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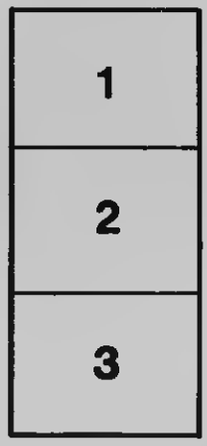
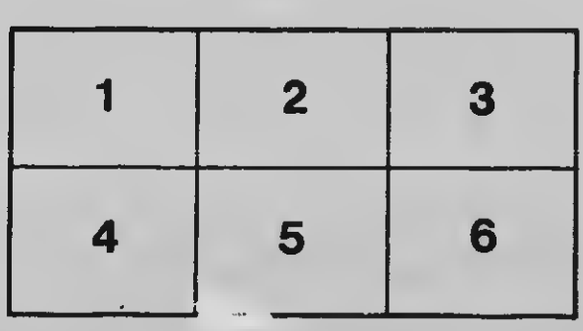




Souvenir

INTERNATIONAL
PORTLAND CEMENT CO.
LIMITED

MONTREAL, QUEBEC

MODELLED
PORTLAND CEMENT

INTERNATIONAL
PORTLAND CEMENT,

Unapproached by any other brand of cement on the market for uniformity, strength, purity and perfection. Practical tests prove it—this souvenir tells the reasons why.

JOSEPH S. IRVIN
Founder and Managing Director.

SOUVENIR
of the
HISTORY, DEVELOPMENT
and FUTURE *of*
PORTLAND CEMENT

INTERNATIONAL
PORTLAND
CEMENT CO.
LIMITED.

OTTAWA, —— CANADA

SOUVENIR
of the
HISTORY, DEVELOPMENT
and FUTURE of
PORTLAND CEMENT

INTERNATIONAL PORTLAND CEMENT CO. LIMITED.

OTTAWA, ——— CANADA.

INTRODUCTORY.

IN offering to the public this Souvenir on the history, development and future of Portland cement, we aim to present material for thought and study. We have gathered such information as can be relied upon to be practically and scientifically correct.

Men about to build will be agreeably surprised and intensely interested if before building with other materials they will investigate the merits of Portland cement, and they will certainly acknowledge themselves grateful to us if the perusal of these pages stimulates them to such efforts.

Progress is the watchword of the 20th Century, and it is with this thought in mind that we present these pages showing the progress recently made in cement manufacture, and the present advanced ideas on cement constructive work. Our purpose here is to show something of what has been done and to afford material for thought as to what can be done in the future with Portland cement. No product in the world has a wider application to useful purposes, and all other building materials suffer markedly by comparison with it.

It is in the hope of acquainting you with these facts, and stimulating you to investigate for yourself that we present you this Souvenir.

It is our purpose to make this book an educator for men willing to know the truth concerning Portland cement, its production, and best methods of building involved in the modern reform movement in construction work; and if we can set you to thinking on these things, this Souvenir will have accomplished its mission, and the business world have been benefitted by its existence.

INTERNATIONAL PORTLAND CEMENT COMPANY, LIMITED.

OTTAWA, CANADA.

INTERNATIONAL PORTLAND CEMENT COMPANY, Limited.

PORTLAND CEMENT.

THE recent marvellous development in the consumption of Portland cement, and the rapid multiplication of its universal uses in all kinds of structural work and architectural design, will, no doubt, make a brief study of its nature and composition of interest at this point.

A true Portland cement is obtained by calcining at high heat an intimate and definite mixture of carbonate of lime, silica, aluminum and iron oxide, and grinding the resulting clinker to a fine powder. If the composition, in molecule and mass, is correct in this mixture the addition of the proper amount of water to the finely ground material causes crystallization, whereupon the mass begins to harden into rock and *continues* to increase in strength for several years before reaching its maximum. It was first commercially made in England about the year 1824, and named from its close resemblance to a building stone quarried at Portland on the Cornish coast.

Before the discovery of artificial cement, the only hydraulic cementing materials known were natural rock cements and hydraulic lime. The reason for the great superiority of Portland cement is that it is made from an artificial mixture of exactly correct composition, and burned at the high heat necessary to bring out the maximum hardening qualities. To manufacture a good article there must be proper selection of materials, careful workmanship, and the exercise of precaution to prevent entering into the finished product any inferior or injurious substance.

Purity of raw materials, their correct chemical combination, a perfect system of manufacture, together with experience and scientific accuracy are essential to the production of a uniform, high grade Portland cement.

This beautiful Bridge is built entirely of Portland Cement.

INTERNATIONAL PORTLAND CEMENT COMPANY, Limited.

HISTORY OF CEMENT MANUFACTURE.

EGYPT was probably the home of the early cement makers, four thousand years ago; but the art perished with their supremacy, and history records nothing important either in the manufacture or use of cement for fully two thousand years after. The Romans then discovered a process for manufacturing a hydraulic cement by burning clay nodules, containing lime and iron, and mixing the product with lime and sand. The result was the so-called Roman cement, intermediate between Portland and Natural cements of to-day, and for which they found very extensive use in the building of walls, vaults, road-beds and the like. But they, like the Egyptians, were the sole possessors of the art, and seem to have found no imitators up to the time of Col. John Smeaton in 1756.

Smeaton was a celebrated English engineer, who discovered that a certain limestone containing a percentage of clay produced, on being calcined, a cement which he termed "Improved Hydraulic Lime." Zealous in his purpose Smeaton risked his reputation as an engineer, and showed his faith in his material by building with it the famous Eddystone Lighthouse, the foundations of which stand to-day as a monument not only to the excellence of his cement, but to his ability and courage as an engineer. The work was completed in 1759, and has withstood the fiercest storms for a century and a half unharmed to the present time. It was with this discovery that the real history of modern cement manufacture commenced.

A third of a century later a Mr. Parker, of London, patented a process for manufacturing Roman cement that produced a product about the grade of the present American natural cements. Several other patents were taken out previous to 1813, when a French professor at Paris discovered the fundamental chemical action in the manufacture of Portland cement, namely, that in the burning the silica of the clay unites with the lime and produces a product with hydraulic properties.

Following this line of investigation, Joseph Aspdin, an Englishman, manufactured in 1824 a cement which he called Portland cement, since the blocks he moulded from it so closely resembled building stone of that name quarried at Portland on the Cornish coast. For twenty-five years the new material was put to frequent tests, and the unqualified endorsements it received forced its recognition by English engineers, who finally accepted it as a reliable building material.

In 1846, the first cement mill was established in France near Boulogne, and in 1855, the first in Germany at Stettin. About the same time Belgium, Austria and Russia also took up the manufacture of Portland cement.

The first cement factory on this continent was built by David Saylor in 1872 in the State of Pennsylvania, and its product soon became a worthy competitor of foreign cements, demanding for itself recognition just as its English predecessor had done. Nevertheless, up till 1891, there had not been manufactured on this continent, all told, probably more than one-half million barrels of Portland cement. But four years later the production had increased to more than one million barrels per annum, and since 1896 the increase in production as well as consumption has been phenomenal.

The secret of the success of the manufacture of Portland cement in this country is due to the development of the rotary kiln, and to other important improvements both mechanical and chemical. Owing to these improvements, and to greater care in the preparation of the raw materials than previously practiced, it is now generally conceded that there is no Portland cement made anywhere else in the world that is equal to the product of the leading factories of this country.

INTERNATIONAL PORTLAND CEMENT COMPANY, Limited.

Type of Rotary Kiln used in International factory.

FACTORY OF THE INTERNATIONAL PORTLAND CEMENT COMPANY, LIMITED, HULL, QUEBEC, SHOWING EXTENSIONS MADE TO THE PLANT DURING THE YEAR 1908.
DAILY CAPACITY 3,000 BARRELS.

FACTORY.

ON the opposite page is given a correct cut of the factory of the International Portland Cement Company, Limited, showing the extensions made during the years 1907 and 1908. To those interested in the manufacture and use of Portland cement, the question of factory, its process, equipment and quality of cement it will produce are of vital importance. This factory is the product of the best mechanical and engineering skill on the continent of America, and is equipped with the very latest and strongest types of machinery, made from our own detailed plans and specifications. The designers and builders of this factory and the machinery therein installed have gained their knowledge after years of practical experience in cement making. They have designed and superintended the construction of many of the most modern cement mills in America, and are pioneers in cement manufacture. They are men to whom the world is largely indebted for the standard of perfection reached in the production of a strictly high grade Portland cement.

The plant is built extraordinarily substantial. The buildings are models of convenience, and are constructed of cement and steel, rendering them practically fireproof. Our power is derived from the Ottawa and Hull Power Company (the great Chaudiere Falls) which is one of the most constant and reliable power plants in Canada. The power generated is electrically distributed throughout the plant, driving induction motors of the most modern type. This distribution of power is most efficient and economical. In our plant there are no line shafts to get out of order, and thus throw the whole department into disuse. Each machine is driven independent of its neighbor, and can, if necessary, be stopped for repairs, while every other machine in the factory performs its ordinary function uninterrupted. There is no multiplicity of pulleys and shafts to produce torsional strain, no difficult alignments necessary, and few bearings to produce friction. This most simple and convenient arrangement means a saving of from ten to fifteen per cent. of generative power, and ensures steady and uninterrupted operation in each department. Under these circumstances a perfect grinding, mixing and clinker burning process is ensured, hence a more perfect product. Our new type of rotary used for calcination produces a very hard clinker, burned with a marked uniformity and thoroughness, not attained by the older methods.

The company manufactures by this latest process but one grade of cement, devoting their entire attention to securing the best quality. Throughout the entire works scientific and mechanical skill are brought into requisition to keep our product at its high standard.

The high quality of International cement was soon recognised, and in less than a year after the works were put in operation the flood of orders received far exceeded the capacity of our factory, necessitating an extension to the plant. By further extensions and improvements the output of our works in 1907 was increased to over two thousand barrels per day. Even this large output proved altogether insufficient to supply the rapidly growing demand, and a further extension became necessary, which resulted in bringing the plant up to its present capacity of over three thousand barrels per day.

This factory, as it stands to-day, is the largest, most complete and efficient Portland cement factory in the Dominion of Canada, and the International Portland Cement Company guarantees its product to fulfill the requirements of standard tests, and to be equal to the best high grade Portland cement in the world.

WHY INTERNATIONAL PORTLAND CEMENT IS OF CORRECT COMPOSITION, UNIFORM AND RELIABLE.

FIRST of all, this Company is fortunate in possessing raw materials that are almost absolutely uniform in character, and that are distinctly separate from each other. This natural condition enables our chemical department to easily proportion the raw materials even before they enter the complete and accurate process of manufacture which follows.

