. Thirty-one persons were

employed at the mine.

Clallam.—Paving gravel was prepared by Blake Sand & Gravel Co., Sequim, and Pieler Construction Co., Port Angeles. Randal Kilmer and county road crews extracted paving gravel for the highway department. Contractors furnished paving gravel and stone to the State for highway maintenance and construction.

Clark.—The following information, obtained from Aluminum Company of America, concerns Pacific Northwest Alcoa operations at

Vancouver and Wenatchee (Chelan County) in 1955:

For Aluminum Company of America the year 1955 was highlighted by its 15th anniversary of operations in the Pacific Northwest. On September 23, 1940, just a decade and a half before, the first commercial primary aluminum made west of the Mississippi River was produced at Alcoa's Vancouver, Wash., smelter.

Since that date of first primary production, Alcoa's Northwest operations have grown to include a new smelting plant at Wenatchee (1952), and fabricating facilities at Vancouver which include a mill for manufacture of aluminum rod, wire, and electrical transmission cable (1950), and a new extrusion mill (1954).

During the year, work was begun to increase primary aluminum production capacity at Alcoa's Northwest plants by a total of 11,000 tons per year. An expansion at the Wenatchee plant was underway to boost annual smelting capacity by 8,500 tons to installed capacity of 108,500 tons annually. At the Vancouver plant, installed capacity was being increased by 2,500 tons to 97,500 tons annually by modification and improved design of existing installations.

Helping to justify this expansion of smelting capacity was the negotiation of a new 12-year power contract which helped ease Alcoa dependence on interon a new 12-year power contract which helped ease Alcoa dependence on interruptible power supplies from Bonneville Power Administration. The parties in this contract were Seattle City Light, Pend Oreille County PUD, Alcoa, and Bonneville Power Administration. The contract provided that of the power Seattle City Light would receive from Pend Oreille PUD's new Box Canyon Dam, 30,000 kilowatts will be used by City Light only during peak load hours. The remainder of the time, when loads are lighter, this power is diverted over RPA's Federal transmission grid to Alcoa's Wenatchee and Vancouver plants BPA's Federal transmission grid to Alcoa's Wenatchee and Vancouver plants.

From a power standpoint, 1955 was a good year for Alcoa operations in the Northwest. Except for momentary cutbacks during the region's peak electric power load hours, there was no curtailment of Alcoa's interruptible power supplies.

The year marked the first full year of operations for Alcoa's new extrusion mill at Vancouver, the first major Northwest extrusion facility. Housing two 2,500-ton extrusion presses and extensive finishing equipment, the mill, new as it was for the region, operated throughout the year, with three shifts per day operating the two presses. Principal market areas for the Vancouver plant's extrusions were the expanding Northwest aircraft, building products, and transportation equipment industries.

Five companies reported output of sand and gravel for building, paving, and foundry sand and railroad ballast. The Carborundum Co. of Vancouver used silica imported from Oregon for the manufacture of silicon carbide. Smithrock Quarry, Inc., Vancouver, processed stone for riprap and roadstone, and Sorensen's Landscape & Rock Supply Co., Portland, mined dimension stone (scoria) from its Red Rock quarry. County highway crews produced crushed stone and sand and gravel; J. N. Conley supplied these commodities to the State highway commission. Building brick and tile were manufactured by Hidden Brick Co. of Vancouver and by C. B. Muffett Brick & Tile Factory near Ridgefield.

Columbia.—Stone was crushed by Ray Weist for the State highway commission. Near Waitsburg, Carbon Bros. processed paving and

road gravel.

Cowlitz.—The principal mineral-industry operation was Reynolds Metals Co. aluminum-reduction plant at Longview. Plans were announced to expand operations at either the Longview, Wash., or Troutdale, Oreg., plants to include fabrication of aluminum extrusions,

shapes, and foil.

Two quarries near Longview, owned by Weyerhaeuser Timber Co., yielded crushed stone for concrete, roadstone, and railroad ballast. One of these operations (purchased from Star Sand & Gravel Co. early in the year) was dismantled at the close of the season. Castle Rock Sand & Gravel Co. and Woodland Sand & Gravel Co. produced structural and paving sand and gravel. County highway crews and contractors for the State highway commission obtained road-building

materials and riprap from stone, and sand and gravel.

Douglas.—Douglas County ranked fourth in the output value of sand and gravel (\$2,056,000); the major portion was for gravel contracted by the United States Army Corps of Engineers for Chief Joseph Dam. The remainder was attributed to Frank G. Baulne, Inc. (paving sand and gravel), Great Northern Railway Co. (building gravel, ballast, and fill), State road crews (sand), and C. E. O'Neal (paving sand and gravel) contracted to the State highway commission. Crushed basalt, for use in maintaining State highways, was supplied by Lone Pine Paving Co., Yakima, from local raw materials.

Ferry.—A small tonnage of tungsten ore was reported milled at the

Kelly Camp mine near Republic.

Two contractors supplied State road crews with highway maintenance materials. Carbon Bros. prepared paving and road gravel, and N. G. Johansen Co. crushed basalt for road materials.

Republic District.—Knob Hill Mines, Inc., increased production from its gold-silver property 11/2 miles north of Republic. Mill products were gold flotation concentrate and precipitate recovered by cyanidation of flotation-cell tailings. A new 300-hp. hoist, steel headframe, and skipway and bins were installed at the mine, which was developed by means of a 1,500-foot inclined shaft. Shaftwork totaling 150 feet, drifting 600 feet, and longholing 1,000 feet were done in 1955 as exploration and development.

Franklin.—Structural sand and gravel was mined by Connell Sand & Gravel Co., Connell, and Pre-Mix Concrete, Inc., Kennewick; the latter firm also reported production of paving material. Contractors provided the county highway department with gravel. Railroad ballast was produced by Northern Pacific Railway Co. from both gravel and crushed stone. Basalt, for use in concrete and as road-stone, was prepared by the Bureau of Reclamation.

Garfield.—The only reported mineral production in the county was a small quantity of basalt, which was crushed for use as roadstone

by county road crews.

Grant.—Six commercial operators, as well as crews and contractors for the State and county highway departments, mined sand and gravel for the production of building and paving materials. Crude diatomite was mined by Kenite Corp. from an open pit about 18 miles southeast of Quincy. Ore was shipped by truck to the company plant at Quincy for preparation and marketing. Crushed stone was prepared by the Bureau of Reclamation and by contractors for the State highway commission for use as roadstone.

Grays Harbor.—Quigg Bros.-McDonald, Inc., produced building and paving sand and gravel and crushed stone. The latter was used primarily for building local logging roads. Swano Excavating Co. marketed road-building sand and gravel. Under contract to the State highway commission, Bocek Bros. crushed stone for use in highway construction and maintenance; structural and road gravel was

produced by county highway crews.

Island.—Structural sand and gravel was processed by Mount Vernon Sand & Gravel Co., Mount Vernon. Small quantities of gravel and stone were supplied to the State highway commission by C. V. Wilder Construction Co. for roads.

Jefferson.—General Construction Co. (Port Ludlow quarry) extracted basalt for crushing into riprap and roadstone and for use in concrete. A small quantity of crushed stone was contracted for

State highway work.

King.—Seattle was the site of many metal processing and fabricating plants. Bethlehem Pacific Coast Steel Corp., Isaacson Iron Works, Northwest Steel Rolling Mills, Inc., Pacific Car & Foundry Co., and Seidelhuber Steel Rolling Mill Corp. operated steel producing

or fabricating facilities.

Northwest Lead Co. produced a complete line of lead products. Bethlehem Pacific Coast Steel Corp. indicated that the annual ingot production of the Seattle plant averaged 246,000 net tons and that operations during 1955 were at about 90 percent of capacity. Metallic requirements of the open-hearth furnaces consisted principally of scrap metal. Raw-material requirements other than scrap were low, compared with integrated steel-plant practices, and were restricted largely to materials used for furnace maintenance. These raw materials, totaling only a few thousand tons yearly, were mainly dolomite, magnesite, iron ore, and fluorspar, which were purchased from west coast producers, and chromite ore, which was imported. The major portion of the steel produced and fabricated was consumed on the west coast, a large part being used in the Pacific Northwest and a sizable tonnage exported to Canada.

Isaacson Iron Works reported that two bays for steel receiving and

storage were to be added to its structural steel division in 1956 and 1957. All structural steel facilities of the works have been completed since 1952. Operations, essentially ingot production and fabrication, consisted of an ingot-production melt plant, forge shop, blacksmith shop, heat-treating plant, machine shop, erection shop, shipping facilities, galvanizing plant, marine-hardware plant, and structural steel shop. Annual capacity of the two Lectromelt furnaces making up the ingot plant was 100,000 net tons of ingots, which were produced entirely from steel scrap. The ingot plant supplied the forge and blacksmith shops, consisting of forging furnaces, steam hammers, hydraulic presses, and other equipment. The adjacent machine shop was equipped to produce all types of ship shafting, affiliated parts, and job shopwork. Plant equipment of the structural steel division was extensive and covered a full range of metalworking tools for fabrication, machining, and forging.

King County, the outstanding nonmetals producing county in the State, had a total nonmetallic-mineral output, including fuels, valued at \$9 million and ranked first in production value for cement and clay,

second for coal, and third for stone and sand and gravel.

Superior Portland Cement Co. and Northwestern Portland Cement Co. obtained limestone from quarries at Concrete (Skagit County) and Soda Springs (Chelan County), respectively, for manufacturing cement. Local clays were used by both firms. The combined value of all sand and gravel produced (commercial and Government-and-contractor) totaled about \$2,061,000. Fifteen companies processed structural, paving, and miscellaneous sand and gravel. Glass sand was prepared by Smith Bros. Silica Sand Co. of Auburn. Cavanaugh Molding Sand Co., Kennydale, prepared molding sand. Chicago, Milwaukee, St. Paul & Pacific Railroad Co., Northern Pacific Railway Co., and Valley Sand & Gravel Co. mined gravel for railroad ballast. In addition to output of city and county crews, contractors supplied the municipal, county, and State street and highway departments and the United States Army Corps of Engineers with paving sand and gravel.

Output by the county coal-mining industry evidenced a marked decrease in both gross tonnage and the number of operators. Production declined from the 1954 figure of nearly 161,000 tons to about 116,000 tons for 1955. J. A. Terteling & Sons and Bianco Coal Mines, active during 1954, did not operate during the year. Despite an increased output at B. & R. Coal Co., the smaller number of operating mines, plus a decrease in production by Palmer Coking Coal Co. (No. 19, No. 12, and Landsburg mines) and Draghi Coal Co. (Black Diamond mine), accounted for the smaller county total. In addition

to coal, nine producers of peat were reported in the county.

The combined output of all the county stone operators was valued at \$783,000. Basalt was crushed by three commercial firms, as well as by Great Northern Railway Co. and Northern Pacific Railway Co., for road metal, railroad ballast, and riprap. Contractors provided State highway crews with crushed stone. Poultry grit and roofing rock were processed by Hemphill Bros., Seattle, from granite mined at the Baring quarry. Limestone was imported from British Columbia by J. A. Jack & Sons of Seattle for agricultural, chemical, glass making, and metallurgical applications.

Value of clay produced in the county totaled about \$144,000. Building brick and tile were marketed by Builders Brick Co., Seattle, and by Gladding, McBean & Co. The latter firm also manufactured fire brick from clay extracted from its Harris and Palmer pits. Pottery was fabricated by Auburn Pottery Co., Inc., Auburn, and by Washington Pottery Co., Seattle.

Gypsum wallboard, formboard, sheathing, and lath were manufactured at the Seattle plant of Kaiser Gypsum Co., Inc. Raw

gypsum was imported from Baja California, Mexico.

Taylor River District.—The Rainey copper mine, 16 miles northeast of North Bend, was worked from May 16 to November 11 by Western States Copper & Uranium Corp. of Seattle. About 250 tons of ore was milled on the property during experimentation on suitable flotation reagents, and 28 tons of ore was shipped crude to a smelter. Total metal content of concentrate and ore was 15 ounces of gold, 560

ounces of silver, and 20,000 pounds of copper.

Kitsap.—Four commercial operators reported production of building and paving sand and gravel. Structural and road-surfacing materials were processed for county and State highway agencies by contractors. County road crews mined a small quantity of structural sand. From its Green Mountain quarry Bremerton Monument Co. extracted rough monumental granite. Northwestern Construction Co. obtained road materials for the Washington State Highway Commission.

Kittitas.—The county was fourth in the total value of nonmetal mineral output (\$3.4 million), including fuels, for the State and ranked first in production of coal. Coal mines of Northwestern Improvement Co. and Roslyn Cascade Coal Co. produced almost 76 percent of the

State total.

Paving and structural sand and gravel were marketed by F. G. Baulne, Inc., and Ellensburg Cement Products Co., respectively. Gravel was utilized by county road crews, and the State highway commission contracted for supplies of both paving sand and crushed basalt.

During its third year of operation Western Ventures, Inc., of Spokane continued to increase its production of diatomite. Ore was mined at the Squaw Creek mine and was processed at the company plant near Ellensburg. Agate and petrified wood (gem quality) were reported marketed by collectors.

Swauk District.—Bowman & Price amalgamated 50 tons of ore from the Anna May mine on Snowshoe Ridge and recovered 42 ounces of gold and 20 ounces of silver. The mine was active from May to

November.

Klickitat.—Owing to the large consumption of sand and gravel in construction of The Dalles Dam by the United States Army Corps of Engineers, Klickitat County ranked second in output value for these commodities (\$2.2 million). Considerable quantities of crushed stone also were utilized on the project. County highway crews mined and processed basalt and sand and gravel for road maintenance. Gas-Ice Corp. recovered natural carbon dioxide from mineral waters for manufacturing dry ice. Joseph S. Gentzler reported collection of moss agate near Roosevelt.

Lewis.—Building and paving sand and gravel were processed by

Cowlitz Construction Co., Inc., Pacific Sand & Gravel Co., and contractors for the county and State highway commission. Northern Pacific Railway Co. crushed basalt for railroad ballast. Contractors supplied the Bureau of Public Roads and the State highway commission with crushed stone. County road crews maintained their own supply for roadwork. Black Prince Coal Co. remained the sole coal producer in the county. Heavy clay products were fabricated by Chehalis Brick & Tile Co.

Lincoln.—Contractors furnished paving gravel as well as a small quantity of crushed stone for county and State highway maintenance divisions, respectively. In addition, gravel was mined by county

road crews.

Mason.—Johns Creek Sand & Gravel Co., at its fixed plant near Shelton, produced sand and gravel for building and road purposes.

Paving gravel was recovered by county highway crews.

Okanogan.—Fred W. Wagener, Jr., reported shipments of chromite ore and concentrate from the Chrome Cliff mine on Johnson Creek. Four commercial operators produced sand and gravel, and railroad ballast was processed from gravel mined by Great NorthernRailway Co. State and county road crews reported output of sand and gravel, and contractors supplied the State with gravel for highway construction and maintenance.

Small quantities of gypsum and epsomite (the only reported production of either commodity in the State), used primarily for agricultural application, were recovered at the Poison Lake deposits by Agro Minerals, Inc.

Conconully (Ruby) District.—A. E. Kaiser continued to develop the Peacock mine and milled lead-zinc ore in a leased flotation plant

at Omak.

Pacific.—Road-building materials were produced from basalt by four commercial operators and by county highway crews. In addition, fill materials were processed by A. W. Hammond, and riprap was prepared by Willapa Harbor Quarries, Inc. Operations were suspended for the year at the Bear River quarry of Columbia River Lime Co.; however, production was expected to resume in the near future.

Pend Oreille.—The county ranked sixth in value of nonmetal production for the State. Limestone and quartzite were mined locally by Lehigh Portland Cement Co., Metaline Falls. Structural sand and gravel was marketed by Romero Bros., Newport. Contractors for the county and the State, as well as county road crews, pro-

duced road-building gravels.

Metaline District.—Two operations in Metaline district continued to supply a large proportion of the lead and zinc produced in the State. At the Pend Oreille mine, ore and zinc production by Pend Oreille Mines & Metals Co. increased 4 and 17 percent, respectively, while output of lead dropped 4 percent. Mining was on a 5-day basis, and milling at the 2,400-ton East mill was carried out 6 days per week in 1955. Development work, at a cost of \$85,700, consisted of 1,007 feet of drifts and raises, 103,300 cubic feet of stationwork, and 13,143 feet of diamond drilling.

According to the company annual report, a new wage contract with the International Union of Mine, Mill and Smelter Workers

was completed in December, providing for a 9-percent increase in

wages, retroactive to July 1, 1955.

Wage and salary increases, greater costs for supplies, and higher taxes caused an advance in costs per ton of ore mined from \$3.054 in 1954 to \$3.176 per ton in 1955. The 700-ton West mill (on the west side of the Pend Oreille River) was idle and the company indicated that a further increase in zinc prices would be necessary before the plant could be operated because the zinc ore normally treated was high in iron and contained no lead. An increase in exploration and development was planned for 1956 including extending the incline shaft 2,500 feet, drifting 2,000 feet, and rotary drilling 20,000 feet in

areas north of present mining operations.

Activities by American Zinc, Lead & Smelting Co. were resumed at the Grandview mine and 750-ton flotation mill early in January after settlement of a strike that lasted over 5 months. Work on exploration and development in 1955 included raises, 8,410 feet; crosscuts, 24,399 feet; slabbing, 5,950 feet; and incline shaft, 1,647 feet. output was to be increased as much as 25 percent if engineering studies indicated that expansion of mining and milling facilities was The higher output would come from the deeper levels that the company opened in 1955. It was hoped that these levels would yield higher grade ore than was mined in 1953 and 1954. Mining and milling was carried out at a capacity rate with a work force of 62 men except for 3 weeks, when operations were shut down after a fire destroyed the compressor plant and shops.

Pierce.—The largest mineral-industry operation was the Ruston smelter and electrolytic copper refinery of American Smelting & Refining Co., employing more than 1,200 persons. Concentrates from overseas sources were the principal raw materials treated; domestic ores, concentrates, and scrap were processed also. Gold, silver, arsenic, nickel sulfate, selenium compounds, and sulfuric

acid were important smelter byproducts.

Kaiser Aluminum & Chemical Corp. aluminum smelter at Tacoma treated alumina received from bauxite-processing plants in the Gulf Coast area. Ohio Ferro-Alloys Co. manufactured silicon metal and ferrosilicon at its Tacoma plant. The company indicated that the plant consumed approximately 25,000 tons of quartz supplied from a quarry at Denison, Spokane County. Coke and coal came mostly from suppliers in the Midwest and East. Petroleum briquets, a byproduct of the local gas-manufacturing industry, were

also used as a source of carbon.

Producing sand and gravel valued at \$1.9 million, Pierce County, in spite of an increased value of output, dropped from first to fifth place in production of these commodities in the State. Nine commercial operators reported production of sand and gravel for structural and paving purposes, railroad ballast, and fill. Walker Cut Stone Co., in addition to output of railroad ballast from crushed sandstone. processed dimension sandstone for architectural use. Harrison Bros. Co. crushed basalt for concrete and road metal. County and State road departments contracted for sand and gravel and crushed stone for paving and riprap, respectively. The city of Tacoma produced, as well as contracted for, its supply of sand and road materials. The

United States Army Corps of Engineers contracted for production of

paving sand and gravel.

Brick and tile were manufactured by the Builders Brick Co. from clay mined locally. Production of coal was reported by Carbonado Coal Co. The chemical-manufacturing industry was represented in the Tacoma area by plants of Hooker Electrochemical Co., Pennsylvania Salt Manufacturing Co., Stauffer Chemical Co., and E. I. duPont de Nemours & Co.

San Juan.—Roche Harbor Lime & Cement Co., the only lime producer in Washington, increased production slightly above 1954. In addition to production of building, chemical, and metallurgical lime, the company also reported output of limestone for cement, road

metal, and agricultural purposes.

At the McGraw-Kittinger quarry near East Sound, Everett Lime Co. processed limestone, primarily for use by the paper industry. A small quantity of structural gravel was marketed by Jensen Construction Co. of East Sound.

Skagit.—As in 1954, the county ranked second in the State for total value of nonmetal mineral commodities. The county ranked first in production of stone and second in cement output; it was the

only county producing olivine and soapstone.

Superior Portland Cement Co., Inc., at Concrete quarried limestone for use at its local plant, as well as its King County plant. Great Northern Railway Co. mined gravel for ballast and structural purposes. The two plants of Mount Vernon Sand and Gravel Co. (Little Mountain and Samish) and Skagit Sand & Gravel Co., Mount Vernon, produced building sand and gravel. Contractors supplied State highway crews with paving gravel and crushed stone; county employees extracted gravel and traprock for riprap and road materials.

A small quantity of pumice was prepared by Rainier Pumice Co. of Auburn. Skagit Talc Products Co. of Marblemount mined soapstone for shipment to Stauffer Chemical Co., Portland, Oreg.; Manufacturers Mineral Co., Seattle; and George Richmond, British Columbia, for grinding. Soapstone from Northwest Talc & Magnesium Co. Clear Lake and Dad's Girl mines, as well as a small quantity purchased from Otto Binchus, Marblemount, was ground at the

company plant near Clear Lake.

Northwest Olivine Co. (formerly Scheel Olivine, Inc.), in addition to a minor production of soapstone at the Mount Vernon quarry, mined a small amount of olivine at its Twin Sisters mine. The company soapstone output was sold to Miller Products Co. of Portland, Oreg. Soapstone production (all producers) was utilized mostly in manufacturing insecticides; however, small quantities were channeled into production of paints and ceramics. Olivine output was used for roofing chips and foundry and floor sands, as well as in mixing fertilizer. Heavy clay products were manufactured by Northwest Brick & Tile Co. at Burlington.

Cascade District.—A small tonnage of lead ore was reported shipped

from the Johnsburg mine.

Skamania.—Paving gravel and roadstone were produced by the county highway department. J. N. Conley, contractor for the State, provided the State with a stockpile of crushed basalt for road maintenance.

Snohomish.—Structural and paving sand and gravel were processed by eight commercial operators, and ballast gravel was produced by Great Northern Railway Co. The city of Everett and the Snohomish County Highway Department mined and utilized gravel for paving, and various contractors supplied the State highway commission and the United States Army Corps of Engineers with road-surfacing materials.

Limestone, for agricultural and miscellaneous uses, was mined by Morcrop Lime Co. at its Paddock quarry and crushed at the company plant near Arlington. Miller Lime Co., operating a quarry and crusher at Gold Bar, supplied limestone for agricultural applications. Granite was crushed by Great Northern Railway Co. for rubble and

by Manufacturers Mineral Co. for poultry grit and roadstone.

Associated Sand & Gravel Co., Everett, crushed basalt for roadbuilding material, and county construction crews quarried breccia for riprap. Heavy clay products were marketed by Lowell Brick & Tile Co. Peat was recovered by three operating companies.

