

CEMENT.

PORTLAND CEMENT.

By SPENCER B. NEWBERRY.

PRODUCTION.

The product of Portland cement in the United States in 1897 amounted to 2,677,775 barrels, an increase of 1,134,752 barrels, or nearly 74 per cent, over the product of 1896. This remarkable growth is distributed fairly evenly over all producing districts, but is most marked in the Lehigh Valley region, in Pennsylvania. In this section, which produces most of the Portland cement made in this country, the product in 1897 was nearly double that of the preceding year.

The following table shows the product of Portland cement in the United States in 1896 and 1897, by States:

Product of Portland cement in the United States in 1896 and 1897.

State.	1896.			1897.		
	Number of works.	Product.	Value, not including packages.	Number of works.	Product.	Value, not including packages.
		<i>Barrels.</i>			<i>Barrels.</i>	
Arkansas				1	15,000	\$26,250
California....	1	9,000	\$18,000	1	15,000	30,000
South Dakota	1	24,000	48,000	1	39,890	79,780
Illinois.....	1	3,000	5,250	1	15,000	26,250
Indiana	1	9,000	15,750	1	2,823	2,117
Michigan	1	4,000	7,000	2	15,000	26,250
New York....	7	260,787	443,175	7	394,398	690,197
New Jersey ..	2	247,100	370,650	2	430,335	753,086
Ohio	4	153,082	267,892	4	146,452	256,291
Pennsylvania	7	825,054	1,224,294	7	1,579,724	2,369,586
Texas	1	8,000	24,000	1	7,778	23,334
Utah.....				1	16,375	32,750
Total...	26	1,543,023	2,424,011	29	2,677,775	4,315,891

This table shows that three new factories, one in Arkansas, Utah, and Michigan, respectively, have contributed slightly to the increased production. Ohio shows a moderate decrease, owing to the destruction by fire of the works at Middle Branch. The production of the one small factory in Indiana is also much reduced. Other sections, especially New York, New Jersey, and southeastern Pennsylvania, show an immense gain. As noted in last year's report, the chief seat of the Portland cement industry remains in the eastern part of the country, and the Central, Western, and Southern States make, as yet, but a meager showing.

The relative development of the industry in different sections of the United States since 1890 is shown in the following table:

Table showing development of Portland cement industry in the United States since 1890.

Section.	1890.			1894.			1897.		
	Number of works.	Product.	Per cent.	Number of works.	Product.	Per cent.	Number of works.	Product.	Per cent.
New York	4	<i>Barrels.</i> 65,000	19.4	4	<i>Barrels.</i> 117,275	14.7	7	<i>Barrels.</i> 394,398	14.7
Lehigh County, Pa., and Phillipsburg, N. J.	5	201,000	60.0	7	485,329	60.8	8	2,002,059	74.8
Ohio	2	22,000	6.5	4	80,653	10.1	4	146,452	5.5
All other sections	5	47,500	14.1	9	115,500	14.4	10	134,866	5.0
Total	16	335,500	100.0	24	798,757	100.0	29	2,677,775	100.0

This table shows that the production in the neighborhood of Lehigh County, Pennsylvania, has increased in seven years to nearly ten times what it was in 1890, and that nearly three-fourths of the Portland cement made in the United States is now produced in that section. The increase in other parts of the country has been very slow, and has by no means kept pace with the increased consumption of cement in the same sections. Apart from the great producing region of Lehigh County, Pennsylvania, the Portland-cement industry of the United States is still insignificant.

IMPORTS.

The imports of Portland cement in 1897 were 2,090,924 barrels of 400 pounds each, a decrease of 898,673 barrels from those of the preceding year. The cause of this decrease is to be found in the gradual replacement of foreign by domestic Portland cement, and also in the marked

stagnation in building industries which prevailed during the first half of the year. Foreign manufacturers find also a ready and constantly increasing demand for their product in their home market, and are much less active than in former years in attempting to extend their trade in this country. The magnitude of the Portland-cement industry in Germany is shown by the reports of the Association of German Portland Cement Manufacturers. This association included, in February, 1898, representatives of 66 German factories, the total production of which amounts to 15,000,000 barrels per year. In 1893 the production amounted to only 11,500,000 barrels. An increase of 3,500,000 barrels has therefore taken place in the last five years. By far the larger part of this increased product is consumed in Germany itself. Reports made by leading German engineers show that other hydraulic materials are but little used in that country, Portland cement having proved cheaper in use, even for the commonest purposes.

