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Toronto's Building

AND

Ornamental Stones

"THEIR NATURE AND UTILITY"

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ISSUED BY

TORONTO LOCAL

January 31st, 1914

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and
Ornamental Stones

"Their Nature and Utility"

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January Thirty-first, Nineteen-Fourteen

The true colors of architecture are those of natural stone, and I would fain see these taken advantage of to the full.—*Ruskin.*

PREAMBLE

We present this brochure dealing with the nature and utility of building and ornamental stones to those who may be concerned in the building industry; either by way of contracting, or constructing residences and the erection of monuments.

With one object in view, i.e., to inform and advise to the best of our ability upon the above stated subject (viz.), the nature and utility of building and ornamental stones.

Considering that we live in an age when the factor of cost is of fundamental importance, it may be wise to consider "cost" with the object you have in view, i.e., "Durable Construction."

To us who have spent our lives in the building industry it is a truth no longer patent "That the stone which nature has provided in such prolific quantities, is from a monetary point of view the cheapest after a lapse of time." And because of the geological process through which it passes it is possible to more accurately inscribe *Organic Nature,* than could possibly be claimed for any kind of "Imitation Stone," because of the coarseness of the material and lack of pressure, as well as the none existence of the chemical proportion which is necessary in a good sound stone.

With this object of enlightenment in view we present this pamphlet, trusting that its perusal will be beneficial to the recipient, as well as advancing the public well being.

The violations of truth, which dishonour poetry and painting, are thus for the most part confined to the treatment of their subjects. But in architecture another and a less subtle, more contemptible, violation of truth is possible; a direct falsity of assertion respecting the nature of material, or the quantity of labor. And this is, in the full sense of the word, wrong, it is as truly deserving of reprobation as any other moral delinquency; it is unworthy alike of architects and of nations; and it has been a sign, wherever it has widely and with toleration existed, of a singular debasement of the arts.—*Ruskin.*

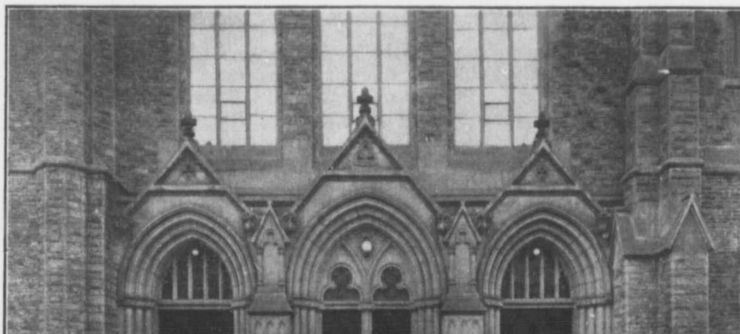
Indiana Limestone

The prominence which Indiana stone has achieved is due to the possession of three ideal qualities in a building stone—light, beautiful color; great strength and endurance; and adaptability to ornamental forms at small expense. The ease with which it is quarried and the facility and certainty with which the hewers and carvers can work out designs upon it, reduce the cost of producing the stone and preparing it for the walls of a building to a very reasonable figure. Granite and marble begin to be costly while they are being taken out of the earth; when they come to the stone cutter to be dressed their hardness and brittleness still further increase their cost. Brownstone and sandstone are produced with comparative cheapness, as they lie in the quarry in strata and are easily broken out; but they are hard, brittle and difficult to carve, and the cost of cutting and dressing them, while not so great as granite and marble, is still very high. Oolitic limestone, on the contrary, is not an expensive material at any point from production to setting in the walls. It therefore enables the architect to carry out the most artistic designs as well in modest dwellings as in more pretentious buildings, such as churches, office buildings, public libraries and state capitols, the element of excessive cost being eliminated without sacrificing anything that is proper for useful and enduring construction. These qualities have rendered the stone universally popular, and the peculiar light and cheerful gray of Indiana stone has therefore become a marked feature of the churches, residences, office buildings and large structures of American cities.

Resemblance to Portland Stone.

Indiana stone has not had the benefit of many years trial to test its endurance, although some of it was used as early as 1850, and is still unimpaired. But oolitic limestone has been thoroughly tested elsewhere. The other great deposit of this stone was found in Portland, England, and was used entirely in the construction of Westminster Abbey, St. Paul's Cathedral, the old city wall of London, and many churches and buildings erected in the time of Queen Anne. Indiana stone and the Portland stone are of the same geological age and quality, and the following comparison shows them to be almost identical in composition:

Household Science Building, Queen's Park, Indiana Limestone



Knox Church, Spadina Avenue, Indiana Limestone

	Portland Stone.	Indiana Stone.
Carbonate of Lime	95.16	97.26
Silica	1.20	1.69
Oxide of Iron	.50	.49
Magnesia	1.20	.37
Water and Loss	1.94	.19
	100.00	100.00

This comparison, however, demonstrates that Indiana stone is the superior of the two, owing to the lesser quantity of oxide of iron and magnesia which it contains and its consequent gain in being more nearly a pure carbonate of lime—a purity rarely, if ever, surpassed, and scarcely equaled in the world. Its superiority is further increased by the fact that it is more than fifty per cent. less porous than the Portland stone, the ratio being 1 in 20 for the latter against 1 in 42 for Indiana stone. Each of these stones possesses the excellent quality of never cracking or scaling, due to the fact that they are pure limestones and are not affected by gases existing in the air.

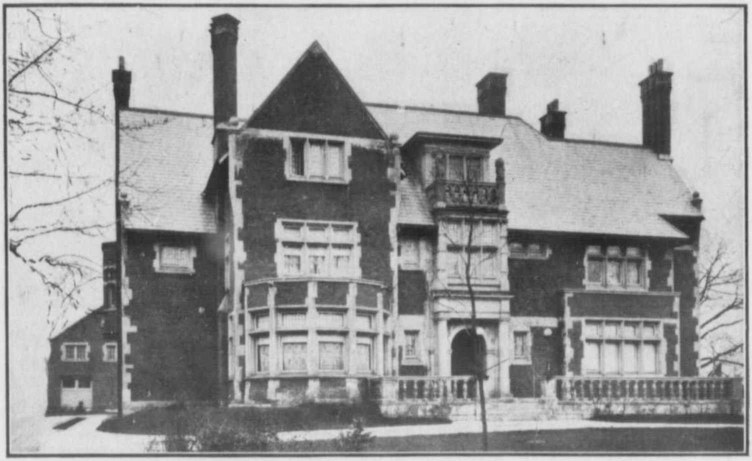
Geological Reports.

The following extracts from the reports of independent scientific men, give briefly some information in regard to the geological character of the stone:

Report of Prof. Maurice Thompson, State Geologist of Indiana.

The rock is an element of the St. Louis group, showing itself in a massive, evenly bedded stratum of homogeneous limestone of a whitish gray color. Upon careful examination with the glass its grain seems to be infinitesimal shells and shell fragments, all bound together by a firm and even setting of lime carbonate. No art of man could construct a mass at once so firm, even and workable and at the same time so elastic and strong. The stone comes from the quarry soft, tough and easily cut. In a short time it hardens, so that it rings with a musical note (like that of a steel bar) when struck with a hammer. A bar four feet in length and two inches square may be bent so as to deflect greatly, and when released will spring back to a right line with the promptness and energy of highly tempered steel. Upon being broken, the stone parts with a smooth direct fracture, showing a surprising evenness and continuity of texture, with no trace whatever of laminations, seams or changes of structure.

