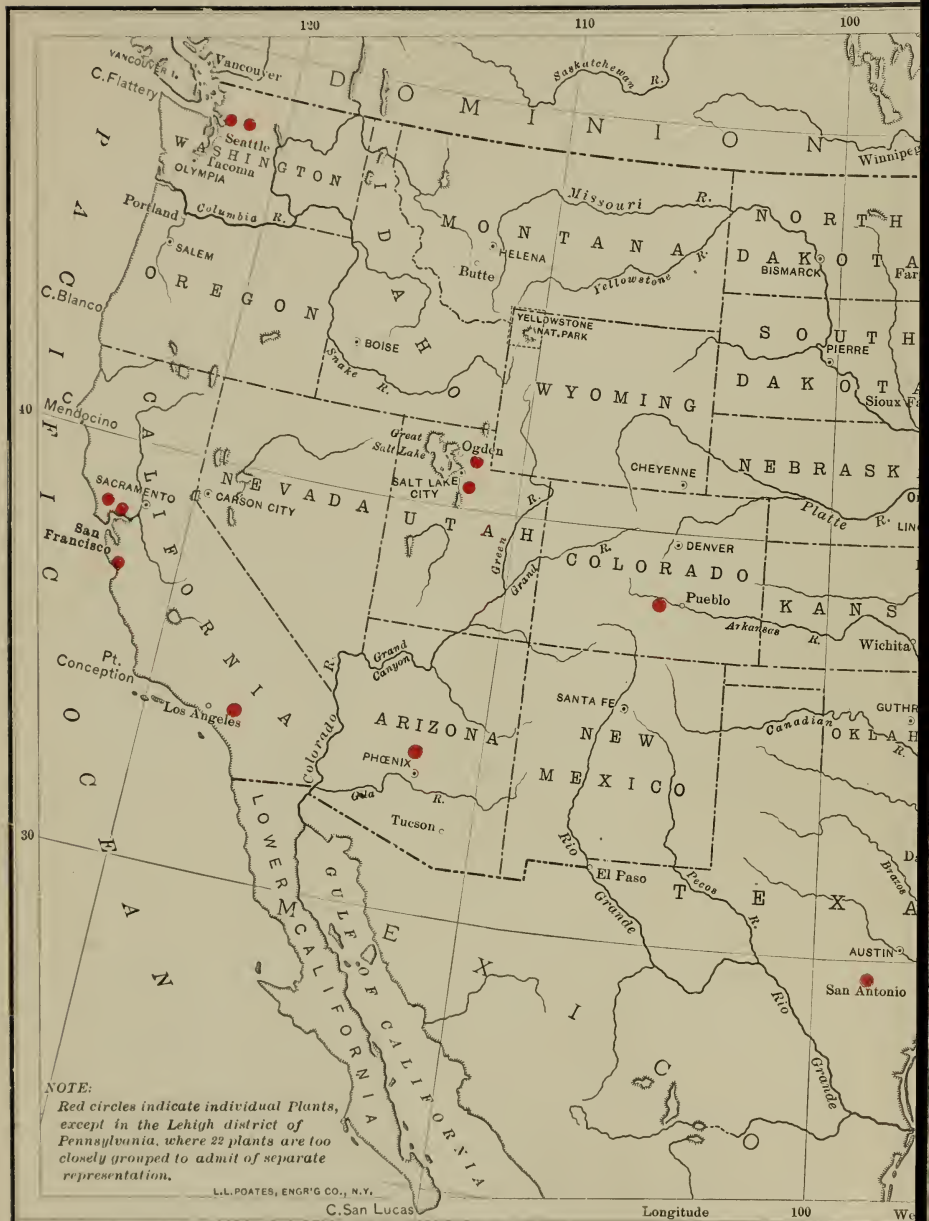
THE PORTLAND CEMENT INDUSTRY FROM A FINANCIAL STANDPOINT

BY

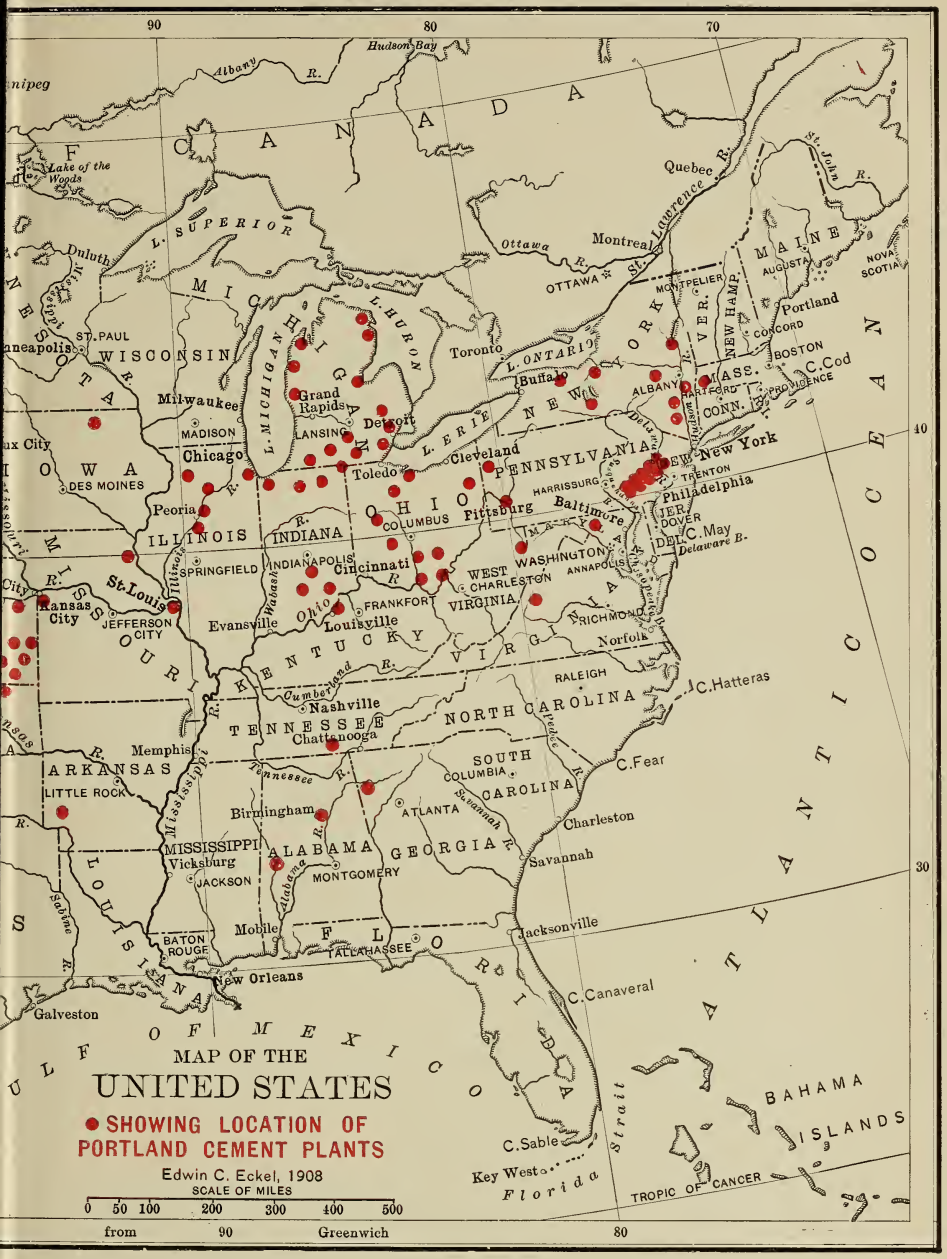
EDWIN C. ECKEL



NOTE:
Red circles indicate individual Plants, except in the Lehigh district of Pennsylvania, where 22 plants are too closely grouped to admit of separate representation.

L.L. POATES, ENGR'G CO., N.Y.

MAP OF THE UNITED STATES SHOWING LO



ION OF PORTLAND CEMENT PLANTS IN 1908.

THE PORTLAND CEMENT INDUSTRY FROM A FINANCIAL STANDPOINT

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EDWIN C. ECKEL

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PREFACE

THERE is at present every indication that the first broad improvement in the general business situation will be the signal for the attempted flotation of an unprecedentedly large mass of cement securities. Some of the enterprises against which these securities are issued will ultimately prove successful and profitable; some, though exploited honestly, will prove to have been mistakenly planned; a third and not inconsiderable group of projects will be exploited for the sole purpose of defrauding the investor.

The Portland Cement Industry is of great and growing importance. Cement plants, when properly financed, located, constructed and managed, have made very satisfactory returns to their stockholders. There is still room in the industry for honestly and intelligently managed new enterprises, but competition is now so keen that there is no room for weak plants—for plants that are poorly located or designed, for companies that are dishonestly promoted or carelessly managed. The manufacture of cement is a legitimate industry, and the methods of mining promoters have no place in it.

The present little volume attempts to discuss certain features connected with the financial side of the Portland Cement Industry. It is hoped that it will prove of service both to the banker, who is invited to aid in the flotation of cement securities, and to the investor,

who is invited to buy them. It will have served its purpose if it aids either banker or investor to differentiate between securities offered against successful existing plants or sound projects, with reasonable prospects of success, and those issued against foolishly planned or fraudulently promoted propositions.

EDWIN C. ECKEL

209 Munsey Building,
Washington, D.C.
October 31, 1908.

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THE HISTORY OF THE PORTLAND CEMENT INDUSTRY

IN spite of the present and growing importance of the industry, the history of Portland Cement manufacture covers a relatively short period of time, as compared with that of the iron industry, for example. Contrary to a somewhat popular idea, the ancients do not seem to have been acquainted with cements of the type which are now so widely employed. The "cements" used by the Romans, for example, were not burned products similar to the Portland Cement now used, but were made by mixing slaked lime with a powdered volcanic ash, called pozzuolana. These pozzuolanic or "puzzolan" cements still survive, though not of the greatest industrial importance.

During the Middle Ages even the use of the puzzolan cements seems to have been discontinued for large structural work. In those periods the material used for holding masonry together was a plain lime mortar, though by using time and great care in the preparation of the lime, the mortar and the masonry, structures of great strength and durability were finally developed. This use of lime as the only mortar material persisted down to near the close of the Eighteenth Century, when a new series of cementing materials, of essentially mod-

ern type, was developed through careful experiment, almost simultaneously in France and England.

THE EARLY ENGLISH NATURAL CEMENTS

In 1756 or thereabouts Smeaton, the English engineer, began a series of experiments on lime mortars, the point at interest being the selection of a lime calculated for use in marine construction, and the immediate necessity for the experiments being the construction of the Eddystone lighthouse. No record of these experiments was published until 1791, so that they had no immediate influence on engineering practise. Smeaton soon found that the property of hardening under water, known to be possessed by some limes, was not due to the purity of these particular limes, as had been long supposed. In fact, the truth of the matter was quite the reverse, for the very impure, clayey limestones, when burned, would harden under water, while the pure limes would not. Though the experiments of Smeaton were apparently not carried to the point of making a true cement, his conclusions regarding the effect of clay in limestone opened the way for further investigation and research.

The next step marked a great advance in practise. This was the invention in 1796 in England, and almost simultaneously in France, of a cement like our present-day natural or Rosendale cements. Parker, who took out an English patent in 1796, later termed his new product "Roman" cement, which was clearly a misnomer, for he had invented a product never known to the Romans. The Parker patent contemplated the use, as a raw material, of certain concretions common in some of the English coastal formations, and consisting of a natural mixture of clay and limey matter. These concretions were to be burned "with a heat stronger than that used for burning lime." When so burned, the product would not slack naturally when water was applied to it, as would an ordinary lime, but it required to be first powdered. After powdering, however, the resulting "Roman cement" would harden when mixed into a paste with water, and this paste would harden not only in air, but also when placed under water.

Parker's cement soon came into general use in England, while a series of similar products were manufactured in France and in other portions of the Continent. The introduction of natural cement manufacture into the United States took place in 1819, the discovery of the native raw materials in central New York being due directly to the construction of the Erie Canal. From that date on, the manufacture of natural cement spread rapidly in the United States. Mr. R. W. Lesley has pointed out the direct relation of our early natural cement industry to the canal construction which was then so prevalent. "The first large public works built in this country were the canals, and the most necessary thing to build a canal was mortar that would hold the stones together at the locks, or walls, under water. Consequently, wherever canals were to be built, there was a search for cement rocks, and all the earliest works in this country were established on the lines of canals. Thus, on the Chesapeake and Ohio Canal are the Cumberland and Round Top Works; on the Lehigh Canal the works at Siegfrieds and Coplay, Pa.; on the Richmond and Allegheny Canal the works at Balcony Falls, Va.; on the Delaware and Hudson Canal the large group of works at Rosendale and Kingston; and on the Falls of the Ohio Canal the large aggregation of works about Louisville. From this same fact grew the early package used in shipping cement in this country, the barrel, which was the package best adapted to water transportation; and it took many years, ever since the railroads came, to overcome the prejudice for this form of package and to substitute the paper or duck bag for the barrel."

The natural cement industry grew rapidly in the United States, reaching a maximum production of not quite ten million barrels in 1899. From that date onward, however, it began to suffer heavily from the competition of domestic Portland Cement, and in the last decade the output of natural cement has shown an almost continuous and quite rapid annual decrease, until now it has become a relatively unimportant factor in the cement situation. This matter will be noted later, in discussing the statistical growth of the American Portland Cement industry.

THE INVENTION AND EARLY HISTORY OF PORTLAND CEMENT

In following out the growth and decline of the American natural cement industry we have overrun considerably the course of events as regards Portland Cement, but it seemed advisable to complete a sketch of the earlier product before taking up the newer and more important material.

The history of Portland Cement begins a quarter-century after that of Parker's "Roman" cement. In 1824, Aspdin took out an English patent for an artificial cement, which he named "Portland" cement, because of a rather fanciful resemblance between the set cement and a favorite English building stone—the oolitic limestone of Portland.

Aspdin's patent specification covered the general method of Portland cement manufacture, though it omitted to mention certain important factors or limitations in the process. He specified that a pure limestone was to be burned into lime. This lime was to be mixed with a specific quantity of "argillaceous earth or clay," and the mixture was then to be pulverized in a wet state. The wet mix was to be dried, broken into lumps, and calcined in a kiln; and finally the burned product was to be powdered. The only serious omissions in this statement are that the relative amounts of lime and clay are not specified, and that no mention is made of the fact that it was necessary to burn the mix at a temperature considerably above that of an ordinary lime kiln. But that these omissions were not due to lack of knowledge, but to carelessness or caution, is evidenced by the facts that Aspdin was actively engaged in Portland Cement manufacture within a year of the issuance of his patent, and that the Aspdin family long continued to be prominent in the English Portland Cement industry.

The English Portland Cement industry showed for many years a very slow rate of growth, and, though manufacture of the new product was taken up on the Continent quite early, the total production was not very large. About 1850, however, a distinct increase in output, both in England and in Germany,

appears to have taken place, and from this time on Portland Cement began to displace the older natural cements in all European markets, while it gradually became an important article of import into the United States.

EARLY AMERICAN PORTLAND CEMENT MANUFACTURE

In spite of the growth of the Portland Cement industry abroad, it was not until the third quarter of the Nineteenth Century that the manufacture was taken up in this country. Then, as in many similar cases, it arose almost simultaneously in several parts of the country, experiments being carried on almost or quite independently at a number of small plants. In 1872 an attempt was made to utilize marl and clay in the manufacture of Portland Cement near Kalamazoo, Mich., but this first project seems to have been entirely unsuccessful commercially, and it is certain that it exerted no influence on later experiments. In 1875 a true Portland was being made at a small plant in Western Pennsylvania, the materials there used being limestone and clay. This plant, at Wampum, Pa., is still in existence. At about the same date small experimental plants were erected in New York State, but these did not result in immediate returns.

In the meantime, the basis for the great Portland Cement industry of the Lehigh district was being laid, the start being made from rather unpromising conditions. Natural cement had long been manufactured in the Lehigh region, and in the early seventies attempts were made by Mr. D. O. Saylor and his associates to select from the natural cement quarries the beds which might on burning furnish a Portland Cement. The result, though always variable and usually unsatisfactory, was that a certain small tonnage of good Portland Cement began to be produced annually in this district, really as a sort of by-product of the natural cement industry. The present Coplay Cement Co. is the outgrowth of the first successful attempt to manufacture Portland Cement in this district.

It must be borne in mind that at this stage in the industry the wet process and stationary kilns were in use in America as well as in Europe. This involved reducing the raw materials to powder, mixing to a paste with water, forming the mixture into bricks or balls, charging into and burning in a stationary kiln, and again reducing the clinkered masses thus formed to powder. When naturally soft and wet raw materials were used, like marl and clay, the earlier stages of this process were of course considerably simplified, but with the hard, dry raw materials of the Lehigh district the cost was almost prohibitive. Under American conditions as to high-priced labor, it was evident that the cement industry, if carried on in such a fashion, stood little chance for growth in this country. This indeed proved to be the case and for a number of years little or no increase in American production could be noted, while the margin of profit as against foreign cements cheaply laid down in our coast cities was too small to encourage the American manufacturer to increase his output.