Glacier Peak District.—A copper-exploration project was begun by Bear Creek Mining Co. at optioned claims in the Glacier Peak area high in the Cascade Mountains. Diamond drilling was carried out until weather conditions halted operations in December. Except for the Holden mine in Chelan County, the deposit was believed to be the most important copper occurrence in Washington. The property was located in 1900, but little exploration was done until 1917, when Minerals Separation Co. of New York drilled 3 holes totaling 1,984 feet. M. A. Hanna Co. took a lease and option on the property in 1937 and by 1942 had drilled 33 holes totaling 18,694 feet. In 1943 International Smelting & Refining Co. drilled an additional 6,822 feet.

Index District.—The old Sunset mine was the site of an exploration project begun by Granore Co. This deposit was discovered in 1897. Small shipments of crude ore were made at intervals through the next 20 years. The period from 1916 to 1930 was more productive, and the mine was operated continuously until a drop in copper prices

caused a shutdown.

Sultan District.—Kromona Mines Corp. continued an underground development program to increase tonnage available for its new 100ton-per-day flotation mill. Copper concentrate produced from development ore was shipped to a smelter, and tungsten concentrate was stockpiled at the mill. The mine-2,000 feet higher than the mill—was reached by an aerial tram, which was used also to move ore from the mine to the orebins. The property was operated from April 20 to December 23, and about 89 tons of concentrate was shipped to The concentrate averaged 22.83 percent copper, 3.93 ounces of silver, and 0.70 ounce of gold, and smelter returns from the shipments totaled \$14,968. About 20 men were employed at the project.

Spokane.—Kaiser Aluminum & Chemical Corp. operated its aluminum-reduction plant at Mead and rolling mill at Trentwood continuously in 1955. Ferrochromium was produced at the Pacific Northwest Alloys, Inc., plant at Mead. Several companies in the uranium-processing field expressed interest in establishing a uranium mill in the Spokane area under AEC license to process ore from the Midnite and Daybreak mines and other mines that might be brought into production. Daybreak Uranium Co. was organized early in 1955 to take over operation of the uranium discovery made on the Dahl ranch in the Mount Spokane area, northern Spokane County. Diamond drilling by the AEC and company development work were carried out, and the first ore shipment was made in July from the property. Bulldozing and drilling in other areas of the Mount Spokane district were reported.

Ranking third in total output value for all nonmetal minerals (\$5.2 million), Spokane County ranked first for sand and gravel (\$2.6 million) and second for clay. Ten commercial operators produced sand and gravel for structural and paving purposes; the United States Army Corps of Engineers, as well as county and State highway maintenance crews, used paving gravel. Union Sand & Gravel Co. (Valley quarry at Spokane) and Chicago, Milwaukee, St. Paul & Pacific Railroad Co. prepared gravel for ballast.

The Irvin plant of Ideal Cement Co. continued to manufacture cement; stone, clay, and shale of local origin were utilized in the operation. Basalt was mined by Carbon Bros. and by Inland Asphalt Co., both of Spokane, as well as by contractors for State and county roadwork.

Silica (quartz) for use in manufacturing ferrosilicon and cement and as roofing material and for miscellaneous purposes, was mined by Pacific Silica Co. at its Latshaw quarry. Dimension granite for use as building and monumental stone was quarried by Roy C. Keene & Son of Medical Lake.

Clay, for use in the manufacture of firebrick and heavy clay products, was mined by Gladding, McBean & Co. (Mica and Sommer pits), Washington Brick & Lime Co. (Mason and Freemen pits), and Charles and Frank Pirello.

Columbia Gypsum Co., Ltd., Spokane, marketed gypsum, mined near Lake Windermere, British Columbia, for agriculture use and as a cement retarder. Vermiculite from Libby, Mont., was expanded and marketed as an insulation material by Vermiculite-Northwest, Inc., Spokane. Humus peat was produced near Greenacres.

Stevens.—In April, Dawn Mining Co., subsidiary of Newmont Mining Corp. took over operation of the Midnite uranium property on the Spokane Indian Reservation in the southwestern part of the county under an agreement with Midnite Mines, Inc., and shipped ore from the original surface discovery cut to a Salt Lake City, Utah, processing plant under an AEC contract. According to published reports there were 100,000 tons of ore in the deposit, making it one of the largest in the country. The company continued diamond drilling begun by the AEC, installed mining equipment, drove test tunnels, and developed and mined ore. Ten men were employed at the project, site of the initial discovery of a commercial uranium deposit in the State. Drilling and surface trenching and stripping were carried out in other areas of the reservation by several companies and individuals under contracts with the Spokane Indian Tribe and on prospecting leases on State and private land immediately to the north.

Other areas of the county were being covered in the search for uranium. Airborne reconnaissance was employed in some instances. At the end of 1955 the Midnite mine was the only property in the

county from which uranium ore had been shipped, although a number of other promising discoveries were reported. Several small tungsten

mines were active.

W. H. West shipped concentrate from the Little King mine, owned by Sunshine Mining Co., and from the Deer Lake property. Addy Development Co. began to develop the Washington Metals mine in May and constructed a small mill, with capacity of 25 tons, 3 miles from the mine. About 100 feet of drift and 100 feet of raise were driven, all on ore. No ore was milled during the year, but crude ore was shipped to Montana and to the Kelly Camp mill at Republic, Ferry County. Some ore was stockpiled for milling in the spring of The Germania mine near Wellpinit was worked in the summer by Frank Eichelberger & Associates. Germania Consolidated Mines, Inc., continued its operation in the vicinity of Hunters but discontinued tungsten development after indications of uranium were found. Bulldozing for uranium disclosed additional tungsten deposits, which were to be developed later.

Magnesite was again the principal mineral commodity produced in the county; stone ranked second in production value (\$797,000). The Nation's principal producer of magnesite, Northwest Magnesite Co., almost doubled its 1954 output; however, production continued to lag considerably behind that of 1953. Ideal Cement Co. continued operations at its newly acquired Limerock quarry. Quarry yield was utilized primarily in the manufacture of cement with a smaller quan-

tity being used in paper mills.

At Northport Peter Janni & Sons marketed crushed and bulk limestone for use at paper plants and for metallurgical flux and stucco. Terrazzo chips, roofing, and stucco were end uses of marble mined at the Wa-No-Me quarry of Washington Non-Metallics, Inc., and at the June Echo, Parks Red, Valley White, and Cottman Black quarries of Manufacturers Mineral Co. The latter company also produced

barite for use as paint filler from its Madsen pit near Addy.

Crushed and ground silica sand products, as well as grinding pebbles, were marketed by Mineral Products Corp. for filler, traction sand, and tube-mill grinding, respectively. Raw-material output originated at the Chewelah quarry. Great Northern Railway Co. mined gravel for railroad ballast, and production of structural sand and gravel was reported by Colville Valley Concrete Co. County road crews and contractors for the State highway commission maintained their respective supplies of road gravels. Washington Brick & Lime Co. (A. B. and Clayton pits) and Eddie Olson recovered clay for manufacturing structural clay products.

Chewelah District.—Chewelah Copper Co. began mining operations

at Eagle Mountain copper properties under a profit-sharing agreement

and shipped ore to a mill north of Colville.

Deer Trail District.—Shipments of copper concentrate produced from dump ore were reported from the Turk mine after Alpine Uranium Corp. acquired the mine and mill and began a development

project at this old copper camp.

Northport (Aladdin) District.—American Smelting & Refining Co. Van Stone mine continued to be the leading zinc producer in the State and was also a source of lead. Mining at the open-pit operation was done under contract by Isbell Construction Co. of Reno, Nev. Enough ore was reported available for several more years' operation. low-grade ore body was developed by American Smelting & Refining Co. under a Government contract providing for purchase of zinc at a floor price of 15½ cents per pound. This contract was completed in 1954, but production on a marginal basis was continued by the company. Tonnage of ore milled at the 1,000-ton-per-day flotation plant was considerably higher than in 1954.

The Deep Creek mine of Goldfield Consolidated Mines Co. also was an important lead-zinc producer. The company annual report to stockholders stated that reserves profitable at prevailing metal prices were adequate only for about another year's operation due to the lower grade ore being mined at deeper levels, although favorable results from projected exploration could improve the reserve situation.

A fire in the inclined shaft on September 25 caused a shutdown until The Deep Creek ore was processed by the Sierra zinc mill, owned and operated by the same company. The Lead Trust open-pit mine in the area was acquired by the firm on October 1 at a cost of \$25,000 by purchase from the Cater Estate of Spokane and A. C. Nieman, lessee, of Colville. Operations began October 5 after mining equipment (including a %-yard Lima shovel, portable compressor, drills, miscellaneous tools, and shed shelters for equipment) was moved in. Work for the year was suspended on November 14 because of weather conditions, but it was planned to continue exploration in the spring of 1956 to develop the vein in length and depth.

A. C. Nieman recorded a small production from the Lead Trust mine in the summer and also operated the Admiral zinc mine and mill,

owned by Admiral Consolidated Mines Co. of Spokane.

Thurston.—Stone for road maintenance was quarried and crushed by contractors for the State highway commission, and county road crews prepared paving and road gravel. Two Centralia operators, Stoker Coal Mining Co. and Tono Coal Mining Co., reported output Production of peat was reported by three companies, all near Olympia.

Wahkiakum.—Basalt was quarried and crushed into riprap by L. E. Holback under contract to the State highway commission.

Walla Walla.—At the Attalia and Walla Walla pits Jones-Scott Co. prepared building and paving sand and gravel and a small quantity of structural sand. State highway crews obtained riprap and roadstone from a contractor. County road crews produced gravel and traprock for roadwork.

Whatcom.—Whatcom County ranked fourth in total value of nonmetal mineral production and fifth in output value for stone. Limestone from the Kendall quarry, Maple Falls, and clay of local origin were utilized by Olympic Portland Cement Co., Ltd., of Bellingham in manufacturing cement. Company production for 1955 was slightly

higher than in the previous year.

Limestone for consumption at paper mills was mined and processed by Mitchell Bay Lime Co. of Seattle. Railroad ballast, as well as building and paving sand and gravel, was produced by three firms within the county. The city of Bellingham used conglomerate rock and sand and gravel for street maintenance. County highway crews mined paving gravel for the maintenance of county roads.

A small output of coal was recorded at the Bellingham No. 1 mine

of Bellingham Coal Mine Co. before its abandonment July 1.

Whitman.—Basalt was crushed for road metal by Frank G. Baulne, Inc., as well as by contractors, for the State and county road maintenance agencies. Sand and gravel was produced by Foley Ready-Mix Co. of Colfax for structural and paving purposes, and gravel was prepared by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co. for railroad ballast.

Yakima.—Ten commercial operations reported production of sand and gravel for construction and road-building purposes; one company also processed railroad ballast. Dimension granite for flagging was quarried by Joe Marston at the Mount Adams Sheet Rock quarry near Glenwood. State and county highway workers utilized crushed basalt for road-stone. Clay, for use in manufacturing heavy clay products,

was mined locally by Granger Clay Products Co., Yakima.

# The Mineral Industry of West Virginia

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the West Virginia Geologic and Economic Survey.

By James R. Kerr 1 and Jean A. Pendleton 2



ALUE of mineral production in West Virginia in 1955 increased 19 percent compared with 1954. The rise in State value was primarily due to a 21-percent increase in value of coal production, which represents 86 percent of State mineral wealth. Other commodities increasing in value of output were: Clay (77 percent), lime (55 percent), sand and gravel (17 percent), natural gas (9 percent), natural-gas liquids (14 percent), and calcium chloride (65 percent). The output of salt and cement also increased in 1955. Petroleum and stone both decreased 17 percent in value of production.

Production was reported from 46 counties in 1955. The principal counties, in order of decreasing value of output, were: McDowell, Logan, Wyoming, Raleigh, Marion, and Kanawha.

TABLE 1.—Mineral production in West Virginia, 1954-55 1

	1	954	1955		
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	
Clays Coal Natural gas Natural gas liquids: Natural gasoline LP-gases LP-gases Sait (common) Sand and gravel Stone Value of items that cannot be disclosed: Abrasive stones (1955), bromine, calcium magnesium chloride, cement, lime, calcareous marl, and recovered sulfur	140 004	\$1, 450, 539 541, 369, 652 45, 601, 000 2, 593, 000 5, 035, 000 8, 500, 000 2, 885, 696 8, 351, 153 11, 743, 440	707, 433 139, 167, 889 212, 403 35, 756 286, 871 2, 320 638, 390 5, 171, 399 5, 898, 585	\$2, 563, 289 653, 388, 287 49, 915, 000 2, 352, 000 6, 376, 000 7, 080, 000 3, 476, 352 9, 779, 288 9, 714, 168	
Total West Virginia 2		636, 311, 000		755, 512, 000	

Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
 Total has been adjusted to avoid duplication in the value of clays and stone.

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# REVIEW BY MINERAL COMMODITIES

## MINERAL FUELS

Coal.—Coal production in West Virginia in 1955 increased 20 percent over the preceding year. Renewed demand caused a general nationwide upswing in coal production from the low of 1954. The iron and steel industry and electric utilities consumed increased quantities of coal, and the export market gained as western Europe

called for increased quantities of American coking coals.

West Virginia continued as leading producer of bituminous coal in 1955. Of the 1,247 mines producing in 1955, 996 were underground; 178, strip; and 73, auger. Ninety percent of State underground production was loaded by mechanical means. Mobile loaders were the chief mechanical loading devices, accounting for 86 percent of production that was mechanically loaded: into shuttle cars, 65 percent; mine cars, 15 percent; and onto conveyors, 6 percent. The remaining mechanical loading was done by continuous miners (6 percent) and by self-loading conveyor or hand-loaded onto conveyors (8 percent). Mechanical cleaning plants processed 60 percent of State production; 55 percent, wet-washing methods; and 5 percent, pneumatic means. Twenty-nine percent was crushed, and 16 percent was treated for dust-allaying and antifreezing purposes, using principally oil and calcium chloride.

Logan County led in coal production; output increased 36 percent over 1954. McDowell County ranked second as production increased 17 percent. Other leading counties were: Wyoming, Kanawha, Marion, Raleigh, Harrison, Mingo, Monongalia, Fayette, Boone, and Nicholas. Of 38 coal-producing counties in West Virginia, 20 supplied more than 1 million tons each in 1955. Underground mining predominated because of rugged terrain; strip mining contributed 7 percent and auger mining 2 percent to the State total.

Optimism characterized the business atmosphere in the coal-mining industry in West Virginia in 1955 as it planned mergers, opening of new mines, and the purchase of coal-underlain properties. West-moreland Coal Co. and Eastern Gas & Fuel Associates opened new, highly mechanized mines. Pocahontas Fuel Co. leased approximately 19,000 acres of valuable coal land in Wyoming County in conjunction with the company long-range expansion program. Of special interest in the mechanization field was the announcement by Amhurst Coal Co., Lundale, W. Va., of the installation of a German coal planer at the No. 4 mine, Accoville, W. Va. The planer operates at a 450-foot longwall face and marks one of the early attempts to utilize the machine in the more friable coal seams in this country.

Coke and Coal Chemicals.—Five oven-coke plants were active in West Virginia in 1955, containing 772 slot-type ovens. Other cokemaking facilities included 703 beehive ovens of which 398 were in operating condition as of December 31; during the year 132 were abandoned or dismantled. A total of 4,438,900 tons of coke, valued at \$58,694,400 was produced (including beehive). Sixty-five percent of coal received by oven-coke plants was mined in Pennsylvania; the remaining 35 percent was obtained in West Virginia. Ninety-four percent of coke production was consumed by producers principally in blast

TABLE 2.—Coal production, 1954-55, by counties, in short tons

	195	4	195	5
County	Total production	Average value per ton	Total production	Average value per ton
Barbour	3, 038, 119 5, 810, 131	\$3.94 4.54	3, 467, 711 6, 381, 116	\$3.93 4.74
Braxton Brooke Clay Fayette	(1)	4.15 4.29	126, 132 972, 085 1, 078, 855	3. 18 4. 30 4. 24
Gilmer Grant Greenbrier	5, 740, 106 71, 649 73, 969 1, 111, 964	5.39 2.87 4.64 4.50	7, 410, 756 150, 691 65, 403 1, 241, 348	4. 79 3. 25 4. 56 4. 45
Harrison Kanawha Lewis	7, 416, 694 7, 761, 560 624, 540	3. 68 4. 56 3. 12	8, 425, 514 9, 088, 770 917, 170	3. 67 4. 53 3. 12
Logan McDowell Marion Mason	15, 406, 695 16, 122, 550 8, 657, 985 185, 567	4. 32 5. 75 4. 79 3. 25	20, 939, 549 18, 848, 329 9, 040, 725	4. 53 5. 62 4. 90 2. 92
Mercer Mineral Mingo	1, 371, 447 63, 445 6, 798, 130	5. 19 4. 38 4. 41	152, 338 1, 719, 554 36, 076 8, 298, 934	5. 20 3. 56 4. 66
Monongalia Nicholas Pocahontas Preston	6, 815, 201 4, 276, 731 370, 656	4. 05 4. 52 4. 25	7, 847, 694 5, 569, 659 366, 533	4, 09 4, 50 5, 97
Toston Putnam Saleigh Sandolph	2, 043, 513 63, 625 6, 679, 717 1, 060, 831	3.36 4.53 5.23 5.14	2, 402, 412 28, 640 8, 548, 631 1, 256, 851	3. 27 3. 99 5. 33 5. 24
Faylor Fucker Joshur	455, 891 104, 600 1, 126, 225	3. 02 4. 64 3. 69	287, 580 (1) 1, 321, 447	2. 97 3. 71
Vayne Vebster Vyoming Indistributed 2	177, 820 588, 552 8, 697, 979 1, 988, 999	3. 27 5. 58 4. 92 4. 43	125, 290 856, 048 10, 522, 890 1, 673, 158	3. 72 5. 61 5. 03 4. 16
Total	115, 996, 041	4. 67	139, 167, 889	4. 70

<sup>&</sup>lt;sup>1</sup> Included with "Undistributed" to avoid disclosing individual company figures.
<sup>2</sup> Includes the following counties: Clay (1954), Hancock, Lincoln, Marshall, Ohio, Summers, and Tucker (1955).

TABLE 3.—Coal production in West Virginia, 1946-50 (average) and 1951-55

Year	Thou- sand short tons	Value (thou- sand dollars)	Value per ton	Year	Thou- sand short tons	Value (thou- sand dollars)	Value per ton
1946–50 (average)	151, 153	730, 530	\$4. 83	1953	134, 105	693, 594	\$5. 17
	163, 310	853, 894	5. 23	1954	115, 996	541, 370	4. 67
	141, 713	741, 421	5. 23	1955	139, 168	653, 388	4. 70

furnaces and for other purposes. The remaining 6 percent was either sold commercially or added to producers' stocks. Other products of slot-type coke ovens were: 67,216,899,000 cubic feet of coke-oven gas; 114,374,000 pounds of ammonium sulfate; 59,962,021 gallons of coke-oven tar; and 18,514,000 gallons of crude light oil, which yielded 9,971,000 gallons of benzene, 2,703,000 gallons of toluene, 746,000 gallons of xylene, and 181,000 gallons of solvent naphtha.

Petroleum and Natural Gas.—Production of natural gas was second in value in West Virginia in 1955, increasing 11 percent over 1954. Output of petroleum, however, dropped 20 percent, declining from fourth to seventh in State mineral value. Value of output of natural-

gas liquids increased 14 percent in 1955, owing primarily to a 27percent increase in LP-gas value. Value of natural-gasoline output decreased 9 percent. During the year there were 610 well completions—77 oil, 432 gas, and 101 dry holes. Thirty of these completions were wildcat wells, of which 11 found natural gas and 19 were dry. The remaining completions were developments of existing fields. Total footage drilled was 1,605,000 feet; average per well was 2,505 feet. Depth classification of the wells drilled was as follows: Under 1,250 feet—20; between 1,250 and 2,500 feet—344; between 2,500 and 3,750 feet—167; between 3,750 and 5,000 feet—96; and between 5,000 and 7,500 feet—12. There was also 1 completion in the 12,500- to 15,000-foot range. Of the total wells drilled, 621 were cable-tool completions, and 19 were rotary-drill completions.3 Proved reserves as of December 31, 1955, were: Crude oil-47,000,000 barrels; natural gas-1,565 billion cubic feet; and natural-gas liquids-30,526,000 barrels.4 **METALS** 

Iron and Steel.—Active in West Virginia in 1955 were 5 blast-furnace stacks, 13 open-hearth furnaces, and 1 crucible or electric Weirton Steel Co. was the leading iron and steel producer. Annual pig-iron capacity of the 4 company blast-furnace stacks was 2.1 million tons; annual steel capacity of the 13 open-hearth furnaces was 2.8 million tons. Wheeling Steel Corp. at Benwood was the only other pig-iron producer. West Virginia Steel & Manufacturing Co. at Huntingdon was the second steel producer.5

#### **NONMETALS**

Cement.—Cement was produced in 1955 by Standard Lime & Cement Co. at Martinsburg, Berkeley County, and by Alpha Portland Cement Co. at Manheim, Preston County. Raw material, except gypsum, for these plants was obtained locally.

Clays.—Output of clay in West Virginia in 1955 increased 20 percent in quantity and 77 percent in value over 1954. Largest increase was in fire-clay production; 40 percent more fire clay was mined in 1955 than in 1954. The increased value was due to the greater average unit value (\$4.13 per ton in 1954 to \$6.00 in 1955) assigned to fire clay used by producers. Hancock and Kanawha Counties led in fire-clay production; Globe Brick Co., Newell, was the leading producer. Fire clay was primarily used in manufacturing refractories, mainly firebrick and block, and fire-clay mortar; the other large use was in manufacturing heavy clay products, such as building and paving brick and tile and draintile. Miscellaneous-clay production increased only 2 percent over the preceding year. Berkeley and Cabell Counties led in miscellaneous clay production; United Clay Products Co., North Mountain, and Continental Clay Products Co., Martinsburg, were the leading producers. Miscellaneous clay was used for manufacturing heavy clay products and in producing cement.

<sup>3</sup> Oil and Gas Journal, Annual Review Forecast: Vol. 54, No. 39, Jan. 30, 1956.
4 American Gas Association and American Petroleum Institute, Proved Reserves of Crude Oil, Natural Gas Liquids, and Natural Gas: Joint publication, Dec. 31, 1955.
5 American Iron and Steel Institute. Annual Capacities of Coke Ovens, Blast Furnaces and Steel Making Furnaces, January 1, 1956.

