VOL. 5. NO 8

JULY, 1912

$3.00 per Year
35c. per Copy

CONSTRUCTION

A · JOURNAL · FOR · THE · ARCHITECTURAL ENGINEERING · AND · CONTRACTING INTERESTS · OF · CANADA

OFFICE OF PUBLICATION
TORONTO

BRANCH OFFICES
MONTREAL - LONDON · ENG.
WINNIPEG

Glidden's Concrete Floor Dressing

THERE is no better material made for the maintenance of concrete floors and for their protection against abrasion and wear and the consequent formation of cement dust than Glidden's Concrete Floor Dressing.

It knits down close to the surface and forms a hard coating that actually becomes integral with the concrete.

It is ideal material for treatment of concrete floors in hospitals, schools, factories and wherever the danger from cement dust is self evident.

Glidden's

Liquid Cement

(Coating)

This material is made in imitation of Bedford Sand-stone and a variety of other practical shades, including Colonial Buff, Pompeian Buff and Pure White.

It is absolutely unequalled for damp-proofing and rendering uniform, cement stucco, plaster and concrete surfaces, both exterior and interior. It produces splendidly decorative effects.

Write for detailed specifications, (including cost data).

THE GLIDDEN VARNISH COMPANY

FACTORIES. TORONTO, Canada; CLEVELAND, Ohio

Branches: New York, Chicago, London

FROM ONE WHO KNOWS

When we last illustrated the Moser & Ryder Block in our advertisement in "Construction," Architect Henderson expressed his satisfaction with Ideal Concrete Machinery in the following letter:—

The Ideal Concrete Machinery Co.,
South Bend, Ind.,
U. S. A.

Gentlemen:

Your advertisement in this month's "Construction," comprising a view of the Moser & Ryder Block in this city, of which I was the architect, brought to my mind your letter of the 16th ult., which, owing to pressure of business, I had neglected to answer. I trust you will pardon my remissness and lack of courtesy, but at the same time it will, I feel sure, be satisfactory to you to know what you state regarding this building is generally correct.

The work done by the Edmonton Concrete Co. was excellent and pleased me, which result, no doubt was greatly owing to the excellence of your machinery.

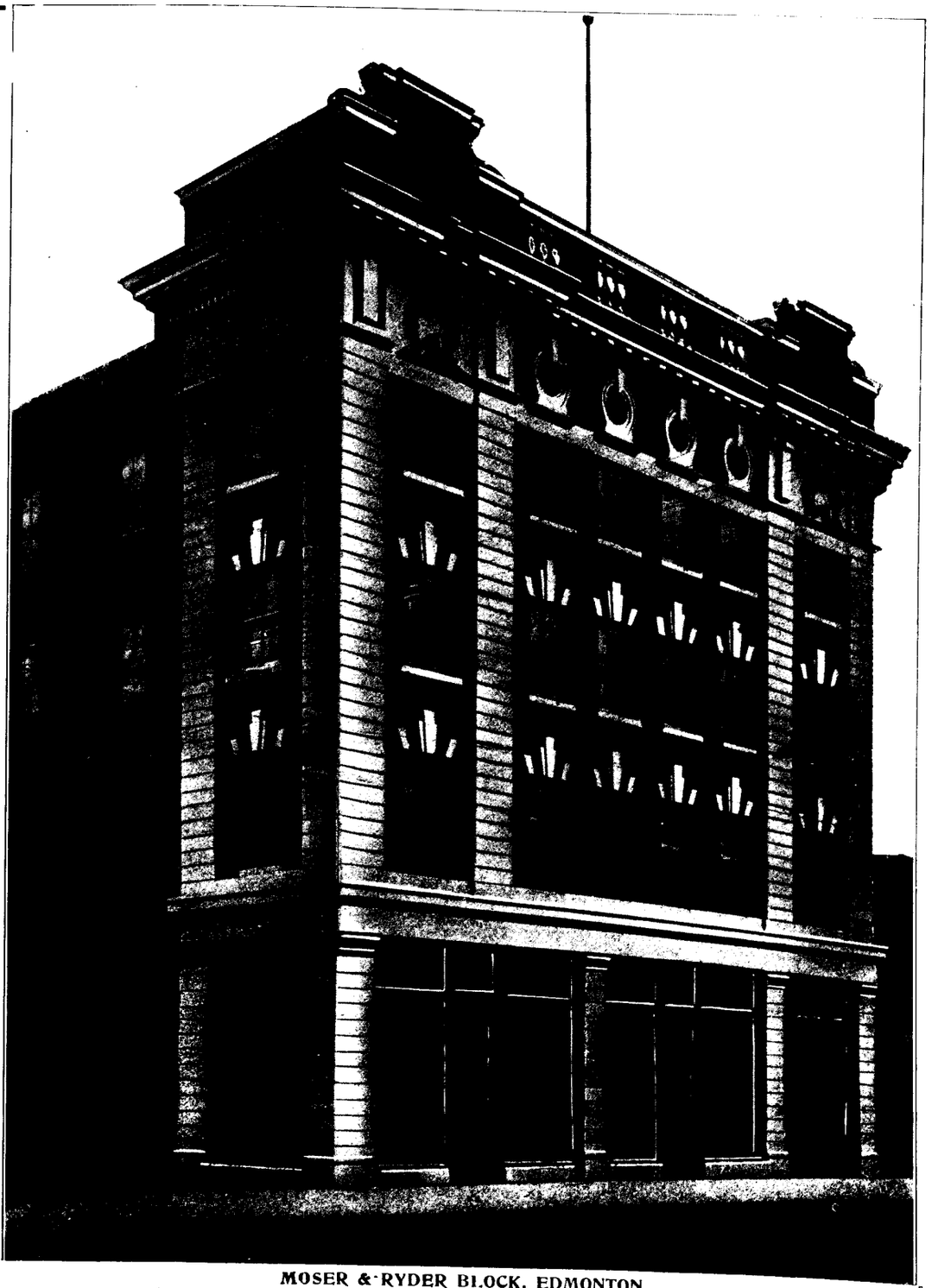
If at any time I can be of assistance to you, let me know.