THE ROTARY KILN AND ITS EFFECTS ON THE INDUSTRY

It was early recognized that the relatively dear labor and cheap fuel of America, as contrasted with the cheap labor and dear fuel of Europe, would necessitate serious changes in Portland Cement manufacture if that industry were ever to be established on a firm footing in this country. In the general effort to cut down the excessive labor-cost of the product, two points of attack were obvious. In order to fit the industry into American conditions both the burning and the grinding processes must be cheapened, and this was effected when the old stationary kilns and millstones were displaced, respectively, by the rotary kiln and by modern grinding machinery. Of the two changes, the substitution of the rotary for the stationary kiln was the more distinctively American in its development, and demands further attention because of the important effects which it had upon the general course of the industry.

The Ransome Patents (Great Britain, 1885; United States, 1886) are looked upon as the basis on which later developments in the use of the rotary kiln were founded, since the kilns now in use are direct successors of those of the Ransome type.

It had been expected that the fuel used in the Ransome kiln would be producer gas, but as a matter of fact, when the rotary was first successfully used in the cement industry—at South Rondout, N.Y., in 1889—petroleum was used as fuel, and for a number of years this continued to be the usual American practise. At the South Rondout plant it was found possible to charge the mixed and ground raw materials directly to the kiln, without wetting, so that another step was made in the industry. In 1891, at Montezuma, N.Y., naturally wet raw materials were charged into the kiln without preliminary drying. The two main types of present American practise were thus in existence—the dry process, used with limestone or cement-rock, and the wet process, used with marl.

The next step in the development of the rotary came when powdered coal was substituted, as a fuel, for petroleum. This took place about 1895, and soon became standard practise throughout the United States. This change brought about long and costly litigation regarding the patent rights involved, and it is probable that this condition will continue for some time. The matter will again be referred to later in this volume, in discussing the effects of patents on the cement industry.

The latest development in the rotary kiln has been purely a matter of dimension. Five years ago American rotaries had arrived at a practically standard length of sixty feet, with a nominal capacity of two hundred barrels of cement daily. Since that date, both size and capacity have been largely increased, the kilns now installed being from one hundred to one hundred and fifty feet in length, and giving an output of from three hundred to five hundred or more barrels daily.

IMPROVEMENTS IN GRINDING APPARATUS.

Running on parallel lines with the improvements in the rotary process of burning cement came the great changes in crushing

and grinding machinery, which have enabled the industry to deal with its enormous tonnage of raw and finished material. From the cracker crushers and mill stones of the early "80's" to the great Gates & McCully crushers, and the Griffin, Fuller, Huntingdon tube and other iron mills of the present day, was an immense step forward. Many of these changes were worked out at the mills of the American Cement Company at Egypt, Lehigh County, Pa., by Messrs. Eckert and Lesley, old associates of Saylor and also at the Lehigh, Alpha and Atlas mills in the same region.

Each of the steps above briefly outlined has had a marked effect on the industrial status of Portland Cement manufacture in the United States. The most obvious result, of course, has been the rapid growth of the industry as regards total annual output. Coincident with this, however, has come a cheapening of the product, and this steady fall in prices is often overlooked when new developments are planned. Both of these phases of the cement industry are best illustrated by long series of comparative statistics, and the following chapter will therefore be devoted to a statistical consideration of the growth of the American cement trade.

CHAPTER

II

THE GROWTH OF THE AMERICAN CEMENT INDUSTRY—STATISTICAL

IN the present chapter statistical data are presented relative to the production of Portland Cement in the United States, imports and exports of cement, apparent annual consumption of cement, average prices, etc. These data are official, being quoted from the reports on this industry annually issued by the United States Geological Survey, though in many cases the tables have been rearranged to better suit the purposes of the present volume.

AMERICAN PRODUCTION OF PORTLAND CEMENT, 1870-1907

Of course any deductions that may be made concerning the possible future growth of the American cement industry must be based upon a study of the facts relative to its past development. In the table following, statistics are given covering the annual production of Portland Cement in this country from the inception of the industry to the present day.

On examination of the above table, it will be seen that the industry showed a fair, but not in any way remarkable, rate of growth from its commencement in the seventies until 1895. At the latter date, however, a very striking development commenced, coincident, it may be noted, with the development of coal-burning in the rotary kiln. This rapid rate of growth continued until 1907, when it was checked temporarily by the financial crisis of that year.

The phenomenal growth of the industry in this period is illustrated very strikingly in the diagram below, where it is shown graphically for the years 1890 to 1907, inclusive. For comparison, the decline in the natural cement industry is plotted on the same diagram.

American Production of Portland Cement, 1870-1907.

YEAR	BARRELS	VALUE
1870-1879	82,000	$ 246,000.
1880	42,000	126,000.
1881	60,000	150,000.
1882	85,000	191,250.
1883	90,000	193,500.
1884	100,000	210,000.
1885	150,000	292,500.
1886	150,000	292,500.
1887	250,000	487,500.
1888	250,000	487,500.
1889	300,000	500,000.
*1890	335,500	704,050.
1891	454,813	967,429.
1892	547,440	1,153,600.
1893	590,652	1,158,138.
1894	798,757	1,383,473.
1895	990,324	1,586,830.
1896	1,543,023	2,424,011.
1897	2,677,775	4,315,891.
1898	3,692,284	5,970,773.
1899	5,652,266	8,074,371.
1900	8,482,020	9,280,525.
1901	12,711,225	12,532,360.
1902	17,230,644	20,864,078.
1903	22,342,973	27,713,319.
1904	26,505,881	23,355,119.
1905	35,246,812	33,245,867.
1906	46,463,424	52,466,186.
1907	48,785,390	53,992,551.

*The figures for 1890 and prior years were estimates made at the close of each year, but are believed to be substantially correct. Since 1890 the official figures are based on complete returns from all producers.

On examining the cement statistics for a series of years, it will be seen that the output of Portland Cement has so far shown an increase each year, rising from 42,000 barrels in 1880 to 335,500 barrels in 1890, to 8,482,020 barrels in 1900, and to 48,785,390 barrels in 1907. The natural cement production, on the other hand, reached its maximum in 1899, with an output of 9,868,179 barrels. Since that year it has shown an almost continuous and quite rapid decrease annually, until now it has become a relatively unimportant factor in the cement situa-

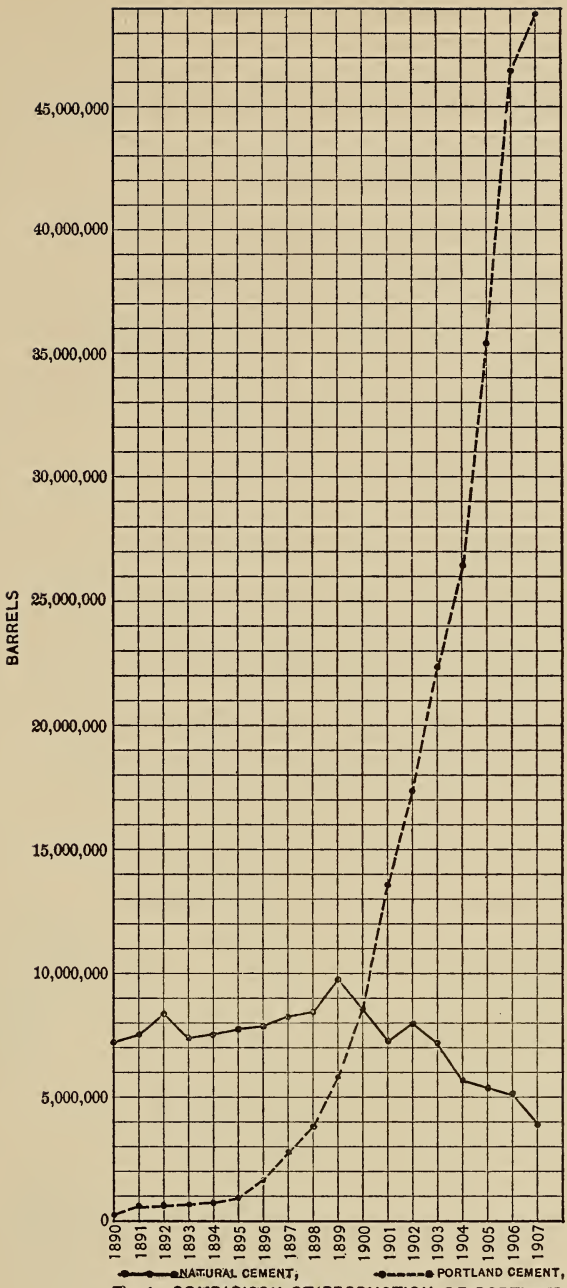

Fig. 1 COMPARISON OF PRODUCTION OF PORTLAND AND NATURAL CEMENT, 1890-1907

tion. These facts are brought out clearly in the appended diagram (Figure 1).

The total Portland Cement production of the United States in 1907 was 48,785,390 barrels, valued at $53,992,551, an increase over the output of 1906 of 2,321,966 barrels, or about five per cent, in quantity, and of $1,526,365, or about three per cent, in value. The distribution of this total among the different producing states in 1907 is given in the following table. The production by states for 1906 is included for comparison:

Production of Portland Cement in the United States in 1906 and 1907, by states.

1906				1907			
State	Producing plants	Quantity (barrels)	Value	State	Producing plants	Quantity (barrels)	Value
Illinois . .	4	1,858,403	$2,461,494	Illinois . .	5	2,036,093	$2,632,576
Indiana .	6	3,951,836	4,964,855	Indiana .	7	3,782,841	4,757,860
Kansas . .	4	3,020,862	3,908,708	Kansas . .	5	3,353,925	4,240,358
Michigan .	14	3,747,525	4,814,965	Michigan .	14	3,572,668	4,384,731
New Jersey	3	4,423,648	4,445,364	New Jersey	3	4,449,896	4,738,516
New York	9	2,414,362	2,725,744	New York	9	2,290,955	2,433,918
Ohio . . .	8	1,422,901	1,709,918	Ohio . . .	9	1,151,176	1,377,155
Penn. . .	19	18,645,015	18,598,439	Penn. . .	22	20,393,965	19,698,006
Alabama .	1			Alabama .	2		
Georgia .	1			Georgia .	1		
Virginia .	1	1,172,041	1,432,023	Virginia .	1	1,274,470	1,383,305
W. Virginia	1			W. Virginia	1		
Arizona .	1			Arizona .	1		
Colorado .	1			S. Dakota	1	534,534	915,301
S. Dakota	1	1,146,396	2,034,382	Texas . .	2		
Texas . .	2			California	4		
Utah . . .	1			Wash. . .	1	1,893,004	2,715,398
California	3			Colorado .	1		
Wash. . .	1	1,310,435	2,110,294	Utah . . .	2	864,938	1,395,179
Kentucky	1			Kentucky	1		
Missouri .	2	3,350,000	3,260,000	Missouri .	2	3,186,925	3,320,248
Total . .	84	46,463,424	52,466,186	Total . .	94	48,785,390	53,992,551

In the foregoing table, the outputs of states having only

one or two active plants are combined, so as to prevent publication of individual figures. In 1907, for example, the following combinations are made: Alabama, Georgia, Virginia, and West Virginia; Kentucky and Missouri; Colorado and Utah; Texas, Arizona, and South Dakota; California and Washington.

PRODUCTION BY DISTRICTS

The Portland Cement Industry exhibits the same tendency toward geographic centralization, though to a less degree, that has given Pittsburg its preeminence as an iron producer. In the case of the Portland Cement Industry the concentration of plants is in the so-called Lehigh district of Pennsylvania, with its New Jersey continuation. Here, 21 plants made over 24,400,000 barrels, or slightly over half of all the Portland Cement produced in the United States in 1907. The Lehigh district was the point where American Portland Cement manufacture was first undertaken, and it owes its continued preeminence to the possession of good raw materials, good labor, good and fairly cheap fuel, and excellent transportation facilities to large Eastern markets.

Geographic Distribution of Portland Cement Industry 1905-1907

	Plants in operation.			Output, in barrels.			Percentage of total output		
	1905	1906	1907	1905	1906	1907	1905	1906	1907
East . . .	30	31	34	19,589,675	25,483,025	27,134,816	55.6	54.9	55.6
Central. .	32	34	37	10,723,802	14,030,665	13,479,703	30.4	30.2	27.6
West. . .	7	8	10	2,470,349	3,834,656	4,463,397	7.0	8.2	9.2
Pac.. Coast	3	4	5	1,225,429	1,310,435	1,893,004	3.5	2.8	3.9
South . .	7	7	8	1,237,557	1,804,643	1,814,470	3.5	3.9	3.7
Total . .	79	84	94	35,246,812	46,463,424	48,785,390	100.0	100.0	100.0

Taking a general view of the matter, the present geographic distribution of the cement industry is well shown in the above table. The term "East," as here used, includes plants in Pennsylvania, New York, and New Jersey, none being located in

New England. The "Central" plants are those in Ohio, Indiana, Illinois, Michigan, and Missouri. Under "West" are included Kansas, Colorado, South Dakota, Arizona, and Utah. On the Pacific Coast are the four active California plants and one recently started in Washington. The "South" includes Virginia, West Virginia, Georgia, Alabama, Arkansas, Texas, and Kentucky.

IMPORTS OF FOREIGN CEMENT

The following table contains the amount of foreign cement imported into the United States during the years 1878 to 1907, inclusive. It is to be noted that, owing to the manner in which import statistics are grouped under existing tariff schedules, the quantities given include not only Portland Cement, but all other hydraulic cements. The Portland Cement, however, probably makes up at least 95 per cent of the total in each year.

Imports of foreign cement, 1878-1907.

YEAR	QUANTITY	YEAR	QUANTITY	YEAR	QUANTITY
1878	92,000	1888	1,835,504	1898	1,152,861
1879	106,000	1889	1,740,356	1899	2,108,388*
1880	187,000	1890	1,940,186	1900	2,386,683*
1881	221,000	1891	2,988,313	1901	939,330*
1882	370,406	1892	2,440,654	1902	1,963,023*
1883	456,418	1893	2,674,149	1903	2,251,969*
1884	585,768	1894	2,638,107	1904	968,409*
1885	554,396	1895	2,997,395	1905	896,845*
1886	915,255	1896	2,989,597	1906	2,273,493*
1887	1,514,095	1897	2,090,924	1907	2,033,463*

* "Imports for consumption." All other years' figures given are for "total imports."

EXPORTS

The United States now possesses only a small export trade in cement, the amount annually exported ranging usually between 1 per cent and 3 per cent of the domestic production.

As noted later, there seem to be excellent reasons for increasing this export trade as rapidly as possible, and it may soon become a more important feature of the industry.

The following table gives the quantity and value of all classes of hydraulic cement exported during the years 1900-1907, inclusive. These totals represent almost entirely exports of Portland Cement.

Exports of hydraulic cement, 1900-1906, in barrels.

Year	Quantity	Value	Year	Quantity	Value
1900 . . .	100,400	$225,306	1904 . . .	774,940	$1,104,086
1901 . . .	373,934	679,296	1905 . . .	897,686	1,387,906
1902 . . .	340,821	526,471	1906 . . .	583,299	944,886
1903 . . .	285,463	433,984	1907 . . .	900,550	

APPARENT ANNUAL CONSUMPTION

The table below contains data on the apparent annual consumption of Portland Cement in the United States for recent years. The computed results are of course merely approximations to the truth, for unavoidable errors arise from the facts that (a) both imports and exports, as reported officially, include not only Portland but small quantities of other classes of cement; and (b) no data are available as to stocks on hand at mills or at distributing points at the close of each year.

Apparent annual consumption of Portland Cement, barrels

	Domestic Production	Imports	Total Available Supply	Exports	Apparent Consumption
1902	17,230,644	1,963,023	19,193,667	340,821	18,852,846
1903	22,342,973	2,251,969	24,594,942	285,463	24,309,479
1904	26,505,881	968,410	27,474,291	774,940	26,699,351
1905	35,246,812	896,845	36,143,657	897,686	35,245,971
1906	46,463,424	2,273,493	48,736,917	583,299	48,153,618
1907	48,785,390	2,033,463	50,818,853	900,550	49,918,303

THE COURSE OF CEMENT PRICES, 1875-1907

Perhaps the most striking feature connected with the American Portland Cement Industry has been the decline in cement prices during the past thirty years. This decline has, as a matter of fact, been as steady and as marked as the growth in annual output.

The following table gives the average price per barrel of American Portland Cement, in bulk at the point of manufacture. It is derived from the official figures on total output and value published annually by the United States Geological Survey.

Average prices of Portland Cement, 1870-1907.