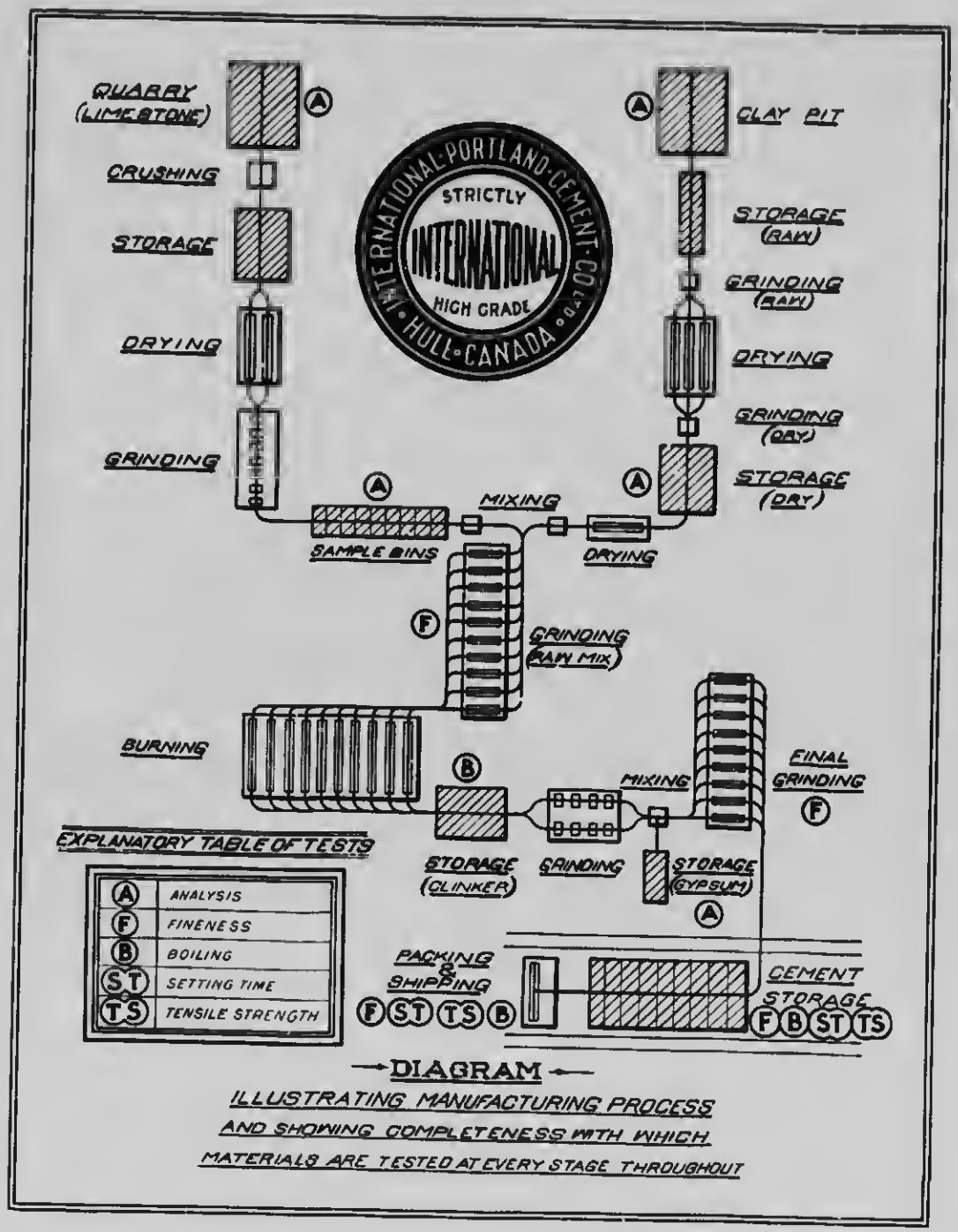
On the opposite page is given a diagram illustrating the improved process of manufacture installed in the factory of the International Portland Cement Company, Limited. A careful study of this diagram will show the completeness with which the materials are tested at every stage throughout, from the quarry to the very car in which the finished product is shipped. It will be noticed that sixteen separate and distinct analyses and tests of the materials are made at different points during the process. These analyses and tests are made at short intervals of time during each twenty-four hours. The samples from which the chemist makes these tests are being constantly and regularly collected, thus insuring an absolutely correct average sample. The two raw materials are correctly analyzed and accurately proportioned in order to obtain a definite mixture before they enter the mills where the process of mixing and grinding takes place. The greatest care is exercised at this point.

In addition to the analyses and tests made as indicated on the diagram, separate and distinct examinations are also regularly made of the product from each individual mill in the entire plant.

It will, therefore, clearly appear that our chemical department may at all times be in the possession of positive knowledge as to the correctness of the mix- .re before allowing it to pass from one stage to another, and that with reasonable care it is practically impossible to obtain anything but the most perfect product. It is an utter impossibility to produce a pure and uniform Portland cement without a definite mixture of the ingredients, or raw materials; hence the great importance of a perfect chemical and mechanical arrangement to accomplish this purpose.

The high class work in which Portland cement is now being used demands a high class cement, and the successful manufacturer must be prepared to meet these demands. By reason of the prominent place Portland cement now holds in the building arts, more attention is being given to *quality* by the architect, engineer and builder than ever before in the history of the industry, and it may reasonably be predicted that in the near future the government will inspect and grade cements as they now do wheat and other commercial commodities.

No subject in this Souvenir Catalogue is of greater importance to the dealer and consumer than that illustrated by the diagram on the opposite page. This process is a departure from the old methods, and is a decided step forward in cement manufacture, and it may be clearly seen that every possible safeguard is provided in our factory to insure the production of a pure and uniform cement. We are, therefore, safe in guaranteeing our product for the purposes shown in this Catalogue, or for any other purpose where a strictly high grade Portland cement is required.



DIAGRAM

ILLUSTRATING MANUFACTURING PROCESS AND SHOWING COMPLETENESS WITH WHICH MATERIALS ARE TESTED AT EVERY STAGE THROUGHOUT

OUR RAW MATERIALS.

THE raw materials from which International cement is made consist of a very pure limestone and clay deposit, covering an area of three hundred and thirty acres. These deposits are separate and distinct from each other. Rarely are the materials necessary to produce a high grade cement found in juxtaposition. In this instance, however, Nature has outdone herself in the lavish placing of the requisite materials. Probably no cement plant in the world is possessed of such enormous deposits of raw materials, running so uniform in character, and so advantageously located with reference to the factory.

By reason of the fact that the two raw materials are distinctly separate from each other, and that they are uniform in character, our chemical department can easily obtain the definite mixture of ingredients so essential to the production of a uniform and pure Portland cement.

EXPERT OPINION.

WILLIAM N. BEACH, President of the Pennsylvania Cement Company, and A. H. Alker, Vice-President of the same concern, two authorities on cement in America, were yesterday in the Capital for a few hours, and were the guests of J. S. Irvin, Manager of the International Cement Company. During their stay in the city, the gentlemen took the opportunity of visiting the immense plant of the International Company, and of making a careful and critical expert examination of the proposition. When the big plant had been thoroughly visited—and few men in the world would have seen so much in a week as these two cement authorities noticed with the eye of a critic in two hours—the party was photographed in front of the big steel warehouse. "Well, what do you think of it?" asked Mr. Irvin. "You've got one of the very finest plants in the world," was Mr. Beach's reply. "One of the finest, barring none. The plant, considered as a mechanical proposition, is well nigh perfect, and should, in my opinion, produce cement of the very highest quality." "And the raw materials?" suggested Mr. Irvin. "Absolutely unique," was the quick reply. "Absolutely unique."—*Ottawa Evening Journal, October 21st*, 1904.

LABORATORY TESTS.

LABORATORY, INTERNATIONAL PORTLAND CEMENT CO., LTD., HULL, QUE.

AVERAGE RESULTS OF TESTS ON INTERNATIONAL PORTLAND CEMENT FOR THE YEARS 1906, 1907 AND 1908.

Specific Gravity, 3.14.
Fineness, Residue on a 2,500 sieve, 0.4%
Fineness, Residue on a 10,000 " 3.2%
Fineness, Residue on a 40,000 " 20.3%
Initial Set, 2 hours, 10 minutes.
Final Set, 6 hours, 15 minutes.
Soundness, O.K.

TENSILE STRENGTH.

Neat.		3 to 1 Sand.	
7 days	628 lbs.	7 days	198 lbs.
28 "	710 "	28 "	275 "
3 months	736 "	3 months	305 "
6 "	751 "	6 "	318 "
9 "	758 "	9 "	346 "
1 year	773 "	1 year	358 "
2 "	804 "	2 "	370 "

INTERNATIONAL PORTLAND CEMENT CO., LTD.

(Signed) J. B. DEAN
Chief Chemist.

REPORT OF McGILL UNIVERSITY.

McGILL UNIVERSITY,

MONTREAL, April 20th, 1906.

REPORT OF RESULTS OF TESTS OF "INTERNATIONAL" BRAND OF PORTLAND CEMENT.

Blowing Test. . .Satisfactory, no cracks or distortions.
Setting. . . . . . Made with "Vicats" needle, 27% water.
Initial 3 hrs. 25 mins. Final, 8 hrs.
Specific Gravity. 3.11

%Residue on Sieves. . .No.	50	100	120	200
	.33	2.26	6.77	18.9

TENSILE STRENGTH IN LBS. PER SQ. INCH.

7 DAYS—	Neat.	1 to 3 of Quartz Sand
Water.	..... 20%	10%
	788	327
	783	350
	700	307
	824	338
	780	354
	3911	1676
Average. .	788	335
28 DAYS—		
	857	402
	942	432
	860	415
	827	400
	779	440
	4263	2089
Average. .	 853	418

FROM REPORT OF CITY ENGINEER, TORONTO, 1906.

CITY ENGINEER'S OFFICE,

TORONTO, February 20th, 1906.

INTERNATIONAL PORTLAND CEMENT CO., LTD.,
Ottawa, Ont.

Dear Sirs—

During 1905 I find we have tested eighteen samples of International Portland Cement.

Enclosed you will please find the average of these tests.

Yours truly,

J. C. JOHNSTON,
Analyst.

LABORATORY TESTS—Continued.

TESTING LABORATORY, CITY ENGINEER'S DEPARTMENT, TORONTO.

AVERAGE RESULTS OF EIGHTEEN TESTS OF INTERNATIONAL PORTLAND CEMENT, 1905.

