“Growth of Cement Industry on Pacific Coast”

From *Concrete-Cement Age*, April 1913, Vol. 2, pp. 196-198

(This magazine is available on Google Books at the following web address.)

http://books.google.com/books?id=TI_mAAAAMAAJ&dq=%22Growth+of+Cement+Industry+on+Pacific+Coast%22&source=gbs_navlinks_s

This article, which begins on the next page, is presented on the
Stone Quarries and Beyond web site in the California state section.
http://quarriesandbeyond.org/

Peggy B. Perazzo
Email: pbperazzo@comcast.net
June 2011

"Growth of Cement Industry on Pacific Coast"

By Charles A. Newhall

From *Concrete-Cement Age*, April 1913, Vol. 2, pp. 196-198

"The industry on the Pacific coast is a little more than 29 years old. In the late 80's and early 90's, two plants in California were making a natural cement from the argillaceous limestones occurring at Jamul in southern California and at Santa Cruz in the central part of the state. A plant at Benicia, north-east of San Francisco, was making a cement from a calcareous conglomerate. At these plants the natural rock was quarried and broken up by hand. This rock, without further treatment, was burned in standing kilns of simple construction. The burnt rock was cooled and then picked over by hand. The pieces that showed the proper degree of burning were crushed and ground to a powder in the old-fashioned burr mill. The equipment of one of these natural cement plants probably would not cost to exceed $5,000. The whole process was exceedingly crude and the investment very small as compared with the modern cement plant.

"Moreover the cement made at these early plants was untrustworthy and exceedingly irregular in quality. The cement made at Benicia was used in the construction of the city hall at San Francisco and the poor quality was well shown in the ruins after the big earthquake of 1906.

"The poor quality of the cement and competition with imported Portland cement caused these natural cement plants to cease operation.

The First Pacific Coast Plant, 1884

"The first plant to make a true Portland cement of good quality was operated in Oregon. Several early writers mention this plant and state that it was the first to use successfully a rotary kiln. I had long tried to get particulars about this plant. None of the cement men on this coast had ever heard of it and I have never found anything in the literature more than the statement given above. The history of this plant would be particularly interesting, for the reason that Oregon is now one of the few states in the Union and the only state on the coast in which no plant is operating or is likely to operate. When I was in Portland, I took pains to find out something about the long-lost plant. After going through the State Geological Survey reports and old newspaper files, I found a reference to the Portland Cement Co., of Portland, together with names of officers. One of these men I found is still living in Portland. This gentleman told me that he had not thought of the plant for 25 years. In 1884, when he was a young fellow he had put all his money – about $5,000 – into the proposition and had served as secretary for the company. The plant was located at Oregon City on the spot where the city pumping plant now stands. The factory was designed and managed by a Mr. Middleton. This man must have been a genius in his line, for his plant was built along plans that did not come into general use, even in the older cement plants in the East, until 10 years later. The raw material, a cement rock from southern Oregon, was ground in pebble mills and this raw mix was burned in a gas fired rotary kiln. The resulting clinker was ground to a cement in a pebble mill. The gas was made for the most part from Australian coal, though local coast was used to some extent.

"The output of this pioneer plant was 100 bbls. per day of true Portland cement. The product was in great demand and was superior in quality to the imported Portland cement. The cement was used in sidewalks and curb work and in making artificial stone.

"The plant was operated on this scale for a little over a year and then it was decided to raise the capitalization of $50,000 and increase the capacity of the plant. About this time the directors ordered a survey of the quarry. It was discovered that the rock was practically exhausted. They had been operating on a thin saucer-like body of stone that was standing on edge against the side of the hill. What they had supposed to be an inexhaustible mountain of stone was in reality a thin veneer.

"This discovery led to discord. Some of the stockholders quit. Middleton and the heaviest stockholders attempted to rebuild the plant and operate on other quarries but with poor success. They finally gave up and along about 1890 the machinery was broken up and sold.

