

CEMENT.

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HYDRAULIC CEMENT.

Decreased product.—The production of hydraulic cement in 1893 shows a considerable decrease from that of the previous year. This is probably chiefly due to the depression in business that prevailed throughout the country during the latter half of the year, in consequence of which building operations were largely suspended and the use of cement of all kinds was greatly decreased. It is to be feared that the reports for the present year will show a still further decline in production, as the demand for cement has not revived and the prevailing scarcity of coal has caused several works to suspend operations. The decrease in the production of hydraulic cement during 1893 was very evenly distributed throughout the country, but is especially marked in the great centers of manufacture, the Rosendale region in New York, the Louisville region in Indiana and Kentucky, and Lehigh county, Pennsylvania. An increased production is to be noted in only one important locality, viz, Utica and La Salle, Illinois, and at this point the increase is slight.

Prices.—As to prices of hydraulic cement, the figures have fallen even lower than before. In the Louisville region sales are reported at as low a price as 22 cents per barrel of 260 pounds, in bulk, at the works. This is less than 7 cents per bushel, or lower than the usual price of common lime at the kilns. It seems almost incredible that the process of quarrying the cement rock, burning in kilns, and grinding can be carried on without loss at these figures. Only by manufacturing on an enormous scale and conducting the burning so as to secure the greatest economy of fuel is it possible to meet expenses at the present figures. In no other country has hydraulic cement of good quality been placed on the market at so low a cost.

Hydraulic cement finds its chief application in mortar for building, for which purpose it has largely replaced common lime, and in laying the foundation for asphalt and brick pavements. Even for these common uses it meets a formidable rival in Portland cement, since the latter allows the addition of a so much larger proportion of sand that the cost of Portland-cement mortar and concrete is about the same as that made from natural-rock cement.

The following table gives the amount and value of hydraulic cement

produced in various localities during 1892 and 1893. The values given are, for the sake of uniformity, made to include the cost of barrels, which for hydraulic cement is about 15 cents each, although the larger part of the product is sold in paper sacks.

Product of hydraulic cement in 1892 and 1893.

	1892.			1893.		
	Number of works.	Product.	Value, including barrels.	Number of works.	Product.	Value, including barrels.
		<i>Barrels.</i>			<i>Barrels.</i>	
Georgia.....	1	50,393	\$41,294	1	10,273	\$9,750
Illinois.....	2	472,876	236,438	2	522,972	283,782
Indiana and Kentucky...	13	2,100,000	1,365,000	13	1,750,350	962,692
Kansas and Missouri.....	2	110,000	77,000	2	60,000	36,000
Maryland and West Virginia.....	5	252,092	220,991	5	231,500	183,451
Minnesota.....	1	100,000	75,000	1	75,000	56,250
New Mexico.....	1	10,000	10,000	1	1,500	1,500
New York:						
Onondaga county.....	8	240,580	152,550	8	161,308	97,721
Ulster county.....	17	2,833,107	2,408,141	17	2,738,884	2,191,107
Schoharie county.....	1	32,000	27,840	1	22,566	20,309
Erie county.....	4	675,000	486,250	4	675,000	496,250
Ohio.....	2	56,863	53,863	3	68,000	60,550
Pennsylvania.....	6	664,594	502,511	6	567,110	466,936
Texas.....	1	40,000	40,000	1	10,000	27,500
Utah.....	1	5,000	7,500	1	5,000	7,500
Virginia.....	1	13,000	10,000	1	17,509	15,084
Wisconsin.....	2	558,676	284,772	2	494,753	248,326
Total.....	68	8,211,181	5,999,150	69	7,411,815	5,104,708

PORTLAND CEMENT.