I remain, yours faithfully,

James Henderson.

Edmonton, Alta.
June 2, 1911.

The dimension stone and ornamental trim on the Moser & Ryder Block was made on the Ideal Sill-Lintel and Dimension Stone Machine. This machine affords unlimited possibilities to contractors for the manufacture of their own sills, lintels, trim, and dimension stone work.



MOSER & RYDER BLOCK, EDMONTON

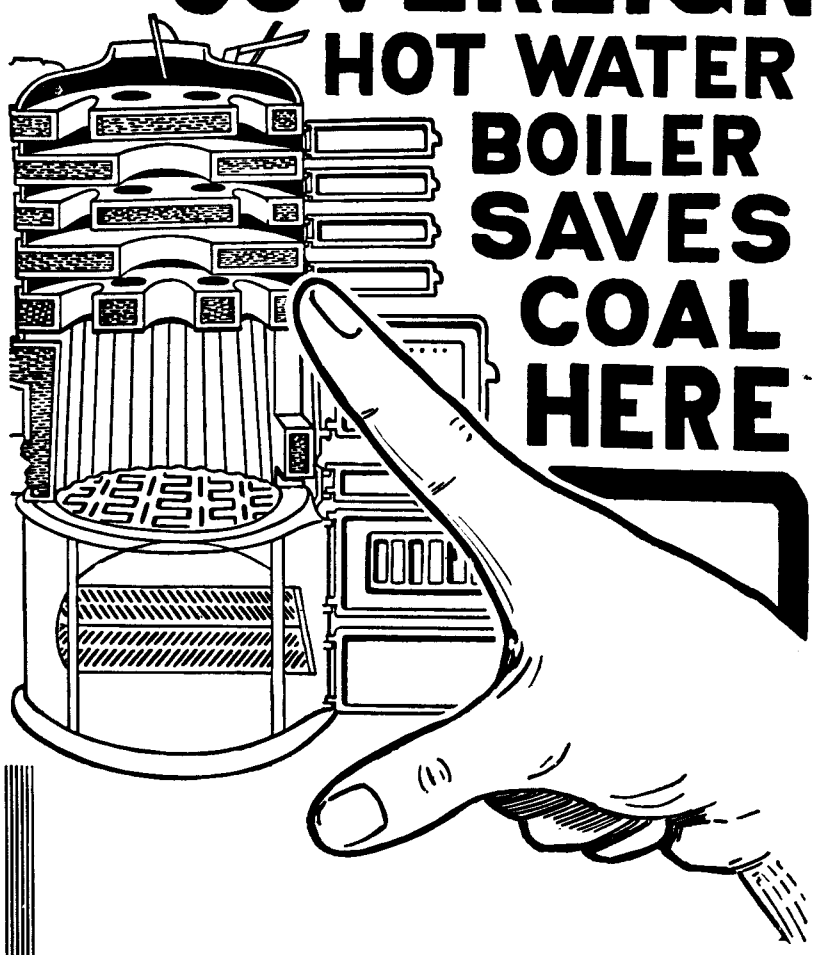
A four-storied block on one of the most commanding sites on First Street, Edmonton, Alberta, which street promises to become one of the most important thoroughfares in the city. Architect, James Henderson, F.R.I.B.A.; Contractors, Edmonton Concrete and Construction Co., Ltd., Edmonton, Alberta, 623 Second St.; built of brick with concrete stone Piers, moulded Sills, Keystones, Coping, Cornices, etc., all made upon the Ideal Dimension Stone Machine. Frontage, 50 feet; depth, 140 feet; cost complete, $60,000.00.