YEAR	AVERAGE PRICE	YEAR	AVERAGE PRICE	YEAR	AVERAGE PRICE
1870-1880	$3.00	1892	$2.11	1900	$1.09
1881	2.50	1893	1.91	1901	0.99
1882	2.01	1894	1.73	1902	1.21
1883	2.15	1895	1.60	1903	1.24
1884	2.10	1896	1.57	1904	0.88
1885-1888	1.95	1897	1.61	1905	0.96
1889	1.67	1898	1.62	1906	1.13
1890	2.09	1899	1.43	1907	1.11
1891	2.13				

In the following diagram, Fig. 2, the fall in cement prices during the period 1880-1907 is shown graphically. On a following page, in discussing the future of the industry, some comment will be made on the industrial and financial meaning of this marked decline in prices.

Fig. 2. THE COURSE OF CEMENT PRICES, 1880-1907.

CHAPTER

III

THE OUTLOOK FOR THE FUTURE

THOSE who are engaged in the active management of an industrial enterprise may be content, and frequently are, with securing a thorough acquaintance with the present status of the industry in which they are interested. Those engaged in financing such enterprises, however, are confronted by a different problem. To the banker or investor, an intimate acquaintance with the present details of the business is not necessary, or even particularly desirable; but it is imperative that he should be able to form some idea of the future possibilities of the enterprise. The difference between the unsuccessful and the successful financier is largely a matter of tense; the one considers only what a possible investment is worth to-day; the other forecasts what it will be worth ten, or twenty, or fifty years from now.

For this reason it is necessary, in the present connection, to attempt the difficult task of outlining the probabilities as to the future development of the cement industry. The points of greatest interest are connected with the possible future growth in output; with the future course of costs and of prices; and with the degree and method of organization which the industry is likely to assume.

THE FUTURE GROWTH OF THE CEMENT INDUSTRY

In attempting to gain some idea of the possible future development of the cement industry, so far as active output is concerned, recourse must be had to comparative studies, for of course direct evidence is not available. We have at hand all

the necessary facts concerning the past growth of the cement industry, and to some small extent the past rate of growth may aid in making an estimate as to future possibilities. But, in the writer's opinion, a much more profitable line of inquiry lies in the study of the history of closely related industries—those connected, for example, with the production of similar staple products, such as coal, pig-iron, copper or oil. The experience gained by producers of these materials may be of service to the younger industry.

For many reasons the manufacture of pig-iron affords a close trade-parallel to that of cement. Both products are cheap, bulky, dependent on fuel supplies and freights. Both require heavy fixed investment in plant, as compared with the value of the output. Both products are used extensively in a way which keeps them in close sympathy with general business conditions; and both products are, in this country, used at a per capita rate which is still increasing on the average.

In Figure 3 the growth of the iron and cement industries is compared graphically for the period 1890-1907. The diagram is, of course, distorted to the extent that, while the pig-iron production is given in tons of 2,240 pounds, the cement output is stated in barrels of 380 pounds. But this distortion does not affect the value of the diagram, when used simply as a means of readily comparing the growth-curves of the two industries.

On examination it will be seen that the cement output has shown an actual increase each year to date, so that on the diagram its curve rises steadily and, until 1907, at an increasing ratio each year, showing no downward flexures or relapses. This is the normal form for the growth-curve of a young and rapidly expanding industry, which has not yet reached the point where its annual output is affected by financial conditions. The iron curve, on the other hand, though showing a decided gain for the period covered, also shows at intervals depression flexures, typical of a mature industry, whose annual output must depend on the general financial and industrial condition of the country. It may reasonably be expected that hereafter the cement and iron curves will approximate in form.

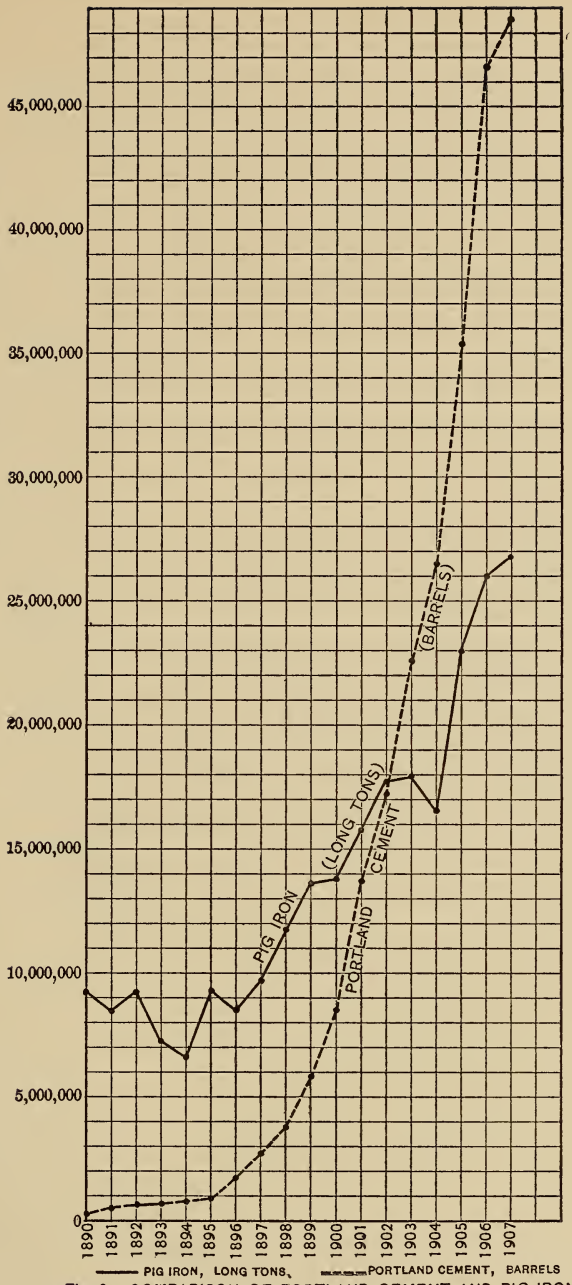

Fig. 3. COMPARISON OF PORTLAND CEMENT AND PIG-IRON PRODUCTION. 1890-1907.

Up to 1907, the American cement industry had shown a practically uninterrupted progress so far as annual output was concerned, and many manufacturers seemed to expect that this pleasant condition could continue indefinitely. The number of plants under construction or in course of promotion increased rapidly, and heavy increases in productive capacity were indicated.

In January, 1907, in discussing* conditions in the cement industry of 1906, the present writer took occasion to call attention to an impending change in these conditions. The statement then made was as follows:

> The cement output, as yet, has not suffered markedly from financial depressions. Prices have fallen off in poor years, it is true, but the annual output has always increased. The rise in yearly output from 1885 to 1906 has not only been continuous, but has even shown a tendency to increase its rate of increase. Of course such a condition of the industry cannot be expected to continue indefinitely. Within a few years we must expect to see the rate of increase lowered, and finally, in some period of business depression, some year will show a lower output than the preceding year. This will mark the end of the youth of the cement industry, and the beginning of its period of maturity. Though the present condition of the industry is as prosperous as might be desired, it is possible that the change in rate of growth may be quite near at hand. New construction in 1906, and plans for 1907, will provide a great increase in mill capacity. If the succeeding years are generally good, this increase will be taken up without difficulty; but a general financial depression in 1908 would probably result in a temporary check to the cement industry. So far as can be estimated now, the plants which will be in operation before the end of 1907 will turn out cement at the rate of 50,000,000 barrels per annum, and it is doubtful whether such an output could be absorbed if the United States were not generally prosperous.

When this statement was published, several cement-trade journals commented on it in interesting fashion. As one editor noted, "The absurdity of such a gloomy prophecy, at a time like this, is obvious to anyone acquainted with the true condition of the cement business. The rush for cement never was

* Engineering Magazine, January, 1907.

greater than it is now. All mills are working to full capacity and the managers only wish that they were bigger."

Later in 1907 the humor of the situation did not seem quite so obvious, and now, near the close of 1908, it seems fairly safe to say that the American cement industry reached a distinct turning point in the latter part of 1907, and that from now on the matter of output must be handled differently. Hereafter we may expect that the cement production will be related very closely to general business conditions; that in times of prosperity we may temporarily fall behind in capacity; but that the approach of business depression will be marked either by radical decrease in cement output or by its alternative—which is general demoralization in the trade. The cement industry has no longer room for poorly managed plants, or for weakly financed companies, for in times of industrial stress such plants and companies become a menace to the entire industry.

POSSIBLE DECREASES IN OPERATING COSTS

The costs of Portland Cement manufacture are, of course, greatly lower than during the early history of the industry. Part of this decrease is, of course, easily understood, being merely the gain shown in any well-conducted industry as its machines and men get gradually fitted to their work. But this regular economy, which is not progressive, but shows most in the first years, is not the explanation of the bulk of the cost reduction which has been affected in cement manufacture. The great decreases came in three abrupt steps, coincident with radical changes in the methods of manufacture.

In 1885 an American Portland Cement plant would have shown costs somewhat larger than an English plant, due to the heavier American labor cost, which was not entirely compensated for by cheaper fuel. The general adoption of the rotary kiln changed this relation, and was the cause of sharp reductions in manufacturing costs. A second fall in costs was noticeable when powdered coal became the standard fuel in the rotary. The last progressive step in the industry—the adoption of long

kilns—was taken at a time when coal and labor were becoming more expensive, and so far has shown a gain in output with but little saving in cost.

So long as there are no absolutely revolutionary changes in our present methods of cement manufacture, no marked decreases in operating costs can be expected. Improvements in grinding machinery can offer little in the way of cost reduction so long as the total amount of grinding to be done remains the same. The main elements in the problem are unfortunately fairly well determined by nature. To make 400 pounds of cement we must burn about 200 pounds of coal, and pulverize almost 1,100 pounds of material—raw mix, clinker and kiln coal. As coal can hardly be expected to decrease in price in the future, and as the other elements of cost are practically unchangeable, there is little room left for further economies. It seems safe to say that the manufacturing costs at well-conducted plants reached in 1904, 1905 and 1908 low levels, which can hardly be lowered in the near future. Until very radical changes in cement manufacture take place, further important decreases in manufacturing costs can hardly be expected.

THE FUTURE COURSE OF PRICES

The Portland Cement Industry is now an industry characterized by moderate and decreasing returns to the investor. This condition is caused by the fact that while free competition is slowly but steadily pushing downward the selling prices of the product, manufacturing costs on the other hand are almost stationary. On a preceding page some attention was paid to the possibility of future radical decreases in costs. At present it will be more profitable to consider how far it is possible to regulate prices.

It will first be necessary to revert for a moment to the statistical data presented in Chapter II and to see what light the past history of unregulated prices may throw upon the future possibilities in this line. The first thing of note is the extent of the price-decline, for we see that cement has fallen during

less than thirty years from a maximum of over three dollars per barrel to a minimum of considerably less than one dollar. In American industrial history the fall in prices most nearly comparable to this is that shown by steel rails from 1867 to 1898, when an almost unchecked decline was witnessed from $166 to

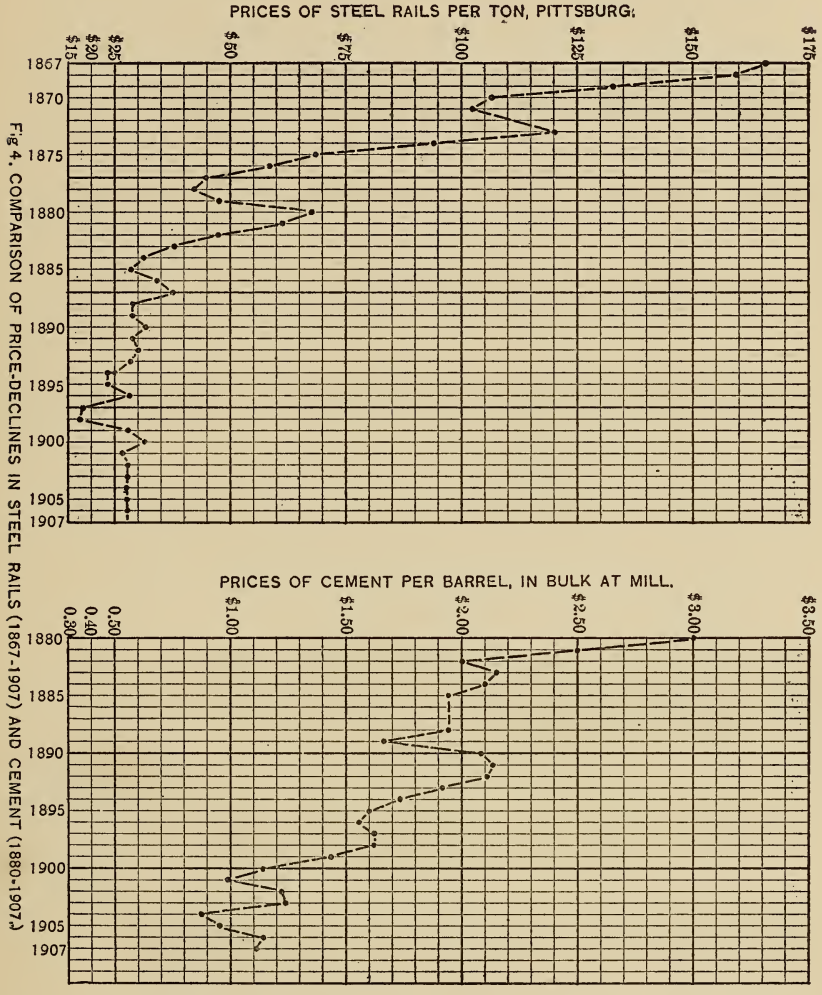

Fig 4. COMPARISON OF PRICE-DECLINES IN STEEL RAILS (1867-1907) AND CEMENT (1880-1907.)

$18 per ton. The two sets of results are shown diagrammatically in Fig. 4, and will repay study. The price-history embodied in the steel-rail diagram shows clearly that in these days of large-scale production prices will at intervals plunge below the level of actual manufacturing cost, and that no natural agencies can be relied on to prevent these periodic disasters. The diagram also shows the result of spasmodic efforts at price regulation, which finally became effective in 1901. There is no reason to believe that cement prices, unassisted, will show any greater resistance to downward pressure than did those of steel rails during their long decline.

On examining more closely the table of annual cement prices or, better, the diagram on page 33 it will be seen that the decline has not been steady, but that the price-history of the American Portland Cement industry can be divided into four periods. In each of these periods price movements were fairly close around an average. In each case the average seemed low enough, looking backward at periods of higher prices; but in each case the next period showed a still lower range of prices. The matter is summarized in the following table:

PERIOD	DURATION	AVERAGE PRICE
1874—1880	7 years	$3.00
1881—1894	14 years	2.01
1895—1899	5 years	1.56
1900—1907	8 years	1.07

In considering these figures, it must be borne in mind that they are averages for the entire United States, and that the average prices secured by Eastern mills will usually range from ten to fifteen cents per barrel lower than the average for the whole country.

The lowest average price for the United States was reached in 1904, when 88 cents per barrel was received. If the crisis of 1907-8 had been of greater intensity, or even if it proves to be of greater duration than now seems probable, there is little doubt that a new low average would be recorded.

POSSIBLE PRICE REGULATION

The necessity for some reasonable degree of price regulation in the cement industry would, in view of these facts, seem to be obvious enough. It must not be overlooked that this condition is not peculiar to this particular industry, but that it exists everywhere in modern production. In a recent study of the trust movement in British industry, McCrosty has summarized strikingly the underlying conditions, under a regime of unrestricted competition, which inevitably tend to bring about some degree of combination or unified control in all modern manufacturing industries. His words are so clearly applicable to the present condition of the American Cement Industry that it seems justifiable to quote them at length:

> With every improvement in transport the market becomes wider and competition becomes keener through the advent of new producers, while at the same time it becomes more difficult to make rational forecasts of the course of trade. Even within tariff walls competition always rages as soon as it is discovered that there are certain industries to which the law has assigned the possibility of greater profits than the average. Alike in protected and unprotected markets free competition becomes cut-throat, prices fall, and over-production ensues in the wild efforts of producers to reduce costs by a larger output. . . . One might say that the normal course of modern trade was that prices should always tend toward the cost of production, that this tendency developed itself with increasing speed, and from time to time ended in production at a loss. Now whatever one may say about a "social contract," or the working out of the welfare of society through the clashing self-interest of individuals, the fact remains that the first object with which a man enters business is to make money, and his second to make as much as he can. Similarly a workman wants first to get a subsistence wage, and next as high a wage as he can. And if any social institutions or trade methods stand in the way there will be a revolt. Such a revolt in a multitude of forms we are now witnessing. . . . . .

The simplest form of price regulator is, of course, the pool. At present, however, pools are without legal protection, and sad experience in both railroad and iron affairs has shown that

the so-called "gentlemen's agreement" has a short life, failing to develop either agreement or gentlemen. It is of course possible that the Sherman law may be so modified, or so re-interpreted, as to afford legal remedies for broken price agreements, but as things are now no form of pool can be considered durable. The inherent difficulty arises from the fact that the pool is simply a temporary device, and that the interests of the members often clash. The usual history of such arrangements has been that the pool was formed during a period of unduly low prices, when everybody was willing to agree to anything; that prices were advanced to remunerative levels, and finally to excessive levels; and that as soon as this caused a slackening in demand price-cutting became obvious. The ordinary excuse for the first cut is the necessity for meeting a temporary intense local competition by some non-member; after the first, no one has time to make excuses.

