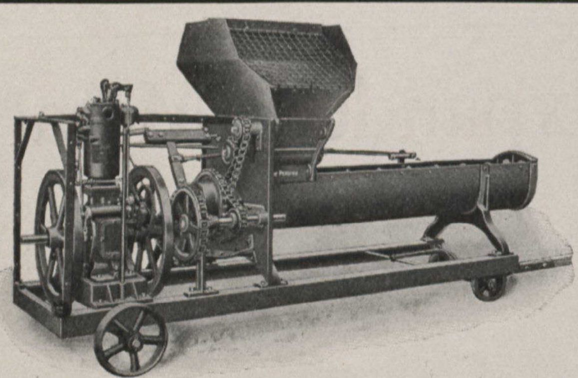
Vol. 1, No. 7. MARCH, 1907.

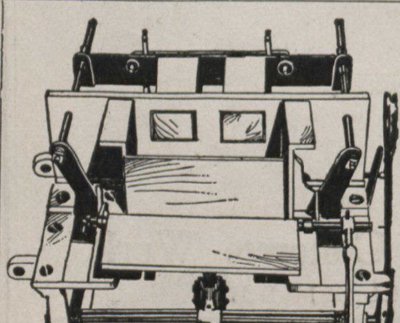
CANADIAN CEMENT AND CONCRETE REVIEW

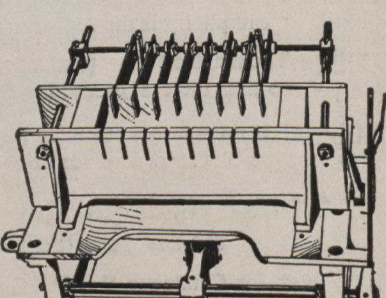
AND FIRE-PROOF BUILDING RECORD

Published by Cement and Concrete Publishing Company
18 COURT STREET, TORONTO

CLASSIFIED ADVERTISERS' DIRECTORY







CANADIAN

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CONTENTS:

PUBLISHED MONTHLY.

Mailed to any address in Canada, United States or Mexico for $1.00 per year.
Single copies 15 cents. To England and other foreign countries, $1.50 per year.

CEMENT AND CONCRETE PUBLISHING COMPANY
18 COURT STREET, TORONTO, CANADA.

MARGARET EATON SCHOOL OF LITERATURE, TORONTO.—Architect, W. R. Meade.

See Page 200.

Canadian Cement and Concrete Review

And Fire-proof Building Record.

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AND

FIRE-PROOF BUILDING RECORD.

An Illustrated Monthly Journal for the discussion, consideration, and development of all that pertains to the great and growing industry.

Published on the fifteenth of each month, at 18 Court Street, Toronto by the Cement and Concrete Publishing Company.

Winnipeg Office: Free Press Building, Portage Avenue. Business Representative :—Geo. W. Goodall.

Montreal Office: B 32 Board of Trade Building. Editorial Representative :—T. C. Allum; Business Representative :—A. H. Clapp.

Telephone Main 7404.

Present Terms of Subscription, payable in advance :

Canada, Great Britain and United States ....$1.00 per annum.
Other Countries.................................$1.50 "

ADVERTISING RATES ON APPLICATION.

The Editor will be pleased to receive photographs, descriptions of buildings machinery, methods of construction and pending contracts, and business changes in connection with the cement and concrete industry.

"The Canadian Cement and Concrete Review" desires to give more prominence to cement and concrete construction work in Canada; while not neglecting developments in other countries.

For this purpose the proprietors invite the co-operation of regular subscribers and the large number of frequent readers of the paper, and will welcome informative matter on every kind of constructional work, involving the use of cement, blue prints; photographs; and working drawings of work, projected, begun, and approaching completion; new machinery and tools; enlargements of old businesses and establishing of new; changes of officers; letters discussing questions of current interest to cement and concrete engineers and workers.

It is the business of the "Canadian Cement and Concrete Review" to keep pace with the growth in every theoretical and practical branch of the industry. Whatever demands upon time, space, and frequency of publication and enterprise generally are made by the effort to do this, they will be met.

SOME TELLING STATISTICS.

In another column appears some interesting statements regarding the production of Portland cement in Canada. They illustrate, to a marked degree, two facts. Firstly, cement imports to Canada are declining, while the Canadian product is increasing. Secondly, Canada consumes almost all it produces.

This is to the country's advantage. In 1906, 694,503 barrels were imported, which proves there is ample demand for the existing production in Canada. Even were Canada to produce sufficient to supply its own needs, there is no reason why it should not become a cement exporting country. This may be looking far ahead, but with the advent of a new constructional period it is well to look into the future.

Since 1901, the Canadian production has increased from 317,066 barrels to 2,119,764 barrels, or 568 per cent. This is a noteworthy example of the expansion of a Canadian industry. In the past twelve months alone the Canadian production increased 57 per cent. Since 1901, the imports of Portland cement into Canada have increased only 24 per cent. In the past twelve months they have actually decreased 24 per cent. Yet the demand in this country has been far larger. The increase in the total number of barrels of Portland cement consumed in Canada since 1901 is 221 per cent. These figures prove beyond doubt the growth of the Canadian cement business.

A feature in which one might reasonably predict expansion is the cult of reinforced concrete construction in the West. Canadian business firms find it imperative to keep pace with Western progress. To do this means the erection of large factories and warehouses in the prairie cities. The reinforced concrete building is a very desirable asset in the West and North-West. Fire protection there has not reached a high standard. Every precaution must be taken against the ravages of the flames. Last fall an exceptional demand for cement came from the West. This spring a larger call may be expected.

This year's figures of Canadian cement production will be larger probably than those of last year. Those of 1908 will show most likely still greater increases. There are many cement plants which will not be in operation until the spring of 1908. During 1906, there were fifteen companies operating plants with a total capacity of about 10,500 barrels. In Ontario are eleven of the plants. There is thus great scope for the establishment of plants in other Provinces. It would not be unreasonable to expect an increase in the number of Western cement plants. Everything tends to show that the industry is making very rapid strides. One thing is certain. The markets can take every barrel of cement which Canada produces and is likely to be able to produce for years to come.

BATTLING AGAINST TRADITIONS.

The reinforced concrete building to the uninitiated is a decidedly dangerous-looking erection. The lay mind cannot conceive how concrete, applied in slight thicknesses and in small dimensions, can sustain the weight of a skyscraper of many storeys. On account of the failures in this form of construction, which, comparatively speaking, have been very few, indeed, the public frequently views with suspicion, and sometimes alarm, the rapidity with which this form of construction is gaining ground. The cement and concrete industry is battling against traditions. We live in a conservative age. People tell us that brick was good enough for constructional purposes a decade ago, and that there is no need for new-fangled methods.

Whenever new ideas are promulgated there is invariably an outcry from those who would rather starve than witness an innovation. Wooden buildings naturally predominate in timber countries. There is much freedom from building restrictions in Canada. A man may buy in many districts his land just without the limits of the city, and can erect there whatever kind of structure he desires. The wooden building is cheap; it is quickly put up. But it is neither durable nor able to resist fire.

In years to come, when Canada is adequately populated, these timber villages will create a problem. Colonies of shacks, which are now without the city limits, must, in the course of time, come under proper municipal jurisdiction. As a rule, the builder of the wooden house owns his building site. This means that in time within the heart of Canadian cities will exist not a few dwellings which will create a fire danger to the whole community. The timber supply of the country must in the course of events become exhausted. As lumber becomes more scarce prices will advance. This will mean that the advantage of cheapness claimed for the wooden building will be less important.

When a man builds, especially in a country such as this, he should not build selfishly. Canada offers him more advantages, probably, than any other country in the world. It is his duty to see that he assists in its proper development. The wooden building is out of date. Every new erection of this class means a step backward instead of forward.

In many instances cost is not a primary consideration. A landowner may desire a large dwelling. He not infrequently chooses a wooden residence, which must necessarily be in constant danger from fire. "If we go forward we die; if we go backward we die; better go forward and die." These are good sentiments, not only for every man, but for all industries.

With the passing away of the timber building has come the era of concrete construction. It has innumerable advantages over plain or ordinary masonry. When reinforced, it may be designed and used very much in the same manner as wood or steel. This form of construction must win out in the end. Its merits will assure that. Strength, durability, flexibility, fire resistance, economy and ease of application are some of its advantages.

FIREPROOF STAIRCASES FOR SCHOOLS.

The town of Hochelaga, which is to all intents and purposes part of the city of Montreal, last month suffered a terrible calamity. Sixteen little children and the lady principal of a school met death in the fire which destroyed the schoolhouse. The fire is supposed to have started from a heap of rubbish in the basement. It made such rapid headway that by the time the children on the first floor were marching down stairs the dense smoke turned many of them back. Had it not been for outside assistance, the deaths would have been doubled or trebled.

The kindergarten classes, instead of being on the ground floor, were on the top, and were caught like rats in a trap. The firemen were quickly on the spot, and the principal, breaking the panes of glass with her hands, handed out some twenty-five of the little tots to the firemen, who had raised a ladder. Refusing to leave her post, even when the flames were burning the ladders, she continued the work of rescue until, becoming suffocated, she reappeared no more at the window with her little burdens.

That such a terrible holocaust could have occurred in a school in the heart of a city, supposed to be provided with all the means for the extinguishing of fires and for rescuing people from burning buildings, is a sad commentary on conditions as they actually exist. It is a warning of what may occur to a very large percentage of Canadian schools.

Much blame is attached to the Protestant School Commissioners for not having carried out the instructions of the building inspector to provide the school with fire escapes. The Rev. Dr. Shaw, one of the commissioners, says that fire escapes would be the cause of more deaths than a fire, if the children could be prevailed upon to trust themselves to them. The chief of the fire brigade, in reply, says that if the school had been properly provided with these escapes, all the children could have been rescued by the firemen. While each department endeavors to escape responsibility, it is time for engineers and architects to come forward with a plan which will make another occurrence of this nature absolutely impossible. It is not enough to have a good fire brigade, an adequate water pressure, fire escapes fitted to the windows, a fire drill, and the various devices commonly adopted. It is really surprising that even worse calamities than that which took place at the Hochelaga school have not occurred more frequently. It is criminal almost on the part of those in authority to permit the safety of the children to hang upon any such slender precautionary measures as commonly exist.

The question of cost has to be met at the threshold. The amount of money placed at the disposal of the trustees is seldom sufficient to build a fireproof school. But it is not necessary that the class-rooms and the entire school should be fireproof. The danger lies in descending from the different floors to the ground. There is little likelihood of a scholar being burned in the class-room. As a rule the child can reach the stairs. It would seem that with a reasonably commodious fireproof staircase leading direct from each floor to the exit at the street that danger would be greatly minimized.

A single broad flight of stairs, the different stories opening upon it, is insufficient. There should be one staircase at least for each floor, with openings only at the top and the bottom. The portion of the building enclosing the staircases should be absolutely fireproof, without one foot of wood from top to bottom. There is no justification for a staircase that is not fireproof. The cost of the building will be increased, but that is little when so many lives are at stake. Staircases must be built in any case. As a rule, they are the first portion of a school to require repair. Cement stairs and cement walls never wear out and cannot burn. Their cost is moderate. It would be impossible for the children to be driven back by smoke from such a staircase. Cement floors, walls, and stairs often are seen standing intact in a mass of ruins the morning after a fire. To pull them down is almost impossible. That is what is needed for the schoolhouse. The staircase would no longer be the means of communicating fire from one floor to another.

With the expert engineers and architects of this country, and with the facilities now afforded for cement and concrete construction, the board of trustees which consented to anything but a fireproof staircase in a modern school might be held for a very serious charge.

EDITORIAL NOTES.

The destruction of a cement plant by fire is a curious anomaly. The plant of the Alpena Portland Cement Company was wiped out almost completely by fire last month. The loss will be probably $400,000, with $200,000 insurance. This is the second fire which has attacked United States cement plants this year. Cement is a good fireproof material. It is handing out ironical advice to suggest that cement companies might try their products in the construction of their own buildings.

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An amusing story of the jerry bulider is going the rounds. A certain contractor, more famous for the strength of his banking account than the stability of his buildings, agreed to erect a row of houses in remarkably quick time. The foreman in charge and his assistant were sent to test the walls. The former remained in one house while the latter went next door. The following interesting conversation between the two parties then took place: "Are you there, Bill?" "Yes." "Can you hear me speak?" "Yes." "Can you hear me tapping?" "Yes." "Can you see me?" "No." Then the buildings were passed by the foreman as satisfactory.

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The Government has assumed the role of cement manufacturer in Arizona. A large dam was to be constructed. The cement makers, scenting large profits, made bids that practically negatived the enterprise. They asked $9 a barrel, including a sixty-two mile haul by waggons from the nearest railway station. Then they learned that the Government thought of setting up as a rival. Their bids were reduced then to $4.89 a barrel. Even this meant an outlay of more than a million dollars for cement alone, or about $7 for every acre of land benefited by the project. The cement makers could give hardly a better price, as the second quotation left them only 60 cents a barrel for their product at the mill. About this time the Government engineers discovered a fine ledge of limestone near the damsite and excellent clay within reach. So they bought machinery and put up their own cement mill. It is turning out cement at a cost of $2.13 a barrel, in which story may be found many morals.

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Several experiments have been made in the United States which are interesting to Canadian roadmakers. The era of temporary roadmaking is disappearing. The value of permanent work is recognized. The smallest municipality might aspire reasonably to durable roads and sidewalks. It was found that, in making macadam or telfer roads, limestone binds well with little rolling, but wears down very rapidly; also that granite and other similar hard rocks, although very durable against abrasion, can be made to bind only by long and expensive rolling, unless clay or some such binder be added. The Public Roads Office of the United States Department of Agriculture has been experimenting upon the effect of combining these two rocks, with the result that the combination was found to have much higher cementing value than the limestone alone. They found that the best application of this discovery lay in "using the limestone as a top dressing, and in the form of screenings as fine as may resist the scattering effect of the wind; the road to be kept moist for as long a time as possible after construction."

ART AND CONCRETE.

One of the Most Handsome Buildings in Toronto is the Margaret Eaton School of Literature and Expression—Cement Plays an Important Part in its Construction.

There exists an erroneous idea that the entrance of concrete means the exit of art. To the man whose knowledge of cement and concrete is based upon hearsay cement is associated with sidewalks and huge square buildings only, both of which are more useful than ornamental. If told that vases, pedestals, wall panels, flower-boxes, altars, and fountains have been fashioned in cement it would be most probably news to him. Some very artistic work has been done with this material. The exterior of many vases which have been modelled in cement have possessed picturesque bas relief figures and scenes.