Every contractor should have our new 160 page catalogue. Send for our proposition to-day.

IDEAL CONCRETE MACHINERY CO., LTD.

211 King Street, London, Ont.

THE SOVEREIGN HOT WATER BOILER SAVES COAL HERE



There is only One Boiler with the True Large First Section

It is a generally admitted fact that the "Sovereign" is one of the best hot water boilers made, and reasoning from this point of view it might not matter whether the heating specification of a house called for a "Sovereign" or another boiler in the same approved class.

As a matter of fact, however, while the "Sovereign" follows the general lines of design, adopted in all modern successful hot water boilers, it differs in one important structural improvement that gives it a claim to particular merit.

The "Sovereign" is the boiler with the LARGER FIRST SECTION, and this larger first section saves coal, simplifies control and affords a uniform and steadily maintained degree of heat under any stress of weather.

The saving of coal is an economic advantage, but this larger first section also gives an advantage in freedom from furnace worry and ensures uninterrupted comfort indoors.

Insist upon being informed of the exclusive merits of the "Sovereign." Bear in mind that the larger first section was originally designed, and finally brought to its present accuracy of proportion, by the makers of the "Sovereign." There is only one boiler with a TRUE LARGER FIRST SECTION.

Taylor-Forbes Company Limited

"Sovereign" Hot Water Boilers

"Sovereign" Radiators

TORONTO—1088 King Street West
VANCOUVER—1070 Homer Street
MONTREAL—246 Craig Street West
ST. JOHN, N.B.—32 Dock Street
WINNIPEG—Vulcan Iron Works
QUEBEC—Mechanics Supply Co.

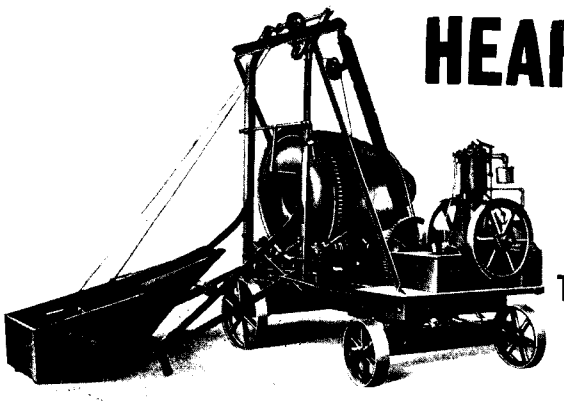
Installed by Heating Engineer and Plumbers throughout Canada

Head Office and Foundries: GUELPH, Canada

Makes Money on Every Job.

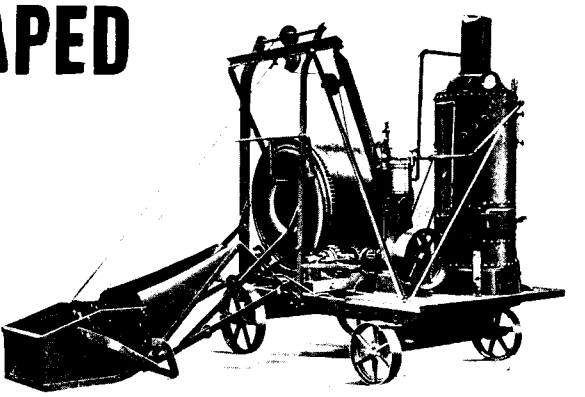
The Heart Shaped Drum illustrated above, turns the batch from end to end at every revolution, mixing perfectly and quickly.