During the past thirty years the American natural cement industry has developed a number of pools, some of very simple type while others had a complex organization and considerable stability. In the Portland Cement Industry local price-agreements are formed at intervals, but heretofore none of these has had any great length of life.

It must be borne in mind that, in order to justify any system of price regulation, it must exercise control in both directions, repressing excessive upward movements as well as steadying prices during times of depression. It can fairly be claimed that this has been accomplished in the steel trade, and the purchaser of steel products is now assured against wild fluctuations in prices either way. As a matter of fact few purchasers of any semi-finished product like cement, pig iron or steel, care much whether prices are high or low; they are chiefly interested in knowing that they are steady and open, so that all competing purchasers will be placed on a practically equal basis.

Since all of our industrial history has established the ineffectiveness of any possible form of simple pooling to maintain prices of any commodity at reasonably profitable levels, it is clear that some other type of price regulation must be expected

to appear in the cement industry. At present it is difficult to say just what form the final regulating process will take, for the Portland Cement Industry of this country affords a peculiarly interesting example of an important and growing branch of manufacture whose future organization and control is still a matter of uncertainty. During the past few years, however, two distinct movements in the trade have become noticeable, and one or both of these may aid in the solution of the problem. The first, which is the normal occurrence in any industry containing a large number of independent competitive units, is the gradual growth of community of interest, which by increasing the size of some of the units, or by decreasing their number, aids in giving stability to the market. The second important movement is towards a control of the trade through the ownership of patents. This form of regulation, though not entirely new in American industrial history, is still much rarer than the other type.

CONCENTRATION OF INTEREST IN THE CEMENT INDUSTRY

Ten or even five years ago the business of making Portland Cement in the United States was confined to a number of comparatively small mills, each of which was practically independent. To-day there is a noticeable degree of concentration of interest in the industry, and three processes are at work to increase steadily this concentration. Owing to the peculiar character of the industry, the final result is still a matter of much doubt. It is clearly impossible for any one organization to gain control of the supply of raw materials, so that in this industry the most effective basis for monopoly is not available. The ownership of comprehensive basic patents would, as noted later, afford a peculiarly serviceable type of control, inasmuch as patent monopolies are thoroughly legal in form.

Setting aside for the moment the possibility of monopoly, it can be said that the three factors which make for concentration of control are—

1. The normal growth of profitable plants.
2. Consolidation by stock control.
3. The growth of the patent-holding company.

A well-located and well-managed plant always has opportunity for expansion which is denied to plants of less technical or financial soundness. Many plants in this country have had opportunities for growth, and some have seized these opportunities. Plants which are built or extended at the height of a boom period, and companies which pay out all the profits of prosperous years as dividends can hardly expect to share in this growth. For in by far the majority of instances, lack of growth in a cement plant has been due, not to defective raw materials or to lack of technical skill, but to unwise financial management either at the inception or during the active life of the company.

Several strong groups of plants connected by stock control rather than by direct ownership are now in existence. Of these the most important is the Iola or Nicholson group, which controls seven plants, mostly in the Kansas district. A second important group is that controlled by Mr. W. J. Dingee and his associates, including plants in California, Washington, and Pennsylvania. The Cowham series of plants located in Michigan, Iowa, Kansas, and Texas also requires notice in this connection, and a number of smaller examples of "community of interest" are known to exist.

THE INFLUENCE OF PATENTS ON THE CEMENT INDUSTRY

The Portland Cement Industry, in its present form, is a comparatively recent development and owes much of its mechanical perfection to the efforts of American inventors. As a result of its recent origin, cement machinery and cement-making processes have been the subjects of innumerable patents, while older industries are more nearly free from comprehensive claims. While many mechanical details are of course covered by minor patents, those claims which are likely to have any serious effect

on the future of the industry may for convenience be grouped as follows:

1. Patents relating to specialized types of grinding machinery. Patents of this type are numerous, and many are sound and valuable. Their only effect, however, is to slightly increase the cost of such machinery; and as the best representatives of the various classes of grinders are fairly well-matched in efficiency, the net result on the industry is small.

2. Patents relating to the burning process. This group includes many and important claims covering kiln details, fuel burning methods, etc. Some of these patents have, as noted below, exercised an important influence on the industry, and may become of still greater importance.

3. Patents on special products. Many patents have been issued covering cements differing more or less from the normal Portland type. Typical cases, for example, are the high-iron marine cements, the low-iron white cements, the high-magnesia cements, etc. Though valuable for certain uses, few of these special cements can be expected to exercise any appreciable influence on the general Portland Cement Industry. Their unimportance in this respect is largely due to the fact that most of them are more expensive to manufacture than an ordinary Portland. If it should develop, however, that some one of these special products could be made more cheaply than a normal Portland, the case would be very different.

4. Patents covering by-products. Claims for the recovery of valuable by-products, notably sulphur and the alkalies, are numerous; but so far none of these processes has proven to be of much practical importance.

THE GROWTH OF THE PATENT-HOLDING COMPANY

Numerous patents have been taken out in connection with various phases of the cement industry, but it is only within the last two years that the patent question has become of the first importance to the cement industry. This recent development is due to the organization and growth of a great patent-holding corporation.

Late in 1906 the North American Portland Cement Company was organized, with a capital stock of $10,000,000, this stock being held by the Atlas, Alpha, American, Lawrence, Lehigh,

and Vulcanite cement companies. The North American Company took over from the Atlas Portland Cement Company the United States rights to the Hurry and the Seaman patents, which cover certain methods for the burning of pulverized coal in cement kilns. At a later date it acquired the Edison long-kiln and the Carpenter patents. The companies now licensed under this system include the six companies which control the North American and also the Whitehall, Northampton, Dexter, Edison, Nazareth, Pennsylvania, Penn-Allen, Catskill, Buckhorn, Phoenix, Bath, and Glens Falls Portland Cement companies. In January, 1907, these licensed companies organized as the Association of Licensed Cement Manufacturers. The following material is quoted from a statement then issued:

> The purposes of the association include the general betterment of the mechanical and chemical processes used in making cement, the improvement of the quality of cement, dealing with matters of traffic and shipment and the establishment of an association laboratory for technical tests and experiments. It is understood that all existing and properly equipped cement plants will be granted licenses and admitted to membership. Infringers of the patents above referred to will be rigorously prosecuted.
>
> Nearly 70 per cent. of the output of the Portland Cement industry in this country is already represented by the association, this being double the annual production in Great Britain, the pioneer Portland Cement manufacturing country, equal to the combined output of England and France, and in excess of that of Germany.
>
> * * * * * * * * * * *
>
> The Association of Licensed Cement Manufacturers, with its facilities for tests and experiments, its investigation of mechanical and chemical problems, its establishment of standards of quality, and its assistance in obtaining proper shipping facilities and rates, is expected to be of great benefit to its members.

PRESENT STATUS OF CONCENTRATION IN THE INDUSTRY

The facts discussed in preceding paragraphs may be summarized as in the schedule below, which is an attempt to indicate the groupings at present existing in the domestic Portland Cement industry. This table is based on information supplied by

those in control of most of the plants mentioned, and is believed to be substantially free from error.

Present groupings in the Portland Cement Industry in the United States

NAMES OF COMPANIES	LOCATION OF PLANTS
1. NORTH AMERICAN PORTLAND CEMENT COMPANY:	
Alpha Portland Cement Company	Alpha, N.J.; Martins Creek, Pa.
Martins Creek Portland Cement Company	Martins Creek, Pa.
American Cement Company	Egypt, Pa.
Central Cement Company	Egypt, Pa.
Reliance Cement Company	Egypt, Pa.
Tidewater Cement Company	Norfolk, Va.[a]
Atlas Portland Cement Company	Northampton, Pa.; Hannibal, Mo.
Lawrence Cement Company	Siegfried, Pa.
Lehigh Portland Cement Company	Ormrod, Pa.; Wellston, Ohio; Mitchell, Ind.
Shenango Portland Cement Company	Newcastle, Pa.
Vulcanite Portland Cement Company	Vulcanite, N.J.
2. NICHOLSON OR IOLA GROUP:	
Iola Portland Cement Company	Iola, Kan.
United Kansas Portland Cement Company:	
Kansas Portland Cement Company	Iola, Kan.
Independence Portland Cement Company	Independence, Kan.
Indian Portland Cement Company	Neodesha, Kan.
Dixie Portland Cement Company	Copenhagen, Tenn.
Iowa Portland Cement Company	Des Moines, Iowa.[a]
Texas Portland Cement Company	Dallas, Tex.
3. UNITED STATES STEEL CORPORATION:	
Universal Portland Cement Company	Chicago, Ill.; Buffington, Ind.; Pittsburg, Pa.
4. DINGEE GROUP:	
Standard Portland Cement Company	Napa Junction, Cal.
Santa Cruz Portland Cement Company	Santa Cruz, Cal.
Northwestern Portland Cement Company	Kendall, Wash.[a]
Atlantic Portland Cement Company	Stockertown, Pa.[a]
Northampton Portland Cement Company	Stockertown, Pa.
Quaker Portland Cement Company	Sandts Eddy, Pa.[a]
5. COWHAM GROUP:	
Peninsular Portland Cement Company	Cement City, Mich.
Southwestern States Portland Cement Company	Dallas, Tex.[a]
Western States Portland Cement Company	Independence, Kan.
Northwestern States Portland Cement Company	Mason City, Iowa.[a]
6. SANDUSKY PORTLAND CEMENT COMPANY	Bay Bridge, Ohio; Dixon, Ill.; Syracuse, Ind.; York, Pa.
7. CEMENT SECURITIES COMPANY:	
Portland Cement Company of Colorado	Florence, Colo.
Portland Cement Company of Utah	Salt Lake, Utah.
Union Portland Cement Company	Devil's Slide, Utah.

[a] Plants thus designated are not yet in operation.

The table above does not include all the Portland Cement companies of the United States, but simply those which have shown some degree of concentration of interest, or of growth in several localities. The Steel Corporation and Sandusky Portland Cement Co. are included for this latter reason, for while they are single companies, so far as organization is concerned, each of them has in operation a number of widely separated plants.

IMPROVEMENTS IN MARKETING CONDITIONS

Regardless of what may be effected along the line of price regulation, it is probable that marketing conditions will, in the near future, be improved in some respects. Among the points to which attention may be directed in this field are the elimination of the "optional contract," the development of a warrant system, and the establishment of fixed basing points for quotations. The first of these appears to be a necessity, while the other two are at least open to discussion as to their worth in the cement trade.

Since its commencement in this country the Portland Cement Industry has suffered, in common with all other lines of manufacture dealing with basic staples under a highly competitive regime, from a lax regard for contract obligations by purchasers. A buyer, placing a future order for cement or iron, felt apparently no obligation to take the product if the market price fell in the meanwhile. A contract was treated precisely as if it had been a free option, to be called only if prices advanced. The worst feature of the situation was that, even when a buyer had cancelled such a "contract" because prices went against him, he felt perfectly assured that the lapse would not be remembered when he next wished to make a similar "contract," for the pressure of competition prevented too close scrutiny of a purchaser's record in this line. It is a fair assumption that the first result of increasing concentration of control in the cement industry will be to eliminate this abuse, as has been done in other lines.

THE DEVELOPMENT OF THE EXPORT TRADE

Ten years ago, when the American market was capable of absorbing all of the domestic cement output, even during times of general business depression, the export trade received scant attention, and deserved little. To-day, when depression means complete shutdown to many cement mills, the situation is very different, and a marked effort to develop foreign trade may be expected.

The countries to the south of the United States are, in general, scantily supplied with fuel, and few of the existing Spanish American coal-fields are well located with regard to transportation routes and markets. For this reason alone, these areas offer a very favorable field for cement exports from the United States, and as their development progresses this field may be expected to expand rather than to contract.

While a competitive export trade is not of itself as profitable as a home market, it affords a valuable balance-wheel to domestic trade-conditions. Under modern conditions, there is always surplus capacity in the manufacture of staples. With depression at home, the surplus becomes disastrous, unless there is some way of disposing of it elsewhere, at or under cost if need be.

SUMMARY OF FUTURE PROSPECTS

So much of detail has necessarily been introduced into the preceding discussion of the future prospects of the cement industry that it may be well to close the discussion with a brief summary covering the more important points that have been brought out.

As regards actual annual output, we may fairly expect this to increase as population increases, and as new uses are found for the product. But we cannot reasonably expect that this increase will, in the future, be as steady as it has been in the past. It is far more probable that the future course of the trade will be marked by successive periods of high and low output, corresponding to the condition of general business at the time.

Prices will, if left to absolutely unrestricted competition,

tend to fall to a point which yields a fair profit only to the largest and best mills. The future decrease in prices, however, can not be comparable in amount to that which has already been experienced, since manufacturing costs show little prospect of marked decrease.

Under the stimulus of decreased profits for the better mills, and of actual losses for the mills which are more poorly located or operated, some attempt at regulation of output and prices may be expected. Such regulation may be made effective through simple pooling, through patent control, or through closer consolidation, the two latter methods offering the greater possibilities in this line.

CHAPTER

IV

FACTORS INFLUENCING THE VALUATION OF CEMENT SECURITIES

THE Portland Cement industry is a manufacture based upon extremely complicated and delicate chemical and mechanical processes, and it would be impossible in this volume to attempt any detailed description of the various stages in the manufacture of the product. It is desirable, however, to call attention to certain characteristics of the industry which are directly connected with its profits and with the valuation of cement securities; and to point out the bearing of these industrial factors on the financial side of the matter.

SUMMARY OF CEMENT MANUFACTURE

At the outset it is well to consider very briefly what sort of a product we are engaged in making and selling, and to endeavor to form some general idea of how it is made.

Portland Cement is an entirely artificial or manufactured product, made by burning a finely ground artificial mixture consisting essentially of lime, silica, alumina, and iron oxide, in certain definite proportions. Usually this combination is made by mixing limestone or marl with clay or shale, in which case about three times as much of the lime carbonate should be present in the mixture as of the clayey materials. The burning takes place at a high temperature, approaching 3,000° F., and must therefore be carried on in kilns of special design and lining. During the burning, combination of the lime with silica, alumina, and iron oxide takes place. The product of the burning is a semi-fused mass called clinker, and consists of silicates, aluminates, and ferrites of lime in certain definite proportions. This clinker

must be finely ground. After such grinding, the resulting powder is Portland Cement.

The finished product is blue to gray in color, has a specific gravity of 3 to 3.25, and when mixed with water will harden or set.

The product must be uniform in composition and quality; and as the processes of manufacture involve certain chemical as well as physical changes, four points may be regarded as of cardinal importance in making Portland Cement. These are:

1. The cement mixture must be of the proper chemical and physical composition;
2. The raw materials of which it is composed must be finely ground and intimately mixed before burning;
3. The burning must be conducted at the proper temperature;
4. After burning the resulting clinker must be finely ground.

From this summary it will be seen that we must deal first with certain natural raw materials, and then with certain mechanical and chemical processes which will produce from the raw materials a definite chemical product. The raw materials are quarried, mixed, ground, burned and reground—and when stated in this general way the manufacture of Portland Cement can be seen to be a very simple proceeding. In practise it is a little more difficult.

THE ELEMENTS OF PLANT LOCATION

In selecting a location for a new cement plant, or in attempting to put a valuation on a location already selected, a number of distinct and to some extent independent factors are involved, all of which should be given due consideration. The more important of these factors are:

1. Chemical composition of the raw materials available.
2. Physical characters of the raw materials.
3. Amount of the raw materials available.
4. Location of the proposed site with reference to transportation routes.
5. Location with respect to fuel supplies.
6. Location with respect to markets.

7. Location with respect to competition, both present and potential.
8. Location with respect to labor supply.

Ignorance of the respective importance of these factors frequently leads to an overestimate of the value of some particular plant location, or to the acceptance of an inferior location when a better one might readily be secured.

When a successful existing company is looking out for a location for a new mill, it will generally, warned by experience, make sure of the points covered in the above schedule. It will endeavor to put the mill where it will pay the greatest returns on the investment, as its interest is in the success of its business, and not in the booming of any particular piece of property. Even under these conditions, however, we have had instances of some remarkably bad new locations selected by previously successful companies.

It is when we deal with "promoted" plants, however, whether the promotion be fraudulent or simply foolish, that the most striking instances of bad location are found. This is due to the fact that the promoter invariably begins at the wrong end of the problem. Instead of selecting first the general territory in which he wishes to build a plant, and then by careful study picking out the best possible location in that territory, the promoter usually begins by buying a piece of limestone land because it is cheap, or because it is located in or near a town whose Board of Trade will offer "suitable inducements to new industries," or because it is near an established and successful plant. Now, as a matter of fact, these three reasons for his selection of a site may be good enough for the promoter, but it is obvious that not one of them has the remotest possible bearing on the earning power of the plant.