Geologically the oolitic limestone is very interesting and its existence is by no means a problem easy of solution. The more it is studied, however, the more it appears to be the result of calcareous sediment deposited at the bottom of a deep trough in an otherwise shallow sea. The shells of which the greater portion of the rock is



Residence, 92 Crescent Road, Indiana Limestone

Bank of Hamilton, Yonge Street, Indiana Limestone composed are, as a rule, much smaller than the smallest ordinary pinhead; indeed, barely distinguishable under the most favorable circumstances by the unaided eye. These minute shells are cemented together with a cement composed of fine fragment dust of other shells, and an intermediate setting of pure lime carbonate, which renders the whole mass perfectly homogeneous, elastic and resonant.

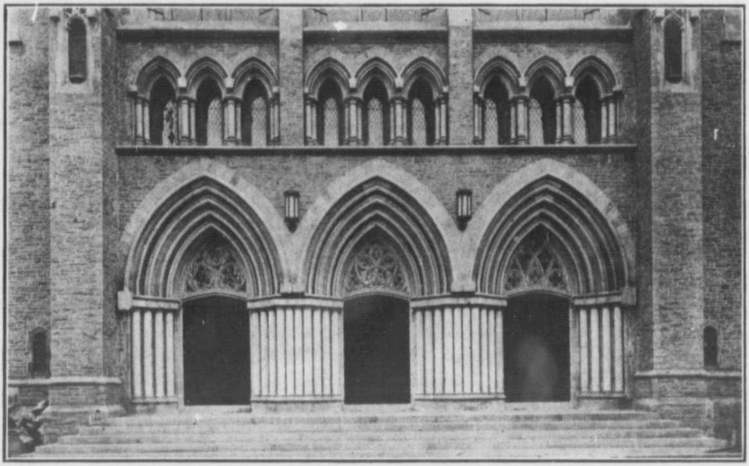
Report of Prof. John Collett, State Geologist of Indiana.

By far the most beautiful and valuable stone for architectural purposes is the oolitic limestone. The supply is simply inexhaustible, as it lies in massive strata of from twenty to seventy feet thick over a large area.

These strata are homogeneous, equally strong in vertical, diagonal or horizontal sections. The stone comes from the quarry so soft as to be readily worked by saw, chisel or planing machine, while on exposure it hardens to a strength of from 10,000 to 12,000 pounds to the square inch—a strength amply sufficient to sustain the weight of the largest structure in the world. It is of almost unprecedented purity, containing an average of 96.8 per cent. carbonate of lime; hence its advantage over the magnesian limestones, as it is not affected by decay in an atmosphere charged with the gases of burning stone coal. In natural outcrop it presents bold, perpendicular faces to the elements, showing every scratch and mark, unaffected after the exposure of thousands of years, as no other stone or rock does.

It is quarried by steam channelers, which carve it out in prisms of 6 x 10, 50 or 100 feet long, putting to shame the boasted prodigies of Egyptian story and effort. It is then rapidly sawed into blocks and dimension forms, and steam planers carve, mould and smoothe it like clay or wood and more accurately than mallet and chisel. It is now fit to be carved into the finest kind of sculptured and ornamental forms.

Ready for the mason or sculptor, it is alive and resonant, answering with a clear metallic ring each touch or blow. This resonance is an excellent test of the perfect unity of its particles, and as a result it is highly elastic, bending under pressure and rebounding to place when relieved from it. This elasticity enables Indiana oolitic limestone to adapt itself without cleavage or disintegration to our changeable climate, where material will be frequently subject to a change of from twenty to sixty degrees of temperature in a few hours, as in large buildings the outside will be subject to a temperature of twenty-five degrees below zero in winter, or 120 degrees above in the summer, while the inside wall will remain at sixty or seventy degrees—a difference of fifty or eighty degrees in the extremities of the same stone—with their accompanying effects in expansion or contraction. The strains of heat and frost will tear down buildings and sides of mountains with their great expansive forces,



St. Paul's Church, Bloor Street East, Indiana Limestone

Residence, Chestnut Park, Indiana Limestone and even steel and iron will give way before them. Here, then, is represented to the builder and architect a new and wonderful element in an elastic stone, a potent quality which when united with its other sterling excellences of strength and beauty, makes Indiana limestone the best in the world for exposed work in localities subject to great changes.

Crushing Strength.

A test made b ythe United States Government gives the crushing strength of Indiana stone at about 135,000 pounds to the square foot. That this enables it to sustain an enormous weight is shown by the following table of maximum weights borne by the piers and masonry of well known structures:

Piers of St. Peter's, Rome	33,000 lbs. sq. ft.
Piers of St. Paul's, London	39,000 lbs. sq. ft.
Piers of Brooklyn Bridge	57,000 lbs. sq. ft.
Granite Masonry of Washington Monument	45,000 lbs. sq. ft.
Reliable sustaining weight Indiana Stone	135,000 lbs. sq. ft.

Fire Tests.

Some curiosity being manifested in relation to the heat enduring properties of Indiana stone, tests were made in 1896 at Rose Polytechnic Institute, with the following result:

"The specimens were first heated until lead melted on their top surface, about 619° F., and cooled slowly in air—all specimens uninjured. Other specimens heated to the same temperature were sprinkled with water and then immersed in cold water—all uninjured.

"The same experiment was tried with zinc—melting at a temperature of about 777° F., with the same result—specimens all uninjured."

And so on to "cherry red," about 1500° F., up to which point the specimens retained their cubical form and sharp edges.

"Other specimens were heated to the temperature of melting potassium chloride, K. Cl, sprinkled and immersed in water. The lower edges went into fine powder (quicklime). The upper edges were uninjured.

"These tests show very conclusively that the oolitic stone is fire proof up to the point of calcination or turning into quicklime, in which respect it is superior to the average building stone, as far as shown by published tests. While a few building stones will withstand uninjured a temperature above the calcination point of lime, the greater number will be destroyed at a temperature below that point."

The Indiana Quarries Company, Indiana, recommend, in setting Indiana Stone, the use of a mortar made of one part lime and three parts sharp, clean sand, both for the stone and for the brick backing. It is not safe to use mortar for the stone and cement for the backing. Like granite and marble, Indiana stone is subject to stains from the penetrating acids in cement, and for that reason lime mortar should be used.

These suggestions are based on the latest experience of builders who have used cement in connection with Indiana stone.

In the specifications for the city buildings in St. John's Park, New York, the architects, Messrs. Carrere & Hastings, instructed that "All this material (Indiana stone) to be set in mortar of one part limeputty and three parts clean, sharp sand." Where the building laws do not compel the use of cement, it is believed that the most satisfactory method is to set both the stone and the brick backing in a mortar made in accordance with Carrere & Hastings' specifications given above.

Two Colors.

Indiana stone is found in two colors—buff, or light gray, and blue. The buff is the more generally known and is produced in the greatest quantity. The blue comes from the bottom ledges and the amount in sight is always comparatively limited; it consequently takes a slightly higher price than the buff, but in all respects the two stones are of equal quality and texture. The "Hoosier light blue" is believed to be the most beautiful variety of the stone ever produced, fading on exposure to a soft, harmonious gray.