TABLE 4.—Clays sold or used by producers, 1946-50 (average) and 1951-55

Year	Fire	clay	Miscellaneous clay		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1946-50 (average)	278, 614 732, 492 621, 996 677, 005 290, 256 406, 025	\$763, 120 1, 923, 872 2, 072, 688 2, 213, 376 1, 171, 495 2, 277, 163	297, 347 371, 154 360, 034 291, 833 296, 864 301, 408	\$218, 431 371, 154 348, 981 275, 562 279, 044 286, 126	575, 961 1, 103, 646 982, 030 968, 838 587, 120 707, 433	\$981, 551 2, 295, 026 2, 421, 669 2, 488, 938 1, 450, 539 2, 563, 289

Lime.—Quantity and value of lime production in 1955 increased 48 and 55 percent, respectively, compared with 1954. Output was used principally in chemical plants and other industries and as a refractory material; lesser quantities were used in construction and agriculture. The leading producers were Standard Lime & Cement Co., with plants at Martinsburg, Berkeley County, and at Millville and Bakerton, Jefferson County; and Jones & Laughlin Steel Corp., with plants at Martinsburg, Berkeley County, and at Harpers Ferry, Jefferson County.

Magnesium Compounds.—Standard Lime & Cement Co. produced refractory magnesia from raw dolomite in Millville, Jefferson County.

Marl, Calcareous.—West Virginia Lime Co. produced calcareous marl for agricultural purposes from a pit in Jefferson County near Charles Town. Production was curtailed somewhat during the year owing to excessively wet weather.

Natural Salines.—Westvaco Chlor-Alkali Division of Food Machinery & Chemical Corp. produced bromine, bromine compounds, and calcium chloride from brines obtained from wells near South Charleston, Kanawha County.

Salt.—Four companies produced salt in the form of well brines in 3 counties in 1955. Output increased 35 percent compared with 1954. Part of the brine output was converted into evaporated salt by open-pan and vacuum-pan methods, but the greater part was consumed as brine in manufacturing chemicals. Marshall County led in salt output; principal companies were Columbia Southern Chemical Corp. near New Martinsville, south of Marshall County in Wetzel County; and Allied Chemical & Dye Corp. at Moundsville, Marshall County. Food Machinery & Chemical Corp. also produced brine from wells near South Charleston in Kanawha County.

Sand and Gravel.—In 1955, more than half of the 32 sand and gravel plants in West Virginia produced at dredges on rivers in the State. The greater part of State output was utilized for building and paving purposes; considerable glass sand was produced; other uses included engine sand, molding sand, and railroad-ballast gravel. Hancock and Morgan Counties led in sand and gravel output. The leading producers were the Dravo Corp. Nos. 8 and 9 dredges, near Moscow, Hancock County, and Pennsylvania Glass Sand Corp. quarry and plant near Berkeley Springs, Morgan County.

TABLE 5.—Sand and gravel sold or used by producers, 1954-55, by uses

Use	19	1954		1955	
	Short tons	Value	Short tons	Value	
Sand: Building Paving Engine Gravel: Building Paving Railroad ballast Other	678, 829 660, 624 157, 771 635, 651 613, 441 26, 142	\$904, 038 709, 287 292, 833 781, 411 669, 631 25, 777	800, 105 1, 191, 328 203, 058 774, 681 657, 737 (1) 122, 139	\$1, 080, 401 1, 305, 433 350, 391 929, 238 750, 517 (1) 164, 540	
Undistributed 3	1, 301, 533	4, 968, 176	1, 422, 351	5, 198, 768	
Total	4,073,991	8, 351, 153	5, 171, 399	9, 779, 288	

<sup>&</sup>lt;sup>1</sup> Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
<sup>2</sup> Includes glass sand, molding sand, grinding and polishing sands, blast sand (1955), fire or furnace sand (1955), and other sand.

Stone.—Crushed limestone, the principal stone produced in West Virginia in 1955, was used for blast- and open-hearth furnance flux (48 percent), concrete aggregate and roadstone (23 percent), railroad ballast (2 percent), agricultural purposes (1 percent), and all other uses, including limestone used in manufacturing cement and lime (26 percent). A small quantity of sandstone was also produced. Jefferson County led in stone production, followed by Berkeley and Greenbrier Counties. The following iron- and steel-manufacturing companies were leading stone producers: Blair Limestone Division of Jones & Laughlin Steel Corp. at quarries at Martinsburg, Berkeley County, and Harpers Ferry, Jefferson County; and the Michigan Limestone Division of United States Steel Corp. at the Molar Quarry at Mill-ville, Jefferson County.

TABLE 6.—Crushed and broken stone sold or used by producers, 1954-55, by uses

Use	19	54	1955		
<b>USC</b>	Short tons	Value	Short tons	Value	
Flux (limestone) Concrete and roadstone Railroad ballast Agriculture (limestone) Other 1 Undistributed 2	2, 419, 318 2, 940, 453 485, 979 94, 028 164, 995 1, 210, 161	\$3, 934, 239 4, 850, 253 575, 647 241, 603 499, 443 1, 642, 255	2, 813, 611 1, 374, 743 141, 196 57, 666 182, 184 1, 329, 185	\$4, 689, 624 2, 188, 805 200, 494 133, 152 564, 401 1, 937, 692	
Total	7, 314, 934	11, 743, 440	5, 898, 585	9, 714, 168	

Limestone for miscellaneous uses.
 Includes limestone for cement and lime, ground sandstone (1954), and refractory stone (1954).

Sulfur.—The Methods Division of E. I. duPont de Nemours & Co., Inc., at Belle, Kanawha County, produced brimstone, using the Koppers process. Olin Mathieson Chemical Corp., Morgantown, Monongalia County, produced liquid sulfur, using the coke process in the liquid purification of gas.

## **REVIEW BY COUNTIES 6**

Barbour.—Production of bituminous coal in Barbour County increased slightly compared with 1954. The principal producers, in order of decreasing output, were the four underground mines of Compass Coal Co., the strip and auger pits of Grafton Coal Co., the underground mines of Simpson Coal & Chemical Corp. and Bethlehem Cuba Iron Mines Corp., the strip pit of Coleman & Gay, Inc., the underground mine of Mountain Fuel Co., the strip and auger opera-

TABLE 7.—Value of mineral production in West Virginia, 1954-55, by counties 1

County	1954	1955	Minerals produced in 1955 in order of value 2
Barbour	\$11,968,108	\$13, 618, 174	Coal.
Berkeley	(3)	9, 339, 616	Cement, stone, lime, clays.
Boone	26, 371, 760	30, 252, 129	Coal.
Braxton	187, 394	401, 327	Do.
Brooke Cabell	(3)	4, 497, 622	Coal, sand and gravel.
Clay		565, 271	Sand and gravel, clays.
Fayette	8	4, 569, 073	Coal. Coal, sand and gravel.
Gilmer	205, 422	489, 597	Coal.
Grant	349, 444	(3)	Coal, lime.
Greenbrier	6, 638, 122	7, 011, 322	Coal, stone.
Hancock	(3)	(3)	Clay, sand and gravel, coal, stone.
Hardy	`31,000	(3)	Stone.
Harrison	27, 300, 166	30, 957, 419	Coal.
Jackson	(3)	47, 691	Sand, and gravel, abrasive stones.
efferson	(3)	(3)	Stone, lime, calcareous marl.
Kanawha	38, 211, 651	44, 150, 070	Coal, salt, bromine, sand and gravel clay, calcium magnesium chloride recovered elemental sulfur.
Lewis	1,957,993	2, 873, 412	Coal, clay.
incoln	(1)	2,010,412	Sand, and gravel, coal.
ogan	66, 578, 618	94, 848, 884	Coal.
Marion	41, 458, 329	44, 268, 079	Do.
Marshall	(3)	(3)	Coal, salt.
Mason	684, 900	(3)	Do.
McDowell	92, 771, 783	105, 920, 522	Coal, clay.
Mercer	7, 274, 340	9, 076, 810	Coal, stone, clay.
Mineral	277, 913	153, 600	Coal, stone.
Mingo	(3)	(3)	Coal, sand and gravel.
Monongalia	28, 973, 266	33, 015, 365	Coal, stone, sand and gravel, recovered elemental sulfur.
Morgan	(3)	(3)	Sand and gravel.
Vicholas	9	(3)	Coal, sand and gravel.
PhioPhioPhio	1 575 004		Do.
reston	1, 575, 064 8, 840, 689	2, 189, 918	Coal.
utnam	507, 794	9, 962, 334 114, 273	Coal, cement, stone. Coal.
Raleigh	(3)	(3)	Coal, sand and gravel.
andolph	5, 626, 811	6, 762, 425	Coal, stone.
ummers	(1)	(3)	Coal.
aylor	is	853, 069	Do.
ucker	484, 930	(3)	Coal, sand and gravel.
yler	(3)		o out, suita una gravou
pshur	(3)	4, 911, 178	Coal, clay.
Zayne	(3)	488, 457	Coal, sand and gravel
Vebster	3, 282, 167	4, 805, 674	Coal.
Vetzel	278, 276	(8)	Sand and gravel.
VoodVyoming	224, 484 (³)	313, 731 52, 919, 776	Do. Coal.
m-1-1	070 000 15:		
Total Undistributed	372, 060, 424	519, 376, 818	•
Unaistributed	264, 250, 251	246, 135, 312	
Grand total	636, 311, 000	755, 512, 000	

The following counties were not listed because no production was reported: Calhoun, Doddridge, Hampshire, Monroe, Pendleton, Pleasants, Ritchie, Roane, and Wirt.
 Fuels, including natural gas, natural gas liquids, and petroleum, included with "Undistributed."
 Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

Excludes petroleum, natural gas, and natural-gas liquids. County data for these commodities are not

tions of Martino Marino, the C & P Coal Co. strip pit, and the underground mines of Queen Bros. Coal Co. and Harris Coal Co.

Berkeley.—Berkeley was the larger of two cement-producing counties; Standard Lime & Cement Co., near Martinsburg was the

only producer.

The county ranked second among the nine stone-producing counties of West Virginia. The principal producers of limestone were Jones & Laughlin Steel Corp., Blair Limestone Division Martinsburg plant, the leading producer; Standard Lime & Cement Co. South Quarry plant; and the W. S. Frey Co. quarry. All these were near Martinsburg. Output was used in blast furnaces and open hearths. in manufacturing concrete and for railroad ballast.

Standard Lime & Cement Co. and Jones & Laughlin Steel Corp. also produced lime for building, agricultural, chemical, and industrial

purposes.

Berkeley County was the second-ranking clay-producing county in West Virginia in 1955. United Clay Products Co., North Mountain, the leading producer, and Continental Clay Products Co.. Martinsburg, mined miscellaneous clay at open pits for use exclusively

in heavy clay products.

Boone.—Of the 37 coal-producing counties in West Virginia, Boone County ranked 11th and increased its production 10 percent over 1954. Bituminous coal was almost entirely mined underground. Principal properties were Eastern Gas & Fuel Associates, Red Parrott Coal Co., Armco Steel Corp., Youghiogheny & Ohio Coal Co., West-moreland Coal Co., Glogora Coal Co., Ridgeview Coal Co., Spruce River Coal Co., Drawdy Mountain Coal Co., and Orlandi Coal Co. Red Parrott Coal Co. also operated an auger mine, and Westmoreland Coal Co. worked a strip mine.

Braxton.—Coal output from Braxton County in 1955 more than doubled in value compared with 1954. Output was mined underground by Barnett & Long Coal Co., Ideal Coal Corp., Cedar Creek Coal Co., Burnsville Coal Co., Long Coal Corp., Bennett & Bennett

Coal Co., Garman-Pullen Coal Co., Inc., and R & S Coal Co.

Brooke.—More strip pits than underground mines were active in Brooke County in 1955. However, tonnage from strip mining supplied only one-third of county production. Windsor Power House Coal Co. contributed most of the deep-mined coal; Beech Bottom Coal Co., Liberty Colliery Co., Inc., and Fireside Fuel Co. followed in order of decreasing output. K & P Construction Co. was the leading strip producer, followed by Huberta Coal Co., W. Va. & Pittsburgh Coal Co., Stefkovich Bros., Sam Area, and Taylor & Hercules Coal Co.

Brooke County ranked fifth among the 17 sand-and-gravelproducing counties in West Virginia in 1955. Duquesne Sand Co. was the leading producer of sand and gravel near Wellsburg for building and paving purposes. Brilliant Sand Co. produced sand near Follansbee for fire and furnace use.

Cabell.—Cabell County ranked fourth in clay production and sixth in sand and gravel production in 1955. Barboursville Clay Manufacturing Co. mined the entire county clay output from its open-pit mine near Barboursville. Miscellaneous clay was used exclusively for heavy clay products. West Virginia Paving & Pressed Brick Co., active in 1954, reported no production in 1955.

Sand and gravel, used for building and paving purposes, was produced by Ohio River Dredging Co., Crown City; Union Sand & Gravel Co., Huntington; and Huntington Gravel & Supply,

Huntington.

Clay.—Coal was the only mineral produced in Clay County in 1955. Underground mines yielded virtually the entire county output. Elk River Coal & Lumber Co. was the leading producer, followed in order of decreasing output by Chemical Coal Co., Osborne Bros., Hickman Lumber Co., and Wriston Coal Co. Eel River Mining Co.

obtained a small tonnage from its strip and auger mines.

Fayette.—Fayette County ranked 10th in 1955 in West Virginia coal production. Underground mines yielded 93 percent of the county output. Principal underground mines, in order of decreasing output, were: New River Co., Semet Solvay Division Allied Chemical & Dye Corp., New River & Pocahontas Consolidated Coal Co., Eastern Gas & Fuel Associates, Southern Coals Corp., Milburn By-Products Coal Co., Ames Mining Co., Electro Metallurgical Division of Union Carbide & Carbon Corp., Royalty Smokeless Coal Co., and Gauley Mountain Coal Co. Southern Coals Corp. also produced almost one-half of the county strip-mining output. Maryland Coal & Coke Co. purchased the Branch Fuel Co., Laurel Smokeless Coal Co., Fire Creek Fuel Co., and the two properties of Alaska Coal Co. during the year. The 5 acquisitions are expected to produce about 20,000 tons of coal a month.

Sun Sand Co. near Thayer, the leading producer, and Elbert Smailes near Rainelle east of Fayette County in Greenbrier County produced sand and gravel in the county for use as glass sand and

engine sand and in building and paving.

Gilmer.—The R & H Coal Co. strip and auger mines supplied more than three-fourths of the bituminous-coal output from Gilmer County in 1955. The underground mines of G. & L Coal Co., L & D Coal Co., and Smith Coal Co. furnished the remaining prduction. No other mineral was produced in the county during the year.

Grant.—Bituminous coal and lime were produced in Grant County in 1955. Underground coal producers were Stony River Coal Co., Taylor Coal Co., Mount Storm Coal Co., Riverside Coal Co., Joes Run Coal Co., Walter S. Arnold, Abernathy Coal Co., and Paul Kuhn. Dipple & Dipple Coal Co., Taylor Coal Co., and Murphy Bros. Coal Co. produced from strip mines.

Oscar Keplinger quarried limestone near Maysville for use in

agriculture.

Greenbrier.—Greenbrier County ranked third in output of coal and stone in 1955. The leading underground coal producers were Left Fork Fuel Co., Raine Lumber & Coal Co., Lafayette Springs Coal Co., Wilpen Coal Co., Betty-Paige Smokeless Coal Co., and Midland Coal Co. Larger strip pits were operated by Burn Rite Coal Co., Lafayette Springs Coal Co., H. R. Gifford Coal Co., Beckley Coal & Coke Co., and Cobb Coal Co.

The Acme Limestone Co. Snowflake quarry near Fort Spring yielded the greatest quantity of limestone; other producing quarries were H. Frazier Co., Inc., Fort Spring and Fullens Stone Quarry, Lewisburg. Output was used mostly for concrete aggregate and rail-

road ballast.

Hancock.—Hancock County led in output of clay and sand and gravel in the State in 1955. A small quantity of coal was also produced. The leading fire-clay producer was Globe Brick Co., Newell. Crescent Brick Co., Inc., and West Virginia Fire Clay Manufacturing Co., New Cumberland, ranked second and third, respectively. Globe Brick Co. entire production was used for ladle brick. Mortar, firebrick and block, and foundries claimed the remainder of county output.

The entire output of sand and gravel for building and paving purposes was dredged from the Dravo Corp. Keystone Division Nos. 8 and 9 near Moscow.

The underground mine of A. A. A. L. W. Mining Corp. and the

strip pit of M & F Coal Co. produced coal in the county in 1955.

Hardy.—Limestone, the only mineral commodity produced in Hardy County, was quarried for use in concrete and agriculture by Beans Lime & Stone, Inc., near Petersburg, west of Hardy County

in Grant County.

Harrison.—Harrison County produced bituminous coal and ranked seventh in coal production in the State. Although the county production was mined mostly underground, Harrison led West Virginia counties in strip mining, producing one-fourth of the State strip output. Consolidation Coal Co. Division of Pittsburgh Consolidation was the leading underground producer. Compass Coal Co., Barnes Dawson Coal Co., Robey Run Coal Co., Acme Coal Co., and McCandish Coal Co. followed in order of decreasing tonnage. Strip producers were Tasa Coal Co., L. E. Cleghorn, B. H. Swaney, Inc., Keeley Construction Co., and Yochym Bros. Coal Co. Tasa Coal Co., L. E. Cleghorn, and Keeley Construction Co. also produced from auger mines. Clinchfield Coal Co. purchased the Ten-Mile mine from Haywood Coal Co. and began constructing a cleaning plant. Upon completion in 1956, the mine is expected to produce 5,000 tons of coal per day.

Jackson.—Ravenswood Sand & Gravel Co produced sand and

gravel for paving purposes at a fixed plant in Ravenswood.

The only grindstone in the State was quarried by Constitution

Stone Co.

Jefferson.—Jefferson, the leading stone- and lime-producing county, was also the only county where calcareous marl was mined. Seventyseven percent of the limestone quarried was used as a flux for blast furnaces. Open-hearth-furnaces flux, concrete aggregate, railroad ballast, glass manufacture, and agstone claimed the remaining output. Producers, in order of decreasing output, were: the Moler quarry of Michigan Limestone Division, United States Steel Corp., Millville; Millville quarry of Blair Limestone Division Jones & Laughlin Steel Corp., Harpers Ferry; and the Millville and Bakerton quarries of Standard Lime & Cement Co. at Millville and Engle, respectively.

Over two-thirds of the State lime value came from the Millville and Bakerton plants of Standard Lime & Cement Co. at Millville and Bakerton, respectively, and the Millville plant of Blair Limestone Division Jones & Laughlin Steel Corp. at Harpers Ferry, Jefferson

The State output of calcareous marl was mined by West Virginia Lime Co. near Charles Town and was used for agricultural purposes. Kanawha.—More minerals were produced in Kanawha County than in any other county in West Virginia in 1955. Coal was the leading commodity; salt, natural salines (bromines and calcium chloride), sand and gravel, clay, and recovered elemental sulfur followed, in order of decreasing value. Coal production increased 17 percent in 1955 over 1954; almost 90 percent was mined underground. Truax-Traer Coal Co., Carbon Fuel Co., and Valley Camp Coal Co., were by far the leading producers. Cannelton Coal & Coke Co., Amherst Coal Co., Imperial Colliery Co., Warner Collieries Co., Central Appalachian Co., Fields Creek Coal Co., and Wyatt Coal Co. also mined coal in 1955.

The Westvaco Chlor-Alkali Division of Food Machinery & Chemical Corp. near South Charleston remained the sole producer of salt and

natural salines used exclusively for manufacturing chlorine.

Pfaff & Smith Builders Supply Co., Charleston, was the leading sand and gravel producer; St. Albans Sand Co. (calvert), Zenith Sand Co., Inc. (Alum Creek), and Charleston Sand Corp. (Big Chimney) were other producers. Output was used for building and paving purposes and engine sand.

West Virginia Brick Co. near Charleston and Charleston Clay Products Co. near Barlow Station mined fire clay from underground pits for use in manufacturing heavy clay products.

E. I. Dupont de Nemours & Co., Inc. at its Belle Works plant, Belle, W. Va., recovered elemental sulfur in the liquid purification of

gas.

Lewis.—Seventy-five percent of the coal produced in Lewis County was strip-mined at the pits of Bitner Fuel Co., Keeley Construction Co., Swaney Contracting Co. (leading producer), Grafton Coal Co., Howard Coal Mining Co., Inc., Marino Coal, and King Bros. Coal Co. A considerable output came from the Bitner Fuel Co. auger mine. At the only underground mine in the county, Weston State Hospital produced and utilized coal for heating purposes.

The Weston Brick & Coal Co. (Weston) and Jane Lew Brick & Tile Co. (Jane Lew) pits yielded miscellaneous clay for use in heavy clay

products

Lincoln.—Sand and gravel was produced in Lincoln County from the dredges of Guyan River Co., Midkiff; Davis & Adkins Sand Co, and Dean Coal & Sand Co., Ferrellsburg; and Hal Dial & Sons, Branchland. Production dropped in 1955, as all companies were idle during part of the year. Output was used predominantly for engine sand. A small tonnage of coal was mined underground by Mud River Coal Co.

Logan.—Logan County was the leading bituminous-coal-producing area in West Virginia in 1955; output was over 20 million tons; 99 percent was mined underground. The principal companies, in order of declining tonnage, were: Island Creek Coal Co., Amherst Coal Co., Guyan Eagle Coal Co., Omar Mining Co., Powellton Coal Co., Lorado Mining Co., Jewell Eagle Coal Co., Boone County Coal Corp., Elk Creek Coal Co., Youngstown Mines Corp., and Jewell Ridge Coal Corp. Coal was the only mineral produced during the year.

Marion.—Marion County dropped from third to fifth place in coal production in West Virginia in 1955. Underground mines supplied virtually all the county tonnage (99 percent) Principal companies were: Bethlehem Cuba Iron Mines Co., Consolidation Coal Co. Divi-

sion of Pittsburgh Consolidation, and Eastern Gas & Fuel Associates. Other producers included: Rochester & Pittsburgh Coal Co., Joanne Coal Co., Jamison Coal & Coke Co., and Konya Coal Co. No other

mineral production was reported in the county in 1955.

Marshall.—Marshall County was the principal area for producing brine for chlorine, bleaches, and chlorides in 1955. Output was supplied by the wells of Columbia-Southern Chemical Corp., leading producer, near New Martinsville, south of Marshall County in Wetzel County, and the Solvay Process Division Allied Chemical & Dye Corp. near Moundsville.

Valley Camp Coal Co. was the sole large-quantity coal producer in the county; West Virginia Penitentiary also mined a small quantity in

1955.

Mason.—Bituminous coal and salt were the mineral commodities produced in Mason County in 1955. Coal was mined underground by Lieving Coal Co., Hudson Bros. Coal Co., Richard Coal Co., Inc., Orchard Coal Corp., J. F. Icenhower, and Moles Coal Co. Young Coal Co. mined at a strip pit.

Liverpool Salt Co. produced evaporated salt at the Hartford plant

for table salt, tanning, meat packing, and water softening.

