REPORTS OF THE

DEPARTMENT OF

CONSERVATION AND DEVELOPMENT

STATE OF NEW JERSEY

HENRY B. KÜMMEL, State Geologist and Director

BULLETIN 32

Geologic Series

THE MINERAL INDUSTRY OF NEW JERSEY FOR 1927

Compiled by

MEREDITH E. JOHNSON

Assistant State Geologist

Published 1929

Division of Geology and Topography

REPORTS OF THE

DEPARTMENT OF

CONSERVATION AND DEVELOPMENT

STATE OF NEW JERSEY

HENRY B. KÜMMEL, State Geologist and Director

BULLETIN 32

Geologic Series

THE MINERAL INDUSTRY OF NEW JERSEY FOR 1927

Compiled by

MEREDITH E. JOHNSON

Assistant State Geologist

Published 1929

Division of Geology and Topography

THE MINERAL INDUSTRY OF NEW JERSEY FOR 1927

By MEREDITH E. JOHNSON

Assistant State Geologist

INTRODUCTION

This bulletin is published as a continuation of the series of articles relating to the mineral industries of New Jersey, which, as separate bulletins, or chapters in the annual reports of the State Geologist, have been published for a continuous period of 31 years. The statistics given are a compilation of figures furnished by the mineral producers of New Jersey to the Division of Geology and Topography of the Department of Conservation and Development, and the Bureau of Mines and the Bureau of the Census of the United States Department of Commerce. In accordance with the established policy of these three organizations, figures of individual producers are concealed except where permission has been granted to publish them and they are believed to add interest to the story.

TOTAL VALUE OF THE MINERAL PRODUCTION IN 1927

Since data of the production of peat, spiegeleisen and low-grade manganiferous zinc residuum are not available for 1927, the total value of the mineral production as given, $83,071,441, is at least two million dollars less than it would otherwise be. A glance at the comparative figures of production and sales for 1927 and 1926 shows unmistakably, however, that in a majority of the mineral industries there was a decline in the value of sales from the record figures of 1926. Of 15 commodities listed, five showed increases in value of 10 to 66 per cent, and ten showed decreases of 2 to 29 per cent, the net result being a loss of $4,318,198 or 4.9 per cent from the preceding year. The greatest proportionate drop in value was sustained by the producers of non-clay refractories and refractory cements; the greatest increase was recorded by New Jersey's lone producer of ground talc. Of the major industries, the greatest change was recorded by the producers of stone, the value of that production increasing 20.3 per cent. Details of the figures of production are given in succeeding pages.

MINERAL PRODUCTION IN NEW JERSEY IN 1927 AND 1926

Products	No. of producers	Quantity—Short or long tons 1927	Quantity—Short or long tons 1926	Value—Dollars 1927	Value—Dollars 1926	Per cent increase or decrease Tonnage	Per cent increase or decrease Value
Zinc ore	1	629,108 s. t.	573,300 s. t.	(a)	(a)	+ 9.7	
Iron ore (shipped)	4	202,720 l. t.	212,152 l. t.	860,393	925,403	— 4.4	— 7.0
Stone	45	2,760,882 s. t.	2,315,451 s. t.	4,334,526	3,602,343	+ 19.3	+ 20.3
Sand and gravel	92	4,627,159 s. t.	4,935,934 s. t.	3,602,289	3,680,064	— 6.3	— 2.1
Clay (sold raw)	42	312,410 s. t.	342,586 s. t.	1,270,572	1,463,288	— 8.8	— 13.2
Brick and tile	[b] 70			20,343,656	23,046,186		— 11.7
Pottery	[b] 60			22,729,721	24,466,328		— 7.1
Feldspar (ground)[c]	4	25,344 s. t.	28,430 s. t.	485,446	550,195	— 10.8	— 11.8
Greensand marl	5	11,259 s. t.	12,606 s. t.	163,048	174,365	— 10.7	— 6.5
Other products—							
Lime	2					+ 60.9	+ 10.5
Portland cement	2					— 4.8	— 14.1
Quartz (ground)	7					+ 40.7	+ 57.7
Talcose rock (ground)	1			29,767,236	29,901,998	+ 51.1	+ 66.2
Zinc ore	1					+ 9.7	+ 15.4
Non-clay refractories and refractory cements	13						— 29.2
Coke[d]	2					— 0.8	— 4.3
Totals				[e] 83,071,441	[e] 87,259,975		— 4.9

