REPORTS OF THE

DEPARTMENT OF

CONSERVATION AND DEVELOPMENT

STATE OF NEW JERSEY

HENRY B. KÜMMEL, State Geologist and Director

BULLETIN 43

Geologic Series

THE MINERAL INDUSTRY OF NEW JERSEY FOR 1934

Compiled by

MEREDITH E. JOHNSON

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Board of Conservation and Development

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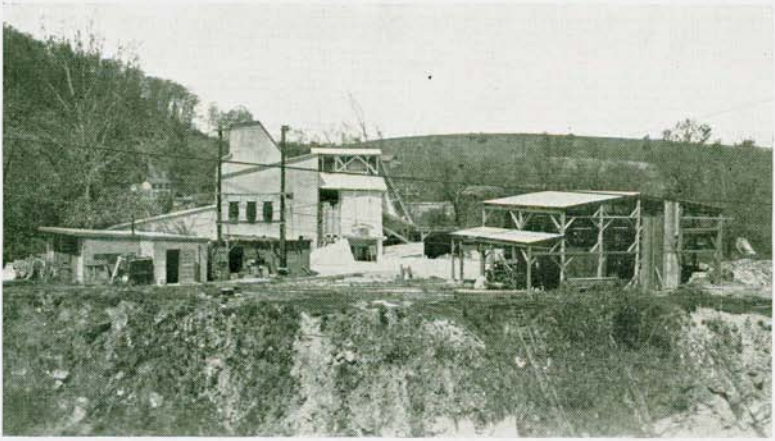
CONTENTS

ILLUSTRATIONS

A. *Headframe, mill, loading conveyors and electrical transformers at the Washington Mine of the Alan Wood Mining Company near Oxford.*



B. *Crushing plant at the Lizzie Clay Quarry of the Jersey Materials Company, situated north of Phillipsburg.*

THE MINERAL INDUSTRY OF NEW JERSEY FOR 1934

By MEREDITH E. JOHNSON
Assistant State Geologist

This bulletin is one of a long series of annual reports on the mineral industry of New Jersey by the State Department of Conservation and Development. It is a compilation of statistics furnished by the mineral producers of New Jersey to this Department, the U. S. Bureau of Mines and the U. S. Bureau of the Census; and its value as a source of fundamental information relative to the industries covered is due entirely to the whole-hearted cooperation of the individuals and corporations supplying the basic data.

As in previous bulletins, no figures are published which might disclose the amount or value of the production of an individual concern unless specific consent has been given to do so. This policy, adopted many years ago by the governmental agencies concerned, will be continued as long as these statistics are published.

SUMMARY OF THE MINERAL PRODUCTION IN 1934.

In a press bulletin released May 16, 1935, the writer reviewed briefly some of the interesting features relative to the production of the mineral industries of New Jersey in 1934, and estimated the value of all mineral products at $33,400,000. Final statistics now available show that this estimate was approximately $800,000 too high, the actual figure being $32,599,532. Even this figure, however, is an improvement over 1933 of 12.2 per cent. The greatest recoveries were made by the iron and stone industries, the latter gaining 25.6 per cent in tonnage and 30.9 per cent in value, and the former nearly doubling its production. Other industries showing considerable improvement over 1933 were: pottery, cement and by-product coke. The lime industry was the only one which lost ground in 1934, but the construction of a new lime plant of large capacity near Newton in 1935 will undoubtedly reverse the downward trend in this industry also.

Diatomite, first dug in New Jersey in 1874, was again produced in commercial amount (but from a different pit) in 1934.

Some prospecting for metallic minerals was done near Sparta Junction, but nothing new was discovered and work was terminated by court order as the result of misleading statements made in circulars distributed by the prospectors.

MINERAL PRODUCTION IN NEW JERSEY IN 1934 AND 1933

Products	*Number of operations* [a] 1934	1933	*Quantity Short or long tons* 1934	1933	*Value in dollars* 1934	1933	*Per cent increase or decrease from 1933* *Tonnage*	*Value*
Zinc ore	2	2	469,339 s. t.	471,607 s. t.	(b)	(b)	— 0.5	
Iron ore	2	1	138,685 l. t.	73,144 l. t.	(c)	(c)	+89.7	
Stone	36	35	1,382,583 s. t.	1,101,402 s. t.	1,679,338	1,282,547	+25.6	+30.93
Sand and gravel	80	89	2,312,794 s. t.	2,064,260 s. t.	1,756,293	1,636,406	+12.0	+ 7.3
Clay (sold raw)	27	28	68,791 s. t.	57,760 s. t.	289,541	259,816	+19.1	+11.4
Brick and tile					2,900,506	2,886,737		+ 0.5
Pottery					7,654,369	6,999,753		+ 9.4
Greensand marl	5	5	7,335 s. t.	6,734 s. t.	209,278	208,002	+ 8.9	+ 0.6
Pulverized sand	4	5	64,467 s. t.	67,080 s. t.	291,733	270,346	— 3.0	+ 7.9
Other Products:								
Lime	3	2						
Portland cement (shipments)	1	2						
Non-clay refractories								
By-product coke [d]	2	2			17,818,474	15,503,049		+13.0
Diatomite	1							
Zinc ore	2	2						
Iron ore	2	1						
Total value					32,599,532	29,046,656		+12.2

a. Number of mines, quarries, pits or plants as the case may be.
b. Estimated value of production included in "Other products".
c. Value of shipments included in "Other products".
d. Raw material from other states.
s. t. = short tons l. t. = long tons.

Production at the mines of the New Jersey Zinc Company was maintained at about the same level in 1934 as in 1933, total output for the year amounting to 469,339 tons, but the estimated value of the production was somewhat greater than in 1933 as the result of slightly better prices for spelter.