Later Developments

"In 1894, Uriah Cummings, one of the most experienced men in the cement business and owner of a large factory in New York, planned to start a plant near Los Angeles. He knew the game thoroughly, and went into the matter of transportation and freight rates at the very first. At that time the railroad practically owned California. After delaying matters for several months the officials called Mr. Cummings into a conference and presented him with a tariff sheet. These rates, he discovered, had been figured exactly to balance the profit he had counted on making. He told them that they were working a hold-up game and that he would not pay their rates. He then gave up all plans of operating a plant on the coast and went back East.

"The first plant to operate successfully was started in 1898 by the California Portland Cement Co., at Colton about 50 miles east of Los Angeles. The initial capacity to 2,500 bbls. per day, of 'Colton' cement. With modern machinery and new methods of controlling the raw materials, this plant is now making a high-grade cement.

"In 1903, two plants were started; the Standard Portland Cement Co., at Napa Junction, Cal., and the Pacific Portland Cement Co., at Cement, Cal. Both of these plants were near tide-water on San Francisco Bay. Both companies were very successful from the start. The cement compared favorably with any on the market at that time and was in great demand on account of the price being a little lower than that of the imported cement. Both plants were enlarged from time to time and in 1906 each company built a new mill.

"The new mill of the Pacific Portland Cement Co. was located only a short distance from the old mill. Both mills draw raw material from the same quarries, so the product of each mill is essentially the same. The combined capacity of the two mills of the Pacific Portland Cement Co., is about 5,000 bbls. per day of 'Golden Gate' cement.

"The Standard Co. located its new plant, the Santa Cruz Portland Cement Co., at Davenport, Cal., near Santa Cruz, and about 150 miles south of San Francisco. The raw materials used at this new plant were vastly different from the materials used at the old plant at Napa Junction and consequently there was a great difference in the quality of the finished product, that made at Santa Cruz being a lower grade cement. The attempt to market the cement from both mills under the same brand was a failure and the company was later reorganized. The Napa Junction plant marketed the 'Standard' brand. The factory at Santa Cruz was remodeled and a different kind of raw material used. The product was marketed as the 'Blue Cross' brand. The Santa Cruz plant is the largest single unit in the world, with a rated output of 12,000 bbls. Per day.

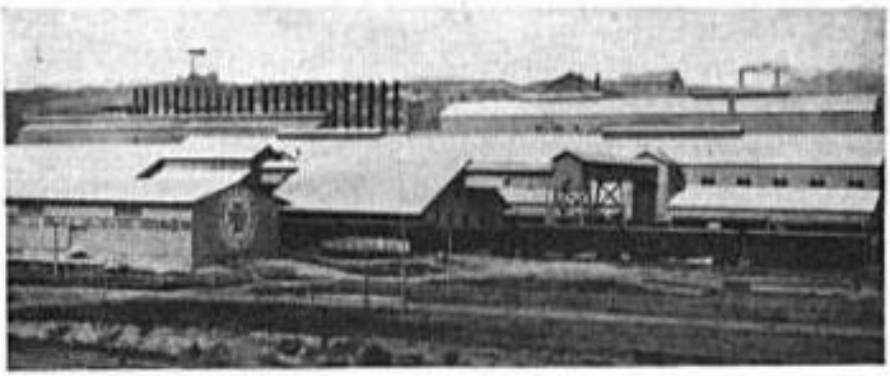

FIG. 1—WHERE "BLUE CROSS" CEMENT IS MADE: THE SANTA CRUZ PORTLAND CEMENT CO'S. PLANT FROM THE OCEAN

"In 1907 the Washington Portland Cement Co. started operation at Concrete, Wn., in Skagit county, with a capacity of 800 bbls. per day. Three years later the capitalization was raised to $700,000, and the daily capacity was increased to 2,500 bbls. of 'Washington' cement.