[a] Value included in "Other products."
[b] Number of plants.
[c] Raw material brought into the state and ground at Trenton.
[d] Raw material from other states.
[e] Figures for the production and value of spiegeleisen, manganiferous zinc residuum and peat are not available for 1927. In 1926 these products had a value of $2,723,024 and the total value of all mineral products amounted to $90,008,915.

DETAILS OF THE PRODUCTION IN EACH MINERAL INDUSTRY

ZINC

The total value of all metals produced in the United States in 1927 was considerably below that in 1926, and zinc shared in this decrease. Total production of zinc fell about 8 per cent, and the value of production about 21 per cent. In contrast with this rather unhappy picture, New Jersey's sole producer, the New Jersey Zinc Company, increased its output 9.7 per cent, and sold it at a price averaging only a fifth of a cent less than in 1926. Since the average price of zinc (at Saint Louis) declined [1] from 7.34 to 6.24 cents per pound, or 1.1 cents, honors must be divided between the producing and selling divisions of the company.

So far as known no new developments occurred during the year and all of the zinc produced came from the two ore bodies at Franklin Furnace and Ogdensburg, which, since 1880, have yielded over 14,000,000 short tons of ore.

IRON ORE

The American iron and steel industry did not enjoy so favorable a year in 1927 as it had in 1926. The production of iron ore was smaller by 8.7 per cent, shipments declined 11.6 per cent, and the value of shipments declined 13.2 per cent; hence the industry as a whole showed a decided recession from the high mark of the previous year.

In New Jersey the situation reflected that in the rest of the country, although the decline there was not so great. The total of all shipments declined 4.4 per cent in tonnage, and 7.0 per cent in value. Just two mines operated during the year, the Mount Hope mine of the Warren Foundry and Pipe Corporation, and the Richard mine of the Thomas Iron Company. These two companies, the only active producers in 1926 also, mined 5.5 per cent more ore than in the preceding year, the balance from shipments going to the stock pile. Improvements in milling technique resulted in raising the percentage of iron in the concentrates from 60 per cent to 62 per cent.

[1] Annual Review Number, Engineering and Mining Journal, p. 96, January 21, 1928.

The Ringwood Company shipped a small amount of magnetic ore from stock, and the Basic Iron Ore Company shipped a few carloads of limonite from stock for use in gas purification and for paint.

STONE

The stone industry took a big step forward in 1927, the total value of all the stone produced amounting to $4,334,526. This is a new record for the State of New Jersey, and represents a 20.3 per cent increase over the previous year. As in previous years, the producers of trap rock must be given credit for the major part of the increase, but the production of all other types of stone quarried in New Jersey increased as well. Presumably the increasing use of concrete in building construction is the cause for the increase in sales of crushed rock, but the larger sales of building stone can only be explained by a reversal of the tide of public opinion which for so many years has swung away from the use of stone as a building material and towards the use of cheaper materials.

Referring to the general table, page 4, it will be seen that the stone industry is now the third most important of all the strictly mineral industries in the State, that honor having been wrested from the sand and gravel industry for the first time since 1921.

DETAILS OF THE PRODUCTION OF STONE IN 1927 AND 1926

Kind	*No. producers* 1927	1926	*Production—short tons* 1927	1926	*Value—dollars* 1927	1926
Trap rock	31	31	2,388,702	2,053,130	3,654,404	3,139,316
Limestone	8	8	233,550	218,640	388,551	353,605
Other Stone ...	6	5	138,630	43,681	291,571	109,422
Totals ...	45	44	2,760,882	2,315,451	4,334,526	3,602,343

Trap rock. Other quarry products are subject to drastic changes in demand, but the demand for New Jersey trap rock is steady and increasing. In 1927 the value of the trap rock produced amounted to $3,654,404, a new high mark for the industry and a gain of $515,088, or 16.4 per cent, over the previous year. Statistics of the production of trap rock in other states are not yet available, but it is a fairly safe guess that in 1927, as in 1926, New Jersey led all other states in the Union in the value of its trap rock production.