Specific Gravity, 3.20.
Fineness, Residue on No. 50 sieve, 0.49%.
Fineness, Residue on No. 70 sieve, 1.49%.
Fineness, Residue on No. 100 sieve, 3.49%.
Setting, Initial, 346 minutes.
Setting, Final, 386 minutes.
Soundness, Faija Test, 14 K.
Water used in mixing, Neat, 21.2%; 3 sand to 1 cement, 10.0%.

TENSILE STRENGTH.

	Neat.		3 to 1	
24 hrs. ..	208 lbs.	per sq. in.	103 lbs.	per sq. in.
7 days. .	717	"	320	"
28 days. . .	787	"	413	"
3 months. . .	893	"	449	"

(No longer time tests were made.)

FROM ANNUAL REPORT OF CITY ENGINEER, TORONTO, 1907.

AVERAGE RESULTS OF THIRTY-FIVE TESTS OF INTERNATIONAL PORTLAND CEMENT, FROM JULY 1st, 1906, TO JULY 1st, 1907.

Specific Gravity, 3.158.
Fineness, Residue on No. 50 sieve, 0.49%.
Fineness, Residue on No. 70 sieve, 0.99%.
Fineness, Residue on No. 100 sieve, 3.49%.
Setting, Initial, 307 minutes.
Setting, Final, 378 minutes.
Soundness, 14 K.
Water used in mixing, Neat, 21.8%; 3 sand to 1 cement, 10.0%.

TENSILE STRENGTH.

	Neat		3 to 1	
24 hrs. ..	338 lbs.	per sq. in.	086 lbs.	per sq. in.
7 days. . .	725	"	322	"
28 days. . .	780	"	423	"
3 months. .	701	"	436	"
1 year. .	871	"	538	"

Presbyterian Church, Esch, Ont.
Built of International Portland Cement.

INTERNATIONAL PORTLAND CEMENT COMPANY, Limited.

TESTIMONIALS.

PRACTICAL WORK SHOWS MERITS OF PORTLAND CEMENT.

CITY ENGINEER'S OFFICE,
OTTAWA, CANADA,
Dec. 28, 1908

Messrs INTERNATIONAL PORTLAND CEMENT CO.,
Hope Building, City.

Dear Sirs,—

I take much pleasure in informing you that we have been using International Portland Cement continuously on Civic Works in Ottawa since 1905. In fact the City of Ottawa was one of your earliest customers, the first car of cement shipped from the factory being purchased by the City.

The Civic Specifications require cement to be of high standard and uniform in quality. The neat cement to stand a tensile strain of 500 lbs. per square inch, after 24 hours in air and 6 days in water.

We have always found the cement to be fully up to the Specifications, and have yet to record any failure.

Since 1905 we have used, approximately, 40,000 barrels in connection with cement sidewalks, roadway construction, reinforced concrete arch bridge, foundations for Exhibition Buildings and foundations for the Water Works Pumping Engines.

Tests are regularly made by the Department and have always proved satisfactory in every respect.

Yours truly,

NEWTON J. KEEFE,
City Engineer.

KEMPTVILLE, ONT.,
Dec. 28th, 1908.

Messrs. THE INTERNATIONAL PORTLAND CEMENT CO.,
Ottawa.

Dear Sirs,—

In response to your inquiry we have no hesitation in expressing the unqualified satisfaction we have had in using your cement the last three or four years. We find it very uniform in strength, color, and time of setting, not finding occasion to complain about a single barrel, although we use from 7 to 8 thousand barrels per year in the manufacture of culvert pipe, sewer pipe, and building blocks, where imperfections in cement are most readily detected in results. We might say further that in addition to our own tests, some of our largest customers make a practice of procuring samples from us for testing purposes, and in no case less a test shown any ground even for suspicion.

Yours truly,

THE DOMINION CONCRETE CO., LTD.
W. DILLANE, Gen. Manager

OTTAWA, ONT.,
June 10th, 1908.

Messrs THE INTERNATIONAL PORTLAND CEMENT CO.,
Ottawa.

Dear Sirs,—

I have great pleasure in testifying that I have used your cement almost exclusively for the last three years. It has given me admirable satisfaction, and I have completely constructed a number of my large buildings entirely with your cement. These include my new paper mill, boiler house, and sulphite mill, as also the extensive concrete flume which was built during last winter.

I have had no difficulty in any of the concrete work which has been constructed with your cement, and it affords me great pleasure to testify to its excellence.

Yours very truly,

J. R. BOOTH.

MONTREAL
February 21st, 1907.

INTERNATIONAL PORTLAND CEMENT CO.,
Ottawa, Ont.

Dear Sirs,—

In answer to your favor of the 16th inst. I take pleasure in stating that I have used about 8,000 barrels of your International Portland Cement in the construction of the New Villa Maria Convent of Montreal, and that I have been fully satisfied as well with its quality as with its prompt delivery.

Yours very truly,

BALTIMORE FERRO-CONCRETE CO.
C. BERNSTEIN.

RENFREW, ONT.,
June 17th, 1908.

INTERNATIONAL PORTLAND CEMENT CO.,
Ottawa.

Gentlemen,—

I have much pleasure in testifying to the high quality of International Portland Cement.

I know of nothing better in the Cement lines.

Yours respectfully,

J. R. STEWART, Town Engineer.

TESTIMONIALS—Continued.

MORRISBURG, ONT.,
February 25th, 1908.

Messrs. THE INTERNATIONAL PORTLAND CEMENT CO.,
Ottawa, Ont., Canada.

Gentlemen,—

I can speak only in terms of praise for your Cement.

For the past two years we have used it solely in our sidewalk construction and its strength and the uniform length of time required for setting has commended it greatly.

In the course of twenty years I have used many kinds of cement, and upon comparison I cannot refrain from congratulating you upon the production of a first class article.

I must not allow this opportunity to pass without speaking favorably of the courtesy with which you have met us in the course of business, and the earnest endeavour to rush an order when through any oversight on our part has rendered it necessary.

Yours faithfully,

MORRISBURG CONCRETE CO.,
H. A. PRUNER, President.

VANKLEEK HILL, ONT.,
Feb. 25th, 1908.

INTERNATIONAL PORTLAND CEMENT CO.,
Ottawa, Ont.

Gentlemen,—

I have used large quantities of your International Portland Cement in the construction of foundations, floors, piers and silos and it has given entire satisfaction; the quality of this Cement is better than any I have ever used.

Yours very truly,
J. BEATTIE, Contractor.

NEW BLISS, ONT.,
June 22nd, 1908.

INTERNATIONAL PORTLAND CEMENT CO.,
Ottawa, Ont.

Dear Sirs,—

Having used your Cement for the past three years in making brick, blocks, tile, sidewalks, stable flooring, etc., it affords me very much pleasure to say that in my opinion there is nothing equal to the International Portland Cement. We have used almost every brand that has been on the market.

Yours most respectfully,
(Signed) BRUCE & LUCKY.

SHAWINIGAN FALLS, P.Q., CANADA,
28th March, 1907.

Messrs. THE INTERNATIONAL PORTLAND CEMENT CO.,
Ottawa, Canada.

Gentlemen,—

We have during the past ten months used ten thousand barrels of International Portland Cement in the enlargement of our Plant, including one of the largest direct current power houses in the world. Your Cement has proven eminently satisfactory.

We regret that we cannot at this time send you photographs of our works, which would give you some idea of their magnitude and general nature. We expect to have a number of photographs taken in the near future and will be pleased to send you copies.

Yours very truly,
NORTHERN ALUMINUM CO., LTD.,
P. H. FALTERLY, Superintendent.

CORNWALL, ONT.,
June 20th, 1908.

INTERNATIONAL PORTLAND CEMENT CO.,
Ottawa.

Dear Sirs,—

Replying to yours of the 15th inst., I would say that I have been using International Portland Cement for the past three years in the making of concrete watering and feeding troughs, tile brick, etc., and I am very pleased to state that it suits me better than any other I have ever used.

It is a genuine Portland Cement of the highest grade.

Yours truly,
(Signed) J. H. RAMSEY.

MONTREAL,
February 28th, 1907.

INTERNATIONAL PORTLAND CEMENT CO.,
Ottawa, Ont.

Gentlemen,—

We have been entirely satisfied with the quality of the cement furnished us by you during the past season, and its use in the construction of the reinforced concrete works for the American Tobacco Company, where some fifteen thousand barrels have been used, has been quite satisfactory.

Yours truly,
DOMINION ENGINEERING & CONSTRUCTION CO., LTD.
H. A. MONCK, General Manager.

OUR ILLUSTRATIONS.

In the following pages of this Souvenir may be seen photographs of a few of the many cement buildings and structural works in which International Portland Cement has been used. They include many complete and costly buildings, great feats of engineering, and a variety of less striking but equally important uses. The illustrations of work done with International Cement might be multiplied to a much greater extent. An attempt, however, has been made to merely represent the variety and importance of the work done with our cement by a few selected examples. These photographs illustrate not only what is to be, but what is actually now in existence.

The following pages will also contain our opinion as well as the opinions of eminent architects, engineers and builders relative to the merits of concrete construction and its present and future use.

VILLE MARIE CONVENT, MONTREAL. BUILT OF INTERNATIONAL PORTLAND CEMENT. 10,000 BARRELS USED.

CONCRETE CONSTRUCTION—ANCIENT AND MODERN.

IT may be easily demonstrated that concrete is the most enduring building material known to ancient or modern architects and builders. Whether the test is the compression and tensile strength as shown by tests of modern appliances, or its power to withstand the ravages of time, concrete proves itself preeminent and unrivalled. Steel, stone and brick, so generally regarded as the materials most enduring, cannot compare with concrete in withstanding the elements, as is evident upon examination of the ancient monuments of the old world.

The aqueducts of Rome, which were built hundreds of years ago, are of concrete without reinforcement, and are still in almost perfect condition. The pools of King Solomon, a short distance from Jerusalem, were built of concrete. These pools still remain and still furnish the city with water. The great Aurelian Wall about Rome, which is over ten miles in length, is still standing. It was built of concrete. The famous Appian Way at Rome had a concrete foundation overlaid with stone. The stone covering has long since worn away, leaving the concrete surface beneath intact, and still harder than the original stone surface. In building construction the Pantheon at Rome, the dome of which was built of concrete nearly two thousand years ago,

Cement Bridge, Hull, P.Q.
In this bridge was used the first cement made by the International Factory. It stands to-day in perfect condition, without a check or crack.

is perhaps the most remarkable instance in the world's history, showing the strength, durability and permanence of cement construction. It has baffled the destructive elements of time for more than nineteen centuries, and shows not a single mark of decay.