McDowell.—McDowell County, the leading coal producer in 1954, dropped to second place in 1955. Ninety-five percent of the county coal output was mined underground. The leading producers, all mining over 1 million tons, were: United States Steel Corp., Pocahontas Fuel Co., Island Creek Coal Co., Olga Coal Co., Eastern Gas & Fuel Associates, and New River & Pocahontas Consolidated Coal Co. Other producers were: Peerless Coal & Coke Co., Page Coal & Coke Co., Nassau Coal Co., Jacobs Fork Pocahontas Coal Co., Lake Superior Coal Co., and Ashland Mining Corp.

Mercer.—Coal, stone, and clay were the minerals produced in Mercer County in 1955. Principal underground coal producers were: American Coal Co. of Allegheny County, Crozer Coal & Land Co., Winding Gulf Collieries, Inc., Weyanoke Coal & Coke Co., and Jeb Pocahontas Coal Co. Leading strip pit operators were: American Coal Co. of Allegheny County, Junior Pocahontas Coal Co., Dipple

and Dipple Coal Co., and Wyborn Coal Co.

Brown & Wright quarried sandstone near Princeton for use on

State roads.

Bluefield Linestone Co. produced crushed limestone near Bluefield for concrete and roadstone. This company consolidated with Road Materials, Inc., on November 30, 1955.

Miscellaneous clay was mined near Princeton by Virginian Brick &

Tile Co. for use in heavy clay products.

Mineral.—Coal was mined by the following producers: Pine Swamp Coal Co., Harding Coal Co., Lynwood Valley Coal Co., Logan Coal Co., Howard A. Bennett, Keller Coal Co., and Sugar Coal Co. Polino Coal Co. operated the only strip pit in the County.

Earl L. Spencer quarried limestone near Keyser for use in concrete

and roadstone.

Mingo.—Bituminous-coal production in Mingo County rose 22 percent in 1955. Underground mines of Island Creek Coal Co. and Red Jacket Coal Corp. were the foremost producers. Other producing

companies were Gay Mining Co., Sycamore Coal Co., Peter White Coal Co., Kimberling Collieries Co., Ames Coal Co., Lando Coal Corp., Burning Springs Collieries Co., and Puritan Coal Corp.
Rock Castle Sand Co. and Guyan Valley Sand Co. at Kermit and

Gilbert, respectively, produced sand and gravel for use as engine sand. Monongalia.—Monongalia County ranked ninth as a coal-producing county and was also an important area for producing stone and sand

and gravel. More than half the county output of bituminous coal was produced by Christopher Coal Co. Division of Pittsburgh Consolidation. Other leading companies were Valley Camp Coal Co., Trotter Coal Co., South Union Coal Co., Locksley Fuel Corp., Rosedale Coal Co., Bakers Ridge Coal Co., Lockview Coal Co., Smith Coal Co., and Lake Lynn Fuel Co.

Greer Limestone Co. at Greer produced and crushed limestone for use in road paving, rock dust for coal mines, stone sand, and agricul-

tural lime.

Deckers Creek Sand Co. near Greer produced sand for glass, engine, grinding, and polishing purposes.

Olin Mathieson Chemical Corp. recovered sulfur in the liquid

purification of gas at a Morgantown, W. Va., plant.

Morgan.—Near Berkeley Springs, Pennsylvania Glass Sand Corp. quarried Oriskany sandstone, which was ground for use principally as glass sand. The company also produced molding, blast, fire

and furnace, and engine sands.

Nicholas.—Nicholas County coal production increased 30 percent in 1955, with output predominantly from underground mines. Important producers in the county were Johnstown Coal & Coke Co., Peters Creek Coal Co., Imperial Smokeless Coal Co., Panther Coal Co. of West Virginia, Donegan Coal & Coke Co., and Tioga Coal Co. Most of the strip coal was mined from the pits of Tasa Coal Co. and Gauley Eagle Coal & Coke Co.

Sand for building purposes was produced by Nettie Sand Co. and Lorn & Clayton McMillion at a portable plant near Nettie.

Ohio.—Valley Camp Coal Co. produced most of the county coal output at two underground mines. Dependable Coal Co. produced the remainder.

The H. L. Seabright Co. Ohio River plant near Wheeling dredged

the county output of sand and gravel for use in construction.

Pocahontas.—Bituminous coal, the only mineral produced in Pocahontas County in 1955, was mined from the three underground mines of Maust Coal & Coke Co., the strip pit of Rich Sewell Coal & Coke Co., and the auger mine of Erickson & Bowers.

Preston.—In terms of value, bituminous coal was the most im-

portant commodity of Preston County in 1955. The county was also an important area in cement manufacture. Crushed limestone and sandstone were also quarried. Although coal was taken mostly from underground mines, the leading producers were the strip pits of Kingwood Mining Co. and Daugherty Coal Co., Inc. The principal underground producers, in order of decreasing output, were: Kray Coal Co., Brookside Mining Co., Inc., Preston County Coke Co.,

Sandy Creek Fuel Corp., Tunnelton Cooperative Coal Co., Industrial

Coal Co., Inc., and Mersing Coal Co., Inc.

Alpha Portland Cement Co. at Manheim manufactured cement and also quarried and crushed the limestone which was used to manufacture the cement.

Paul E. Garbart quarried sandstone from an open pit near Terra

Alta for use in concrete and as roadstone.

Putnam.—Bituminous coal was mined underground by the following companies in Putnam County in 1955: Zitzelsberger Mine, H. S. B. Thomas Coal Co., Roy Webster Mines, D. G. Thomas, John Massie,

and Hughes Coal Co.

Raleigh.—Raleigh County was the sixth-ranking coal-producing area in West Virginia in 1955. Production increased 28 percent over 1954; underground mines produced 93 percent of the output. Eastern Gas & Fuel Associates, New River Co., and Winding Gulf Collieries, Inc., were the leading producers. Armco Steel Corp., Slab Fork Coal Co., Lillybrook Coal Co., C. H. Mead Coal Co., Gulf Mining Co., and Amigo Smokeless Coal Co. also mined in 1955. Eastern Gas & Fuel Associates began constructing a completely mechanized mine near Helen, W. Va., which is expected to start producing 1,500 tons a day early in 1956.

Grandview Sand Co. at Grandview produced crushed sand for use in making silica brick and at its plant near Beaver (which was permanently shut down during the year) also produced sand for building purposes and gravel for paving. The Table Rock Sand Co. plant near Beaver also produced sand for use in building and paving.

Randolph.—Coal and limestone were the mineral commodities produced in Randolph County in 1955. Bethlehem Cuba Iron Mines was the leading producer at a strip and underground mine. Other major producing properties were the strip mines of Peerless Coals, Inc., Roaring Creek Coal Co., Inc., and Lewis Mining Co. and the underground mines of Three Fork Coal Co., Inc., Norton Coal Co., Demotto Coal Co., Ralph M. Roy, and Tucker County Coal Co., Inc. Elkins Limestone Co. produced crushed limestone near Elkins for

use in making concrete and roadstone.

Summers.—Bituminous coal mined by Springdale Coal Co. and Flanagan Lumber Co. constituted the entire mineral production of Summers County in 1955. Watts Fuel Co. leased several hundred acres near Hinton and planned to begin coal mining by early 1956.

Taylor.—Two-thirds of the bituminous-coal production of Taylor County in 1955 was mined underground. The leading underground producers were: Wendel Coal Co., Del-Marga Coal Co., Mason Bros., Mearns Mining Co., Kerns Coal Co., and Dorothy Coal Co. The strip pits of Sinsel Coal Co. and Green Valley Mining Co. were also active during the year.

Hammond Brick Co. went out of business during the year.

clay production was reported in the county in 1955.

Tucker.—The strip pit of Zianti & Sons and the underground mine of Pierce Coal Co. produced the only bituminous coal in Tucker County in 1955.

Fairfax Sand & Crushed Stone Co. produced sand for use as engine sand and for paving purposes at a fixed plant near Thomas, W. Va.

Upshur.—Coal and clay were mined in Upshur County in 1955. Principal coal producers were: Reppert Fairmont Coal Co., Pecks Run Coal Co., Badger Coal Co., Inc., Hacker's Creek Coal Co., Inc., Redstone Coal Mining Co., Inc., Wilson Coal Co., S. M. Miller Coal Co., La Rosa Fuel Co., and Bennett Coal Co., Inc. Casella Coal Co. produced most of the county strip-mined coal.

Buckhannon Brick Co. mined fire clay from an open pit near Buckhannon, which was used in manufacturing building tile and brick and

field draintile.

Wayne.—Bituminous coal was produced from underground mines by the following companies in Wayne County in 1955: Trace Fork Coal Co., Big Lynn Coal Co., Fry Bros. Coal Co., Warnie Webb Coal Co., Russell Coal Co., Sanders Coal Co., Northland Coal Co., Andrew J. Fry Coal Co., and Jenks Hale Coal Co.

The Laval Sand Co., Inc., dredged sand near Fort Gay, which was

used exclusively for engine sand.

Webster.—Bituminous coal was the only commodity produced in Webster County in 1955. The underground and strip mines of Pardee & Curtain Lumber Co. yielded most of the county output. Other producers included: Gauley Mountain Coal Co., Elk Lick Coal Co., Kessler Coal Co., S. & K. Coal Co., G. C. & H. Coal Co., Webster Coal Co., Pike Coal Co., and Russell Talbert.

Wetzel.—Wetzel County was the third-ranking sand- and gravelproducing area in the State in 1955. The Ohio River Sand & Gravel Corp., producers in Tyler County in 1954, moved its dredge down the Ohio River and produced sand and gravel near Martinsville. Ohio Valley Sand Co. continued work at its fixed plant, also near New Martinsville. Output from the two companies was used for railroad ballast and building and paving purposes.

Wood.—Sand and gravel for building and paving purposes was the only mineral produced in Wood County in 1955. Duquesne Sand Co. and the Ohio River Sand & Gravel Corp. dredged on the Ohio

River near Parkersburg.

Wyoming.—In Wyoming County, third largest coal-producer in in West Virginia in 1955, 96 percent of the bituminous-coal output came from underground mines. Auger and strip mining provided the remainder of county production. Pocahontas Fuel Co., Semet Solvay Division Allied Chemical & Dye Corp., and Eastern Gas & Fuel Associates were the foremost underground producers, all with output exceeding 1 million tons. Red Jacket Coal Corp., Crozer Coal & Land Co., Raleigh-Wyoming Mining Co., American Coal Co. of Allegheny County, United Pocahontas Coal Co., Jones & Laughlin Steel Corp., and Gulf Mining Co. followed in order of decreasing tonnage. Pocahontas Fuel Co. leased approximately 19,000 acres of valuable coal land from W. M. Ritter Co. Although Pocahontas Fuel Co. has no immediate development plans, the land was acquired in conjunction with the company long-range expansion program.



# The Mineral Industry of Wisconsin

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

By Matthew G. Sikich 1



INERAL production in Wisconsin in 1955, valued at approximately \$66 million, increased 21 percent over 1954, an alltime high for the State. The previous record high of \$55 million was established in 1952. Marked increases in production and value or iron ore, lead, sand and gravel, stone, and zinc were recorded in 1955. Cement and lime production also increased over the previous year. Output of abrasive stones, clays, and marl was less than in 1954.

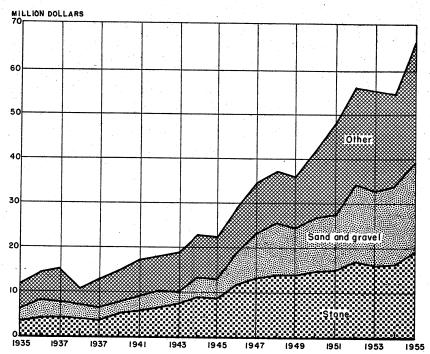


FIGURE 1.—Value of sand and gravel, stone, and total value of all minerals produced in Wisconsin, 1935-55.

<sup>&</sup>lt;sup>1</sup> Commodity-industry analyst, Region V, Bureau of Mines, Minneapolis, Minn.

TABLE 1.—Mineral production in Wisconsin, 1954-55 1

	19	54	1955	
Mineral	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	180, 233 1, 428, 910 1, 261 115, 397 19, 607 23, 978, 722 8, 289, 373 15, 534	\$174, 488 (2) 345, 514 1, 557, 579 9, 817 17, 396, 438 16, 187, 738 3, 355, 344	14, 087 27, 978, 335 3 12, 180, 452 18, 326	\$166, 030 (2) 580, 504 1, 767, 563 7, 330 19, 958, 450 3 18, 843, 272 4, 508, 196 20, 528, 430
Total Wisconsin 4		54, 286, 000		65, 813, 000

<sup>&</sup>lt;sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

by producers).

Figure withheld to avoid disclosing individual company confidential data.

Figure withheld to avoid disclosing individual company confidential data.

Excludes basalt, value for which is included with "Items that cannot be disclosed."

Total has been adjusted to eliminate duplication of value of clays and stone.

### DEFENSE MINERALS EXPLORATION ADMINISTRATION

One contract for minerals-exploration assistance in Wisconsin was in effect in 1955. The contract between Paul Gille, Cuba City, and the DMEA covered zinc-lead exploration work in Lafayette County.

Proposed total cost of the contract was \$24,846. The Government share of the actual cost was to be 50 percent, which would be repaid on a royalty basis if production was achieved. Work was begun on the project in February 1955 and was still in progress at the end of the year.

Three of the DMEA contracts in effect in Minnesota in 1954 had resulted in certifications of discovery.

## REVIEW BY MINERAL COMMODITIES METALS

Iron Ore.—Shipments of iron ore increased 32 percent over 1954 and were the greatest in the history of the State. Chief reason for the substantial increase was the demand for iron ore by the steel industry, which operated at 93 percent of average rated ingot capacity, compared

with 71 percent in 1954.

Iron ore was produced by three companies: Oglebay, Norton & Co. (Montreal mine); Pickands Mather & Co. (Cary mine); and Zontelli Bros., Inc. (Meress mine, formerly called the Davidson). Both the Montreal and Cary were underground mines in Iron County in the Gogebic range. The Meress mine, idle in 1954, produced again in 1955. It was an open-pit mine in Florence County in the Menominee range.

Stocks of iron ore at Wisconsin mines at the beginning of 1955 totaled 396,936 long tons. Production during the year was 1,588,523 tons, shipments totaled 1,886,029 tons, and year-end stocks were 99,430 tons. All ore produced in 1955 was of direct-shipping grade.

TABLE 2.—Iron-ore production and shipments, 1951-55

	Year	Number of mines	Production (long tons)	Shipments (long tons)	Iron-content shipments natural (percent)
1951					
1952		 2	1, 757, 234 1, 495, 109	1, 745, 120	52. 41
1953		 3	1, 756, 150	1, 485, 845 1, 655, 331	52. 56 52. 48
1954			1, 491, 470	1, 428, 910	52. 48 52. 81
1955		 2 3	1, 588, 523	1, 886, 629	52.03
		[			02.00

In 1955 the greater part of Wisconsin iron ore was shipped by rail to ore docks at Ashland, Wis., and Escanaba, Mich., for lake shipment to lower Lake ports. A smaller quantity of ore was shipped all rail

to consuming furnaces.

Throughout 1955 Lake Erie base prices for iron ore were: High-Phosphorus, \$10.00 per long ton; Mesabi Non-Bessemer, \$10.10; Mesabi Bessemer and Old Range Non-Bessemer, \$10.25; and Old Range Bessemer, \$10.40. These prices were for ore delivered at lower Lake ports and are based on the following guaranteed base analyses: Non-Bessemer grades, 51.5 percent iron (natural); Bessemer grades, 51.5 percent iron (natural) and 0.045 percent phosphorus (dry). Ores containing more than 0.18 percent phosphorus (dry) are classed as High-Phosphorus. Premiums and penalties are applied for variations in analyses and physical structure.

Lead and Zinc.—In 1955 Wisconsin mines produced 1,948 tons of lead and 18,326 tons of zinc (in terms of recoverable metals) compared with 1,261 tons of lead and 15,534 tons of zinc in 1954. Chief reasons for the greater output of both lead and zinc in 1955 were the increases in consumption and the sustained Government purchases for the National Stockpile. All production was from the southwestern part

of the State in Grant, Iowa, and Lafayette Counties.

Average market prices for 1954 were: Lead, 13.7 cents per pound; zinc, 10.8 cents per pound. The price for zinc (East St. Louis) was 11.5 cents a pound at the beginning of 1955 and rose to 12.0 cents on April 6, to 12.5 cents on June 16 and to 13.0 cents on September 6. Lead prices (New York) opened at 15.0 cents a pound, rose to 15.5 cents on September 26, and on December 29 reached 16.0 cents, the highest since October 1952.

TABLE 3.—Mine production of lead and zinc, 1946-50 (average) and 1951-55, in terms of recoverable metals

	Mines producing		Materia	l treated	Lead		Lead Zinc		
Year	Lode	Tail- ings	Ore (short tons)	Tailings 1 (short tons)	Short tons	Value	Short	Value	Total value
1946-50 (average)	39 22 24 29 7 10	2 3 10 3 11 5	217, 359 499, 971 670, 332 534, 882 523, 755 583, 731	168, 974 14, 750 82, 146 19, 133 39, 799 31, 831	1, 001 1, 391 2, 000 2, 094 1, 261 1, 948	\$280, 936 481, 286 644, 000 548, 628 345, 514 580, 504	9, 076 15, 754 20, 588 16, 830 15, 534 18, 326	\$2, 294, 317 5, 734, 456 6, 835, 216 3, 870, 900 3, 355, 344 4, 508, 196	\$2, 575, 253 6, 215, 742 7, 479, 216 4, 419, 528 3, 700, 858 5, 088, 700

<sup>1</sup> Partially estimated.

TABLE 4.—Mine production of lead and zinc in 1955, by months, in terms of recoverable metals, in short tons

Month	Lead	Zinc	Month	Lead	Zinc
January February March April May June	108 165 139 144 178 147 222	1, 266 1, 309 1, 268 1, 284 1, 577 1, 620 1, 575	August	166 204 204 134 137 1,948	1, 728 1, 775 1, 655 1, 697 1, 572

### **NONMETALS**

Abrasive Stones.—Grinding pebbles and tube-mill liners were produced by Baraboo Quartzite Co. from a quartzite deposit in Sauk County. Sales of these abrasive stones in 1955 decreased 31 percent below 1954.

Cement.—Portland cement was produced in Manitowoc by Manitowoc Portland Cement Co., a subsidiary of Medusa Portland Cement Co. and sole producer of cement in the State in 1955. Shipments and value increased slightly over 1954. The average mill value per barrel

was \$2.89 in 1955 compared with \$2.83 in 1954.

Clays.—Miscellaneous clay for manufacturing cement and heavy clay products was produced by nine companies from pits in Brown, Dunn, Fond du Lac, La Crosse, Manitowoc, Marathon, Racine, and Waupaca Counties. Quantity and value of clays produced in 1955 decreased slightly below the previous year.

Gem Stones.—A small quantity of agate material was recovered from a gravel pit in Clark County. Hobbyists explored for gem ma-

terials, but none were commercially produced.

Lime.—Shipments of quicklime and hydrated lime increased 17 percent, and value of sales 13 percent over 1954. Lime plants were run by five companies in Brown, Calumet, Dodge, Douglas, Fond du Lac, and Manitowoc Counties. Over 73 percent of production was for chemical and industrial uses, such as metallurgy, water purification, sewage treatment, paper manufacture, polishing compounds, and various other products. Approximately 25 percent was for building purposes, including masonry mortar and finishing lime. The remainder was used in agriculture. Average value per ton of lime sold in 1955 was \$13.13 compared with \$13.50 in 1954.

Marl.—Production of marl decreased substantially compared with the previous year. Output was reported by eight companies in Portage, Washburn, and Waushara Counties. Sales in 1955 were entirely for agricultural purposes. Average value per ton of marl sold in 1955 increased slightly to \$0.52, compared with \$0.50 in 1954.

in 1955 increased slightly to \$0.52, compared with \$0.50 in 1954.

Perlite.—Crude perlite produced in Colorado was expanded at plants in Milwaukee and Outagamie Counties, chiefly for use as a

lightweight aggregate in plaster and concrete.

Pyrite Cinder.—Vinegar Hill Zinc Co. of Platteville shipped pyrite cinder for use in manufacturing cement. The material has been accumulated over the years from the roasting of ore in producing sulfuric acid at the company plant in Cuba City.

Sand and Gravel.—Output of sand and gravel, approximately 28 million short tons, increased 17 percent over 1954 and established

an alltime high for the State. The previous high of about 25 million tons was recorded in 1952. Chief reason for the marked increase was expansion of road-construction activity in the State. Production was reported from 61 of the 71 counties. Approximately 54 percent of the total was produced commercially; the remainder was Government-and-contractor output. The State ranked fourth in the Nation in sand and gravel production in 1955.

TABLE 5.—Sand and gravel sold or used by producers, 1954-55, by classes of operations and uses

	1954			1955			
Class of operation and use		Value			Value		
	Short tons	Total	Average per ton	Short tons	Total	Average per ton	
COMMERCIAL OPERATIONS							
Sand: 1							
Glass	110,844	\$187, 270	\$1.69	32, 136	\$22,045	\$0.69	
Molding	566, 659	820, 160	1. 45	860, 504	1, 567, 675	1.82	
Building	2, 698, 027	2, 184, 277	.81	2, 500, 203	1, 920, 510		
Engine	(2)	(2)		491	736	1. 50	
Paving	649 063	570, 270	.88	1, 387, 897	1, 097, 148		
Blast	_  (2)	(2)	.00	52, 918	109, 857	. 79 2. 08	
Filter	7, 415	3, 402	.46	55	260	4. 73	
Railroad ballast	(2)	(2)		13, 525	7, 345	. 54	
Filler				4,065	2,033	.50	
Other	366, 447	174, 868	3, 48	752, 725	371, 269	.49	
Undistributed 4	75, 841	140, 109	\$ 1.85	102,120	011, 205	. 20	
Total commercial sand	4, 474, 296	4, 080, 356	. 91	5, 604, 519	5, 098, 878	. 91	
Gravel:							
Building	2, 786, 990	0 270 007	0.5	0 550 045	0.000.00=		
Paving	4, 270, 359	2, 376, 825	.85	3, 758, 245	2, 989, 827	.80	
Paving Railroad ballast	855, 996	3, 396, 608 418, 223	.80	4, 369, 709	3, 524, 375	. 81	
Other	483, 243	302, 719	.49	984, 750	465, 116	. 47	
O MOISSESSESSESSESSESSESSESSESSESSESSESSESSE	100, 240	502, 719	. 63	410, 598	319, 903	. 78	
Total commercial gravel	8, 396, 588	6, 494, 375	. 77	9, 523, 302	7, 299, 221	. 77	
Total commercial sand and							
gravel.	12, 870, 884	10, 574, 731	. 82	17 107 001	10 000 000	-	
Prot 01	12,010,001	10, 574, 751	.02	15, 127, 821	12, 398, 099	. 82	
GOVERNMENT-AND-CONTRACTOR OPERATIONS							
Sand:					1		
Building	20, 882	7, 472	. 36				
Paving	1, 110, 219	444, 095	.40	4, 089, 935	1, 466, 961	. 36	
	1,110,210	111,000	. 10	4,000,000	1, 400, 901	. 30	
Total Government-and-con-							
tractor sand	1, 131, 101	451, 567	. 40	4, 089, 935	1, 466, 961	. 36	
				-,,	= 1, 100, 001		
Gravel:			1				
Building	59, 774	17, 932	.30	170, 872	81, 972	.48	
Paving	9, 916, 963	17, 932 6, 352, 208	. 64	8, 589, 707	6, 011, 418	. 70	
m-4-10							
Total Government-and-con-			i	1			
tractor gravel	9, 976, 737	6, 370, 140	. 64	8, 760, 579	6, 093, 390	. 70	
Total Community and and							
Total Government-and-con-	11 105 000	0 004 -0-	1				
tractor sand and gravel	11, 107, 838	6, 821, 707	.61	12, 850, 514	7, 560, 351	. 59	
ALL OPERATIONS							
			i	J	· I		
Sand.	5, 605, 397	4, 531, 923	.81	9, 694, 454	6, 565, 839	. 68	
Gravel	18, 373, 325	12, 864, 515	.70	18, 283, 881	13, 392, 611	.73	
				20, 200, 001	10, 002, 011	. 10	
Grand total	23, 978, 722	17, 396, 438	. 73	27, 978, 335	19, 958, 450	. 71	

Includes friable sandstone.
 Included with "Undistributed" to avoid disclosing individual company confidential data.
 Revised figure.
 Includes blast, engine, and railroad ballast sand (1954).

