GEOLOGICAL SURVEY OF NEW JERSEY.

HENRY B. KÜMMEL, STATE GEOLOGIST

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THE MINERAL INDUSTRY OF NEW JERSEY FOR 1913.

BY

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Letter of Transmittal.

TRENTON, August 18, 1914.

The State Printing Board, Trenton, N. J.:

Gentlemen:—I hereby request that the State Printing Board order the publication of 2,700 copies of a Bulletin on the Mineral Industry of New Jersey for 1913, the manuscript of which is transmitted herewith. The publication of this report has been approved by the Board of Managers of the Geological Survey, and favorable action by the State Printing Board is requested, as provided by Chapter 46, Laws of 1910. The printing contract for 1913-1914 provides for the publication of such Bulletins of the Geological Survey as shall be ordered by your Board.

The Bulletin shows that the Mineral Industry of New Jersey during 1913 had a value of $40,715,001. This was $323,453 more than in 1912, and was greater than ever before in the history of the industry.

Very respectfully,

HENRY B. KÜMMEL,

State Geologist.

The Mineral Industry of New Jersey.

BY M. W. TWITCHELL.

GENERAL SUMMARY.

As for several years past, the statistics of the mineral production of New Jersey for the calendar year 1913 were collected by the Geological Survey of New Jersey in co-operation with the United States Geological Survey. This method avoids the necessity of troubling producers by requests from two organizations, and insures greater accuracy and completeness in the results.

The total value of the mineral production in New Jersey in 1913 was $40,715,001. This is $323,453 more than in 1912. It is distributed among the different industries as follows:

VALUE OF THE MINERAL INDUSTRY IN NEW JERSEY 1913.

	Number of Producers.	*Value.*	*Increase or Decrease.*
Zinc Mining,	1	$9,421,664*a*	$204,527 D
Iron Mining,	6	980,303	212,513 D
Clay and Clay-working Industries,	205	20,475,067	65,494 D
Stone,*b*	93	1,794,684	56,211 I
Sand and Gravel,	85	1,162,050	15,410 I
Portland Cement,	3	3,638,755	586,657 I
Lime,	15	55,775	9,466 D
Mineral Water,	14	188,546	21,180 D
Sand-lime Brick,	4	15,757	8,833 I
Mineral Paints,	4	2,982,177*d*	169,753 I
Coke and By-products,	1		
Miscellaneous,*c*	4	223	231 D
Total,	435	$40,715,001	$323,453 I

a Value of output figured as spelter (or metallic zinc) on the basis of the recoverable zinc content of the ore.

b Includes Slate and Talc.

c Greensand Marl. In 1912 included Gems also.

d Combined in order to conceal the output of individual producers.

Metallic Ores.

ZINC.

Through the efforts of the New Jersey Geological Survey, the State now receives full credit for its zinc production in the publications of the National Government. The following statement of Mr. E. W. Parker, published last year in the "Mineral Resources of the United States for 1912" is significant in connection with the change in the method of statement which was inaugurated in 1913:

"In the discussion of the mineral products by States in 1911 New Jersey was credited only with the production of spelter made in the State. This method of presentation does not give to New Jersey the proper distinction as a producer of zinc. The production of spelter in New Jersey in 1911 was 15,128 short tons, increasing in 1912 to 16,941 short tons. If, however, the recoverable zinc content of the ore produced in New Jersey be considered, the production in 1911 amounted to 77,445 short tons, valued at $8,828,781, and in 1912 to 69,755 short tons, valued at $9,626,191. The latter method is pursued in the presentation of the statistics of New Jersey's mineral production in the present report. It advances the zinc-mining industry to second in importance in the State, and makes New Jersey second in rank as a producer of zinc, being exceeded only by Missouri."

There was a large increase in the zinc production in New Jersey in 1913, as compared with that of 1912; though the fall in prices during the latter part of the year made the total value of the product somewhat less than in 1912. The amount of zinc ore mined during 1913, according to figures furnished direct to the State Survey by the New Jersey Zinc Company, was 481,899 short tons. They also shipped 2,000 tons of old dump ore. This great output was from the famous Franklin Furnace mine in Sussex County. A new three-compartment shaft has been

started at the Stirling Hill mine, near Ogdensburg, Sussex County, which is also owned by the New Jersey Zinc Company; but no ore was produced from this mine in 1913.

According to Mr. H. D. McCaskey, of the U. S. Geological Survey, the amount of New Jersey zinc ore sold or treated in 1913 was 490,434 short tons, which, figured as spelter, on the basis of the recoverable zinc content of the ore, gives as the zinc output 168,244,000 pounds, with a total value of $9,421,664. As the corresponding figures for quantity in 1912 were 459,585 short tons, or, figured as spelter, 139,510,008 pounds, there was an increase in output of 40,849 short tons, or, figured as spelter, of 28,733,992 pounds. On the other hand, as the total value of the output in 1912 figured as spelter was $9,626,191 there was a decrease in value of $204,527. This was due to the decline in the price of spelter at St. Louis, which dropped from .074 cents per pound in September, 1912, which was the highest in several years, to .05 cents per pound in December, 1913, which is the lowest in several years.

According to C. E. Siebenthal, of the U. S. Geological Survey, the actual production of zinc (or spelter) from New Jersey ores in 1913 was 24,247 tons, a gain of 7,306 tons. Most of this was smelted at the smelter of the New Jersey Zinc Company, at Palmerton, Pennsylvania. The largest part of the 1913 output of the New Jersey zinc mines was made into zinc white, or zinc oxide, at the plants of the New Jersey Zinc Company at Palmerton and Freemansburg, Pennsylvania. Part of the output is used in the manufacture of spiegeleisen.

ZINC ORE MINED IN NEW JERSEY SINCE 1880.

Previously reported,	5,730,226	short tons[1]
Mined in 1913,	481,899	" "
Total,	6,212,125	short tons.

[1] Heretofore the amount has been reported in long tons.

IRON.

The iron industry showed a decrease in production in 1913 as compared with 1912. This was chiefly due to the death of Mr. Joseph Wharton, of the Wharton Steel Company, and the consequent shutting down of all the mines of that important pro-

ducing company. The Wharton Steel Company owns the Wharton, Crane, Hibernia, Lower Wood and Wood and De Camp mines at Hibernia, the Allen and Teabo mines at Teabo, and the Hurd, Orchard and Irondale mines at Wharton. Of these mines the Wharton at Hibernia and the Hurd at Wharton have been the most active in recent years.

There were 6 active operators in 1913, whose total production (or ore mined) was 325,305 long tons, and whose total quantity of marketed ore was 291,653 long tons valued at $980,303. This involved decreases of 39,368 tons in the quantity of ore produced, 75,170 tons in ore marketed and a decrease in the total value of the ore marketed of $212,513. The total stock on hand Dec. 31, 1913, was 160,894 long tons.

IRON ORE MINED IN NEW JERSEY SINCE 1870.

Previously reported,	19,814,967	long tons
Mined in 1913,	325,305	" "
Total,	20,140,272	long tons

PIG IRON.

Only two blast furnaces were in operation in New Jersey in 1913, that of the Empire Steel & Iron Company at Oxford Furnace, and that of the Musconetcong Iron Works at Stanhope. As there were less than three producers the New Jersey output of pig iron cannot be separately given. According to figures furnished by the Bureau of Statistics of the American Iron and Steel Institute, the total production of pig iron in 1913 of New York and New Jersey together was 2,187,620 long tons.

Non-Metallic Minerals and Products.

CLAY AND CLAY-WORKING INDUSTRY.

As stated in last year's report, there was a very large increase in the total production of clay and clay products in New Jersey in 1912 as compared with 1911, the increase being $1,703,458 and the value of the total production for 1912 being $20,540,561. The value of the total production for 1913 was $20,475,067, which, while it involves a decrease of $65,494 as compared with 1912, also involves an increase of $1,637,964 over 1911, and therefore means that the industry practically held the position gained by the great advance of 1912. The figures for the three years are given in the following table:

PRODUCTION OF CLAY AND CLAY PRODUCTS IN NEW JERSEY, 1911-1913.