The following table shows the imports, by countries, in 1896 and 1897:

Imports of cement into the United States in 1896 and 1897, by countries.

[Barrels.]

Country.	1896.	1897.
United Kingdom	742, 169	344, 336
Belgium.....	742, 237	529, 686
France	26, 714	19, 319
Germany	1, 366, 909	1, 109, 280
Other Europe.....	99, 184	46, 916
British North America	11, 334	4, 907
Other countries	1, 050	36, 480
Total.....	2, 989, 597	2, 090, 924

This table shows that the imports from Germany have decreased much less than those from other countries. While in 1896 the imports from Germany were 45 per cent of the total, in 1897 this proportion had risen to 53 per cent. The imports from Great Britain in 1897 were less than one-half those of 1896, and are now comparatively insignificant. English Portland cement is, in fact, seldom met with in our principal cities at the present time.

Trade reports toward the close of the year showed that the demand for Portland cement in Europe was far beyond the supply. Manufacturers were far behind on orders and prices had advanced considerably. This condition of affairs was still more marked early in 1898. At present American importers of European cement find great difficulty in securing an adequate supply to complete their contracts, and are making but little effort to meet the competition of domestic Portland. The prejudice which once existed against the American product may be said to

have entirely disappeared, and foreign and domestic cements compete on nearly even terms on the basis of price and quality. These conditions make it appear probable that the year 1898 will witness a still further falling off in imports, and that the complete replacement of foreign by domestic Portland cement is not far distant.

The above table shows that Belgium comes next after Germany in amount of cement exported to the United States. The imports from Belgium in 1897 show a considerable decrease from those of the preceding year, but have advanced rapidly during the last few years. Most of the Belgian product is of distinctly inferior grade, and is not, properly speaking, a true Portland cement, since it is produced by burning a natural cement rock in its raw state. At the last meeting of the Association of German Portland Cement Manufacturers Dr. Prussing reported on the unfair competition of the "natural Portland cements" of Belgium against the true artificial Portland cement of Germany. These Belgian cements are chiefly made by the direct burning of a limestone of approximately the composition of a correct cement mixture. The variations in the proportions of lime and clay present in the rock, however, cause great fluctuations in the quality of the product, and many of the Belgian manufacturers sell their product under foreign labels as Portland cement of highest quality, and in many cases well-known German labels are purposely counterfeited.

At a meeting of English and German cement manufacturers held in Cologne in July, 1897, it was resolved to take the following steps to meet this fraudulent competition:

1. Samples of Belgian natural cement are to be purchased in open market and tested at the royal testing station at Charlottenburg, and by competent experts in England.
2. An attempt is to be made to secure from the Belgian Government an official definition of Portland cement.
3. A pamphlet is to be published showing the untrustworthiness of the so-called Belgian "natural Portland cements," and stating the names of the Belgian factories which produce a genuine and reliable article. This pamphlet is to appear in German, English, French, and other languages, and is to be circulated as widely as possible in all countries.

RELATION OF DOMESTIC PRODUCTION TO IMPORTATION.

The total consumption of Portland cement in the United States increased in the five years ending with 1896 by about 1,000,000 barrels. The increased consumption in 1897 over that of 1896 was 268,099 barrels. The comparatively small amount of this increase is due to the great inactivity in building operations which prevailed during the first half of the year. Owing to the great increase in domestic production and the marked decrease of imports, the proportion of domestic to

imported cement consumed evinces a remarkable advance, as the following table shows:

Comparison of the domestic production of Portland cement with the imports.

[Barrels.]