The amount of production increased in almost exactly the same ratio as the value (*i. e.*, 16.3 per cent as compared with 16.4 per cent), hence it is obvious that prices remained at just about the same level as in the preceding year.

Practically all of the trap rock quarried is crushed to 3-inch or smaller sizes. Most of it is used in concrete, but a good deal is used as railroad ballast or as road metal. A small amount of "screenings" is used in surfacing walks and driveways, and in the manufacture of concrete blocks. The following table gives details of the production.

PRODUCTION OF TRAP ROCK IN 1927 AND 1926

Use	*Quantity—short tons* 1927	1926	*Value—dollars* 1927	1926
Road metal	2,003,967	358,810	3,144,313	565,305
Concrete		1,460,940		2,266,582
Railroad ballast	348,250	232,320	455,456	301,832
Other uses	36,485	1,060	54,635	5,597
Total	2,388,702	2,053,130	3,654,404	3,139,316

Limestone. Five operators sold small quantities of limestone for agricultural purposes in 1927, the total amount and value of the sales being just a trifle less than in the preceding year. The amount of limestone sold for flux also decreased a little; but that sold for road metal, concrete and other purposes increased enough to more than counterbalance the losses, the net result being a gain of 6.8 per cent in total amount and 9.9 per cent in total value.

The number of producers remained the same; E. J. Neighbor did not operate his quarry in 1927, whereas the Singer Manufacturing Company, of 149 Broadway, New York City, renewed operations at Andover, Sussex County.

PRODUCTION OF LIMESTONE IN 1927 AND 1926

Use	*Quantity—short tons* 1927	1926	*Value—dollars* 1927	1926
Road metal and concrete..	34,770	20,640	41,137	25,988
Flux	129,050	136,120	120,871	129,884
Agriculture	35,700	35,030	104,270	100,901
Other uses	34,030	26,850	122,273	96,832
Total	233,550	218,640	388,551	353,605

Other Stone. In order to conceal the figures of production and sales of individual concerns, all other quarry products, including argillite, granite, marble (serpentine), and sandstone, are grouped under this heading. The tremendous gain shown by the group as a whole is explained by the fact that production in 1926 was unusually small, and by the inclusion in this year's figures of the large output of the sandstone quarry at Raven Rock. This quarry is operated by Charles T. Eastburn of Yardley, Pa., and it is the source of many of the large blocks of stone used to protect the beaches at Asbury Park and nearby resorts.

One other change in the list of producers was caused when Lyman Kice sold his granite quarry at Long Valley, Morris County, to G. N. McLean.

SAND AND GRAVEL

There was a slight decline in the production of sand and gravel in 1927, but since the value of the production declined only 2.1 per cent, as compared with a 6.3-per-cent-decline in the tonnage, it is obvious that the price received per ton was greater than in 1926, and profits were no doubt as substantial as in that year. Of the total production, 75.8 per cent, or an increase of 1.2 per cent over 1926, was washed before it was sold. Ninety-two individuals or firms, or seven more than in the previous year, were engaged in the industry. Detailed statistics of the production are shown in the following table:

PRODUCTION OF SAND AND GRAVEL IN 1927 AND 1926

Type of production	No. of pits	Quantity—short tons 1927	1926	Value—dollars 1927	1926
Glass sand	6	185,568	185,581	278,588	508,507
Molding sand	44	444,667	468,757	564,826	633,554
Structural sand	46	1,512,150	1,548,018	788,626	743,659
Paving sand	26	1,303,523	1,005,136	704,700	534,004
Cutting, grinding and blast sand	11	70,961	88,346	203,897	241,147
Fire or furnace sand	14	57,428	50,083	84,316	68,320
Engine sand	6	87,529	69,358	36,615	28,423
Filter sand	4	29,208	.....	82,048	.....
Other sands [a]	6	29,109	78,209	39,756	151,541
Total sand	..	3,720,143	.....	2,783,372	.....
Building gravel	19	270,421	346,074	267,212	328,803
Paving gravel	34	587,509	519,749	487,111	435,294
Other gravel [b]	6	49,086	96,101	64,594	103,068
Total gravel	..	907,016	.....	818,917	.....
Total sand and gravel.	..	4,627,159	[c] 4,935,934	3,602,289	[c] 3,680,064