Of what is commonly known as the seven wonders of the world, only one—the Pyramids of Egypt—now remain in their original form as monuments of their ancient greatness. The Pyramids, as is now universally conceded, were built of concrete. For more than four thousand years their majestic forms have towered above the desert and bid defiance to the eternity of time. Of them it has been said "Time mocks all things, but the Pyramids laugh at time."

We are now beginning where these ancients left off. Modern science has given to the world the art of producing cement of a better grade than these ancients knew, and the architects and builders of to-day are devising methods of reinforcing concrete, giving to it a strength and durability then unknown. As we view the many magnificent structures now being built of Portland cement concrete, one cannot doubt that the success of the early Roman builder in the application of cement concrete for building operations will be surpassed in the present generation. It is, therefore, a safe prediction, judging from the wonderful progress made in the past few years in developing a true understanding concerning cement and its uses, that the engineer and architect of the present day will give to posterity examples of their best creation built of Portland cement concrete.

The ancients builded well. We were long in learning the art which they lost. Having now learned the secret of their success, we are improving upon them in accordance with the spirit of this modern age, and are going forward to results not possible with their ancient facilities and appliances.

INTERNATIONAL PORTLAND CEMENT COMPANY, Limited.

Residence built by W. Lamb, Ottawa. Built of International Portland Cement.

The use of what is known as reinforced concrete combines the best features of steel and concrete as structural materials. The alliance of the two has proved one of the most important discoveries of the age, and the rapid development of this system of construction is a very interesting study. It has brought about a revolution in building operations. It has made possible the modern sky-scraper in our large cities. It surrounds the steel and forms the foundations of the million dollar structure, and makes the humblest home better, cheaper and more sanitary. With its aid engineering and architecture are being born again; a building revolution such as the world has never known.

We are to-day building large and beautiful concrete bridges to stand as monuments to modern civilization and progress. We are building great tunnels under mighty cities through which are conveyed endless masses of people to their daily avocations. We are building a great canal to connect the two oceans, and through which the commerce of the world may pass; and concrete is the one indispensable material entering into all of these stupendous undertakings, making their construction possible within practicable cost.

But above and beyond all this, we may safely say that the extent of the uses to which Portland cement will be put in the future is not yet fully comprehended. The builder of the future will look to permanency, and nowhere can he find a material that will answer this purpose as will cement concrete. For durability, strength and absolute protection against fire and the elements Portland cement stands alone and unapproachable.

The use of Portland cement is hoary with age, but a new era beckons it on to greater possibilities.

Royal Bank, Bank St., Ottawa.

Built of International Portland Cement.

Bridge on St. Maurice Railroad, P.Q.

International Portland Cement used in piers.

INTERNATIONAL PORTLAND CEMENT COMPANY, Limited.

J. R. Booth's Pepar Mills, Ottawa. Built of International Portland Cement. Over 11,000 barrels used.

EXTRACT FROM AN ADDRESS ON PORTLAND CEMENT.

By H. Howard Humphreys, M.I.M.E., A.M.I.C.E.

Delivered before the Discussion Section of the British Architectural Association, London, England.

THE subject upon which I have the honor of addressing you to-night is one which, although at first sight it appears to be essentially dry, is in reality teeming with interest. Several years ago, when I first began to take special interest in Portland Cement, the manager of a large works on the Thames made a remark which I, at the time, thought somewhat extravagant. He said, in effect, that in undertaking the study of this substance, I was embarking upon a study for a lifetime; after a good many years of research, I have, however, come to the conclusion that the remark was entirely justifiable. Cements all seem to possess an individuality which is marked to a far greater extent than is that of any other building material.

The deep debt which we owe to Portland Cement is hardly recognized as widely as it should be. Its invention alone rendered possible many of the extraordinary architectural, and more especially engineering, feats of the past century, and, when properly prepared, its durability far exceeds that of bricks and building stones. Its present excellence is the outcome of years of patient scientific investigation, and, although the names of its inventors and perfectors (who labored principally during the first half of the nineteenth century) are forgotten, or at best but dimly remembered, the result of their work has revolutionized and assisted design to as great—or, perhaps, greater—an extent than has the introduction of milled steel for construction purposes.

DOMINION CONCRETE COMPANY'S TILE YARD, KEMPTVILLE, ONT. FROM SEVEN TO TWELVE THOUSAND BARRELS OF INTERNATIONAL PORTLAND CEMENT USED EACH YEAR.

INTERNATIONAL PORTLAND CEMENT COMPANY, Limited.

THOMAS A. EDISON'S PREDICTION.

"CONCRETE is destined to become the building material of the world and will be universal. It will take the place of steel in the construction of bridges and there will be nothing but concrete houses in the course of a few years. I am making experiments in my laboratory and expect shortly to make a test in which I will build a concrete house, complete, in one day. I do not propose, however, to go into the business. I will merely pioneer the idea and leave the work to construction companies."—*Nelson News, Friday, Sept. 4th*, 1908.

Ingall's Building, Cincinnati. Built entirely of Portland Cement.

INTERNATIONAL PORTLAND CEMENT COMPANY, Limited.

American Tobacco Company's Factory, Montreal. Built of International Portland Cement. Over 12,000 barrels used.

ERA OF CEMENT CONSTRUCTION.

By Julius Kahn, Architect and Engineer.

IT is not generally recognized that we are at the present time in perhaps the greatest constructive epoch in the world's history. This age shall probably be classed as the steel age in 100 years from now. People in general are too busy to realize the importance and size of the works which are at the present time under construction. In fact, we are all too busy with our own personal matters to realize the greatness and significance of this movement in construction.

Whereas, 40 years ago the manufacture of iron and steel was as yet too expensive and too poorly developed, at the present time machinery and chemistry have advanced to such a high stage of development as to allow the manufacture of this material to reach a high state of excellence.

The fact that this has been done so well has encouraged engineers, builders and architects, and at the present time a majority of the buildings erected are mainly of a steel skeleton framework, which supports the floors and walls, the latter being merely a light protective covering for the steel work. This high state of development in the steel industry has allowed the building of enormous structures in New York, Chicago, and all the large cities, as well as here at home.

If brick and masonry had been employed, the foundations and lower story walls would probably have been so heavy and expensive that financially this size of structure could not have been

Ottawa Residence, built by H. N. Bate. Built of International Portland Cement.

made profitable. But with the use of steel the supports and foundations were made comparatively small and little floor space was occupied by them. Apparently to an outsider it seemed a mystery how the upper floors were supported on the lower, the real supporting members being entirely hidden within the masonry.

At the present time there is a revolution going on in construction in general. There are many things to indicate that we are at the present time passing out of the iron and steel age. It is only about 25 years ago that the steel age could be said to have had its modern beginning. The Bessemer and Open Hearth process of steel manufacture wrought a revolution in construction in general, and at the present time its use has reached the highest point in its history. Will it decline? This is a grave question, and from present indications it would seem that the answer must be affirmative.

There are certain things in connection with the use of steel that will not allow it to satisfy the value of the engineer and architect. If steel could be so thoroughly protected as to be absolutely fire and rust proof there would not be so many objections to it. But in these two respects it is seriously lacking. The best chemists of the country have been studying to find a rust proof covering for steel. Leading engineering societies have had the subject up for discussion continually for the last five years, but so far no satisfactory solution has been reached. One man will say he has discovered the proper paint covering, but when tested it will fail after a time like everything else that has been tried. A few years ago there was a great rush over oxide iron paint. Everybody said it was the proper material to use, and its application was really quite universal. Then it was found that rust spots multiplied underneath the covering. This was attributed to a galvanic action claimed to exist between the paint pigment and the metal.

Dam and Headgates, Wakefield, P.Q.

Built of International Portland Cement.

Then came the red lead theory, and many engineers were strong in advocating it, but it ended in the same way. Then the graphite theory, and Detroit may be said to be one of the first places that practiced it; in fact, Detroit claims to have built the first graphite paint factory. This paint, however, has been criticized almost as severely as the oxide of iron, as rust gathers under it in just the same way in a large number of instances, and painting must be done with great regularity. Recently chemists had advised the use of gum oil paints; that is, paints composed of the natural gums, with pigments and oils as necessary. This gives a brief idea of the theorizing which protective coating for steel has undergone. At a discussion of a recent meeting of the American Society of Civil Engineers, a number of the most prominent members claimed to have discovered such a covering and held the same secret, not for reasons of desiring an exclusive patent right, but on account of uncertainty. As yet the paint theories are anything but reliable.

An ordinary exposed steel structure has a life all the way from 10 to 30 years, depending upon the care given it in its protection. As an example, near at hand in many of our M. C. R. R. viaduct bridges it was recently found that the steel beams were eaten through on account of the corrosive action of the gases from the locomotives, and required replacing. In fact, some railway companies are replacing steel with concrete bridges, because steel is not reliable, nor permanent; among these may be named the Michigan Central, Illinois Central, Pere Marquette and others.

The question is anything but solved. There is scarcely a month but that some man comes forward with a preparation which he hopes will do it, but so far they have all failed.

Again, steel is lacking in fireproof qualities. Under a heavy fire steel will melt like wax. Although a high temperature is required to make a liquid of it, a comparatively low temperature converts it into welding state. Under anything like extreme heat and heavily loaded it will curl

Hardman's Bridge, Ottawa. Built entirely of International Portland Cement. 3,000 barrels used.

up and collapse. Unless well protected against fire, it is little better than wood construction under certain conditions. As a result of high temperatures the latter, when made of heavy timbers, will char and burn only on the outside, without deep penetration, and for this reason mill construction, which consists entirely of such timbers, is used very largely. It originated in the cotton mills of New England and is now used largely in all factory construction. In this type the floors are made of planks four to six inches wide, set edgewise and nailed together. The posts are of very heavy proportions, so as to prevent quick burnings. Buildings of this type will stand very severe fires, and there are engineers who believe mill construction to be better than steel, unless the latter be well protected. It does seem that if a new type of construction comes into use that will provide a permanent and fireproof structure, the steel age will draw to a close. At any rate, it is a subject that engineers are studying more earnestly than ever before, and they are coming to the conclusion that cement construction affords relief from these vexatious problems. Cement is now manufactured of such excellence, at such a low price, and so thoroughly answers the wants of the engineer that there is no question that it will replace steel construction. The only question is how fast it will do so. There is probably no subject so much discussed by engineers now as concrete and concrete steel construction.