The claims of cement in its relation to art are becoming recognized rapidly. Not only is this noticeable in small ornamental work, but with large buildings. It is being proved by experience that an artistic building of cement construction is equally as satisfactory as one of cut stone. The Margaret Eaton School of Literature and Expression, which has recently been erected in Toronto, is a notable instance. The whole front is modelled in cement, after the famous temple at Athens, with four Corinthian pillars instead of eight forming the entrance, over which is inscribed the Greek words, "Kaaskat Aoon," which, translated, means, "The beautiful and the good." This is the only example of early Grecian architecture in Canada. The architect is Mr. W. R. Meade. The Canadian Art Stone Company, of Toronto, are the builders. Manufactured art stone is making rapid strides, especially in heavy construction, for which it is well adapted. Another example in Toronto of cement stone work is the handsome Press Bureau at the Exhibition grounds, a building which also was erected by the Canada Art Stone Co.

It has been argued that when cement or concrete is used to reproduce a classic design the originality cannot be retained. Mr. William Price, who last year read a paper before the Association of American Portland Cement Manufacturers, stated that in the case of classic orders or their modifications in the Renaissance, a frank succession of blocks and columns set upon plinths will be found, or directly on basement wall, cap, abacus, freize and cornice, all built up, stone upon stone, with major joints marked by mouldings, bands and ornament, a logical, built structure. But, he added, if an attempt was made to follow such a system of design in a plastic material, or even a material like wood, the results would be disastrous to true architecture. The design would become a matter of external form, not of the true expression of methods and materials used.

"Concrete," he continued, "is built with shovel and trowel, and its proper ornamentation should be either cast in moulds or such as can be run or fashioned on the work, with the addition of such color ornament as may be obtained by the use of terra cotta or other protecting material used as wall copings, roofs, pier caps, etc., and such other flat color ornamentation as may be produced by the use of tiles, marble, glass or other material which is evidently applied to the surface. It is evident that this would and should make a wide departure from classic forms and accepted styles, that it means, in fact, a new architecture, although it will not be necessary to abandon all precedent. But in a material so plastic, the forms of openings and mouldings may be expected to vary much from those necessary to an architecture dependent on arches and lintels. There is more to be learned in the Spanish or Californian and Mexican varieties of Spanish than any other accepted typ.e Their plastered walls, tile roofs, and wall copings suggest concrete more than they do brick, and their domes and curved pediments are already suggestive of plastic rather than block construction."

But in the case of the Margaret Eaton School the use of cement has not necessitated a wide departure from the classic form or the accepted style. Neither has it meant a new architecture. It is an exact reproduction of the early Grecian Doric period. The process used in the erection of the front of the school is not new. In Germany, the home of cement stone, a great deal of similar construction has been carried on for more than a century. From a purely financial point of view, this form of construction possesses advantages over stone. In this particular instance, there was a saving made of some 40 per cent. by the utilization of cement.

Such has been the curious antipathy to cement, when the proposal is to use it artistically, that the manufacturer has invented special names for it. It has been called Artificial Stone, Pompeian Stone, and other similar names. It is time that such disguises were discarded. Cement and concrete, from the artistic point of view, can stand alone upon their merits. In the Margaret Eaton School of Literature and Expression we have an example of how the architect and cement manufacturer may combine and produce an excellent example of classic architecture. This structure is one of the most beautiful public buildings in the city of Toronto. And it is a trimuph for cement.

CEMENT WANTED.

The city of Brandon, Man., invites tenders up to April 11th for the supply of from 6,000 to 8,000 barrels of Portland cement.

USEFUL POCKET BOOK.

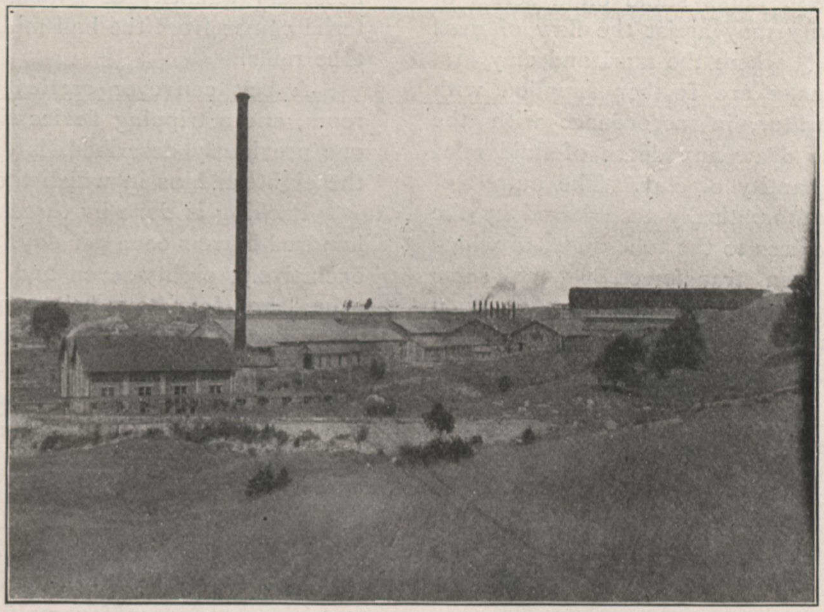
The Stinson-Reeb Builders' Supply Co., of 188 William Street, Montreal, has issued a handsome vest pocket note book, which they will be pleased to furnish builders who may write for them.

The Manitoba Art Stone Company is being promoted in Winnipeg. A deed of incorporation will be obtained shortly, and the company will undertake the business of cement products. Both Toronto and Winnipeg capital is interested.

The Cement Industry of Ontario.

By P. GILLESPIE.

(From the last published Report of the Ontario Bureau of Mines).



NATIONAL PORTLAND CEMENT COMPANY, DURHAM, ONT.

General View of Works.

IV.

Ontario's Cement Plants.

The description of the various cement plants in Ontario, as seen by the writer, is continued.

The National Portland Cement Company.

President	W. F. Cowham.
Vice-president	A. F. MacLaren, M.P.
Superintendent	H. H. Farr, Durham, Ont.
Authorized capital	$1,000.000.
Works	Durham, Ont.
Brand	"National."

The National Portland Cement Company began the manufacture of cement early in 1903. The works stand at the bottom of a rather steep declivity, and the railway supplying the raw materials is continued from the plateau on a level steel trestle over the storage rooms, thus facilitating the unloading very materially.

Wilder's Lake, five and a half miles from Durham, and Tobermory Lake, in the same neighborhood, are the sources of the marl. The former has an area of 125 acres, and the deposit varies in depth from two to fifty feet. The latter is but fifty acres in extent. The overlying water is of a depth of twelve feet in places, and beneath this is an average of twenty-five feet of marl. Clay is brought from Stratford, a distance of sixty-nine miles, and is hauled to the works on flat cars. Of this, the company has acquired a deposit of forty acres.

The marl is raised by floating dredge with an orange-peel dipper. This dredge is equipped with a stone separator and a pug-mill.

After passing through these machines the marl is conveyed through a flexible tube, carried on a series of pontoons, to the hopper-shaped cars on shore. The "Harris" system of conveying by compressed air is here employed, and is said to work to the utmost satisfaction.

The clay is fed into a plain rolls disintegrator, and after passing through a cylindrical rotary drier, 50 feet long and five feet in diameter, is conveyed to a Phillips & McLaren dry pan. This consists of a pan containing a pair of huge upright wheel-like "molars," similar in construction to the at one time familiar "edge-runners." The pan has a moveable meshed bottom, so that the size of openings can be altered from three-eighths to five-eighths of an inch. The pan is made to revolve while the axis of the molars retains its fixed position. The clay is thus pressed through the meshes and reduced to the desired size. It is then fed to a conveyor and passes to the dry clay storage room, 100 by 60 feet. Here the chemist takes samples for analysis every hour of the twenty-four.

Running longitudinally with the dry clay storage room and beneath its centre line is an underground arched tunnel, carrying a bucket conveyor. The roof of the arch is provided with hopper-like openings, which may be opened or closed at pleasure. The dry clay may thus be drawn from any part of this building and transferred to the wet department. It has been the practice of the company to store during the open season a quantity of clay for winter consumption, and for this purpose a large wet storage room from which the drying plant is conveniently supplied, has been erected. The dry clay is delivered to the mixing pug-mill by measuring hoppers, each of about 600 pounds capacity.

The marl is brought in on the high level trestle above referred to and dumped into a hopper of two cars capacity, which supplies the marl pug-mill. From here it is conveyed to a battery of nine marl storage tanks, at the bottom of each of which a series of pipes delivers compressed air through bent nozzles. This imparts to the fluid a swirling, boiling motion, completely preventing settlement. These tanks stand on a series of step-like piers that gravity may assist the flow of marl to the "mixing pug-mill," where the marl and clay first come together. The tanks are further supplied with floats, enabling the operator, in accordance with the chemist's instructions, to draw any depth of fluid marl to mix with a known quantity of clay. The output of the mixing pug-mill is automatically transferred by the Harris compressed air devices to the tube mills, of which there are four. It is then transferred by the same method to eight steel slurry tanks. From an open "header," supplied by compressed air from these tanks, the kilns are fed. A revolving disc carrying a number

ORANGE PEEL DIPPER.

Part of the Plant of the National Portland Cement Company.

of buckets, which alternately fill from the header and discharge into the tube supplying the kiln, accomplishes this step. The speed of the disc varies with that of the kiln.

There are eight rotary kilns, 70 by 6 feet, which are capable of being run at different speeds. The clinker drops into pits built beneath the kilns. Here it gives up a portion of its heat to air, which is in turn mown with the ground coal into the rotaries. The clinker then passes by chute into the water-tight buckets of a McCausland conveyor, which is at this point moving horizontally in a bath of water rising nearly but not quite to the edge of the pans. This conveyor completely surrounds the clinker storage room, passing through a tunnel underneath, up a vertical shaft at one end, along the roof, and down again at the other end. A movable tripping device at the roof is so arranged that clinker may be emptied at any point desired. Further, there are hopper-shaped openings in the roof of the tunnel, so that clinker may be drawn from any part of the building. In this way, when the conveyor is not bringing fresh clinker to the room, it is feeding cold clinker into the hoppers supplying the ball and tube mills. The necessary quantity of gypsum is added after the material comes from the ball mills and before it goes to the tube mills.

A belt conveyor carries the cement to the storeroom, and a tripping device similar in its purpose to the one previously described, is employed to fill any one of the eighteen bins in which the cement is stored.

Packing is done by three automatic machines of five hundred barrels each per day. Bags are employed almost exclusively, eighty-seven and a half pounds constituting a bag, and four bags being the equivalent of a barrel of three hundred and fifty pounds. The capacity of the plant is one thousand barrels per day. Ontario and the Canadian West absorb the output.

Coal for fuel for the rotary kilns is dried in rotary driers and reduced to a flour in improved Griffin mills. The power-house is equipped with suitable engines and generators, driving by individual motors being the method generally adopted throughout the plant.

A most complete laboratory, equipped with all the requisite appliances for making analyses and tests is maintained, and is in charge of Mr. S. H. Ludlow, a specialist in the chemistry of cements.

This plant, which undoubtedly is representative of the best modern practice, was designed by W. B. Bogardus, of Cornell, N.Y.

The Ontario Portland Cement Company.

President	E. L. Goold.
Vice-president	W. S. Wisner.
Secretary-treasurer	E. D. Taylor, Brantford, Ont
Authorized capital	$450,000.
Works	Blue Lake, Ont.
Brand	"Giant."

Blue Lake is about three miles from the town of Paris, and is reached therefrom by electric railway. The plant stands on the shore of the lake, and at present the marl is being obtained not 600 feet from the works, to which it is brought in dump cars by locomotive. There are in this one deposit 100 acres, running all the way from thirty-five to fifty feet in depth. A dredge will shortly be installed to supplant the present method of raising by manual labor. Fifty acres of clay of a depth of ten to twenty feet are available in one deposit beyond the lake. It is brought in by cars as is the marl.

In the process of mixing the wash-mill is employed. As is usual in such cases, the marl is measured and the clay weighed. The mix passes from the mill through a grating to a large rotary double agitator. A well adjoining receives the slurry, from which by a large duplex pump it is conveyed to a hopper above the tube mill.

After the process of grinding it is collected in two large concrete storage tanks, reinforced by expanded metal. Compressed air is employed in these tanks to keep the slurry in a state of constant ebullition. Before being admitted into the supply trough, the contents of each kiln are checked by titration and corrected by the addition of whatever constituent is lacking. Three rotary kilns, 70 by 6 feet, are at present in use, but the management contemplate considerable additions to the plant. The velocity of the rotaries is controlled by a speeder, which is operated by the man in charge of the kilns. If the clinker should be discharged from the kilns insufficiently burned, the feed of slurry or the speed of the rotary can be reduced.

From the kilns the clinker is wheeled to the clinker-room to cool. No special device to accomplish this is employed. The grinding is done in Krupp ball and tube mills, after which the cement passes to the stock-house, which is provided with eight bins of three thousand barrels capacity each. These are built on the "cribbing" plan, commonly exemplified in the construction of grain elevators. Power is conveyed to the coal-grinding plant from the power-house by rope drive.

Coal for fuel is stored in bins under cover until required. Prior to grinding in the tube mill it passes through a rotary Cummer drier.

The company has two shipping connections in the Grand Valley Electric Railroad and the Grand Trunk Railway, each of which has a spur running to the works. The former of these is owned by the company. The present output is 450 barrels per day, but will be increased this coming summer to 750 by corresponding additions to the plant. "Giant" cement seems to be well received, and the directorate report the demand for their product to be very good.

The buildings are of brick, steel and Redcliffe corrugated iron, and are as nearly fireproof as possible. The company has its own fire appliances. Boarding-houses, workmen's cottages, and laboratory have also been erected by the company. The post-office of Blue Lake is for the present in the company's office.

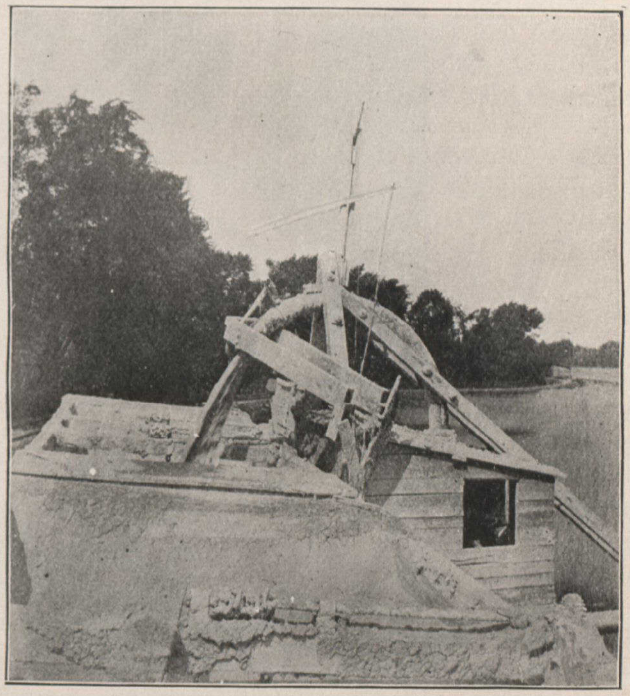
The Owen Sound Portland Cement Company.