Though the mining operations of the New Jersey Zinc Company have been described more or less lengthily several times, it is believed that few people know that the company is one of the largest timber operators in New Jersey.

The systems of mining employed at Franklin and Ogdensburg necessitate the use of timber in the stopes where it forms a protective screen or mat between the ore and the fill (broken rock). Large quantities are also used in haulageways, ladderways, chutes, lagging, and for other purposes. Because of this extensive and continuous use, steps were taken many years ago to keep such costs to a minimum. For that reason, and because it was feared that the indiscriminate cutting of local timber-lands by independent lumbermen would eventually lead to a shortage of the larger sizes of timber, the company began purchasing timber-lands about 1916. A large tract surrounding Wawayanda Lake was first secured, and this was followed by purchases northeast of Roseville, north of Stanhope, and at Edison. In all, some 10,000 acres of timber-land have been purchased. This acreage is sufficient to supply most of the logs needed in mining operations. Cutting on the company's property is restricted to trees 12 inches or more in diameter, and such a cutting will yield 5,000 board-feet per acre from newly purchased timber-land, and 4,000 board-feet per acre every twenty years thereafter through natural reproduction.

The company also purchases standing timber to supplement its own supply and such timber is cut to a 10-inch minimum. The 10-inch logs are all used in the round as posts, caps or sills in mine sets, but most of the larger logs are cut into lumber. Sawmills are maintained both in the Wawayanda tract and at Franklin, and all lumbering operations are supervised by a forester.

Everyone interested in either the geology or mineralogy of the Franklin and Ogdensburg mineral deposits will be grateful for the very able treatise by Charles Palache entitled "The Minerals of Franklin and Sterling Hill, Sussex County, New Jersey," and published by the United States Geological Survey as Professional Paper 180. The paper contains many excellent photographs of rare and unusual minerals, and even a greater number of line drawings to illustrate the crystal forms described. It is chiefly valuable, of

course, for the detailed descriptions of the many minerals found at Franklin and Sterling Hill, but the chapters which describe the paragenesis of the minerals and discuss the various theories of origin of the ore deposits are of equal interest to anyone who has studied the deposits.

IRON ORE.

Though the total production of iron ore in the United States in 1934 was still far below normal, it nevertheless was 40 per cent greater than in 1933.[1] New Jersey did better than most states in that the percentage of increase was 89.7; however, total production was only 138,685 tons, which is still just a fraction of total capacity. Though two mines were operated, one of these, the Washington Mine at Oxford, was closed down April 20 and has not yet (November, 1935) been reopened; and the other, the Scrub Oak Mine at Wharton, resumed operations May 14 and closed down again September 21. This latter period of operation was brief, but it was sufficiently long to demonstrate remarkable improvements in mining and milling practice as compared with old production records at the same mine. In August alone, more than 55,000 tons of ore were hoisted and milled,[2] from which 25,337 tons of concentrates were shipped. The efficiency of underground operations is shown by an average of 10.56 tons of ore hoisted per man-shift as compared with 7.21 tons per man-shift in the first four months of 1931. Yet the latter performance would be considered good in comparison with other iron-producing districts. For example, the production per underground man-shift in Minnesota in the same year was less than 6 tons,[3] and in the Red Mountain District of Jefferson County, Alabama, where the day-shift is about an hour longer, the production per man-shift was approximately 5.3 tons.

Milling efficiency at the Scrub Oak Mine was increased from 22.44 tons per millman-shift in 1931 to 42.37 tons in 1934. This is truly a remarkable accomplishment and reflects great credit upon the present management. The reduction in costs consequent upon the increased efficiency in mining and milling operations has also led to renewed interest by iron and steel companies in the possibility of utilizing New Jersey's magnetic iron ore. The writer has verified the story which appeared October 10, 1935, in the New York Times, to the effect that engineers of the United States Steel Corporation

[1] Mineral Market Reports, U. S. Bur. of Mines, July 12, 1935.

[2] Crockett, R. E., and Hood, K. K., Comments and data on recent operation of Scrub Oak Mine: Paper presented at annual meeting of the Amer. Inst. of Mining & Met. Eng., Feb., 1935.

[3] Recent trends in man-hour production at iron-ore mines: U. S. Bur. of Mines R. I. 3266, 1935.

had for several weeks been investigating iron mines in the vicinity of Dover; and at least one other large company has evinced renewed interest in New Jersey's iron ores.

The average analysis, on a dry basis, of the ore concentrates shipped from the Scrub Oak Mine in 1934 was: iron, 60.3 per cent; manganese, .03 per cent, and phosphorus, .049 per cent. Because of its low phosphorus content such ore is suitable without further treatment for use in the manufacture of low-phosphorus pig iron—the basis of strong, ductile steel. Ore from the Washington Mine contains approximately 0.5 per cent phosphorus, but has a much higher iron content initially, hence an entirely different milling practice is followed there. Instead of crushing the ore and then concentrating it by wet magnetic and tabling processes, the ore is run over a magnetic pulley as it comes from the mine. This single operation is sufficient to raise the iron content to 60 per cent, and it reduces milling costs by saving the expense of crushing the rejected material. As mentioned in a previous report of this series,[4] the efficiency of mining operations at this mine also is very high, production per man-shift having been raised to 11.4 tons in 1931.

A considerable part of the ore shipped from the Washington Mine in 1933 and 1934 was still in stock in Conshohocken in October, 1935, but the Scrub Oak Mine was reopened August 1, 1935, and in mid-October it was still operating at full capacity. Should this one mine continue in operation till the end of the year, total production for 1935 would be greater than that from both mines operated in 1934.

Total shipments of iron ore from mines in New Jersey have been as follows:

Shipments from 1870 to 1933, inclusive	25,739,746	gross tons
Shipments in 1934	145,326	
Total shipments	25,885,072	gross tons

STONE.