It must be granted that concrete has this against it, that if poorly made, it is deceptive; but on the other hand, if the carpenter uses timber that has dry rot, is worm-eaten, or has serious knots or wind shakes, which deficiencies cannot be perceived by the ordinary layman, and even by a thorough engineer, the dangers are much greater. Thus the carpenter may deceive. Again, steel work may be even more dangerous and deceptive if the connections and sizes are not right, or if anything about its make-up is slighted. These risks must be carefully guarded against. The

Interior, W. C. Edwards' Mills, Ottawa. Built of International Portland Cement. Over 10,000 barrels used.

engineer figures heavy loads for every square inch of steel, and the dangers are proportionately greater if workmanship or quality of material is below the standard; he is careful that a test be made from every batch of material. Then, again, he guards against the workman's poor riveting, the winding of steel members, the security of connections, etc. There are a hundred ways in which errors can creep in, any one of which may wreck his structure. It must be assumed that skill is not required to such an extent in concrete work. If a good brand of cement is used, it only remains for the superintendent to watch the proportions of mixing, its manipulation and placing in structures, and he is assured that the strength is ultimately there. There is this consolation, too, instead of becoming weak with age, as steel, owing to its corrosion, or as wood, owing to its rotting, the strength of *cement construction continually increases* and moisture only serves to make it harder.

Again, it is as fireproof as any material known. If this is so, the question may be asked, why is cement not used more largely at the present time? In answer I will say: "It is only very recently that America was able to produce the excellent quality of cement it now produces, at a marketable price. Europe led us, but Europe is now conservative, and our rapid strides have placed the American product in the front rank.

It is no longer as it was ten years ago, that European Portland cements are specified in our best construction works. Now American Portland cement is used. In fact, it is probably only seven or eight years since we made Portland cement in any considerable quantities. Our own cements were formerly the natural cement, but in the past few years America has put up Portland cement factories not only equal, but far superior to those in Europe.

But, again, used under other conditions, cement is as effective as steel, without its defective qualities. Concrete is excellent when used in compression, but it is not so good as timber in

Windsor Hotel Annex, Montreal. International Portland Cement used.

tension, as it has about one-fifth of its tensile strength. For that reason engineers did not formerly use concrete where such strains were carried. But now comes a new method, called concrete steel, or "reinforced concrete" construction, which enables us to use cement in tension as well as in compression. This type of construction will work a revolution in the use of steel, for, if concrete, with steel imbedded in it, be as good in tension as in compression, then it is an ideal material, for it gives the necessary strength, is *fireproof and permanent.*

Probably no subject is now so much before engineers and engineering societies as concrete steel construction. Different engineers have different ideas in regard to placing the steel within the concrete. There are at the present time 50 to 100 different systems or ways of doing so. These differ from one another in the arrangement of the steel within the concrete, but all agree that the steel must be placed in the concrete where it takes the tension. Of course the concrete is used for compression. Again, there is no material which so thoroughly protects steel as concrete, and steel imbedded in concrete is as permanent as masonry itself. The simplest form of this construction is a rectangular beam, with steel rods imbedded in the lower side. With such a beam a load placed on some tries to deflect it, and the steel at the lower side comes into tension, the concrete above it into compression. The greatest virtue of concrete in this construction is the union which the steel makes with the concrete. This adhesive property of concrete was only realized in the last few years and gave birth to the present concrete-steel system of construction. As before stated, there are from 50 to 100 systems. Some of the best ones come from Europe, in just the same manner as the best Portland cements originally came from Europe. A few of the European are the Von Emperger, the Monnier, the Considere, the Hennebique, etc., and in this country we have the Ransome, the Expanded metal, the Columbian and the Johnson, etc. These systems are

Howick Pavilion, Exhibition Grounds, Ottawa. Built of International Portland Cement.

well represented by many structures at the present time. They all have in common the placing of steel on the tension side of the concrete, and differ only in the form of the steel or its arrangement.

One thing more in favor of concrete is its use for long floor spans in building construction. Spans as large as 25 feet are easily constructed at the present time, and there are many records of concrete spans 50 to 100 feet long. Only very recently I was called to witness tests where the walls, floors and columns of a building consisted of concrete, with floor spans of 24 feet 6 inches. I was unable to attend, but I understand a number of very prominent engineers were present. The records of the tests were sent to me. These spans carried without serious deflection a load of 100,000 pounds uniformly distributed over them. Two concreted steel beams supported a concrete slab four inches thick on which the weight was piled. The actual sagging under this enormous load was only 13-32 of an inch. If a steel beam of the same strength had been used, it would have settled 1¾ inches, thus showing that the properties so greatly desired by engineers have been more than realized in concrete-steel, as the latter can be constructed so as to deflect under weights only one-quarter as much as steel.

There is another remarkable advantage for concrete-steel construction. In buildings constructed of brick or stone, the vibrations due to the moving parts of machinery are very great, but in the case of concrete-steel it is little or nothing. In this regard it is of great advantage in factory construction. The experimental stage in concrete-steel construction has passed by. It is an accepted fact among all engineers that concrete-steel construction has come to stay.

The only matter of discussion among them is how shall the steel be placed within concrete,

The Royal Mint, Ottawa. International Portland Cement used.

and some little variation as to the proper proportions and proper mixture of concrete. These, however, are matters of detail. It is quite generally understood how good concrete can be made, even though some may understand better than others its mixing and manipulation. It is useless to try to go into a description of all the forms of concrete construction that can be made. Suffice it to say that buildings are being made entirely of concrete (including the columns, walls, floor spans and roof), making a building absolutely fireproof. It is an interesting fact that a building constructed of concrete steel is not necessarily heavier than a steel building, and costs less than one-half as much. Construction of this nature is permanent, rust-proof, fireproof and rot-proof. This is a remarkable relief to the engineer who for years has studied the art of preserving to the community its costly structures.

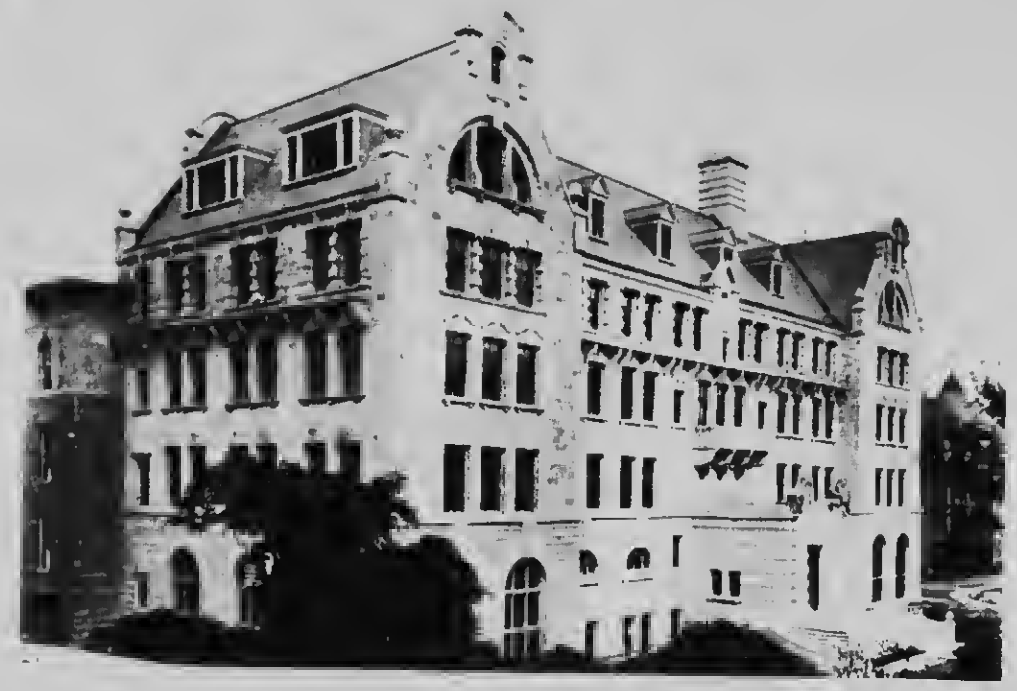
In Europe there is a large amount of this work. I have in mind one concern that did $25,000,000 worth of concrete-steel construction this last year. This construction is coming into the American market at the present time, and it was from a structure by this concern that the tests mentioned before were made.—*Detroit Tribune, February* 9, 1903.

Dairy Building, Exhibition Grounds, Ottawa.

Built of International Portland Cement.

Breakwater, Three Rivers, P.Q.

International Portland Cement used.



New Addition, McGill College, Montreal. International Portland Cement used.

FIREPROOF CONSTRUCTION.

AS to fireproofing a large majority of structures erected to-day are a constant menace to life and neighboring property. Aside from the fact that no man has a moral right to erect tinder-box structures it may be reasonably claimed that strict business economy and thrift demand radical reforms in methods of construction with reference to fireproofing.

The problem of fireproofing for factories, warehouses, storages, large office buildings, theatres, schools and colleges, churches, hospitals and private dwellings is now occupying the attention of builders everywhere, and it is perhaps unnecessary to state that the advantages of Portland cement as a fireproof building material is now becoming well known to the leading engineers and architects of the world. As time passes on and the economy and fireproof qualities of Portland cement become of more general knowledge, it is but reasonable to expect that fireproof building laws will be framed and enforced for the protection of both life and property.

The President of one of the largest Fire Insurance Companies of New York City, who is a recognised authority on such matters, says:—"It is a popular mistake to suppose that a loss by fire is not felt by property owners at large. It should be borne in mind that insurance merely distributes the burden on property owners throughout the country, all of whom would have loss to pay annually in rates if any portion of the fire waste could be prevented.

"Careful computation shows only one out of five fires, where damage exceeds $100, is extinguished short of total destruction of building and contents. This is because the old methods of

Showing New Addition to Chateau Frontenac, Quebec. 7,000 barrels International Portland Cement used.

construction actually favor rapid combustion. On the other hand if fires could be restricted to the buildings in which they start instead of extending to other structures, as they so often do, under existing conditions, the fire tax of the country would be lessened fully one-third. Building laws should require that in the compact portions of cities, especially, no structure should be erected for the storage of merchandise which would not, in case of fire, prove a safe for the cremation of its own contents without damage to the adjoining and surrounding buildings.

"It is a stupendous and lamentable reflection upon the intelligence of a nation that a vicious cow in a frame shanty could with a single kick inflict a loss of over $175,000,000 upon the citizens of Chicago, and through the distributing medium of insurance upon the whole country."

In the great London fire the property loss amounted to £11,000,000. At the fire of Moscow the loss was £30,000,000. At Hamburg the loss amounted to £35,000,000. The Paris fire of 1871 cost that city £33,000,000. In the same year Chicago's great conflagration consumed the greater part of the city, the loss amounting to £38,000,000. The fire at Boston was not under control until city property, amounting to £13,000,000, was destroyed.