	Value 1911.	*Value 1912.*	*Value 1913.*
Clay (mined and sold as clay), ...	$658,875	$702,008	$769,689
Clay products, ...	18,178,228	19,838,553	19,705,378
Total, ...	$18,837,103	$20,540,561	$20,475,067

There was an increase in the output of clay in 1913 of $67,681 which offset in part the decrease in clay products, which was $133,175, of which $35,800 was in brick and tile (chiefly brick) and $97,375 was in pottery.

CLAY.

Only a small part of the clay mined in New Jersey is included under this head. All that used by the miner in the manufacture of brick, tile, etc., is reported as the finished product, and only that sold by the miner is here included. For several years New Jersey has stood first, both as regards quantity and value, among the States in the production of raw clay.

The details regarding the production of clay are given in the following table:

CLAY MINED AND SOLD RAW, 1913.

	Amt. in Short Tons, 1913.	*Value in 1913.*	*Value in 1912.*
Ball clay,	2,256	$8,522	$9,152
Fire clay, including sagger clay,	327,175	576,957	502,053
Stoneware clay,	18,231	43,180	39,905
Brick clay,	35,134	29,941	33,168
Miscellaneous,	65,339	111,089	117,730
Total,	448,135	$769,689	$702,008

As compared with 1912 there were increases in fire clay ($74,904), and stoneware clay ($3,275), decreases in ball clay ($630) and brick clay ($3,227) and a total increase of $67,681.

As usual, fire clay greatly exceeded all other kinds combined. Of course, it is to be borne in mind that this means only fire clay mined and sold raw, and is compared with other clays mined and sold raw. There was also a large amount of fire clay dug and made into fire brick directly; and, on the other hand, there was probably more brick clay actually dug than fire clay, but most of it was used at once by the miner. The value of clay so dug but not sold is included elsewhere in the returns for the clay products manufactured.

Of the counties, Middlesex stood first, producing far more than all the others combined, its production in 1913 being 382,990 short tons, valued at $664,025. The other counties in the order of their output were Mercer, Ocean, Burlington, Camden, Cumberland and Union.

POTTERY.

The pottery industry of the United States made a further stride forward in 1913, the total value of the production being (according to figures furnished by the U. S. Geological Survey) $37,992,375, which was $1,488,211 more than in 1912, and was the largest output yet reported.

Of the different varieties of ware, increases were shown in all except stoneware. The details are given in the following table:

POTTERY PRODUCTION OF THE UNITED STATES 1913.

Product.	*Value 1912.*	*Value 1913.*	*Increase or Decrease.*
Red earthenware,	$958,270	$1,000,529	$42,259 I
Stoneware and yellow and Rockingham ware,	3,919,778	3,683,567	236,211 D
White ware, including C. C. ware, etc.,	14,829,431	15,066,811	237,380 I
China, bone china, delft and belleek ware,	2,177,305	2,424,060	246,755 I
Sanitary ware,	7,902,255	8,214,838	312,583 I
Porcelain electrical supplies,	4,927,316	5,737,741	810,425 I
Miscellaneous,	1,789,809	1,864,829	75,020 I
Total,	$36,504,164	$37,992,375	$1,488,211 I

As for a number of years past, the three leading pottery producing States are in the order of their rank, Ohio, New Jersey and West Virginia. Ohio's total production in 1913, according to the U. S. Geological Survey, was valued at $16,519,889, or 43 per cent. of the total, of which nearly 64 per cent. was white ware. New Jersey's total production was $8,838,545, or more than 23 per cent. of the total, of which more than 59 per cent. was sanitary ware. West Virginia's total production was valued at $3,424,887, or over 9 per cent. of the total, the principal product being white ware.

An interesting comparison of the statistics of the three counties where the three greatest pottery centers, East Liverpool, Ohio, Parkersburg, West Virginia, and Trenton, New Jersey, are located is made possible by the following figures furnished to the State Survey by Mr. E. W. Parker, of the U. S. Geological Survey:

POTTERY PRODUCTION OF THREE LEADING COUNTIES IN UNITED STATES.

	1912.	*1913.*
Columbiana County, Ohio,	$7,866,329	$8,248,654
Mercer County, N. J.,	8,069,695	7,898,474
Hancock County, W. Va.,	1,913,404	1,894,682

As will be seen from the above table, Mercer County, which stood first in 1912, fell to second place in 1913. This was due to a decrease of $171,220 in its own production and an increase of $382,325 in the production of Columbiana County, Ohio.

The pottery industry of New Jersey during 1913 practically held the ground made by the great advance in 1912. It is true that the small total decrease of $97,375 is reported for 1913; but

this is hardly significant on a total output of $8,838,545 and in view of the unusual total increase of $533,979 in 1912 over the output for 1911.

The following table gives the different kinds of pottery, with the amount of each kind produced in New Jersey in 1913. The figures for 1912 are also given, for the sake of comparison:

POTTERY PRODUCTION BY VARIETIES, 1913.

	No. of Producers Reporting.	*1912.*	*1913.*	*Increase or Decrease.*
Red earthenware,	7	$36,655	$35,360	$1,295 D
Stoneware and yellow or Rockingham ware,	3	48,297	66,993	18,696 I
White ware, including C. C. ware, white granite, semi-porcelain ware and semi-vitreous porcelain ware,	7	1,090,683	834,716	255,967 D
China, bone china, delft and belleek ware,	7	1,155,766	1,239,453	83,687 I
Sanitary ware,	20	5,199,278	5,238,013	38,735 I
Porcelain electrical supplies,	12	1,146,467	1,190,448	43,981 I
Miscellaneous,[1]	9	258,744	233,562	25,182 D
Total,	52	$8,935,920	$8,838,545	$97,375 D

As will be seen from the above table, there were decreases in the output of red earthenware, white ware and miscellaneous products. The most noticeable decrease is in white ware, etc., there being three producers less and a decrease of $255,967 in the total value of the output as compared with 1912. This decrease made New Jersey fall from second to third place, Pennsylvania replacing her. On the other hand, there were increases in the production of china, stoneware and yellow ware, sanitary ware and porcelain electrical supplies. The increase in stoneware and yellow ware offsets to a certain extent the decrease in these products in 1912 as compared with 1911; while the increases in china, sanitary ware and porcelain electrical supplies are even in advance of the unusual increases in these products in 1912 over 1911.

The production of the leading counties is as follows:

[1]Includes chemical ware, art pottery, clay tobacco pipes, doorknobs, porcelain hardware trimmings and druggist's earthenware.

POTTERY PRODUCTION BY COUNTIES, 1913.

Rank.	Counties.	No. of Producers Reporting.	Value 1912.	Value 1913.
1	Mercer,	32	$8,069,694	$7,898,474
2	Middlesex,	4	353,285	370,026
3	Hunterdon,	3	173,998	217,452
4	Camden,	3	242,973	215,328
	All other counties,	10	85,970	137,265
	Total,	52	$8,935,920	$8,838,545

Mercer County still stands far in the lead, producing 89 per cent. of the total pottery output, and making Trenton, where all of the potteries in the county are located, the second greatest pottery center in the United States.

Middlesex County has apparently established itself firmly in second place. Hunterdon and Camden were practically equal in their output in 1913, though Hunterdon's slight lead enables it to displace Camden for third place.

Mercer County made all of the white ware and china, all of the sanitary ware except to the extent of $617,683, and by far the larger part of the porcelain electrical supplies. The counties outside of Mercer increased their output of sanitary ware from $536,510 in 1912 to $617,683 in 1913, a gain of $81,173. Hunterdon County continued to lead in the manufacture of stoneware and yellow ware, and Essex in red earthenware.

As a further aid to observing the developments in the different phases of the pottery industry, we print the following table giving the statistics during the years 1910 to 1913 inclusive:

POTTERY PRODUCTION OF NEW JERSEY, 1910-1913.

Products.	1910.	1911.	1912.	1913.
Red earthenware,	$26,529	$38,910	$36,655	$35,360
Stoneware and yellow or Rockingham ware,	55,734	75,915	48,297	66,993
White ware, including C. C. ware, white granite, semi-porcelain ware and semi-vitreous porcelain ware,	1,345,156	1,148,904	1,090,683	834,716
China, bone china, delft and belleek ware,	1,131,412	1,105,278	1,155,766	1,239,453
Sanitary ware,	4,955,066	4,898,588	5,199,278	5,238,013
Porcelain electrical supplies,	874,013	913,921	1,146,467	1,190,448
Miscellaneous,	200,545	220,425	258,744	233,562
Total,	$8,588,455	$8,401,941	$8,935,920	$8,838,545

BRICK AND TILE.