	1891.	1895.	1896.	1897.
Production in the United States	454,813	990,324	1,543,023	2,677,775
Imports	2,988,313	2,997,395	2,989,597	2,090,924
Total	3,443,126	3,987,719	4,532,620	4,768,699
Exports		83,682	85,486	53,466
Total consumption	3,443,126	3,904,037	4,447,134	4,715,233
Percentage of total consumption produced in the United States	13.2	25.4	31.7	56.8

In the above table the exports shown under the years 1895 and 1896 consisted of both cement and lime. These items are now separately classified by the Treasury Department, and the figures for 1897 represent cement only.

The above table shows that during the last year the increase in the domestic production of Portland cement has, for the first time in the history of the industry in this country, greatly exceeded the increase in consumption. Considerably more than half the Portland cement consumed in 1897 was of American manufacture. This important step toward the replacement of imported by domestic Portland has been largely brought about by the successful efforts of American manufacturers to produce a high-grade product. Engineers in all parts of the country are finding, to their surprise, that the product of the leading American factories shows decidedly higher tests than the imported brands which have long been regarded as a standard. This is strikingly shown in the reports of Mr. Richard L. Humphrey, inspector of cements for the city of Philadelphia. These reports are included in the annual messages of the mayor of Philadelphia. The average of all American Portlands tested in 1896 and 1897 is decidedly higher, both neat and with sand, than that of all the English or German Portlands tested. In fineness of grinding also the American cements were found superior to the imported. It is gratifying to find that an industry so new to this country, and one requiring so high a degree of technical knowledge, has already been developed to a point beyond that which it has reached in England and Germany.

The conditions which have influenced the American Portland-cement industry in 1897 appear likely to prevail in a still more marked degree

in 1898. The war with Spain has led to an immense amount of work on seacoast fortifications, and has brought the United States Government into the market as a purchaser to the extent of thousands of barrels of Portland cement per day. Building enterprises have also been very active during the early months of the year. Imports during the same period show a considerable increase over 1897. The present year will undoubtedly show a further increase in production. The two largest factories in the country, situated at Coplay, Pennsylvania, and Phillipsburg, New Jersey, respectively, are increasing their capacity by nearly 50 per cent, and at many other works extensive enlargements are in progress. Many new enterprises are projected, but those in all sections, except the East, seem to be slow in materializing. From present indications it appears probable that the American production in 1898 will reach 3,500,000 barrels, and that the Lehigh Valley region will produce a still larger proportion of the total than in 1897.

THE PORTLAND-CEMENT INDUSTRY IN THE VARIOUS STATES.

California.—Works are to be built at Arroyo Grande.

Connecticut.—A factory has been established at Stamford by the Berkshire Portland Cement Company. Marl from the Berkshire hills and clay from Long Island are the raw materials. As the deposits from which these are obtained are nearly 200 miles apart, and both must be transported to Stamford, the enterprise will certainly labor under considerable disadvantage.

Illinois.—The factory of the Chicago Portland Cement Company was destroyed by fire February 3, 1898. The work of rebuilding was at once begun, and it is stated that the new works will be on a much more extensive scale than the former ones. Limestone from Bedford, Indiana, is the principal raw material.

Indiana.—The works of the St. Joe Portland Cement Company, at South Bend, have been purchased by the C. H. Rose Company, of Chicago, and are to be greatly enlarged.

A large deposit of marl at Syracuse, Kosciusko County, has been purchased by the Sandusky Portland Cement Company, of Sandusky, Ohio. The deposit covers an area of over 400 acres, and is from 20 to 40 feet in depth. It is estimated by the purchasers that the amount of material available is sufficient to produce 2,000 barrels of cement per day for seventy-five years. Clay of suitable quality is found in close proximity to the marl.

Analysis of this marl resulted as follows:

Analysis of marl from Syracuse, Kosciusko County, Indiana.

	Per cent.
Calcium carbonate	88.49
Magnesium carbonate.....	2.71
Insoluble.....	1.78
Iron oxide and alumina.....	1.21
Calcium sulphate.....	1.58
Organic matter, etc., by difference.....	4.23
Total	100.00

This marl shows a much lower proportion of magnesia than has been generally found in the marls of Indiana and southern Michigan. It is the intention of the Sandusky company to begin at once the erection of large works at this point.