Though operations in the stone industry were still greatly depressed in 1934, production from New Jersey's quarries was increased 25.6 per cent as compared with 1933. Perhaps equally important from the standpoint of earnings, the average value per ton increased from $1.16 to $1.21, the total production having a value of $1,679,338, or nearly 31 per cent more than in 1933.

Thirty-six quarries were active in 1934, one more than in the preceding year; and of the total production, approximately 85 per cent was crushed trap rock, the balance being limestone, granite, sandstone, argillite, verde antique marble and talc.

[4] Bul. 41, p. 9, 1934.

TOTAL PRODUCTION OF STONE IN 1934 AND 1933

Kind	No. of quarries		Production in short tons		Value in dollars	
	1934	1933	1934	1933	1934	1933
Trap rock	27	26	1,154,190	964,760	1,295,313	1,037,649
Other stone ..	9	9	228,393	136,642	384,025	244,898
Total	36	35	1,382,583	1,101,402	1,679,338	1,282,547

Trap Rock. Two quarries, previously reported as idle, have been definitely abandoned within the last year. One, belonging to the Cliffside Trap Rock Company, Inc., was situated at Cliffside directly above the tunnel of the Erie Railroad, and overlooking Hudson River. The other, about two miles west-southwest of the Cliffside quarry, was on a small knoll near the foot of the back slope of the Palisades ridge and between Granton and Babbitt Stations. For many years it was operated by the Belmont-Gurnee Stone Company, but in 1930 it passed into the hands of George M. Brewster and Son, Inc., of Bogota, who leased it to the Hudson County Crushed Stone Company, Inc. New machinery was installed and production was maintained at a high rate in 1931, but declining demand, coupled with law suits instituted by nearby residents claiming damages as a result of blasting in the quarry, finally led to its abandonment and the complete dismantling of the crushing and screening equipment. This was the last of the score or more of quarries that have been operated at one time or another along the Palisades ridge.

The large quarry of the Delaware River Quarry and Construction Company at Moores Station on the Belvidere Division of the Pennsylvania Railroad was operated by a receiver in 1934, but was sold on March 16, 1935, to the Lambertville Trap Rock Company. It will not be operated for the present.

George Sanders reported that the small quarry he operates south of Stirling in southern Morris County was idle in 1934, but to offset this, production was reported for the first time in several years by the Middlesex County Highway Department.

On the whole, producers of trap rock fared a good deal better in 1934 than in 1933, although the rate of production is still less than half of present capacity. The average value of a ton of crushed trap rock in 1934 was $1.12, an increase of four cents a ton as compared with 1933. Production increased by 20 per cent.

Detailed statistics of the production of trap rock in 1934 and 1933 are given in the following table:

A. *Quarry in Franklin Limestone operated by the Edison Cement Corporation and situated near Oxford.*

B. *Quarry in the basalt (trap rock) of the Second Watchung Mountain. Operated by Sowerbutt Brothers and situated on Snake Hill Road, north of Paterson.*

A. *Dredge and part of the "silica sand" plant constructed by the Peerless Sand Company in 1935 and situated two miles north of Lakewood.*

B. *The modern sand and gravel plant of the Great Notch Corporation in Pequannock Township, Morris County.*

PRODUCTION OF TRAP ROCK IN 1934 AND 1933

Use	Quantity in short tons		Value in dollars	
	1934	1933	1934	1933
Concrete	387,735	551,350	428,654	618,889
Road metal	725,684	364,566	828,268	372,887
Railroad ballast and other uses.	40,770	48,844	38,391	45,873
Totals	1,154,190	964,760	1,295,313	1,037,649

Other Stone. Sales of *limestone* were reported by M. C. Mulligan & Son, of Clinton, and by the Limestone Products Corporation of America. In the summer of 1935 a third commercial operator, the Farber White Limestone Products Company, completed a plant for the crushing and screening of rock from the quarry at McAfee operated for many years by the Bethlehem Steel Company. As the company's name would indicate, its product is the white crystalline limestone known to geologists as the Franklin limestone.

Crushed and sized *granite* was again produced in important amount by the Pompton Crushed Stone Company and the Trimmer Stone Company. Rough and dressed granite blocks were quarried by the Haskell Granite Company and used in the construction of homes in Ridgewood, Madison, Summit, Wyckoff, Pines Lake, Jayson Lake and West Orange. About 50 per cent of this company's production was in the form of rough blocks used as a veneer in covering brick or frame construction. A considerable amount of waste rock from the Mt. Hope and Scrub Oak Mines was also sold for use in concrete and as road metal. As compared with 1933, production of granite was trebled, the total output in 1934 amounting to 151,873 tons with a value of $191,684.

The only *sandstone* produced in 1934 came from the quarry of Closter Stone Quarries, Inc., which is in Bergen County, about a mile and a quarter east of the railroad station at Closter. Stone was sold as rubble and for construction purposes in Montclair and Glen Rock and in the Mt. Hebron Cemetery Chimes Tower.

Other quarries operated were the old Lizzie Clay quarry, north of Phillipsburg, from which *talc* and *serpentine* are obtained, and the *argillite* quarry near Lawrenceville, now owned by Mae Van L. Houghton and operated under the name of Lawrenceville Quarries, Inc. Polished serpentine from the Lizzie Clay quarry was used in the interior finish of new post offices at Lansdale and Wilkes-Barre, Pa., at Louisville, Ky., and at Newark. Long operated by the Rock Products Company, in 1934 the company was reorganized under the name of Jersey Materials Company.