The great gain of over a million dollars made by the brick and tile industry in 1912 over that of 1911 could hardly be expected to be repeated. In fact, there was a small decrease in 1913, compared with 1912. The total value of the production for 1913 was $10,866,833, while in 1912 it was $10,902,633, a decrease of $35,800. However, this really means that the advanced ground gained in 1912 was practically held in 1913. The quantity and value of the output of the different kinds of brick and the value of the output of the different kinds of tile is given in the following table:

PRODUCTION OF BRICK AND TILE, 1913.

	Production in Thousands.	*Value.*	*Increase or Decrease.*
Common brick,	401,702	$2,391,287	$200,804 D
Front brick,	45,841	474,501	83,871 D
Fancy brick,		517,263	133,094 I
Enameled brick,			
Fire brick,	43,181	1,246,294	214,694 D
Total brick,		$4,629,345	$366,275 D
Drain tile,		44,020	6,964 D
Architectural terra cotta,		2,388,293	58,228 I
Fireproofing and hollow blocks,		2,092,370	61,020 I
Tile (other than drain tile),		1,308,787	26,772 I
Miscellaneous,[1]		404,018	164,650 I
Total tile, etc.,		$6,229,758	$330,475 I
Total all products,		$10,866,833	$35,800 D

It will be noted that there were decreases in all kinds of brick except fancy and enameled brick, which showed an increase; consequently a general decrease on the total brick output of $366,275. On the other hand, there were increases in architectural terra cotta, fireproofing and hollow blocks, tile (not drain) and in miscellaneous products which not only offset the decrease in drain tile and give a general increase in the total tile output of $330,475, but nearly offset the decrease in the total brick output, reducing the total decrease on all brick and tile to only $35,000.

[1]Includes sewer pipe, stove lining, glass-house pots, gas-furnace linings, conduits, gas logs, wall coping, chimney brick, silica brick and flue lining.

As a further aid for observing the developments in the different phases of the brick and tile industry, we print the following table, giving the statistics during the years 1910 to 1913 inclusive.

BRICK AND TILE PRODUCTION OF NEW JERSEY, 1910-1913.

Product.	*1910.*	*1911.*	*1912.*	*1913.*
Common brick,	$2,215,628	$2,401,962	$2,592,091	$2,391,287
Front brick,	609,845	531,024	558,372	474,501
Fancy brick, Enameled brick,	246,257	432,118	384,169	517,263
Fire brick,	1,001,063	1,344,884	1,460,988	1,246,294
Total brick,	$4,072,793	$4,709,988	$4,995,620	$4,629,345
Drain tile,	$23,147	$26,502	$50,984	$44,020
Architectural terra cotta,	2,000,039	1,669,973	2,330,065	2,388,293
Sewer pipe,		103,137		
Fireproofing and hollow blocks,	1,582,101	1,728,811	2,031,350	2,092,370
Tile (not drain),	1,199,113	1,197,330	1,255,246	1,308,787
Miscellaneous,[1]	368,661	340,546	239,368	404,018
Total all products,	$9,245,854	$9,776,287	$10,902,633	$10,866,833

The production of brick and tile by the three leading counties in 1913 in the order of their rank was: Middlesex, $8,081,206; Mercer, $720,022, and Monmouth, $493,662. Following these were Somerset, Bergen, Camden, Hudson, Burlington, Atlantic, and others of lesser rank.

STONE.

The production of stone ranks fourth in value of output among the mineral industries of New Jersey. The total product in 1913 was valued at $1,794,684. This was an increase of $56,211 as compared with 1912. Of the different varieties of stone produced trap rock has stood first for some time, and in 1913 formed 75.77 per cent. of the total production. In 1912, trap rock formed 69.16 per cent. of the total stone output, so in 1913 it increased still further its lead over the other varieties. Limestone stood second, forming 15.63 per cent. of the total

[1]Includes glass-house pots, gas furnace linings, underground conduits, wall coping and stove lining. Also chimney brick in 1910, 1911 and 1913, retorts and mufflers in 1910 and 1911, sewer pipe in 1910, 1912 and 1913, gas logs in 1912 and 1913, flue linings in 1912 and 1913, and silica brick in 1913.

stone production; its total value for 1913 being $280,680, of which $178,233 was for use as blast furnace flux.

The production of stone for 1913 by varieties and by uses is given in the following tables:

PRODUCTION OF STONE BY VARIETIES, 1913.

	Value.	*Per cent.*
Trap,	$1,359,931	75.77
Limestone,	280,680	15.63
Sandstone,	69,584	3.87
Granite,	62,637	3.49
Slate, Talc and Serpentine,	21,852	1.22
Total, 1913,	$1,794,684	100.00
Total, 1912,	1,738,473	100.00

PRODUCTION OF STONE BY USES, 1913.

	Value.	*Value.*	*Per cent.*
Building stone and monuments,	.....	$63,111	3.53
Paving,	.....	50,949	2.83
Rubble and Rip-rap,	.....	8,718	.48
Crushed stone,	.....	1,377,257	76.73
Road metal,	$728,246	.....	.....
Railroad ballast,	250,571	.....	.....
Concrete,	345,465	.....	.....
Unclassified,	52,975	.....	.....
Blast furnace flux,		178,233	9.93
Other uses,[1]		116,416	6.48
Total, 1913,		$1,794,684	100.00
Total, 1912,		1,738,473	

Of the building stone output of $63,111, $38,335 was sandstone, $18,856 trap and $5,920 was granite. The $50,949 production of paving blocks was all trap. Of the $8,718 output of rubble and rip-rap, $4,976 was trap and $3,742 granite. Of the crushed stone production, $1,274,663 was trap, $52,975 granite, $27,956 limestone and $21,663 sandstone.

The writer recently visited quite a number of the stone quarries in different parts of the State and inspected the character and situation of the rock, the equipment for and methods of quarrying, crushing, loading, etc. In this way he has endeavored to acquire a first-hand knowledge of the actual conditions of the industry and to come in personal touch with the

[1]Includes curbing, flagging, agricultural and others of minor importance.

operator. At times he has given information and advice regarding minerals, the structural features of the rocks and methods of developing the quarry. In this way the inspection visits have proved mutually beneficial and will be continued and extended in the future.

TRAP ROCK.

New Jersey ranks among the leading States as a producer of trap rock, and its output steadily increases as the high quality of the New Jersey material for road making and other purposes becomes more and more widely known. Before the San Francisco earthquake, New Jersey stood first among the States; but with the great increase in road building and other construction work after the earthquake, California forged to first place, which it has held ever since. New Jersey still held second place in 1912 and probably also in 1913, though the figures for the other States for 1913 are not yet available. The following table (which is slightly modified from one by E. F. Burchard in Mineral Resources of the United States for 1912) shows the relative rank of the producing States in 1912.

TRAP ROCK PRODUCTION IN UNITED STATES IN 1912.

			Crushed Stone				
State.	*Building.*	*Paving.*	*Road making.*	*Railroad ballast.*	*Concrete.*	*Other.*	*Total.*
California, ..	$500	$229,261	$591,036	$340,561	$543,254	$221,735	$1,926,347
New Jersey,.	9,213	31,646	616,674	189,641	342,079	13,144	1,202,397
Pennsylvania,	14,458	1,347	359,844	326,512	210,331	3,891	916,383
Massachusetts,	30,614	.....	303,007	10,000	564,706	6,914	915,241
New York,..	20,000	.....	376,460	39,106	396,101	.....	831,667
Connecticut,	15,683	3,081	274,036	89,645	180,370	18,255	581,070
Hawaii, ...	2,707	.....	128,854	.....	94,140	5,650	231,351
Michigan, ...	.....	.....	18,366	.....	9,340	8,500	36,206
Total, ...	$93,175	$265,335	$2,668,277	$995,465	$2,340,321	$278,089	$6,640,662

The trap rock industry in New Jersey was in a prosperous condition during 1913, the total value of the production being $157,534 greater than in 1912. This, too, in spite of the fact that the production of 1912 was $66,012 more than in 1911. The total value of the trap rock produced in 1913 was $1,359,931. By far the larger portion of the output was crushed stone, of

which the production was 1,640,135 short tons, having a value of $1,274,663 and constituting 93.71 per cent. of the total. While in 1911 and 1912 there were increases in the amount used for concrete and decreases in the road metal output, in 1913, the condition was reversed, there being an increase of $84,820 in the value of the road metal production and a decrease of $19,481 in that of crushed rock for concrete.