It will be found on examining the average cement prospectus that it usually contains statistics regarding the past growth of the cement industry, more or less truthful statements concerning the profits of cement manufacture, a few analyses of the raw materials to be used at the proposed plant, and attractive estimates as to earnings and dividends. Little or nothing definite

will be said regarding shipping facilities, fuel costs, labor supply, markets, and competition. And yet these are the important things to be considered, and until the investor is assured that the proposed location is satisfactory in these particulars he is not in a position to judge as to the value of the securities offered him. The following paragraphs summarize the main points on which he should secure accurate information before becoming deeply involved in the proposition.

Before going further it is necessary to say that in every case the burden of proof must be on the promoter. We have gotten past the stage where new plants, dumped down at random over the United States, will prove profitable. In every case the man who proposes to build a new plant must be able to give clear and definite reasons why a plant of a certain size should be built at that particular location. If these reasons can be given, then the only questions which remain relate to the ability and honesty of the management. If these reasons cannot be given, no sane man should consider risking his money in a plant in Nebraska, for example, simply because another plant in Pennsylvania has made money.

RAW MATERIALS AND THEIR VALUATION

Very erroneous ideas appear to be current concerning the value of deposits of cement materials. It should be clearly understood that in most parts of the United States excellent cement materials are common, and that the commercial value of undeveloped deposits of such materials is necessarily slight. In most of the Eastern, Southern, and Middle Western states there is no difficulty whatever in securing lands containing limestones suitable for cement manufacture at prices ranging from $5 to $50 per acre, and it is only exceptional circumstances which would allow any cement deposit to be valued at more than the latter price. As indicated on a previous page, the value of the location depends less upon the character of the materials than upon other factors.

The characteristics of a deposit of raw material necessary to

justify the erection of a Portland Cement plant may be briefly stated as follows:

1. The raw material must be of correct chemical composition for use as a cement material.
2. Its physical character must be such that the operations of quarrying, drying and grinding can be carried on at a minimum cost.
3. The size of the deposit must be great enough to keep a large plant supplied with material for at least twenty years.

These characteristics may be now discussed at somewhat greater length. So far as the chemical composition of the raw material is concerned, there is usually little room for doubt. Good raw materials are so common everywhere that few promoters offer a proposition distinctly bad in this respect. That is to say, it is usually possible to make Portland Cement, in some way, at the location which the promoter has selected. But on the other hand, it is frequently the case that the actual operations of manufacture develop defects in the raw materials—defects slight in appearance, and readily overlooked during a hasty preliminary examination, but which are sufficient to make the cement either poor in grade or unnecessarily costly to manufacture. A number of recent Southern promotions, for example, contemplate the use of a raw material whose high percentages of alumina result in the making of a low-grade cement, while its moisture content makes operating costs high. In other localities variable or excessive percentages of magnesia have developed after operation has commenced, and similar chemical defects appear in many propositions.

In going over a report or prospectus dealing with this phase of the subject, the following points may profitably be borne in mind.

The material, if a limestone, must contain as small a percentage as possible of magnesium carbonate. Under present conditions 5 or 6 per cent of magnesium carbonate is the maximum permissible. Free silica, in the form of chert, flint, or sand must be absent, or present only in small quantities, say 1 per cent or less. If the limestone is a clayey limestone or "cement rock," the

proportion between its silica and its alumina and iron should fall within the limits.

$$\frac{SiO_2}{Al_2O_3+Fe_2O_3} > 2. \quad \text{and} \quad \frac{SiO_2}{Al_2O_3+Fe_2O_3} < 3.5$$

A clay or shale should satisfy the above equation and should be free from sand, gravel, etc. Alkalies and sulphates should, if present, not exceed 3 per cent or so.

The nearer a limestone approaches in composition to the mixture used in Portland Cement manufacture the greater its value for that purpose, for it will require the addition of less extraneous material to make the mixture absolutely correct in composition. The following are analyses of Portland Cement mixtures, ready for burning, as used at various large cement plants in the United States:

Analyses of Portland Cement Mixtures

	1.	2.	3.	4.
Silica (SiO_2)	12.85	12.92	13.52	14.94
Alumina (Al_2O_3)	4.92	4.83	6.56	2.66
Iron oxide (Fe_2O_3)	1.21	1.77	. . .	1.10
Lime carbonate ($CaCO_3$)	76.36	75.53	75.13	75.59
Magnesium carbonate ($MgCO_3$)	2.13	4.34	4.32	4.64

It will be seen that the usual mixtures carry from 75 to 77 per cent of lime carbonate. Bearing this in mind, it will be obvious that there is a great advantage in using, as one of the raw materials, a limestone of about this degree of purity. If rock of this composition occurs in sufficient quantity, it would require but little admixture of other materials to keep the cement correct in composition.

For present purposes it will be sufficiently accurate to consider that a Portland Cement mixture, ground and ready for burning, will consist of about 75 per cent of lime carbonate ($CaCO_3$) and 20 per cent of silica (SiO_2), alumina (Al_2O_3) and iron oxide (Fe_2O_3) together, the remaining 5 per cent includ-

ing any magnesium carbonate, sulphur, and alkalies that may be present.

The essential elements which enter into this mixture—lime, silica, alumina, and iron—are all abundantly and widely distributed in nature, occurring in different forms in many kinds of rocks. It can therefore be readily seen that, theoretically, a satisfactory Portland Cement mixture could be prepared by combining, in an almost indefinite number of ways and proportions, many possible raw materials. Obviously, too, we might expect to find perfect gradations in the artificialness of the mixture, varying from the one extreme where a natural rock of absolutely correct composition was used, to the other extreme, where two or more materials, in nearly equal amounts, are required to make a mixture of correct composition.

The almost infinite number of raw materials which are theoretically available are, however, reduced to a very few in practise under existing commercial conditions. The necessity for making the mixture as cheaply as possible rules out of consideration a large number of materials which would be considered available if chemical composition was the only thing to be taken into account. Some materials, otherwise suitable, are too scarce; some are too difficult to pulverize to the fineness necessary to bring about the requisite chemical combination of the mixture in the kiln. In consequence, a comparatively few combinations of raw materials are actually used in practise.

In certain localities deposits of argillaceous (clayey) limestone or "cement rock" occur, in which the lime, silica, alumina, and iron oxide exist in so nearly the proper proportions that only a relatively small amount (say 10 per cent or so) of other material is required in order to make a mixture of correct composition.

In the majority of plants, however, most or all of the necessary lime is furnished by one raw material, while the silica, alumina, and iron oxide are largely or entirely derived from another raw material. The raw material which furnishes the lime is limestone, chalk, or marl, while the silica, alumina, and iron oxide of the mixture are derived from clay, shale, or slate.

In the following table the production of Portland Cement in the United States is classified according to the kinds of raw materials from which the cement was manufactured.

The production is grouped as follows:

Type 1 includes cement produced from a mixture of argillaceous limestone ("cement rock") and pure limestone. This is the combination of materials used in all the cement plants of the Lehigh district of Pennsylvania and New Jersey, and also at several Western plants.

Type 2 includes cement made from a mixture of comparatively pure limestone with clay or shale. This mixture is employed at many plants all over the United States.

Type 3 includes cement manufactured from a mixture of marl and clay. This type of mixture is used only in the states of Michigan, Ohio, Indiana and New York.

Type 4 includes Portland Cement manufactured from a mixture of limestone and blast-furnace slag.

Production, in barrels, and percentage of total output of Portland Cement in the United States according to type of material used, 1898-1907.

Year	Type 1 Argillaceous limestone (cement rock) and pure limestone.		Type 2. Limestone and clay or shale.		Type 3. Marl and clay.		Type 4. Slag and limestone.	
	Quantity	Percentage	Quantity	Percentage	Quantity	Percentage	Quantity	Percentage
1898 .	2,764,694	74.9	365,408	9.9	562,092	15.2	. . . .	. . .
1899 .	4,010,132	70.9	546,200	9.7	1,095,934	19.4	. . . .	. . .
1900 .	5,960,739	70.3	1,034,041	12.2	1,454,797	17.1	32,443	0.4
1901 .	8,503,500	66.9	2,042,209	16.1	2,001,200	15.7	164,316	1.3
1902 .	10,953,178	63.6	3,738,303	21.7	2,220,453	12.9	318,710	1.8
1903 .	12,493,694	55.9	6,333,403	28.3	3,052,946	13.7	462,930	2.1
1904 .	15,173,391	57.2	7,526,323	28.4	3,332,873	12.6	473,294	1.8
1905 .	18,454,902	52.4	11,172,389	31.7	3,884,178	11.0	1,735,343	4.9
1906 .	23,896,951	51.4	16,532,212	35.6	3,958,201	8.5	2,076,000	4.5
1907 .	25,859,095	53.0	17,190,697	35.2	3,606,598	7.4	2,129,000	4.4

GEOGRAPHIC DISTRIBUTION OF CEMENT MATERIALS IN THE UNITED STATES

It is of course impossible to discuss this subject within the limits permissible in this chapter, for any satisfactory treatment

of it would require hundreds of pages, while the scope of the present report is necessarily restricted. Detailed descriptions of this character are contained in Bulletin 243 of the United States Geological Survey. This bulletin, which was published a few years ago, but was soon out of print, is now being rewritten and will be issued in an entirely revised form as soon as possible. In order to fill the requirements of the present report, an attempt has been made to summarize in the following schedule the main facts regarding the occurrence or non-occurrence of the more important cement materials in the various states.

Occurrence of the more important cement materials, by states.

State	Raw Materials			Fuels			State	Raw Materials			Fuels		
	Low-magnesia limestones	Fresh-water marls	Soft limestones	Coal	Oil	Gas		Low-magnesia limestones	Fresh-water marls	Soft limestones	Coal	Oil	Gas
Alabama . .	A	0	A	A	0	C	Nebraska . .	B	0	B	0	0	0
Arizona . . .	B	0	0	C	0	0	Nevada . . .	B	0	0	0	0	0
Arkansas . .	A	0	B	A	0	0	NewHampshire	B	0	0	0	0	0
California . .	B	0	B	C	A	C	New Jersey .	A	C	0	0	0	0
Colorado . .	A	0	A	B	A	0	New Mexico .	B	0	0	C	0	0
Connecticut .	C	0	0	0	0	0	New York . .	A	A	0	0	C	B
Delaware . .	C	0	0	0	0	0	North Carolina	C	0	A	C	0	0
Florida . . .	A	0	A	0	0	0	North Dakota	0	0	C	0	0	0
Georgia . . .	A	0	B	B	0	0	Ohio	A	A	0	A	A	A
Idaho	B	0	0	B	0	0	Oklahoma . .	A	0	B	A	A	A
Illinois . . .	A	A	0	A	A	A	Oregon . . .	C	0	0	C	0	0
Indiana . . .	A	C	0	A	A	A	Pennsylvania	A	0	0	A	A	A
Iowa	A	0	0	A	0	0	Rhode Island	C	0	0	0	0	0
Kansas . . .	A	0	C	A	A	A	South Carolina	C	0	B	0	0	0
Kentucky . .	A	0	0	A	A	A	South Dakota	0	0	B	0	0	0
Louisiana . .	0	0	C	0	B	0	Tennessee . .	A	0	0	A	C	C
Maine	B	0	0	0	0	0	Texas	A	0	A	C	A	A
Maryland . .	A	0	0	A	0	0	Utah	A	0	0	A	0	0
Massachusetts	C	C	0	0	0	0	Vermont . .	B	0	0	0	0	0
Michigan . .	A	A	0	A	0	0	Virginia . . .	A	0	A	A	0	0
Minnesota . .	C	C	0	0	0	0	Washington .	B	0	0	C	0	0
Mississippi . .	C	0	A	0	0	0	West Virginia	A	0	0	A	A	A
Missouri . . .	A	0	0	A	0	0	Wisconsin . .	C	C	0	0	0	0
Montana . .	A	0	B	C	....	....	Wyoming . .	A	0	B	A	A	.

In this table four symbols are used to denote various degrees of abundance or rarity. A indicates the occurrence of large and

widely distributed deposits; B indicates the occurrence either of a few large deposits or of a number of small ones; C indicates the occurrence of a few small deposits only; O indicates that the material is either absolutely wanting or is so scarce as not to be of any possible commercial importance.

In regard to the fuel supplies noted in the table, a word of caution is necessary. The term "coal" is here limited to such coals as can be used in cement manufacture with reasonable economy. Peat, lignite, and many Western "coals" are therefore omitted from consideration.

THE IMPORTANCE OF FUEL SUPPLIES

The necessity that any proposed cement location should be advantageously situated with regard to fuel supplies can hardly be stated too strongly. The importance of this feature of the location can be understood when it is recollected that the average plant will use in the neighborhood of 200 pounds of coal per barrel of cement produced. In other words, the fuel used in power plant and kilns will weigh half as much as the product, in a good plant, while this proportion may be greatly exceeded in a poor plant or in one operating on wet raw materials.

It is obvious that since fuel is such an item in the total costs of cement manufacture, a proposed plant should be so located as to secure a regular supply of cheap and good fuel. The lack of such supplies is what operates so strongly to discourage cement manufacture along the Southern Atlantic Coast, for example, and in most portions of the West.

The fuels used in Portland Cement kilns are powdered coal, oil, natural gas, and producer gas. The relative importance of these four fuels is well brought out by the following table, which is based upon the official statistics for 1907, the latest available.

Oil is used by all of the cement plants in Arizona, California, Texas and Washington. Natural gas is used by all the operating Kansas plants, and by one plant elsewhere. A small output on producer gas at one plant is included in the natural-gas figures.

Powdered coal is, however, the principal fuel used, 79 plants, with a toal of 753 kilns, and producing 88.5 per cent of the total output, being equipped with powdered-coal burners.

Fuels used in Portland Cement plants in 1907.

Fuel Used	Number of plants.	Number of kilns.	Output in 1907	Per-centage. of total
			Barrels.	
Powered Coal	79	753	43,151,461	88.5
Oil	8	64	2,229,004	4.5
Natural Gas	6	58	3,404,925	7.0
Producer Gas	1	1		
Total	94	876	48,785,390	100.

Throughout the greater part of the Middle, Eastern and Southern United States kiln and power coals of at least fair quality can be obtained at costs of from $1.50 to $3.00 per ton at mill, the cost depending more on the location of the cement plant with respect to the coal fields than on the quality of the coal. If we assume that the plant uses 200 pounds of coal per barrel of cement, the fuel cost will therefore range between 15 and 30 cents per barrel of product. It is obvious that with this allowance for fuel alone, the promoter who expects to make cement at a total cost of fifty cents or less per barrel has little margin left for labor, supplies, repairs, raw materials and other items of expense.

As a matter of fact, most promoters recognize this difficulty, and in order to avoid it promise to run their plants on natural gas at a merely nominal fuel cost. In Kansas and Oklahoma, particularly, we find prospective plants allowing from two to ten cents per barrel for total fuel cost. That most of these low estimates are based on very erroneous data, even in dealing with a natural gas proposition, is evidenced by the following statement relative to fuel conditions in the principal Kansas cement district, prepared by an engineer well acquainted with the situation there:

There is now no pool of gas developed in Allen County which will supply sufficient fuel to run a cement plant of 2500 barrels daily capacity, as was the case two or three years ago.

The plants in operation derive their gas from several pools, scattered far apart, and it has been necessary to construct miles of pipe line in order to connect these pools with the plant.

In order to conduct gas any distance, say twelve or fifteen miles, to a plant manufacturing two to three thousand barrels of cement daily, it would require a 12-in. pipe line; the cost of which, when right-of-way, damages, etc., is added to the cost of the pipe and laying same, is close to ten thousand dollars per mile.

The Kansas Natural Gas Co. and other companies who handle gas commercially pay two cents, or even more, per thousand cubic feet, rather than lease the land and develop the gas themselves. Added to this the cost of pipe-line and other necessary equipment, it can readily be seen that when gas has to be carried even a small distance, four or five cents per thousand cubic feet is a low estimate of the cost.

The Kansas Natural Gas Co. has never sold gas to manufacturing institutions for less than 8 cents per thousand cubic feet, and would make no contract for definite time or definite quantity at this price, and have persistently refused to supply gas for manufacturing purposes, claiming that they could only afford to produce and carry gas for such a price as they could command for domestic consumption.

It requires from 3,500 to 4,000 cubic feet of gas for fuel purposes to produce a barrel of cement. Taking this into consideration, and at the figures above mentioned, it is very evident that anyone is guessing and not stating developed facts when they claim that cement plants can produce cement in Allen County for less than 14 cents per barrel for fuel.

These figures are based on using long kilns, and good Corliss engines, with good boiler conditions. If gas engines were used to develop power, the figures might be reduced 500 cubic feet per barrel, but this would be liable to introduce other features, in the way of unsatisfactory operation, which would counterbalance the difference in gas cost.

TRANSPORTATION FACILITIES

As Portland Cement is a cheap and bulky product, special attention should be paid to the shipping facilities of the location at which it is proposed to erect a new cement plant. It must be

on transportation routes which give access to important markets, or else a large plant is not justified; and the rates to these markets must be low enough to put the new plant on at least an equal basis with its nearest competitors. Further, the road or roads on which it is located must be of such a class as to be able to afford good car service at all times of the year. Some Southern roads, for example, never have any cars to use for manufactured products during the cotton-shipping season; while some of the Western lines are almost as useless to the cement manufacturer while the crops are moving.

