CEMENT.

PORTLAND CEMENT.

By SPENCER B. NEWBERRY.

PRODUCTION.

There were 8,482,020 barrels of Portland cement manufactured in the United States in the year 1900; an increase of 2,829,754 barrels, or 50.1 per cent over the product of 1899.

The following table shows the production of Portland cement in 1899 and 1900 by States:

Production of Portland cement in the United States in 1899 and 1900.

State.	1899.			1900.		
	Number of works.	Product.	Value, not including packages.	Number of works.	Product.	Value, not including packages.
		Barrels.			*Barrels.*	
Arkansas	1	50,000	$87,500	1	40,000	$70,000
California	1	60,000	120,000	1	44,565	89,130
Colorado	.....	.....	.....	1	35,708	71,416
Illinois	2	53,000	79,500	3	240,442	300,552
Indiana	.....	.....	.....	1	30,000	37,500
Kansas	.....	.....	.....	1	80,000	100,000
Michigan	4	342,566	513,849	6	664,750	830,940
New Jersey	2	892,167	1,338,250	2	1,169,212	1,169,212
New Mexico	1	1,500	4,500	.....	.....	.....
New York	7	472,386	708,579	8	465,832	582,290
North Dakota	1	1,700	5,100	1	400	1,200
Ohio	6	480,982	721,473	6	534,215	667,769
Pennsylvania	9	3,217,965	4,290,620	14	4,984,417	4,984,417
South Dakota	1	35,000	70,000	1	38,000	76,000
Texas	.....	.....	.....	2	26,000	52,000
Utah	1	45,000	135,000	1	70,000	175,000
Virginia	.....	.....	.....	1	58,479	73,099
Total	36	5,652,266	8,074,371	50	8,482,020	9,280,525

The above table shows that by far the greatest total increase in product, as in former years, was in the States of Pennsylvania and New Jersey, the chief seat of the industry in this country. Illinois

and Michigan are, however, coming to the front as extensive producers, and will probably show a still greater increase in 1901. Colorado, Indiana, and Texas, in which States Portland cement has been made on a small scale in past years, have established the industry on a substantial basis. Kansas and Virginia appear for the first time as producers. In other States the changes have been unimportant.

The relative growth of the industry in the most important producing sections during the last ten years is shown in the following table:

Development of the Portland-cement industry in the United States since 1890.

Section.	1890.			1894.		
	Number of works.	Product.	Per cent.	Number of works.	Product.	Per cent.
		Barrels.			*Barrels.*	
New York	4	65,000	19.4	4	117,275	14.7
Lehigh and Northampton counties, Pa., and Warren County, N. J	5	201,000	60.0	7	485,329	60.8
Ohio	2	22,000	6.5	4	80,653	10.1
All other sections	5	47,500	14.1	9	115,500	14.4
Total	16	335,500	100.0	24	798,757	100.0

Section.	1899.			1900.		
	Number of works.	Product.	Per cent.	Number of works.	Product.	Per cent.
		Barrels.			*Barrels.*	
New York	7	472,386	8.4	8	465,832	5.5
Lehigh and Northampton counties, Pa., and Warren County, N. J	11	4,110,132	72.7	15	6,153,629	72.6
Ohio	6	480,982	8.5	6	534,215	6.3
Michigan	4	342,566	6.1	6	664,750	7.8
All other sections	8	246,200	4.3	15	663,594	7.8
Total	36	5,652,266	100.0	50	8,482,020	100.0

The product of New York has declined from that of the previous year; and New York's proportion of the total has steadily fallen since 1890. This is probably due to the fact that the factories in that State are equipped with intermittent or continuous vertical kilns, and are not able to compete effectively in the matter of price with more modern works using rotaries. One of the oldest factories in the State is, in fact, to be remodeled and equipped with rotary kilns, and a new rotary plant is under construction in one of the western counties.

Ohio shows some increase, but fails to maintain her relative place. This is due to lack of large deposits of favorable material.

Michigan shows a remarkable growth, and will show a still greater increase in output in 1901. There are at present nine factories in operation in the State, and five more under construction, while an almost countless number are projected. Marl is abundant everywhere, and nearly every lake and marsh in the State is underlain by it.

The "other sections" appearing in the table include Indiana, Illinois, Kansas, Virginia, Texas, and the West. These show rapid growth, and will require subdivision in the next report. Indiana should be grouped with Michigan, as the material is the same, and the factories so far established are near the boundary between the States.

IMPORTS.

The imports of Portland cement into the United States in 1900 were 2,386,683 barrels, an increase of 278,295 barrels over the quantity imported in 1899. This increase took place chiefly during the first half of the year, and resulted from the extraordinary demand for cement which then prevailed. It is certainly remarkable that in spite of the immense growth of domestic manufacture the imports should have remained practically constant for the past eleven years. There is good reason to believe, however, that this condition will not longer continue. The marked fall in the price of American Portland cement toward the close of 1900, and the continuance of low prices in the present year, have checked imports in a marked degree, and it is evident that the amount of foreign cement brought into the market in 1901 will be much less than in 1900. High-grade Portland cement is at present manufactured in this country much more cheaply than anywhere in Europe, and is sold nearly a dollar per barrel cheaper than imported brands of no better quality. Further, the leading American manufacturers are in position to warrant their products to give tests superior to the best imported, and for their own reputation are always ready to guarantee delivery in good condition and to be responsible for the success and durability of important work in which their cements are used. These safeguards to the consumer are wholly lacking in the case of imported cements, while abundant ground for complaint against many foreign brands is found in damage by water, breakage of packages, etc.