Fires of more recent date have been equally disastrous. The destructive fire at Pittsburg swept away $2,000,000 worth of property in a single day. The fire in the Iroquois Theatre at Chicago resulted in a loss of life that exceeds anything of modern times. In the city of Aalesund, Norway, ten thousand people were rendered homeless. Fire in Baltimore's business district destroyed property the value of which is estimated at $70,000,000; one hundred and forty acres, comprising seventy-five city blocks with about two thousand five hundred buildings, were burned over. The city of Rochester, N.Y., was swept by fire causing a property loss of $3,200,000. The tremendous loss sustained by the citizens of San Francisco in 1906, caused by the disastrous fire

Ville Marie Convent, Montreal. Built of International Portland Cement. Over 10,000 barrels used.

which followed the earthquake, is still fresh in the memory of all. In the year 1900 a large district of the city of Ottawa was wiped out, and three years later the same district was again destroyed, the loss in property amounting to hundreds of thousands of dollars. In December, 1903, the Arts Building of the Ottawa University was destroyed with the loss of many valuable books and documents, and at a sacrifice of lives. The greatest fire disaster in the history of the city of Toronto occurred on April 20th, 1904, in which $10,000,000 worth of property was destroyed in a single night. Within the past few months the cities of Three Rivers, Quebec, Fernie, B.C., and Pembroke, Ont., have all suffered by disastrous fires which destroyed the greater portion of the business districts. The city of Fernie was completely wiped out, with the loss of many lives.

The result of these fires has been to call attention to two important points; first, the absolute necessity for the use of modern fireproof building material; and second, more equitable adjustment of insurance rates. The first of these is everywhere commanding the attention of the leading engineers, architects and builders, and thousands of tons of concrete is being used in rebuilding these burnt districts as a best means of fire protection. There has already been shipped and received at Fernie, B.C., nearly one hundred carloads of cement to rebuild the stricken city. As to the second consideration, the fire insurance associations now provide a rate according to the risk, giving to the property owner the benefit of any improvement in fireproofing he may make that will reduce the fire risk. In this connection Mr. Henry Evans, chairman of the Committee of twenty of the Associated Boards of Underwriters, says: —"This movement is distinctly in the interest of the public. When the proposed insurance schedule is applied in various cities it will be found that a well built structure will be given a low rate, while a poor one, from a fire standpoint, will be penalized to the extent that will force improvement and so lessen the sweeping fire

Leslie Hall, Kemptville, Ont. Built of International Portland Cement.

danger. We Fire Underwriters often wonder that men in public life seem to overlook the fact that fire waste in the United States alone amounts to $450,000,000 a year. Occasionally we have a conflagration like the one at Baltimore that paralizes some cities and strikes a blow at our immediate progress that is hardly realized."

When building laws are framed for the compact sections of cities and towns, compelling the use of modern fireproof materials in the construction of all buildings, it is safe to say that the great danger from spreading fires will be reduced to a minimum, and human life and property, therefore, correspondingly protected. That such laws are sure to take effect in the near future is shown by the fact that in the city of New York a Bill has been brought before the Board of Aldermen requiring fireproofing of all buildings more than seventy-five feet high, and specifying that no woodwork is to be used except for doors and window frames, and that this woodwork shall either be covered with metal or treated by some fireproofing process. These restrictions also apply to all theatres, schools, hospitals and similar institutions whose buildings are more than thirty-five feet high.

After the Pittsburg fire an investigating committee of engineers reported concerning the fire as follows:—"In view of the developments in this fire, it is our opinion that important structures of this class should have a radically different method of fireproofing which should be in itself strong and able to resist severe shocks, and should, if possible, be able to prevent the expansion of the steel work. There seems to be but *one material* now known that could be utilized to accomplish these results, and that material is first class *Portland cement concrete*."

The most elaborate investigations ever made into the fire resisting properties of concrete were conducted by a German Commission at Hamburg in 1895. Their report shows that *Port-*

Partial View W. C. Edwards' Mills, Ottawa. Over 10,000 barrels International Portland Cement used.

land cement concrete does not lose its coherence by exposure to fire. Their tests were made upon actual concrete exposed to fire at a temperature of 2000° Fahrenheit for several hours and then suddenly cooled by water. In their report they affirm that the concrete "showed good coherence," and "did not suffer by wetting while hot."

The building department of New York City conducted a series of similar experiments in 1897, with probably the most remarkable results ever shown in fireproofing. A four inch plate of concrete with embedded expanded metal was loaded with pig iron to 150 lbs. per square foot, on a span of four feet. It was then subjected to the action of a continuous fire for five hours where the average temperature exceeded 2000°. From this high temperature it was suddenly cooled by a stream of water at 60 lbs. pressure from a fire engine. The stream was directed against the underside of the floor for fifteen minutes, at the short range of ten feet. The floor was then flooded on top for five minutes, and instead of collapsing or disintegrating under the load and exposure, it recovered one-half the deflection which it suffered while heating.

Mr. G. C. Henning, who personally conducted the test, mentions six different tests of concrete construction and floors of tile, and sums up the results as follows:—"Tile floors of whatever construction or make fail and are destroyed at 2000° Fahrenheit, an excessive temperature beyond that at which the tile was baked, while concrete floors resist all temperatures obtainable in ordinary conflagrations, and are not materially weakened by such fires."

In many of these fires of recent date, enough reinforced concrete was exposed to demonstrate its superior fire resisting qualities, and the manner in which Portland Cement Concrete withstood the extreme severity of these fires has awakened a universal interest alike among architects, builders and property owners. The colossal loss of life caused by the burning of the Iroquois Theatre of

Chicago, and the tremendous loss of property by fire in the above mentioned cities seem very emphatic reasons why our entire system of building construction should be made to comply with the demands of modern civilization.

The one valuable lesson taught by all of these recent disastrous conflagrations is that Portland Cement Concrete as a fireproof building material has no peer in the world; and this fact alone has given to the Portland Cement industry an impetus unequalled by any occurrence in the last quarter of a century. In a word, reinforced concrete claims the attention of all who desire *economy, strength, permanence, and protection against fire* combined in one structure.

Single pier of Bridge on St. Maurice Railroad, Shawinigan Falls P.Q. International Portland Cement used.

INTERNATIONAL PORTLAND CEMENT COMPANY, Limited.

Methodist Church, Chesterville, Ont. Built of International Portland Cement.

LOW PRICED, DURABLE, FIREPROOF CONSTRUCTION FOR SMALL BUILDINGS.

By S. M. Fechheimer.

THE art of modern fireproof construction has been so widely developed that the advantages of economy appear not alone in the large factory, warehouse or office building, but also in smaller structures. It reflects great credit on the industry and the ingenuity of the American fireproof companies that buildings of this construction can compete successfully in point of price with the old type of short-lived inflammable construction. Permanence, endurance, fireproofness and elimination of all repairs make it unquestionably the most economical way to build.

Reinforced concrete has taken the lead in this type of building because it not only represents the lowest cost but absolute permanence. The concrete thoroughly protects the steel from any possible chance of corrosion or deterioration. The steel strengthens the concrete and makes it act as one monolith.

Henry Birks Building, Montreal

International Portland Cement used

Northern Aluminum Company's Power Plant, Shawinigan Falls P Q Over 10,000 barrels International Portland Cement used in building this plant.

INTERNATIONAL PORTLAND CEMENT COMPANY, Limited.

The Pembroke Fire. Built of International Portland Cement.

A FIRE-RESISTING MATERIAL.

CEMENT as a material for fireproof construction received a strong certificate of character in the recent disastrous fire at Pembroke. In the whole fire-burned area but one building remains intact, that of the Alexander Barr Carriage and Wagon Company, and this is of solid concrete construction. It was surrounded by a fierce circle of flame and a quantity of wood piled beside it was consumed, but no damage was done to the building. In an interview after the fire the head of the company said:

"I was both surprised and delighted with the way my building stood the flames. The test was a particularly severe one, too. The adjoining buildings—as will be plainly seen in the illustration—were entirely swept away. They were located within eighteen inches of the wall of my building, which remains standing. In addition to the severe heat of the burning buildings there was that of five cords of wood, which were piled against the carriage factory wall. The cordwood was entirely consumed, but the wall was unharmed. No water was used to stop the progress of the flames at this point, and, in fact, no water was used by the city department on the building shown in the photo. I was an eye witness to the fire from beginning to end, and I believe that my building would have been entirely swept away had it been erected with other materials. I put up the building in 1905, using International Portland cement throughout. It is 102 feet long and 40 feet wide. By erecting it with Portland cement you will agree I have saved thousands of dollars and a great deal of time and trouble besides."

INTERNATIONAL PORTLAND CEMENT COMPANY, Limited.

La Patria Building, Montreal. International Portland Cement used.

Immediately after the fire the International Portland Cement Company sent two experts to Pembroke to examine the building. Their report shows that the test was a particularly severe one, the building having been located in the middle of the heat zone. Such a test, disastrous as it was to the sufferers, should be of considerable value to pointing the necessity of erecting fire-proof structures.—*Industrial Canada*, Dec., 1908.

VANCOUVER, B.C., Aug. 7, 1908.

Last night's local paper contained an item that should be of the greatest interest to you and to all interested in concrete throughout the country. The item was in the *Daily World* of this city and was as follows:—"For future catastrophes Fernie has learned the value of non-combustible building materials." In the fire-swept district, which includes all the business portion of the town, *There are standing just three Business Blocks* and *these are built of Concrete Blocks*. Concrete seems to have much better resisting qualities against heat than brick, as all of the brick buildings were burned. Many of the merchants who plan to build express their intention of using concrete blocks, even if they have to build smaller stores.

What more conclusive testimony could be produced as to the superiority of concrete as a fire resisting material? It is a matter of history that the Town of Fernie was swept by one of the most terrible conflagrations that ever visited a city on this continent. Hemmed in on both sides by mountains covered with heavy timber, which was ablaze on every side, and which made the place

Women's Building, MacDonald College, Ste. Anne de Bellevue, P.Q.
Over 20,000 barrels of International Portland Cement used in the various buildings.

a veritable furnace, no inflammable structure could escape, in fact none did except a few shacks outlying that seem to have missed the track of the fire.

This is the time to turn on the "lime light," give it all the publicity possible. Our brick friends may have some excuse for the tumbling down and burning of the structures built of their material, but they cannot get round the fact that the only good buildings standing are three concrete block structures.

CONCRETE ENGINEERING & CONSTRUCTION COMPANY, LTD.