As one man can operate it, and as it works steadily, with no danger of breakdown, it saves money for the contractor on every job. Daily demonstrations at all our showrooms.



HEART SHAPED MIXER

THE MIXER THAT DELIVERS THE GOODS



WETTLAUFER BROS. Head Office and Showrooms **178 Spadina Ave., TORONTO**

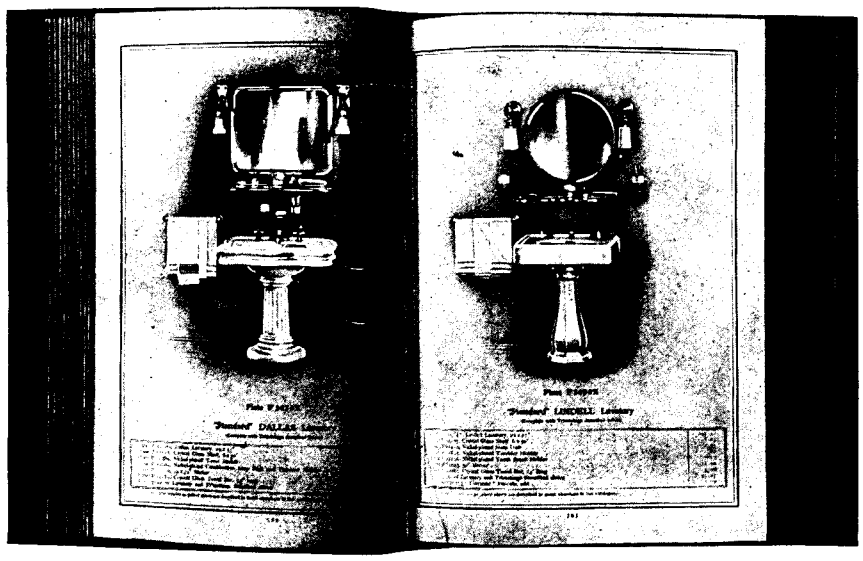
Winnipeg Office: HOOTON & MOORE,
216 Ashdown Block
A. R. WILLIAMS MACHINERY CO.,
15 Dock St., St. John, N.B.

WETTLAUFER HEART-SHAPED MIXER

WETTLAUFER BROS.,
316 Lagauchetiere ST. W., Montreal, Que.
LAVALLE-ROSS LIMITED,
Alexander Block, Edmonton, Alta.
Factories:
Mitchell, Ont., Buffalo, N.Y., Detroit, Mich.

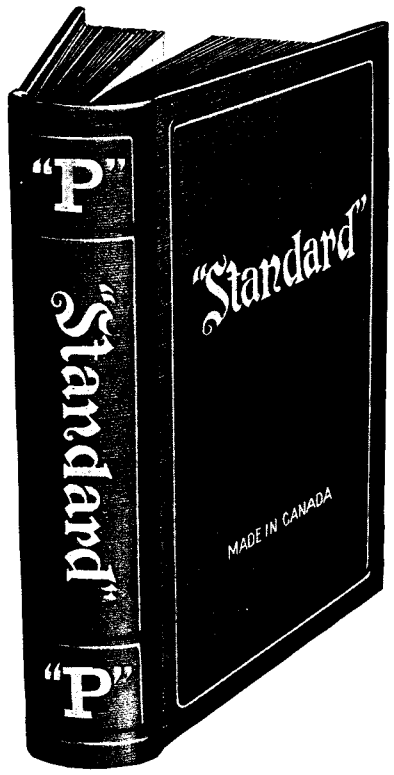
"Standard Sanitary"
CATALOGUE "P"

A Complete Reference Book of High Grade Plumbing Fixtures, containing 676 Pages, and 1600 Illustrations with comprehensive descriptions.