Utility and Ornamentation.

This particular stone lends itself admirably to the construction of Public Buildings, Factories, Warehouses, and Residences, and can be obtained in any quantity and dimension. As well as being suitable for the purpose of expressing Artistic Design, it appeals to the business man because of its cheapness and durable construction.

(*Note.*—We desire especially to draw your attention to the tests made by the U. S. Government, as it will express more forcibly than any words of ours the enormous strength of Indiana Limestone.)

Considering that this is the only stone that is being imitated to any extent, we deem it advisable to inform our readers "that the artificial products that most resemble this stone can be shown to possess only approximately one-fourth of its power of resistance." And further, we have it upon the authority of geologists and chemists that, "because of the natural process through which stone passes in its formation, it is adapted to combat climatic conditions, and its process of disintegration is much slower than is the case with imitation stone."

Buildings Constructed of Indiana Limestone.

Burwash Hall, Victoria College, Queen's Park.

Household Science Building, Bloor St.

Bank of Hamilton, Yonge St.

Bank of Hamilton, Queen St. West.

Bank of Ottawa, Broadview Ave.

Bank of Ottawa, Queen St. East.

Bank of Toronto, Yonge St.

Bank of Toronto, Queen St. East.

Imperial Bank, Queen St. West.

Traders Bank, Yonge St.

Dominion Bank, Bloor St. East.

Dominion Bank, St. Clair Ave.

St. Paul's Church (Anglican), Bloor St. East.

Presbyterian Church, Rosedale, South Drive.

Knox Church, Spadina Ave.

Timothy Eaton Memorial Church, St. Clair Ave.

Methodist Church, Yonge St.

Catholic Church, Sherbourne St.

Stock Exchange, Bay St.

National Club, Bay St.

Central Y. M. C. A., College St.

West End Y. M. C. A., College St.

Canada Bible College, College St.

Mr. Curney's Residence, Walmer Rd.

Hart Memorial Institute, Queen's Park.

Brown School, Avenue Rd.

Kent School, Dufferin St.

Technical School, College St.

Bishop Strachan School, Warren Ave.

C P. R. Offices, King St.

Knox College, College St.

Customs House, Front Street, Ohio Sandstone

Ohio Sandstone

The fitness of stone for structural purposes can be determined approximately by examining a fresh fracture. It should be bright, clean and sharp, without loose grains, and free from any dull, earthy appearance.

Tests of the strength of blocks of stone are useful only in comparing different stones, and give no idea of the strength of structures built of such stone, or of the crushing strength of stone in large masses on its natural bed. The crushing resistance per square inch of compressed surface increases approximately in the ratio of the cube roots of the sides of the respective cubes.

The durability of sandstones varies with both their physical and chemical composition. Great differences may exist in the durability of stones of the same kind, presenting little difference in appearance.

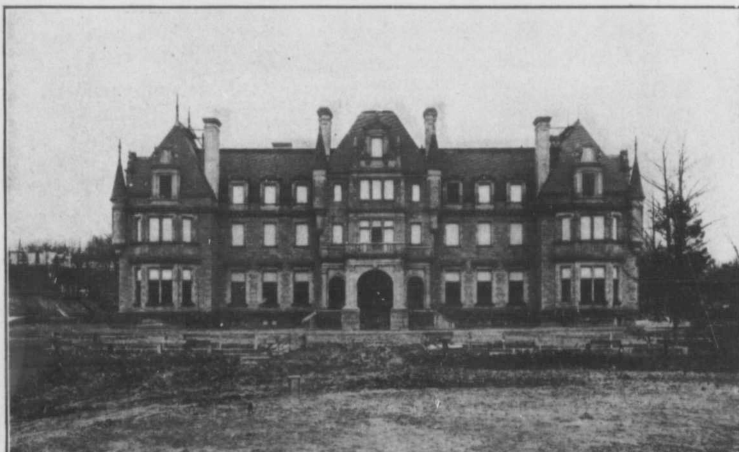
When nearly pure silica, and well cemented, sandstones are as resistant to weather as granite, and very much less affected by the action of fire. Taken as a whole, they may be regarded as among the most durable of building materials. When first taken from the quarry, being saturated with quarry water (a weak solution of silica), they are frequently very soft, but on exposure become harder by the precipitation of the soluble silica contained in them.

The stone derived from the Gray "Canyon" and Berea quarries is a member of the lower carboniferous series, and is the most valuable geological formation in this country. It is very homogeneous in texture and composed of nearly pure silica. These stones are a light blue-grey color, very resistant to fire and weathering, and, on the whole, are the best and handsomest building stones known.

By Crowell & Murray, Chemists.

Silica	93.28%
Alumina	3.60%
Sesqui Oxide of Iron	1.45%
Carbonate of Iron	None
Carbonate of Lime	.57%
Carbonate of Magnesia	.46%
Water	.59%
	99.95%

Residence, Walmer Road, Ohio Sandstone



Governor's New Residence, Rosedale, Ohio Sandstone

By F. A. Emerton, Chemist.

Silica	92.95%
Alumina	3.14%
*Iron Protoxide	1.22%
Lime	.13%
Magnesia	.37%
Alkalies	.65%
Water (combined)	.80%
Carbonic Acid	.74%
	100.00%

*There is no iron as pyrite present.

CRUSHING STRENGTH TEST.

By Crowell and Murray, Chemists.

Mark.	Crushed at.	Lbs. per Sq. In.
1⅞ inch cube	32,397 lbs.	9,229 lbs.
2 inch cube	35,343 lbs.	8,846 lbs.
2 inch cube	41,233 lbs.	10,308 lbs.
2½ inch cube	60,868 lbs.	9,739 lbs.
2½ inch cube	43,014 lbs.	6,883 lbs.
		45,005 lbs.

Average, 9,001 lbs.

These tests prove the stone, in our opinion, to be well suited for building purposes.

Decoration and Utility.

The utility and decorative value of the Ohio Sandstones has probably outrivalled any other sandstone as a suitable material for building construction, and the extent to which it is used in the City of Toronto.

The firm and homogeneousness of this stone renders it exceedingly well adapted for ornamentation; the most elaborate design can be executed in the highest relief and retain its clean-cut outlines through generations of time and exposure.

Two of the most distinguished buildings in our city are constructed of Ohio Sandstone, viz., the Customs House and the Bank of Montreal. Notwithstanding the lapse of a generation of time since their erection, they are in a remarkable state of preservation, and still stand at the portals of the Queen City of Canada, to impress upon the visitors entering therein the virtues of strength and beauty. This stone finds a ready market in Toronto because it

Veterinary College, University Avenue, Ohio Sandstone is cheap and easily cut. As well as being adapted to distinctive art, it finds a customer in the residential builder, because of the uniformity of its strata and layers, which factors make it possible to split in any dimension with a minimum amount of labor, thus making it possible to construct at a very low estimate.

It possesses a remarkable degree of elasticity, and is noted for the fineness of its texture, which enables the cutter to express in his workmanship both accuracy and precision. The symmetry of its strata and layers teach us that Nature possesses a plan of construction not yet exceeded by the art of man. No pencil can outline nor brush paint the symmetry of its lines and the beauty and harmony of its color.