In view of the very low rate of building activity in 1934, it is not surprising to find that the sand and gravel industry as a whole fared little better than in the previous year. Total production amounted to 2,312,794 tons, an increase of 12 per cent as compared with 1933, but the value of the production increased only 7.3 per cent. One of the largest producers in the state—namely, the dredge operated by the Warner Company in Delaware River below Riverside—was reported as idle throughout the year, but most of the other operators reported somewhat better business. Though no new plants were constructed in 1934, the Peerless Sand Company reported the purchase of a tract of approximately 70 acres about two miles north of Lakewood "which contains a very high grade of white sand. Before purchasing this property we made extensive borings and the analysis shows better than 99 per cent SiO_2 and 0.50 per cent Fe_2O_3". Upon the basis of these findings a modern dredging, washing and drying plant was constructed in the spring and summer of 1935. From the geological point of view the deposit utilized is interesting because it is a part of the Kirkwood formation, whereas all the other "silica-sand" operators in New Jersey are using similar deposits of white sand in the Cohansey formation.

The declining trend in the number of active pits, predicted in the early years of the depression but not developing until 1933, was noticeable again in 1934, when the total number of active pits was 80, a decrease of nine from the number active in 1933.

PRODUCTION OF SAND AND GRAVEL IN 1934 AND 1933

Products	*No. of pits*		*Quantity in short tons*		*Value in dollars*	
	1934	1933	1934	1933	1934	1933
Glass sand	4	4	115,990	121,418	194,488	189,473
Molding sand	24	27	275,778	235,418	354,632	233,177
Structural sand	42	45	720,857	843,674	366,081	472,862
Paving sand	23	26	461,793	298,143	239,538	162,641
Grinding, polishing and blast sand	7	6	12,054	12,821	29,953	27,155
Fire or furnace sand	9	9	18,576	16,517	24,188	18,326
Engine sand	5	6	30,723	17,353	13,659	7,186
Filter sand	3	3	10,148	8,395	29,550	23,153
Other sand	10	10	27,890	47,956	20,822	52,482
Total sand			1,673,809	1,601,695	1,272,911	1,186,455
Structural gravel	33	32	409,878	324,726	334,465	353,004
Paving gravel	20	22	201,641	120,724	134,665	78,831
Other gravel	5	6	27,466	17,115	14,252	18,116
Total gravel			638,985	462,565	483,382	449,951
Total sand and gravel	80	89	2,312,794	2,064,260	1,756,293	1,636,406

Study of the detailed statistics of production discloses that for the second straight year there was a marked increase in sales of molding sand, and important increases in the production of paving sand and gravel. Perhaps the most surprising feature of the statistics is the lower value attributed to the greatly increased (26 per cent) production of structural gravel.

Because the dredge operated by the Warner Company in 1933 and prior years near Riverside is of large capacity, its idleness in 1934 was the cause of Burlington County dropping from first rank as a producer of sand and gravel in 1933, to fifth in rank in 1934. Cumberland County outstripped all others from the standpoint of value of production, with an output worth $456,850, but it was outranked in volume of production by both Morris and Middlesex Counties. The wide range in the average value of the output in Morris and Cumberland Counties is interesting and is, of course, due to the fact that nearly all the sand and gravel produced in Morris County is used in concrete and road work; whereas most of the output from Cumberland County is either the relatively pure quartz sand used in the manufacture of glass and various "silica sand" products, or else the special types of molding sand and gravel needed by different foundries.

The relative ranking of the five counties with largest production in 1934 is shown in the following table:

No. of pits	*County*	*Production in short tons*	*Rank*	*Value in dollars*	*Rank*	*Value per ton in dollars*
12	Cumberland	332,470	3	456,850	1	1.37
9	Morris	473,721	1	303,262	2	.48
11	Middlesex	374,415	2	247,621	3	.66
4	Camden	(a)	4	(a)	4	.75
9	Burlington	172,424	5	74,811	5	.43

(a) Figures concealed in order not to disclose the production of individual operators.

As in other recent years, some changes have been made in the list of active producers. In March, 1934, Brimfield Brothers succeeded The Winslow Gravel Company as operators of the pit near Cedar Lake, Atlantic County. The Burlington Clay Company now operates the Cugliotta sand and clay pit in the outskirts of Burlington, and the plant of the Champion Sand and Gravel Company at Palermo, Cape May County, previously reported as idle, was sold and dismantled. W. J. Golder, of Millville, now loads exclusively for Whitehead Brothers Company. The plant built by M. W. Read near Ledgewood, Morris County, and operated for a while by the Roxbury Washed Sand and Gravel Company, was sold and dismantled in the

spring of 1935. The plant of the Morris County Sand and Gravel Company, which was sold by receivers September 10, 1934, has been reopened by H. J. Stehli under the old name. The sand and gravel plant near Milltown formerly operated under the name of Standard Sand and Gravel Company, is now operated by the Dallenbach Sand Company. And finally, the pit near Allendale, Bergen County, formerly operated by the Ridgewood Sand and Trucking Company, is now operated by the owner, Henry Schmidt, under his own name.

New names on this year's list of producers are:

Name and Address	*Pit Location*
Frank Becker, Old York Rd., Burlington, N. J...	Burlington
C. Cunninghaui	Pleasantville, Atlantic County
Roberts and Warren Sand Co., Penns Grove, N. J.	Penns Grove

The pit of the Roberts and Warren Sand Company is in an exceptionally interesting deposit of light-colored sand and gravel containing occasional large boulders of crystalline rocks seldom seen south of Philadelphia. About one-third of the material is gravel and practically all of it is unoxidized and unweathered. This is in marked contrast to most of the gravel deposits in southern New Jersey, which are thoroughly oxidized (hence yellow or brown because of the iron content) and contain little coarse material. A probable explanation for the lack of oxidation is to be found in the layer of black peat which caps the deposit. Decomposition of the organic matter in the peat has produced gases which have reacted with all the available oxygen in the ground-water and left it weakly reducing in character. Hence the material is still in much the same condition as when it was brought down the river valley by the swollen waters of an ancient Delaware River.