About 89 percent of the sand and gravel output in Wisconsin in 1955 was for building and paving use. Substantial quantities were used for railroad ballast and molding purposes. Smaller quantities of special types of sands were consumed in sand blasting, engine use. glass manufacture, and for filter purposes.

Approximately 88 percent of the quantity produced in the State

was hauled by truck; the remainder was transported by rail.

The 10 principal commercial producers were: Capitol Sand & Gravel Corp., Madison; Consumers Co., Chicago, Ill.; Courtney & Plummer, Inc., Neenah; Hartland Sand & Gravel Co., Hartland; Jaeger Sand & Gravel Co., Inc., Milwaukee; Janesville Sand & Gravel Co., Janesville; Palmer Crushing Co., Slinger; Portage-Manley Sand Co., Rockton, Ill.; A. J. Reiske Sons Co., Milwaukee; and Lerov Schmidt, Germantown.

Stone.—Stone products included limestone, granite, sandstone and quartzite, basalt, and miscellaneous stone. Production in 1955 was over 12 million short tons, an alltime high for stone production in the State. The previous record year was 1952. The principal reason for the marked increase over 1954 was greater statistical coverage relative to Government-and-contractor production. However, a good share of the increase was attributable to expansion of road-construction activity in the State.

TABLE 6.—Limestone sold or used by producers in 1954-55, by uses 1

		1954		1955			
Use	Value				Value		
	Quantity	Total	Average per unit of measure	Quantity	Total	Average per unit of measure	
Dimension: Rough construction Short tons Rubbledo Rough architectural cubic feet Dressed (cut and sawed) cubic feet Flaggingdo	11, 829 7, 538 24, 001 364, 812 65, 157	\$53, 751 14, 175 26, 107 807, 007 81, 313	\$4. 54 1. 88 1. 09 2. 21 1. 25	5, 185 11, 607 89, 458 547, 218 51, 608	\$23, 961 41, 299 187, 098 1, 121, 259 51, 441	\$4. 62 3. 56 2. 09 2. 09 1. 00	
Total dimension equivalent short tons 2	55, 685	982, 353	17.64	71, 855	1, 425, 058	19.8	
Crushed and broken:  Riprapshort tons. Fluxdo Refractorydo Concrete aggregate and roadstoneshort tons.	107, 732 26, 538 24, 638 6, 030, 942	74, 777 32, 169 26, 609 6, 201, 650	. 69 1. 21 1. 08 1. 03 1. 20	36, 573 (3) 25, 000 9, 935, 936 142, 354	47, 677 (3) 30, 120 9, 263, 502 172, 713	1. 30 (3) 1. 20 . 90 1. 2	
Railroad ballastdo Agriculturedo Otherdo	105, 419 760, 321 246, 265	126, 989 1, 095, 189 288, 513	1. 20 1. 44 1. 17	886, 536 321, 937	1, 257, 112 399, 161	1. 4 1. 2	
Total crushed and broken short tons.	7, 301, 855	7, 845, 896	1.07	11, 348, 336	11, 170, 285	. 9	
Grand totaldo	7, 357, 540	8, 828, 249	1.20	11, 420, 191	12, 595, 343	1.1	

Includes both commercial and Government-and-contractor production.
 Average weight of 160 pounds per cubic foot used to convert cubic feet to short tons.
 Included with "Other" to avoid disclosing individual company confidential data.

Limestone is widely distributed throughout the State. Dimension limestone for structural and architectural use, rubble, and flagging was produced in Brown, Door, Fond du Lac, La Crosse, Manitowoc, Vernon, and Waukesha Counties. Crushed or broken limestone was produced in 39 counties in 1955. Output was chiefly for concrete aggregate and roadstone, and agricultural, industrial, and chemical Table 6 shows limestone sold or used by producers in the State in 1954-55, by uses.

Dimension granite was produced by eight companies in Ashland, Marathon, Marinette, Marquette, and Waushara Counties. Output was chiefly for monumental purposes, but some rough material was marketed for rough structural and architectural uses. production of crushed granite was reported in the State in 1955. Granite production—9,668 short tons valued at \$1,200,343—decreased

26 percent in quantity and 16 percent in value below 1954.

Production of dimension sandstone was recorded in Dunn, Marathon, and Wood Counties in 1955. Output was used for flagging, rubble, and rough construction and as dressed or cut stone. Crushed sandstone and quartzite were produced in Marathon and Sauk Counties for use as refractory stone, roofing granules, and abrasives. Production of sandstone and quartzite was 630,144 short tons valued at \$4,948,208, a slight increase over 1954.

Crushed basalt was produced in Marinette and Polk Counties. Output was chiefly for roofing granules. Other uses included concrete aggregate and roadstone, riprap, railroad ballast, and filter stone.

A quantity of miscellaneous stone, produced in Brown, Burnett, and St. Croix Counties, was entirely from Government-and-contractor output and was used as roadstone and riprap. Total production was 120,449 short tons valued at \$99,378.

#### MINERAL FUELS

Peat.—Peat was not produced commercially in the State in 1955. The last reported output came from a bog near New London in Outagamie County in 1954. Although peat is classed as a mineral fuel, its principal use in the United States is for soil improvement.

### **REVIEW BY COUNTIES**

Adams.—Gravel for building and road purposes was produced in the county by A. T. Riese, at a portable plant near Wisconsin Dells. Arthur Overgaard Co. produced gravel for building use.

Ashland.—Cold Spring Granite Co. quarried dimension granite near Mellen for architectural and monumental use. The rough material was finished at the company plant in Cold Spring, Minn.
Inland Steel Co. leased some land in the county and planned to do

exploratory drilling for commercial iron-ore deposits.

Barron.—Clyde Lilly produced sand and gravel for building purposes near Poskin. Sand and gravel for road use was produced by the county highway department and H. T. Smith, who operated a portable plant near Cameron. The Barron County Agricultural Commission produced crushed limestone for agricultural purposes.

TABLE 7.—Value of mineral production in Wisconsin, 1954-55, by counties 1

County	1954 *	1955	Minerals produced in 1955 in order of value
Adams	(8)	(3)	Sand and gravel.
Ashland.	(6)	(3)	Stone,
Barron	\$218,506	\$240, 758	Sand and gravel, stone.
Brown	1,011,410	1,044,906	Sand and gravel, lime, stone, clays.
Buffalo	(3)	230, 893	Stone.
Burnett	105, 767	47 050 1	Stone, sand and gravel.
Calumet	178, 111	88, 480 67, 458 145, 912 1, 311, 519 160, 263	Lime, stone, sand and gravel.
hinnews	(3)	67, 458	Sand and gravel. Sand and gravel, gem stones.
Dhippewa	133, 921 1, 045, 222 194, 495	145, 912	Sand and gravel, gem stones.
Columbia	1, 045, 222	1, 311, 519	Sand and gravel, stone.
Columbia Crawford	194, 495	160, 263	Stone, sand and gravel.
Dane	903, 658	3, 646, 765	Do.
Oodge	741, 357	653, 103	Lime, sand and gravel, stone.
000r	248, 304	201, 873	Sand and gravel, stone.
ouglas	(3)	(3)	Lime, sand and gravel.
Ounn	65, 203	38, 503	Sand and gravel, clays, stone.
au Claire	12, 668	00,000	
Name of the contract of the co	12,000	(3)	Iron ore.
lorence	Q40 QE0	777, 544	Stone, sand and gravel, lime, clays.
ond du Lac	842, 852 89, 338	69, 244	Sand and gravel.
orest	400 400	1 040 040	Zinc, stone, lead, sand and gravel.
rant	492, 496	1,049,842	Stone, sand and gravel.
reen	354, 441	392, 638	
reen Lake	366, 403	519, 881	Sand and gravel, stone.
owa	514, 910	261, 367	Stone, zinc, sand and gravel, lead.
ron	(2)	(3)	Iron ore, sand and gravel.
ackson	(3)	17, 904 108, 016 124, 632 180, 142	Sand and gravel.
efferson	92, 975 64, 745 242, 212	108, 016	Sand and gravel, stone.
uneau	64, 745	124, 632	Stone, sand and gravel
enosha	242, 212	180, 142	Sand and gravel.
Cewaunee	(3)	(*)	Do.
a Crosse	128, 713	131, 657	Stone, sand and gravel, clays.
afayette	3, 456, 340	4, 572, 435	Zinc, lead, pyrite cinder, sand and gravel.
anglade	(3)	4, 572, 435 129, 973	Sand and gravel.
Lincoln		(3)	Do.
Manitowoc	5, 506, 470	6, 225, 176	Cement, sand and gravel, lime, clays, stone.
Marathon	5, 186, 496 871, 757 224, 311	5, 072, 452	Stone, sand and gravel, clays.
Morinette	871, 757	(3)	Stone.
Marinette Marquette	224, 311	212, 764	Stone, sand and gravel.
Milwaukee	1, 509, 159	1, 447, 599	Sand and gravel, stone.
Monroe	242, 617	67, 103	Stone.
Oconto.	(3)	210, 606	Sand and gravel.
Omeide I	176, 731	110, 147	Do.
Jueiua	206 977	305 850	Stone sand and gravel.
Jutagamie	386, 877 258, 256	262 773	Stone, sand and gravel. Sand and gravel.
Outagamie	11 600	395, 850 262, 773 17, 219 253, 985	Stone.
Герш	11, 620 510, 376	253 025	Sand and gravel, stone.
TIEFCE	389, 508	341, 028	Stone, sand and gravel.
POIK	009, 008	206 520	Sand and gravel, marl.
Portage	291, 883	306, 532	
Price	420	16, 335	Sand and gravel.
Racine	694, 841	(3)	Stone, sand and gravel, clays.
Richland	(3)		Stone, sand and gravel.
Rock	1, 362, 772 69, 780 365, 250	1, 329, 687	Sand and gravel, stone. Sand and gravel.
Rusk	69, 780	64, 641	Cand and gravel stone
St. Croix	365, 250	449, 390	Sand and gravel, stone.
Sauk	1.424,035	1, 590, 790	Stone, sand and gravel, abrasives.
Sawyer	83, 234	67, 201	Sand and gravel.
Shawano	160, 557	248, 386	Sand and gravel, stone.
hehovgan	405, 463	396, 792	Do.
Taylor	(3)	(3)	Sand and gravel.
Frempealeau	31,000	140, 189	Stone.
FaylorFrempealeauVernon	569, 547	454, 731 44, 798	Stone, sand and gravel.
Vilas	(3)	44, 798	Sand and gravel.
Walworth		229, 357	Sand and gravel, stone.
Washburn	1,500	863	Marl.
Washington	573, 432	837, 460	Sand and gravel, stone.
Waukesha	3, 780, 998	4, 940, 994	Do.
wannes		(3)	Stone, sand and gravel, clays.
Waupaca	54, 902	30, 030	Sand and gravel, stone, marl.
Waushara	1 199 227	1 425 720	Sand and gravel, stone, marl. Sand and gravel, stone.
	1, 188, 337	1, 720, 120	Stone good and gravel
Winnebago	1 (2)		
Winnebago	15 096 772	1, 425, 720 22, 323 22, 386, 440	Stone, sand and gravel.
Winnebago Wood Undistributed	15, 986, 773	22, 323 22, 386, 449	Stone, sand and graver.

Bayfield County is not listed because no production was reported.
 Revised figures.
 Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

Brown.—Sand and gravel was produced in the county, chiefly for building and road use. Producers in 1955 included: Daanen & Janssen, De Pere; Flor Evraets, O. K. Sand & Gravel Co., Frank Van Nelson, and Vic Zeman, Green Bay; Ed Kocken, West De Pere; Peters Trucking Co., Suamico; Quality Sand & Gravel Co., Wrightstown; Schuster Construction Co., Denmark; and Wm. Winkler & Sons Construction Co., Greenleaf. Road gravel was produced under contract for the Green Bay Street Department.

Daanen & Janssen also produced crushed limestone for road surfacing and agricultural use. Victor De Cleene produced dimension limestone for house stone veneer and flagging. Nels Scray reported output of both dimension and broken limestone for building and road use, respectively. Roadstone was produced by the highway depart-

ment of the town of Howard.

Quicklime and hydrated lime were produced by Western Lime & Cement Co. at its Green Bay plant. Sales were for chemical and industrial uses.

Clay for manufacturing brick and other heavy clay products was produced by Duck Creek Brick Co. and Hockers Bros. Brick & Tile Co.

Buffalo.—Crushed limestone for agricultural and road use was produced by H. E. Kochenderfer near Cochrane and by Neuheisel Lime Works near Mondovi. Roadstone was produced by Edward Kraemer & Sons. H. O. Tiffany, Jr., produced crushed and broken limestone for riprap, roadstone, and agricultural purposes at a portable plant near Nelson.

Burnett.—Crushed stone and sand and gravel were produced by

the county highway department for road use.

Calumet.—Western Lime & Cement Co. produced quicklime and hydrated lime at its High Cliff plant. Sales were chiefly for building and agricultural purposes. The company produced crushed limestone from its High Cliff quarry for use in its lime plant and as roadstone. Crushed limestone and gravel for road use were produced by the county highway department. Arnold M. Ortlepp produced sand for building and road construction and gravel for railroad ballast and other uses at a fixed plant near Chilton.

Chippewa.—A. T. Riese produced road gravel near Chippewa Falls. The Chippewa Sand & Gravel Co. fixed plant near Chippewa Falls produced sand and gravel for building use. H. T. Smith produced

sand and gravel for road construction from the Holcomb pit.

Clark.—Output from the Plautz Brothers Sand & Gravel Co. fixed sand and gravel plant near Greenwood and portable plant near Withee was used for building and road construction. Paul Bros. produced road gravel. The county highway department produced sand and gravel for road use.

Dr. G. A. Legault recovered a small quantity of agate material

from a gravel pit in the county.

Columbia.—Sand for molding use was produced by Portage-Manley Sand Co. near Portage and by Harold Rudolph & Francis James near Doylestown. The county highway commission produced sand and gravel for road use.

Dann & Wendt crushed limestone from the De Puy quarry chiefly for agricultural use and for driveways. Edward Kraemer & Sons

crushed limestone for road use.

Crawford.—Loren J. Slaght crushed limestone for road surfacing and agricultural use at the Teynor and O'Connell quarries. Edward Kraemer & Sons crushed limestone for use as roadstone from several Velda Ward & Velmer Monroe crushed quarries in the county. limestone for agricultural use.

Sand and gravel for building and road purposes was produced by Prairie Sand & Gravel Co. and Stenner & Schneider near Prairie du

Chien. Building sand was produced by Frank Mezera.

Dane.—Sand and gravel was produced for a vareity of purposes but chiefly for building and road use. The following companies produced in 1955: Boehnen, Inc., Capitol Sand & Gravel Corp., Einar Evenson & Sons, General Silica Co., Hartland-Verona Gravel Co., Charles Langer & Son, Madison Sand & Gravel Co., Melvin Paulson, Rein & Schultz, Inc., August Shemanek, Speedway Sand & Gravel Co., Sundby Sand & Gravel, and George Wendtlandt. Gravel and crushed limestone for road use were produced under contract for the county highway department. Commercial producers of crushed limestone in 1955 included the following: Boehnen, Inc., Alva Brumm, Norman Carpenter, Einar Evenson & Sons, Kuhnan & Hosig Bros., Madison Stone Co., Quam & Kaupanger, Carl F. Raemisch, and Wingra Stone Co. Output was chiefly for riprap, roadstone, and agricultural use.

Dodge. Western Lime & Cement Co. sold hydrated lime produced at its lime plant at Knowles for building and agricultural use. Mayville White Lime Works produced quicklime at Mayville for building and chemical use. Both companies quarried limestone in the county,

for manufacturing lime and other uses.

Melvin Voigt produced gravel for building and road purposes. Sand and gravel for road use was produced by and for the county highway

Door.—Hubert Charles produced sand for road use. Gravel and crushed limestone for road use was produced by the county highway

department.

Dimension limestone for homes and fireplaces was produced near Sturgeon Bay by Adamski & Fisher. Output of crushed limestone for metal polishing was reported by Clare R. Schuur.

Douglas.—Cutler-LaLiberte-McDougall Corp. at Superior sold

quicklime for building, chemical, and industrial uses.

The county highway department produced and contracted for sand and gravel for road use. Paving sand was produced by the city of Superior.

Dunn.—Red Cedar Sand & Gravel Co. produced sand and gravel

for building use at its fixed plant near Menomonie.

Menomonie Brick Co. produced miscellaneous clay at Menomonie

for manufacturing heavy clay products.

Downsville Cut Stone Co. produced dimension sandstone for

chitectural use and rubble.

Florence.—Shipments of 108,119 long tons of iron ore were reported in 1955 from the Meress mine (formerly the Davidson), operated by Zontelli Bros., Inc., Ironton, Minn. The mine is an open pit near Florence in the Menominee range. All shipments were of directshipping grade.

Fond du Lac.—Western Lime & Cement Co. produced quicklime and hydrated lime at Eden for building, agricultural, chemical, and

industrial uses. Its limestone quarry in the same vicinity crushed limestone for paper mills, roadstone, and lime manufacture. Fond du Lac Stone Co. produced dimension limestone for rough construction, architectural use, and flagging; it also crushed limestone for agricultural and road use. Hamilton Stone Co. produced limestone for architectural use, flagging, and other purposes.

Sand and gravel for building and road use was produced by Lake View Sand & Gravel Co. and Schroeder Bros. Sand & Gravel Co. from pits near Peebles and St. Cloud, respectively. M. A. Leiberg at a portable plant near Eden, and the county highway department, pro-

duced road gravel.

Oakfield Shale Brick & Tile Co. produced miscellaneous clay for

manufacturing building brick and other heavy clay products.

Forest.—Gravel for railroad ballast and other uses was produced by the Minneapolis, St. Paul & Sault Ste. Marie Railroad. The

county highway department produced road gravel.

Grant.—Lead and zinc were produced by Piquette Mining & Milling Co. at the Piquette mine No. 2 and the 300-ton flotation mill near Tennyson. The mill was put into operation in May 1955. Crude material mined and milled during 1955 totaled approximately 54,000 short tons, from which 3,651 tons of zinc concentrate and 389 tons of lead concentrate were produced.

The various quarries of Becker & Tuckwood in the county produced crushed and broken limestone for riprap, roadstone, and agricultural use. E. C. Schroeder Co., Inc., crushed limestone near Wyalusing for railroad ballast. Dell Needham crushed limestone for roadstone. Zens & Sturmer crushed limestone for agricultural and road use.

George Wendtlandt produced gravel at several pits for road use. Paving sand was produced by and for the county highway department.

Green.—The various quarries of P. W. Ryan Sons crushed limestone

for use as roadstone. Rees Construction Co. produced crushed lime-

stone for agricultural and road use.

The Green County Sand & Gravel Co., Inc., fixed plant near Albany produced sand and gravel for building and road purposes. Henry Altmann produced sand and gravel for fill near Monroe. The county highway department produced sand for ice control on highways and contracted for road gravel. The city of Monroe produced sand for road use.

Green Lake.—Sand was produced chiefly for molding, glass manufacture, and building purposes. Gravel was obtained for building and road use. The following companies produced during the year in the western part of the county: C. Carey, C. A. Chier Sand Co., Edward Chier, Leonard & Theodore Chier, Chier St. Marie Co., F. B. Dubberstein & Sons, Inc., Fox Valley Sand & Gravel, A. F. Gelhar Co., Inc., Kolpin & Peterson Gravel Co., Kopplin & Kinas Co., Inc., and Paul Polenska & Son.

Fox Valley Sand & Gravel also crushed limestone for road use.

Iowa.—Dodgeville Mining Co. near Dodgeville produced lead and zinc. The company operated during the period April to July 1955 and mined and milled approximately 10,000 short tons of lead-zinc ore. In 1955, Davis Mining Enterprises produced 128 tons of zinc concentrate from about 2,400 tons of crude material before ceasing all operations in February.

Crushed limestone for road purposes was produced by Davis & Richardson, Ivey Construction Co., G. A. Watson, R. C. Wonn, and the county highway commission. George Wendtlandt produced road gravel and crushed limestone for agricultural use.

Iron.—Iron ore was produced by Oglebay, Norton & Co. and

Pickands Mather & Co. at the Montreal and Cary mines, respectively.

Both are underground mines in the Gogebic iron range.

The county highway department produced road gravel. Jackson.—The Chas. Marek fixed plant near Black River Falls produced sand and gravel for building use and fill. Sand and gravel for road use was produced from the Peterson and Hylcin pits by H. T. Smith.

Jefferson.—Hausz Bros. produced sand and gravel for building and road construction and fill near Fort Atkinson. Road gravel was produced by Brunt & Frings. Joe Claute produced sand for mis-The county highway commission produced sand and cellaneous uses. gravel for road use.

Hausz Bros. also crushed limestone for road use.

Juneau.—Edward Kraemer & Sons and Overgaard Rock Products Co. crushed limestone for roadstone. The county highway commission produced sand for road use and contracted for road gravel.