"The next year, 1908, the Superior Portland Cement Co., was started, the plant not one-half mile away from the plant of the Washington. The Superior is capitalized at $1,000,000 with a daily output of 1,500 bbls. of 'Superior' brand per day.

"In 1909, two plants were started; that of the Riverside Portland Cement Co., at Riverside, Cal., with a capacity of 3,000 bbls. per day of 'Riverside' brand; and that owned by the Los Angeles Aqueduct Commission of the City of Los Angeles.

"The history of this experiment in municipal ownership is interesting and I would like to go into details but the discussion would hardly fall in with my subject. It is sufficient to say that when the Aqueduct Commission called for bids on something like 1,000,000 bbls. of cement the manufacturers put in a figure that seemed unduly high. The engineers of the Commission figured that they could build and operate their own plant and still save the City a good sum, so the bids were rejected and the municipal plant constructed. Figures given by Mr. Mulholland show[1] that the city has been saved a considerable sum over the original bid of the manufacturers but would break about even at the price which cement is now offered.

([1] Ch. Engr. Los Angeles Aqueduct Commission.)

"In 1910 the plant of the Golden State Portland Cement Co., was started at Ore Grande – on the Mojave Desert, in southern California. This plant is capitalized at $200,000 and rated at 1,000 bbls. per day.

"In 1911 the Inland Portland Cement Co., - a subsidiary of the Lehigh Portland Cement Co., Allentown, Pa. – began operation at Metaline Falls, Wn., north of Spokane.

"In 1913 three new plants will be in operation – the International, just out of Spokane – the Olympic in Bellingham, Wn., and the San Juan near Watsonville on Monterey Bay, Cal.

Changes in 29 Years

"In the 29 years since 1884 the cement industry on the Pacific coast has grown from the single plant at Oregon City with its 100 bbls. per day capacity and $50,000 capitalization to a total of 13 plants, capitalized at about $24,000,000 and with a combined output of about 38,500 bbls. per day.

"During this 29 years of physical growth there has been an even more astonishing change in the quality of the cement. While it is common knowledge that the industry has grown very rapidly but few people realize or know of the revolutionary changes that have taken place in the methods of manufacture with the resulting changes in the quality of the cement produced by these new methods. On the Pacific coast these changes have been felt within the last five years only, though in Europe and the East the transition from old methods to new has been more gradual and has extended over a period of about 15 years.

"Even 10 years ago very little was generally known about the chemical and physical changes that take place in the manufacture of cement. The whole process was shrouded in mystery. Each mill superintendent had his own formula for 'making the mix' and for treating the raw materials. There were many 'patent methods' and 'secret methods' of making cement. I know one man who made a tidy sum by selling his secret formula for making cement to a group of capitalists. Another took in a royalty on every bbl. of cement sold for years because of a patent he held on a fluxing agent. Once, in all innocence, I explained to the superintendent of our plant how we calculated the mix; when my chief – an old timer of the mysterious sort, – found out what I had done, I nearly lost my job; in fact, this bit of communicativeness on my part eventually led to my undoing at that plant.
"Let me say right here that there is nothing mysterious in making cement. It is just a matter of plain chemical engineering and the use of ordinary common sense in keeping a bunch of men working happily together. The process of making cement consists in grinding a mixture of limestone and clay together to a fine powder and heating this mixture to incipient fusion; this partly fused entire mold should cost in time spent. A mold must be as nearly perfect as the cement. That in a very few words describes the whole process of cement making.