It is of course obvious that a cement plant located on only one transportation route is usually at a very serious disadvantage. Until railroad management becomes more purely altruistic than it is at present, there will be very material benefits to be derived in so locating the plant that it can ship over two or more roads. It is hardly necessary to enumerate the advantages thus obtained; they consist, briefly, of competitive rates, satisfactory switching arrangements, and adequate car service.

There is a certain moral advantage in having, in addition to the railroads, a navigable river or canal close at hand. Under ordinary circumstances it is of course unlikely that much cement will ever be shipped over either river or canal, but their presence is of use as an argument. In a few cases, it is true, as on the Lakes, the lower Mississippi, or the Hudson, the water transportation is really a serious factor in the situation.

MARKETS AND COMPETITION

In selecting a plant location, the technical advantages of the raw materials at some given site must not be permitted to have undue weight. The only good reason for building a cement plant anywhere is that it can be expected to sell at a profit the cement which it makes, and no possible advantages in the way of raw materials can make up for the lack of a good local market. Of course in a rapidly developing section some allowance may be made for possible future growth of this market, but at least some of the market must be there by the time the plant is built.

It is a question if this phase of the matter has not been overlooked in some of the recent Western promotions, located in areas densely populated by jack-rabbits. Plants built in Southern swamps, with the expressed intention of supplying the Panama Canal with cement, are in even worse case.

In considering the earning possibilities of a prospective plant in a new district, without present local competition, the certainty of future competition must not be lost sight of. It is not possible to prevent this, but it is usually possible to so select the site of the first plant that future competitors must operate at more or less of a disadvantage. It is in this respect that "promoted" plants are requently defective, for their site is selected not because it is the best possible in that locality, but because the owner of that particular piece of land was willing to sell cheap, or to take stock in payment, or for some other reason of similar type.

FINANCIAL PLANS

If the new project appears, on examination, to be sound so far as all of its technical and commercial factors are concerned, there is still room for further inquiry and study on the part of the investor, for he must assure himself that the project has been financed along reasonable and even conservative lines. The plant itself may turn out to be, technically, a successful cement-maker; but if the stock issues are out of all relation to actual construction cost, the returns on the investment will be small or entirely lacking, while if the company is loaded down with excessive fixed charges the entire investment may be lost.

Both the methods and the results of the financing operations require careful scrutiny, and it is more than hazardous to accept prospectus-statements regarding these features of the enterprise at their face value. In the remaining chapters of this book the matters of promotion methods, bond issues, stock capitalization and profits will be taken up separately, and dealt with in the detail which their importance justifies.

CHAPTER

V

THE METHODS AND PROFITS OF CEMENT PROMOTIONS

IN the present chapter an attempt is made to discuss certain matters, acquaintance with which may save the investor or banker from considerable loss at a time when cement promotions are offered to him. Beginning with an estimate of the total amount of such promotions which are in view at present, an outline is given of the general methods pursued by the promoter of cement propositions, and of the source and amount of his profits. This is followed by a discussion of some of the more obvious errors usually contained in the prospectus of a "promoted" cement plant.

THE IMPENDING FLOOD OF CEMENT SECURITIES

Not so many years ago a leading financier described an acute crisis in the New York market as being due to the presence of an excess of "undigested securities," on which statement Mr. James J. Hill promptly commented that the bulk of the securities in question were not only "undigested" but positively "indigestible." At that date neither of these terms could fairly have been applied to the relatively few cement securities which had then been offered to investors, for most of the early cement companies were financed privately, capitalized on a reasonable basis, and managed much like private businesses. It is only within the past few years that we have seen the cement industry made the basis for wholesale attempts at robbing the investing public through the agency of overcapitalized projects and misleading prospectuses.

Until figures on the subject are assembled and compared, it is difficult to realize the extent to which foolish or fradulent pro-

motion has been carried in the cement industry. An estimate made recently showed that there were already in the United States 113 cement plants, with a total capitalization of $141,587,000. These actual plants had a total annual capacity of over eighty-five and a half million barrels, while their production in 1907 was less than forty-nine million barrels. In other words, the existing plants could not run profitably at much over half their rated capacity.

As compared to the real condition of the industry at that date, the same estimate showed that 114 new plants were then in various stages of promotion. These projected plants had a total capitalization of $160,125,000 and a total annual capacity of 62,000,000 barrels.

The comparison of these two sets of figures brings out sharply two facts. The first is that with an annual output of not much over half the capacity of existing plants, preparations are being made to add sixty-two million barrels of cement per year to the capacity. The second fact of importance is that the proposed plants are capitalized much more heavily than the old ones.

	Capitalization	Capacity	Capital per barrel
Existing plants . .	$141,687,000	85,505,000	$1.65
Proposed plants. .	160,125,000	62,000,000	2.58

As a matter of fact, it is probable that if this estimate were brought up to date, the contrast between the two sets of figures would be still more striking. It is probably well within limits to say that as soon as general market conditions seem to warrant it, the people of the United States will be asked to furnish between 175 and 200 millions of dollars for the purpose of erecting new cement plants, and that much over half of that immense total will represent investments of very doubtful value.

THE PROFITS OF CEMENT PROMOTERS; THEIR SOURCE AND AMOUNTS

In almost every fraudulent cement promotion, whatever its scale, the profits of the promoters are taken off at two stages.

In the first stage a relatively small but quick profit is made on the land purchase necessary to supply the proposed company with raw materials, while in the second stage much larger profits are secured on the construction account. It may be of interest to follow a hypothetical case through its various stages and endeavor to get some idea of the source and amount of the promoters' profits.

We will assume that in passing through a prairie state the promoter has noticed a disused lime kiln, and the idea strikes him that here is a possible site for the Great Plains Cement Corporation. A sample of the rock is sent to the nearest chemist, and if it shows less than 3 per cent magnesia no further tests are necessary at this stage of the proceedings. About two hundred acres of land are now optioned or bought. As the limestone outcrops all over this land it is worthless agriculturally, and costs perhaps ten dollars an acre.

The next step is to arrange for the concurrent "experting" and advertising of the find. As to experting, it will be advisable to have several reports. The cheapest and, from the promoters' point of view, the safest method of handling this matter is along the following lines.

The property should be examined for a report as to quantity of material by some local man. It is best to secure the State Geologist or State Chemist for this purpose when possible, as they have a number of advantages over others. First, their services are cheap or entirely free. Second, they have no embarrassing knowledge concerning the cement business. Third, they do have local pride, and will be glad to have a large cement plant located in their state. Fourth, their official positions will add weight to their reports.

The local expert will select several sets of satisfactory samples, and duplicate sets can be then sent to two absolutely reputable Eastern laboratories for analyses and burning tests. Three of the necessary reports will have then been obtained. It is usually desirable to secure a fourth, containing estimates as to costs, profits, etc. This can often be gotten very reasonably from the representative of a firm interested in selling cement

machinery. The proposition is now fully equipped as to reports, and is almost ready for flotation.

The expenses to date have been about as follows:

200 acres of land at $10	$2000
Expert's reports	1750
Local advertising	250

The last item will cover the insertion of items relating to the recent rapid growth of the cement industry elsewhere, to the fabulous profits of the Trust, to the advantages of making cement locally, and to the investigations which are being carried on for "the largest Eastern cement company," for "directors of the Standard Oil Company" or for other probable investors. These will serve to create an educated public opinion, and will prepare the local banking interests to take up their part of the work.

The Great Plains Cement Corporation can now be incorporated, with a capitalization and bond issue arranged about as follows:

Bonds, 6 per cent.	$1,500,000
Preferred stock, 7 per cent. cumulative	2,000,000
Common stock	2,000,000

Of the bonds, $200,000 are set aside to cover purchase money and other expenses connected with acquiring the valuable raw material properties of the corporation. Charters from most states will provide that the directors' opinion as to the value of these properties is conclusive, but it will be well to furnish presumptive evidence in one of the expert reports. The following statements would serve this purpose well:

Professor ———, State Geologist and President of the ——— University, has estimated that our 200 acres of land contain above a depth of 100 feet fifty million tons of limestone and ten million tons of shale. The official reports of the United States Geological Survey show that the average value of the limestone quarried last year was $1.20 per ton. To be entirely conservative, however, we will assume that our vast limestone deposit is worth only ten cents per ton. On this basis the property contains limestone alone whose value is $5,000,000, to say nothing of the shale, much of which

would make excellent pressed brick as well as cement. Under these circumstances our stockholders are to be congratulated on having secured this magnificent reserve of raw material at a cost of less than one-twentieth of its real value, as certified by Government experts.

A statement such as the above will add to the interest of the prospectus as well as tending to exonerate the directors from suspicion of having overvalued the property.

At this stage of the proceedings the promoter has expended $4,000, and has received in return bonds of the par value of $200,000, which the next steps will allow him to dispose of for perhaps $125,000 in cash.

* * * * * * * * * *

In order to secure all the possible profits, it is good policy to proceed now to organize the Altrurian Construction Company, with a full-paid capitalization of one thousand dollars, the stock being held by the promoter and his ground-floor associates. The Altrurian Construction Company will then agree to construct and deliver to the Great Plains Cement Corporation a modern well-built plant of a daily capacity of 2,000 barrels, and to accept in payment therefor the entire stock and bond issue of the Great Plains Cement Corporation, excepting the $200,000 in bonds already paid for the land.

The construction company is now ready to realize on the bond and stock issues of the cement company as they are paid over to it. If times are prosperous and the public is in a mood to snatch greedily at well-advertised offerings of this type, it will be usually possible to turn the bonds over to a syndicate of small local bankers, who will underwrite them at 80 and get a bonus of ten shares of preferred and ten shares of common with each thousand-dollar bond disposed of. The public will commonly take the bonds at par, with a bonus of five shares of stock with each bond. After the bonds are out of the way, the preferred stock can usually be marketed at or near par, with a half-share of common as a bonus. The net results of these operations will be summarized later.

* * * * * * * * * *

The plant can either be built directly by the Altrurian Construction Company, or the contract can be sublet to a reliable firm already equipped for such work. In either case, a good 2,000 barrel plant can be delivered to the Great Plains Cement Corporation, with sufficient working capital to keep it off the rocks for a year, at a net cost of not over $750,000 to the construction company.

Assuming that the promoters do not desire to retain any interest in the project, and that all the issues are now in the hands of the public, the three parties to the transaction will stand as follows:

1. The public have paid $2,500,000 for the entire bond issue, with which they received a bonus of 12,500 shares of common stock. They have also bought the entire preferred issue at par, and have received 20,000 shares of common as a bonus with it. The remaining common, as noted below, has been distributed otherwise, without direct cost to the public. The public have paid altogether $3,500,000 in cash.

2. The promoter has paid out $754,000 for land, plant, and working capital. In return he has received $1,200,000 from the bonds, and $450,000 from the sale of his portion of the preferred at 90. It is assumed that he has given up the $250,000 excess of common stock, at the urgent request of the banking syndicate, for use in advertising and wash sales.

3. The bulk of the profits have of course gone to the underwriters, but as the promoter will usually have at least a minor interest in the underwriting he can not well complain of this.

* * * * * * * * * *

Industrially the net result is that the country is presented with a new cement plant heavily overcapitalized both as to stock and bonds. The way in which this overissue of securities has come about is summarized below:

Actual cost of land and plant, and working capital	$754,000
Promoters' profits on purchase and construction	896,000
Underwriting profits and marketing expenses	1,650,000
Total cost to public	$3,300,000
Excess stock as bonuses, etc.	2,200,000
Total face value stock and bond issue	$5,500,000

The above example of cement plant promotion might perhaps be regarded as exaggerated, but unfortunately almost every element in it can be matched on comparison with promotions actually on foot to-day, or which have been placed before the public within the past three years.

THE MISSTATEMENTS OF CEMENT PROSPECTUSES

It is obvious that such a proposition as outlined on preceding pages could not be successfully floated if the prospective purchasers of the bonds and stock had the faintest idea of the truth regarding conditions in the cement industry. Nevertheless, flotations of equally bad character have been successfully accomplished in the immediate past, and similar schemes will undoubtedly again attract attention when business revives sufficiently to make them possible. Their successful flotation is accomplished by trading on the profound ignorance of bankers and the public regarding cement conditions, and by increasing this ignorance through the medium of most attractive prospectuses and advertisements.

It is of course difficult to name in advance all of the errors and misstatements which are likely to be found in a cement prospectus, but certain types of misstatement occur very uniformly throughout this class of literature, and these persistent types of error may conveniently be grouped as follows:

A. Misstatements as to the GENERAL CONDITIONS of the industry; as to the demand being greatly in excess of the supply; as to the effect of individual engineering works—i.e., the Panama Canal—on the cement market.

B. Excessive valuations placed on RAW MATERIAL SUPPLIES.

C. Misstatements as to average SELLING PRICES to be expected.

D. Low estimates as to MANUFACTURING COSTS.

E. Exaggerated estimates of PROFITS to be realized.

In the following pages each of these types of misstatement will be taken up in turn; examples of each will be given from

actual prospectuses; and the facts in the case will be briefly discussed.

A. MISSTATEMENTS AS TO GENERAL CONDITIONS

The average prospectus will on examination be found to contain a series of misstatements relative to the general conditions of the cement industry. Starting with statements as to the rapid growth of the industry in the period 1890-1906, inclusive, which was astonishing enough, the prospectus-writer goes on to say that its future growth will be more rapid and equally steady. The probabilities in this line have been discussed at length in an earlier chapter of this book, where the conclusion was reached that the period of steady and uninterrupted growth reached its climax during the early part of the year 1907, and that hereafter we may expect the industry to follow closely the other basic manufacturing industries in their close dependence on general business conditions.

Much stress is also laid, in a number of prospectuses, on the market which will be afforded by single engineering works—the favorite example being, of course, the Panama Canal.

The following extracts from recent promotion literature are fair samples of the sort of misrepresentations that can be expected along these lines:

> Not a failure ever recorded in a modern Portland Cement industry; not a Portland Cement plant that is not away behind in its orders; not a Portland Cement security that is not paying good dividends; not a year but the uses of Portland Cement are on the increase; not a possibility of a failure in our project where the supply of natural cement stone is inexhaustible and where orders are waiting for full capacity of plant.

> It is an important fact that holders of cement stock are a satisfied lot of investors, because:
>
> 1. They are receiving regular and generous, and in some instances enormous returns on their investment.
>
> 2. They are owners in a manufacturing business that is overwhelmed with orders for its output.
>
> 3. They can see a splendid surplus growing, which pays back their original investment, leaving big dividends on their common stock.

4. There has never been a failure in a Portland Cement factory.

5. The assets of the company are always in sight, where every stockholder can see and know.

6. The raw material in the business which produces the profits is not subject to manipulation whereby it loses its value.

7. There is no possibility of the supply of rock giving out on our property as quantities can be estimated without a doubt and an absolute measurement made where deposits are entirely on the surface.

According to commercial journals, the supply of Portland Cement at this writing is short of the demands more than 2,500,000 barrels.

We are better situated than any other concern in the United States for cheap transportation to Panama. The building of this canal will consume daily more than one-third of the entire output of Portland Cement in the United States to-day. This will raise the price of Portland Cement.

B. EXCESSIVE VALUATIONS OF RAW MATERIAL SUPPLIES

A second interesting series of misrepresentations group themselves around the question of raw material supplies. In an earlier chapter it has been noted that good cement materials are so common, and so widely distributed throughout the United States, as to be, of themselves, almost valueless. This view of the case is not to the promoter's liking, however, and in many prospectuses we find misstatements tending to give the idea that the particular company under promotion has a monopolistic control over desirable raw material supplies. The following extracts will serve to exemplify this type of misrepresentation:

The material used in making Portland Cement is natural Portland Cement rock, which is found only in the state of Pennsylvania and Southern Alabama. The latter, however, on our property, is a soft rock, which is easily and cheaply manipulated, while that of Pennsylvania is a very hard substance and very expensive to reduce, besides being treacherous in its analysis. Mills in other states than the above must use a mixture of marl, limestone, clay and gypsum.

There are only four locations in the world where are found natural rocks which when calcined at a very high heat, will in themselves produce clinker, making a high grade of Portland Cement, namely: In the Lehigh district in Pennsylvania, at Boulogne in France, and in Belgium, and at no place in such enormous quantities as on this company's property. The rock has been tested to a depth of 300 feet and is uniform in its character throughout. Estimating the rock at only one ton to the cubic yard throughout, we get the enormous total of 200,000,000 tons, or counting five barrels per ton, we have 1,000,000,000 barrels; enough for nearly all time to come.

On this company's land the three items of raw material essential in the production of Portland Cement—shale, limestone and coal—are found in inexhaustible quantities and of superior quality. Expert opinion has estimated that the value of the coal on the property, on a basis of ten cents a ton in the ground, would return to the company over $3,000,000; and the shale and limestone, estimating each item at two cents per ton in the quarries, the values of each would be $2,000,000—a total minimum valuation of raw material on the company's property of $7,000,000.