Color.—This stone also possesses two distinctive colors, generally known as buff Amherst and Grey Canyon. These characteristics are considered very important by architects, as aiding them in design, "both for interior and exterior decoration."

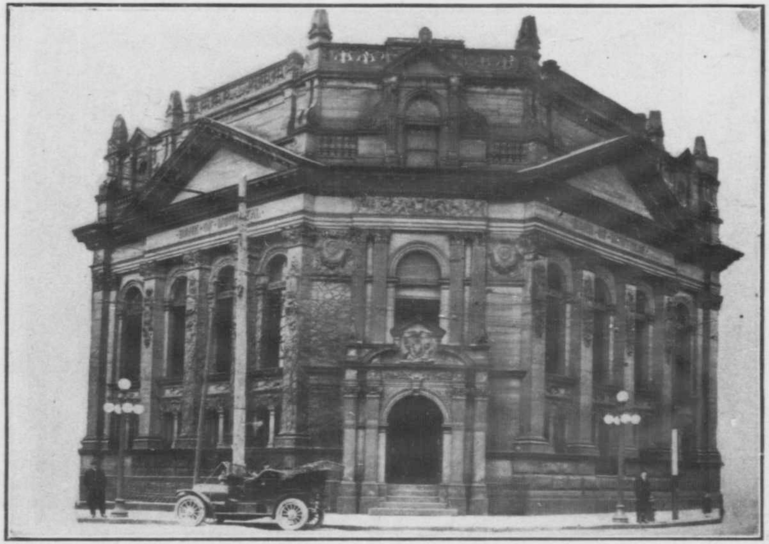
The stone can be supplied in any quantity, and as a building material is unexcelled in the City of Toronto.

Buildings Constructed of Ohio Sandstone.

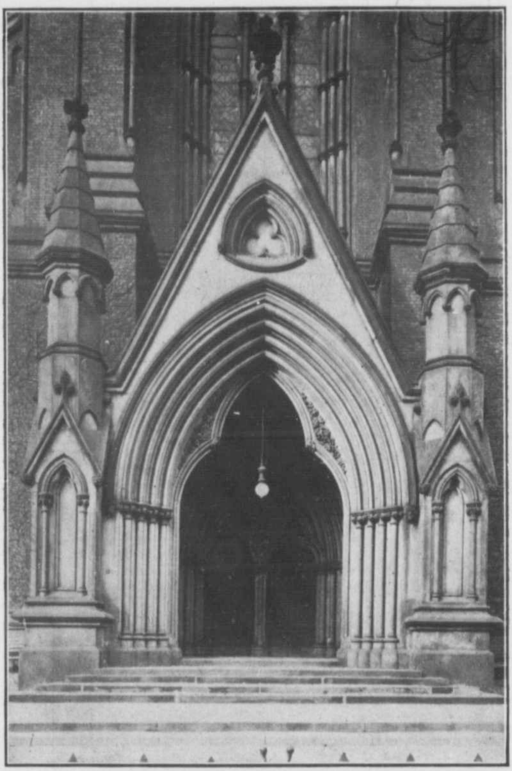
Dominion Post Office	Berea
Dominion Customs House	Buff Amherst
York County Court House	Buff Amherst
Dominion Bank Building	Buff Amherst
Standard Bank Building	Buff Amherst
Imperial Bank of Canada	Buff Amherst
Ontario Bank Building	Buff Amherst
Union Loan and Savings Building	Buff Amherst
Building and Loan Association Building	Buff Amherst
Trust and Loan Company of Canada Building	Buff Amherst
Federal Bank of Canada	Buff Amherst
Bank of Montreal Building	Berea
Bank of Toronto Building	Berea
Merchants' Bank of Canada	Berea
St. Andrew's Cathedral	Buff Amherst
Manning Arcade Building	Buff Amherst
Toronto Arcade Building	Berea
Canadian Pacific R. R. Offices	Buff Amherst
Victoria Chambers	Buff Amherst
Osgoode Hall	Buff Amherst
Toronto Insane Asylum	Berea
McMaster's Building	Buff Amherst

Hon. W. T. McMaster's Residence	Buff Amherst
Lieutenant-Governor's Residence	Buff Amherst
Lakeside Building	Berea
McDonald Building	Berea
Toronto University Laboratory Building	Berea
New Governor's House, Rosedale	Berea
Veterinary College	Berea

Bank of Commerce, Bloor and Yonge Streets, Ohio Sandstone



Bank of Montreal, Yonge and Front Streets, Ohio Sandstone



St. James' Cathedral, King Street East, Ohio Sandstone

Doorway, Central Building, University, Ohio Sandstone

Connecticut Brownstone

This stone is quarried at Portland, Connecticut, commencing about the year 1665, and has been used (in the construction of many of the best buildings in the United States and Canada), both for general utility in buildings and monumental works.

COLOR.—Its color is of a rich dark brown, not unlike those quarried in Nova Scotia and New Brunswick, and the claim is put forward by some experts that it cannot be duplicated or imitated, and is not susceptible to changing color by chemical or elemental processes.

It is absolutely free from clay, marl or gravel, which weather out on exposure to the atmosphere or cause fractures in working; and if laid upon its natural bed (as Nature intended all stone should be), is calculated to withstand the ravages of time and weather for many generations.

Many noted buildings in the States date so far back that they have become landmarks in history. In this particular we make mention of the Connecticut State House at Hartford, which was built in the year 1794, and still stands, a monument of beauty. Connecticut Brown Stone has stood not only the test of time and weather, but also fire.

The Flood residence, on Nob Hill, San Francisco, demonstrated during the earthquake and fire which followed, the remarkable power of this stone to resist the ravages of fire, in so far as it is still a remarkable building, and shows but little sign of deterioration. Considering these important factors, we are justified in advising its utility.

CHEMICAL ANALYSIS.

Silica	70.11%
Alumina	13.49%
Iron Oxide	4.85%
Manganese	.35%
Lime	2.39%
Magnesia	1.44%
Soda, Potash, etc.	7.37%
	100.00%

Crushing strength, 14.500 lbs. per square inch.

Specific gravity, 2.35.

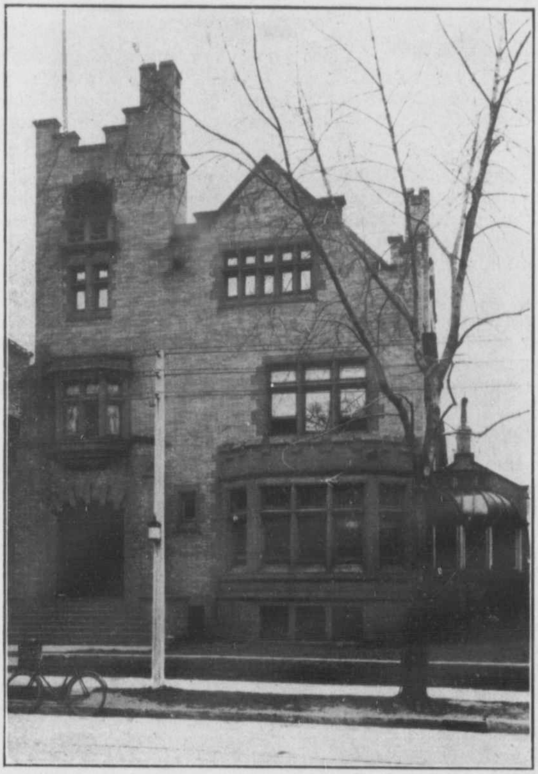
BUILDINGS CONSTRUCTED WITH BROWN CONNECTICUT STONE.