Pages from Lavatory Section illustrating Lavatories complete with Trimmings

THIS NEW CATALOGUE IS NOW BEING DISTRIBUTED TO THE ARCHITECTS AND PLUMBERS IN CANADA. REGULAR APPLICATION BLANKS ARE FURNISHED UPON REQUEST



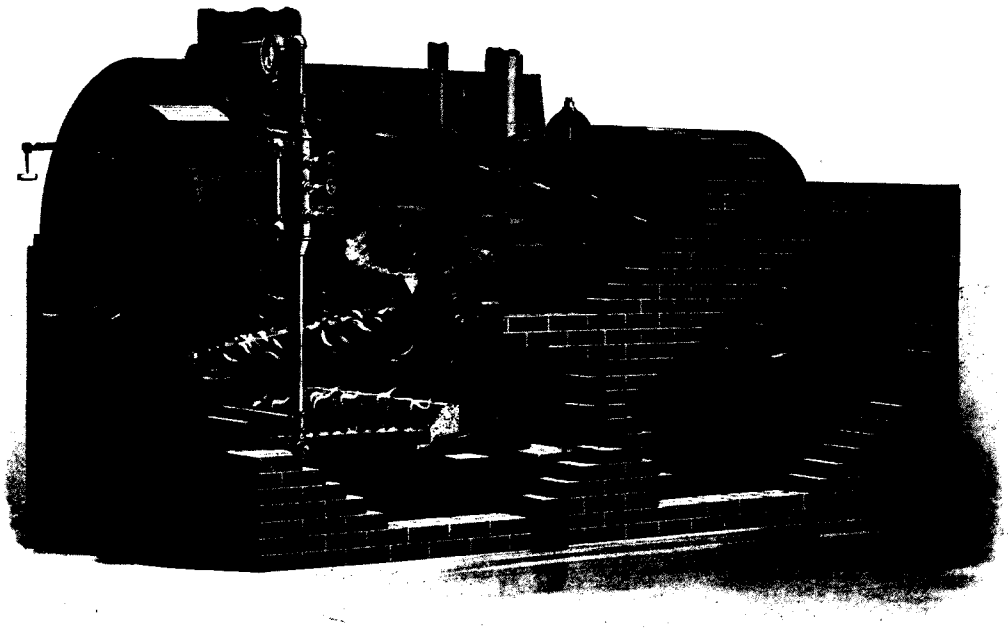
GENERAL INDEX OF "Standard" CATALOGUE "P"

Standard Sanitary Mfg. Co.
LIMITED

General Offices and Factory
Royce and Lansdowne Aves., Toronto

TORONTO STORE
55-59 Richmond Street, E.

HAMILTON STORE
20-28 Jackson Street, W.



KEWANEE Smokeless Boiler

KEWANEE Boilers Win Plaudits

Testimonials are the oldest form of advertising—sometimes the best. The world has a willing ear and is always ready to hear what the other fellow has to say. If the testimonials are on the square, YOU CAN'T BEAT IT. It makes you THINK. We have more testimonials for the Kewanee Fire-Box Boiler than there are "Hints on Practical House-Keeping." We'll serve 'em in small doses just as an ante-antidote against the Fretful Boilers and Fitful Heating Methods. Our dope never fails to cure.

Our testimonials are from serious minded men who are the owners and managers of the finest renting properties in the biggest cities on the continent, and these men state unequivocally that the Kewanee Boiler has made their buildings steadily desirable.

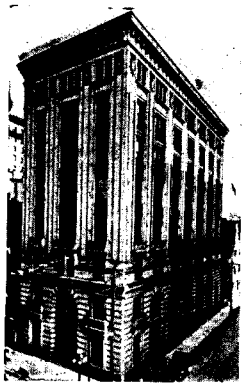
Regelin, Jenson & Company, of Chicago, have this to say: "In the ten years we have managed apartment buildings where Kewanee Fire-Box Boilers are installed we have found them to be the best we have ever used." This from McKey & Poague, of Chicago: "The Kewanee Boilers have given very good satisfaction in every instance. So far as we know there is no better boiler on the market than yours." Cochran & McCluer say: "Our experience with Kewanee Fire-Box Boilers has been very satisfactory indeed, and we have no hesitancy in recommending them." We've got a lot more of them from all over the country.

Send to the Old Man Behind the Boiler for No. 58 Catalogue.
It describes the Fire-Box Boiler.