President	J. E. Murphy.
Vice-president	W. H. Pearson.
Secretary-treasurer	G. S. Kilbourn.
Works	Shallow Lake.
Brand	"Samson."

Away back in 1889 the North American Chemical, Mining and Manufacturing Company was organized at Owen Sound for the purpose of manufacturing Portland cement. Its capital was $100,000. A large building of mansonry walls was constructed at Shallow Lake in that year, and a plant subsequently installed. A Ransome cylinder was used in which to burn the cement, but proved unsatisfactory, and was abandoned. This industry was the forerunner of the Owen Sound Portland Cement Company, which to-day carries on a very extensive manufacturing business.

Shallow Lake occupies lots 6, 7, 8 and part of 9 in the seventh concession of the township of Keppel. The area is nearly 600 acres, including several small islands, and about 500 acres are under water for half of the year. "Two streams flow into the lake, and in the dry season they unite near the works on the northern side, the channel continuing about 800 yards farther in a north-westerly direction towards the margin of the lake, where the waters disappear with a loud, rumbling noise through a series of sinkholes in the bottom." The bottom of the lake is covered with marl to a depth of four feet, underneath which lies the clay, running to ten feet in places. A narrow gauge track has been constructed from the works out into the lake, and a locomotive and train of cars are employed to bring the clay and marl from the steam dredge to the plant. A contract was lately entered into with the James Cooper Company to erect tall towers and equip a system of cable transportation for the raw materials, but the new method has not yet been put into working shape.

The ingredients are mixed in a rotary wash-mill, the clay having been first put through a disintegrator. A Ferris wheel is used to elevate the slurry to a pair of Sturtevant emery stones. Nine large storage tanks have



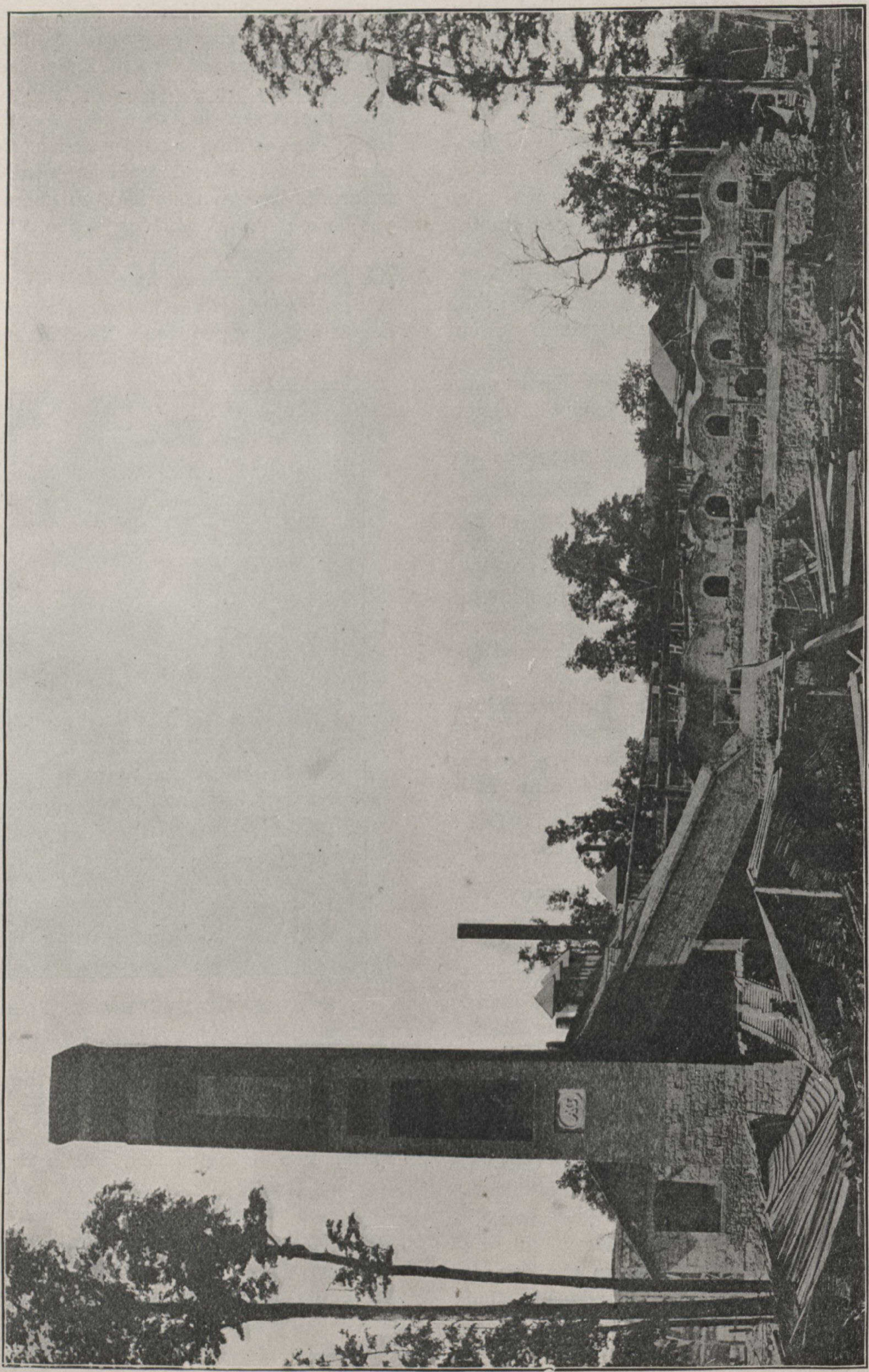
PNEUMATIC SYSTEM OF PUMPING MARL.

The Harris Pneumatic System is employed by the National Portland Cement Co.

been constructed, into which the material is next pumped, and in which it is agitated by compressed air.

The burning is done in nine Batchelor kilns, each having two drying arches, and in two rotary kilns, each 100 feet long. These rotaries were orignally 65 feet long, and the additional 35 feet were added to act as a drier for the slurry. They have a capacity of 120 barrels each per day. The Batchelor kilns are intermittent, it being the usual custom to get 14 kilns of clinker from the nine furnaces each week. They are charged with alternate layers of dried slurry and coke, there being a 10-inch layer of the former to a 3-inch layer of the latter.

The clinker from the Batchelor kilns is first crushed before going to the ball and tube mills; that from the rotaries is first passed through a rotary cooler. The final grinding plant consists of two Krupp ball mills and three tube mills. The output of the plant is 700 barrels per day.



EIGHT BACHELOR KILNS.

This imposing looking array is part of the Owen Sound Portland Cement Company Shallow Lake, Ont.

Ground coal is used for fuel, this being dried and ground in a Raymond grinder and in emery stones.

The power plant comprises an Inglis Brown 500-h.p. engine, a Corliss compound 350-h.p. engine, an air compressor made by the Rand Drill Company, of Sherbrooke, Que., and a battery of five boilers. The company has its own fire protection plant, its own blacksmith and repair shop, and an extremely tidy office and laboratory made of cement blocks—a striking exemplification of the use of the article which the company manufactures. The management propose doubling the capacity of the works this present year. "Samson" cement is favorably known from coast to coast.

(To be continued.)

SOME OPPORTUNITIES FOR CANADIAN CEMENT.

J. A. Jacobs, Montreal, will erect a warehouse on St. Helen Street, at a cost of about $19,000.

A new post-office will be erected at St. Lambert, Que.

The congregation of the Roman Catholic Church, Grand Falls, N.B., will erect a new edifice, 120 x 60 feet.

J. M. Grassie, Strathclair, Man., will erect a three-storey hotel at a cost of about $10,000.

A new fire hall will be erected at Moose Jaw, Sask., at a cost of about $19,000.

W. B. Sherman, Calgary, Alta., will erect a new theatre.

T. L. Buckton and several others, Olds, Alta., will erect a large flour mill.

The E. B. Eddy Co., Hull, Que., have purchased a site in Medicine Hat, Alta., and will erect a factory for the manufacture of matches, pails, brooms, etc.

A new school will be erected at Sintaluta, Sask.

A town hall is being erected at Wauchope, Sask.

The Alberta Pacific Elevator Co. will erect a large elevator at Red Deer, Alta.

An incinerator will be erected at Victoria, B.C., at a cost of about $35,000.

The Government will erect a large immigration building at Victoria, B.C.

J. Griffin, Fort William, Ont., will erect a four-storey business block.

S. Ballachey, Paisley, Ont., will erect a new creamery.

A cold storage plant will be established at Owen Sound, Ont., at a cost of about $40,000.

McKinnon Bros., Port Arthur, Ont., have secured a site and will erect a factory for the manufacture of automobiles and bicycles.

The Ottawa Turkish Baths, Ottawa, will be enlarged at a cost of about $20,000.

The Sawyer-Massey Co., Hamilton, Ont., will erect a warehouse at a cost of about $15,000.

The board of directors of the Y.W.C.A., Hamilton, Ont., will erect a new building.

The First Baptist Church, Ottawa, will be improved at a cost of about $15,000.

UNITED STATES CEMENT OUTPUT.

A report from Washington upon the growth of the manufacture of cement in the United States shows that instead of its being gradual, and by means of small or medium plants, the tendency is towards large establishments with enormous output. At the close of 1905 there were 88 plants in existence owned by 78 companies; and several of these nominally independent companies are closely connected in ownership.

Of these companies, fifteen produced more than two-thirds of the whole United States Portland cement output. Seven of these showed an annual output of over 1,000,000 barrels each, and these seven together produced somewhat over half of the entire output of the country. The five largest companies together produced about the same percentage of the American cement output that the United States Steel Corporation does of the American output of pig iron.

As a writer recently remarked: "The cement industry is essentially one in which brains and money are far more important than raw materials, and consequently cement plants with intelligently directed capital will rapidly increase in size, while poorer or ill-managed plants either remain stationary or expand very slowly. This of itself operates to cause a gradual concentration of interest; the stronger plants grow at the expense of the weaker."

PROPORTIONING CONCRETE.

In a paper by Sanford E. Thompson, read before the Boston Society of Civil Engineers, the author, after discussing various methods and tests, offers the following suggestions as guides to proportioning concrete:

1. The size of the largest stone in the aggregate should be as great as is consistent with proper placing of the concrete.

2. If size of stone is small, a richer mixture must be used; thus 1:3:6 is a fairly rich mix with 2-inch stone, but a lean mix with ½-inch stone.

3. If sand is fine, a smaller quantity may be used in proportion to the stone.

4. For concrete a sand with too large a percentage of very coarse grains may be detrimental because they will not fit into the voids of the coarse aggregate.

5. If the broken stone or gravel contains fine stuff, a smaller proportion of sand must be used.

6. Better proportions are obtained in practice by screening the sand or dust from the coarse material and remixing in required proportions, than by using the run of the bank or the run of the crusher.

7. If the mortar in concrete is rich, say, up to 1:2½, sand should be coarse, with comparatively few fine grains. A lean mortar, on the other hand, is improved not only in strength but in smoothness of working, by using a sand containing dirt or dust.

8. If fine sand must be used, the proportions must be richer than for coarse sand, because a fine sand makes a mortar of lower density.

Dawn of a New Constructional Era.

Some Interesting Opinions and Statements Concerning the Age of Concrete.

Concrete and its Journal.

CANADA is taking its full share of work in the development of the cement and concrete business. Six years ago this country produced 317,066 barrels of cement. Last year it manufactured 2,119,764 barrels—an increase of 568 per cent. Those who become associated with the industry right now will do better than those who wait indefinitely. The demand for reinforced concrete construction in Canada is increasing and persistent. The "Canadian Cement and Concrete Review" recognizes its great possibilities. It is the only journal in Canada devoted exclusively to the subject. It will keep pace with the industry, whatever demands may be made upon time or space, or other considerations. It asks the co-operation of its readers to make it a worthy exponent of a Canadian industry, the great expansion of which is but a matter of time and enterprise. Here are a few opinions of the paper:—

A Detroit reader.—"We appreciate the efforts you are making in the lines of building up the cement and concrete industry."

Chatham (Ont.) Daily Planet.—"It is a magazine gotten up on a good paper, and the illustrations, which are numerous, are exceedingly well produced. It is a trade paper that no one interested in building should be without."

A Montreal wholesale house.—"I have seen the Canadian Cement and Concrete Review. As I am considering the erection of a new warehouse for our business, I would be glad to see a copy with any information as to the use of cement and concrete in the erection of warehouses." Articles on this subject appeared in the December and February numbers of the "Canadian Cement and Concrete Review."

The Telephone Age, Toronto.—"The Canadian Cement and Concrete Review and Fireproof Building Record for November is sufficient evidence in itself, if any were needed, that the era of cement for constructive purposes has arrived in earnest. The paper is full of 'meat' for those whose interests lie in any branch of the building trades. It contains several suggestive articles as well as a host of timely trade items. It presents a large number of well-done illustrations on good paper."

The Monetary Times, Canada's leading financial and commercial paper.—"The industry has reached the stage of having its own exponent in the press. Much about it can be learned from a perusal of the columns of the Canadian Cement and Concrete Review, a bright, informative, illustrative monthly, which is devoted to the interests of the trade, and which will undoubtedly prove of great assistance in guiding the footsteps of the industry of Canada, of recording its progress throughout the country, and so far as the Canadian cement and concrete business is concerned, to advocate the motto, 'Canada First.'"

Concrete and Its Critics.

THAT reinforced concrete construction has come to stay is beyond question. Its qualities are fast becoming of world-wide fame. New cement plants are being established in towns and cities throughout the continent. The demand for cement is rapidly increasing. Those who have cast in their lot with this industry, those whose money is invested in this business, have cause to congratulate themselves. In a few years the cement and concrete industry will be one of the most potent factors in the world of constructional work. Failures of reinforced concrete structures are the result of carelessness. Bad workmanship will cause ruin anywhere. Canada has no reinforced concrete failure to record. Concrete has arrived. Its merits alone will ensure its progress. Here are a few opinions on this subject:—

New York Journal of Commerce.—"A considerable impulse has been given to this kind of construction in the recent advance in the cost of other materials for building, and of the skilled labor required in their use. This may give to concrete, and the ease with which it is handled, a competitive influence of no small value in the building trades."