[a] Includes sand for use by golf clubs and other special purposes. In 1926 the production and value of filter sand was also included under this heading.
[b] Includes gravel for all purposes other than building or paving.
[c] Revised figures for 1926. Not the sums of the amounts shown.

CLAY

New Jersey is one of the leading producers of clay in the Union. In 1927 it ranked fourth among all the states with a production aggregating 8.1 per cent of the total. Both production and sales declined from the previous year, all classes of clay sharing in the decline. The figures represent only the clay sold as raw clay and do not include the much greater quantity of clay which was mined by the manufacturers of clay products who possess clay pits of their own.

RAW CLAY SOLD BY PRODUCERS IN 1927 AND 1926

Kind of clay	Production—short tons 1927	1926	Value—dollars 1927	1926
Ball clay	5,901	5,919	33,083	39,862
Fire clay	251,205	292,155	1,134,143	1,296,759
Stoneware clay	12,406	16,506	55,298	74,617
Miscellaneous clay	42,898	28,006	48,048	52,050
Total	312,410	342,586	1,270,572	1,463,288

Middlesex County continues to be the center of the clay industry, the operators in that one county accounting for 78.3 per cent of the entire raw clay production of the State.

BRICK AND TILE

There was a definite, though moderate, decrease in the volume of construction in New Jersey and nearby states in 1927. This decline in building activity was reflected by proportionate declines in some of the industries supplying building materials. In New Jersey the portland cement industry, the brick and tile industry, the sand and gravel industry, and possibly the iron and pottery industries, were all affected to some extent. Production in the brick and tile industry declined appreciably, and the value of the production declined $2,702,530 or 11.7 per cent from the high mark of the previous year. Details of the production are shown in the following table:

BRICK AND TILE IN 1927 AND 1926

Products	No. of producers	Quantity produced 1927	Quantity produced 1926	Value in dollars 1927	Value in dollars 1926
Common brick	23	356,860 M	335,673 M	4,125,754	4,750,628
Face brick	3	21,995 M	25,389 M	717,079	868,635
Fire brick [a]	17	22,041 M	18,557 M	1,231,740	1,385,262
Terra cotta	6	42,313 n. t.	42,310 n. t.	4,378,074	5,672,649
Hollow building tile [b]	13	412,025 n. t.	440,110 n. t.	3,485,616	3,829,492
Floor tile	8	5,180,725 sq. ft.	3,935,919 sq. ft.	1,199,496	960,734
Ceramic mosaic	4	4,068,485 sq. ft.	6,336,463 sq. ft.	957,507	1,325,761
Faience tile	4	218,084 sq. ft.	583,679 sq. ft.	212,325	463,981
Wall tile	7	7,978,758 sq. ft.	8,206,827 sq. ft.	2,653,158	2,716,276
Miscellaneous [c]	12	.....	.....	1,382,907	1,072,768
Totals				20,343,656	23,046,186

M = thousands.

n. t. = net ton of 2,000 pounds.

[a] Includes 14 firms producing clay brick, block, or tile; boiler and locomotive brick; and other refractory clay products (9-inch equivalent); also 3 firms producing special shapes.

[b] Includes 8 firms producing partition, load-bearing, furring, or book title; and 5 firms producing either floor-arch, silo, and corncrib tile; conduits; radial chimney blocks, or fire-proofing tile.

[c] Includes 3 producers of enameled brick; 3 of enameled tile; 2 of drain tile; 1 of flue lining; 1 of wall coping; 1 of glass-house tank blocks, melting pots, stoppers, floaters and rings; 1 of chimney pipe and tops; 1 of plastic furnace lining and 1 of rough imperial brick.