Bank of Commerce, King and Jordan Sts.

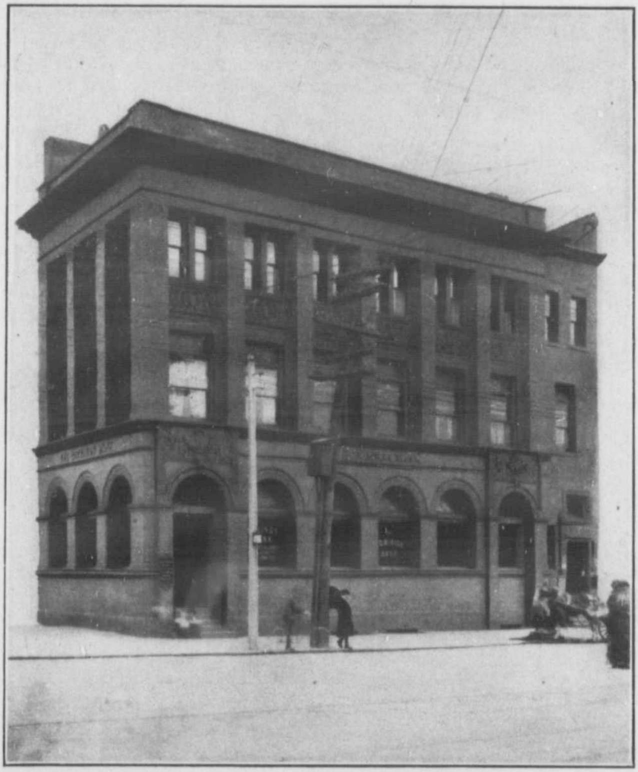
Dominion Bank, Spadina Ave. and College St.

Dominion Bank, Queen and Sherbourne Sts.

Moose Club, Sherbourne St.



The Moose Club, Sherbourne Street, Connecticut Brownstone



Dominion Bank, Spadina and College St., Connecticut Brownstone

Portage Brown Sandstone

The characteristics of Portage Sandstone are very similar to the Connecticut stone before mentioned, both in color and chemical constitution.

This is a stone possessing a very fine texture and depth of color. If the reader will take the trouble to examine the Yonge Street entrance to the Confederation Life Building, and the twisted columns on Richmond Street, it will leave no room for doubt regarding the possibility of expressing therein artistic design. Unfortunately, we have to admit that we have been unable to get a chemical analysis of same up to date, but feel sure that it will fulfil the desired qualifications of beauty, strength and durability, the requisites of a good sound building material. A consideration of the appended list of buildings in which this stone has been used may be a stronger recommendation than any words of ours.

Club House, St. George and Bloor Streets, Portage Sandstone

The Ryrie Building, Yonge and Shuter Sts., Portage Sandstone

PORTAGENTA BROWN STONE.

Club House, George and Bloor Sts.
Confederation Life Bldg., Yonge and Richmond Sts.
Sick Children's Hospital, College St.
Dominion Hotel, Queen and Sumach.
Board of Trade, Yonge St.
Bell Telephone Co., Adelaide St.
Northern Crown Bank, Spadina and College.
Wycliffe College, Hoskin Ave.
Ryrie Bros.' Store, Yonge St.

CANADIAN SANDSTONES

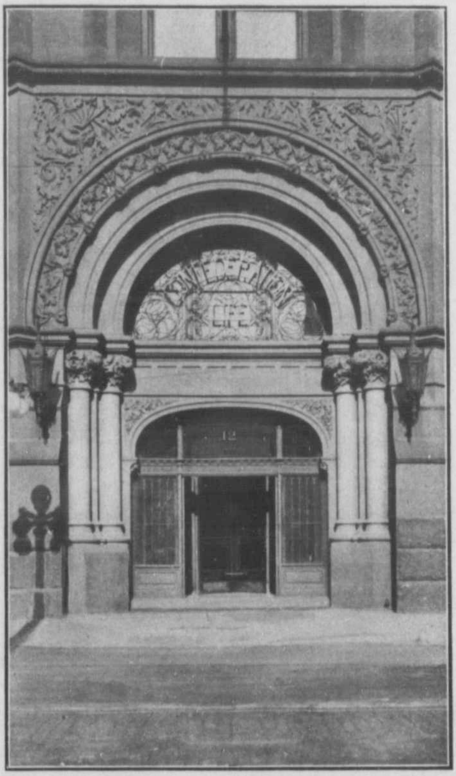
In presenting for your consideration the Sandstones of Ontario and the Maritime Provinces, with the chemical analysis of same, we may be pardoned for making a few observations upon our outlook as Canadian citizens.

Experience has taught us that it is a wise policy to stand for the development of home industries; and believing that this is the only safe course to pursue in protecting the home worker against the invasion of foreign products, "which factor is playing such havoc in our craft at the present time, owing to the remarkable development of machinery, and the manner in which artificial methods facilitate the production of wealth.

The evil resulting from this is easily discerned in the number of skilled mechanics either temporarily employed or totally unemployed. We clearly foresee the foolishness of endeavoring to prohibit mechanical means of production, "but" we are of opinion that a condition could be made operative which would result in a minimum of suffering, to those dependent upon the industry for a living, viz.: 1. That as far as possible all work should be executed in the locality for which the construction is intended. 2. And secondly, that preference should be given to home products as far as the supply is possible.

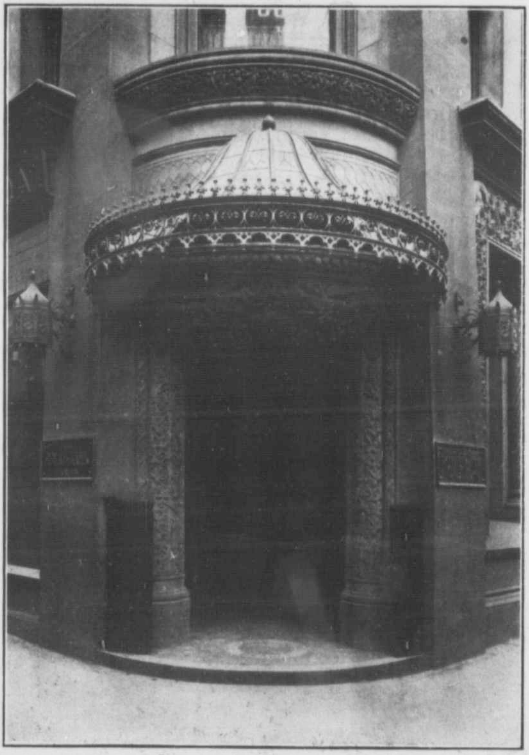
Many objections may be raised to these suggestions, but we are placed in the unfortunate position of having to choose between two evils, and, like wise men, choose the lesser. The question of supply will probably take priority in the objections, and without discussing the question on its broad merits here, we conclude that from a national point of view, we have a home market, "why not a home supply?"