Engineering News, New York.—"If an independent engineer be employed to either work out the design, or to prescribe specifications and verify the design by them; and if further, an independent engineer be placed in charge of the construction work to see that it is properly done; then reinforced-concrete construction is as safe as other types of construction."

The World To-day.—"Concrete is becoming, in the constructive world, a word to conjure with. Ask a hundred men—architects, engineers, contractors, capitalists, and men of affairs—for their opinion as to the most significant development of the day in construction work, and they will tell you, almost to a man, that it is the tendency to make concrete the universal building material."

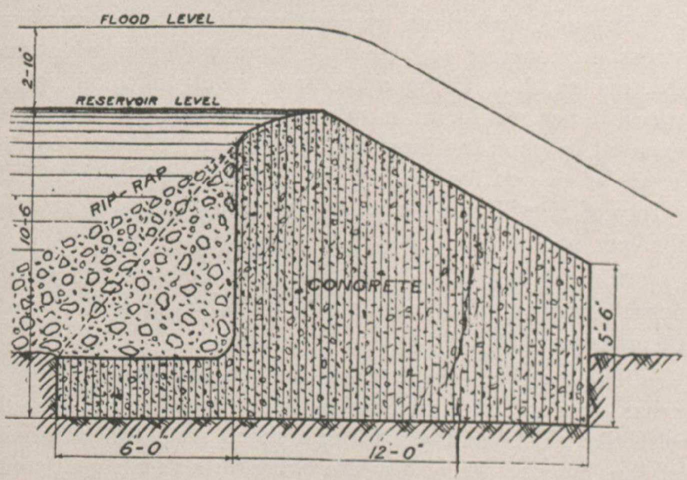
Industrial Times.—"In a single copy of a cement paper last month description was given of construction from cement of the following: Residences, schoolhouse, hotel, apartment building, car barn, warehouse, wholesale bakery, cemetery monuments, mantels, electric power-house, canal locks, dam, tunnel, curbstone, sidewalk, subway railroad bridge, factory, cistern, roof, culvert, reservoir, 200-foot smokestack, city hall, cement brick, docks, packing-house, and a life-saving station."

Valve World.—The revolution in engineering construction now going on, due to the increase in the use of cement, has been aptly compared to that following upon the general use of the Bessemer or open-hearth processes of making steel. In its importance to our present civilization, cement is surpassed among mineral products only by iron, coal and oil: in rate of increase in annual production during the last decade, even these three products cannot be compared with it."

CONCRETE DAM.

A good example of the concrete dam is that built for the R. Forbes Company at Hespeler, Ont. The design of the dam is by Mr. J. S. Fielding, C.E., of Toronto. It contains a special feature in the use of an up-stream floor or toe, extending six feet under the reservoir, and loaded with the stone out of the old dam. The connection of this toe to the dam is increased by the addition of ribs.

The bed of the stream at the site of the dam is a formation of hard, unstratified limestone, forming an ideal sub-base for the concrete structure. The old dam was a wooden structure, with knee-frames and stone filling, and was thought to be unsafe. It also leaked, and failed to hold the water at a time when most needed. The new dam was built immediately below the old one, the latter serving the work as a coffer dam. The work was carried down to hard rock, all the weathered or deteriorated rock near the surface being removed. The depth necessary to secure a good bed varied from 18 inches to six feet.



CONCRETE DAM.

Section View of Concrete Dam, Hespeler, Ont.

The concrete used was in the proportion of 1:2½:5, with an addition of 20 per cent. of rubble stones in the interior of the mass. The aggregate used was pit gravel, from ground owned by the company, and sand was obtained by screening.

The height of the dam varies from 12 feet to 8 feet. The clear length of the spillway is 204 feet.

One abutment of an average thickness of 3 ft. 6 in. was built at the eastern end, up against the wall of the mill, and at the western end an abutment, 10 ft. in width, was provided with a 6 x 9-foot opening, controlled by stop-logs six feet in length, to enable the reservoir to be emptied when desired.

During flood time the vertical pressure of the water on this toe is increased as the horizontal pressure on the up-stream face of the dam is increased, and in this way the safety factor remains satisfactory at all conditions of the flood. Mr. Fielding claims this device to be a distinct advance in the design of dams for low heads. Messrs. Frazer & Eickle, of New Hamburg, were the contractors.

Metal reinforcement was used in a horizontal plane at base of the dam, and also in the vertical and sloping faces, the total cost of such not exceeding $80. It gives an extra strength to the structure to resist temperature stresses, and to enable it to act as a unit. The cost of the work, including the stone filling and removal of the old dam, was $4,100.

The safety factors against sliding with a co-efficient of friction of .65 are:—

Main portion with water at crest level.........	2.73
Total section with water at crest level.........	3.64
Main portion with 2-10 of flood..............	1.70
Total section with 2-10 of flood...............	2.465
Total section with 4-6 of flood...............	2.10

NEW CEMENT COMPANIES.

The Excelsior Constructing and Paving Co., Ltd., Toronto, have been incorporated with a capital of $30,000. The object of the company is to carry on the business of manufacturers, dealers and contractors in cement and concrete works, walks and pavements, and to deal in cement and other articles incidental thereto. The provisional directors are J. G. Murphy, W. Mitchell, and A. Murphy.

The Trussed Concrete Steel Company, of Canada, Ltd., Walkerville, Ont., have been incorporated with a capital of $200,000 to manufacture concrete steel. The provisional directors are G. Kahn, D. C. Raymond, and Charlotte L. Wiman.

The Standard Concrete Construction Company, Toronto, has been incorporated with a capital of $100,000 for the purpose of general building and construction. The provisional directors are F. Rielly, J. B. Bartram, and E. A. Scott, Toronto.

A new organization, with ample resources, has been formed to carry on the business in concrete machinery heretofore conducted by Messrs. Brady & Abbott, under the name of the Eureka Machine Co. The new company acquires all patents, good-will and personal property of the old firm other than open accounts. The new company does not assume any liability for the debts of the firm of Brady & Abbott or of the Eureka Machine Company as under its former management, but Messrs. Brady & Abbott will be able to settle in full all their outstanding indebtedness.

The Brockville Cement Pressed Brick and Concrete Company, Ltd., has been incorporated with a capital of $10,000, the head office to be at Brockville. The incorporators named are B. Dillon, architect; A. T. Wilgress, editor; R. N. Norton, physician; J. C. Yarwood, contractor, and H. A. Stewart, barrister, all of Brockville.

Building has been active at St. Louis de Mile End, a suburb of Montreal, during 1906. The increase in value of new structures was $806,740, and of repairs to old ones $13,400. The number of dwellings erected was 543 and of stores 30.

Failures of Reinforced Concrete.

By W. C. FARRINGTON.

(Specially written for the "Canadian Cement and Concrete Review.")

GENERALLY the first question which the builder asks the architect or the engineer, who recommends or shows him a design of a reinforced concrete structure, is, Is it safe?

The few failures in reinforced concrete structures have shaken his faith in all structures of this class. In most cases he has no idea or knowledge of the real cause of such failures, except "that the structure was built of concrete." When they occur, the quality of cement is usually blamed, although collapses are seldom traceable to this cause, and but little thought is given to improper workmanship or design.

The owners of the Eastman Kodak Company works, Kodak Park, near Rochester, N.Y., which collapsed last year, engaged two consulting engineers, experienced in concrete construction, to investigate the causes of the failure. Their report is interesting.

"We are fully convinced," they say, "that the primary cause of the failure was due to the fact that the supports under girders and floor construction were removed too soon for that season of the year, your records showing that the concrete was only about three weeks' old. The concrete throughout is of good quality, but was too green (i.e., not sufficiently hard) to enable the respective members to carry even their respective dead loads with safety. Had the forms around the columns and sides of the large beams been first removed, and the supports under girders and floor construction left undisturbed for a period of at least four weeks longer, it is our opinion that you would not have experienced the slightest trouble.

We do not find that any abnormal or eccentric loading exists.

The girders tributary to Col. 47 were constructed and executed with ample factor of safety. We find that

The dead load of roof construction coming on Col. = ...	45,000 lbs.	
The dead load from mezzanine floor construction = ...	16,300	
Making the total dead load of roof and mezzanine floor construction (together with the weight of column) on Col. 47 = ...		61,300 lbs.
Live load from roof = ...	29,700 lbs.	
Live load from mezzanine floor =	16,000	45,700 lbs.
Combined dead and live load on Col. 47 = ...		107,000 lbs.
Cross sectional area of Col. 47 = ...	144	sq. ins.
Steel area = ...	2.24	
Net concrete area = ...	141.76 sq. ins.	
Fifteen times steel area = ...	33.6	
Total effective area reduced to concrete =	175.36 sq. ins.	

The unit dead load stress on Col. 47 = 61,300 ÷ 175 = 350 lbs. per sq. in.

The unit dead and live load stress on Col. 47 = 107,000 ÷ 175 = 612 lbs. per sq. in.

It is customary to reduce the live load as it comes on to the girder and column, for the reason that owing to the necessity of passageways only 80 per cent. of the floor can be loaded; therefore using 80 per cent. of the live load on mezzanine floor, the total unit stress per square inch of Column 47 equals 103,000 ÷ 175 = 594 lbs. per sq. in.

In our calculations we used an ultimate compressive stress on concrete (mixed as in your building) of 3,000 lbs. per sq. in. Using a factor of safety of 4 will give 750 lbs. per sq. in. as a safe working stress. On steel as used in your building we allowed an ultimate tensile stress of 64,000 lbs. per sq. in., which, with a factor of safety of 4, will admit of a safe working stress of 16,000 lbs. per sq. in.

We further submit the following detailed report of actual test conducted on Col. 43. Col. 43 is constructed the same as was Col. 47.

The marked prints attached to our report show areas of roof and mezzanine floor that were loaded with tile. The red tile were 12 x 12 x 4 ins., and weighed 21 lbs. apiece; the yellow tile were 12 x 12 x 4 ins., and weighed 17.75 lbs. apiece. Owing to the fact that the area tributary to Col. 43 is smaller than the area tributary to Col. 47, increased unit live loads were used in order to produce an excess column load.

The area marked is 40 x 31 ft., which equals 1,240 sq. ft.; the total weight of tile on this area uniformly distributed equals 80,000 lbs. The weight per square foot of loaded area equals 80,000 ÷ 1,240 = 64.5 lbs. The additional central load placed directly over the column occupied a space of 10 x 10 ft., and weighed 21,200 lbs.

Total dead load of roof supported by Col. 43 =	41,250 lbs.
Total live load of roof supported by Col. 43 =	42,980
Total dead and live load of roof, including column and girders supported by Col. 43 =	84,230 lbs.

The mezzanine floor was loaded with five courses of red tile and one course of yellow tile; total weight per sq. ft. equals 122.75; allowing 5 per cent. for unloaded areas will give a uniform load of 122.75 ÷ 105 = 117 lbs. per sq. ft. The area of mezzanine floor supported by Col. 43 is 163 sq. ft.

Mezzanine floor live load = 163 × 117 = ...	19,100 lbs.
Mezzanine floor dead load = 163 × 83 = ...	13,500
Girders A and C = ...	1,905
Col. 43, mezzanine floor to floor below, 8.5 × 114 = ...	1,220
Total dead and live load from mezzanine floor transmitted to Col. 43 = ...	35,725 lbs.
Total dead and live load from roof transmitted to Col. 43 = ...	84,230
Combined dead and live loads from roof and mezzanine floor transmitted to Col. 43 =	119,955 lbs.
Estimated combined dead and live loads from mezzanine floor and roof transmitted to Col. 47 = ...	107,000 lbs.

$\frac{119,955}{107,000}$ = 112 per cent., or the test load was 12 per cent. greater than the load for which the column was designed.

This gives a unit stress of $\frac{119,955}{175}$ = 687 lbs. per sq. in.

As before stated, it was found necessary to increase the unit live loads; this gave a unit load on roof of 64.5 lbs., or $\frac{14.5}{50}$ = 29 per cent. more than specified. The live load on mezzanine floor was 117 lbs. per sq. ft., or 17 per cent. more than specified.

The deflection under the mezzanine floor load with 117 lbs. per sq. ft. was 3-16-in. The deflection of the roof was 3-32-in. in middle of 21-ft. and 19-ft. spans. These deflections are very small considering the loads."

Further tests were made by the owners' own engineers, and were reported as follows:—

Test on Roof Slab.—A section of the roof between Cols. 45-43 and 51-53 was tested as follows:—

In a perfect section a portion consisting of three joists and two tile was isolated by breaking out the tile and concrete next to the two outside joists. The cinder filling and cement finish were removed; 4 x 4-in. props and ledgers with suitable cross diagonals in both directions were put under the section to be tested, leaving a clear gap of about 6 ins. between the bottom of the slab and the top ledgers, this structure being placed to catch the slab and load if failure occurred.

The load consisted of 4 x 12 x 12 in. yellow tile laid flat three wide and seventeen long, the area covered by them being 19 ft. by 3 ft., or 57 sq. ft. The tile were piled 19 courses high. The actual number of tile = 19 × 17 × 3 = 969; by 17 lbs. equals 16,473 lbs. (considering the tile to weigh 17 lbs. apiece.)

The unit load was 16,473 ÷ 57 = 289 lbs. per sq. ft. The deflection under this load was ¼-in. The span from centre to centre of beams was 19 ft., and the clear span of the slab 18 ft. 2 in. The width of section tested was 3 ft. (three 4-in. joists equals 12 ins., two 12-in. tile equals 24 ins.)

The load was increased until the tile were 25 courses high; the number of tile was 25 × 17 × 3 = 1,275, and their weight 1,275 × 17 = 21,675 lbs.

The unit load = $\frac{21,675}{57}$ = 380 lbs. per sq. ft. (with tile at 17 lbs.). The deflection under this load was ⅜-in. When this load was removed the deflection was reduced or went back until it was only 1-16-in.

Actually weighing the tile gives the following result: The weight of tile = 21,875; the unit load = 21,875 ÷ 57 = 384 lbs. per sq. ft., and the weight per tile 21,875 ÷ 1,275 = 17.2 lbs. each.

The roof slab weighs 58 lbs. per sq. ft., and consists of 6-in. tile with 2-in. concrete, the reinforcement being ½ × 1½-in. Kahn bars spaced 16 ins. on centres.

384 live load
58 dead load

442 dead and live load.

$\frac{384}{50}$ = 7.7 times the live load designed for.

58 dead load
50 live load

108 lbs. dead and live load.

$\frac{442}{108}$ = 4.09 times the dead and live load designed for.