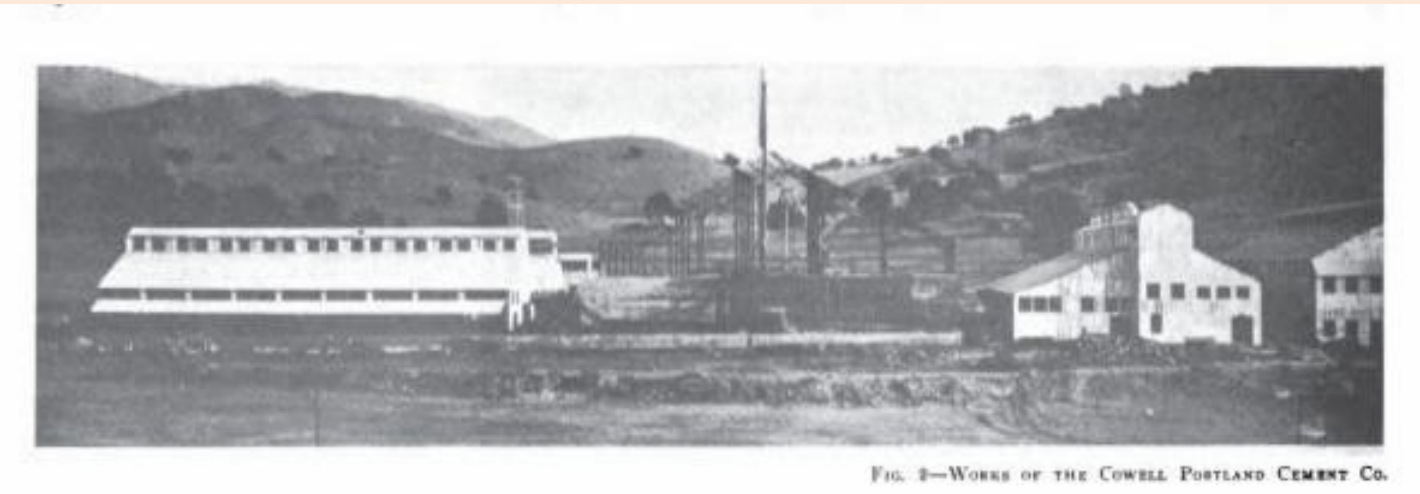

FIG. 2—WORKS OF THE COWELL PORTLAND CEMENT CO.

Cowell, Cal., "Mt. Diablo" Cement

The Chemical Engineer in the Cement Plant

"The great change in the quality of cement took place when the plant manager no longer heeded the methods of the mysterious people but changed to the wide-open methods of the chemical engineer. It has taken some plant managers a long time to order the change and sometimes the change was made in a half-hearted way, because of the expense involved. Always there was fighting and grief between the men of mystery and the chemical engineer because no man will see himself displaced without putting up a fight. Every plant on the coast is now run according to the principles and methods of chemical engineering. In some the principles are heeded more than in others and the quality of the product varies in proportion to the number of times these principles are disregarded.

"Now the principles of chemical engineering as applied to the cement business may be stated as: first, a complete knowledge of the chemical composition of the raw materials; and second, full control of every step in the manufacturing process.

"The first five plants here on the coast were constructed without any regard for these points. Economy in handling the materials was the main feature in their design.

"In these plants no provision was made for sampling and testing the raw materials prior to mixing. In one plant where I worked, the mix was made 48 hrs. before we had a chance to check the composition. If the composition was found to be wrong, we had no way of correcting it. I have often seen the composition of the mix jump in two hours from 70% to 77% carbonate of lime. Nowadays we get excited if the composition varies by ½ of 1% in a 24-hr. mix. Of course all this guess-work meant an irregular and low-grade product.

"Competition and more stringent demands on the part of consumers soon forced the remodeling of the old plants. Storage bins for ground limestone and ground clay were installed so that the chemist could determine the exact composition of the raw materials and thus be in a position to make a uniform mix. In the latest plant the further refinement of a correction tank has been installed. The chemist has a second chance to analyze the mix and bring it to the exact composition desired, thus insuring a cement of absolutely uniform quality.