CLAY.

Production of clay from New Jersey's pits is still at very depressed levels, although sales in 1934 were 19 per cent greater in amount and 11.4 per cent greater in value than in 1933. Practically all of the increase was in the production of fire-clay, but it was apparently obtained at the cost of lowered prices; for whereas the average value of the fire-clay sold in 1933 was $4.58, in 1934 the same type of clay was sold for an average price of $4.29 a ton. That the increase in production is still far from satisfactory is further shown by a comparison with clay production throughout the country:

	Production in short tons		*Decline expressed as a percentage*	*Production in 1934 short tons*	*Percentage of production in 1925-1929*
	1925-1929 (*Ave.*)	1932-1933 *low*			
United States ..	4,044,029	1,391,816	65.6	2,187,263	54.1
New Jersey ...	300,640	57,760	80.8	68,791	22.9

Obviously the recovery of the clay industry in New Jersey has been retarded by some factor that does not apply to the country as a whole. Perhaps it is due to the shift of the clay products industries towards West Virginia and Ohio. Whatever the cause, New Jersey's producers are aware of the trend and are doing all in their power to retain their markets. For example, they have for a number of years helped defray the cost of the investigations of the physical and chemical properties of New Jersey's clays conducted by members of the Ceramic Department at Rutgers University. In addition, certain of the producers have investigated the properties of their own clays by both experiment and analysis. Probably the one thing needed more than anything else to bring a return to more normal conditions in the clay industry is a revival of home and office construction. Such a revival is being fostered in every possible way by the Federal government and is already perceptible.

Details of the production of clay in 1934 with comparable figures for 1933 are given in the following table:

RAW CLAY SOLD IN 1934 AND 1933

Kind of Clay	*No. of pits*		*Production in short tons*		*Value in dollars*	
	1934	1933	1934	1933	1934	1933
Fire-clay	23	25	59,404	48,307	254,649	221,241
Stoneware clay	4	4	3,980	3,873	15,253	15,750
Ball clay and miscellaneous	12	9	5,407	5,580	19,639	22,825
Totals	27	28	68,791	57,760	289,541	259,816

For the first time in many years, no sales were reported by William G. Moore from his pit near Corbin City, Atlantic County. An operator of even longer standing, the Sayre and Fisher Brick Company, found it necessary to reorganize in order to continue operations. Founded as a partnership by Peter Fisher and James Sayre in 1851, and first incorporated in 1887, this company probably has the longest record of continuous operation of any clay producer or manufacturer of clay products in the state and it is to be hoped that the present reorganization will enable it to continue operations on a profitable basis for many years to come.

BRICK AND TILE.

Tabulated statistics of the brick and tile industries reflect the small amount of construction in 1934. Manufacturers of common brick increased their sales from the low figure of 45,691,000 bricks in

1933, to 52,671,000 in 1934, but this amount is still only a small fraction of former production. For example, in the decade from 1920-1929 the average yearly production was approximately 286,000,000 bricks, and minimum production was 160,549,000 bricks. Study of the statistics for that decade reveals other interesting facts:

PRODUCTION OF COMMON BRICK IN THE DECADE 1920-1929

Year	*Quantity in thousands*	*Value in dollars*	*Year*	*Quantity in thousands*	*Value in dollars*
1920	160,549	3,075,388	1925	309,101	4,356,375
1921	191,208	2,546,793	1926	335,673	4,750,628
1922	289,406	4,340,175	1927	356,860	4,125,754
1923	322,491	5,231,979	1928	340,154	3,681,065
1924	305,187	4,542,788	1929	247,730	2,847,564

Average annual production=285,836,000 brick
Average value of production=$3,949,851.

For instance, the production of common brick reached a peak in 1927 which was not equaled in either of the following "boom" years. Still more enlightening, however, are the figures for the value of the production. These show that the peak value was attained in 1923, several years before the peak in building activity was reached. It seems a logical deduction from these figures that the early years of the building boom in the "nineteen-twenties" were the profitable ones for brick manufacturers; and if we may consider present conditions—from a building standpoint—as comparable to those in 1922, when the country emerged from an earlier industrial depression, then within another year the manufacturers of common brick should again be obtaining profitable business. Not that we predict a rapid return to an annual production of three hundred million common brick. On the contrary, the continued development of other types of building materials may absorb a still greater proportion of the total demand for building materials than they now command, but the accumulated shortage of new homes and other buildings is now so great that the resumption of building activities cannot help but create an enlarged demand for both common and face brick as well.

The remarks in the foregoing paragraph apply with almost equal force to the production of terra cotta, ceramic mosaic, and various types of tile; although it is believed the resumption of building may benefit brick manufacturers relatively more at first.

The following figures were compiled by the U. S. Bureau of the Census from statistics supplied by the manufacturers of brick and tile in New Jersey:

BRICK AND TILE PRODUCED IN 1934 AND 1933

Products	Unit of Measure	Quantity produced 1934	Quantity produced 1933	Value in dollars 1934	Value in dollars 1933
Common brick	(thousands)	52,671	45,691	625,535	453,395
Fire-clay products:					
Brick, block or tile	(thousands)	6,833	5,514	367,888	265,263
Special shapes	(short tons)		7,476		213,198
Faience tile	(sq. ft.)	16,762		15,157	
Draintile	(short tons)	345		5,500	
Refractory cement (clay)	(short tons)	3,674	4,483	236,380	165,494
Clay sold, raw or prepared	(short tons)	3,642	1,803	24,071	16,667
Other clay products				1,625,975	1,772,720
Total value				2,900,506	2,886,737

The increase in the unit value of the refractory cement sold is due to a general increase in the price received for such material, and to an improvement in the refractory qualities of the cement made by one manufacturer with the consequent marked increase in the value of his product.