Test on Mezzanine Floor.—A section between mezzanine beams A and D, Columns 37-38 and 45-46, was cut out and prepared as described in the roof test. The isolated section consisted of 3 joists and 2 tile. On this, 4 × 12 × 12 in. tile were piled 4 wide, 17 long and 19 high and a photograph taken. The number of tile = 19 × 17 × 4 = 1,292. Considering these tile to weigh 21 lbs. apiece, their total weight = 1,292 × 21 = 21,132 lbs. The actual area covered by the tile was 20 ft. by 4 ft., or 80 sq. ft., and the unit load, therefore, was $\frac{27,132}{}$ = 340 lbs. per sq. ft. The above weights are estimated.

Actually weighing the tile gives the following results: Weight of the tile = 30,675 ÷ 80 = 384 lbs. per sq. ft. actual weight.

The deflection was ½-in. On removing the load the deflection returned to ⅛-in.

The mezzanine floor slab consists of 10-in. tile and 2-in. concrete with ¾ × 2-in. Kahn bars 17 ins. on centres; weight per sq. ft. 85 lbs.

Live load	384 lbs.
Dead load	85
	469

Designed for
Live load .... 100 lbs.
Dead load 85

Dead and live loads 185 lbs.

$\frac{469}{185}$ equals 2.54 times the dead and live loads.

$\frac{384}{100}$ equals 3.84 times the live load."

Though the supports were not removed for some three weeks after the concrete was put into the work, apparently this period was insufficient for the full strength to be developed, and a recommendation was made to the effect that a further time should elapse before the concrete was made to do full duty. This disaster is one of several which have been attributed to the hasty removal of the supports from a reinforced concrete structure. Cement will harden rapidly at first, but the rate of hardening diminishes as time goes on, so that the difference in the hardness of cement between the sixth and seventh week after gauging is less than that between the third and fourth. As the induration is assisted to some extent by contact with the air, the interior of a large mass of concrete suffers by being surrounded, and consequently such masses ought to be allowed a longer time in which to thoroughly harden.

Failures in reinforced concrete structures more often happen through bad workmanship than through any other cause, i.e., in mixing, tamping, improper consistency, the too early removal of forms, etc. Too much care cannot be given to workmanship. Too much attention cannot be given to vigorous inspection. Perhaps the most essential point in the workmanship is to see that the proper materials and the proper aggregate is given. Next, that these materials are thoroughly mixed; and further, that the mixture is of a proper consistency. This is often more essential than the tamping, although generally not so understood.

I can point to several failures in modern reinforced concrete structures due almost entirely to a lack of proper consistency. I have also known several failures to happen from the too early removal of forms, and from this cause alone. The time for the removal of forms depends on the design, strength of the concrete, and the weather. Sufficient time should be given to assure against the slightest flexure.

It would be impossible for one to attempt to give an illustration of the many different designs of reinforcement. Suffice it to say that a multitude of careful tests and experiments have taught the use and necessity of many important factors most essential for proper design.

The idea that reinforced concrete is considerably strengthened by the addition of steel is erroneous, and nothing is more detrimental to the cause and examples of well-designed constructions than a bold design in reinforced concrete, as is too often given, without any knowledge whatsoever of any of the factors required in such designs. For rock concrete the percentage of reinforcement should not exceed 1½ per cent.; for cinder concrete the percentage of reinforcement should not exceed 6-10 per cent.; higher percentages of metal lessen the distance between the centre of compression of the concrete and the centre of the steel, which reduces the strength of the beam or member.

Failures of reinforced concrete structures occur, not because the buildings are of concrete, not because of a poor quality of cement, not usually because of the design. As thorough and unbiased investigations have proven, nearly all failures occur during the process of construction, and are due to a too early removal of forms or to bad workmanship.

CEMENT IN WESTERN CANADA.

The Commercial Cement Company, Carman, Man., is making active preparations to begin the manufacture of cement at Carman, about 70 miles south-west of Winnipeg. A side track has been constructed connecting the company's plant with the main line of the Canadian Northern Railway. The works, including the factory proper, power-house and chemical laboratories, are approaching completion, and a quantity of the heavy machinery is on the ground. A large volume of water is supplied from a spring on the hillside above the works. The rock supplying the raw material is also procured at a considerable height above the mill, and is transported through the various processes almost entirely by gravitation. Manufacturing will be begun in the early spring. The company, the head office of which is in Winnipeg, has $150,000 capital, N. P. Alsip, of that city, being president, and Otto Babcock, general manager and secretary-treasurer.

REINFORCED CONCRETE WAREHOUSE.

Excavating has been begun for the foundation of the new warehouse and factory to be erected by the Andrew Darling Company at Toronto. It will be a nine-storey building, of steel and reinforced concrete construction, absolutely fireproof. While the building itself will be of material over which fire will have no power, precautions will be made to safeguard the contents as thoroughly as modern skill can accomplish by the placing of sprinklers in each department.

Staircases and elevators are to be encased, and the heating plant will be outside the building, underneath the sidewalk. The entire equipment will be modern in every sense, and the designs, finish, both inside and out, will be of the most attractive and substantial description.

The building has a frontage of 112 feet on Spadina Avenue and 97 feet on Adelaide Street. It is to be completed by October 1st, and will cost in the vicinity of $150,000.

CEMENT BUILDING IN BROCKVILLE.

A Short Sketch of its Inception and Success.

The story of the advent of the cement brick and cement block industry to Brockville is probably a fair example of the rapid adoption of cement as a building material throughout Canada. For some years past the farmers in the Brockville district of Eastern Ontario have been using cement to a limited extent for barn and stable floors, and now and then for the making of concrete foundations; but only recently has the use of cement bricks and cement blocks become general.

A year or so ago Mr. B. Dillon, a Brockville architect, found that the time had come when his patrons desired something of more variety and higher quality than the ordinary clay brick. He endeavored in vain to induce some one to start the manufacture of cement bricks. He determined to do so himself on a small scale to introduce them, especially as he was preparing plans for a new building for Mr. A. T. Wilgress, publisher of the Brockville "Times," who had decided upon the use of cement brick. Accordingly a contract was closed with the Messrs. Wettlauffer Bros., of Berlin, for one of their machines, just in time to begin brick-making last fall for the new printing-house.

Two men were kept busy supplying cement brick, and so close did the builders keep them running that some of the brick had hardly time to mature. The consequence was that certain wiseacres shook their heads sagely and prophesied disaster and failure when they beheld the green bricks that occasionally got knocked to pieces. One sceptic quietly secured a green brick, took it home, and placed it in a pail of water in order to see how soon it would crumble to pieces. He was vastly astonished to find at the end of a week that, instead of melting, the brick was so hard that it could be broken only with difficulty. It was also discovered that the longer the brick set in the wall the harder it became and the better it matured. Little by little, those who doubted became convinced that cement brick was really a good thing. Finally, the new printing-house was completed, and when the Brockville "Times" moved into its permanent home last January it was acknowledged by general consent to be the best and most attractive office-front in Brockville.

Mr. Dillon himself made the moulds for the fancy brick used in the four columns on the ground floor. The ease with which brick of any design can be manufactured is an obvious advantage. The Brockville "Times" office runs back for 125 feet on the Press-room floor and 75 feet on the office and composing-room floor, while the front of the building is surmounted by an artistic cement brick cornice.

At the same time that the Brockville "Times" office was being built, a local contractor, Mr. J. S. Mix, a man of wide experience in Canada and the United States, built a cottage of Mr. Dillon's cement brick down on the river front overlooking the waterworks park. This also helped to educate the public taste in the matter of cement brick as a first-class building material. During the summer, too the Canada Carriage Company built a large cement block addition to their extensive plant. This addition was 176 x 64 feet, three storeys high, with solid piers of cement under each beam supporting the floors. Despite the fact that there is a great deal of window space, the building is heated easily by exhaust steam, and altogether gives the highest satisfaction to the company.

The result of these enterprises even now is manifest. Some enterprising gentlemen, recognizing the future possibilities of the cement brick and block business, have organized the Brockville Cement Pressed Brick and Block Company, and have a well-equipped steam plant in operation, turning out bricks, blocks, etc., of a wide variety of faces and sizes. H. B. Wright & Co., confectioners, of Brockville, have bought a property on the main street of the town, and the first thing in the spring will commence a handsome building of cement brick, and there are enquiries from all quarters in the town and vicinity regarding cost and quality of cement bricks, blocks, lintels, etc.

Nothing succeeds like success, and the experience of Brockville well illustrates the spread of the use of cement in various forms. The main thing to guard against is defective or inferior work. Cement building material, when properly made and given a fair chance, cannot be beaten.

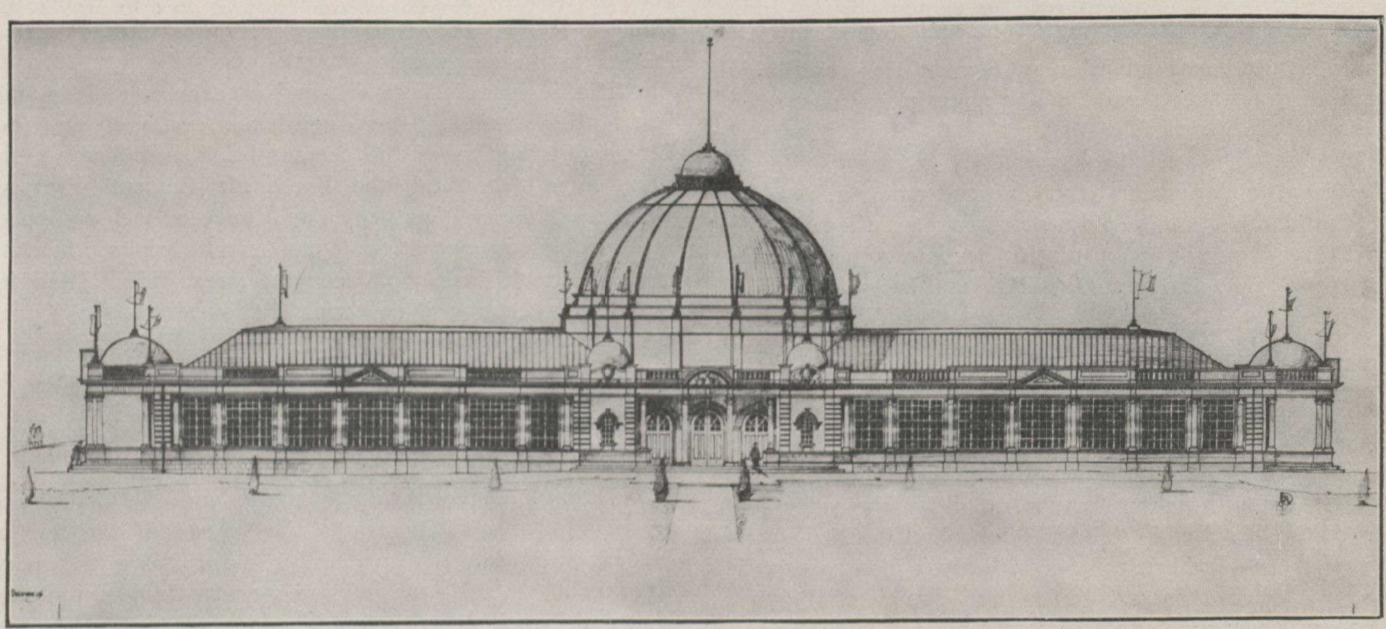
Fire Tests.

The first tests this year of the British Fire-Prevention Committee were devoted entirely to reinforced concrete floors. With a reinforced concrete and brick-lined floor under a four hours' fire test, for classification as "fully protective," was attained classification with a deflection of about 3 in. A hollow reinforced concrete floor which was also put forward for test for a similar classification obtained classification with a deflection of about 1-3 in. The load in both cases was 2½ cwt. per foot super., and the fire temperature ranged between 1,800° and 2,000° Fahr. Water was applied from a steam fire engine at the conclusion of each test for a period of five minutes. Some preliminary load tests with sections of the hollow reinforced concrete floor were also undertaken, and these will probably serve as a basis for a systematic series of tests in this direction, the floor sections under investigation having 14-ft. and 28-ft. spans respectively to a width of about 2 ft. 6 in.

English cement manufacturers are said to be in better condition than a year ago, competition from Belgium and Germany having been diminished through the demand for San Francisco, as well as by increased activity on the continent of Europe. Good prospects for the next few years are attributed to the requirements of the American and Chilian markets, as well as those of the Panama Canal, the locks, docks, and embankments of which will require large quantities of cement. French railway contracts, the rebuilding of South Italian villages, and the needs of the Egyptian market will, it is expected, further enhance demand.

Toronto Exhibition's New Buildings.

Chief Features will be Reinforced Concrete, Steel, and Fireproof Construction.

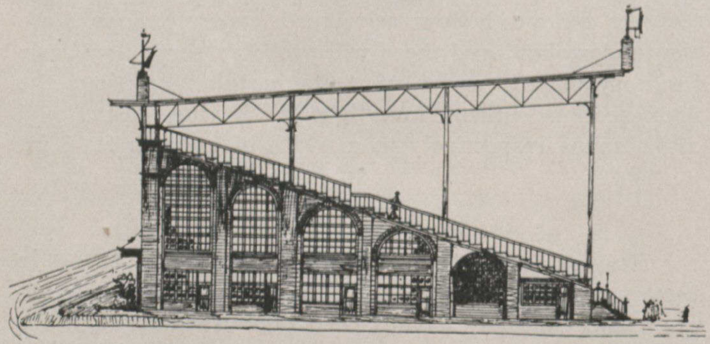


FRONT ELEVATION, HORTICULTURAL BUILDING, TORONTO EXHIBITION.

This will be constructed of Steel, Pressed Brick and Cut Stone, and the Floor throughout will be of Cement Construction.

Through the courtesy of the architect we are able to give our readers some illustrations of the new and handsome Horticultural Hall of the Toronto Exhibition, and of the substantial fire-proof structure which will replace the grand stand, burned some months ago.

The stand will be crescent in shape, one story high, enabling every individual to see perfectly the proceedings in front of it. The dimensions are 700 feet in length and 113 feet in depth. The height at the rear will be 54 feet, and in the front 60 feet, and it is to have seating capacity for fifteen
by it.
thousand. The construction is entirely fire-proof, of steel, reinforced concrete and brick. There will be three entrances fifteen feet wide, from the rear to the front under the stand. These will be on an incline easy of access. Provision is



END VIEW OF GRAND STAND, TORONTO EXHIBITION

The new Grand Stand will be entirely fireproof—of steel, reinforced concrete, and brick.

made for 72 boxes, which will be enclosed by wrought-iron railings. The steps to the staircases will all be of iron. Toilet rooms will be arranged under the stand, access to which may be had from the passageways entering from the Park.