In spite of unfavorable conditions for growth, the production of Portland cement in 1893 showed a marked increase over that of the previous year. This is due to the commencement of operations in two new factories rather than to increased output at older works. There were at the close of the year 19 factories producing Portland cement in the United States, with a total output of 590,652 barrels. The imports for the year 1893 were 2,674,149 barrels. About 18 per cent. of the Portland cement consumed was, therefore, produced in this country. The following table shows the relative proportion of Portland cement made in this country and imported during the past four years:

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

	1890.	1891.	1892.	1893.
	<i>Barrels.</i>	<i>Barrels.</i>	<i>Barrels.</i>	<i>Barrels.</i>
Production in the United States.....	335,500	454,813	547,440	590,652
Imports.....	1,940,186	2,988,313	2,440,654	2,674,149
Total.....	2,275,686	3,443,126	2,988,094	3,264,801
Exports.....			21,536	14,276
Total consumption.....	2,275,686	3,443,126	2,966,558	3,250,525
Percentage of total consumption produced in the United States.....	14.7	13.2	18.4	18.2

It appears from this that the domestic product has, on the whole, decidedly gained ground, though the increased production in 1893 almost exactly balanced the increased importation. There can be no doubt that future years will witness a still further growth in the ratio of production to imports, and that all the Portland cement needed in this country will ultimately be produced at home. There are several causes, however, which combine to postpone this result, the most important of which is probably the very rapid increase in the use of Portland cement in this country. There is also a widespread prejudice in favor of foreign cement, due to the great excellence which some of the German manufacturers have attained through many years of experience. The first efforts to make Portland cement in this country were not altogether successful so far as quality is concerned, and up to the present time more or less cement of poor quality has been put upon the market. It is certain, however, that some of our leading factories are now making cement which is fully equal to the best German or English Portland, and the prejudice against the American product, at no time a bitter one, is fast disappearing.

Another important obstacle to the rapid growth of the industry in this country is the low price at which foreign cements are supplied in our markets. In Europe the industry is established on an enormous scale, with correspondingly low cost of production. The Dykerhoff factories on the Rhine and those at Stettin are said to produce from 1,500 to 2,000 barrels of cement per day, while our largest works (at Coplay, Pennsylvania) do not produce more than 300 barrels per day. The cost of labor, which plays an important part in the expense of manufacture, is also much higher in this country than in Europe. Against the disadvantages of production on a small scale and high cost of labor may be set the cost of shipment to this country and the present duty of 32 cents per barrel. The first of these items is of slight importance in Eastern markets, since the ocean freight usually amounts to only a few cents per barrel. Within the past year the transportation companies engaged in shipping cement from New York to Chicago have agreed to absorb the ocean freight, making a through rate of 52 cents per barrel from Europe to Chicago. The prices of many brands of foreign cements have also fallen to a very low figure during the past year, as the following table shows:

Prices of foreign Portland cement, in large lots, alongside wharf, duty paid, at close of 1893.

	New York.	Chicago.
Belgian and cheaper English	\$1.45	\$1.95
Good English and German	1.75	2.25
Best German	2.00	2.50

American cements are generally classed with the cheaper English and Belgian, though in many cases fully equal to the best German. A good American cement must be sold at least 25 cents per barrel lower than a foreign cement of equal quality, in order to find a market. To meet the above figures, American manufacturers are selling at very low rates. At Eastern factories the prices are from \$1.50 to \$1.75, in wood, at the works; in Ohio, from \$1.75 to \$2. A slight advantage is gained by the domestic producer in the possibility of shipping by rail in paper or duck sacks, which is impossible in the case of foreign cement.

In conclusion, it may be said that, in order to replace foreign cements American cements must be manufactured on a very large scale, with great economy of labor and fuel, and with the closest attention to quality. It is encouraging to note that in spite of the fact that the prices of foreign cements in our markets have fallen nearly one-half during the past ten years, the industry has become permanently established in this country, and has steadily increased, while the quality of the domestic product has been very greatly improved.

Product of Portland cement in 1892 and 1893.

States.	1892.			1893.		
	Num- ber of works.	Product.	Value including barrels.	Num- ber of works.	Product.	Value including barrels.
		<i>Barrels.</i>			<i>Barrels.</i>	
Colorado.....	1	10,000	\$30,000	1	10,000	\$25,000
Dakota.....	1	34,000	68,000	1	33,739	69,502
Indiana.....	1	12,000	30,000	1	20,000	45,000
New York.....	4	124,000	279,000	5	137,096	287,725
New Jersey.....	1	20,000	40,000	1	60,000	96,000
Ohio.....	2	46,600	108,500	3	36,500	85,500
Pennsylvania.....	6	300,840	597,100	6	285,317	521,411
Texas.....				1	8,000	28,000
Total.....	16	547,440	1,152,600	19	590,652	1,158,138

GENERAL NOTES ON PORTLAND CEMENT.