Kenosha.—Bloss Sand & Gravel produced road gravel near Burlington. Sand and gravel for building use was produced by Sam S. William Wertz produced sand and gravel for building and The city of Kenosha produced sand and gravel for road purposes. road use.

Kewaunee.—Casco Sand & Gravel Corp. produced gravel for road

La Crosse.—Edward Kraemer & Sons, Mindro Construction Co., and Overgaard Rock Products Co. crushed limestone for road con-Herbert Hass produced dimension limestone for use in struction. rough construction.

Kammel Smith Sand & Gravel Co. produced sand and gravel at a fixed plant near La Crosse for building use. Road sand was produced

by the county highway department.

Meir Brick Co. produced clay from the George Schmitz property

near La Crosse for manufacturing heavy clay products.

Lafayette.-Mineral products of the county in 1955 were lead, zinc, pyrite cinder, and sand and gravel. The leading producer of both lead and zinc in the State in 1955 was Eagle-Picher Co., Mining and Smelting Division. Throughout the entire year, it produced lead-zinc ore from the Shullsburg and Winskell mines and zinc ore from the Birkett and Andrews mine; its 1,200-ton-daily-capacity mill near Shullsburg treated ore from the Shullsburg mine. Crude material from the Birkett and Andrews mine was milled at its Graham Central mill in Jo Daviess County, Ill. Ore from the Winskell property was mined by a sublease agreement and sold to American Zinc, Lead & Smelting Co. for milling. The latter company acquired all operating properties and a number of leases from Vinegar Hill Zinc Co. on August 1, 1955. Active lead-zinc operations of Vinegar Hill Zinc Co. at that time were the Blackstone and Hancock mines (Hancock ore mined through the Blackstone shaft) and the Hancock mill. Vinegar Hill Zinc Co. stopped mining at the Mulcahy mine in February owing to exhaustion of the ore body. Other producers of zinc and/or lead in 1955 included: George M. Baker, who treated old tailings at his flotation mill near Shullsburg; Murray & Richards; Big Dick Mining Co.; George Laird; and George Whitechurch. A contract between Paul Gille of Cuba City and DMEA covering zinclead exploration work in the county was in effect in 1955. Work begun on the project early in the year was still in progress at the end of 1955.

Vinegar Hill Zinc Co. also sold pyrite cinder in 1955 for use in

cement manufacture.

George Wendtlandt produced road gravel from several pits in the

Langlade.—The Duffek Sand & Gravel, Inc., fixed plant near Antigo produced sand and gravel for building and road purposes. Road gravel was produced by the county highway department.

Lincoln.—Sand and gravel for building and other uses was produced by Merrill Gravel & Construction Co. Gravel for road use was pro-

duced by the county highway department.

Manitowoc.—Manitowoc Portland Cement Co. produced portland cement at Manitowoc and also clay for its own use in manufacturing Quicklime and hydrated lime were produced by Rockwell Lime Co. for building, chemical, and industrial uses; limestone was crushed for manufacturing lime, roadstone, and agricultural products. Valders Lime & Stone Co., Inc., produced quicklime for building and agricultural purposes and also irregularly shaped limestone for architectural use and rubble. The city of Manitowoc produced crushed limestone and sand and gravel for road use.

R. & J. Fricke Co. near Manitowoc and Norman Schema near St. Nazianz produced sand for building use and gravel for building and road purposes. The Schroeder Bros. Sand & Gravel Co. fixed plant near Kiel produced sand and gravel for building and road use. Fred Radandt Sons produced sand and gravel for building and road construction and fill near Manitowoc. Sand and gravel for road use was produced by the county highway department.

Marathon.—Sandstone and quartizite, granite, clay, and sand and gravel were produced in the county in 1955. Argillaceous sandstone for roofing granules and quartzite for abrasive use were produced by Minnesota Mining & Manufacturing Co. near Wausau. Ellis Quarries, Inc., produced dimension sandstone for architectural use and flagging

from a quarry near Knowlton.

Producers of granite in the county in 1955 included: Anderson Bros. & Johnson Co., Cold Spring Granite Co., Lake Wausau Granite Co., Prehn Granite Quarries, Inc. (formerly Rib Mountain Granite Co.), and Red Wausau Granite Co. Output was for monumental and architectural purposes. DeVoe Granite Co. stopped producing in 1955.

Marshfield Brick & Tile Co. produced clay for manufacturing

building brick.

Sand and gravel was produced near Wausau, Marathon, and Edgar by the following companies: Frances Gesicki, Sr., Carl Lemke, Lotz Sand & Gravel Co., Riverside Gravel Co., and Mike Wisnewski. Output in 1955 was for building and road use, railroad ballast, and other purposes.

Marinette.—Central Commercial Co. crushed basalt near Pembine for manufacturing roofing granules.

E. A. Mundt Granite Co. produced rough granite for monumental

use near Marinette.

Marquette.—Montello Granite Co. produced dimension granite for monumental purposes. Edward Kraemer & Sons crushed limestone The county highway department produced road gravel.

Milwaukee.—Franklin Stone Products, Inc., Manegold Stone Co., and Milwaukee Limestone Products Co. crushed limestone for use The latter company also crushed limestone for asphalt as roadstone.

Sand and gravel chiefly for building and road use was produced by A. J. Reiske Sons Co. near Wauwatosa. Sand and/or gravel for building use was also produced by Fink Sand & Gravel, Emma Kleist, Moritz Sand & Gravel, and Walter W. Rowe Sand & Gravel. Merget Sand & Gravel and Sweeney Sand & Gravel Corp. produced

Badger Perlite Products Co. expanded perlite at Milwaukee from crude material mined in Colorado, for use chiefly as a lightweight

aggregate in plaster and concrete.

Monroe.—Crushed limestone for road construction and/or agricultural use was produced by Ray Frings, Edward Kraemer & Sons, and Schendel Bros.

Oconto.—Belongia Construction Co., John Jaworski, Thompson Sand & Gravel, and the county highway department produced road

gravel.

Oneida.—Musson Bros., Inc., produced sand and gravel for building and road purposes and fill near Rhinelander. Webber Coffen produced sand for road use. Dean B. Ekstrom produced road gravel. The county highway commission reported output of sand and gravel for road use.

Outagamie.—Black Creek Limestone Co. crushed limestone for agricultural and road use. The Landwehr & Hackl portable plant near Appleton crushed limestone for use as roadstone and concrete aggregate and sand and gravel for building use. Road gravel was produced by M. R. K. Construction Co., Inc., and Sell Bros. Sand and gravel for building purposes was produced by Frank Murphy. Crude perlite produced in Colorado was expanded at Appleton by Midwest Perlite Co. for use as a lightweight aggregate in plaster and concrete.

Ozaukee.—Sand and gravel for building and/or road use was produced by Kleist Sand & Gravel Co., Otto Ladwig & Sons, Inc., and Muehlberg Gravel Co. Road gravel was also produced by the county highway department.

Pepin.—Crushed limestone for agricultural use was produced by

Neuheisel Lime Works, at a quarry near Durand.

Pierce.—Baumgardt Construction Co. and Edward Kraemer & Sons crushed limestone for road use. Sanders Stone & Lime Co. and Pierce County Agricultural Conservation Association crushed limestone for agricultural purposes.

Maiden Rock Silica Sand Co. produced blast sand near Maiden Rock. Sand for molding, sand blasting, engine, and filter use was produced near Bay City by Bay City Sand Co. River Falls Sand & Gravel Co. produced sand and gravel for building purposes. Rush River Sand & Gravel Co. produced sand and gravel for building and road use.

Polk.—Dresser Trap Rock Co. produced crushed and broken basalt

for roadstone, railroad ballast, riprap, and filter use.

The Minneapolis, St. Paul & Sault Ste. Marie Railroad produced gravel for railroad ballast and other uses. Jorgenson Construction Co. produced road gravel near Luck. The county highway department produced sand and gravel for building and road purposes.

Crushed limestone for agricultural and other purposes was produced

by the county agricultural department.

Portage.—F. F. Mengel Co. near Custer and Gilford Wimme near Arnott produced sand and gravel for building and road purposes and railroad ballast. George Wendtlandt produced road gravel. The county highway department produced gravel for building use.

Calcareous marl for agricultural use was produced by Clifford Caldwell and Bert Somers near Waupaca and Amherst, respectively.

Price.—The Minneapolis, St. Paul & Sault Ste. Marie Railroad

produced gravel for railroad ballast and other purposes.

Racine.—Consumers Co. near Racine produced crushed and broken limestone for riprap, refractories, roadstone, railroad ballast, filter use, and agricultural purposes. The county highway commission crushed limestone for road use.

Hillside Sand & Gravel Co. produced road gravel from a pit near

Racine.

Clay used for manufacturing heavy clay products was produced

by Union Grove Drain Tile Co.

Richland.—Crushed limestone for road use was produced by Edward Kraemer & Sons and the county highway commission.

Kraemer & Sons and the county highway commission.

Bock Bros. produced sand and gravel for building and road purposes. Rock.—Sand and gravel producers included the following: Atlas Sand & Gravel Co., Chicago, Milwaukee, St. Paul & Pacific Railway Co., Consumers Co., Edgerton Sand & Gravel Co., Janesville Sand & Gravel Co., William J. Kennedy & Son, Luety Bros., and the county highway department.

Frank Bros. produced crushed and broken limestone near Milton for riprap, roadstone, and agricultural use. Little Limestone Co. and Peter J. Roth also produced crushed limestone for agricultural purposes. P. W. Ryan Sons and the county highway department

produced crushed limestone for road use.

Rusk.—Road gravel was produced by the county highway depart-

ment.

St. Croix.—Casey Gravel Works produced gravel for building and road use near New Richmond. Ed. J. Leary Construction Co. produced gravel for building use and crushed limestone for agricultural and road construction near River Falls. The county highway department produced crushed limestone, sand and gravel for road use, and miscellaneous stone for riprap. Wilson Rock & Limestone Co. crushed limestone for agricultural and road use from a quarry near Wilson.

Sauk.—Quartzite for refractory use was produced by Baraboo Quartzite Co., General Refractories Co., John D. Geoghegan, and Harbison-Walker Refractories Co. Baraboo Quartzite Co. also

produced grinding pebbles and tube-mill liners.

Edward Kraemer & Sons produced crushed limestone for road construction from 13 quarries in the county. Matoushek Bros. produced crushed limestone for agricultural use near Prairie du Sac.

Road gravel was produced by Deppe Lumber Co. and W. R. Dubois & Son, Inc. Sand and gravel for road construction was produced by and for the city of Baraboo and the county highway department.

Sawyer.—The county highway department produced sand and

gravel for road use.

Shawano.—Riemer Sand & Gravel produced gravel for building and road purposes near Cecil. Murphy Sand & Gravel Co. and Edward Weishoff produced sand and gravel for building use. M. J. Zimmerman Construction Co. produced sand and gravel for building use and road gravel. The county highway department produced sand and gravel for road construction.

Edward Kraemer & Sons produced crushed limestone for use as roadstone. The county agricultural department produced crushed

limestone for agricultural and road purposes.

Sheboygan.—Sand and gravel producers in the county in 1955 were: Braun Construction Co., Cascade Sand & Gravel Co., Crystal Lake Crushed Stone Co., Elkhart Moraine Sand & Gravel Co., and the county highway commission. Output was chiefly for building and road construction and railroad ballast.

The county agricultural department crushed limestone for agricul-

tural and road use.

Taylor.—H. T. Smith produced sand and gravel for road use from two pits in the county. Zenther Bros. & Haenel and the Forest Service of the United States Department of Agriculture produced road gravel.

Trempealeau.—Neuheisel Lime Works crushed limestone for agricultural and road construction near Arcadia. Clarence Weiss produced crushed and broken limestone for riprap and roadstone from

a quarry near Ettrick.

Vernon.—Crushed limestone used chiefly as roadstone was produced by Ellefson Bros., Edward Kraemer & Sons, and Ed Mueller & Sons. The county highway commission produced dimension limestone for rough construction and rubble and sand for road use.

Vilas.—Chicago & Northwestern Railway Co. produced gravel for railroad ballast. Road gravel was produced by the county highway department.

Walworth.—B. R. Amon & Sons produced sand and gravel for road use at a portable plant near Elkhorn. Community Sand & Gravel produced gravel for concrete aggregate and road construction near Delavan. Sand and gravel for building and road purposes and ground sand used as filler were produced by Lake Geneva Sand & Gravel Co. near Fontana. Mann Bros. Sand & Gravel, Inc., produced sand and gravel at a fixed plant 4 miles north of Elkhorn for building and road use and fill. Delavan Sand & Gravel Co., Inc., produced sand and gravel for building and road purposes. Road gravel was produced by R. W. Miller near Lake Geneva, L. F. Stoflet & Sons, Inc., near East Troy, and under contract for the county highway department.

H. E. Wheeler produced crushed limestone for agricultural and road use near Elkhorn.

Washburn.—The county agricultural department produced cal-

careous marl near Spooner for agricultural purposes.

Washington.—Sand and gravel output in the county in 1955 was chiefly for building and road construction and railroad ballast. Operators during the year included: John B. Jacklin, Minneapolis, St. Paul & Sault Ste. Marie Railroad, Northern Sand & Gravel Co., C. & W. Gravel Co., Ozaukee Sand & Gravel Co., Palmer Crushing Co., Leroy Schmidt, Fred C. Schultz & Son, West Bend Ready Mix, and the county highway commission.

The county highway commission also produced crushed limestone

for road use.

Waukesha.—Limestone was produced in the county for a variety of purposes. Dimension limestone, which was used for house stone veneer, retaining walls, flagging, dressed architectural purposes, rough construction, and rubble, was produced by the following companies in 1955: Cawley Quarry Fonda Lannon Stone Co., Halquist Lannon Stone Co., Ideal Lannon Stone Co., Joecks Bros. Stone Quarry, Meadow Hill Quarries, Inc., Midwest Lannon Stone Co., Milwaukee Lannon Stone Co., Perren's Quarry, Quality Limestone Products, Inc., Sussex Lannon Stone Corp., West Side Stone Co., and White Rock Lannon Stone Co. Crushed and broken limestone was produced by Halquist Lannon Stone Co., Ideal Lannon Stone Co., Milwaukee Lannon Stone Co., Quality Limestone Products, Inc., Waukesha Lime & Stone Co., Inc., and West Side Stone Co. Output was chiefly for riprap, roadstone, flux, filler for asphalt and fertilizer, filter use, and agricultural purposes.

Sand and gravel was produced in the county in 1955 for building and road construction, railroad ballast, and other uses. Producers reporting output in 1955 were: Wm. Buege, Frank Clark & Sons, Consumers Co., Hales Corners Gravel, Hartland Sand & Gravel Co., Jaeger Sand & Gravel Co., Inc., Kohler Bros. Sand & Gravel Co., Edw. Lutz Sand & Gravel Co., Inc., Merget Sand & Gravel, Northwest Sand & Gravel Co., A. W. Nowatske, Walter D. Pett, G. Earl Rolefson, State Washed Sand & Gravel Co., H. Turner & Son, Valley Sand & Gravel Co., Vogt, Inc., and the county highway department. Waupaca.—C. H. Peters produced road gravel and crushed lime-

Waupaca.—C. H. Peters produced road gravel and crushed limestone for agricultural use at a portable plant near Readfield. Howard W. Waite produced sand fill and gravel for building purposes

from a pit near Clintonville.

Hockers Brick Co. produced clay for manufacturing building brick at New London.

Waushara.—Lohrville Stone Co. produced dimension granite for rough construction, architectural, and monumental use at Lohrville.

Calcareous marl was produced by Theodore Anderson, Elmer Bruch, Gaylord Dehling, William Edwards, and Thomas Lundberg. The entire output was for agricultural purposes.

The county highway commission produced road gravel.

Winnebago.—Cook & Brown Lime Co. produced sand and gravel for building use near Omro. Courtney & Plummer, Inc., produced sand and gravel chiefly for building and road use and crushed limestone

for concrete aggregate, roadstone, and agricultural purposes. Friedrich & Loots produced sand and gravel for road use. Schulz Sand & Gravel, Inc., produced sand and gravel for road use and fill. The

county highway department produced road sand.

Crushed and broken limestone for riprap, concrete aggregate and roadstone, railroad ballast, and asphalt filler was produced by Badger Highways Co., Inc., at Menasha. Consumers Co. crushed limestone for agricultural and road purposes. Crushed limestone for road use was produced by Edward Kraemer & Sons, and under contract for the county highway department.

Wood.—Ellis Quarries, Inc., Felix Klesmith, and Tony Schmick produced dimension sandstone for building use and flagging near

Rudolph. •

Alex Kauth Concrete Co. produced sand for building use.

## The Mineral Industry of Wyoming

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

By D. H. Mullen, Breck Parker, and Alfred L. Ransome 2



THE VALUE of all minerals produced in Wyoming in 1955 continued a trend that has been upward for 6 years and reached \$297.7 million (exclusive of uranium)—a 6-percent gain over 1954. The mineral industry during the year was characterized by continued gains in the output of petroleum, trona, natural gas, sulfur, gypsum, coal, and iron ore. Sand and gravel production increased in 1954 but declined in 1955, even though the value of production increased. The shipments and value of cement advanced moderately during 1955.

Mineral fuels continued to rank first in value of output and contributed 88 percent to the total value of the mineral wealth of Wyoming in 1955, compared with 90 percent in 1954. Crude petroleum supplied 91 percent of the total value of all mineral fuels in both

1954 and 1955.

Production of nonmetals as a group remained second to fuels. The total value for this group—headed by clays, trona, and sand and

gravel—was 10 percent of the total for all minerals in 1955.

The output of metals in Wyoming remained relatively small. Iron ore still was the most important metallic-mineral commodity, in terms of value. Uranium mining and exploration continued to center in Fremont and Natrona Counties.

Government assistance to the mining industry in Wyoming continued through the activity of the Defense Minerals Exploration

Administration (DMEA).

Commodity-industry analyst, Region III, Bureau of Mines, Denver, Colo.
 Chief, Division of Mineral Industries, Region III, Bureau of Mines, Denver, Colo.

TABLE 1.—Mineral production in Wyoming 1954-55 1

	19	54	195	5
Mineral	Short tons (unless other- wise stated)	Value	Short tons (unless other- wise stated)	Value
Clays Coal Copper (recoverable content of ores, etc.) Gem stones Gold (recoverable content of ores, etc.) Grysum Iron ore (usable)long tons, gross weight. Natural gasmillion cuble feet. Natural-gas liquids: LP-gasesthousand gallons. Natural gasoline Qo. Petroleum (crude)thousand 42-gallon barrels. Phosphate rocklong tons. Sand and gravel Silver (recoverable content of ores, etc.) troy ounces. Stone Stone Stone Sulfur, recovered elementallong tons. Value of items that cannot be disclosed: Cement, pumice, sodium carbonates, sodium sulfates, vanadium (1954), and values indicated by footnote 3.	407 7, 403 458, 237 71, 068 46, 084 47, 082 93, 533 (3) 4, 163, 660	\$9, 534, 087 11, 541, 312 (5) 590 14, 245 29, 612 (7) 5, 970, 000 2, 128, 000 3, 137, 000 229, 160, 000 (8) 2, 681, 527 1, 665, 302 2, 977, 954	2, 926, 598 (7) 52 22, 373 748, 831 77, 819 46, 106 40, 290 99, 483 54, 958	\$10, 923, 521 11, 845, 252 57, 000 1, 820 89, 493 (2) 6, 615, 000 2, 775, 000 239, 750, 000 345, 451 3, 977, 677 2, 033, 800 3, 206, 353
Total 4		281, 306, 000		297, 752, 000

TABLE 2.—Average unit value of selected mineral commodities in Wyoming, 1954-551

Commodity	1954	1955	Commodity	1954	1955
Claysshort ton Coaldo Gold 2troy ounce Gypsum (crude)short ton Natural gas thousand cubic feet Natural gas liquids: LP-gasesgallon Natural gasolinedo	\$10.105 4.076 35.000 4.000 .084 .046 .067	\$10. 548 4. 047 35. 000 4. 000 . 085 . 043 . 069	Petroleum (crude) \$ 42-gallon barrel Sand and gravelshort ton Silver 4troy ounce Stoneshort ton Sulfur (elemental)long ton	\$2.450 .644 .905+ 1.030 26.330	\$2. 410 1. 006 . 905+ 1. 560 26. 565

<sup>1</sup> Prices are based on average value f. o. b. mines or mills reported by the producers, except as otherwise

<sup>1</sup> Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Value of uranium ore is excluded.

3 Weight not recorded.

3 Figure withheld to avoid disclosing individual company confidential data.

4 The total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing cement.

Prices are based on average value? of 5. 5. Initial of Initial Price and authority of Gold Reserve Act of Jan. 31, 1934.

3 Value at wells.

4 Treasury buying price for newly mined silver July 1, 1946, to date—\$0.9050505 (\$0.905 used in 1947 for calculating purposes).

TABLE 3.—Defense Minerals Exploration Administration contracts executed, 19551

		Contract		
County and contractor	Property	Date	Total amount	
Campbell County				
Price Exploration Co	Pumpkin Buttes	Dec. 22	\$24, 852	
Crook County				
Shannon Oil Co	Laymon lease	Sept. 14	59, 360	
Fremont County				
Gaddis Mining Co	Crooks Gap mine Helen May claims	June 27 Aug. 10	31, 220 25, 500	
Total			140, 932	

<sup>&</sup>lt;sup>1</sup> All contracts for uranium; Government participation, 75 percent.

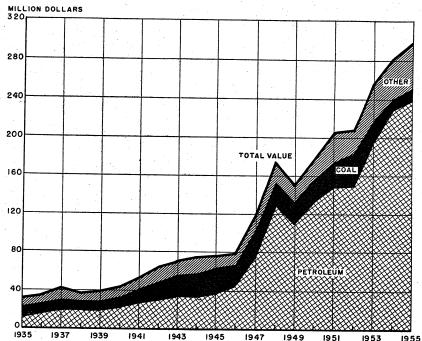


FIGURE 1.—Value of petroleum, coal, and total value of all minerals produced in Wyoming, 1935-55.

### REVIEW BY MINERAL COMMODITIES

### MINERAL FUELS

Coal.—Coal production from 24 active mines in Wyoming totaled 2.9 million tons, a 3.3-percent increase over 1954. The counties showing major changes in output were Lincoln and Campbell (increases)

and Carbon (decrease).

The 8 strip operations in the State supplied 1.5 million tons in 1955. The relatively low cost of extraction associated with these mines is reflected in the average f. o. b. mine value for Campbell, Carbon, Converse, Lincoln, and Sheridan Counties, where strip-mine output was either a large portion or all of the tonnage in 1955. For the State, stripped coal averaged \$2.57 per ton at the mine, compared with \$5.69 per ton at underground operations.