The details regarding the production of trap rock are given in the following table:

PRODUCTION OF TRAP ROCK, 1913.

	No. of Producers.	*Amount Short Tons.*	*Value.*	*Average Price Per Unit.*	*Increase or Decrease.*
Building stone, rough and dressed,	3	.....	$18,856	.....	$9,643 I
Paving Blocks,	7	(1,470,648a)	50,949	27.84b	19,303 I
Rubble,	1	.....	4,976	.....	619 I
Rip-rap,	6				
Crushed stone—					
Road metal,	51	876,447	701,494	.80	84,820 I
R. R. ballast,	12	347,165	250,571	.72	60,930 I
Concrete,	32	416,523	322,598	.77	19,481D
Other values,	3	.....	10,487	.....	1,700 I
Total, 1913,	53	(c)	1,359,931	.....	157,534 I
Total, 1912,	56	(c)	1,202,397	.....	66,012 I

From the above table it will be seen that during 1913 there were increases in the production of all varieties of trap rock except crushed rock for concrete.

The leading county in 1913 was Somerset, followed in order by Hunterdon, Passaic, Essex, Hudson, Mercer, Union, Bergen and Morris. In 1912 the order was Somerset, Passaic, Hunterdon, Essex, Hudson, Mercer, Morris, Union and Bergen.

SANDSTONE.

Sandstone was reported from fourteen producers in five counties, the total value being $69,584, a decrease of $96,999 as compared with 1912.

a. Total number of individual blocks. The number in 1912 was 1,015,841.
b. Value per thousand blocks.
c. The total quantity of crushed rock in 1913 was 1,640,135 short tons; while in 1912 it was 1,477,404 short tons.

The different uses, value of stone and number of producers is shown in the following table:

PRODUCTION OF SANDSTONE IN 1913.

	No. of Producers.	*Value.*
Building stone, rough,	10	$32,848
Building stone, dressed,	3	5,487
Concrete,	3	10,288
Road metal,	3	11,375
Rubble, rip-rap,	3	6,168
Other uses,	2	3,418
Total,	14	$69,584

There were decreases all along the line, as compared with 1912.

The leading county in 1913 was Mercer, with six producers and a total output valued at $42,848.

LIMESTONE.

The limestone statistics do not include the amounts nor value of stone used in the manufacture of lime or of Portland cement, this portion of the production being included in the value of those manufactured products.

The total value of the limestone quarried for other uses in 1913 was $280,630, an increase of $75,296 compared to 1912. This increase was chiefly in stone for flux, the value of which showed an increase of $99,529.

PRODUCTION OF LIMESTONE IN 1913.

Uses.	*No of Producers.*	*Short. Tons.*	*Value.*
Road making,	5	22,607	$15,377
Concrete,	4	16,164	12,579
Blast furnace flux,	9	330,352	178,233
Other uses[1]	6	.....	74,491
Total,	12	.....	$280,680

The producing counties were Sussex ($204,910), Warren ($51,650), and Hunterdon.

[1]Includes limestone for building, railroad ballast, agricultural and other purposes of minor importance, here grouped together to conceal the output of individual operators.

GRANITE.

Granite and granite-gneiss were quarried by 11 producers located in Morris and Passaic Counties. This was one county less and 14 producers less than 1912. The total value was $62,637, as against $142,515 for 1912, a decrease of $79,878. Details are shown in the following table:

PRODUCTION OF GRANITE IN 1913.

	No of Producers.	Value. 1913
Sold rough—building,	3	$672
Sold rough—monumental,	3	
Sold rough—other uses,	2	5,248
Dressed—building,	2	
Rubble,	2	
Rip-rap,	4	3,742
Crushed stone—		
Road making,	2	
Railroad ballast,	2	52,975
Concrete,	1	
Total	11	$62,637

Morris County led in production, its output being considerably greater than that of Passaic. The production of Morris County was chiefly in the form of crushed stone for railroad ballast.

In 1912 there was a notable increase in the output of building stone; but in 1913 there was a large decrease in the building stone as well as in the crushed stone.

SLATE.

As there were less than three active producers in the slate industry, in order to conceal the production of individual producers the figures are combined with those of the talc and serpentine industry. The combined value of the two industries for 1913 was $21,852; which is slightly more than in 1912, when the combined output was valued at $21,644, the difference being $208.

As in previous years, there were two active slate properties, one at Lafayette, and the other at Newton. The quarries were not continuously operated throughout the year at either locality;

and the total for 1913 is made up largely of sales from stocks on hand. The slate from both quarries is a practically unfading black slate and is used chiefly for roofing slate. The writer has seen slate from the Newton quarry which has been in place in one of the older buildings in Newton since 1847 and shows practically no color change. The sales were somewhat greater in 1913 than in 1912, and the average price per square increased from $4.45 to $4.68.

The process of dressing the roofing slates as observed by the writer during a recent visit was as follows: The slate was quarried partly by hammer and chisel and partly by small blasts so placed as to separate without injuring the slabs. These large slabs, averaging 6 feet by 3 feet by 1 foot, still moist with quarry water, were hoisted from the quarry, loaded on a tram car and pushed to the little dressing sheds. In these sheds the large slabs are first cut up into small slabs or blocks about 2 feet by 1½ feet and 2 inches thick. The blocks are then split by long thin splitting chisels, 10 to 15 inches long, with an edge 2 to 3 inches wide, into thinner and thinner sheets until they are of the thickness desired, usually from one-eighth to one-fourth inch. The thin sheets are then trimmed by a long knife, which is hinged at one end and the other end of which is pulled down to cut the slates.

The slates are graded into first, second and third grades, according to smoothness of surface, even thickness, freedom from defects, etc., and piled on edge on the storing ground. In making sales, the unit of measurement is the "square," which is a sufficient number of pieces of slate of any size to cover 100 square feet of roof. The usual sizes of the individual pieces range from 7 by 9 inches to 16 by 24 inches, while there are from 85 to 686 pieces to a "square," according to size.

TALC AND SERPENTINE.

There being less than three producers in this industry, the figures of production are combined with those of slate, to conceal the output of individual producers. The combined production of the two industries in 1913 was $21,852; which is slightly more than in 1912, when the combined output was valued at $21,644, the difference being $208.

There was but one producer of talc and serpentine in New Jersey in 1913, the Lizzie Clay and Pulp Company. The quarry of this company is located on the Delaware River about 2 miles north of Phillipsburg, and their grinding mill is situated in the southeastern part of Phillipsburg. Both quarry and mill were recently visited by the writer. The quarry is a large, open pit about 125 feet deep. The country rock is the Franklin limestone, here more magnesian in composition than usual; while the rock quarried is chiefly a serpentine varying in color from light to dark. The light-green rock is carted to the mill at Phillipsburg, where it is passed through crushers and pulverizers until it is as fine as flour, constituting what is known as "mineral pulp" and having practically all the characteristics of ground talc. The dark-green serpentine is quarried as large blocks, some 6 feet by 4 feet by 3 feet, which are sold in the rough state, and afterward sawed into slabs, polished and sold for use as "verd antique marble" for interior decoration.

SAND AND GRAVEL.

An advance chapter of the Mineral Resources of the United States, by Ralph W. Stone, of the U. S. Geological Survey, which has just been issued, gives the total production of sand and gravel in the United States during 1913, so far as reported to the Survey, as "79,555,849 short tons, valued at $24,217,508, a net increase in quantity of 11,201,286 tons and in value of $1,104,300 over the production of 1912." The same authority gives figures upon which is based the following summary relative to the rank of New Jersey among the States.