This stand, it is claimed, will be the largest and most complete stand on the North American Continent, and will cost complete $217,000, and is to be finished entirely on or before the 10th day of August next.

This building will have a frontage on the south of 254 feet, and a width of 58 feet. The three wings run northward a depth of 156 feet from the front of building, and are 58 feet in width. An attractive feature of the building is that it will be surmounted by a dome 65 feet in diameter by 70 feet high, to be constructed of steel and wired glass, and the ribs arranged for receptacles for electric lighting, so that a magnificent electric effect may be had in the evenings.

The building will be constructed of steel, pressed brick and cut stone, the floor throughout of cement construction. Ample toilet accommodation is provided for male and female separately. It is of one story, having a basement for storage of plants and shrubs. Its cost will be $90,000, and it is intended it shall be the most ornate structure on the grounds. The date of completion is fixed for the 10th of August, but it may be ready before that date. The architect of both these fine buildings is Mr. Geo. W. Gouinlock, of Toronto.

A prominent Montreal architect predicts that the present year will be "the biggest in the history of building" in that city. An extraordinary amount of work is on hand.

What is described as the largest drydock in the world, with a stone and concrete basin big enough to hold any two of the battleships of the United States navy at one time, is about to be constructed at Hunter's Point by the San Francisco Drydock Co. at a cost of $1,250,000. It is said that the new dock will be 1,050 feet in length, 170 feet longer than the famous dock at Glasgow, and 225 feet longer than the Alexandra dock in Belfast harbor.

REINFORCED CONCRETE ARCH BRIDGE.

In our issue of December was an illustration of the reinforced concrete arch bridge which spans the Oshawa Creek, in the town of Oshawa, Ont. The bridge was seen then with the centres of the temporary bridge in the foreground which prevented a complete view of the structure. The illustration here shown gives a complete view of the bridge.

The span of the structure is 50 ft in the clear at the springing line, and the rise of the arch is about 7.5 ft. The width is 19 ft. 6 in. from out to out of spandrel walls, and the height from the water to the centre of the arch is 12 ft.

The arch ring is a plain slab 12 in. thick at the crown and 21 in. thick at the haunches, reinforced longitudinally with Kahn bars and transversely with plain round rods. The spandrel walls are secured to the arch ring by 7/8-in. dowels, and expansion joints are made in these walls at the centre of the bridge to provide for

REINFORCED CONCRETE ARCH BRIDGE.

This structure spans the Oshawa Creek, Ontario, and replaces a steel bridge with crib abutments, which was swept away by a heavy flood early last year.

free movement of the arch under temperature stresses. Both wing and spandrel walls are reinforced with 3/4-in. round steel.

The bridge is designed to carry, in addition to its own weight, a moving load of 100 pounds per square foot, and an 8-ton engine on axles at 8 ft. centres. The maximum allowable fibre stresses in the steel and concrete were as 16,000 and 500 pounds per square inch, respectively, and the ratio of their moduli of elasticity ... 12. The stresses were calculated at a number of sections, and the sizes so determined for any position of the moving loads that, combining the maximum bending moment with the thrust corresponding to the same loading, or the maximum thrust with its corresponding bending moment, the total resulting fibre stresses should not exceed the limits above mentioned.

The total quantity of concrete in the work is about 195 cubic yards. For reinforcement, 7,300 pounds of Kahn bars and 1,600 pounds of plain round rods were used.

The contractors for the work were Messrs. Barrett & Hill, of Toronto. The bridge was designed by Messrs. Connor, Clarke & Monds, consulting engineers, Toronto, to whom we are indebted for the above description and photograph. A full description appeared in our December issue.

ANNUAL MEETINGS.

The Sun Cement Company report a very successful season. The demand has been steady and prices good. The plant has been kept running to its full capacity in order to fill its orders. About $7,000 was spent in improvements to the works during the season. It is the intention of the directors to further increase the capacity of the plant. The total output for the season was 100,000 barrels.

The Imperial Cement Works report the past season as by far the most successful in the history of the company. The output was between 95,000 and 100,000 barrels. Before the mill opens up again in the spring extensive improvements will be made that will give the works a capacity of from 800 to 1,000 barrels a day. Two new separators and a ball mill will be installed in the grinding plant. The drive on the rotary kilns will be rearranged and the boiler capacity is to be increased by the installation of a new boiler. Each will be equipped with Murphy automatic stokers. Besides the improvements at the works an additional dredging outfit will be installed at the marl beds at Williams Lake. During the past season the plant has been run at full capacity. With the enlarged plant greater things are expected next season.

The annual meeting of the International Portland Cement Company, Limited, was held at the head office at Ottawa last month. There was a full attendance of shareholders, when the report of the directors was received and adopted. The distinctive feature of the meeting was the unanimous approval by the shareholders of the recommendation of the directors to double the capacity of the plant. At present the plant at Hull is turning out 2,000 barrels of cement per day, but the demand for its products has been so greatly in excess of the capacity that the directors felt constrained to recommend this duplication of the plant. The shareholders, in addition to receiving and adopting the report, ordered the directors to proceed at once with the construction of the necessary plant to give the mill a capacity of 4,500 barrels per day. The extension will give employment to between 400 and 500 men, and active operations will be begun as quickly as the season will admit of it. The old board of directors was re-elected by a unanimous vote.

Mr. E. H. Cotterell, civil engineer, has opened an office at 528 Main Street, Winnipeg, and intends taking up reinforced concrete constructions as a specialty. His announcement will be found on another page.

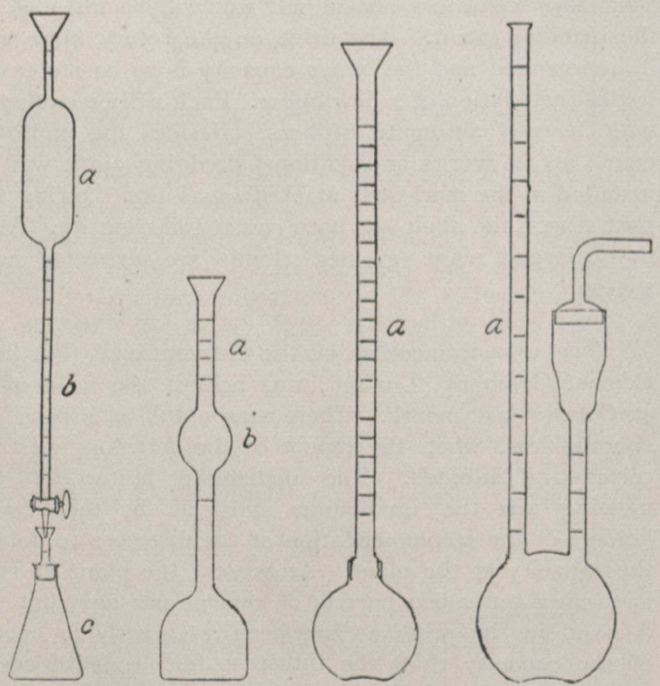
The Determination of the Specific Gravity of Cement.

By RICHARD K. MEADE, Chemist, The Dexter Portland Cement Co., Nazareth, Pa.

(Read at the Atlantic City Meeting of the American Society for Testing Metals).

SOME time ago the writer undertook a series of experiments to determine the reliability of the various forms of apparatus now in common use, both in this country and abroad, for taking the specific gravity of cements. The result of this investigation is given below.

As the first step to this investigation, four samples of cement were prepared by drying at 100° C. and passing through a No. 50 sieve. The specific gravity of each sample was then carefully determined by the use of a 50 cc. pycnometer or specific gravity bottle. Kerosene, freed from water by distillation over lime, was employed for the liquid, and the temperature was controlled to 0.1° C. The specific gravities of the samples were compared with water at 15° C. and were 3.088, 3.121, 3.193, and 3.240, respectively. The samples were kept in air-tight fruit jars.



SPECIFIC GRAVITY OF CEMENT.

These are the various forms of apparatus now in common use for taking the specific gravity of cement. Fig. 1 is the Jackson Apparatus; Fig 2 is the Le Chatelier; Fig. 3, the Schumann; and Fig. 4, the McKenna.

The specific gravities of the four samples were then taken with Le Chatelier's apparatus, Jackson's apparatus, McKenna's apparatus, and Schumann's apparatus. The results of these determinations were as follows:—

Le Chatelier's apparatus gave results uniformly 0.01 too high.

Jackson's apparatus gave results from 0.13 to 0.15 too low.

McKenna's apparatus gave fairly satisfactory results.

Schumann's apparatus gave satisfactory results.

The error in the case of the Jackson's apparatus seemed most probably due to improper calibration of the flask, and since all volumetric apparatus is likely to be incorrectly graduated, all four forms of apparatus were examined to ascertain how carefully this had been done. The apparatus in all cases was washed free from oil with benzine, ether, alcohol and water, in the order named, freed from cement particles by washing with a little hot dilute hydrochloric acid, and from dust, etc., by allowing a mixture of potassium bichromate water and sulphuric acid to stand in it over night. After washing and drying it was calibrated.

In the Le Chatelier apparatus, Fig. 2, the bulb, **b**, should hold exactly 20 cc., and the stem, **a**, between the graduations 0 and 3 should hold 3 cc. The bulb of the apparatus tested held 20.05 cc. at 70° F., or an error of 0.05 cc. The graduations on the stem were found to be accurate, consequently the total error amounted to 0.05 cc., and this amount (equivalent to an error of about 0.008) was added to each reading in making a determination with this particular Le Chatelier apparatus.

In the Schumann apparatus, Fig. 3, the stem, **a**, is graduated into 40 cc., and these again into tenths cc. These graduations were found to be accurate.

In the Jackson apparatus, Fig. 1, the bulb, **a**, of the burette should hold 180 cc. and the stem, **b**, 5.71 cc. The flask, **c**, should hold 200 cc., or if the burette bulb holds less or more than 180 cc., it should hold the contents of the bulb plus exactly 20 cc.

The flask of the apparatus in question held the contents of the burette bulb plus 19.3 cc., or an error of 0.7 cc. (equivalent to an error of from 0.12-0.15 in specific gravity.) The graduations on the stem were found to be correct. All of the apparatus was calibrated by running in water or kerosene from a calibrated 25 cc. burette, graduated into 1/20 cc. and easily read to 1/40 cc.

The flask of the Jackson apparatus was then recalibrated by adding 20 cc. of water from the burette and then the bulb of the Jackson burette full (180 cc.) of water.

Determinations made with the recalibrated Jackson apparatus and by applying the correction to the Le Chatelier apparatus, were very satisfactory, as the following table will show:—

Table of Results.

Cement No.	1.	2.	3.	4.
Form of Apparatus Used.				
Pycnomiter	3.193	3.088	3.121	3.240
Jackson's	3.19	3.09	3.12	3.23
Le Chatelier's....	3.20	3.09	3.12	3.24
McKenna's	3.19	3.08	3.13	3.25
Schumann's	3.19	3.09	3.12	3.24

To guard against improperly calibrated specific gravity apparatus, the tester should either check the volume of the bulb of the Le Chatelier apparatus and of the flask of the Jackson apparatus, or else request the maker of the apparatus to furnish with the same a certificate from the U. S. Bureau of Standards testifying to its trustworthiness. Of the four forms of apparatus, three are affected by any change in the temperature of the liquid between the two readings. With the Jackson apparatus, a table is supplied which gives the correction to be applied. In the other forms of apparatus, precautions are usually taken to guard against changes in temperature, such as immersing the instruments in a jar of water.

The coefficient of expansion of kerosene is 0.0009 per degree C., or 0.0005 per degree F. The Le Chatelier apparatus has a volume of 139 cc., consequently the expansion due to a rise of one degree C. amounts to 0.12 cc., after deducting for the expansion of the glass, or an error of approximately .018 in specific gravity.

The Schumann apparatus holds from 110 to 150 cc., and hence has about the same error. The McKenna apparatus, however, has a volume of 300 cc., and, since the stem is graduated into only 11 cc., the sample is smaller (between 30-35 grams) than that used for either the Le Chatelier or the Schumann apparatus. The expansion per degree C. rise with this apparatus amounts to 0.27 cc., or an error of approximately 0.07 in specific gravity. Dr. McKenna has now improved his apparatus by blowing a thermometer into the bulb between the two tubes, allowing temperature corrections to be easily made. The bulb itself is much smaller, doing away with the large error due to expansion, and the graduated tube is narrower and longer, making the apparatus much more delicate.

Since it is by no means an easy matter to keep the temperature constant during a determination, unless water, oil, cement and apparatus are allowed to remain side by side for some time, I have usually found it more convenient to take the temperature of the oil just before bringing it to the zero point and just after making the final reading. With the Le Chatelier apparatus 0.12 is then deducted from the final reading for every degree C. rise or added for every degree drop in temperature of the second reading over the first.

The chief objections I have found to the standard Le Chatelier apparatus is the time and care necessary to run the cement into the apparatus. The same objection holds good for both the Schumann and McKenna forms of specific gravity apparatus. McKenna's apparatus must also be protected from even slight changes of temperature, and requires a higher degree of manipulative skill than any of the other three forms. The Jackson apparatus is much more convenient than any of the others, and is just as accurate, provided it is properly graduated. This latter may be made sure of, as I have suggested, by having it certified to by the U. S. Bureau of Standards. The makers could have this done at small cost in lots of ten or more. The greatest objection to the Jackson apparatus when properly graduated is the necessity of drying the flask before each determination. This can be gotten around by graduating the flask wet (with kerosene), say, after draining two minutes in an inclined position so as to allow the bottom also to drain and removing the suspended drop. Flasks so graduated give just as accurate results as do dry flasks, and time may be saved by using the wet flask.

It is sometimes necessary to take the specific gravity of samples of cement after ignition at a low red heat. With the appliances at hand in the ordinary cement testing laboratory it is a difficult matter to ignite more than 5 or 10 grams at one time. None of the forms of apparatus ordinarily used for taking the specific gravity of cement is suited to the use of such a small sample. For this purpose I have used the method given below:—

From one arm, **a** (the left), of the balance take off the balance pan and in its place suspend from the stirrup, as shown in Fig. 5, a 50-gram weight, **b** (or any weight sufficient to more than balance this pan, such as a lead fishing sinker). Take the weight of this on the other pan, and call this weight "A." Now, attach to this by a fine silk thread or wire a 50 or 100 cc. pycnometer, **c** (a small 100 cc. Erlenmeyer flask with a narrow mouth will also do). Weigh the pycnometer so suspended and call the total weight "B." B—A will then be the weight of the pycnometer in air. Now, fill the pycnometer with water in the usual way, carefully forcing out all air, and weigh suspended in a tall, narrow breaker or jar, **d**, of water. Call this weight "C." "Loss in water" = (B — A) — (C — A). Now, dry the pycnometer, fill with oil and weigh suspended in kerosene. Call this weight "D." "Loss in kerosene" = (B — A) — (D — A).