New York.—The new factory of Messrs. Thos. Millen & Co., at Wayland, began operations in October, 1892. The materials used are marl and clay, and the burning is done in ordinary dome kilns. The works were partly destroyed by fire in July, 1893, but were soon rebuilt, and were in full operation at the close of the year.

The factory at Montezuma, described in the report for 1892, was destroyed by fire in June, 1893, and has not been rebuilt.

The works of the Warners Cement Company, near Syracuse, were totally destroyed by fire in February, 1893. The factory was immediately rebuilt on a greatly improved plan, and operations were commenced in October last. Owing to the prevailing business depression, the works were shut down early in 1894.

Ohio.—The Diamond Portland Cement Company, at Middle Branch, near Canton, began manufacturing early in 1893. Limestone and clay

are the materials used, and the burning is carried on in continuous kilns of the Dietzsch type.

The Sandusky Portland Cement Company, at Portland, 5 miles west of Sandusky, began operations in August, 1893. At these works the marl and clay are mixed in revolving pans with edge-runners; the wet mixture is then ground in special steel mills and dried in rotary cylinders, from which it issues in the form of small rounded pieces. The dried material is burned in this form in rotary kilns heated by crude-oil flames.

Portland cement at the Columbian Exposition.—Very interesting displays were made by the leading English, German and French manufacturers; among them the Germania and Heidelberg factories were the most striking. Very beautiful specimens of polished slabs and mosaics of cement were shown, illustrating the growing use of Portland cement for ornamental purposes. Among American exhibitors may be mentioned the American, Coplay, Buckeye, and Sandusky cement companies. A very interesting exhibit was made by the editors of the *Thonindustrie Zeitung*, Dr. Seger and Mr. G. Cramer. This included all the latest appliances used in Germany for testing cements, Dr. Böhme's revolving table for determining the wear-resisting qualities of cement, Bauschingers apparatus for testing expansion, etc., and a full library of books of reference on the cement industry. The exhibit was, in fact, a complete testing laboratory, and experiments were carried on during the whole exposition. Dr. M. Gary has given in the *Thonindustrie Zeitung* a full review of the clay and cement industries as shown at Chicago. In a paper read before the German Cement-makers' Association at their annual meeting in February, 1894, Dr. Gary gives an extended account of the present condition of cement manufacture in the United States, and describes several factories which he visited. Speaking of the efforts that are being made to develop the manufacture of Portland cement in this country, he says:

"At present there is naturally no little difficulty in introducing a cement which has not yet had time to prove its excellence, since no architect nor engineer can be persuaded to take the risk of using an unknown material. This circumstance, and the prejudice of consumers in favor of foreign cements, are the obstacles which the American manufacturer encounters in introducing his product. 'All foreign cements are good,' says the consumer, 'no matter whether they come from small or large factories, from those thirty years or one week in operation, so long as the cements come from Europe or bear a foreign label. All American cements are bad, on the same principle, even though made by a manufacturer of long experience and provided with the best appliances.'" An American Portland cement manufacturer for his own consolation writes: "If this view really prevails, the American cement-maker can overcome it only by furnishing a faultless

product. Meanwhile the German manufacturer may derive advantage from it."

In commenting on the published results of tests of American cements, he says that the figures show that the products tested were far from equalling German cements. This may be true regarding the best brands of cements sold in Germany, but is by no means applicable to the cements sent to this country. The writer has made a great number of tests of English and German cements found in our markets, following closely the German official requirements. In comparatively few cases were the cements found to stand the German Government tests (227 pounds per square inch at twenty-eight days with three parts sand). In the majority of cases the cements fell greatly below the German standard, some of the best known brands giving very poor tests indeed, while several cements of American manufacture complied fully with the German requirements. It appears that much of the cement sent to this country is of inferior quality, and evidences of adulteration of foreign cements with slag are not uncommon. With the prevailing prejudice in this country in favor of foreign cements, and the lack of general acquaintance with correct methods of testing, this state of affairs is not to be wondered at.

A paper on testing cements, by the writer of this report, containing an abstract of the official requirements of various countries, appeared in the *Scientific American Supplement*, April 21, 1894.