POTTERY

It seems entirely probable that with less homes and office buildings being constructed, there would be a lessened demand for new plumbing fixtures; but whether or not this was the cause, the fact is indisputable that the pottery industry also showed a decline in activity from the previous year corresponding closely to the decline in building activity. As shown by sales, the decline amounted to only 7.1 per cent; however, it is worthy of note that the total volume of sales in 1927 is less than that in any year since 1922. Since the volume of building construction reached a peak in this region in 1926, any parallelism between declines in the two industries stops there, and one is forced to the conclusion that New Jersey's leadership in the pottery industry has been challenged. To maintain that leadership, New Jersey potters must decrease costs per unit or better the quality of their product, otherwise they will meet prematurely the fate of all leaders.

Two new names, the Isolantite Company of America, and the Willette Corporation of New Jersey, were added to the list of active potteries in 1927; but their addition was counterbalanced by the fact that the Anchor Pottery and the Acme Pottery Works, Inc., were reported as inactive. The plant of the Isolantite Company of America is located at Belleville, Essex County, that of the Willette Corporation of New Jersey at New Brunswick, Middlesex County.

POTTERY—1927 AND 1926

Products	No. of producers	Quantity—pieces 1927	Quantity—pieces 1926	Value in dollars 1927	Value in dollars 1926
White ware	2	.....	.....	(a)	548,572
Hotel china	5	.....	.....	1,770,213	1,893,962
Vitreous china plumbing fixtures[b]	..	2,217,619	1,487,084	9,876,743	9,740,589
Semi-vitreous or porcelain plumbing fixtures[c]	16	.....	.....	4,793,569	5,063,504
Porcelain electrical supplies[c]	18	.....	.....	3,838,772	4,352,263
Saggers (of own make)	27	.....	.....	261,818	487,167
Other pottery products[d]	..	.....	.....	2,188,606	2,380,271
Totals				22,729,721	24,466,328

[a] Included in "Other pottery products."
[b] Includes bathroom and toilet fixtures; laundry tubs and kitchen sinks; and other fixtures. The value of fittings is excluded.
[c] Excluding value of fittings.
[d] Includes red earthenware (flowerpots, etc.); stoneware (except chemical) and yellow and Rockingham ware; chemical stoneware; white ware, including cream color, white granite, semi-porcelain, and semi-vitreous porcelain ware; porcelain china, bone china, delft, and belleek ware; art pottery; gas and electric logs; and other miscellaneous products.

FELDSPAR (ground)

Since the principal uses of feldspar are in the manufacture of pottery and enameled ware, it is not surprising that the production of ground feldspar decreased in about the same ratio as the production of those commodities. Four mills, all located in Trenton, and one more than in the preceding year, reported a production in 1927. Their names and addresses follow:

Eureka Flint & Spar Co., New York Avenue, Trenton.
Golding Sons Co., Trenton Trust Co. Bldg., Trenton.
Standard Flint and Spar Corp., New York Avenue, Trenton.
Trenton Flint & Spar Co., Marion Street and P. R. R., Trenton.

In 1927 the mills at Trenton ground 13 per cent of all the domestic feldspar.

The price of domestic ground feldspar ranged from $10.63 to $22 a ton in 1927, the apparent large discrepancy between the high and low figures being largely explainable by differences in location of the mills, those near the sources of supply quoting lower figures than those at Trenton or other consuming centers where the cost of transportation has been added.