TABLE 4.—Production of coal, 1954-55, by counties

(Exclusive of mines producing less than 1,000 tons)

	1954		1955	
County	Production (short tons)	Average value per ton 1	Production (short tons)	Average value per ton 1
Campbell. Carbon Converse. Fremont. Hot Springs Johnson Lincoln Sheridan Sweetwater. Other counties.	(2) 233, 200 (2) (2) (2) (2) (2) (2) (2) (2) (2) (2)	(2) \$3. 57 (2) (2) (2) (2) (2) (2) (2) (2) 5. 61 2. 69	349, 566 192, 493 8, 040 3, 624 17, 442 1, 393 645, 720 437, 222 1, 271, 093	\$1. 2 3. 5 3. 3 6. 5 6. 9 4. 5 2. 8 3. 3 5. 6
Total	2, 831, 430	4.08	2, 926, 593	4.0

<sup>&</sup>lt;sup>1</sup> Value received or charged for coal f. o. b. mine, including selling cost. (Includes value for coal not old but used by producer, such as mine fuel and coal coked, as estimated by producer at average prices hat might have been received if such coal had been sold commercially.)

<sup>2</sup> Included with "Other Counties," not published to avoid disclosing individual operations.

Natural Gas.—The marketed production of natural gas was 77.8 billion cubic feet in 1955. The 9.5-percent increase over the previous year mainly was due to increased out-of-State shipments, totaling 41.7 billion cubic feet, compared with 32.8 in 1954.

Fremont, Sweetwater, and Washakie Counties supplied over half of the total production, with an additional third from Natrona, Park,

and Uinta Counties.

Nine gas discoveries were made during the year, and 37 development wells were drilled—a total of 46 gas wells, compared with the 29 drilled during 1954. Greater interest in the Green River Basin gas potential was the major cause for increased drilling, as portions of the Pacific Northwest Pipe Line were completed and a gathering system for the Big Piney field (Sublette County) was under construction.

Natural-Gas Liquids.—Production of liquefied-petroleum gases (46.1 million gallons) remained at the same level as in 1954, and natural-gasoline output declined from 47.1 million gallons in 1954 to 40.3 million in 1955.

At the end of 1955, 10 extraction plants were operating within the State with a total daily productive capacity of 407,000 gallons, compared with 344,000 gallons from 7 plants 2 years earlier. Additionally, two plants to process gas from the Clareton field, Weston County,

were reported under construction as the year closed,

Petroleum.—Production of crude petroleum rose to 99.5 million barrels in 1955 and furnished 80.5 percent of the value of all minerals produced in the State. Production by counties was distributed approximately as follows: Park—20 percent; Big Horn, Fremont, and Hot Springs—40 percent; Converse, Johnson, Natrona, Sweetwater, and Weston—30 percent; and 12 other counties—10 percent.

Exploration drilling decreased from 271 wildcat holes (1.50 million feet) in 1954 to 262 holes (1.35 million feet) in 1955, and the decline in new oil discoveries was more pronounced—from 42 to 26. Development drilling decreased by an even greater amount from 950 holes (5.03 million feet) in 1954 to 653 holes (3.13 million feet) in 1955.

The shift downward in drilling activity can be ascribed almost wholly to declining interest in the Clareton field in Weston and Niobrara Counties, where drilling was strongly concentrated during 1954.

One of the results of exploration in 1955 was the successful production of oil from the Muddy sandstone (Lower Cretaceous) in Big Horn County. The discovery led to a restudy of numerous other areas in the Big Horn Basin where the member was known to exist.

TABLE 5.—Production of crude petroleum, 1951-55, by fields, in thousand barrels

Field	1951	1952	1953	1954	1955
Beaver Creek	314	679	605	726	1, 130
Dig Muddy	878	1, 197	1, 373	1.088	1, 232
Big Muddy Big Sand Draw	2, 185	2, 387	2, 400	2,503	2, 546
		1, 620	2, 935	3, 536	5, 033
Byron-Garland	(¹) 5, 186	4, 343	5, 603	6,642	7, 599
Cole Creek-Northeast and South		1, 820	2, 271	1,506	1, 223
				6, 889	7. 543
Elk Basin	7, 292	8,041	8, 488		
		3,709	3, 731 888	3,708	3, 523 1, 469
Gebo	323	288		698	
Glenrock-South		2, 414	4, 197	3,940	3,660
Grass Creek	1,816	2, 395	3, 583	4, 367	4, 155
Hamilton Dome		3,075	3, 558	3,766	4, 681
Lance Creek	2, 385	1,895	1,662	1,937	1, 484
Little Buffalo		951	1, 142	1,224	1, 228
Lost Soldier-Wertz, etc	5, 225	5, 299	5, 900	6, 519	6, 449
Oregon Basin		2,688	3, 508	4,898	5, 888
Salt Creek		4, 159	4, 375	4,583	4, 423
Steamboat Butte		2,056	3, 611	3, 443	3, 470
Sussex-Meadow Creek		2, 960	4,022	6.802	7, 392
Winkleman	817	811	1, 255	1,414	1,349
Other fields 2	17, 179	15, 287	17, 511	23, 344	24, 006
Total	68, 929	68, 074	82, 618	93, 533	99, 483

<sup>1</sup> Included with "Other fields."

<sup>2</sup> Includes crude oil consumed on leases and net change in stocks held on leases for entire State.

TABLE 6.—Wildcat and development completions in 1955, by counties
[Oil and Gas Journal]

	County	Oil	Gas	Dry	Total	Footage
ildcat completions	:					
Albany		 1	l	10	11	40, 400
Big Horn		 3		18	21	91,000
Campbell		 1 "		6	6	42, 800
Carbon		 1		12	13	82, 500
Converse		 l i		12	3	20, 400
		li		5	6	27, 100
		2	1		18	91. 20
		ĺ	1	15		
		1 -		18	19	39, 900
				10	10	48, 700
		1		11	12	23, 10
		1		11	12	84, 400
				2	2	10,000
Natrona		 8	2	39	49	253, 50
		1		10	11	43, 80
		2	J	5	7	42, 30
				18	18	116, 400
Sublette		 1	5	7	12	83, 70
Sweetwater		 l	1 1	10	11	82,000
Teton		 		2	2	11, 100
				2	2	10, 10
		2		4	6	39,000
		ĩ		10	11	67, 80
W COMMITTEE		 		10	11	07,800
Total wildcats.		 26	9	227	262	1, 351, 200
evelopment comple	etions:					
Albany	etions: 	 1		3	4	11, 40
Big Horn		 29	5	9	43	193, 20
Carbon		 1	l i	5	7	36, 30
		28	-	ĕ	34	195, 00
		5		ıĭ	16	17, 10
		34	1	10	45	217, 90
		6	-	5	ii	77, 000
Hot Springs		 36		5	41	165, 40
Tohnson		 39		12		287, 00
		6		2	51	
		0			8	59, 40
				1	1	3, 30
		39	1	16	56	225, 30
		6		8	14	71, 30
		27		. 8	35	165, 80
		17		. 7	24	119, 50
Sublette		 2	21	13	36	109, 50
Sweetwater		 l	6	1	7	42, 500
Uinta		 l		1	1 1	80
Washakie		 10	1	5	16	92, 90
		127	î	75	203	1, 042, 40
Weston						
	nents	 413	37	203	653	3, 133, 00

Eleven refineries operated in 1955 and at the close of the year had the capacity to process 110,900 barrels of crude oil per day. However, 2 of the smaller refineries (combined capacity, 9,650 barrels per day) at Glenrock and Lovell were scheduled to close in 1956, according to announcements made by the operators.

#### **METALS**

Gold and Silver.—Because of the closing of the Carissa mine of the Pioneer-Carissa Gold Mines, Inc., in November 1954, production of gold and silver declined from 407 ounces of gold and 74 ounces of silver in 1954 to 52 ounces of gold and 20 ounces of silver in 1955. The low grade of the ore and the increasing costs of operation made profitable operation impossible. Six tons of material obtained from a mill cleanup was shipped. Elayer Co., Inc., completed constructing a 60-ton-per-day mill at the Duncan mine and made a 2-week test

run in December before closing for the winter. Two hundred tons of development ore was treated. Both mines are in the Atlantic City and South Pass district in Fremont County.

TABLE 7.—Mine production of gold, silver, copper, and lead, 1946-50 (average), 1951-55, and total, 1867-1955, in terms of recoverable metals  $^1$ 

Year	Mate- rial sold or			Silver (lode and placer)		Copper		Lead		Total
	treated 2 (short tons)	Fine ounces	Value	Fine ounces	Value	Short tons	Value	Short tons	Value	value
1946-50 (average) 1951	1, 757 10	419 9	\$14, 665 315 35	31 2	\$27 2	(3)	<b>\$</b> 65			\$14, 75 31
1953 1954 1955	1, 445 206	1 407 52	35 14, 245 1, 820	11 74 20	10 67 18	1 1	574 590			61 14, 90 1, 83
1867–1955	(4)	80, 501	1, 925, 863	74, 926	52, 009	16, 328	5, 685, 536	14	\$1, 486	7, 664, 89

<sup>&</sup>lt;sup>1</sup> Includes recoverable metal content of gravel washed (placer operations), ore milled, and ore shipped directly to smelters during the calendar year indicated.

<sup>2</sup> Does not include gravel washed.

Less than ½ ton.
Figure not available.

Iron Ore.—Iron ore was produced in the Hartville district, Platte County. Production was 748,831 long tons, a 63-percent increase over 1954, which reflected, in part, the increased demand for steel and the fluctuation of crude stocks at the steel plant. The entire output was used at the Pueblo, Colo., furnaces of the Colorado Fuel & Iron Corp. for producing steel. Iron ore ranked sixth in the value of mineral production in the State.

TABLE 8.—Shipments of iron ore, total 1900-50 and by years, 1951-55

Year	Long tons	Year	Long tons
1900-50	24, 054, 656	1953	654, 285
1951 1952	616, 949 484, 945	1954	458, 237 748, 831

Selenium.—Small quantities of selenium have been found in the Miocene rocks in the Baggs area and in the uranium fields at Gas Some exploration and development were in progress during Recovery of selenium from the low-grade primary deposits and extraction from the uranium ores were major problems that remain unsolved.

Titanium.—The Union Pacific Railroad Co. continued to explore the titaniferous iron deposits at Iron Mountain northwest of Laramie in Albany County. Discoveries of titanium-bearing black-sand deposits have been reported, but tonnage has not been estimated. Metallurgical tests on the black sands were being planned to determine if the material would be amenable to current processing methods.

Uranium.—During 1955 exploration and development efforts were confined largely to previously known districts, and no major new uranium discoveries were reported. The Gas Hills (Fremont and Natrona) and the Crooks Gap (Fremont) districts were the major centers of activity.

At Riverton, Fremont County, the Atomic Energy Commission (AEC) opened a buying station in March, and shipping distances

for central Wyoming producers were substantially reduced.

Production increased severalfold over the previous year; more than half of the total was mined from the Gas Hills district. Other areas in Fremont County, plus those in Crook, Campbell, Converse, and Carbon Counties, also contributed uranium ore.

Private drilling increased markedly during the year and totaled

400,000 feet.

#### **NONMETALS**

Cement.—Shipments of portland cements from the Laramie plant of the Monolith Portland Midwest Co. increased 3 percent over 1954. Production consisted of general-use and moderate-heat (types I and II), high-early-strength (type III), high-sulfate-resistance (type V), oil-well, and waterproof portland cements. The average value in 1955 was \$3.11 per barrel, compared with \$3.01 in 1954.

Clays.—Bentonite, the most important of the nonmetallic minerals and third in value in the State, was mined in Crook, Weston, Big Horn, Johnson, and Natrona Counties. Nine companies operated 12 deposits and 7 processing mills. Wyoming ranked first in the United States in the production of bentonite, and sales increased 11 percent over 1954. Principal uses were for rotary-drilling mud and in foundries and steelworks. Other uses were in chemicals, insecticides, filtering, and as a concrete admixture. The average value was \$12.98 a ton in 1955, a slight increase over comparable \$12.58 a ton in 1954. The processing plants were in Crook (2), Weston (2), Big Horn (2), and Natrona (1) Counties.

Miscellaneous clay was mined in Big Horn and Sheridan Counties for manufacturing building brick, tile, and other heavy clay products

and in Albany County for manufacturing cement.

The alumina plant at Laramie, built by the Federal Government during World War II to determine the feasibility of extracting alumina from anorthosite rock, was sold to the Ideal Čement Co. of Denver, Colo., in June 1954. The company organized a subsidiary, Great Western Aggregates, Inc., and remodeled the plant for the production of lightweight aggregate. Trial runs were begun in February 1955 with shales from deposits in Colorado. Shales in the vicinity of the plant are of the same geologic age as those in Colorado, and the corporation planned to use local sources of shale when the trial runs were completed.

TABLE 9.—Shipments of bentonite, 1946-50 (average) and 1951-55

Year	Short tons	Value	Year	Short tons	Value
1946-50 (average)	320, 202	\$3, 180, 592	1953	670, 756	\$9, 861, 321
1951	465, 254	5, 981, 655	1954	742, 453	9, 339, 755
1952	692, 853	9, 168, 708	1955	825, 810	10, 721, 577

Gem Stones.—Various types of agates and agatized and petrified woods were mined in Fremont, Sweetwater, Carbon, and Natrona Counties, and jade was mined in Fremont County. The value of sales in 1955 was \$57,000.

Gypsum.—Gypsum was produced in Albany County for manufacturing cement and in Park County for agricultural use. The output in 1955 tripled that of 1954 because of stockpiling for cement

manufacture.

Phosphate Rock.—Phosphate rock was mined at the Leefe mine northwest of Sage in Lincoln County. Production was considerably below that in 1954. The dry-separation plant was operated the entire year. A substantial portion of the raw material treated was from deposits in Utah. The material was used for manufacturing triple superphosphate, superphosphate, and elemental phosphorus and as direct-application fertilizer.

Pumice.—Pumice and scoria were produced in Sheridan and Sweet-water Counties. Production declined 64 percent below that in 1954. The output was used for concrete aggregate and railroad ballast.

Sand and Gravel.—Production of sand and gravel decreased 5 percent in 1955; but, because of the higher valuation applied to production by and for municipal, State, and Federal agencies for contract material, the total value increased 48 percent. The overall production was 4 million tons, of which 86 percent was used for paving and road construction, 9 percent for building, and 5 percent for railroad ballast. Government agencies produced or contracted for 83 percent of the sand and gravel used in paving and road construction. Nearly all (94 percent) of the sand and gravel produced was crushed, washed, screened, or otherwise prepared. Transportation was almost entirely (95 percent) by truck.

The leading commercial producers were Gilpatrick Construction Co., Union Pacific Railroad Co., Boatright-Smith, W. E. Barling, Inc., and Casper Concrete Co., Inc. The major Government-and-contractor producers were Big Horn Construction Co., Read Construction Co., Asbell Bros., Woodward Construction Co., and

Knisely-Moore Co.

Sodium Carbonate and Sulfate.—Natural sodium carbonate (trona) was mined and processed at Green River in Sweetwater County. Production increased 21 percent over 1954, and Wyoming continued to lead the United States in the production of this commodity. Sodium sulfate (glauber's salt) was produced from open-pit deposits and dry-lake brines in Carbon and Natrona Counties. Production was 38 percent below that of 1954 because of the temporary suspension of operation by 1 operator.

Stone.—Stone production consisted of limestone, granite, sandstone, and miscellaneous stone. The principal uses of all types of the crushed stone were for railroad ballast, concrete aggregate, road metal, and riprap, and in manufacturing cement, and refining sugar. Dimension sandstone and miscellaneous stone (rubble) were used for

rough construction.

Crushed limestone was produced in 21 counties and represented 64 percent of the output of stone. The major producing counties were Platte, Albany, Laramie, Lincoln, and Teton. The principal uses were in manufacturing cement, constructing roads, and refining sugar, and for railroad ballast, concrete aggregate, and riprap. Smaller quantities were used for mineral food and as a flux. Crushed granite supplied 31 percent of the production of stone in the State and was produced in Sweetwater, Park, Laramie, and Big Horn Counties, the last two being the major sources. The principal uses were for railroad ballast, concrete aggregate, and road metal.

Sandstone produced in Teton, Platte, and Park Counties was used for concrete aggregate, road metal, riprap, and rough construction. All production was for Government agencies and represented 3

percent of the total production of stone.

Miscellaneous stone was produced in Park, Teton, and Sweetwater Counties, and Yellowstone Park and was used for riprap and rough construction.

The major stone producers were Morrison-Knudsen Co., Inc., Guernsey Stone Co., Monolith Portland Midwest Co., Great Western Sugar Co., Knisely-Moore Co., Gibbons & Reed, and A. E. & W. R. Schmidt.

Sulfur.—Shipments of elemental sulfur in 1955 increased 7 percent to 120,697 long tons, valued at \$3 million. The sulfur was recovered from sour natural gas at five plants in Big Horn, Park, and Washakie Counties.

### **REVIEW BY COUNTIES**

Albany.—The Monolith Portland Midwest Co. operated its wet-process plant at Laramie and produced general-use and moderate-heat (types I and II), high-early-strength (type III), high-sulfate-resistance (type V), oil-well, and waterproof portland cements. The company mined limestone and shale from quarries near the plant. Shipments increased 3 percent over 1954. The average price per barrel was \$3.11 in 1955 and \$3.01 in 1954. Wyoming Construction Co. produced crude gypsum for manufacturing cement.

The alumina plant built by the Federal Government at Laramie during World War II was sold to Ideal Cement Co. of Denver, Colo., in June 1954. The company organized a subsidiary, Great Western Aggregates, Inc., and remodeled the plant for the production of

lightweight aggregates. Trial runs began in February 1953.

M. C. Justesen produced crushed limestone for road construction and sand and gravel for building and paving. Carl V. Hill produced paving gravel and C. F. Yeoman produced building sand and gravel Union Pacific Railroad Co. produced gravel for railroad ballast. Crushed limestone (for riprap) and paving gravel were produced for the Wyoming Highway Department.

At Rock River the Ohio Oil Co. operated a natural-gas processing

plant.

Big Horn.—Petroleum, clays (mostly bentonite), elemental sulfur, sand and gravel, and stone, plus natural gas and natural-gas liquids, in order, were produced in the county during 1955.

TABLE 10.—Value of mineral production in Wyoming, 1954-55, by counties 1 2

County	1954	1955	Minerals produced in 1955 in order of value
Albany	\$3, 298, 632	\$3, 958, 657	Cement, stone, clays, sand and gravel, gypsum.
Big Horn	2, 298, 970	2, 888, 201	Clays, sulfur, sand and gravel, stone.
Campbell	480, 023	599, 721	Coal, sand and gravel, stone.
Carbon	1, 144, 040	940, 527	Coal, sand and gravel, sodium sulfate, stone, gem stones.
Converse	106, 223	45, 671	Coal, sand and gravel.
Crook		4, 105, 589	Clays, sand and gravel, stone.
Fremont	290, 444	244, 815	Sand and gravel, gem stones, coal, stone, gold, silver.
Goshen	49, 202	193, 101	Sand and gravel, stone.
Hot Springs		195, 852	Coal, sand and gravel, stone.
Hot Springs Johnson	148, 150	212, 639	Sand and gravel, clays, coal.
Laramie	973, 510	1, 011, 302	Stone, sand and gravel.
Laramie Lincoln	2, 422, 846	2, 481, 613	Coal, phosphate rock, sand and gravel, stone.
Natrona	571, 902	336, 799	Sand and gravel, clays, sodium sulfate, stone, gem stones.
Niobrara	90, 781	87, 702	Sand and gravel, stone.
Park		1, 021, 321	Sulfur, sand and gravel, gypsum, stone.
Platte	3, 372, 382	5, 646, 008	Iron ore, stone, sand and gravel.
Platte Sheridan	1, 673, 457		Coal, sand and gravel, pumice and pumicite, stone, clays.
Sublette	10,040	54, 060	Sand and gravel, stone.
Sweetwater	13, 512, 922	14, 752, 629	Coal, sodium carbonate, sand and gravel, stone, pumice and pumicite, gem stones.
Teton	127, 100	126, 175	Stone, sand and gravel.
TTinta	51, 070	21, 080	Sand and gravel, stone.
Washakie	2, 251, 377		Sulfur, sand and gravel, stone.
Weston	2, 863, 660	4, 163, 263	Clays, sand and gravel, stone.
Yellowstone Park		8,770	Stone.
Undistributed	240, 530, 524	251, 572, 061	[마마타 1: 10 14.8
Total 3	281, 306, 000	297, 752, 000	[전문학생 12 등 전문학 12 급하고 함드

Value data of gem stones (1954 and some in 1955), natural gas, natural-gas liquids, petroleum, some sand and gravel, and vanadium (1954) that cannot be assigned to specific counties are excluded from county totals and included with "Undistributed".
 Value of uranium ore excluded.
 Adjusted to eliminate duplicating value of raw materials used in manufacturing cement.

Production of petroleum came from fields along the northeast flank of the Big Horn Basin; all but a small portion of the output

came from the Bonanza, Garland, and Byron fields.

The discovery and development of oil production from the Muddy sandstone (Lower Cretaceous) by L. J. Peterson was considered one of the year's important exploration results in the Big Horn Basin. The discovery well, No. 5 Wycol-Govt., is in the Manderson area. The Muddy sandstone had been known to be oil bearing, but owing to its low permeability the stratum had not been considered productive. Artificial fracturing led to the successful completion of the discovery hole and resulted in the reevaluation of drill logs from other areas in the Big Horn Basin. Several holes, previously drilled deeper, were recompleted at the Muddy horizon with production of natural gas and condensate being recorded.

At Manderson early in the year, Mobil Producing Co. began operating a natural-gas-liquids plant to process sour gas from the Manderson area. Hydrogen sulfide was removed from the natural gas and treated for recovery of sulfur by the Modified Claus process at an adjoining plant operated by Jefferson Lake Sulphur Co., which, under construction in 1954 and 1955, began operating March 16, 1955.

Ohio Oil Co. operated its refinery at Lovell; at year end, however, the company announced that the plant would be closed and disposed of in 1956. Crude-oil supplies for the plant came primarily from the nearby Byron and Garland fields and the Oregon Basin field in Park

County. The refinery reportedly operated at half its capacity for

the last several years.

Magnet Cove Barium Corp. and Wyo-Ben Products Co. produced and processed bentonite for use in rotary-drilling mud, iron and steel foundries, and chemicals. Lovell Clay Products Co. produced miscellaneous clay for manufacturing building brick, tile, and other heavy clay products. Knisley-Moore Co. produced crushed granite for concrete aggregate and road construction. Crushed limestone for riprap and building sand and gravel were produced for the Wyoming Highway Department.

A bulletin 3 describing the geology of the Big Horn Canyon-Hardin

area was published.