Forty-nine States reported a production, giving the total as quoted above. Eight States reported a production having a value of over $1,000,000 each; these eight, in the order of their production, being Pennsylvania ($3,381,692), New York ($2,963,663), Ohio ($2,092,401), Illinois ($2,070,491), Michigan ($1,529,142), Indiana ($1,260,672), New Jersey ($1,162,050), and Missouri ($1,109,233). New Jersey stood third in both quantity and value of fire and furnace sand, fourth in quantity and value of molding sand, fourth in value but seventh in quantity of engine sand, fifth in both quantity and value of glass sand, sixth in value

but ninth in quantity of grinding and polishing sand, sixth in quantity but eighth in value of building sand, and seventh in value but eighth in quantity of paving sand.

The production of sand and gravel constitutes an important mineral industry in New Jersey. It is one of the most widely distributed and involves a large number of producers. During 1913 the total production was 3,896,421 short tons, having a value of $1,162,050. This was a large increase in quantity—650,654 short tons—but only a small increase in value—$15,410—as compared with 1912. The increase in quantity was chiefly in the gravel output, which had a low value. The production of the different varieties is as follows:

SAND AND GRAVEL MINED IN 1913.

Variety.	*No of Producers.*	*Amt. in Short Tons.*	*Value.*
Molding sand,	37	503,648	$285,677
Glass sand,	7	108,560	82,577
Building sand,	38	1,666,057	369,993
Grinding and polishing sand,	4	21,379	14,803
Fire sand,	11	95,889	87,580
Engine sand,	3	57,133	22,626
Paving sand,	10	175,543	59,722
Other sands,	4	45,608	22,485
Gravel,	30	1,222,604	216,587
Total,	85	3,896,421	$1,162,050
Total in 1912,	95	3,245,767	$1,146,640

The leading counties, during 1913, named in the order of the total value of their production, were Burlington, Middlesex, Cumberland, Morris and Cape May. Cumberland County led in the production of glass sand, with Camden second. Cumberland also led in the production of molding sand, Burlington being second. Middlesex County is the chief producer of fire, paving and engine sands, Burlington of grinding and polishing sand. In gravel production Monmouth County led, Burlington being second.

The production of the three leading counties was as follows: Burlington 1,760,331 tons, valued at $365,075; Middlesex 462,996 tons, valued at $244,814, and Cumberland 786,173 tons, with a value of $189,875.

PORTLAND CEMENT.

The Portland cement industry of the United States made another record production in 1913, when, according to the United States Geological Survey, the output reached 92,097,131 barrels. In 1912, the production was 82,438,096 barrels, so that there was an increase of 9,659,035 barrels, or nearly ten million barrels! The same authority also gives the shipments and stocks on hand for 1913. The shipments in 1913 were 88,689,377 barrels, while in 1912 they were 85,012,556 barrels, an increase of 3,676,821 barrels. As will be seen, the increase in production was much greater than the increase in shipments; consequently there was an increase in stocks on hand. In 1913 the stocks on hand amounted to 11,220,328 barrels, while in 1912 the amount was 7,811,329 barrels. In 1912 shipments exceeded production; in 1913 production exceeded shipments. On the other hand, the price received was, on the average, higher in 1913 than in 1912.

In New Jersey, during 1913, the Portland cement industry showed an increase in production, a decrease in the quantity of shipments, an increase in the value of shipments, an increase in the average price per barrel and an increase in the stock on hand, as compared with 1912. The figures are given in the following table:

PORTLAND CEMENT IN NEW JERSEY IN 1913.

	1913	*1912*	*Increases or Decreases.*
Number of producing plants,	3	3	0
Production, in barrels,	4,460,027	4,246,803	213,224 I
Shipments, in barrels,	4,255,015	4,490,645	235,630D
Value of shipments,	$3,638,755	$3,052,098	$586,657 I
Stock on hand, in barrels,	415,799	231,398	184,401 I
Average price, per barrel,	0.855	0.68	0.175 I

It will be noticed that despite the decrease of over a quarter of a million barrels in shipments, there was an increase of over half a million dollars in the total value of the shipments.

During a recent visit, the writer ascertained that the Edison Portland Cement Company is developing a new cement rock quarry. It is located along the course of the Pohatcong Creek, about one-half mile west of the railroad station at New Village. In order to open up the quarry properly, it was necessary to

divert the creek and make it take an entirely new course, and the quarry in part occupies the old stream bed. It is of interest to note that the new quarry is located within the area where the cement-rock (or the Jacksonburg limestone) is shown as occurring on the new geologic map of the State, recently issued by the New Jersey Geological Survey.

LIME.

The stone used in making lime is not included in the statistics of limestone in the stone industry, as to do so would result in a duplication of values.

The production of lime in 1913 amounted to 14,378 short tons, valued at $55,775, which is a decrease of 2,160 tons and $9,466 in value. The average value in 1913 was $3.90 per ton. There were 15 active producers, most of them burning the blue magnesian limestone. Several firms, however, use the white crystalline limestone and these manufacture the larger part of the output. Most of the lime made was for use as a fertilizer.

The chief facts regarding the industry are tabulated as follows:

PRODUCTION OF LIME IN 1913.

Uses.	*No. of Producers.*	*Amount Short Tons.*	*Value.*
Building lime,	3	192	$892
Paper mills,	1		
Dealers,	1	4,644	27,452
Tanneries,	1		
Fertilizer,	14	9,542	27,431
Total,	15	14,378	$55,775

The producing counties in 1913 in the order of their rank were Warren, Sussex, Hunterdon and Somerset.

SAND-LIME BRICK.

There has been not a little prejudice to overcome in order to introduce sand-lime brick in place of clay building brick; but according to the following figures taken from a recent statement issued by the United States Geological Survey, the sand-lime brick is slowly but surely gaining a foothold. With some

bad years between, the total value of the lime-brick production of the United States rose from $155,040 in 1903 to $1,238,325 in 1913, which was its record production. The best previous year was in 1907, when the total value was $1,225,769. The number of operating firms reporting was only 16 in 1903, increased to the maximum of 94 in 1907, and has since declined to 68, the number operating in 1913. There has evidently been a case of the "survival of the fittest," with a corresponding improvement in the quality of the material, which promises well for the real success of the industry.

In New Jersey, in 1913, there were four plants making sand-lime brick; three in Camden County and one in Morris County. The total production for 1913 was 2121 thousand, having a value of $15,757. This is $8,833 more than the value in 1912; but the year 1912 was evidently not a normal year in this particular industry. In 1911, the total value of the production was $17,710, or $1,953 more than in 1913.

MINERAL WATERS.

The total quantity of mineral water sold in New Jersey in 1913 was 2,067,277 gallons, valued at $188,546. This was less both in quantity and in value than the production in 1912, which was 2,386,217 gallons, with a value of $209,726. The decrease was 318,940 gallons in quantity, but only $21,180 in value. The average price per gallon increased somewhat, being 9.1 cents in 1913, as against 8.8 cents in 1912. As in previous years, nearly all the water was sold for table use, the figures as reported being 187,108 gallons for table use and 1,438 gallons for medicinal purposes.

There were 14 active springs in 1913, two of which were new. The new springs were the "Great Notch," located at Great Notch in Passaic County, and "Rock," located at West Orange in Essex County. Of the active springs, 4 were in Bergen County, 3 in Somerset; and one each in Camden, Essex, Mercer, Monmouth, Morris, Passaic and Union.

MINERAL PAINTS.

Among the mineral paints are natural pigments, pigments made directly from ores and chemically manufactured pigments.

New Jersey is not an important producer of natural pigments; there being but one manufacturer, located in Middlesex County, who makes a paint from ground shale. A few years ago, New Jersey was a leading producer of pigments made directly from ores, when zinc oxide was made at Newark, by the New Jersey Zinc Company, directly from the zinc ore mined at Franklin Furnace; but for several years past, the company has reported no output from the Newark plant. The New Jersey Zinc Company is, however, still a large producer of zinc oxide at its works at Palmerton, Pa., South Bethlehem, Pa., and Freemansburg, Pa., the ore used being obtained from the zinc mines at Franklin Furnace and Ogdensburg, New Jersey.

Most of the mineral paints made in New Jersey in 1913 were of the chemically manufactured type, including white lead (both dry and in oil), red lead, litharge and lithopone. Of these the principal one was lithopone, which was made by three producers, one in Camden County, one in Essex County and one in Union County. The combined production of these producers in 1913 was 15,891 short tons, valued at $1,154,118, an increase of $248,575 over 1912.