"Nowadays in an up-to-date plant every step in the manufacturing process is under close watch. The fineness of the raw mix and of the finished cement is tested every hour of the 24. Each kiln is watched closely and kept under accurate control by means of variable speed motors. In one plant, recording pyrometers[2] and draft gauges are in use on each kiln. The chemist has found that a uniform fineness and a uniform kiln treatment are just as essential to the production of a high-grade cement as is an exact chemical composition.

([2] A description of such an installation is published on page 20 of the Cement Mill Section for Feb., 1913.)

"To indicate the great change in quality that has been brought about by those new methods it is of interest to compare the tests of Sample No. 8 shown in Table II with the following tests (Table I) made five years ago. These cements were made at the same plant and from the same materials. The new process cement is 240% better than the old.

TABLE I.

Fineness: Through 100-mesh sieve		89.75%
" 200 " "		69.63%
Set: Initial		5° 10'
Final		7° 40'
Tensile Strength: Neat	1 da.	203 lbs.
	7 "	695 "
	28 "	755 "
1 cement: 3 sand	7 "	131 "
	28 "	194 "

*(°) is used here for "hours;" (') for minutes.

TABLE II.

TEST SHEET SHOWING VARIATION IN QUALITY OF PORTLAND CEMENT

Sample No.	Fineness % through 100-mesh	Fineness % through 200-mesh	Set Initial	Set Final	Soundness	Tensile strength in lbs. per sq. inch Neat Cement 1 da.	Neat Cement 7 da.	Neat Cement 28 da.	Sand 3 to Cement 1 7 da.	Sand 3 to Cement 1 28 da.
1	90.0	69.6	2° 45'	6° 45'	poor	250	535	710	135	200
2	98.4	84.0	3° 45'	6° 15'	perfect	212	532	660	285	375
3	92.0	81.6	4°	6°	"	215	550	700	180	350
4	97.6	91.2	3° 20'	6° 30'	"	430	750	900	450	475
5					"	275	645	710	250	420
6					"	167	602	775	230	395
7					"	70	285	600	100	258
8	94.0	95.2	2°	6°	"	340	820	890	445	590
8a	(Mixed 4 sand:1 cement instead of 3:1)								390	390

Detail of Samples used:

No. 1 Cement used in Vancouver, B. C. Brand "A," very low grade.
No. 2 Cement used in Vancouver, B. C. Brand "B," average quality.
No. 3 Cement used in Seattle, Wn. Brand "C," low grade.
No. 4 Cement used in Seattle, Wn. Brand C," high grade; bought one month later than No. 1; furnished after No. 2 had been rejected.
No. 5 Cement. Brand "D," fresh from grinding mills.
No. 6 Cement. Brand "D," stored in sealed jars for 90 days.
No. 7 Cement. Brand "D," stored in open shed for 90 days.
No. 8 Cement. Brand "E," used in Seattle, Wn. Very high grade.

"A like increase in the quality of the product can be shown in every plant in which the principles of chemical engineering have been adopted and consistently followed.

"It may be asked here, why, if we know how to make high-grade uniform cement, do so many companies send out poor stuff at times. The answer is that a cement plant is run first of all to make money and to make money the quantity of the output must be kept up. There is a dividing line between quantity and quality and some manufacturers will let the quality suffer just as long as there are enough careless engineers around to use up poor quality stuff.

“It has always been a mystery to me why an engineer or architect will allow low-grade cement to go into work when he can buy high-grade cement for the same price. If engineers could buy cement under specifications worded so as to recognize the fact that different grades of cement exist – calling for high-test cement for important work and low-test and cheaper cement for the less important work, I believe the whole question of quality would take care of itself.

“As to the future of the industry: – Even with the great increase in production due this year there is every reason to believe that one or two more plants will be started in the near future. So far the increased production has been more than offset by the increased consumption. The Good Roads movement and the harbor improvements that are bound to come with the opening of the Canal will create a new market for a vast tonnage of cement. The day of permanent construction is here and good concrete is the one permanent structural material.”