GREENSAND MARL

The history of the greensand marl industry in New Jersey is an interesting one. In the first half of the nineteenth century great quantities of marl were dug and sold to farmers as fertilizer. The demand was so great that several railroads were built to transport it. As other and more concentrated fertilizers were brought on the market, however, the demand for greensand marl as a fertilizer slowly died away and most of those engaged in the industry were forced to seek other means of livelihood. By 1914 only four operators were left in the business. Then came the World War and with it the necessity for developing in this country a supply of potash to meet the shortage caused by the cessation of supply from Germany. Prices soared. With muriate of potash (K Cl) selling at four to five dollars per unit (20 pounds) of K_2O, is it any wonder that the almost unlimited supplies of greensand in New Jersey, containing 5 to 7 per cent of K_2O, attracted attention as a cheap source of raw material. Four different companies were organized to produce potash from New Jersey's greensands. Then the war ended, once more the gates were opened to imports of German potash and prices took a precipitate drop. Unable to compete with the low-cost German product, the newly born industry was snuffed out before it really had a chance to assert itself. Production dragged. Once more greensand could be marketed only as a fertilizer, and in that field competition was perhaps even stronger than it had been before the war. The industry seemed doomed. Then someone discovered that by proper treatment, greensand could be made to act as a very efficient water-softener. In 1922 The Permutit Company built a plant to treat greensand marl and prepare it for this purpose. It was successful from the start. Other plants followed, and now this industry is on a firm and established footing.

Experimental work to determine a profitable method of extraction of the potash from greensand marl still goes on with considerable hope that eventually such a process will be devised. The experimental plant of the Electro Company at Odessa, Delaware, is still in operation and during the year produced a small amount of potash alum from greensand obtained in Delaware. Experimental work has also been continued by the Bureau of Chemistry and Soils, U. S. Department of Agriculture, at Washington.

In 1927 the production of greensand marl declined 10.7 per cent

from that in the previous year. Its use as a fertilizer continues to wane and in the water-softening field, the demand is strictly limited.

OTHER PRODUCTS

Lime. The production of lime gained 61 per cent over the output of the preceding year, the additional production being almost entirely accounted for by one company, the New Jersey Lime Products Corporation of Ogdensburg, Sussex County, whose lime plant was inactive in 1926. A little more than one-third of the lime produced was sold for use in the building trade, the remainder was sold for agricultural purposes.

Portland Cement. The increasing use of cement in construction work is indicated by the fact that for the country as a whole, consumption last year amounted to 171,864,728 barrels, an increase of 6.0 per cent over 1926, although the volume of construction (as indicated by figures compiled by the F. W. Dodge Corporation) declined 1.1 per cent from the previous year.

The natural market for New Jersey's two cement plants is northern New Jersey and metropolitan New York. In that district the decline in construction was greater proportionally than in the rest of the country, amounting to 5.1 per cent; hence it is not surprising that combined shipments of the Edison Portland Cement Company and the Vulcanite Cement Company decreased 4.8 per cent.

The decline in volume of shipments, however, is of little moment compared to the much more important decline in selling price. This amounted to almost 9 per cent; and since manufacturing costs remained about the same as in 1926, earnings must have suffered proportionally.

In this motor age considerable cement is used each year in the construction of concrete roads. That the decline in shipments of New Jersey cement was due almost wholly to the decline in building construction is shown by the fact that in New Jersey 124.565 miles of such roads were built in 1927, as compared with 123.552 miles in 1926.

Ground Quartz. There are seven firms in New Jersey which grind sand for various purposes. Five of these buy their sand from other firms whose production is included under the heading "Sand and Gravel". One firm, the New Jersey Pulverizing Company, buys some sand but gets most of its supply from its own pit near Pinewald, Ocean County. No measurement is made of the sand used until after it has

been ground; hence the amount and value of that production are included here. The production of the remaining firm is also included here because it bought sand from a subsidiary corporation which did not make a separate report.

Talcose Rock. The Rock Products Company of Easton, Pa., is still the only producer of talcose rock in this State. This company seems to have developed a good market for its ground talc and again increased its production from its Lizzie Clay quarry north of Phillipsburg.

Non-clay Refractories and Refractory Cements. Silicon carbide brick, other silicon carbide refractories, magnesite brick, other magnesia refractories, refractory clay cement, non-clay refractory cement and other unlisted refractory products are included in this grouping. Their value is included in this report because of the fact that a part or all of the raw materials for their manufacture came from this State, and because the value of those raw materials is not shown elsewhere.

In 1927 the value of the above-named group of products declined 29.2 per cent. Since most of these products are used in the metallurgical industry, it would be natural to expect sales to fluctuate with conditions in that industry; but no such decline was suffered by any of the major metallurgical industries and therefore it would seem that local conditions must be responsible for the drastic decline shown.