POTTERY.

The value of the pottery manufactured in New Jersey increased from $6,999,753 in 1933 to $7,654,369 in 1934, a gain of 9.4 per cent, but the available statistics are not sufficiently detailed to indicate what varieties of pottery were responsible for the gain. Sales of washdowns and flush tanks, two of the most important pottery products, decreased 29.3 per cent and 23.5 per cent, respectively, and sales of laundry tubs, kitchen sinks and other semivitreous sinks likewise decreased sharply. The only itemized pottery product to show an important gain was "porcelain electrical supplies". Presumably, the manufacturers of such supplies benefited from the greatly increased production of automobiles.

POTTERY MANUFACTURED IN 1934 AND 1933

Products	Number of pieces 1934	Number of pieces 1933	Value in dollars 1934	Value in dollars 1933
Vitreous china plumbing fixtures:				
(a) Bathroom and toilet fixtures				
Closet bowls				
Siphon jets		21,831		146,314
Washdowns	143,434	227,236	561,466	793,587
Reverse traps		15,701		85,602
Flush tanks	134,408	205,468	645,892	844,020
Lavatories		27,051		340,520
Other bathroom fixtures			1,502,932	297,177
(b) Other vitreous china fixtures			158,282	346,139
Semi-vitreous or porcelain plumbing fixtures:				
Laundry tubs and kitchen sinks	13,770	18,810	121,944	172,216
Other semi-vitreous fixtures			251,057	411,598
Red earthenware				59,854
Porcelain electrical supplies			2,055,663	1,743,574
Saggers			32,123	19,711
Other pottery products			2,325,010	1,739,441
Total value			7,654,369	6,999,753

GREENSAND MARL.

Sales of greensand marl in 1934 amounted to 7,335 short tons, valued at $209,278. This was an increase of 8.9 per cent in amount, but only half of one per cent in value as compared with 1933.

As in past years, most of the marl sold was used in water-softening equipment for removing iron and other objectionable substances from hard water, but a small amount was also used on lawns and golf courses as a soil-conditioner and weak fertilizer. In fact, the lawns surrounding the State House Annex in Trenton, where this is written, were improved with marl brought from Hornerstown, the type locality of the geologic formation bearing that name.

PULVERIZED SAND.

The higher prices received for the pulverized sand sold in 1934 gave an increase of 7.9 per cent in the total value of sales, although the volume of sales actually decreased 3.9 per cent from that in 1933. As already related under the heading "Sand and Gravel", a new "silica sand" plant was constructed by the Peerless Sand Company in the early months of 1935, and the incorporation of the Manumuskin Silica Company by John J. Hoppin, of Ocean City, and associates " * * * to mine and deal in silica sand products in this vicinity" (Ocean City) was reported in "Ceramic Age" for February, 1935.

The pulverizing plants operated in 1934 were situated at or near Manumuskin and Newport in Cumberland County, at Pinewald in Ocean County, and at Trenton.

OTHER PRODUCTS.

Lime. The item of chief interest relative to the lime industry of the state is the construction of a modern lime plant by the Limestone Products Corporation of America. There are good arguments for the construction of such a plant, for this state has for years consumed a vastly greater amount of lime than it has produced in spite of high freight rates and the availability of local limestone deposits from which to manufacture a local supply. According to statistics compiled by the U. S. Bureau of Mines, the total consumption of lime in New Jersey in 1934 was 85,626 tons, of which only 720 tons were produced locally. All of this was made in field kilns operated by Henry & John Kinkel, at Stewartsville; by M. C. Mulligan & Son, at Clinton, and by the Peapack Limestone Products Company—now the Peapack Lime Company, Inc.—at Peapack. Only the lime manufactured by the latter company was hydrated prior to its sale.

The new plant of the Limestone Products Corporation is near Sparta Junction, Sussex County, at the large quarry and crushing

plant operated by the Limestone Products Corporation. High-calcium rock from the quarry is burned in a rotary kiln, cooled, hydrated and sacked in one continuous and efficient operation, and a large storehouse provides adequate reserve for peak shipments in the spring.

Portland Cement. The plant of the Vulcanite Portland Cement Company remained idle during all of 1934, this state's entire production coming from the part-time operation of the New Village plant of the Edison Cement Corporation. Though still subnormal, the latter company's production was considerably greater than in 1933 and it is believed that 1935 will show still more improvement.

The Metropolitan Cement Corporation in Raritan Township, Middlesex County, is still awaiting the revival of building operations and a sufficiently improved demand for cement to justify the beginning of operations.

Non-clay Refractories. The fire-brick used in kilns, furnaces, converters and other types of equipment involving the use of high temperatures are commonly made of refractory clay. In some processes, however, other refractories, such as silica, chrome, magnesite and silicon carbide, give better or more economical results. Such products are included in the term "non-clay refractories" as used by the U. S. Bureau of the Census in its statistics, and the total value of such products manufactured in New Jersey in 1934 was $1,179,976. This is an increase of 20 per cent as compared with the corresponding figure for 1933.

By-product Coke. Strategically situated on the Kearny meadows between trunk-line railroads and a sharp bend of the navigable portion of the Hackensack River, the Kearny plant of the Koppers Gas and Coke Company is near the center of one of the greatest industrial and residential districts in the world. Coal can be brought cheaply to the plant by boat, and the products of its distillation can be distributed quickly and cheaply by pipe line, boat, rail and motor truck to the nearby consuming centers. Small wonder that this plant has operated successfully through all the recent period of adversity when many other normally prosperous manufacturing plants have been forced to either close their doors or operate at greatly reduced rates.