C. MISSTATEMENTS AS TO SELLING PRICES

The promoter, as shown by the following prospectus extract, usually fixes the selling price of his cement at between $1.50 and $2.00 per barrel in bulk at the mill, regardless of the fact that the day of such prices passed away a decade ago. The tables of average selling prices published in Chapter II of this book would alone serve to disprove his statements in this regard:

At present, Portland Cement is selling in the South from $2.25 to $2.65 per barrel. We have, therefore, kept within safe limits on that score (i.e., in estimating the probable average selling price at $1.50 f.o.b. mill).

D. LOW ESTIMATES OF MANUFACTURING COSTS

The estimates of manufacturing and general operating costs found in cement prospectuses are remarkable, less for their uniformity than for their extreme lowness. One or two, out of a large series in the writer's possession, figure on a total cost of

80 cents per barrel or thereabouts; but at least four-fifths of the prospectus-writers give an estimate for total costs of between 45 and 60 cents per barrel. A few interesting examples carry their cost estimates as low as 30 or 35 cents per barrel.

In considering the figures thus given, it must be remembered that they are not supposed to be mill-costs only, but to include overhead charges, selling costs, etc. To be at all safe, they should also include heavy allowances, not only for ordinary depreciation, but for changes made necessary by the continual progress of the industry. When this is understood, it is obvious that not one promoted plant out of twenty can ever hope to show actual costs as low as those promised by the prospectus-writer. In the case of the plants which expect to make thirty or thirty-five cent cement, the proposition is not even open to serious consideration.

E. EXAGGERATED ESTIMATES OF PROFITS

By underestimating manufacturing costs, and overestimating selling prices of the product, the promoter is able to promise profits of very unusual degree to the investor in the securities of his new cement company. In the final chapter of this book some facts are given relative to the experience of existing companies, which may serve to compare with the hopeful estimates of the promoter, of which the following affords a fair sample:

After a careful investigation of the cost of making cement at the various factories now in operation, we can manufacture, without any doubt, at the following prices:

Material delivered at mill,	.04 per bbl.
Coal at $2.25 per ton,	.24 "
Superintendent and office staff,	.03 "
Labor operating plant	.14 "
Supplies,	.02 "
Renewals, repairs and sacks,	.10 "
Insurance and taxes,	.02 "
Contingencies,	.02 "
	.60 per bbl.

These figures look out of reason, but the cost in every item is figured at 10 per cent. more than the highest estimate, and we can cut the profits half in two and then still have one of the best kind of investments.

3000 bbls. per day, 1,095,000 bbls. per yr. at $1.50	$1,642,500
Cost to manufacture 1,095,000 bbls. at 60 cents	657,000
Profit of company per year	$ 985,500

The entire plant will cost, ready for operation, not over $750,000.

CHAPTER

VI

THE CAPITALIZATION OF CEMENT COMPANIES

TO the investor in cement securities the question of proper capitalization is one of paramount importance. Assuming that the company is so located and managed that it can make and market its product at a reasonable profit per barrel, the returns to the stockholder will depend solely upon whether or not the company has been capitalized at a proper figure. If, as is too often the case with recent promotions, its capitalization is excessive, it will be impossible to pay regular dividends at a rate commensurate with the risks ordinarily involved in an industrial enterprise.

THE OBJECTIONS TO OVERCAPITALIZATION

It is often said that it is a matter of perfect indifference, both to the public and to the stockholder, if a corporation—either industrial or railroad—is overcapitalized, since the excess of stock over true value will be promptly discounted by a fall in the price of the stock. Though this statement is true enough, it overlooks the fact that there are several good reasons for avoiding overcapitalization, particularly of an industrial.

Fraud against the original purchaser. The principal objection is that the usual purpose of overcapitalization is to defraud the original purchaser of the stock. When stock is being sold to the general public through agents, as is the case in most of the cement promotions now under consideration, the promoter or his agent is dealing with individuals who know nothing about the industry in which they are asked to "invest," and who must in consequence rely entirely upon the statements of the prospectus. In order to secure stock subscriptions it is obviously necessary to

promise regular and large dividends; and if the company is heavily overcapitalized these promises can not be kept. Even in a reasonably capitalized and honestly managed company the stockholder is likely to have some anxious moments, but in a fraudulently or foolishly promoted company of the type above noted the purchaser of stock does not even have a fair gambling chance. He is buying into a concern which cannot possibly pay dividends except in unusually prosperous years, and he is in line for depreciation of capital as well as loss of interest.

Effect on company management. Stability of dividend return is as much to be desired by the company management as by the stockholder, though that fact is frequently overlooked. On this account overcapitalization exerts a powerfully injurious influence on the history of the company which is so burdened.

If dividends are low or lacking, the stock of the company will depreciate in price to a point fixed by its value for purposes of control, and not for investment. If the dividend rate, even though fair on the average, be too irregular, the stock will also lose its investment value and become purely speculative. In either case there will be a large floating supply of stock available, at low or greatly fluctuating prices, and the temptation to manage the company as a speculative machine will be almost irresistible. These conditions have been well exemplified, during the past decade, by the experience of several of the larger steel companies, which, though technically in an excellent position, have had a most painful financial history owing to the manner in which they have been handled for stock-market purposes. In all of these cases, the primary cause of the difficulties in which the companies became involved was excessive capitalization—either created at the outset or caused by later unjustifiable stock issues.

There is another way in which overcapitalization has a directly bad effect from the management's point of view. Most of our American industrial companies have shown an unhappy facility for periodically running short of working capital. When a company reaches this point, its capitalization and past dividend record become matters of the first importance. It is true that there are two points in our financial cycles—at the height of

a boom and at the bottom of a depression—at which the ordinary banker will not make much distinction between good and bad companies. But at normal periods in the money market, when collateral or other security is scrutinized with reasonable care, there will be a very marked difference in the ease of securing funds between a reasonably capitalized and an excessively capitalized company.

THE BASIS FOR REASONABLE CAPITALIZATION

Before the question of overcapitalization in proposed cement plants can be satisfactorily discussed, it is necessary to arrive at some basis for determining what may be considered to be a reasonable capitalization for a plant of some given size, operating under average conditions of economy.

Limiting factors. There are two factors which operate to limit, in the two opposite directions, the amount for which a cement plant can and should be capitalized. On the one hand, it is obvious that the capitalization must at least equal the amount of money actually spent on the construction of the plant, plus the working capital required. This condition fixes the minimum possible capitalization, a matter with which promoters are rarely concerned. The second consideration, which fixes the maximum satisfactory capitalization, is that the plant should be capable of paying a reasonable industrial rate of dividend, continuously over a long series of years, on the total capitalization. It will be seen later that the minimum and maximum capitalizations thus arrived at are, contrary to the popular impression, not very far apart for average plants in the Eastern and Middle Western states. In other words, a plant can not be safely capitalized for an amount much in excess of its actual cost.

Minimum possible capitalization. In the case of a new plant, to be financed solely by stock issues, it is obvious that it can not well be capitalized for less than the actual cost of land, plant and working capital. It is possible to fix this necessary minimum with a fair degree of accuracy.

Under the most favorable conditions as to land, labor and

materials, it is impossible to erect a cement plant and supply it with working capital for much under one dollar of capital per barrel of actual annual output. In most parts of the country the ratio will run considerably higher, while in the Far West it may reach two dollars or even more per barrel of output.

On examining the table of actual capitalizations of existing companies on page 14, it will be seen that a number of the Lehigh district companies are capitalized at less than one dollar per barrel of actual output. It must be remembered, however, that most of these companies date back to periods when everything involved in plant construction was cheaper than at present, that many of them have financed new construction from earnings, and that there are occasional bond issues not considered in that table.

Maximum safe capitalization. The maximum capitalization which can be considered satisfactory is fixed by the consideration that it should not be so high as to endanger a fair dividend return. If we accept 7 per cent as a reasonable rate for an industrial, the plant should be so capitalized that it is possible to pay at this rate, on the whole capitalization, continuously over a long series of years.

If this rate of return be accepted as a fair expectation, the results given in the little table below are of course obvious.

Capitalization of company, per bbl. actual output.	Necessary net profits per bbl. to maintain dividend rate.
$1.00	7 cents
2.00	14 cents
3.00	21 cents
4.00	28 cents
5.00	35 cents

From what is known of present conditions in the cement business, and with the expectation that in all parts of the country its margin of profit per barrel will necessarily, though perhaps slowly, diminish in the future, it would seem highly inadvisable to capitalize a plant anywhere in this country for more than four dollars per barrel of actual output, even if at present the plant in question has a remunerative and well-protected local

market. In parts of the United States where the cement industry is already on a highly competitive basis, any capitalization over two dollars per barrel of output will result in handicapping the possible future growth of the plant. No new company, with all of its experience and growth still before it, can hope to become any serious factor in the American cement industry if it starts out with a narrow margin of safety, for the industry has now reached a stage where wide fluctuations in annual earnings may be looked upon as normal, and not as exceptional.

ACTUAL CAPITALIZATION OF EXISTING COMPANIES

Passing from more or less theoretical discussion of possible bases of capitalization, it is of interest to examine the experience of existing companies in regard to this point. During twenty years we have had a slow but steady sifting process at work, which has distinguished always between the weak and the strong companies. Periodically there come times when weak plants are either eliminated entirely, or experience temporary receiverships, or have their growth checked. The stronger, better managed or better located companies, on the other hand, pass through these periods of stress and emerge stronger, more important and larger than before. Of course all the differences between the sound and unsound companies cannot be charged against the manner in which they were originally financed, but the question of capitalization is of such importance in this connection that it merits careful study.

In the table below a selected series of American cement plants have been arranged by groups. Following each group are data on its total capitalization, its total nominal yearly capacity, and its actual output during 1907. The total capitalization given, in each case, omits bond issues and the stock issues of subsidiary companies, as these data could not be readily obtained. The error so introduced, however, will affect all the groups, and as the table is designed largely for purposes of comparison, may be dismissed with this note. In the last two

columns of the table are given, for each group, its capitalization per barrel of nominal annual capacity, and its capitalization per barrel of actual output during 1907. It will be seen that these figures, when the different groups are compared, are both striking and varied. The lesson to be drawn from the variations is noted below.

	Capitalization	Nominal capacity per year	Output, 1907	Capital per barrel of	
				Nominal capacity	Actual output
		Barrels	Barrels		
Group 1	$21,200,000	29,750,000	22,890,310	$0.71	$0.92
Group 2	2,050,000	2,550,000	2,050,284	0.80	1.00
Group 3	15,217,000	17,465,000	7,983,676	0.87	1.91
Group 4	21,750,000	7,600,000	2,775,247	2.86	7.83
Group 5	19,300,000	5,400,000	2,581,744	3.57	7.47
Group 6	25,250,000	6,980,000	2,792,000?	3.62	9.50
Group 7	14,200,000	2,750,000	1,289,839	5.16	11.01

The companies included in the above table represent about three-quarters of the total American production of Portland cement, so that the results obtained from examination of the table may be considered to have a broad comparative value. The grouping adopted is as follows:

Group 1 includes seven of the largest cement companies operating in the Lehigh district of Pennsylvania-New Jersey. The companies here included are all large, the smallest producer making in the neighborhood of one million barrels per year, while the group together makes almost half of the total American output of cement. The capitalization of these companies averages only 71 cents per barrel of nominal capacity, and 92 cents per barrel of actual output. In other words, a profit of only 5 cents per barrel of cement would be sufficient to enable the payment of 6 per cent dividends on the stock of his group.

Group 2 is of interest as showing that common-sense and conservative capitalization are not necessarily confined to the larger companies. This group consists of four relatively small companies

operating in the Lehigh district—companies whose plants produce from one-quarter to three-quarters of a million barrels annually. The capitalization per barrel is, it will be noted, only slightly in excess of that of Group 1.

Group 3 includes fifteen companies operating in various parts of the United States outside of the Lehigh district, but mostly in the East and Middle West. These particular companies have been selected as being, so far as known, in absolutely sound technical and financial condition. The group may therefore be assumed to be representative of the better class of American cement companies, exclusive of those in the Lehigh district. The average capitalization of the group is 87 cents per barrel of nominal capacity, and $1.91 per barrel of actual output.

The companies included in the three groups so far considered agree in being commercially successful, thoroughly sound, and conservatively capitalized. With Group 4, however, we reach companies of an entirely different class, affording an interesting contrast to those of the three first groups.

Group 4 includes seven plants, all except two of which are located west of the Mississippi, and all of which are known to have been built for the sake of the promotion profits, and not for the sake of creating sound industrial enterprises. It will be seen that their capitalization amounts to $2.86 per barrel of nominal capacity, and to $7.83 per barrel of actual output during 1907. It will also be noted that their actual output was only 36 per cent. of their rated capacity, a condition which often occurs in "promoters" plants. To pay 7 per cent. dividends on their stock issues, the plants of this group would have to show net earnings of 55 cents per barrel of actual output.

Group 5 includes five plants, some in the Lehigh district and some elsewhere, which owe their present condition not to original overcapitalization but to later injudicious stock issues. They were able to produce during 1907 almost 50 per cent. of their rated capacity, but their basis of capitalization is so high as to render them unsafe except in boom times.

Group 6 includes eight recently advertised promotions—three in the Lehigh district and five elsewhere. Assuming that they can turn out 40 per cent. of their nominal capacity, which is probably over the mark, these plants will have to earn net profits of 66½ cents per barrel, in order to pay the assumed dividend rate of 7 per cent. The possibility of doing this is hardly worth considering, in

spite of which fact most of the promoters promise not 7 per cent., but 20 per cent. or 25 per cent. dividends.

Group 7 includes nine cement companies which are now, or have been recently, in the receiver's hands. The cause of failure seems to be obvious when attention is directed to the basis on which this group of plants was capitalized. Referred to their nominal or rated capacity, these plants were capitalized at $5.16 per barrel, which proved to be equivalent to $11.01 per barrel of actual output. There is, in this case, no need to point a moral.

CHAPTER
VII

CEMENT BOND ISSUES

BOND issues make up a very small percentage of the total securities outstanding against existing cement plants, by far the greater portion of the total capital required for the construction and operation of these plants having been raised through stock issues alone. It seems, however, as if the series of companies now in various stages of promotion expect to place more dependence on bonds than did the older companies, and it is very probable that the bonds issued against such prospective plants will amount, in the next few years, to a heavy total. As pointed out later, the security back of bonds issued against unbuilt plants is usually very different, both in kind and in amount, from that which is back of the bonds of seasoned companies.

THE GENERAL STATUS OF INDUSTRIAL BONDS

The average small investor, accustomed to the use of the word "bond" to designate our Government securities, has shown a tendency to consider that any security called a bond has of necessity certain elements of soundness and respectability not inherent in other securities called stocks. There is, of course, a certain reasonable basis for this belief. When the two terms are properly used, the stockholder is merely a partner, while the bondholder is a creditor; and so long as the security back of the bond issue is of proper character and amount, there is little possibility of loss on a bond investment as compared with that on a purchase of stock. In dealing with an industrial bond it is peculiarly necessary to see that this security is present.

Under ordinary conditions, it may be said that a sound bond issue should fulfil two conditions:

1. Security of principal. The bond issue should be so small, relative to the value of the property it covers, that even in a foreclosure sale the property will bring enough to pay off the bonds in full.

2. Security of income. The earning power of the property against which the bonds are issued should be sufficient to cover, even during a series of the poorest business years, the annual charges on the bonds.

A third condition it is highly desirable, though not necessary, that the bonds should fulfil:

3. Increase in security. The average surplus earning power of the property should be sufficient to permit either the creation of a bond-retirement fund from earnings, or the creation of an additional equity through expenditures on the enlargement and improvement of the property.

All of the above conditions are fulfilled by the average first mortgage issue of the better American railroads. They are often fulfilled by issues of bonds against old-established and prosperous industrial concerns. They can rarely, if ever, be fulfilled by bonds issued against industrial plants before the completion of such plants.

BOND ISSUES AGAINST ESTABLISHED PLANTS

Occasionally bonds are offered which are a lien against the plants of old and well-established cement companies. When this is done, it is usually for one of two purposes. Either the proceeds of the bond issue are to be spent for new construction, or the bonds are issued in order to capitalize expenditures already made for extensions and previously paid for out of surplus.

Bonds issued under such conditions must, for satisfactory flotation, be accompanied by reasonably full statements as to the present financial condition and past earning capacity of the company. If these statements show that, even during the poorest years, the minimum net earnings of the company would have been sufficient to pay the annual charges on the bond issue, the

question of security of income may be regarded as settled. As to security of principal, data should be obtained showing the value, above existing liens, of the present properties of the company. Satisfactory arrangements to retire the bonds at or before maturity through sinking fund operations must also be described in detail.

Assuming that the security offered is ample, the question remaining is as to the price at which cement bonds of high grade would become reasonably profitable investments. To judge from the more extended data which we have on iron and steel securities, even first-class cement bonds during years of depression might be expected to sell on a $6\frac{1}{2}$ to 7 per cent income basis, while in years of high security prices they may sell on a 5 or $4\frac{3}{4}$ per cent basis.