The total for mineral paints is combined with that of coke and its by-products, in order to conceal the production of individual operators; the combined total for 1913 being $2,982,177.

COKE.

The production of coke in the United States, broke all records in 1913, according to a statement by Edward W. Parker, of the United States Geological Survey, the output being 46,311,369 short tons, valued at $128,951,430. This is an increase over the 1912 output of 2,327,770 tons in quantity and $17,146,317 in value. Of the 1913 production 33,596,669 tons were made in beehive ovens and 12,714,700 tons, or 27.4 per cent., in retort or distillation ovens where all the by-products—tar, gas, ammonia, etc.—are saved. The increase in production of by-product coke was over twice as large as the increase in beehive coke.

In New Jersey, coke, with its by-products, tar, liquid ammonia and gas (illuminating and fuel), was manufactured at Camden. Since there was only one producer, separate quantities and values cannot be given and the total value of the coke and its by-products produced has been combined with that of mineral paints. In 1913 the combined total amounted to $2,982,177.

According to the United States Geological Survey,[1] New Jersey was, in 1912, one of eight States in which there were three or less than three operating coke producers. In these eight States there were, in all, 11 coke-making establishments, with a total of 2,006 ovens, whose total production of coke was 2,530,018 short tons, having a value of $9,386,978. The average value of the coke per ton was $3.71.

GREENSAND MARL.

Only four producers, three in Burlington County and one in Monmouth, reported a production of greensand marl in 1913, their total being only 314 tons, valued at $223. As even this output was chiefly used by the owners of the pits, the value represents hardly more than the cost of digging. This industry, which thirty or forty years ago was one of the most important mineral industries of New Jersey, has gradually declined until it has practically ceased to exist. The writer recently visited several of the marl pits and talked with former producers. The reason they gave for the decline of the industry was that it costs too much to dig the marl and there is practically no demand for it when dug.

PEAT.

According to Mr. Charles A. Davis, of the U. S. Geological Survey,[2] New Jersey was one of the six States reporting a production of peat in 1913.

There was only one operator in New Jersey reporting a production, the peat produced being for use as a fertilizer filler.

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[1]Mineral Resources of United States, 1912, p. 64.

[2]Mineral Resources of the United States, Calendar Year 1913, Part II, p. 391.

According to Mr. Davis, there were seven factories in the United States making peat fertilizer products, their total combined output in 1913 being 28,460 tons, valued at $169,600. The average price per ton was $5.95. The output of the single New Jersey operator must, of course, be withheld. The figures in regard to the production of peat in New Jersey were received too late to be included in the total mineral production of the State.

Review of the Mineral Industries of the Counties.

GENERAL STATEMENT.

In the belief that it will be of interest to the residents of each of the various counties of New Jersey to know as far as possible the extent of the mineral industry of their own county, its rank among the counties, and the nature and relative importance of its various mineral products, the general table and the detailed review of each county which follows has been prepared. The statistics of production are, of course, based on the same reports from producers as the preceding part of this Bulletin, and have been collected by the Geological Survey of New Jersey in co-operation with the United States Geological Survey. Where there are less than three producers of any products; and in some cases where there are more than three producers, but the publication of the production would approximately reveal the output of individual operators, the figures have been concealed.

MINERAL PRODUCTION OF NEW JERSEY BY COUNTIES, 1913.

Rank.	*County.*	*Number of Producers.*	*Value 1913.*	*Per Cent. of Total.*
1	Sussex	14	$9,664,898	24.09
2	Middlesex	90	9,361,571	23.33
3	Mercer	61	8,843,606	22.04
4	Warren	20	4,197,106	10.46
5	Camden	21	2,612,706	6.51
6	Essex	16	687,770	1.71
7	Somerset	19	681,872	1.69
8	Passaic	24	615,411	1.53
9	Burlington	32	590,691	1.47
10	Monmouth	16	538,127	1.34
11	Bergen	24	534,161	1.33
12	Union	10	516,013	1.29
13	Morris	21	506,965	1.26
14	Hunterdon	18	499,101	1.24
15	Hudson	8	337,690	0.80
16	Cumberland	17	228,045	0.56
17	Atlantic	6	147,390	0.36
18	Cape May	3		
19	Ocean	6		
20	Gloucester	7	151,878	0.38
21	Salem	2		
	Total	435	$40,715,001	100.

An examination of the above table shows that all of the 21 counties of New Jersey were more or less active as mineral producers in 1913. The five leading counties, Sussex, Middlesex, Mercer, Warren and Camden, together produced 86.43 per cent. of the total output of the State; while nine counties (Essex, Somerset, Passaic, Burlington, Monmouth, Bergen, Union, Morris and Hunterdon), ran remarkably close together, ranging between 1 per cent. and 2 per cent. of the State total. Middlesex had the largest number of producers—90, Mercer being second, with 61. Sussex had the producer with the largest individual output—the New Jersey Zinc Company.

ATLANTIC COUNTY.

The total mineral production of Atlantic County in 1913 had a value of $147,390. This consisted chiefly of brick and tile; the varieties being common and front brick and sewer pipe. There was also some red earthenware and considerable gravel and building sand. There were six operators in all, three in brick and tile, one in pottery and two in sand and gravel. Atlantic County ranked seventeenth in total mineral production; but ninth in production of brick and tile and tenth in production of sand and gravel.

BERGEN COUNTY.

There were twenty-four active producers of mineral products in Bergen County in 1913, the total value of the output being $534,161. The chief product was common brick, which were made by 10 operators, the total production being 50,844,000 valued at $294,106. The other products, in the order of their value were, mineral waters, stone and sand. Bergen County sold more mineral water than all other counties put together. The stone output consisted chiefly of trap rock, both in the form of paving blocks and crushed stone. There was also some sandstone, both rough and dressed, for building purposes, and some for use as rubble and crushed stone. Bergen County ranked first in the production of mineral water, second in the manufacture of common brick, third in sandstone, eighth in trap rock and twelfth in sand and gravel.

BURLINGTON COUNTY.

The total value of the mineral production of Burlington County in 1913, as reported by 32 producers, was $590,691. This gave it the rank of ninth among the counties.

The chief product was sand and gravel, in which it stood at the top with a total output of 1,760,031 short tons, valued at $365,075. With the exception of glass sand, nearly all important varieties of sand were produced by the eighteen operators reporting, but the larger part of the output consisted of building sand (1,132,579 tons, value—$189,102), molding sand (147,231 tons, value—$71,477), and gravel (400,233 tons, value—$68,857). Considerable molding sand from Burlington County has been purchased by the Panama Canal Commission and shipped to the Isthmus for use in making steel castings. Burlington County also produced some grinding and polishing sand, fire sand, engine sand and paving sand.

Clay products ranked next in importance to sand and gravel, there being 7 operators and the output in 1913 having a value of $208,920. This consisted chiefly of common brick, though there were also produced sanitary ware, architectural terra cotta, fire proofing and drain tile. The remaining mineral products of the county are fire clay (reported by 5 operators) and marl (reported by 3 operators). Among the counties Burlington ranks first in sand and gravel, first in marl, fourth in clay, fifth in pottery, fifth in tile, sixth in brick and eighth in clay products.

CAMDEN COUNTY.

Camden produces a greater variety of mineral products than any other county, the list (arranged in the order of importance) including coke and its by-products, mineral paints, brick and tile, pottery, sand and gravel, sand-lime brick, clay and mineral water. The total production in 1913 amounted to $2,612,706; which makes Camden rank fifth among the counties. As there was only one producer each of coke and mineral paints, further details in regard to these products, other than to mention that Camden was the only county producing coke and one of the leading counties producing mineral paints, must be withheld.

The total value of the clay products manufactured by Camden County in 1913 was $436,664. Of this $215,328 was for pottery —chiefly sanitary ware, but also includes chemical ware, red earthenware and stoneware; and $221,336 for brick and tile— chiefly common and front brick, also some drain tile and fancy or ornamental brick. Camden ranks fourth among the counties in clay products, fourth in pottery alone, fourth in brick alone and sixth in brick and tile.