Almost equally strategic was the selection of the site for the Camden plant of the Public Service Gas and Electric Company, since it adjoins Delaware River and the connecting railroad between the Camden termini of the Atlantic City Railroad (the Reading Railroad System) and the Pennsylvania Railroad. The population and the number of industries served is smaller, but the demand for gas and coke is equally stable.

Total production of by-product coke from the Kearny and Camden plants in 1934 was 910,121 tons, an increase of almost 9 per cent from the total for 1933.

Diatomite. The development of a deposit of diatomite north of Lake Musconetcong by J. G. Marcrum, of Netcong, was described in the preceding report of this series. Further experimentation by Mr. Marcrum has shown that the moisture and organic material which still remain in the raw diatomite after prolonged draining and air-drying in heaps can be removed by one carefully regulated burning in a vertical kiln. He has therefore eliminated the secondary burning in a rotary kiln, which he first employed, and now feeds the burned cakes of diatomite from the vertical kiln directly to a disintegrator. This machine breaks the material into the tiny diatomaceous skeletons of which it is composed, and these are air-floated to two storage bins placed in series. The finest material passes to the second bin and this very light, powdery substance—it weighs only 10 pounds a cubic foot—is sacked and sold for use in metal polish. The slightly coarser and heavier material which settles in the first bin is sold for use in furnace cements and insulating brick, as a filler in various manufactured products, in concrete and mortar where better workability is desired or where the material is to be used in contact with water, and for clarifying oils.

In a recent letter from Mr. Marcrum he states: " * * * My plant is working full blast and there are orders on hand for all I can turn out. Early in the spring (1936) I shall increase my capacity because inquiries are coming in continually." It thus appears that another small but successful enterprise has been added to the list of New Jersey's mineral industries.

Peat. In many countries peat is the chief domestic fuel, but because this country was abundantly endowed with coal, natural gas and petroleum, its use for that purpose here is almost unknown. There is another use, however, for which there has long been a moderate demand.

It is well-known that maximum plant growth can only be obtained in soils containing a liberal amount of organic material. Most soils are deficient in that respect and consequently where good plant growth is desired some type of organic material has to be added. Manure is commonly used on farms, but for lawns, gardens and greenhouses it has disadvantages which are not found in prepared peat. Consequently, our urban and suburban development has been accompanied by a growing demand for such material. Peat moss is an imported product and is used by many gardeners as a blanket, an inch or more thick, on top of the soil in flower beds. So used, it serves the double

A. *Plant and peat bog of the Hyper-Humus Company.*

B. *Light and compact, hydraulic drilling rig used by the U. S. Geological Survey for drilling test holes in sandy terrain where roads are poor.*

purpose of conserving moisture and keeping down weeds, but unless it is incorporated in the soil, it adds little or nothing to it and hence does not aid the growth of the flowers. For that purpose, native peat, or humus, is preferred and is now widely used by horticulturists.

Most of the native peat deposits were formed in shallow lakes left by the retreating ice of the last glaciation and represent the decayed remains of generation upon generation of plant growth in the lakes. Many such deposits occur in northern New Jersey and two of them have been worked continuously for many years. One such deposit, covering 40 or more acres, overlies the diatomite recently developed by Mr. Marcrum and is 3 to 10 feet thick. It is dug with a tractor and scraper and passed through a shredding machine to eliminate coarse material, after which it is air-dried and shipped in bags or bulk to points as far distant as California and Florida.

The Hyper-Humus Company of Newton has developed a still larger deposit of peat in a bog which stretches from Newton to Warbasse—a distance of three miles—and since this company is the leading producer of peat in the entire United States, its operations will be described in some detail.

The company was founded about twenty years ago by Col. Samuel Price Wetherill, of Philadelphia, who realized the potential value of the peat deposit near Newton and purchased more than a thousand acres of the bog. In developing it test boreholes were sunk which showed that the peat was 4 to 37 feet thick and was underlain by white, calcareous marl and sand. Ditches were dug to drain the upper few feet of the deposit, and the sod was stripped from the peat. Presumably the peat was dug and sold in its raw state at first, but today it undergoes a long system of preparation, of which the first step is to enrich the peat by planting it with cover crops of soy beans, vetch and cowpeas. These are turned under time and again until the peat is considered ready for the market. It is then repeatedly harrowed to break it into small pieces and to reduce its normal acidity. Next it is dug by caterpillar-mounted, drag-line shovels and stacked in heaps to dry. The heaps are restacked at least once to speed the evaporation of the contained moisture, and the material is then conveyed by tram-car to the plant (see Plate IV), where it is passed through a triple-cage mill to break it into still finer pieces. The shredded material is stored at the plant in the summer months in order to have enough material on hand to meet the demand in spring and fall.

"Hyper-Humus", the trade name of the prepared and enriched peat sold by the Hyper-Humus Company, has been used on the White House lawn and other public properties in Washington, and on famous football fields, parks, golf courses and private lawns through-

out the country. It is also used by fertilizer manufacturers in the preparation of a complete soil-enriching product.

Mineral Wool. The Geologic Division of the Department of Conservation and Development has in recent years received a number of inquiries relative to sources of the raw materials used in the manufacture of mineral wool—that fluffy, white, non-inflammable, vermin-proof insulation that one sees going into the walls of so many new houses. Because of these inquiries it is believed that mention of those sources and a brief description of the industry in this state may be of some general interest.