Campbell.—Coal was produced from the Wyo-Dak strip mine near Gillette by an average of 25 men employed during 1955. Most of the output was used as fuel in the thermal-electric plants of the Black Hills Power & Light Co. of South Dakota.

Crushed limestone (for riprap) and paving gravel were produced

for the Wyoming Highway Department.

In the Pumpkin Buttes area restoration of land withdrawn by the AEC was scheduled for May; but, because of anticipated conflict between surface owners and prospectors, the restoration order was delayed until late fall. Kerr-McGee Oil Industries was one of the major uranium-ore producers in the area, and shipments were also reported as being made by San Juan Exploration, Inc., and Little Star Uranium Co., Inc. Most of the ore from the area was shipped to Edgemont, S. Dak.

Carbon.—Carbon County was a source of petroleum, coal, sand and gravel, and natural gas, plus smaller amounts of sodium sulfate, stone,

and gem stones.

Petroleum was produced from the Wertz, Rock River, and Big Medicine Bow fields, which supplied three-quarters of the county

output; nine other fields yielded the remainder.

At Sinclair the State's largest refinery was operated by Sinclair Refinery Co. The 24,000-barrel-per-day plant drew its crude supply from fields in western Carbon County, northeastern Sweetwater County, and the Sand Draw and Crooks Gap area of Fremont County.

Coal production from Carbon County declined again in 1955 as the effect of closing in 1954 the Hanna No. 4A mine of Union Pacific Coal Co. continued to be felt. Before closing in 1954, the mine produced 54,000 tons. The remaining three mines, however, increased their output over the previous year: These were the Nugget Strip No. 1, Nugget Coal & Timber Co.; the Hanna No. 2 Strip, Monolith Portland Midwest Co.; and the Thomas, Thomas Coal Co. The average employment at these mines was 34 men.

Iowa Soda Products Co. was temporarily idle in 1955. Natural sodium sulfate (glauber's salt), stockpiled at the mine, was shipped to its processing plant at Council Bluffs, Iowa.

Crushed limestone (for riprap) and paving gravel were produced for the Wyoming Highway Department. R. J. Voerding Co. pro-

<sup>&</sup>lt;sup>3</sup> Richards, P. W., Geology of the Big Horn Canyon-Hardin area, Montana and Wyoming: Geol. Survey Bull. 1026, 1955, 93 pp.

duced paving gravel. A. L. Krueger produced agatized wood and

Fred E. Hagie produced turritella agates.

Converse.—Converse County was a source of petroleum, coal, and sand and gravel in 1955. The major areas of petroleum production were the Glenrock-South, Big Muddy, Glenrock, and Cole Creek-South fields.

Continental Oil Co. announced that its Glenrock refinery would be closed and possibly sold during 1956. The plant operated on crude supplies from the area immediately adjacent to Glenrock.

Coal was mined from the Antelope stripping operation by the Best

Coal Co.

Exploration for uranium was carried out in the southern Powder River Basin north of Douglas. Some of the more active properties were the Hardy lease (Richard L. Peterson), The Fly claim group and Morton Ranch lease (Little Star Uranium Co., Inc.), Jackalope group (Mid-Continent Uranium Corp.), and the Lamb group (Loma Uranium Corp.). Shipments of ore were reported from the area.

Paving gravel was produced for the Wyoming Highway Depart-

Crook.—The county led in the production of bentonite. principal producers were Baroid Division, National Lead Co.; Wyodak Chemical Division, Federal Foundry Supply Co.; Eastern Clay Products Department, International Minerals & Chemical Corp.; and Black Hills Bentonite Co. Baroid Division and Black Hills Bentonite Co. operated processing mills. The principal uses of the material were for rotary-drilling mud and in foundries and steel plants. map 4 showing bentonite deposits in the northern Black Hills was published.

Homestake Mining Co. continued to produce uranium ore from properties in the Western Black Hills and carried out exploration of its New Haven claim group. The company's original property, the Carlile mine, was largely depleted by the beginning of 1955, and effort was shifted to the New Haven area, which supplied most of the production for the county in 1955. Production was also reported from the Jubilee mine near Devil's Tower by Jubilee Exploration & Mining Co. and from property operated by Sodak Uranium & Mining

Co., Inc.

Fremont.—Petroleum, the most valuable mineral commodity from Fremont County, furnished 95 percent of the value of the mineral output in the county (excluding uranium). Natural gas, sand and gravel, gem stones, coal, stone, and precious metals, in that order. supplied the remainder.

The major producing oilfields, in order of rank, were: Steamboat Butte, Big Sand Draw, Winkleman Dome, Circle Ridge, Beaver Creek, and Happy Springs, each of which produced over 1 million barrels of oil in 1955. In addition to petroleum, the Beaver Creek

and Big Sand Draw fields produced most of the natural gas.

Sinclair Oil & Gas Co. was credited with an oil discovery in producing from the Nugget sandstone of the Crooks Gap field. Previous production had come from stratigraphically higher units.

<sup>&</sup>lt;sup>4</sup> Knechtel, M. M., and Patterson, S. H., Bentonite Deposits of the Northern Black Hills District, Montana, Wyoming, and South Dakota: Geol. Survey MF 36, Scale 1: 48,000, 1955.

in the Sheldon-Northwest field (a 1954 discovery) a deeper productive horizon was discovered by Skelly Oil Co. A gas discovery was made by Atlantic Refining Co. between the Beaver Creek and Riverton fields.

In the Beaver Creek field Stanolind Oil & Gas Co. continued development drilling of the Madison pool, which the company discovered

in 1953.

At Sand Draw the Northern Utilities Co. extracted natural gasoline from natural gas produced in the immediate area.

Coal was produced from the Rogers mine of the Rogers Coal Co. and

the George mine operated by Ben George.

Raecke & Scott produced paving sand and gravel and the Federal Bureau of Reclamation produced paving gravel. Crushed limestone for riprap and paving gravel were produced for the Wyoming Highway Department.

Jade, agates, and petrified wood were produced by nine operators;

jade was the most important of the gem minerals.

The Pioneer-Carissa Gold Mines, Inc., idle since November 1954, recovered 6 tons of material in a mill cleanup. Because of the low grade of the ore and increasing costs, the corporation suspended gold-mining operations and considered remodeling the mill for concentrating uranium ores. Elayer Co., Inc., completed construction of a 60-ton-a-day mill at the Duncan mine and made a 2-week test run before closing down for the winter. The mill consists of a jaw crusher, ball mill, mineral jig, flotation cells, and a filter. The product from the mineral jig was treated in an amalgam barrel to recover coarse

gold. In the test 200 tons of ore was treated.

Fremont County developed into the leading area in the State in uranium production and reserves during 1955. In the Gas Hills district, which supplied over half of Wyoming's total production, extensive development drilling was carried out, and by year end the industry was considering a milling operation. To the southwest the Crooks Gap district, although not so fully explored and developed, appeared to have a similar potential. Production from the latter area, however, was not large. In the northern part of the county Little Mo Mining, Inc., shipped ore from the Copper Mountain district throughout most of the year. Ore from these three districts was shipped to the AEC buying station at Riverton, which opened in March.

Properties yielding the bulk of the ore from the Fremont County portion of the Gas Hills district were those of Vitro Minerals Corp., Lucky Mc Uranium Corp. (optioned by Utah Construction Co.),

Globe Mining Co., and Savannah Construction Co.

Surface-mining methods were used exclusively in the Gas Hills and varied from digging surficial deposits with a front-end loader to stripping 50 feet of overburden with a dragline. During the first few months of 1955 most operations were closed owing to the severe cold weather and impassable roads. In the spring Lucky Mc had to remove a substantial tonnage of snow, which had drifted into its open pit during the winter.

On the Beaver Rim, 2 miles west southwest from the Gas Hills and not strictly in the district proper, the Cheyenne Mining Co. produced

ore from an asphalt-impregnated sandstone of the White River formation.

In the Crooks Gap district the major producers were Wyoming Uranium Corp. and Lost Creek Oil & Uranium Co., which operated

the Sno Ball property.

Goshen.—Crushed stone for riprap and road construction was produced for the Federal Bureau of Reclamation and the Wyoming Highway Department. Building sand and gravel was produced for the Federal Bureau of Reclamation, and the Goshen County Highway

Department produced paving gravel.

Oil-well-drilling activity increased markedly in 1955 over the previous year. In 1954, 2 dry wildcat wells were recorded; during 1955, 19 wildcat and 11 development wells were completed, resulting in the discovery of and initial production from the Torrington field south of the town of Torrington. F. R. Anderson and Great Basins Petroleum Co. were credited with discovering the field, which at year end had produced approximately 75,000 barrels of oil.

Hot Springs.—Hot Springs County was a source area for petroleum, coal, sand and gravel, natural gas, and stone; petroleum supplied all but a small fraction of the value derived from mineral exploitation

during 1955.

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Most of the crude petroleum in Hot Springs County came from the Hamilton Dome, Grass Creek, Little Sand Draw, Gebo, Murphy Dome, and Golden Eagle fields. Development drilling was carried out in the Hamilton Dome, Lake Creek, and Gebo fields.

The 5,000-barrel-per-day skimming plant of Empire State Oil Co. at Thermopolis was operated during the year, and its crude supply

was obtained from the Hamilton Dome field.

Coal production advanced 50 percent over the previous year; increases were shown by the Roncco mine (Roncco Coal Co.) and the T & T and Grass Creek mines (T & T Coal Co.)—the three mines active in 1955.

Charles M. Smith produced paving sand and gravel. Crushed limestone (for riprap) and paving gravel were produced for the

Wyoming Highway Department.

Johnson.—Crude oil, clays, sand and gravel, natural gas, and coal, in order of value, were produced in Johnson County during 1955.

Oilfields contributing the major share of the petroleum output in the county were Sussex, Sussex-West and Dugout, and Meadow Creek; smaller amounts were reported from Meadow Creek-North, North Fork, and Tisdale-North. In the Sussex-West field Continental Oil Co. found production in the Tensleep sandstone, a new productive zone for the field although not for the surrounding area.

A small quantity of coal was mined from the Clear Creek mine of

the Clear Creek Coal Co.

Benton Clay Co. and Royal Earth, Inc., produced bentonite for use in rotary-drilling mud. Paving gravel was produced by and for the Wyoming Highway Department.

Laramie.—Laramie County was a source of crude petroleum,

stone, and sand and gravel.

Crude petroleum was produced from the Borie, Horse Creek, Pine Bluffs, and Tracy fields. The Pine Bluffs field, discovered in July by Hiawatha Oil & Gas Co., is 1 mile west of the town of Pine Bluffs. The Tracy field, in the southwest portion of the township, was discovered in 1952 by Union Oil Co. of California and was later abandoned; in 1955 a producing well was drilled in the field by C. M. & W. Drilling Co., Inc.

At Cheyenne, Frontier Refining Co. operated its 14,500-barrelper-day refinery on crude petroleum supplied from the Big Horn,

Powder River, and Denver-Julesburg Basins.

Morrison-Knudson Co. produced crushed granite. Its principal use was for railroad ballast, but it was also used for riprap, concrete aggregate, and chips and grit, and in road construction. The Great Western Sugar Co. produced crushed limestone at its Horse Creek underground mine. Although the bulk of the production was used by the company for refining sugar, substantial quantities were used for riprap, railroad ballast, mineral food, and flux, and in road construction. A. H. Reed Co. produced building gravel. Crushed limestone for riprap and road construction and paving sand and gravel were produced for the Wyoming Highway Department.

A report 5 of the exploration work at the Copper King mine was

published.

Lincoln.—The output of coal in the county approached 650,000 tons in 1955, an 18-percent increase over the previous year. The Elkol Strip and Brilliant No. 8 mines of the Kemmerer Coal Co. supplied all but a small fraction of the coal mined in the county. Additionally, Joe Goyen, lessee, operated the Blind Bull mine. The average employment for the year in coal mining was 144 men.

The Lincoln County petroleum output was derived from the southern end of the La Barge field, which lies in both Lincoln and Sublette

Counties.

The San Francisco Chemical Co. operated its Leefe open-pit phosphate mine and beneficiation plant near Sage. Shipments from the Leefe mine in 1955 totaled 54,958 long tons, a substantial decrease from 1954. The bulk of the material treated at the beneficiation plant was from company-owned deposits in Utah.

Spencer Call Sand & Gravel produced building and paving sand and gravel. Larson-Meyer Construction Co. produced paving gravel. Crushed limestone (for riprap and road construction) and paving gravel were produced for the Wyoming Highway Department.

Natrona.—Mineral products of Natrona County, in order of value in 1955, were petroleum, natural gas, sand and gravel, clays, sodium

sulfate, stone, and gem stones.

The Salt Creek field yielded approximately three-fourths of the county oil production; most of the one-fourth remaining was produced from the Sage Spring Creek, Burke Ranch, Salt Creek-East, Grieve, and Notches fields. Natrona led other counties in the State in exploration drilling, and 8 oil and 2 gas discoveries were reported.

At Casper 3 oil refineries, representing 40 percent of Wyoming's refining capacity, were operated by Standard Oil Co. of Indiana,

<sup>&</sup>lt;sup>8</sup> Soulé, J. H., Investigation of the Copper King Copper-Gold-Silver Deposits, Silver Crown Mining District, Laramie County, Wyo.: Bureau of Mines, Rept. of Investigations 5139, 1955, 37 pp.

The Texas Co., and Socony-Mobil Oil Co., Inc. At Midwest, Stanolind Oil & Gas Co. operated a plant to process natural gas from the Salt Creek field. The plant, the largest in the State, produced 151,000 gallons of natural-gas liquids per day at the close of the year, which was 35 to 40 percent of the total capacity in Wyoming in 1955.

Benton Clay Co. produced bentonite and operated its processing plant at Casper. About half of the crude bentonite processed was from company-owned deposits in Johnson County. The product was used for rotary-drilling mud and chemicals. William E. Pratt produced natural sodium sulfate (glauber's salt) from an open-pit deposit near Casper. Building sand and gravel was produced by Casper Concrete Co., Inc., and Malloy Construction Co. See Ben Realty Co. produced building gravel. Crushed limestone for riprap was produced for the Federal Bureau of Reclamation and the Wyoming Highway Department. Paving gravel was produced by and for the Wyoming Highway Department. Crane's Rock Shop, Mills, produced agates.

The eastern part of the Gas Hills uranium district lagged in development, compared with the Fremont County part. Shipments of ore were made from the Aljob mine and from a mine operated by Joe Wentz on the nose of the Rattlesnake anticline. Considerable claim staking and prospecting were also done in the Poison Spider area

east of the Rattlesnake anticline.

Niobrara.—Niobrara County was a source of crude oil, natural

gas, sand and gravel, and a small quantity of stone in 1955.

Larger oilfields were Lance Creek, Little Buck Creek, and the Niobrara County portion of the Clareton area. The Ohio Oil Co. was credited with the one discovery in the county in 1955—production from the Morrison formation of the Lance Creek field. One small refinery was operated at Lusk by C & H Refinery Co., and a natural-gasoline plant at Manville was operated by Continental Oil Co. Crushed limestone (riprap) and paving gravel were produced for the Wyoming Highway Department.

Park.—Park County ranked first in the State in oil production and was also an important source of natural gas and elemental sulfur.

Sand and gravel, gypsum, and stone were additional products.

The major sources of crude oil were the Elk Basin, Frannie, Oregon Basin-South, Oregon Basin-North, Garland, and Little Buffalo Basin fields. The Husky Oil Co. operated its refinery at Cody, and at Elk Basin the Stanolind Oil & Gas Co. operated a natural-gas-liquids plant and a sulfur-recovery unit. Seaboard Oil Co. also recovered sulfur at its Silvertip plant at Powell. Both plants used the Modified Claus process.

The Wyoming-Gulf Sulphur Corp. produced crude gypsum for agricultural use. Feeley Bros. produced building sand and gravel. Building and paving sand and gravel, and crushed granite, limestone, and sandstone for use as riprap were produced for the Federal Bureau of Reclamation and the Wyoming Highway Department. Paving gravel was produced for the Willwood Irrigation District. F. M.

Moore produced crushed miscellaneous stone for riprap.

Platte.—The Colorado Fuel & Iron Corp. operated the Sunrise underground mine in the Hartville district. Production increased 63 percent over 1954 to 748,831 long tons. The hematite ore, containing 50.9 percent iron (dry), was used for blast-furnace feed in the corpo-

ration furnaces at Pueblo, Colo. The corporation acquired the mineral rights to 8,000 acres in Platte and Goshen Counties that show indications of minable deposits of iron ore. A report 6 describing first-aid training at the corporation properties was published.

The Guernsey Stone Co. produced crushed limestone for railroad ballast, concrete aggregate, road construction, and riprap. The Federal Bureau of Reclamation produced crushed sandstone for riprap and building sand and gravel. Paving gravel and crushed limestone for riprap were produced for the Wyoming Highway Department.

Sheridan.—Sheridan County produced petroleum, coal, sand and gravel, pumice and pumicite, stone, and clays, in order of value, in

1955.

The Ash Creek and Ash Creek-South fields were the source of the

county crude petroleum.

Three coal mines were active in 1955 and employed an average of 72 men. The Big Horn No. 1 (strip), operated by the Big Horn Coal Co., was the largest in the county and the fourth largest mine in the State. The other two mines were the Welch strip mine of Welch Coal

Co. and the Storm King of Anna Patvaros.

Basil Dean, Mullinax Engineering Co., and Sheridan Sand & Gravel Co., Inc., produced building and paving sand and gravel. Paving gravel and crushed limestone for riprap were produced for the Wyoming Highway Department. The Sheridan Wyoming Coal Co. and the Tongue River Stone Co. produced scoria (pumice) for railroad ballast and concrete aggregate. The Sheridan Press Brick & Tile Co. produced miscellaneous clay for manufacturing building brick and tile and other heavy clay products at its Sheridan plant.

Sublette.—Petroleum, sand and gravel, natural gas, and stone were

produced during 1955 in Sublette County.

Three fields—La Barge, Tiptop, and La Barge-South—produced the county output of crude oil. During the year, construction of a gathering system for the Big Piney gas field was undertaken, and 5 natural-gas discoveries were recorded—3 in the Pinedale area, 1 an extension of the Big Piney field, and 1 in the Hogsback unit near the La Barge-North field.

Sweetwater.—Sweetwater County produced petroleum, coal, sodium carbonate, natural gas, sand and gravel, stone, pumice and pumicite, and gem stones during 1955. The county was one of the Nation's major sources of sodium carbonate, Wyoming's major source of coal,

and a leading producer of natural gas.

Petroleum was obtained primarily from the Lost Soldier and Wertz fields; the leading producers of natural gas were the Baxter Basin-South, Hiawatha-East, Baxter Basin-North, and Church Buttes fields. At Bairoil, Sinclair Oil & Gas Co. operated a natural-gasliquids plant.

Coal totaling 1.3 million tons was produced from 7 mines employing 655 men during 1955. Three mines of the Union Pacific Coal Co. and the Rainbow mine of the Gunn-Quealy Coal Co. produced the bulk of the tonnage with the remaining production coming from the Peacock

<sup>6</sup> Moschetti, A. C., and Fritts, G. B., 100-percent Cooperative First-Aid Training, Mines and Quarries, Colorado Fuel & Iron Corp., Colorado and Wyoming: Bureau of Mines Inf. Circ. 7712, 1955, 10 pp.

No. 12 (Colony Coal Co.), the Nugget Strip No. 2 (Nugget Coal & Timber Co.), and a smaller mine, the Swanson (Swanson Mining Co.).

Intermountain Chemical Co. produced trona (natural sodium carbonate) from its underground mine and operated a processing plant at Green River. Shipments of soda ash increased 21 percent over 1954. Building sand and gravel and crushed granite and miscellaneous stone for riprap were produced for the Federal Bureau of Reclamation. Paving gravel was produced for the Wyoming Highway Department. Layos & Layos produced building sand and gravel. The Superior Pumice Co. produced pumice for use as a concrete aggregate.

Several varieties of agate and petrified wood were produced by 2 companies and 4 individual collectors. The total production ex-

ceeded 3 tons, valued at about \$4,000.

Uinta.—Natural gas and natural gasoline from the Church Buttes field, plus petroleum, sand and gravel, and stone, comprised the mineral production of Uinta County in 1955. Church Buttes natural gas, transported via pipeline by the Mountain Fuel Supply Co., formed a portion of the supply to Salt Lake City. The company also operated a natural-gasoline plant at Church Buttes. Petroleum was produced from the Spring Valley field.

Crushed limestone and gravel were produced for the Wyoming

Highway Department for road construction.

Washakie.—The mineral products of Washakie County during 1955 were, in order of value, petroleum, sulfur, natural gas, natural-

gas liquids, sand and gravel, and stone.

The oilfields leading in production were the Neiber Dome, Worland, Slick Creek, and Hidden Dome. The Worland field was also the main source of natural gas in the county. At the town of Worland, Pure Oil Co. extracted natural gasoline and LP-gases from natural gas and supplied hydrogen-sulfide gas to the Texas Gulf Sulfur plant, where elemental sulfur was recovered by the Modified Claus process.

Signal Oil & Gas Co. completed constructing its Stockham-Federal sulfur-recovery plant at Worland and recovered a small quantity of elemental sulfur. None was sold. Construction of the Neiber Dome sulfur-recovery plant at Worland by Signal Oil & Gas Co. continued, and completion early in 1956 was expected. The plants use the

Modified Claus process to recover the sulfur.

Crushed limestone and gravel were produced for the Wyoming

Highway Department for road construction.

Weston.—Petroleum, the most valuable of the county minerals in 1955, was produced primarily from the Clareton, Mush Creek, and Skull Creek fields. Because of the Clareton-field development drilling, Weston County remained the center of development activity in 1955; however a marked decline was noted in the number of development holes and in the success ratio. Development holes drilled during the year totaled 203 (128 successful), compared with 500 (436 successful) in 1954. Activity declined enough to affect significantly the State total drilling statistics.

Because of rapidly falling reservoir pressures in the Clareton field, the Wyoming Oil & Gas Commission ordered all wells producing

more than 5,000 cubic feet of gas per barrel of oil to be shut in, and studies to develop maximum ultimate recoveries were undertaken.

A natural-gasoline plant was constructed and placed in operation at Newcastle by the Mountain Valley Corp., and two other plants were reported under construction. Also at Newcastle, a 4,000-barrel-per-day refinery was operated by the Sioux Oil Co. The state of the s

Weston County ranked second in the State in the production of The Baroid Division, National Lead Co., operated mines near Osage and a mill at Clay Spur. Wyodak Chemical Division, Federal Foundry Supply Co., operated mines and a mill at Upton, and American Colloid Co. operated mines near Upton. The processed product was used in rotary-drilling mud, at foundries and steel plants. for insecticides, filtering, and as a concrete admixture.

Crushed limestone for riprap and paving gravel were produced for the Wyoming Highway Department. The Newcastle City Highway

Department produced paving gravel.