Coke. As compared with the previous year, there was very little change in the production of by-product coke. The same plants were in operation and they produced only 0.8 per cent less coke. Prices were a little lower and the value of sales accordingly declined somewhat more than production (*i. e.,* 4.3 per cent).

UNDEVELOPED RESOURCES

Many minerals and rocks, useful in the industries, are known to occur in New Jersey. Some of these, such as the well-known zinc ores at Franklin Furnace and Ogdensburg, the magnetite ores of the Highlands region, the glass sand deposits, and the ridges and hills of trap rock, have been successfully exploited for years. Other deposits, such as the bog-iron ores of southern New Jersey, have been worked for years, only to have changing economic conditions render the deposits valueless. It is obvious that no hard and fast line may be drawn to separate for all time the undeveloped mineral deposits from those that are worthless. Deposits that today are of no value because the ore is too dis-

Year in which drilled	*Name of Company*	*Location*	*Depth when abandoned. (Feet)*
Before 1868		"In the Ramapo Valley"	335+
1915	Perron Oil & Gas Co.	Cassville, Ocean County	600+
1916	Cumberland Oil & Gas Co.	3 mi. east of Millville, Cumberland County	705
1917		Belle Mead, Somerset Co.	2100
1917		Hammonton, Atlantic Co.	120±
1918	The East Coast Oil Co.	1½ mi. east of Newport, Cumberland Co.	1100±
1919-1920	The New Jersey Oil & Gas Fields Co., Inc.	In Ocean County just south of Prospertown, Monmouth Co.	1700±
1920–1921	The New Jersey Oil & Gas Fields Co., Inc.	Jackson Mills, Ocean County	2200
1921	The N. J. Oil & Gas Fields Co., Inc., and the W. & K. Oil Co.	Jacksons Mills, Ocean County	5000+
1928	Middlesex Development Co.	Dunhams Corners, Middlesex County	565

reported that "showings" of oil were obtained during the drilling, results to date are such that it too must be classified as a dry hole.

The members of this Survey still feel that the weight of accumulated evidence is strongly against the occurrence of oil in this state in commercial quantities and take this occasion to remind investors that so far all efforts to discover oil in such amounts have been uniformly unsuccessful. The following is an incomplete list of wells drilled primarily in search of oil:

seminated, may, when richer deposits are worked out, prove of great value. The development of improved milling or metallurgical technique may bring the same result. Perhaps the most striking example of the changing value of mineral deposits is shown in the copper industry. Before the Revolution and in the early part of the nineteenth century, the lean copper ores occurring in the Triassic belt of New Jersey were worked at several localities. Richer ores were discovered in Michigan and the west and the New Jersey mines were abandoned as unprofitable. Then a western mining engineer demonstrated the fact that large bodies of low-grade ore may be worked with greater profit than the richer vein ores of Michigan and Montana. Already ores containing less than 1½ per cent of copper have been profitably exploited. Who knows whether or not New Jersey's copper ores should still be classified as a mineral resource?

The tendency is to classify all mineral deposits as undeveloped resources which occur in sufficient quantity or concentration to give rise to the hope that even if they cannot be profitably worked today, changes may occur which will cause them to become valuable at some time in the future. New Jersey possesses many such mineral deposits. Among the most promising are the veins of high-grade, flake graphite which have been found at a score or more points in the Highlands region. Attempts have already been made[1] to develop profitable mines near Bloomingdale, Passaic County; Peapack, Somerset County; west of Morristown, Morris County; near Fairmount and High Bridge, Hunterdon County; near Pottersville, Somerset County; McAfee, Sussex County; Mendham and Washington Corners in the southeast corner of Morris County, and south of Chester. None of these attempts proved very profitable, although the Bloomingdale mine was worked for a number of years and probably yielded a profit during a part of that time.