Camden County also produces considerable sand and gravel, its output in 1913, as reported by six producers, being 99,003 tons, with a value of $55,140. This output was chiefly glass and molding sand; but also included fire sand, building sand and gravel. The county ranked sixth among those producing sand and gravel.

Camden also had two operators producing raw clay, making it rank fifth among the counties, the variety being fire clay. With three producers of sand-lime brick out of the four in the State, Camden stood first in this industry.

CAPE MAY COUNTY.

The only mineral industry in Cape May County is the production of sand and gravel. In 1913 its production, as reported by three operators, placed it fifth among the counties; the output was chiefly building sand, gravel, engine sand and sand for miscellaneous uses. Some sand from the county has been exported to Europe and to the West Indies for use in filter construction. It is not practicable to publish separately statistics of production of Cape May County. The value of the combined mineral production of Cape May, Ocean, Gloucester and Salem Counties in 1913 was $151,878.

CUMBERLAND COUNTY.

The chief mineral industry of Cumberland County is the production of sand and gravel, the total output of which in 1913 was 786,173 tons, with a value of $189,875. This made Cumberland rank third among the counties in this industry. The varieties were chiefly molding and glass sand, also fire sand, grinding and polishing sand, paving sand, building sand and gravel.

The total value of the mineral production of Cumberland County in 1913 was $228,045. It ranked sixteenth among the counties. In addition to sand and gravel, the county produced red earthenware, common brick, glass-house pots, and brick clay. Cumberland ranked sixth in the production of clay (mined and sold as clay), sixth in products classed with tile (i. e., the glass-house pots) and thirteenth in brick and tile.

ESSEX COUNTY.

The total value of the mineral production of Essex County in 1913 was $687,770. This was sufficient to make Essex rank sixth among the counties.

The various products arranged in the order of the value of production are—mineral paints, trap rock, red earthenware and some miscellaneous varieties of pottery, dressed sandstone for building purposes and mineral waters.

Essex ranked among the three leading counties producing mineral paints, fourth in the production of trap rock, fifth in sandstone and seventh in pottery.

GLOUCESTER COUNTY.

The production of sand and gravel is the chief mineral industry of Gloucester County. There were six operators reporting a production in 1913, the output being sufficient to make Gloucester rank ninth among the fifteen producing counties. The output was chiefly molding sand, but there was also some fire sand, building sand and gravel. The only other mineral product of the county is common brick, of which one operator reported a production in 1913. It is impracticable to give detailed figures in regard to this county without revealing the output of individual producers. The value of the combined mineral production of Gloucester, Ocean, Cape May and Salem counties in 1913 was $151,878.

HUDSON COUNTY.

The total value of the mineral output of Hudson County in 1913 as reported by eight producers, was $337,690. This made Hudson rank fifteenth among the counties.

Clay products stood in the lead with a value of $195,613; the varieties being common brick, fire brick and clay tobacco pipes. Hudson County ranked fifth in brick and eighth in pottery production.

The only other mineral product was trap rock, with five operators reporting and an output valued at $142,077. This made the county rank fifth in this industry.

HUNTERDON COUNTY.

Hunterdon is one of the leading counties in the production of trap rock, ranking second in 1913, with a total output valued at $226,178. Although some stone was sold for use as rubble and rip rap, most of the material was crushed stone for road making and concrete.

Hunterdon is also one of the important pottery-producing counties, ranking third (though Camden almost ties it for third place). The value of the pottery production in 1913 was $217,452. The varieties ranked according to importance were, sanitary ware, stoneware and porcelain electrical supplies.

The total mineral production of Hunterdon County in 1913 as reported by 18 operators, was valued at $499,101, sufficient to give the county a rank of fourteenth. The other products, in addition to trap rock and pottery, arranged in the order of the value of the output, were limestone, sandstone, lime and common brick. Hunterdon ranked third in the production of limestone, its output being used chiefly as crushed stone for roads and concrete, though some was used as a flux and some as building stone. It ranked second in sandstone production, the rock being chiefly sold in the rough for building purposes, though some was also used for rip rap and some for concrete. As a producer of lime, Hunterdon also ranked third, its output being used chiefly for agricultural purposes, though some was for the building trade and some sold to tanneries.

MERCER COUNTY.

Mercer is one of the leading counties of New Jersey as a mineral producer, ranking third; the total value of its production in 1913, as reported by 61 operators, being $8,843,606. It also produces a

greater variety of mineral products than any other county, except Camden and Morris, including (in the order of importance) pottery, brick and tile, trap rock, clay, sandstone, mineral water and sand and gravel.

As a pottery producer Mercer County stands first, its output being much greater than all the other counties put together. The total value of the pottery production in 1913 as reported by 32 operators, was $7,898,474, which was 89 per cent. of the total pottery output, while the total of all other counties together was only $940,071. This great output makes Mercer County rank second in the United States, Columbiana County, Ohio, being first, with a production of $8,248,654, and Hancock County, W. Va., third, with an output of $1,894,682. In 1912, Mercer was first and Columbiana second, but the positions were changed in 1913.

Of the different varieties of pottery produced by Mercer County, sanitary ware stands first, with a total output in 1913 valued at $4,620,330. There were 14 operators reporting. As the total of all the other counties together was only $617,683, the pre-eminent position of Mercer is evident. In fact, Mercer County is the leading county in the United States in the production of sanitary ware. Mercer County's production of china, bone china, delft and belleek ware in 1913 amounted to $1,239,453. There were 7 operators reporting a production. Mercer not only stands first, but is the only county producing this high grade of pottery; it also ranks first among the counties in the United States. In the production of porcelain electrical supplies Mercer also stands first among the counties of the State and is probably second among the counties of the country. Eleven out of the twelve active producers of porcelain electrical supplies in the State are located in Mercer County. Of the total output of the State, $1,190,448, Mercer naturally produced by far the larger part, though the exact figures may not be given as it would reveal the production of individual operators. Mercer County also produced considerable white ware and certain miscellaneous pottery products, including hardware trimmings and specialties, souvenirs and decorated goods.

In the production of brick and tile Mercer ranks second, Middlesex being first. There were 11 active operators in the County in 1913, with a total output valued at $720,022. This was made up chiefly of tile (other than drain tile), also of common brick, fire

brick and front brick. It ranked second in tile, and third in brick, and second in brick and tile together.

Mercer is the leading county in the production of sandstone, its output in 1913 being valued at $42,848, with six operators reporting. The material was chiefly rough stone for building purposes; though there was also some for paving, curbing, flagging and crushed stone for roads and concrete.

Mercer ranked second as a producer of clay (mined and sold as clay), the variety being fire clay. It was sixth in the production of trap rock, its output being chiefly crushed rock for roads and concrete, though some was sold rough for building and some for rip rap. The county did not rank very high as a producer of sand and gravel, there being only two operators reporting a production; nor in mineral waters, of which there was only one active producer.

MIDDLESEX COUNTY.

Middlesex is next to the leading county in the value of its mineral products. The total value of the output in 1913 (not including mineral paints), was $9,330,071. This was the production reported by 89 operators.

The chief mineral industry is the manufacture of brick and tile, the output of which in 1913 reached a value of $8,081,206, as reported by 36 producers. In this industry, Middlesex ranks first, its output being far greater than all of the other counties together. Mercer stands second, but its production had a value of only $720,022; and the total production of all the counties outside of Middlesex was valued at $2,785,627. The relative position of Middlesex in the brick and tile industry is about the same as Mercer in the pottery industry.

Of the different varieties of brick and tile, architectural terra cotta stood first ($2,084,137), fireproofing second ($1,864,623), common brick third ($1,120,553), and fire brick fourth ($1,031,159). There was also a considerable production of tile (other than drain tile), fancy brick, front brick, sewer pipe, drain tile, stove lining and miscellaneous products (the latter including vitrified clay conduit, chimney brick, silica brick, flue lining, wall coping and gas logs).

Middlesex County ranks first as a producer of clay (mined and sold as clay), its output in 1913 having a value of $664,025. This is far greater than any other county, and in fact the value of the total output of all the other counties was only $105,664. There were 33 operators in Middlesex County. Most of the clay mined and sold was fire clay, though there was also stoneware clay, brick clay, ball clay, and terra-cotta clay.