Specific gravity of the kerosene =

$$\frac{\text{"Loss in Kerosene"}}{\text{"Loss in Water."}}$$

Now, remove the pycnometer and pour out half of the kerosene, introduce W (usually 5 to 10) grams of the ignited cement and mix thoroughly by twirling around the contents of the pycnometer. Fill the pycnometer to the neck with oil and allow a few minutes for the contents to settle. Fill the neck fully by pouring down the sides, suspend in kerosene and weigh as before. Call weight "E."

Specific gravity of the cement =

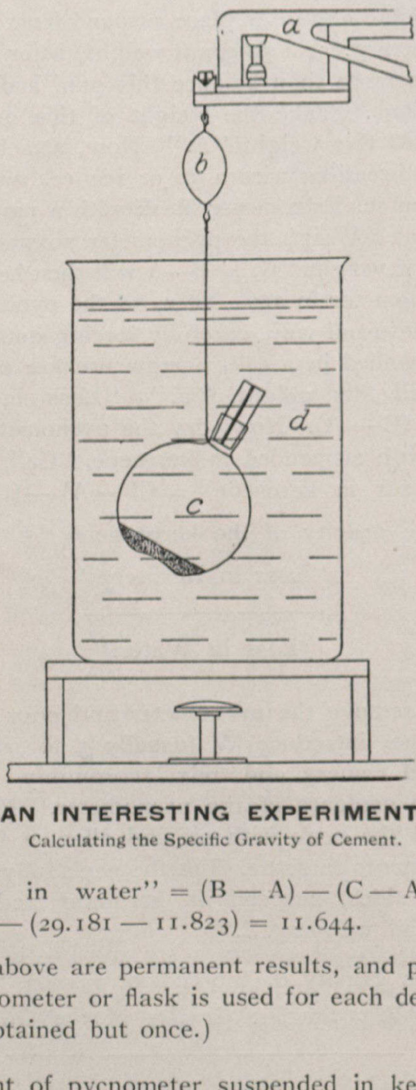
$$\frac{W \times \text{Specific Gracity of the Oil}}{(W + D) - E.}$$

The temperature of the oil should not change more than 2° C. during the time between the taking of its own density and that of the cement. The weight of the pycnometer suspended in water need be taken but once. After this is done a determination can be easily made in ten minutes. Even the finest particles of the cement settle in a few minutes, and results obtained by the method are very trustworthy, as the following will show:—

Sample No.	Pycnometer Method.	Suspension Method.
1	3.193	3.190
2	3.088	3.086
3	3.121	3.120
4	3.240	3.241
5	3.135	3.136
6	3.027	3.026

An example of the calculation is given below:—

Weight to balance (A) 11.823
Weight of pycnometer suspended to the above in air (B) 40.825
Weight of pycnometer suspended to the above in water (C) 29.181



AN INTERESTING EXPERIMENT.
Calculating the Specific Gravity of Cement.

"Loss in water" = (B — A) — (C — A) = (40.825 — 11.823) — (29.181 — 11.823) = 11.644.

(The above are permanent results, and provided the same pycnometer or flask is used for each determination need be obtained but once.)

Weight of pycnometer suspended in kerosene (D), 31.662.

"Loss in oil" = (B — A) — (D — A) = (40.825 — 11.823) — (31.662 — 11.823) = 9.163.

Specific gravity of oil =

$$\frac{\text{Loss in Oil}}{\text{Loss in Water}} = \frac{9.163}{11.644} = 0.787.$$

Weight of pycnometer + 10 grams of cement suspended in kerosene (E), 39.152.

Specific gravity of cement =

$$\frac{W \times \text{Sp. Gravity of Oil}}{(W + D) - E} = \frac{10 \times 0.787}{(10 + 31.662) - 39.152} = \frac{7.87}{2.510} = 3.136.$$

PUBLICATIONS REVIEWED.

Portland Cement:—Its Composition, Raw Materials, Testing and Analysis. By Richard K. Meade, B.S., Easton, Pa.; Chemical Publishing Company: Toronto, Canadian Cement and Concrete Review. 385 pages. Price, $3.50.

Mr. Richard K. Meade, B.S., chemist to the Dexter Portland Cement Company, and editor of "The Chemical Engineer," has added a valuable manual to the library of the cement industry, in the shape of his treatise upon Portland cement. Some four years ago he published a small volume entitled "The Chemical and Physical Examination of Portland Cement." In the new book is added a section on the manufacture of Portland cement, for the reason that the chemist who is to intelligently supervise the process of manufacture as well as the chemist who is to report upon the raw materials, and the engineer who is to inspect the product, should have a good general knowledge of the technology of Portland cement.

It was also found necessary to re-write almost the entire section upon the physical testing of cement in order to give special prominence to the uniform methods of testing adopted by the American Society of Civil Engineers, and to the standard specifications of the American Society for Testing Materials. Much new matter has also been added to the section on the analysis of cement and its raw materials. Sections on the experimental manufacture of small lots of cement and on the history of the industry have been included also.

The analytical methods have all been used to some extent in the writer's laboratory, and have been found satisfactory. Comments as to the accuracy and advice as to the best methods of manipulation are found with each method under the heading, "Notes."

The more the cement manufacturer knows of his material the more successful he will be. A good library is one of his essentials. Mr. Meade's book should not be missing from the book-shelf. It is profusely illustrated and contains some useful tables. There is one, for instance, showing the mechanical equipment of some modern Portland cement plants.

Speaking of the time of setting, Mr. Meade says "The rapidity with which a cement sets furnishes us with no indication of its strength. The test is usually made to determine the fitness of the material for a given piece of work. For example, in most submarine work a quick-setting cement is desired, that is, a cement which loses its plasticity in less than half an hour, while for most purposes where sufficient time will be given the cement to harden before being brought into use, a slow-setting cement will usually answer better, or one that sets in half an hour or more. The slow-setting cements can be mixed in larger quantities than the quick-setting, and do not have to be handled so quickly, so that for most purposes where permissible they are used.

The rate of set is determined by a number of things, chief of which are temperature and the percentage of water used in making the mortar:—The higher the temperature the quicker the set and the larger the percentage of water the slower the set. Temperature has a very marked influence, and many cements which are suitable for use in this country could not be used in the tropics. Similarly in the early spring and late fall when the temperature out of doors is from 20° to 30° F. below that indoors, cement which tests up quick in the laboratory may give perfect satisfaction when used at the outside temperature.

The Smith Publishing and Supply Company recognizing the value of this treatise, which is considered the best practical book on cement in the country, are undertaking its sale in Canada. The price of the volume is $3.50. Orders should be addressed to The Manager, Order Department, Smith Publishing and Supply Company, 18 Court Street, Toronto.

The Elastic Arch:—With special reference to the Reinforced Concrete Arch. By Burton R. Leffler, A.M.A.S.C.E., New York: Henry Holt & Company.

"Writers on the arch have invariably neglected to give a rough view. I have attempted to overcome this by giving a preliminary view of arch action, and then a definite statement of this action. Further exposition is nothing but a detailed account of the definite statement."

Mr. Burton R. Leffler, Engineer of Bridges, Lake Shore and Michigan Southern Railway, thus opens his introductory chapter, "How to Study." "Superiors in office," he says, "giving instructions to their subordinates, often carry a subject for quite a while in their minds and then present it all at once to their subordinates expecting them to see it in an instant as they themselves see it." This volume accordingly treats the subject so that the average reader may grasp easily its intricacies.

Mr. Leffler claims several new features. He has shown how the subject of reinforced concrete arch construction can be deduced from one simple equation. He also gives, which we believe, is the first presentation, a correct and simple method of designing a reinforced concrete section for combined thrust and moment. A graphical analysis of an arch for oblique forces is also given. Speaking of the objections to the elastic theory, Mr. Leffler says, "One objection is its difficulty in theory and practice. This is largely the fault of writers. It is no more difficult than the theory of continuous beams, yet the theory of continuous beams furnishes the only practical determination of stresses in draw-bridges. The difficulties can be largely overcome by the use of good English.

"Another objection is that the external forces cannot be exactly determined. The most glaring case is an arch under a high embankment. A similar case is a lintel carrying a wall over a door or window. This objection is not peculiar to the elastic theory. It applies to any theory of the arch. It will not do to say that, since the forces cannot be determined, no calculation of stresses is necessary. The folly of this is evident in the broken lintels that can be seen often. In railroad work, many arches are close to the track, and the loads are quite definite.

"The exact determination of the points on the gravity axis at which the tangents are rigidly fixed is uncertain. The best that can be done, is to join the ring to the abutments by a rather sudden enlargement of section. In a two-hinged arch, this objection vanishes."

The articles in this useful volume include, A Rough View of Arch Action, Meaning of the Pressure Curve, Location of the Pressure Curve, Determination of Unit Stresses, Time to Calculate an Arch, Shrinkage of Concrete, Shear, Summary, Approximations Necessary for the Use of Eq. 1, Application of Eq. 1, Graphical Use of (2), (3), and (4), Temperature Stresses, The Effect of $\frac{T}{A}$ in Eq. 1, Some Objection to the Elastic Theory, Unsymmetric Arches, Some Vagaries in the Development of Reinforced Concrete, and Graphical and Algebraic Methods.

It is a practical manual, and is written in plain English, by one who is an authority on his subject. A very difficult subject is presented in its simplest form.

Directory of American Cement Industries.—C. C. Brown, M. Am. Soc. C.E., Indianapolis, Ind.; New York, N.Y.; Municipal Engineering Company.

The cement industry has progressed with such strides that the publishers of this volume have issued a new edition of their directory. The condensed list of cement companies which it contains, and which is arranged alphabetically by States, is most convenient. A map accompanies this list which clearly shows the distribution of cement plants in operations and proposed. There is also a directory of cement brands. From this, one can easily place the quality, situation, and method of manufacture of any brand presented to the trade.

All the lists in the book have been revised by persons in individual cities and acquainted with their conditions, so that in general and in particular they are accurate and full. It has been the intention to include all cities and towns with more than 2,500 population. Many names from smaller places will be found, but no organized effort was made to carry the lists into these smaller places.

They are unusually complete for places larger than 2,500 population. There is a table of freight rates which has been revised and is one of the most valuable single features of the directory. Other features are; American Cement Manufacturers, Directory of Sales Agents, Cement Companies' Names not now in use, Dealers in Cement, Contractors and other users of Cement, Engineers and other supervisors of the use of Cement, Cement Tests and Analyses, Engineers Designing Cement Plants, Machinery and Supplies for Cement Plants, Machinery and Tools for Cement Users.

The volume is a valuable addition to the trade-list. It is indispensable to those who desire to keep in close touch with the industry throughout the continent.

CEMENT MARKETS.

"Cement and Concrete Review" Office,
Montreal, March 14th.

The markets for cement throughout the whole of Canada, as will be seen from other items in this issue, are opening up in a most satisfactory manner. A large number of contracts have already been closed, and many factories have their output contracted for well into the summer. In fact, some well-informed dealers state that the entire output of a few of the Canadian mills is booked up for the season. Apparently manufacturers are looking forward to a considerable advance in the near future, as some of them do not appear specially anxious to book orders at the moment. Buyers are not experiencing any difficulty whatever in getting all the cement they require placed on order.

Prices of English cement have advanced within the past few week and factories are fairly well booked up already. English dealers are said to be looking forward to advances in the near future. The advance which has already taken place is said to have been largely due to the high price of jute, the English bags being made of that material.

Following are the latest prices:—

Canadian Cement.—Prices are $1.80 to $1.85 per barrel, in cotton bags,, and $2.10 to $2.20 in wood, weights being in both cases 350 pounds. There are four bags of 87½ pounds each, net, to a barrel, and 10 cents must be added to the above prices for each bag, the bags being, however, accepted back at the same figure. In the case of American cement, 10 cents each is charged for the bags, and only 7½ cents is allowed when they are returned.

Foreign Cement.—English cement is quotable at $1.80 to $1.90 per barrel in jute sacks of 82½ pounds each (including price of sacks), and $2.10 to $2.20 in wood, per 350 pounds, gross. Belgian cement is quoted at $1.75 to $1.90 per barrel, in wood.

Toronto, March 15th.

Cement here has advanced during the last month 5 cents per barrel. There is most likely to be another advance. The manufacturers are not looking for any orders as they are booked right through to the end of the season.

Some Hints on Waterproofing Concrete.

The Elastic versus the Rigid Method.

By E. W. DE KNIGHT.

(This interesting paper was read at the annual convention at Chicago of the National Association of Cement Users, and was specially sent with others, which will appear in subsequent issues, to the "Canadian Cement and Concrete Review" for publication.)

HE importance of waterproofing in these days is not so much in keeping water out of buildings as in protecting and preserving the embedded steel.

What is first necessary is to determine upon method, and having done that, then decide upon materials. In looking over the field it will be found that all waterproofing efforts are divided into two totally dissimilar lines of action, viz.:

1. Treating concrete to make it, in itself, impermeable.

2. Protecting concrete or masonry with something apart therefrom to waterproof them.

Aside, therefore, from any consideration of materials, it will be found that the question dividing these two dissimilar lines of action is one of method, i.e.:

Shall water reach the concrete, or shall it not reach the concrete?

We will first consider treating concrete to make it, in itself, impermeable. Under this head comes those materials and methods for making concrete impermeable—first, by mixing certain chemicals with the concrete for the purpose of making the solid mass impermeable; and, second, by applying a coating or wash to the hardened surface of the concrete, or applying thereto a cement plaster. The ingredients generally used are lime, silicate, soda, lye, soap, alum, etc.

Among many objections to the first process is that the mixing of the chemicals with the cement will not lessen the present general difficulty of having concrete properly mixed in the field. Without, or with, the chemicals, therefore, there will always exist zones weak in quality and density. The second objection is the uncertain effect the addition of the chemicals will have in time upon the concrete, and particularly upon the embedded steel.

Objections to Coatings or Washes.

One of the chief, among numerous, objections to the second method, i.e., using coatings or washes, is the poor judgment in basing dependence for permanent waterproofing upon one thickness or layer of any single thing, which in this case happens to be a wash almost imperceptible in its thinness. This, aside from any consideration of the fact that but one infinitesimal pore imperfectly closed, by permitting the entrance of water, which would soon spread, would make valueless the balance of the washed surface. Such treatment is not even consistent with the doctrine of **similia similibus curantur**, because we are not curing like with like, but adding a bad thing to a bad thing.