There is an abundance of stone in the provinces, and if its production was facilitated, could supply every legitimate demand of the building industry. So far as the stones of themselves are concerned, they stand well in comparison to other stones not produced in the provinces. (The necessary chemical combination and the demonstration of actual strength of the same, and, considering that we have almost every variety of sandstone possessing the desirable characteristics for the expression of artistic design), leads us to conclude that the advocacy of its practical utility is reasonable, and to accomplish a much wider use of these stones is not beyond our expectation.



Confederation Life Building, Richmond Street,
Portage Sandstone

Board of Trade Building, Yonge and Front Streets,
Portage Sandstone



Confederation Life Building, Yonge Street,
Portage Sandstone

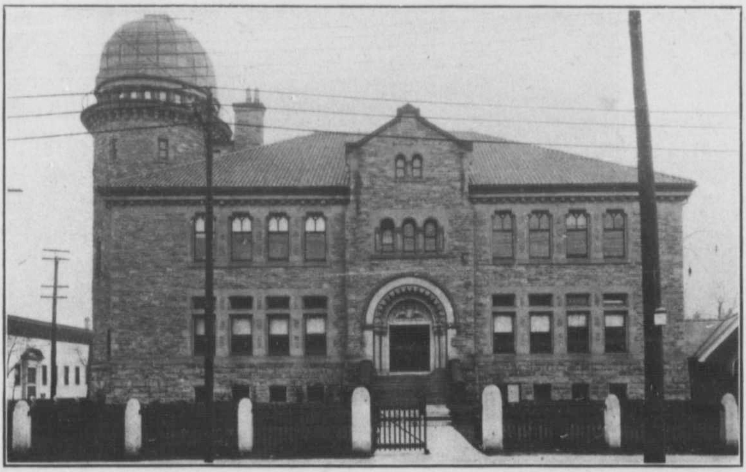
Miramichi Sandstone

NEW BRUNSWICK

The Miramichi Sandstone is unique in its formation, and the irregularity of its lines, combined with its buff color, invite the claim of its being select. It presents a very fine texture, thus suggesting the possibility of inscribing high and expressive art, is very uniform in color, weathers well, and is not susceptible to discoloration. Although this stone has not been used in Toronto to any great extent, the buildings composed of it stand out as being unique; its color is pleasing to the eye, and it maintains its clean-cut outlines through generations of time and exposure. An example can be seen in the upper section of Charles Street Postal Station.

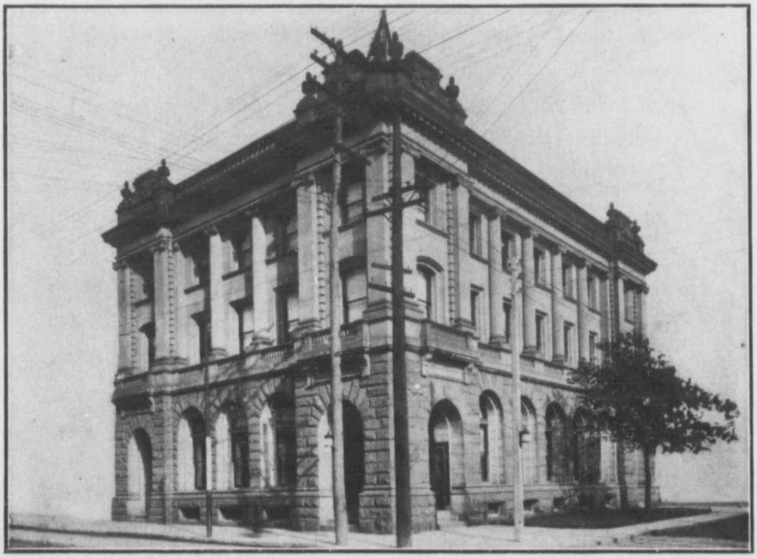
MIRAMICHI SANDSTONE.

Averages of four stones—two from Miramichi Quarry Co., one from Adam Hill's Quarry, and one from Old French Fort Cove Quarry:



Meteorological Observatory, Bloor St. West, Miramichi Sandstone

Specific Gravity	2.647
Wt. per Cu. Ft., lbs.	141.739
Pore Space, per cent.	15.08
Ratio of Absorption, per cent.	6.809
Coefficient of Saturation, 1 hour	.56
Coefficient of Saturation, 2 hours	.65
Crushing Strength, lbs., per sq. in.	10494.
Crushing Strength, lbs., per sq. in., wet	6916.
Crushing Strength, wet, after freezing	4466.
Gain on Corrosion Test	.0039
Transverse Strength, lbs., per sq. in.	1299.
Chiselling Factor	7.3
Drilling Factor	19.5
Boring Factor	130.
Factor of Toughness	5.
Ferrous Oxide	2.95
Ferric Oxide	1.81



Postal Station, Charles and Yonge Sts., Miramichi Sandstone

New Brunswick Brownstone

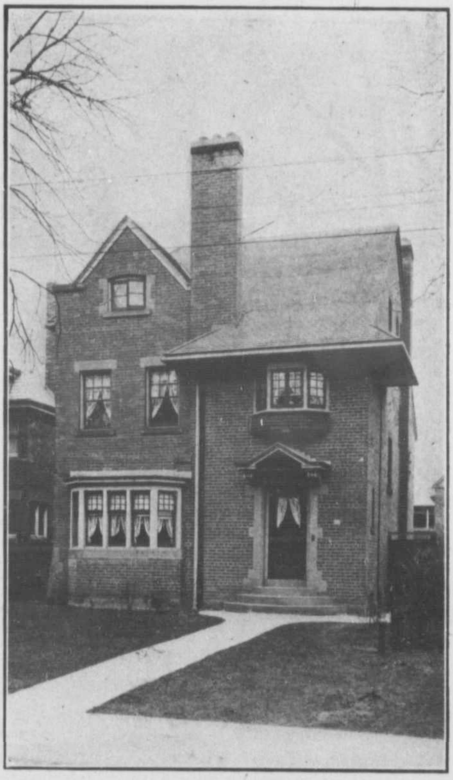
SACKVILLE

The most noted and extensively used Sandstone of the above-mentioned province is known as "Sackville." The isolated formation of rock deposited at Sackville during the new red stone period, so graphically described by Dawson, the noted geologist, as being unique and very different from any other deposit in the province.

The formation is in horizontal beds, from 2 feet to 9 feet thick, and is uniform both in color and quality, which renders it a very useful material for building and architectural designs. It so aptly blends with the color of brick, is strong and durable, as well as being one of the cheapest cutting stones on the market, which enhances its usefulness in building construction.

During the past few years there has been a great expansion in this particular stone area, due to the fact "that the public are being enlightened to the utility of this stone," which has resulted in an ever-increasing demand being made. The buildings in which it has been used are its best recommendation, viz.:

Mr. Morrison's Residence, Lyndhurst Ave.
Mr. Gooderham's Residence, Elm St.
Mr. Dinwoody's Residence, Wells Hill Rd.
Mr. Harris' Residence, Pape Ave.
Parliament Buildings, north wing, Queen's Park.
City Hall Entrance, Queen St.
Methodist Church, Sherbourne St.