Probably the first mineral wool made in this country was manufactured from slag from the old Musconetcong Iron Works at Stanhope, for the United States Mineral Wool Company—which still utilizes slag from the old dumps at Stanhope—was organized in August, 1894, and according to the best information available, mineral wool was not made elsewhere in this country until 1897. Subsequent experimentation evidently showed that the quality of the company's product could be improved by the addition of calcium carbonate, for crystalline calcite—presumably from Sussex County—is now added to the slag, which is the major ingredient of the mineral wool produced at Stanhope.

The second plant to produce mineral wool in New Jersey was built by the Johns-Manville Company at Manville, and that company also used slag and limestone for raw materials, obtaining at least a part of the limestone from quarries at Peapack and Clinton.

Quite recently a third plant has been built by the Baldwin-Hill Company in Trenton. After considerable experimentation, Mr. Hill also decided to use slag as a raw material, and this he obtains from old slag dumps in eastern Pennsylvania.

The processes of manufacturing mineral wool are all essentially alike. Rock or slag, or mixtures of the two having the desired chemical composition, are melted in an ordinary foundry cupola. Steam or air, under pressure of 80 to 100 pounds per square inch, is then blown through a thin stream of the molten material. The tremendous velocity of the steam or air is sufficient to shred the material into long white filaments of very small diameter which, in falling to the floor of the blowing room, become interlaced in a light mat similar in appearance to wool. Largely because of the entrapped "dead" air, this material is an excellent insulator and sound-deadening medium.

Mineral wool is used in several forms. Perhaps the greatest amount is made into pads which are placed in the walls and ceilings of new buildings to absorb sound and lessen the flow of heat. Much

of the production, however, is granulated by passing it through a machine which breaks the threads into short fibres and eliminates the glass beads to which many of the threads are attached. In that form it can be blown into place through small openings—a highly desirable property where it is used to insulate completed buildings. Some wool is used in a loose form and is either pressed lightly between boards, and sawed into blocks for convenient handling, or else mixed with other materials and made into refrigerator linings, pipe coverings and similar pre-formed insulation.

As determined by various investigators, mineral wool can be made from materials having a wide range in chemical composition, but the final product is essentially a calcium silicate with usually some replacement of CaO by MgO, Al_2O_3 and Fe_2O_3. Old slag heaps have been mentioned as one source of raw material having approximately the correct chemical composition and there are many such in New Jersey. Two of the largest are at Oxford and Pequest, and though the writer cannot recall seeing it, there is doubtless another large one near the site of the old iron furnaces at Wharton. Still others are to be found at Secaucus and Phillipsburg. Another prospective source of slag would be the large metal smelting plants in the district between Perth Amboy and Newark. In fact, it is rumored that another mineral wool plant is already under construction in the latter area.

One of the inherent advantages of using slag as raw material for the production of mineral wool is that it can be dug cheaply. Were none available, however, New Jersey manufacturers could still get their raw materials locally, for the "cement rock" now being quarried and used in the manufacture of cement at New Village, and which occurs in many other localities in Warren and Sussex Counties, could also be used to manufacture mineral wool. Were that unavailable, there would still be the possibility of using mixtures of shale and limestone. But the availability of large slag heaps makes it improbable that any other material will be used by New Jersey manufacturers for many years to come.

PROSPECTING FOR METALLIC MINERALS.

A large sign posted beside the highway at Woodruffs Gap on the Sparta-Branchville road, which invited the passerby to come and inspect the "Indian Silver Mine" aroused the writer's curiosity in June, 1935. Accepting the invitation, he traveled southwest about two miles to another sign which directed him up a steep and little-used road, past an old furnace, to an old inclined shaft at the top of the hill. There he found the proprietor who, when asked the relevancy of the name, "Indian Silver Mine", naively replied that he thought

it sounded attractive. The shaft, and several nearby test pits, were actually dug about seventy-five years ago by the Sussex Lead Company in a futile search for lead ore. Examination of out-crops near the old shaft disclosed disseminated grains of galena (lead sulphide) and sphalerite (zinc sulphide), but there was no indication at the surface that these minerals occurred in paying quantities, nor was any ore found in the old shaft. "Prospecting" terminated a few months later as the result of a court order enjoining the proprietor of the Indian Silver Mine from the further sale of stock in his enterprise.

GROUND-WATER SUPPLY.

Since 1932 New Jersey's residents have enjoyed a normal amount of precipitation. Existing water supplies have been adequate therefore except where consumption has increased. Though satisfactory to the great majority of residents, the water well drillers, whose livelihood depends upon the drilling of new wells as much as upon the repair of old ones, have not, therefore, greatly prospered as a class. Normally, the largest demand for wells is from farmers, and although the earnings of New Jersey's agricultural population have definitely improved, there has been little or no Federal money disbursed by the Agricultural Adjustment Administration in this State. Lacking such "easy" money, many farmers with unsatisfactory water supplies have undoubtedly continued their use and spent their small earnings to replace worn-out machinery or for necessary repairs. Another large source of business for well drillers in normal times is providing a water supply for new homes in suburban areas that lack a public water supply. That type of business has been very poor in recent years, but is now definitely improving. The one branch of business that has provided more than the usual amount of work is the liquor trade. The reopening of old breweries and distilleries, and the construction of several new ones has necessitated the drilling of many new wells. Unfortunately for the drillers, the peak of that business has passed and they must now look elsewhere for new business. One such source is communities desiring to develop a public water supply or to augment or improve an existing supply with cheap money obtained from the Federal government in the form of grants and loans at low interest rates. A dozen or more communities have already obtained such grants and loans, and others are still pending.

With the death of the NRA and the necessity of preparing a satisfactory code under which to operate, the work of the New Jersey Water Well Drillers' Association has turned to local problems. Perhaps the outstanding accomplishment of the organization was to obtain a marked reduction in the license fee for truck-mounted well rigs, but the members have benefited even more perhaps through the opportunity to meet their competitors on a friendly footing and openly discuss mutual problems.