Although past efforts to mine graphite have been almost uniformly unsuccessful from a financial point of view, there are good reasons for believing that improvements in milling technique may yet enable producers to win a livelihood from these deposits. Analyses of many

[1] New Jersey Geol. Survey Annual Reports for 1879, pp. 153-156; 1880, p. 178; 1883, p. 168.
Spencer, A. C., U. S. Geol. Survey Geol. Atlas, Franklin Furnace folio (No. 161), p. 25, 1908.
Bayley, W. S., Salisbury, R. D., and Kummel, H. B., U. S. Geol. Survey Geol. Atlas, Raritan folio (No. 191), p. 30, 1914.

samples have shown that ore containing 10 per cent of graphitic carbon is available at several of the localities mentioned; moreover, the graphite is of excellent quality, one of the biggest dealers in the industry considering it the equal of any now produced. Recently the Annandale Graphite Corporation, of Annandale, N. J., has developed a milling process which gives promise of an economical treatment of the ore. Several years ago this company built a large and well equipped mill on a shoulder of the hill just north of the railroad station at Annandale. A mine was opened near the foot of the east slope of the hill, and a large electric shovel was employed to trench the hillside and block out the available ore. Boreholes were also put down to help determine the grade and extent of the ore-body. Ore from the mine and trenching operations was treated in the mill until it had become definitely established that profitable concentration of the graphite with the original mill arrangements and equipment was impossible. Large-scale operations were then suspended and experimental work was carried on to determine a cheaper and more efficient milling process. We are informed that such a process has now been developed and though details may not yet be given, this much can be said: that whereas the former process involved fine grinding in the dry state, the new process involves wet grinding to a very fine state in rod mills, and the concentration of the graphite from the pulp by means of flotation machines.

PROSPECTING FOR OIL

Work still continues on the deep well of the W & K Oil Company (formerly the New Jersey Oil and Gas Fields Company, Inc.) at Jackson Mills, Ocean County. Drilling was first started here October 21, 1920. After drilling for about a year the first hole was abandoned when the drill became jammed at a reported depth of 2200 feet. The rig was then shifted some 50 to 100 feet and a second hole was started. This hole was reported to be down over 5,000 feet in the summer of 1927. Later it was reported that the tools had been lost in the hole and since then all efforts have been centered on clearing it.

The Middlesex Development Company has so far been equally unsuccessful with its well located near Dunhams Corners and almost exactly three miles south by east of the bridge over Lawrence Brook at Milltown. In the summer of 1928 this well was sunk to a depth of 565 feet, at which depth operations were suspended. Although it is

Other deep wells, drilled to obtain supplies of artesian water, have also failed to find any oil. The location and depth of some of these wells is given below:

Community in or near which well was drilled	*Total depth in feet*
1. Atlantic City	2306
2. Jersey City	2200
3. Paterson	2100
4. Elizabeth	1600
5. Lavalette, Ocean County	1522
6. Bayonne	1397
7. Asbury Park	1350
8. Hoboken	1350
9. Cape May	1313
10. Wildwood, Cape May County	1244
11. Millville	1200
12. Island Heights, Ocean County	1145
13. Sea Girt, Monmouth County	1137
14. Ocean Grove, Monmouth County	1134
15. Lambertville	1005
16. Newark	1000
17. Alpine, Bergen County	1000
18. Bridgeton	990
19. Seaside Heights, Ocean County	986
20. Sayreville, Middlesex County	976
21. Bayhead, Ocean County	960
22. Elwood (Amatol), Atlantic County	950
23. Avalon, Cape May County	925
24. Mantoloking, Ocean County	922
25. Beach Haven, Ocean County	920+
26. League Island, Philadelphia	906
27. Caldwell (near the Penitentiary), Essex County	900
28. Trenton	900
29. Farmingdale	900
30. Bay Head, Ocean County	885
31. Ramsey, Bergen County	876
32. Sea Isle City, Cape May County	854

It is hoped that the foregoing lists of deep holes—dry from the standpoint of those seeking oil—are sufficiently long to impress everyone who reads them with the fact that the odds against the success of wildcatting for oil in New Jersey are very great indeed. We have no bone to pick with those who enter such ventures with open eyes—in fact we learn much from such operations, whether or not they are successful—but we do want those who undertake such ventures to understand the hazards of the game and the probability that only financial loss will result.