BOND ISSUES AGAINST UNBUILT PLANTS

Bond issues against unbuilt plants make up a relatively small proportion of the flood of new cement securities with which the country has been deluged during the past few years. There are indications that this type of promotion is becoming more favorably thought of, and with the advent of prosperous times we may fairly expect to see bond issues on proposed plants appear in quantity.

It may be said to the credit of such issues that they are rarely turned out in connection with absolutely fraudulent schemes. They offer a decided advantage to the honest but impecunious promoter, in that by a bond issue he may borrow sufficient money to more than pay for the construction of his plant, while he still owns and controls the company through its stock issue. That such a condition is possible is due entirely to the magic which inheres in the word "bond." If the securities so offered were called stock, or even preferred stock, they would be very difficult to float at par, but as bonds they find a ready market, even though it is demonstrable that such bonds are little more secure than the stock issues which they precede.

EXAMPLES OF TYPICAL CEMENT BOND OFFERINGS

The characteristics of bonds issued against uncompleted industrial plants are best brought out by a study of actual instances. For this purpose two fair examples have been selected from among the offerings of the past year. These particular examples have been picked out because they contain all the elements necessary for use as illustrating the general features of such bonds. The propositions with which they are connected are neither strikingly bad, nor exceptionally good, as compared with the average run of recent cement promotions, so that these two bond issues can be accepted as being fairly representative of the whole group of similar issues.

Example 1. Offering of an issue of $1,500,000 bonds of an unbuilt cement plant. Bonds are 6 per cent, twenty year, first mortgage. Capital stock of company is $2,500,000. "A first offering of the bonds of this company to the amount of $750,000 is made to investors at par with absolute assurance of their conservative, safe and attractive character. They are based upon the most reliable and substantial security, the value of which is four or five times as great as the par value of the entire bond issue as demonstrated by the development and opinions of experts and engineers as to the vast resources of coal, shale and limestone on the land owned by the company." Proceeds to be used in construction of a plant with capacity of 2,000 barrels per day.

The "most reliable and substantial security" above noted consists of the following items:

1. The bonds are a first mortgage on 4,420 acres of land. "Expert opinion has estimated that the value of the coal on the property, on a basis of 10 cents per ton in the ground, would return to the company over $3,000,000; and the shale and limestone, estimating each item at 2 cents per ton in the quarries, the values of each would be $2,000,000, a total minimum valuation of raw material on the company's property of $7,000,000."

2. The bonds will be a first mortgage on a 2,000-barrel plant when built, which plant is to be built on the proceeds of the bond sale. The construction of such a plant, it may be noted, would cost perhaps $600,000. The reliable experts of the company figure that it can produce cement at "a cost not exceeding $1.75 per ton

of cement, readily salable at $6 per ton or more at the mill." These figures may be assumed to correspond approximately to 35 cents and $1.20 per barrel, respectively, and such a margin of profit is certainly interesting—if true. On this basis it is a simple matter to prove that a 400-ton plant, operating 365 days in the year, would make a net profit of $620,500 annually, which is obviously ample to provide not only for the $90,000 of fixed charges on the bonds, but for heavy dividends on the stock and for ample retirement funds.

Example 2. Offering of an issue of $2,000,000 bonds of an unbuilt cement plant. Bonds are 6 per cent, twenty year, first mortgage. Capital stock of company is $5,000,000. Bonds offered at par, with stock bonus to secure funds for construction of a 5,000-barrel plant, with guarantee of $100,000 working capital. Present security back of bonds is the ownership of 700 acres of land. The ultimate security will be a mortgage on a plant costing possibly $1,500,000. A plant of this size, operating 360 days in the year, and making a net profit of 65 cents per barrel, will, as pointed out in the prospectus, show total net profits of $1,170,000 annually. This is of course ample to cover the charges on the bonds, which amount to only $120,000 per annum.

SECURITY OFFERED FOR BOND ISSUES

The two preceding examples have been selected from among recent bond offerings, to illustrate more fully the type and amount of security that is offered for bonds of this class. These issues have been extensively advertised, and are fairly typical of their class in all respects. On examination and comparison it will be seen that they offer security of precisely the same present grade, and differ only in the enthusiasm with which they set forth the possible future earning power of the plants when completed. In each case the bonds as now issued are secured by a first mortgage on certain real property at present unimproved but underlaid by ample deposits of cement materials. In each case the purpose of the bond flotation is to secure funds for the erection of a large modern cement plant on the company's property. In each case the amount of funds to be raised by the bond issue is considerably in excess of the cost of constructing such a plant. In each case, therefore, the ultimate security back of the bonds will represent less than 100 per cent

of the face value of the bonds themselves, to say nothing of the liberal stock issues.

When these facts are considered, it is obvious that such bond issues are very inadequately secured. In case of default and foreclosure, the plant could not be expected to bring under forced sale anywhere near its actual cost of construction, and therefore the bondholders cannot expect to get back, in such a contingency, as much as they paid for their bonds. So long as the plant is in profitable operation, holders of such bonds are secured, but a receivership means a heavy scaling down in the bonds. A banker accustomed to dealing in investment securities will realize that these characteristics—safety in time of prosperity, but heavy loss of value on receivership or reorganization —are characteristic, not of the usual first mortgage bond to which he is accustomed, but of junior issues, debentures and the stock issues. He should be prepared, therefore, to scrutinize even more carefully than usual the provisions of the deed of trust, and the evidence offered that the bond issue placed before him will always be secured by earnings, since it is not fully secured by property value. Regarded purely as income bonds or as preferred stock, such bond issues may have some value, but they must obviously be differentiated sharply from such well-secured issues as the average railroad first mortgage.

EARNING POWER BACK OF THE SECURITY

Since the issues in question are really to be regarded as debentures, the principal question which the banker or bond-buyer must settle is whether the proposed plants will every year over a long series of years show sufficient net profits to accomplish the following objects:

1. To satisfy the annual interest charges on the bonds.
2. To set aside an ample allowance for replacement of raw materials used.
3. To make heavy allowances for depreciation of plant.
4. To provide for improvement and growth of plant, so that in time the property security for the bond issue will increase.
5. To provide a sinking fund for the retirement of bonds.

In determining the adequacy of the probable earning power of the plant, certain data are readily available. Annual Government reports, which have now been issued for a long series of years, furnish detailed figures on the production and average selling value of cement and of fuels, in each state of the Union. These figures alone will serve to controvert many of the highly exaggerated estimates presented in prospectuses as to the possible profits in the cement business. For a proposed plant in any given district the question of probable profits and growth will demand consideration of a large number of factors—labor conditions, character of raw materials available, grade and cost of fuel, economy of plant construction, location and status of competitive plants, freight rates, present size and possible growth of local market, average previous selling prices in both local and competitive markets. When these questions have been settled satisfactorily, there still remains a more important personal problem—whether or not the proceeds of the bond issues will be entrusted to men who will use them honestly, economically and intelligently in the construction and operation of the proposed plant.

CHAPTER
VIII

THE PROFITS AND LOSSES OF CEMENT MANUFACTURE

BEFORE closing this discussion of the financial side of the cement industry, it is necessary to take up more directly the question of profits, in order that some idea may be obtained as to what may reasonably be expected from an investment of this nature. It would, of course, be possible to work out a purely theoretical exposition of this phase of the subject, giving estimated costs of cement manufacture under certain fixed conditions. But the conditions governing costs are so numerous and variable, that this method of procedure would seem to promise results of little general utility. In place of such general estimates, the present chapter, therefore, contains summaries of the actual results obtained in the operations of several large and well-known Portland Cement companies. Examination and study of these accounts will serve, far better than mere estimates, to correct the errors involved in the extravagant claims of promotion literature.

ACCOUNTS OF A LEHIGH DISTRICT CEMENT COMPANY, 1899-1907

The accounts summarized below are those of the American Cement Company, one of the largest of the Lehigh district companies:

The American Cement Company is the only large cement corporation whose stock is listed on one of the larger exchanges, and which publishes audited annual reports. Its policy of full

publicity deserves the more credit in that it considerably antedates the much advertised adoption of the same policy by the United States Steel Corporation.

Financially, the American Cement Company of New Jersey is a holding company, with a capital stock of $2,000,000, and an original bond issue of $1,000,000, now considerably reduced through sinking fund operations. At various dates smaller bond and stock issues have been made for the account of subsidiary companies, but the bulk of these issues of the subsidiaries have been absorbed through the operations of sinking funds and by direct appropriation from surplus.

Industrially, the subsidiaries of the American operate a group of plants in the Lehigh district of Pennsylvania, with a rated or nominal capacity of 2,400,000 barrels annually, and an actual output quite closely approximating to that amount, as shown by the annual reports. A relatively small portion of this output is natural cement, but by far the bulk of the production is Portland Cement. One of the subsidiaries is the selling agency for the product of the others.

A summary of the results of the company's operations for the years 1900 to 1907, inclusive, follows:

	1900	1901	1902	1903	1904	1905	1906	1907
Net earnings of subsidiaries.	371,523	246,334	296,480	492,145	216,190	208,815	420,183	481,810
Fixed charges.	102,688	77,812	80,537	97,769	95,625	90,910	117,012	128,358
Surplus over charges . .	268,835	168,522	215,943	394,376	120,565	117,905	303,172	353,451
Expenses of holding Co.	17,296	15,954	22,467	19,703	11,964	12,630	15,512	22,412
Balance available for div.	251,539	152,568	193,475	374,673	108,601	105,275	287,660	331,039
Dividends paid	220,000	160,000	160,000	160,000	140,000	120,000	140,000	140,000

The balance available for dividends, or the net profit of the American Cement Company of New Jersey, in each year since its organization, is given in the following table. The second column of this table contains the actual amount of such annual

profits in dollars; the third column gives the same items expressed in percentages of the stock capitalization of the company.

Year.	Net profits.	Profits in per cent of capital.
1900	$251,539	12.57
1901	152,568	7.62
1902	193,475	9.67
1903	374,673	18.73
1904	108,601	5.43
1905	105,275	5.26
1906	287,660	14.38
1907	331,039	16.55
Average,	$225,604	11.28

When it is borne in mind that the American Cement Company is conservatively capitalized, its stock issue being only slightly in excess of one dollar for each barrel of actual annual output, it will be seen that the cement industry does not yield profits at the extravagant rate claimed by promoters. An average profit of slightly over 11 per cent, as shown by eight years' experience, cannot be considered more than a fair industrial return, by no means comparable to the profits obtainable in the iron and steel business under favorable conditions. On the other hand, while these accounts show no abnormal profits, they also show no serious tendencies toward deficits.

ACCOUNTS OF A MICHIGAN CEMENT COMPANY, 1906, 1907, 1908

The Wolverine Portland Cement Company, operating in Michigan, has published, at various dates, its annual reports for the three years ending on February 28, 1908. These are of interest for comparison with those from the Lehigh district cited previously.

As an introduction, it may be said that the Wolverine is one of the best of the Michigan companies which use marl and a wet process. It operates two plants, in closely adjoining towns,

and is credited with a rated or nominal capacity of 800,000 barrels per year. It may be noted that its actual output is much nearer to its rated capacity than in most cement plants. The income account for the three years in question follows; rearranged somewhat from the form in which it has usually been published:

Income account of Wolverine Portland Cement Company. For year ending February 28.

	1906	1907	1908
Gross receipts from operation	$655,981	$887,014	$705,292
Operating costs, repairs and taxes	514,777	555,567	496,729
Net earnings from operation	141,204	331,447	208,563
Rents and other income	11,635	957	1,421
Total net earnings	152,839	332,404	209,984
Charged off, depreciation, etc.	52,839	37,404	14,984
Balance available for dividends	100,000	295,000	195,000
Dividends paid during year	60,000	260,000	195,000
Surplus for year	40,000	35,000	0
Previous surplus	125,000	165,000	200,000
Surplus at close of year	$165,000	$200,000	$200,000

A very much condensed general balance sheet for the same three years follows:

BALANCE SHEET OF WOLVERINE PORTLAND CEMENT COMPANY.

	As of February 28,		
Assets	1906.	1907	1908
Permanent assets	$ 987,241	$ 977,919	$ 974,711
Current assets	152,440	101,097	102,519
Cash assets	38,480	128,025	128,429
Total assets	$1,178,161	$1,207,042	$1,205,659
Liabilities.			
Capital stock	$1,000,000	$1,000,000	$1,000,000
Surplus	165,000	200,000	200,000
Accounts payable	13,160	7,042	5,659
Total liabilities	$1,178,161	$1,207,042	$1,205,659

On inspection of the income accounts above presented, it will be seen that the net earnings from operation have, in the three years covered by the reports, amounted respectively to 14.12 per cent, 33.14 per cent and 20.85 per cent on the total capitalization of the company. This is at the average rate of 22.71 per cent per annum. The operating ratio is very low, the operating costs for the three years amounting respectively to 78.1 per cent, 62.6 per cent, and 70.4 per cent of the gross receipts. The amounts carried as "charged off, depreciation, etc." appear to have been selected for the simple purpose of leaving a surplus which could be stated in conveniently round figures. In each year the dividends paid have been at a rate which practically used up the balance available for dividends.

In view of all these facts, a proper interpretation of the reports would require a knowledge of factors which are not presented. If the operating costs quoted contain proper allowances for depreciation, then the operating ratio is so low as to point to unusually low mill costs for a plant of this type.

DIVIDENDS OF TWO ESTABLISHED COMPANIES

It is of interest to compare the extravagant dividends promised in the average prospectus with the results of actual experience in the past. The table below contains data on the dividends paid by two large and well-established cement companies during a long term of years. The two companies have been selected as covering a wide range in locality and practise. The American Cement Company is one of the largest in the well-known Lehigh district of Pennsylvania, which certain natural advantages have united to make the principal cement producing region of the United States. The Sandusky Portland Cement Company, on the other hand, is the largest and probably the best equipped of the group of plants in the Middle West which use marl as a raw material. The two companies, therefore, differ widely as to location, markets and technical factors, but agree in being long and favorably known as large cement producers. In spite of this last fact, it will be seen from the fol-

lowing table that neither of them has been able to show the twenty per cent to thirty per cent annual dividends that are so freely promised by promoters at the present day:

Dividends paid by established companies, 1898-1908.

Year	American Cement Co.	Sandusky Portland Cement Co.*	
	Rate	Preferred Stock	Common Stock
		Rate	Rate
1898		6 per cent.	2 per cent.
1899		6 "	4 "
1900	8 per cent.	6 "	6 "
1901	8 "	6 "	4 "
1902	8 "	6 "	6 "
1903	8 "	6 "	6 "
1904	7 "	6 "	3 "
1905	6 "	6 "	6 "
1906	6 "	7 "	7 "
1907	8 "	4½ "	3 "
1908	6 "		
Average	7.22 per cent.	5.41 per cent.	4.27 per cent.

* In justice to the cement industry it is necessary to point out that, in addition to the dividends above noted, stockholders of the Sandusky Cement Co. have at various dates received "rights" whose exact value is difficult of determination.

THE CHANCE OF SUCCESS AND FAILURE

A favorite claim of the cement promoter is that the cement industry has been free from failures. This claim, ridiculous enough on its face, is by no means difficult to disprove. Ever since its commencement in the United States, the Portland Cement industry has had its full share of disappointment, litigation and failure.

In the early stages of the industry here, a large number of plants failed, not primarily because of financial troubles, but because of technical difficulties. Of the plants built at different points between 1875 and 1895, it would probably be a fair estimate to say that not over half have been able to survive these early difficulties and get on a sufficiently sound footing to be in existence at the present day. From 1895 to 1905, the percent-

age of mortality among cement plants was less, because, while the technical side of the matter had come to be well understood the companies formed were still conservatively financed and managed. During the past few years, however, the percentage of litigation and failure has again increased, for the business world and the courts now have to deal with a large number of badly handled companies, promoted more for the sake of stock selling than for cement manufacturing. Recent troubles have, therefore, been chiefly due to fraudulent promotion or to foolish investment.

On going over a long series of records concerning cement companies which have been organized during the past five years, certain ratios of success seem to be fairly well established. These may be summarized as follows:

1. Of one hundred cement companies taking out charters, over half will fail to sell sufficient stock to even commence actual construction. In these cases the stock purchaser may receive back some of his money.
2. Of the plants which begin construction, about half are unable to complete it without reorganization and new security issues.
3. About 25 per cent. of the plants which actually get to the operating stage default on their bond issues at some time during the first five years of their history, or are prevented from such default only by the issue of secured notes or other securities paid for by the stockholders.
4. Of each hundred companies organized, not over five will ever pay dividends to the original stockholders sufficient to make a fair interest return on the investment.

These conditions are not due to any radical unsoundness in the cement industry itself, as compared to any other important line of industrial activity, but to the unsound manner in which too many of the recent cement projects have been financed and handled. Given an originally sound proposition, with conservative financing and good management, and a cement company has as much chance of ultimate success as a new iron or steel company. The margin of profit in the industry is, however, now too low to permit overissue of securities, technical unsoundness, or careless control.