Most seriously, however, neither of these methods make any provision whatever for the cracking of concrete, which is entirely overlooked. That concrete **will** crack is indisputable. That it can be made impermeable is possible. Why, however, make it impermeable if its impermeability will not prevent cracking, or provide waterproofness for practical, every-day conditions? Are not, then, the extensive laboratory tests as to the waterproofness of briquettes and water-filled boxes of cement, or tubes filled with water, whether under 10 or 50 feet pressure, resting on blocks and cubes of specially treated cement, an expenditure of time and energy in the wrong direction, at least from the viewpoint of practical waterproofing? Would it not be impossible to extend into monolithic form in the field concrete so perfect in texture and mixture as the specially prepared laboratory sample? Masses of concrete in the open, especially in this climate, where the temperature ranges over 120° F., are subject to inequalities of settlement, contraction, and expansion, and other conditions impossible, to the same degree, in a laboratory sample.

Testing the strength and quality of cement, as cement, is a different thing.

Percolation of Water through Concrete.

We have seen water drawn up fifteen or twenty feet by concrete. We have also seen water come through concrete over twenty feet thick. It may take two or three years to do so; meanwhile the assumption is that the concrete is fairly water-tight. But, with the average concrete, water will come through it **in time**. When the concrete thus becomes damp, wet and saturated with moisture, it is impossible to get the moisture out. If the moisture freezes—expanding ten times its volume in so doing—it requires no stretch of imagination to calculate the effect upon the concrete or masonry. Enough water will be taken in through a crack, **before the crack is filled,** to attack and injure the steel. Filling the crack after that is simply patching without curing.

It has often been, not facetiously, but seriously, suggested that all that is needed to solve the difficulty is for some one to invent something to fill the cracks and make a water-tight joint, with special reference to structures above ground level. The United States Patent Office will not entertain an application for patent on an invention claiming perpetual motion, on the assumption that there is no such thing in mechanics. A perpetual crack-filler which will make a crack water-tight under a temperature of 120° F. in August and 20° F. below zero in January is beyond the pale of possibility, or even perpetual motion.

We sincerely believe that a great deal of harm will come to the cement industry from the indiscriminate use of the numerous preparations on the market for hardening the surface of concrete, or, in other words, for the purpose of making the concrete impermeable. We think that this has been already observed in attempts to make concrete blocks impervious by the use of such preparations, and the recommending and using of such blocks for situations and purposes for which they were never intended. Some of these waterproofing preparations are practically worthless, while the bulk of them, we think experience will later show, are of but passing value. Their use simply temporizes matters instead of permanently curing same. We understand that one of the most extensively used of these preparations was originally intended by the inventor to lessen the absorbent quality of cement or concrete, and **not** for "waterproofing" foundations, arches, walls, floors, etc., in the every-day, practical waterproofing sense.

Even though liquid glass were spread over the surface to be waterproofed, it would not serve for practical waterproofing, because, while glass would, of course, be in itself water-tight, it would readily crack with any jar, contraction, expansion, settlement, etc.

Where Logic Counts.

Another thing. The majority of these preparations, cement plasters, etc., are placed on the inside surface of the wall.

It is against the logic of things to place the waterproofing in front (where in time it can be shoved off) of the line of resistance (the wall) instead of behind it. One of the chief uses of waterproofing is to keep water entirely from the wall, instead of allowing it to come to and through it, and by capillarity work up and saturate the entire wall, and in the course of years press off the hardened cement or other coating on the other side, which it must finally do by the very law of nature.

Of what use is a waterproofing which will not accommodate itself to the wall, instead of having the wall accommodate itself to the waterproofing (i.e., of having the owner guarantee that his wall will not crack the waterproofing). Waterproofing is applied to protect the surface waterproofed under all conditions—settlement, jars, shocks, expansion, contraction, heat, cold, water, snow, ice, etc. To accommodate itself to and protect the wall or other surface under above described conditions is exactly what the elastic "membrane method" does, and what the rigid cement method, by the admissions of its own exponents, does not and cannot do. It matters not, then, how durable may be the cement.

Further, in addition to the undesirability, on general principles, of permitting water to soak through the entire wall and gradually work its way upward, the presence of moisture or water in the wall constantly pressing against the thin layer of cement plaster on its inner surface is to make the entire wall, including the cement coating, so cool or cold as to make it difficult, if not impossible, to heat the wall and prevent condensation thereon. As it will be also practically impossible to drive the moisture out of the wall, the condition will grow more serious with time. As furnaces and boilers are placed in the foundation, and heat draws water instead of driving the water out of the wall, it will tend to draw it through it. All this aside from any consideration of the cracking of the cement itself. On the other hand, the "membrane method" not only insulates the wall against the surrounding earth, but keeps the water entirely away from and out of the wall, making a dry wall susceptible of heat or warmth and preventing condensation thereon.

Why permit the saturation of the wall and the consequent corrosion and slow but sure destruction of the embedded steel?

On careful consideration, therefore, does it not seem absolutely necessary that we get **away** from the concrete, and so protect it that water will not reach it? This protection standing between the water and the concrete will then make it permanently water-tight, whether it cracks or not.

Will Make It Permanently Watertight.

Under the head,—Protecting concrete with something apart therefrom, to make it waterproof,—come those materials and methods for preventing water from coming in contact with the concrete. Practically the first efforts in this direction were to coat the surface to be waterproofed with hot coal-tar-pitch or asphalt, which, however, when set and cold, cracked and separated with any settling or cracking of the masonry. Burlap was subsequently used to reinforce the pitch or asphalt, without, however, preventing them from cracking, and the burlap, being of itself not waterproof, did not give waterproofness. Later on there came into use for this purpose tar paper, which, however, lacks pliability and tensile strength. Tar and tar paper have been extensively used for waterproofing in the past, simply because there was nothing else open to the profession.

It was not until recent years that any serious effort was made to place waterproofing on a scientific basis—and to make materials specially adapted to the various conditions—materials which would not become brittle or be injuriously acted upon by water, the salts in the earth, alkali in cement, etc. The result of this specialization has been to greatly improve methods and to open to the profession products for difficult work and special conditions, considerably in advance of old school materials.

There are also used for waterproofing mastics composed of coal-tar-pitch, or asphalt, mixed with sand or torpedo gravel, resembling somewhat, when finished, an asphalt pavement. Mastics on floors, especially on bridge floors, soon separate from walls, steel columns and girders. If the mastic is made soft enough so as to not crack in winter, it becomes too soft to bear the load of traffic in summer. The chief objection to mastics is that they crack clear through with any contraction and expansion or cracking of the masonry or concrete surface, of which they become an integral part when applied hot thereon.

(*To be concluded.*)

A good test of the tenacity of brick masonry laid in cement mortar was recently seen in West Terre Haute, Ind. A cistern 10 ft. deep, 7½ ft. in diameter, with the top portion drawn in to a manhole, resembling the top part of a jug, had been completed, but no water had been turned into it. By the breaking of the Wabash River through a levee the town was flooded, and the cistern floated from its foundation and turned over on its side without fracture. It continued to float as long as the high water lasted.

NEWS AND NOTES.

The citizens of Westmount, Ont., will petition the Government to build a new post office.

City Architect McCallum has revised the building by-laws of the City of Toronto, and has sent out draughts of the new regulations to the Board of Trade, the Manufacturers' Association, the Architects' Association, and the Builders' Association, in order that the proposed changes may be criticized and altered if necessary. The proposed alterations are not radical in their nature, and cannot be expected to materially alter the situation as regards building.

The Brockville Cement Pressed Brick and Concrete Company, Limited, has secured the agency of the International Portland Cement Company, of Hull.

The Grand Trunk Pacific is about to commence the construction of a large cement bridge at Edmonton. The cement was supplied by the Stinson-Reeb Builders' Suply Co., of Montreal.

The Colonial Portland Cement Company, of Wiarton, Ont., have placed an order with the Owen Sound Iron Works Company for three large slurry pumps, three feed pumps and two steel smoke stacks.

The Superior Portland Cement Co., of Orangeville, has not yet turned out any cement, but expect to do so by mid-May. The buildings are substantial and their machinery modern. That there was some disappointment at the recent annual meeting at the delay in completing the works seems natural, but the shareholders appear satisfied that the company has a prosperous future before it.

A majority of the Portland cement manufacturers in Germany have formed themselves into groups or syndicates to promote the industry. Rudolph Dykerhoff, the well-known manufacturer, says that, owing to the great impulse given to building construction the demand for cement has been extensive, and a majority of the works have been fully engaged to meet it. Selling prices have advanced, but, unfortunately for the manufacturer, this advantage has been offset by the increased cost of the materials which enter into the manufacture of cement, and a general advance in wages, etc.

A concrete block factory company is being formed at MacLeod, Alta., and two new brickyards are to be opened. Building will be brisk there in the spring. A new hotel and the new Hudson Bay building are nearly finished, and a mill will shortly be built. Two new blocks and four banks and other buildings in brick, stone, or concrete are to be erected.

The twenty-one storey addition to the Fisher Building, Chicago, has been finished and is now occupied. This addition has set a new time record in erection, only sixty days being required for the construction of the steel structure. There are 1,157.35 tons of steel in the steel structure of the addition, which rests on sixteen caissons, containing 48,000 cubic feet of concrete. Fireproof construction of the most approved design has been used throughout, and the exterior of the building, Gothic in design, of pressed brick and terra cotta, resembles the older building which it adjoins.

CEMENT PRODUCTION IN CANADA.

The Mines Section of the Geological Survey Department of Canada has received from the manufacturers complete returns of the production of Portland cement in Canada for 1906.

Mr. E. D. Ingall, the Mining Engineer, informs the "Canadian Cement and Concrete Review" that a statement was compiled and issued within a few hours of the receipt of the last return from the manufacturers. The Mines Section of the Department is to be complimented on such a notable departure from the traditions concerning the publication of Government statistics. It would not be surprising to know that this statement is the first ever issued from a Government Department within a few hours of the receipt of the complete figures.

"The Canadian Cement and Concrete Review," of Toronto, will publish in the March issue, to appear on Friday, some interesting statistics regarding the production of Portland cement in Canada. The figures have been compiled by the statistician to the Mines Section of the Geological Survey of Canada. The editor of the journal in question has supplied the Monetary Times with a copy of the figures, which are as follows:—

The total quantity of Portland cement manufactured was 2,152,562 barrels as compared with 1,541,568 barrels in 1905, an increase of 610,994 barrels or 39.6 per cent. The total sales of Portland cement were 2,119,764 barrels as compared with 1,346,548 barrels in 1905, an increase of 775,216 barrels, or 57.4 per cent.

Fifteen companies were operating plants during 1906, with a total daily capacity of about 10,500 barrels, namely; one in Nova Scotia; two in Quebec; eleven in Ontario; and one in British Columbia. At least four plants were under construction during the year, of which the total initial daily capacity will be about 4,700 barrels.

Detailed statistics of production in 1905 and 1906 are as follows:—

	1905. Bbls.	1906. Bbls.
Portland cement sold	1,346,548	2,119,764
Portland cement manufactured	1,541,568	2,152,562
Stock on hand 1st January	111,446	269,558
Stock on hand 31st December	306,466	302,356
Value of cement sold	$1,913,740	$3,164,807

Some companies do not take stock at the end of the calendar year, consequently their estimates of stock on hand do not always agree from year to year.

The average price per barrel at the works in 1906 was $1.49 as compared with $1.42 in 1905.

The imports of Portland cement to Canada in 1906 were:

	Quantity. Cwt.	Value.
Six months ending June	945,187	$319,021
Six months ending December	1,485,573	459,685
The year 1906	2,430,760	$778,706

This is equivalent to 694,505 barrels of 350 pounds each at an average price per barrel of $1.12. The duty is 12½c. per hundred pounds.

The imports in 1905 were equivalent to 917,558 barrels valued at $1,138,548, or an average price per barrel of $1.24.

There is very little cement exported from Canada. The consumption is therefore practically represented by the Canadian sales together with the imports.

The following is an estimate of the consumption of Portland cement in Canada for the past six years.

Year.	Canadian. Bbls.	Imported. Bbls.	Total. Bbls.
1901	317,066	555,900	872,966
1902	594,594	544,954	1,139,548
1903	627,741	773,678	1,401,419
1904	910,358	784,630	1,694,988
1905	1,346,548	917,558	2,264,106
1906	2,119,764	694,503	2,814,267

CEMENT WEIGHTS AND TESTS.

A very important topic was introduced by Mr. J. A. Jamieson at the annual meeting of the Canadian Society of Civil Engineers, held in Montreal recently. The Society, he said, had now reached a position of importance in the country, which justified it in taking a stand upon certain matters which more particularly concerned the engineering profession. He would now speak of one of these matters, and later would introduce the other. The first related to the testing of Portland cement. Cement was a most important material, and one with which all engineers were dealing. Notwithstanding this, there were no modern specifications in the rules of the Society respecting the uniformity of test. The American Society had rules touching the subject, and he thought it would be well for the Canadian Society to follow their example. He, therefore, moved that a committee be appointed to investigate the matter, and to formulate uniform rules for testing cement, and to report results to the Council before the 1st of next October.

The motion was seconded by Mr. Dodwell and carried, and the following were appointed members of the committee, with power to add to their number: Messrs. Rust, for Toronto; McPherson, for Ottawa; Dodwell, for Halifax; Gutelieus, for Montreal; and Denis, for the West, with Mr. Jamieson as convener or chairman.

Mr. Jamieson then stated that the other question referred to by him was that of what should be the weight of a standard barrel of cement. "At the present time," said he, "cement is sold both in barrels and bags, and these packages run in all sorts of weights. Some barrels are 325 pounds, and others 350 pounds, while American cement runs 375 pounds.

In Canada, and also in America, the manufacture of cement in barrels is going out to some extent and shipment is taking place in bags. This variety in package and weight causes much confusion and no doubt quite a little loss, as light barrels will sometimes be delivered in place of heavy. The time has come when we should buy our cement exclusively by weight. If it were put up in 100-pound bags it would suffice. I move that this meeting instruct the incoming Council to memoralize the Government suggesting that cement should be sold in Canada as soon as practicable by weight."

Mr. Francis seconded the motion, adding that the Government had been an offender in this matter itself, and claiming that 100-pound bags would be most convenient. The motion was carried.

TO FARMERS.

Farmers are interested in the progress of the cement and concrete industry. They will be interested also in the "Winnipeg Market Record," which is authorized by the Winnipeg Grain, Produce and Fruit Exchanges to publish the reports of their daily market session.

Subscription rate, $1.00 per annum in advance. Specimen copies sent on application to 330 Smith Street, Winnipeg.