No event that has happened in years has provided such proof of the value of concrete construction as did the forest fire that swept down upon the City of Fernie, B.C., a few weeks ago and wiped out the town, leaving but seven structures standing. Of these seven, three were on the outskirts, outside the path of the flames.

Of the four buildings in the fire zone, three are of concrete, and the fourth was the new Post Office, of brick, stone and steel. The walls of these four buildings are standing. The office building of the Crow's Nest Pass Coal Company, built of concrete blocks, with fire-proof doors and windows, was left absolutely uninjured, though in the center of the fire-swept territory. Brick and stone structures all around it are in ruins, with the frame buildings of course in ashes. The walls of the Bank of Commerce Building are of concrete and are in good condition. Wood fittings allowed the fire to enter the building and destroy the contents. The same is true of the Quail Building, of which the Fernie Hotel is a part.

Credit Foncier Building, Montreal. International Portland Cement used.

The fourth building to remain standing, the new Post Office which was not quite completed, will have to be reconstructed, though the walls, both brick and stone, are still standing. The floors were to be carried on steel girders, and these were twisted out of form by the intense heat.

Referring to the building of the Crow's Nest Pass Coal Company our correspondent, who visited Fernie, says:—

"This building was in the centre of a square, and all the buildings around, many of them of brick, were completely levelled by the fire. This structure was immediately made the headquarters of the relief committee.

"After the last fire in Fernie, particular care was taken to make the new buildings fireproof. In some of the larger structures concrete was used, but the free use of wood in windows and doors and even in the interior construction made the buildings an easy prey, once the fire had obtained a good hold. Even in these cases the cement and concrete walls withstood the immense heat and are still standing silent tributes to the efficacy of cement construction.

"The loss in the City of Fernie is officially placed at $2,000,000.00, and almost without exception the business firms have signified their intention of rebuilding. That cement and concrete will play a prominent part in the material used in the new city is certain after the advertisement this class of building has had in the office of the Crow's Nest Pass Coal Company.

"Throughout the city are blackened piles of ruins, with brick and steel and stone intermingled. The fact that the three concrete structures and the new post office building are still standing, is the cause of wonderment to the insurance adjusters, building inspectors and railway officials, who have visited the burned town. The camera gives us the best evidence of the thoroughness with which the business section was swept away."

Eastern Townships Bank, Montreal. International Portland Cement used.

There is no doubt that when the rehabilitation of Fernie takes place, the example set by the rebuilding San Franciscans will be emulated, on a smaller scale, by the citizens of this town. The example seen on the charred and smoking city square of Fernie is striking and convincing, to put it mildly. Property owners are enquiring about concrete, and the next year will see many concrete buildings erected there.

These details are published not to decry brick or stone or steel, or any other building material, but to show that concrete buildings, properly built, will resist fire. One of the four buildings that resisted the fire was partially of brick construction and will not be a total loss. This narrative is a recital of facts, and endeavors to give credit where credit is due. The truth of these statements can be ascertained easily enough. The point CONCRETE wishes to make is, that three concrete buildings were among the many other structures composing the town of Fernie. The fire swept straight through the town on its way from mountain to mountain, and these buildings were in the path of the flame. Buildings on all sides crumpled and fell. Two concrete structures, with inflammable fittings, were stripped of these wooden accessories and still stand. One concrete structure, properly fireproof, came through the furnace heat unscarred.

"Concrete Publishing Company."

UNIVERSITY OF OTTAWA

EXTRACT FROM CEMENT AND ENGINEERING NEWS.

THE selection of armoured concrete for this building was in a great measure due to J. S. Irvin, Managing Director of the International Portland Cement Company, of Ottawa, who made such a clear and convincing presentation of the superior merits of armoured concrete to the University authorities that they selected a committee to investigate and report on the subject. This committee of which Rev. Father J. E. Emery, President of the University, was a member, visited various parts of the United States and Canada and especially the city of Baltimore.

On the return of this committee Rev. Father Emery addressed the following letter to M Irvin:—

J. S. IRVIN,

MANAGING DIRECTOR INTERNATIONAL PORTLAND CEMENT COMPANY,

Dear Sir,—

I have the pleasure of informing you that after considerable research and enquiry in both the United States and Canada, we have decided to use ferro-concrete fire-proofing in our new building as being the safest and at the same time the cheapest of present fire-proofing systems.

I have the honor to be,

Yours very truly,

J. E. EMERY, O.M.I.,
Pres. "Ottawa University."

On May 25th, the corner stone of the building was laid with the solemn ritual of the Roman Catholic Church, in the presence of the Papal Delegate to Canada, and the assembled dignitaries of the Church and State, including Cardinal Gibbons, of Baltimore, Md., Lord Minto, Governor General of the Dominion of Canada, and Sir Wilfrid Laurier, Premier of Canada.—*Cement and Engineering News*, Chicago, May, 1904.

Wabash Railroad Bridge, Mason, Illinois.

Built entirely of Portland Cement

Patterson Creek Bridge, Ottawa.

This beautiful bridge and railing complete built of International Portland Cement.

Perspective view of proposed Henry Hudson Memorial Concrete Arch Bridge, as it will appear when completed. It will have a single arch span 703 feet in the clear and a rise of 177 feet centre to centre, or approximately three times as long as the longest Concrete Arch Bridge now in existence.

THE GREAT HUDSON MEMORIAL BRIDGE.

WHILE the proposed concrete bridge to be erected over Spuyten Duyvil Creek, New York City, as a memorial to the achievements of Henry Hudson, has no direct significance as far as Canada is concerned, nevertheless, this project, owing to its great magnitude, will undoubtedly prove to be of especial interest to those engaged in engineering work in the Canadian field.

Anything heretofore accomplished in concrete arch bridge construction seems to dwindle into diminutive proportions when compared to this huge undertaking. The very fact that the span of its arch is to be approximately three times as great as that of any similar structure erected up to the present day, is in itself sufficient to attract the attention of the engineering world to whom it will afford a valuable object lesson.

Canada is fast approaching that stage in her development where she will find it necessary to call upon her engineers to design and construct the many bridges which will be required to span the numerous waterways in the Dominion in order to provide adequate means of communication with which to facilitate the rapidly increasing traffic. In view of this fact, we believe that the construction of the Henry Hudson Memorial Bridge will bring to light many important structural features which should not only awaken an unusual interest in Canadian engineers, but should enable them to glean much valuable data which will be of great benefit to them in solving the many perplexing problems in bridge construction with which they will have to grapple in the near future.

In addition to serving as a monument of an important historical event, the bridge will connect Manhattan Island with the mainland to the north, and in this manner form a part of New York City's elaborate driveway and park system. The work of Mr. Whitney Warren, consulting architect, in developing the architectural features of the bridge, is most interesting as a demonstration of what may be accomplished in architectural elaboration in concrete bridge design. The monumental character and symmetrical lines of the whole design of this proposed structure is very striking and should supply much material for interesting study by Canadian architects as well as bridge engineers.

Bridge on St. Maurice Railroad, Shawinigan Falls, P.Q

Piers built of International Portland Cement.

Breakwater, La Prairie, P.Q.

Built of International Portland Cement.

INTERNATIONAL PORTLAND CEMENT COMPANY. Limited.

Silo on farm of Samual Johnston. This silo was built by Mr. Johnston himself in five days. International Portland Cement used.

HOW TO USE PORTLAND CEMENT.

FIRST OF ALL, ALWAYS USE A PURE, UNIFORM HIGH GRADE PORTLAND CEMENT.

TO the Consumer the most important tests to determine the relative value of Portland Cement are with sand in the proportion in which it will be used in actual work. These tests not only show the strength of cement concrete when first tests are made (which is usually at seven days), but what is far more important to show how much it will increase in strength with age, or from one period to another.

This is a practical way to determine the real value or superiority of one cement over another.

How to Make Good Concrete.

Ideal concrete is made of cement, sand and crushed rock. The sand should be clean, coarse and sharp. River bottom sand, when fine and round, should not be used when much strength is required.

As a test of sand, rub it in the hand and if there is much dirt left on the hand discard the sand.

If when a large handful of the same is thrown into a pail of water it leaves the water muddy, discard it.

Hardmen's Bridge, Ottawa. Built of International Portland Cement: Over 3,000 barrels used.

Dirty sand makes a weak concrete. Crushed rock is much better than screened gravel because of the rough edges.

The following are the recognized mixtures for concrete:—

Rich Mixture—One part cement, two parts clean, coarse sand, four parts of crushed rock.

Safe Mixture—One part cement, three parts clean, coarse sand, five parts of crushed rock—for heavy walls, piers, abutments, etc.

Lean Mixture—One part cement, four parts clean, coarse sand, eight parts of crushed rock—for footings and in places where volume and not great strength is needed.

When gravel is used the proportions are one part cement and from six to eight parts gravel, according to the amount of sand in the gravel.

To make one cubic yard of concrete the following respective amounts of cement are required:—

Rich Mixtures—One and one-half barrels.

Safe Mixtures—One and one-eighth barrels.

Lean Mixtures—Seven-eighths of a barrel.

In construction work, such as floors, barns, fence posts and bridges, reinforcements of iron should be used. The beginner will need the supervision of an expert in using reinforcements.

Measure exact amounts for each part. Mix thoroughly and not too long before applying the water. It is very important that concrete should be put into the work before the initial set takes place, otherwise it loses its strength.

Spread the sand and cement on a mixing board and mix thoroughly, adding enough water when mixed to bring the mixture to the consistency of mortar.

Add the proper quantity of crushed rock and mix all together, after which it is ready for use.

Grand Trunk Bank St. Subway Ottawa. Built of International Portland Cement.

In this manner the sand grains are all covered with the finer particles of cement and the crushed rock when added has all the voids filled with temperate mixture. This undoubtedly gives the greatest strength for materials used.

A very common method, however, is to mix all three parts at once while yet dry, and then to mix with water until the mixture will puck well and handle with a shovel.

Get the form walls rigid and do not use lumber that is too dry, as it takes up moisture and changes its shape so as to injure the concrete in setting.

Do not allow concrete work to dry out fast, as cracks will appear. It should be protected from the sun for three or five days and sprinkled with water to insure even setting throughout.

One barrel of International Portland Cement will make about 20 cubic feet of concrete, 1-2-4; or 25 feet, 1-3-5; or 35 feet, 1-4-8.

Concrete Floors.

Too much care cannot be exercised in preparing foundations for concrete floors. These should be always well drained and firmed to a depth of from 6 to 8 inches below the concrete.