The following table shows the imports, by countries, from 1897 to 1900:

Imports of cement into the United States in 1897, 1898, 1899, and 1900, by countries.

Country.	1897.	1898.	1899.	1900.
	Barrels.	*Barrels.*	*Barrels.*	*Barrels.*
United Kingdom	344,336	241,198	199,633	267,921
Belgium	529,686	651,204	624,149	826,289
France	19,319	17,294	15,649	32,710
Germany	1,109,280	1,032,429	1,193,822	1,155,550
Other European countries	46,916	51,582	68,348	75,827
British North America	4,907	4,635	4,398	4,517
Other countries	36,480	15,476	2,389	23,869
Total	2,090,924	2,013,818	2,108,388	2,386,683

RELATION OF DOMESTIC PRODUCTION TO IMPORTATION.

The following table shows the relation of production to imports in 1891, 1896, 1899, and 1900. It will be noted that the proportion of domestic cement consumed to that of foreign manufacture has increased from 13.2 per cent in 1891 to 79.1 per cent in 1901.

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

	1891.	1896.	1899.	1900.
	Barrels.	*Barrels.*	*Barrels.*	*Barrels.*
Production in the United States	454,813	1,543,023	5,652,266	8,482,020
Imports	2,988,313	2,989,597	2,108,388	2,386,683
Total	3,443,126	4,532,620	7,760,654	10,868,703
Exports	.....	85,486	110,272	139,939
Total consumption	3,443,126	4,447,134	7,650,382	10,728,764
Percentage of total consumption produced in the United States	13.2	34.7	73.9	79.1

It will be noted that the domestic product in 1900 exceeded the sum of product and imports in 1899. This shows that production is pursuing demand with ever increasing speed.

The production and annual percentage of increase in the last eleven years have been as follows:

Production of Portland cement, with increases each year, since 1890.

Year.	Product.	Increase.	Percentage of increase.	Year.	Product.	Increase.	Percentage of increase.
	Barrels.	*Barrels.*			*Barrels.*	*Barrels.*	
1890	335,500	.....	.....	1896	1,543,023	552,699	55.8
1891	454,813	119,313	35.6	1897	2,677,775	1,134,752	73.5
1892	547,440	92,627	20.4	1898	3,692,284	1,014,509	37.9
1893	590,652	43,212	7.9	1899	5,652,266	1,959,982	53.1
1894	798,757	208,105	35.3	1900	8,482,020	2,829,754	50.1
1895	990,324	191,567	24.0				

The average rate of increase from year to year has been over 40 per cent, while the increase from 1899 to 1900 was over 50 per cent.

THE PORTLAND CEMENT INDUSTRY IN THE VARIOUS STATES.

California.—The Usona Portland Cement Company is building large works at Benicia.

Georgia.—The Chickamauga Cement Company is building a factory for the manufacture of Portland cement at Rossville, Ga., and near Chattanooga, Tenn. The material to be used is a natural cement rock, nearly free from magnesia, said to approximate to the composition of a correct cement mixture.

Illinois.—Three factories are now in operation near Lasalle. At South Chicago the Illinois Steel Company is making a true Portland cement by grinding granulated slag with the necessary proportion of limestone and burning the mixture in rotary kilns.

Indiana.—The factories at Stroh and at Syracuse are completed and in operation. The latter will at once be enlarged to 1,800 barrels per day.

Kansas.—The factory at Iola was started at the close of 1900. Natural gas is used as fuel, and the materials are limestone and shale.

Michigan.—The writer is informed by the Michigan Alkali Company, of Wyandotte, that the materials used for Portland cement manufacture from caustic-soda waste are not as stated in the report for last year. The composition of the materials at present used is as follows:

Composition of Portland cement materials used at Wyandotte, Mich.

Constituent.	Lime waste.	Clay.
	Per cent.	*Per cent.*
Silica	0.60	46.40
Alumina and iron oxide	3.04	16.30
Carbonate of lime	95.24	25.36
Carbonate of magnesia	1.00	4.30
Alkalies	.20	.75
Combined moisture	.....	7.00
Total	100.08	100.11

Factories under construction during the year at Jonesville, Newaygo, Alpena, and Woodstock are completed and in operation. That at Newaygo has command of 2,000 horsepower of water power from the Muskegon River, and presents many interesting features.

Factories are under construction at Baldwin, Grass Lake, Fenton, Holly, and White Pigeon. Other enterprises are projected in nearly every county in the State.

New York.—A very complete and interesting description of Portland cement plants in New York State, by Mr. E. C. Eckel, appeared in Engineering News, May 16, 1901. From this the following notes are in part taken.