As a pottery producer Middlesex ranks second, though its output is far below that of Mercer, which ranks first. In 1913 the pottery production of the county had a value of $370,026, which was reported by four operators. The varieties included sanitary ware, chemical stoneware, door knobs and art pottery.

Middlesex ranks second among the counties in the production of sand and gravel, its output in 1913, as reported by 16 operators, being 462,966 tons, valued at $244,814. This output was made up chiefly of fire, building and molding sands; though there was also produced paving, engine, grinding and polishing, glass and miscellaneous sands, and gravel.

In its production of mineral paints Middlesex ranked fourth among the four producing counties. This was the only county producing mineral paint from ground shale.

MONMOUTH COUNTY.

The total value of the mineral production of Monmouth County in 1913, as reported by 16 operators, was $538,127. This gave Monmouth a rank of tenth among the counties.

The chief mineral industry was the manufacture of brick and tile, in which the county ranked third, with a total output in 1913 valued at $493,662. This was made up chiefly of fireproofing, also tile (not drain tile), common brick, front brick and drain tile.

The other mineral products of Monmouth are gravel, building sand, red earthenware, stoneware, mineral water and greensand marl.

MORRIS COUNTY.

Morris is one of the counties having a considerable variety of mineral products. Arranged in the order of value of output, the

list includes iron ore, sand and gravel, brick, granite, trap, mineral water and sand-lime brick. The total value of the mineral production, in 1913, as reported by 21 operators, was $506,965. This makes Morris rank thirteenth among the counties.

There were three active iron mines in Morris County in 1913: the Richard mine, owned by the Thomas Iron Company and located near Wharton; the Mt. Hope mine, owned by the Empire Steel & Iron Company, and located at Mt. Hope, and the Hoff mine, owned by the Hoff Mining & Realty Company, and located at Wharton. The total amount of ore marketed by the six operators in the three producing counties in 1913 was 291,653 long tons, valued at $980,303. It is impracticable to publish separate figures for each county.

Morris County ranks fourth as a producer of sand and gravel, its output in 1913, as reported by six operators, being 290,594 tons, having a value of $95,883. The output was made up chiefly of building and molding sand, also paving sand and gravel.

Morris County ranks first in the production of granite, with a total output in 1913, as reported by 8 operators, of $55,465. This was chiefly crushed stone for railroad ballast, also some for road making and some for rubble, rip-rap and stone for building purposes.

OCEAN COUNTY.

Ocean ranked third among the counties in the production of clay (mined and sold as clay). The variety produced is fire clay. There were three operators reporting a production of clay in 1913. There was also some gravel produced by one operator; and some common brick manufactured by two operators. It is not practicable to publish separately the statistics of production of Ocean County. The value of the combined mineral production of Ocean, Cape May, Gloucester and Salem Counties in 1913 was $151,878.

PASSAIC COUNTY.

Passaic County ranks eighth as a mineral producer, the total value of its output in 1913, as reported by 24 operators, being $615,411.

The products, in the order of their importance, are iron ore, trap rock, common brick, granite, mineral water, molding sand and gravel.

The Peters mine, owned by the Ringwood Company and located near Ringwood, was the only active iron mine in Passaic County in 1913; but it is one of the largest producers in the State and its output is sufficient to give Passaic a high rank among the counties. The amount of iron ore marketed by the three producing counties in 1913 was 291,653 long tons, valued at $980,303. It is impracticable to give the production of the counties separately.

Passaic County ranks third in the production of trap rock. There were 13 operators reporting a production. The output was chiefly crushed stone for road-making, concrete and railroad ballast; though some was also sold in the rough for building purposes.

SALEM COUNTY.

The only mineral products produced by Salem County in 1913 were common brick and drain tile. It is impracticable to publish the figures of production as there were only two operators reporting and the output of the individual operators would be revealed. The value of the combined mineral production of Salem, Cape May, Ocean and Gloucester Counties in 1913 was $151,878.

SOMERSET COUNTY.

Somerset County ranks seventh as a mineral producer, with a total output in 1913, as reported by 19 operators, valued at $681,872.

The list of mineral products, arranged in the order of importance, includes trap rock, brick and tile, mineral water, lime and sandstone.

Somerset is the leading county producing trap rock, but its production, despite the fact that there are 11 operators reporting, may not be published as to do so would reveal approximately the output of individual producers of some other products of the county. Most of the output is crushed stone for road-making, railroad ballast and concrete; also some paving blocks and some rough stone for building purposes.

Somerset ranks fourth as a producer of brick and tile together, its output being chiefly architectural terra cotta. The county is one of the leading producers of mineral water, ranking second. It is fourth in the production of lime, its output being chiefly used as a fertilizer. It is also fourth in the production of sandstone, its output being chiefly in the form of both rough and dressed stone for building purposes.

SUSSEX COUNTY.

Because of the great value of its zinc output Sussex ranks first among the counties as a mineral producer. Its total mineral production in 1913, as reported by 14 operators, had a value of $9,664,898. This is $303,327 more than Middlesex and $821,292 more than Mercer, which rank second and third.

Sussex is the only county in the State producing zinc. There is but one operator, the New Jersey Zinc Company, and there was but one active mine in 1913, that at Franklin Furnace; but the output of this world famous mine is so great as to place New Jersey second among the States as a producer of zinc. According to Mr. H. D. McCaskey, of the U. S. Geological Survey, the amount of New Jersey zinc ore sold or treated in 1913 was 490,434 short tons, which, figured as spelter, on the basis of the recoverable zinc content of the ore, gives as the zinc output 168,244,000 pounds, with a total value of $9,421,664. The zinc ore is a varying mixture, often very beautiful in appearance, of a black mineral, Franklinite, a red mineral, Zincite, and a pale yellow or pink mineral, Willemite, all of which are rare outside of New Jersey, but which occur in great masses in Sussex County at Mine Hill, near Franklin Furnace and Sterling Hill, near Ogdensburg.

Sussex County also ranks first in the production of limestone, its output in 1913, having a value of $204,910. This output was chiefly for use as a flux in smelting iron. Some was also ground and sold for agricultural purposes, and some was crushed and used in road making and as railroad ballast.

Sussex is the only county producing slate. There were two operators in 1913, one near Newton and one near Lafayette. Most of the slate is split and trimmed to the proper sizes at the quarries and sold for roofing purposes. The county is also the leading

producer of lime, its product being used as a fertilizer and for miscellaneous purposes.

UNION COUNTY.

Union ranks twelfth among the counties as a mineral producer, the total value of its output in 1913, as reported by 10 operators, being valued at $516,013. It has a considerable variety in its mineral products, including, in order of importance, mineral paints, trap rock, pottery (sanitary ware and red earthenware), mineral water, gravel and building sand, common brick and clay. Union is one of the three leading counties in the production of mineral paints. It ranks seventh in the production of trap rock and sixth in the production of pottery.

WARREN COUNTY.

Warren is one of the leading counties as a mineral producer, chiefly on account of its Portland cement industry. It ranks fourth among the counties, its total mineral production in 1913, as reported by 20 operators, having a value of $4,197,106. There is also considerable variety in the mineral products of the county, including as it does, cement, iron ore, brick and tile, limestone, sand and gravel, lime and talc and serpentine.

The chief mineral industry of Warren County is the quarrying of cement rock (an argillaceous limestone) and manufacturing Portland cement from it. This is the only county producing cement; and in 1913, the three operators reported a total production of 4,255,051 barrels, having a value of $3,638,755. This output of Warren County is sufficient to give New Jersey a rank of seventh among the states as a cement producer.

Ranking next to the cement industry is the production of iron ore, in which the county ranks well. Two out of the six iron mines which were active in New Jersey in 1913 are in this county, namely, the Washington mine, owned by the Empire Steel and Iron Company and located near Oxford Furnace, and the Ahles mine, owned by the Basic Iron Ore Company and also located near Oxford Furnace.

Warren ranks second as a producer of limestone, its output being used chiefly for agricultural purposes in the form of ground limestone, although some is also crushed and used for roads and concrete and some as a flux in smelting iron ore.

Warren County is also the only producer of talc and serpentine.

It also ranks second in the production of lime. Its brick and tile output is chiefly common brick, the rest being fireproofing. Of its sand and gravel output, and it ranks seventh among the counties, the chief varieties in order of importance are gravel, building sand, fire sand and molding sand.