Michigan.—The works of the Monarch Portland Cement Company, at Bronson, were started late in the year. Extensive additions are already projected. A deposit of marl has been found near Coldwater, and works at that point are in process of erection.

Ohio.—The plant at Middle Branch, destroyed by fire early in 1897, is being rebuilt on a more extensive scale.

The works of the Sandusky Portland Cement Company, at Bay Bridge, near Sandusky, have been enlarged to a regular production of 500 barrels of cement per day.

The Castalia Portland Cement Company began the construction of works near Sandusky in the fall of 1897, and expect to produce cement in the summer of 1898. The material used is a white marl, which covers a part of the Castalia prairie, and appears to have been deposited from the water of the Castalia springs. The rotary process of burning will be used.

Pennsylvania.—New works are in process of construction by the Lehigh Portland Cement Company and the Nazareth Portland Cement Company, near Allentown, and also at Maidencreek, Berks County. These will all use argillaceous limestone from the same formation as that employed at Coplay. The Atlas Cement Company is again largely increasing its works. The Clinton Cement Company, of Pittsburg, is building works, and will make Portland cement by burning a mixture of limestone and blast-furnace slag.

MATERIALS.

By far the larger part of the Portland cement product of the country is still made from limestone, as the following table shows.

Comparative product of Portland cement from limestone and marl.

	1896.		1897.	
	Number.	Product.	Number.	Product.
		<i>Barrels.</i>		<i>Barrels.</i>
Factories using limestone	18	1,208,234	18	2,282,126
Factories using marl	8	334,789	11	395,649
Total	26	1,543,023	29	2,677,775

PROCESSES.

The use of the rotary kiln continues to increase, as the following table shows.

Amount of Portland cement made in kilns of various kinds.

[Barrels.]

	1893.	1895.	1896.	1897.
Rotary kilns.....	149,000	400,821	632,370	1,311,319
Vertical kilns (continuous and intermittent).....	441,653	589,503	910,653	1,366,456
Total	590,653	990,324	1,543,023	2,677,775
Per cent of total product burned in rotary kilns	25.2	40.5	41.0	49.0

AMERICAN ROCK CEMENT.

By URIAH CUMMINGS.

PRODUCTION AND PRICE.

The production of rock cement in the United States during the year 1897 was the largest ever known in the history of the industry. There were 8,311,688 barrels placed upon the market, being an increase of 341,238 barrels over the output for 1896, or 4.28 per cent.

Active competition among the manufacturers, due mostly to the fact that the capacity exceeds the demand by about 25 per cent, has had a tendency to depress the prices somewhat.

The following table gives the amount and value of the rock cement produced in the United States during 1896 and 1897. The values are based on the selling prices in bulk at mills.

Product of rock cement in 1896 and 1897.

State.	1896.			1897.		
	Number of works.	Product.	Value.	Number of works.	Product.	Value.
		<i>Barrels.</i>			<i>Barrels.</i>	
Georgia	1	12,700	\$9,525	1	18,165	\$10,899
Illinois.....	2	544,326	217,731	3	510,000	209,000
Indiana and Kentucky	15	1,636,000	654,400	15	1,731,287	692,515
Kansas.....	2	125,567	50,226	2	160,000	64,000
Maryland and West Virginia	5	271,500	125,175	5	296,000	118,400
Minnesota	2	83,098	38,549	2	111,731	55,865
New York.....	29	4,181,918	2,423,891	29	4,259,186	2,123,771
Ohio	3	28,565	17,139	3	23,697	14,218
Pennsylvania ..	6	608,000	304,000	7	775,000	387,500
Texas.....	1	12,000	18,000	1	11,390	17,085
Virginia	3	16,776	10,566	3	15,232	9,139
Wisconsin.....	1	450,000	180,000	1	400,000	160,000
Total	70	7,970,450	4,049,202	72	8,311,688	3,862,392

NEW DEVELOPMENTS.

The two cement works at Howes Cave, New York, have passed into the hands of a single company, and the works are being enlarged and improved with new buildings and machinery.

In the Louisville, Kentucky, district, two new plants of large capacity are being erected, with the expectation of getting their products upon the market during the season of 1898.