Residence, 25 Roxboro St. East, Miramichi Sandstone

Residence, 29 Roxboro St. East, Miramichi Sandstone

Corrosion Test.—No change in color, but a little loss of weight.

Microscopic Test.—Quartz grains sharply angular and of variable size. The largest exceed ½ mm. Feldspar grains in an advanced stage of decomposition are as numerous as quartz grains. Some glistening mica.

Cement is ferruginous clayey material and a slight amount of carbonate of lime.

Specific gravity	2.711
Weight per cubic ft., lbs.	145.743
Pore Space, per cent.	13.882
Ration of Absorption, per cent.	5.946
Coefficient of Saturation, 1 hour	.47
Coefficient of Saturation, 2 hours	.58
Coefficient of Saturation, 38 hours	.66
Crushing Strength, lbs. per sq. in	11899.
Crushing Strength, lbs. per sq. in., wet	6083.
Crushing Strength, lbs., per sq. in., wet and frozen	3856.
Loss on Corrosion Test, grams, per sq. in	.00213
Transverse Strength, lbs., per sq. in	*1016.
Chiselling Factor	5.2
Drilling Factor	15.5
Boring Factor	148.
Factor of Toughness	7.
Ferrous Oxide, per cent	1.93
Ferric Oxide, per cent.	4.28

*Probably too low.

NOVA SCOTIA SANDSTONE

With respect to the Amherst, Wallace, and Pictou Sandstones, we desire to state that, with the exception of the chemical analysis, we have little of statistical matter to present for your consideration, owing to the incomplete state of our enquiries. But we anticipate making a further addition at no distant date, when we hope to be in possession of the official report of Professor Parkes, the Government analyst, on the Sandstones of the Maritime Provinces.

We may state that the Museum in Ottawa is constructed of Wallace stone, and that the characteristics of the above-named stones are similar to those before mentioned, i.e., when newly quarried they are easily cut, and harden on exposure; and admitting that the quantity is not so prolific as is the case with other stones from the same locality, we believe they are calculated to fulfil the object of all true art, i.e., to transmit, through the eye, facts, ideas, and emotions, and to remain static or to fix the fleeting moment—the evanescent present—in imperishable lines and colors.

We herewith submit the chemical analysis of same, and at the same time express our thanks to Professor Parkes for the chemical analysis, which he has so kindly submitted to us, on the Sandstones of Ontario and the Maritime Provinces:

City Hall, Sackville and Credit Valley Sandstone

Residence, Lyndhurst Avenue, Sackville Sandstone

Residence, Elm Avenue, Sackvil'e Sandstone

Wallace Stone.

The grey stone shows, under the microscope, the structure of uniform quartz grains of 1/4 mm. diameter. Feldspars of same size are far less abundant. Grains rounded and fitted close together with a small amount of cement. Stone is cleaner than New Brunswick olive-green varieties. The blue stone is very similar under the microscope.

	Grey.	Blue
Specific Gravity	2.687	2.687
Weight per cubic ft., lbs.	144.808	145.869
Pore Space, per cent	13.688	13.038
Ration of Absorption, per cent	5.902	5.58
Coefficient of Saturation, 1 hr.	.61	.62
Coefficient of Saturation, 2 hrs.	.63	.63
Crushing Strength, lbs., sq. in.	13681.	15633.
Crushing Strength, wet	10075.	12235.
	8754.*	7451.
Corrosion Test Loss	.0057	.00164
Transverse Strength	1838.	1534.
Chiselling Factor	5.9	4.6
Drilling Factor	12.	14.
Boring Factor		215.
Factor of Toughness		6.
Ferrous Oxide, per cent.	3.6	4.88
Ferric Oxide, per cent.	1.14	Trace

*Low.

Pictou Stone.

True grey, with a cast of brown, slightly speckled by mica flakes. Irregular under microscope. Grains of 1/4 mm. in a finer matrix. Fine feldspars and a large amount of cementing matter. Cement of clay, oxide of iron and carbonate of lime. The large amount of clayey cement accounts for the heavy loss in strength on soaking.

Specific Gravity	2.687
Weight per cubic foot	141.652
Pore Space, per cent.	15.552
Ratio of Absorption	6.853
Coefficient of Saturation, 1 hour	.65
Coefficient of Saturation, 2 hours	.72
Crushing Strength	10348.
Crushing Strength, wet	5555.
Crushing Strength, wet, after freezing	3463.
Loss on Corrosion	.0148
Transverse Strength	869.
Chiselling Factor	5.7
Drilling Factor	22.
Ferrous Oxide	4.37
Ferric Oxide	1.57

Parliament Bldg., North Entrance, Sackville Sandstone.

Amherst Stone.

Brighter in color and coarser in grain than the Sackville. Cement is clay and oxide of iron.

Specific Gravity	2.7
Weight per cubic foot	142.93
Pore Space	15.20
Ratio of Absorption	6.894
Coefficient of Saturation, 1 hour	.47
Coefficient of Saturation, 2 hours	.59
Crushing Strength	11122.
Crushing Strength, wet	6938.
Crushing Strength, wet, after freezing	4000.
Loss on Corrosion	.00454
Transverse Strength	551.
Chiselling Factor	4.8
Drilling Factor	19.5
Ferrous Oxide	1.8
Ferric Oxide	3.71

Residence, Deancroft, Glen Road, New Brunswick Sandstone.

Ontario Sandstones.

We desire to inform our readers and supporters that, from information to hand, we are led to believe that the Sandstones of Ontario are not very greatly utilized at present for decorative work, owing to two important factors, which will be observed by a study of the analysis given, i.e.:

1. The stone being very hard and being capable of enormous strain.

2. Many of the quarries are in disuse, ''or'' are only providing shoddy and rubble.

It will be observed that owing to factor No. 1 the cost of cutting will be abnormally high on decorative workmanship.

But notwithstanding these adverse conditions, the stones indicated in appended list are probably the best in the Dominion for colossal strength and durability. In this particular let us remind you that two of the most distinguished buildings in our city, viz., the Provincial Parliament and Municipal Buildings, are constructed of Credit Valley stone. Where strength, combined with beauty and harmonious stratification, is required, we suggest that the twin stones of Credit Valley and Medina Brown are unrivalled in this particular, and present the analysis of same combined with those of the rest of the province, for your consideration, with appended important buildings, in which the before-mentioned stones have been utilized.

Grey Medina Sandstone.

Grey Medina sandstone, which is the finest building stone at present produced from the sedimentary rocks of Ontario. While minor variations, such as greater or less development of "reed," slight difference in hardness, color and brilliancy, are to be noted, the general character of the grey Medina may be inferred from the following description. The general color of the stone is mottled grey; in places it is quite uniform, but fine horizontal lines, representing the bedding planes, may be observed in most of the stone, particularly after weathering for a short time. On treatment with carbonic acid in water, the color is not materially affected.