The foundation should be thoroughly tamped before putting on the mixture. If the soil contains a great deal of clay it may be necessary to remove part of it and to fill in with broken stone, gravel or cinders to within four or six inches of the proposed finished surface, depending on the thickness of the floor. Blind drains of coarse gravel or tile may be laid from the lowest points in the excavation to carry off any water that may accumulate beneath the structure.

For the construction of the ordinary stable or barn floor, which is not to carry any great weight, the following proportion is to be recommended for the concrete base: One part cement, three

Gateway, W. C. Edwards' Mills, Ottawa. Built of International Portland Cement.

parts clean, sharp sand, and five parts of loose gravel or broken stone. This should be finished on the surface with 1 inch to 1½ inch layer of a mixture of one part cement and one and a half to two parts of clean, sharp sand. The total thickness of this floor must be from 5 to 8 inches depending on the load it has to carry.

For engine foundations, floors or driveways over which heavy loads pass, the following proportion is to be recommended: One part cement, three parts sand and five parts broken stone or gravel.

Do not trowel the surface too much until it has begun to stiffen, as it tends to separate the cement from the sand and injure the wearing surface.

Protect the new floor from the direct rays of the sun, currents of air and frosts, and keep constantly moistened for several days. Water is very important in the curing of concrete constructions, and must be used liberally.

House Foundations.

To build a house foundation, first excavate to the desired depth of cellar and around the edge dig a trench 18 inches wide and 6 inches deep, and build forms for wall about 12 inches thick. Fill with concrete, one part cement, three parts sand, and five parts broken stone or gravel, ramming or puddling carefully, allowing the concrete at the bottom to flow out under the forms the width of the trench, to the desired height. Allow the concrete to set hard before removing the forms. If earth is filled in against back of wall the face forms should be left three or four weeks, but superstructure may be begun in about a week.

Patterson Creek Bridge, Ottawa. This beautiful bridge and railing complete built of International Portland Cement.

Partition walls are constructed in same manner as outside walls, but need not be more than 8 inches thick.

Barn foundations should be built the same way as house foundations, except that the cellar is omitted.

Cisterns.

Make a circular excavation 16 inches wider than the desired diameter of the cistern, or allow for a wall two-thirds the thickness of a brick wall that would be used for the same purpose and from 14 feet to 16 feet deep. Make a cylindrical inner form, the outside diameter of which shall be the diameter of the cistern. The form should be about 9 feet long for a 14 foot hole, and 11 feet long for one 16 feet deep. Saw the form lengthwise into equal parts for convenience in handling. After forms are united in cistern, block up at intervals of six inches above the bottom of the excavation. Withdraw blocking after filling in spaces with concrete and then fill holes left with rich mortar.

Make concrete one part cement, two parts clean, coarse sand, and four parts broken stone or gravel. Mix just soft enough to pour.

Be sure that inside surface is clean, and moist. Then plaster with one cement to two sand. Allow cement to set before any water enters the cistern.

Watering Troughs.

Watering troughs may be made with or without reinforcing, but troughs without reinforcing should have a greater thickness of concrete. Troughs may be built with a solid base or set on bowls

Silo, MacDonald College, St. Anne de Bellevue, P.Q. Built of International Portland Cement.

blocks. One of the sizes in common use is 8 feet long, 2 feet wide at top and 1½ feet at bottom, and 1½ feet deep, all inside measurements, which may be varied to suit convenience.

Make concrete one part cement, two parts clean, coarse sand, and four parts broken stone or gravel. Mix and tamp well.

Cement Blocks.

There are many cement block machines on the market, some more suitable than others. The purchaser, however, can better be guided by his own requirements in making a choice.

In the selection of material for block making, and in the process of making blocks, a greater degree of care should be taken than in ordinary concrete work.

Cement—International Portland Cement is particularly well adapted for this purpose, having Uniformity in Quality—Uniformity in Color, and great Strength.

Sand—Coarse, sharp, clean sand should be selected.

Stone—If stone or gravel is used it should be fine but clean. Good sand without the addition of any stone or gravel will make a better looking block.

Silos.

Concrete silos are without question the best, as they are air-tight, too heavy to blow over, will not shrink or collapse when empty, and if properly built will last for ages.

Silos, 20 feet diameter, 32 feet high, and walls 12 inches thick, use:—

One part cement.

Two parts clean, coarse sand.

Great Chaudiere Dam, at Ottawa and Hull, in course of construction. Over 12,000 barrels International Portland Cement used.

Three parts clean, fine gravel.

Four parts clean broken stone or brick.

The stone to be broken so that it will pass through a 2-inch ring. If good, clean cinders, free from unburned coal, are procurable, they will take the place of stone. If broken brick is used, it must be *hard burned*.

Mix the materials used thoroughly, then put in the mould and ram thoroughly.

Plaster entire inside of silo with cement and sand in the proportion of two of cement to three of sand, then pebble dash outside.

Sidewalks.

Provide a good foundation of stone, gravel or cinder for drainage and to prevent settling or heaving by frost. Lay four inches concrete, one part cement; three parts clean, sharp, coarse sand; five to seven parts crushed stone or coarse, clean gravel from one-quarter to two inches in size. Pound the concrete well and before the sub-surface is set, clean and roughen it. Then lay top surface from one-half to one inch thick, composed of one part cement one part sand or one part cement to one and one-half parts sand. Use nothing but clean, sharp sand; level with straight edge, then get smooth, even surface with trowelling, but too much trowelling will produce air cracks; separate into blocks four or five feet square by cutting down through the concrete. Keep the finished work thoroughly wet for several days to prevent cracking, which it is su e to do if allowed to dry out too quickly.

One barrel International Portland Cement will lay from 45 to 60 square feet of four inch sidewalk finished, or from 75 to 90 square feet of good cellar floor.

Keewatin Flour Mills.

Built entirely of Portland Cement

Breakwater, La Prairie, P.Q.

Built of International Portland Cement.

INTERNATIONAL PORTLAND CEMENT COMPANY, Limited.

New Addition to House of Commons, Ottawa. International Portland Cement used.

A FEW WORDS FOR THE BENEFIT OF THE MAN WHO IS ABOUT TO ENGAGE IN CONCRETE WORK.

1—Purchase International Portland Cement as it is reliable.

2—Use clean sand that contains particles of all sizes, as it will make a denser concrete with the same amount of cement.

3—If you use crushed stone, see that it is free from dust and is not of a kind that will disintegrate when exposed. Clean gravel, limestone or trap rock is the best.

4—See that the materials are well mixed dry, so as to distribute the cement evenly. If this is not done the cement will form lumps, when wet, that will be difficult to break up.

5—Use reinforcement if the article is to withstand bending, tensile or shearing stresses.

6—For masonry, use one part cement, from three to five parts sand and one part fresh slacked lime. One barrel of International Portland Cement will make mortar enough to lay up 2,000 brick.

7—To prevent freezing of concrete, use warm water; dissolve salt in the water used for mixing, using from one to four ounces to each gallon of water according to the severity of the weather. Cover the work with saw-dust, straw or other material until the cement is thoroughly set.

8—Bricks to be laid in cement, also wood frames for concrete, should be well soaked in water, otherwise they will absorb the moisture the cement needs for setting.

9—Always use cement as soon as possible after mixing. Never attempt to use mixed cement or concrete that has been allowed to set or partially set.

Results in the making of Portland Cement Concrete will depend not only upon the quality of the materials used, but quite as much upon the workmanship in its preparation and laying.

GOVERNMENT MUSEUM BUILDING, OTTAWA.

OVER 21,000 BARRELS OF INTERNATIONAL PORTLAND CEMENT USED IN THIS BUILDING.

INTERNATIONAL PORTLAND CEMENT COMPANY, Limited.

New Addition to Post Office, Montreal.

International Portland Cement used.

DON'TS ON CONCRETE.

Cement.

Don't use natural or slag cement for reinforced concrete work. Portland cement is the only material which is sufficiently trustworthy.

Don't use cement which has not been ground to the necessary degree of fineness. Coarse particles of cement are of no more value than sand.

Don't use a cement which requires aeration before it can be used.

Don't use a cement which has caked through being allowed to get damp.

Don't use a cement which will begin to set before the concrete is placed in situ.

Aggregate.

Don't give the selection of the sand, gravel or stone less attention than the selection of the cement.

Don't use large stone or gravel for reinforced concrete work. For floors everything should pass through a ¾-inch mesh.

Don't measure ballast without screening; it is necessary to know how much is sand and how much gravel.

Aqueduct, Montreal Water Works.
Length about six miles. Capacity about 60 million gallons per hour. Approximately 50,000 barrels of International Portland Cement used.

Don't sift the fine particles out of your sand.

Don't use a loamy, greasy, or dirty sand, gravel or stone of any kind.

Don't use mixtures of the same richness for all work. Whilst a 1 :2 :4 (1 :6) mixture will do for foundations, 1: 1½: 3½ (1 :5) mixture is wanted for floors and columns.

Mixing.

Don't use water until the materials are mixed dry, so as to show a uniform color.

Don't use sea water when you can get fresh; and don't use dirty water on any account.

Don't add water all at once. Add it gradually until the color is again uniform.

Don't make it so dry that it will not enter between the reinforcing rods and wires.

Don't mix more concrete than you can use at one time.

Filling and Ramming.

Don't use thin or weak timbering; it is false economy.

Don't allow careless ramming; that displaces the reinforcements.

Don't add more concrete after one layer has been filled and rammed without first roughing the surface and pouring on a liquid grout.

Don't leave unfinished concrete work in cold weather without covering and protecting from frost.

Residence built by W. Lamb, Ottawa.

Built of International Portland Cement.

GENERALLY.

Don't omit to provide for change of volume (expansion or contraction) when dealing with large horizontal or vertical areas.

Don't remove shuttering or other timbering before the concrete has had time to become thoroughly hard.

Don't slight any portion of the work.—*Concrete and Engineering.*

CEMENT BRIDGE SPANNING 100 FEET.

This bridge crosses the Housatonic River at Stockbridge, Massachusetts, connecting Laurel Hill and Ice Glen with an arch spanning one hundred feet in the clear. The form, flatness, and extreme thinness at the crown of the arch give to the structure a very bold and graceful appearance.

INTERNATIONAL PORTLAND CEMENT COMPANY, Limited.

Read these pages deliberately, ponder over the thoughts there expressed, and if the information you gather affords either pleasure or profit, acknowledge yourself grateful to the Company that issued this Souvenir, THE INTERNATIONAL PORTLAND CEMENT COMPANY, LIMITED.

If you want a good, uniform and reliable cement buy your product from this Company, where most approved, modern, and positive methods are used in its production. They can give you the best. You get what the world cannot better when you buy this Brand,

INTERNATIONAL PORTLAND CEMENT.

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