The Catskill Cement Company's works at Smiths Landing were put into operation in July, 1900. Helderberg limestone and clay of the following composition are used:

Composition of Portland cement materials at Smiths Landing, N. Y.

Constituent.	Limestone.	Clay.
	Per cent.	*Per cent.*
Silica	1.54	61.92
Alumina	.39	16.58
Iron oxide	1.04	7.84
Lime	53.87	2.01
Magnesia	.52	1.58
Alkalies	.....	3.64

Rotary kilns are used at these works.

The Alsen Portland Cement Company, of Germany, is building works at West Camp-on-Hudson, and will begin manufacture in the present year. Limestone and clay will be used, and the burning will be done in rotary kilns.

The Iroquois Portland Cement Company is building works at Caledonia, in the western part of the State. Marl and clay are the materials to be used. These are to be ground and mixed dry, and burned in rotaries.

The Cayuga Portland Cement Company is building works near Ithaca. The material will be obtained from an outcrop of the Tully limestone and underlying shales. These works will probably be in operation before the close of the present year.

Ohio.—A new factory is under construction at Wellston, near that of the Alma Company.

Pennsylvania.—The Dexter Company's works, near Nazareth, began manufacturing near the close of 1900. The material used is a cement rock quarried close to the factory, and is remarkable for the fact that it shows the average composition of a correct mixture and requires no addition of limestone.

The works of the Reading Portland Cement Company, at Evansville, produce a cement of interesting composition, being made from highly siliceous material. This, in the judgment of the writer, is an advantage, both for convenience of manufacture and permanence and soundness of product. Published tests of this cement appear to confirm this view, and are very satisfactory. The composition of the cement, as given by the manufacturers and confirmed by the writer, is as follows:

Composition of Portland cement from Evansville, Pa.

	Per cent.		Per cent.
Silica	24.48	Lime	64.33
Alumina	4.51	Magnesia	2.59
Iron oxide	2.68	Sulphuric acid	1.41

West Virginia.—The Buckhorn Portland Cement Company is building large works at Rowlesburg, on the Cheat River. The materal to be used is limestone of the sub-Carboniferous period, a face of which, more than 60 feet in thickness, is exposed at the top of the hill, several hundred feet above the factory. The stone shows the average composition of a correct mixture, and no other material will be required.

MATERIALS.

The following table shows the comparative product from limestone and marl in 1899 and 1900:

Portland cement made from limestone and marl in 1899 and 1900.

	1899.		1900.	
	Number.	Product.	Number.	Product.
		Barrels.		*Barrels.*
Factories using limestone	24	4,697,722	35	7,154,318
Factories using marl	12	954,544	15	1,327,702
Total	36	5,652,266	50	8,482,020

THE CEMENT INDUSTRY IN EUROPE.

The total European product of Portland cement is estimated to be about 8,000,000 tons (of 1,000 kilograms), equivalent to 44,000,000 barrels. Of this amount Germany produces about 15,000,000 barrels. This production is considerably in excess of the demand, and during the past year, especially in England and Germany, the industry has been in a very depressed condition, as shown by the great decline in the price of securities of the leading manufacturing companies. Tulloch & Co. (February, 1901) speak of the price of cement in England as very low, $1.20 to $1.35 per barrel. These prices are, however, considerably higher than those at which many American manufactures are at present selling with considerable profit. All the important works on the Thames and Medway, and some inland companies, have lately combined under the name of the "Associated Portland Cement Manufacturers, Limited," and it is hoped that this consolidation will make it possible to advance the price to $1.60 per barrel, also that the introduction of the American type of rotary kilns will produce a marked saving in cost of manufacture.

In Germany a "cement syndicate" has been organized, including all important factories in the northwestern and central sections of the country, and proposes to diminish overproduction by a reduction of 40 per cent in the output of the mills.

OPPORTUNITY FOR EXPORT.

At the request of the writer, the State Department asked the United States consuls in Canada, Mexico, Central America, and the West Indies to furnish information in regard to the possible market for American cement in their respective countries. This information has lately appeared in the form of Advance Sheets of Consular Reports, No. 1052, June 3, 1901,[1] and will be found of great interest to American manufacturers.

Apparently there is good demand for Portland cement in Canada at prices high enough to allow export from this country in spite of the Canadian duty of 50 cents per barrel. There are, however, four factories in process of erection in Ontario, and these will go far toward supplying the demand of the province. The duty on cement from England is one-third less than from other countries, and yet large quantities of Belgian cement are imported. So long as this is the case the superiority and lower cost of production of the best American Portland cement should make it easily possible for our manufacturers to compete in the Canadian market.

Mexico, Central America, Martinique, and the Guianas appear also to present favorable conditions for export of cement from the United States.

SLAG CEMENT.

Slag cement, a mechanical mixture of granulated blast-furnace slag and slaked lime, was made in 1900 at five factories, situated in New Jersey, Maryland, Ohio, Illinois, and Alabama, respectively. The total product was 365,611 barrels, valued at $274,208.

[1] Apply to the Consular Bureau, Department of State, Washington, D. C.