Under the microscope the quartz grains have an average diameter of less than one-eighth of a mm.; there is, however, a large number of very fine grains scattered between the larger ones. Considerable feldspar in a partly decomposed condition is present, as well as several other minerals in very small amount. The cement, which is largely of a calcareous character, is quite evident, but interstitial pores are not to be seen with distinctness, despite the high percentage of pore space. The physical characteristics of the stone are indicated below:

Specific Gravity	2.66
Weight per cubic foot, lbs.	146.01
Pore Space, per cent.	12.04
Ratio of Absorption, per cent.	5.16
Coefficient of Saturation	0.53
Permeability, c.c., per sq. inch, per hour	143.4
Crushing Strength, lbs., per sq. inch	21715.
Crushing Strength, after freezing (unsatisfactory test, probably about)	18000.
Loss on freezing, per cent.	0.072
Loss on treatment with carbonic acid, grams, per square inch	0.0131
Transverse Strength, lbs., per square inch	1614.
Chiselling Factor	4.02

Analysis: F. G. Wait, Mines Branch laboratory.

Cement—Calcium carbonate, with a small quantity of argillaceous matter.

Ferrous Oxide, per cent.	0.41
Ferric Oxide, per cent.	0.14
Sulphur, per cent.	0.11

Buildings constructed in Medina Sandstone:

Municipal Building, Woodstock.

Church of England, St. Catharines.

Catholic Church, Niagara Falls.

Nepean Sandstone.

The stone is composed of irregularly shaped quartz grains embedded in a calcareous cement, of which there is a considerable quantity.

The physical characteristics are enumerated below:

Specific Gravity	2.631
Weight per cubic foot, lbs.	153.504
Pore Space, per cent.	7.22
Ratio of Absorption, per cent.	2.93
Coefficient of Saturation	0.21
Permeability, c.c. per square inch, per hour	4.87
Crushing Strength, lbs., per square inch	22032.
Crushing Strength, after freezing (not ascertained)	
Loss on freezing, per cent.	0.023
Loss on treatment with carbonic acid, grams per square inch	0.064
Transverse Strength, lbs., per square inch	1620.
Chiselling Factor	0.25

Analysis: F. G. Wait, Mines Branch laboratory.

Cement—Calcium carbonate and a trifling quantity of argillaceous matter.

Ferrous Oxide, per cent.	0.12
Ferric Oxide, per cent.	0.25
Sulphur, per cent.	0.002

The Government Buildings, Ottawa, are constructed of this stone.

Potsdam Beekmanton Sandstone.

Ratio of Absorption, per cent	3.72
Permeability, c.c. per square inch, per hour.......	1845.
Crushing Strength, lbs., per square inch..........	15459.
Crushing Strength, after freezing, lbs., per sq. inch..	11300.
Loss on freezing, per cent	0.0009
Loss on treatment with carbonic acid, grams, per square inch	0.00386
Transverse Strength, lbs. per square inch...........	417.
Chiselling Factor	2.37

The following list indicates some of the chief structures in which this stone may be observed:

The Tay locks.

Postoffice in Smith's Falls.

Postoffice, Almonte.

Postoffice, Arnprior.

Mr. Code's Residence, Perth.

C. P. R. Station, Perth.

Postoffice, Perth.

Postoffice, Napanee.

SUBSTITUTES

With all due respect to the companies that are producing artificial substitutes to take the place of stone, and in justice to their claims, we submit the following report by Mr. P. Gillespie, School of Practical Science, College Street:

		No.	Date	Crushing Load	Lbs. per Sq. In.	Remarks
19	Days	Z-12	Sept. 28	6.200	.390	Endwise
17	Days	Z-11	Sept. 26	7.800	.487	Endwise
3	Mos.	Z- 8	Sept. 24	14.000	.875	Endwise
3½	Mos.	Z-14	Sept. 30	57.400	1.790	Endwise
3½	Mos.	Z-	Oct. 3	35.200	1.100	Flatwise
10	Mos.	Z-17	Oct. 5	59.800	1.870	Flatwise

Size of blocks, 4x8x4.

If these figures are a criterion of the crushing strength of the artificial product, and we are strongly of that opinion, we are justified in drawing the conclusion that natural stone is by far superior in that particular.

We will go farther by saying that many of the producers of the artificial products are presenting to the public a gross misrepresentation of the facts, and in the interest of truth and justice these people must be given the lie direct. Considering that the use of substitutes has only been operative for a comparatively short space of time, and the newspaper records of disasters, many resulting in people being killed or injured, is sufficient to refute the claims put forward "that artificial products are better than natural stone as a building material." We have many and varied photographs in our possession to demonstrate that this statement is no exaggeration. Is it feasible to suppose that a product "which, upon the claim of its supporters, possesses only a crushing strength of 2,000 lbs per square inch can show to advantage against the stones quoted herein at a crushing test of 10,000 lbs. and upwards per square inch?"

Secondly, what argument can be put forward to demonstrate that the product of the day can equal in retaining power against heat and cold, wet and dry climatic factors, Nature's product, formed by a geological process extending into the unknown past, and containing, as it does, a very large percentage of silica, one of the most important factors in a good sound building material.

Surely we have all written history behind us to demonstrate the value of stone, and what would history and civilization be without it?

As a medium for educational purposes, it is unequalled, and as a substance in which to express organic form, thus making it possible for the art of man to express truth in every branch of architecture, is par excellence.

But what have the artificial people by way of legitimate argument to present? Nominal cost. That is, it costs less. From some points of view this seems to be the case. For instance, a speculative builder, whose idea is a quick sale, may get a good bargain, especially when he utilizes low-priced material. But, if you have the two most important ideas in mind—strength and durability—as buyers you will get a better bargain by paying a higher nominal cost, with a guarantee that the material is as we suggest, and in the long run it will be cheaper.

One fact stands out prominently in an investigation concerning the rival merits of Stone *versus* the artificial products. "That, in all the important parts of a building, where strength is required, natural stone is invariably used."

This booklet is presented to those concerned, in order to dispel any illusion that exists regarding the merits of natural stone, and basing our arguments upon truth that is born of experience, and the conclusive evidence to be drawn from the chemical analysis of stone itself are open to defend the claims herein stated. Should any prospective builder desire any further information upon this subject, we invite him to communicate with the Secretary, whose address can be had at any time from the Labor directory.

We herewith append a list of employers in the cut-stone trade, whom we approve, and desire to state that stone can be supplied by them to suit the spacious mansion or the humble dwelling.

G. U. Employers.

Holmes & Son, 1113 Yonge St.
Page & Co., Hart Building, University.
Witchall & Son, 193 Havelock St.
Oakley & Son, 278 Booth Ave.
Isaacs & Son, 18 Dupont St.
Thomas Bros., 420 Dupont St.
Nicholson & Curtis, 1117 Yonge St.
Geo. Webb, 253 Macpherson Ave.
Vokes & Son, 736 Dupont St.
Hibberd & Newcombe, 155 Adelaide St. W.
Norcross Co., Logan Ave.
S. Hurst, 854 Dundas St.
Terrell & Sinclair, Dupont St., (Ont. Lime Co.)
A. McKay, 517 Gladstone Ave.
D. W. Whyte, Woodbine Ave., & G. T. R.
P, Bristow, West Toronto.
Roman Stone Co., 504 Temple Bldg.
Marsden & Ireland, 8 Weston Road.
Duncan & Thomas, 1896 Yonge St.

Scott Bros., 38 McGee St.

Signed on behalf of the Toronto Branch of the Journeymen Stone Cutters' Association of North America.

H. NEWSON,
T. A. WOOD,
I. BAINBRIDGE.