Canadian Representatives:

DOMINION RADIATOR COMPANY LIMITED

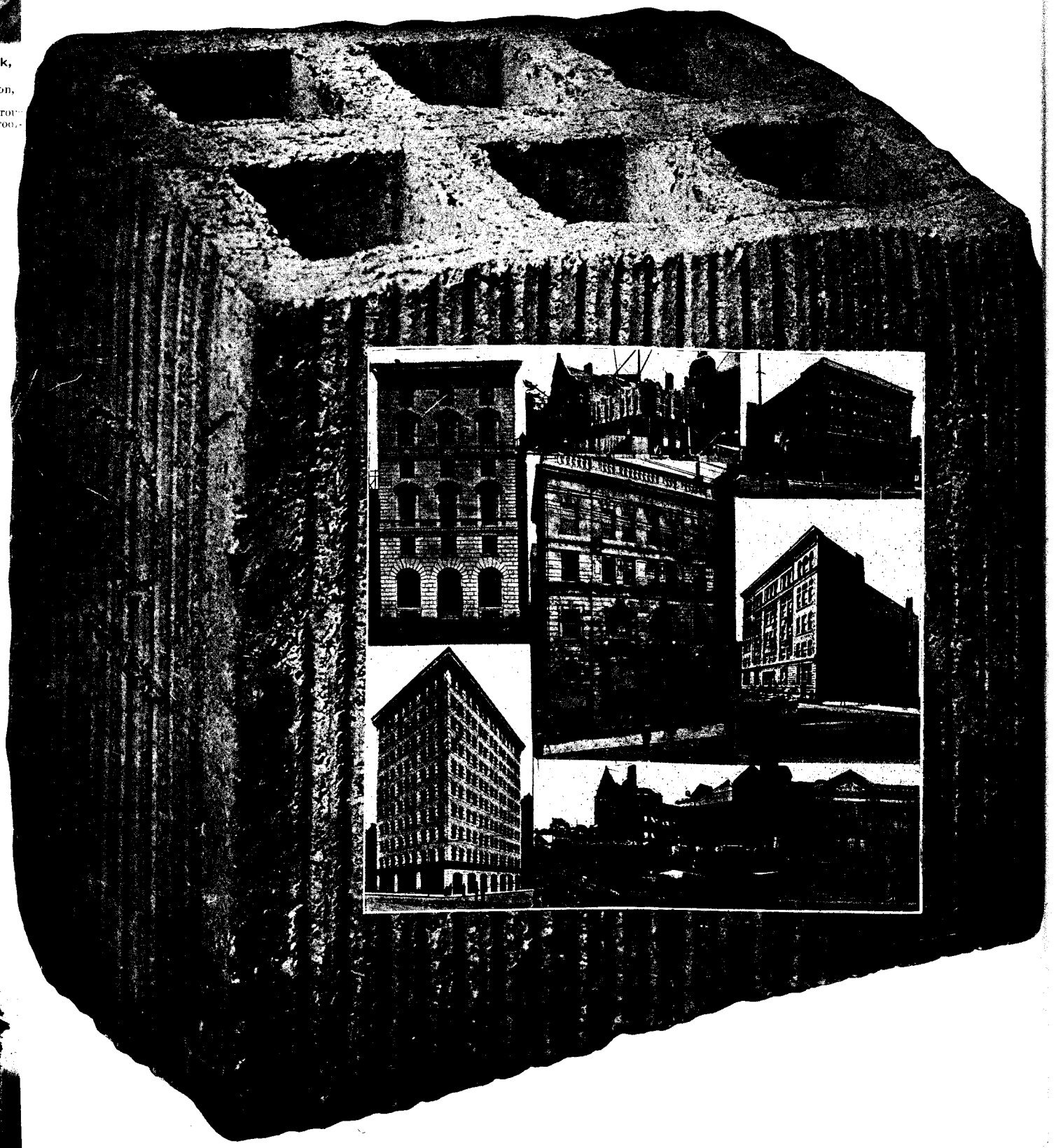
TORONTO MONTREAL WINNIPEG ST. JOHN VANCOUVER

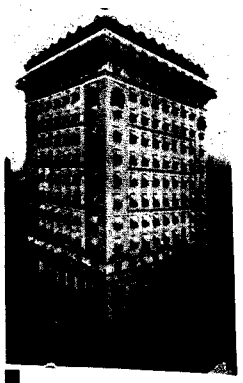


Standard Bank, Toronto.
Darling & Pearson, Architects.
Don Valley Porous Terra Cotta Fireproofing used.

Don Valley Products Have

The Extensive Use of DON VALLEY BRICK and Has Done Much to Raise the Standard of Excellence





Traders Bank, Toronto.
Carrere & Hastings and F. S. Baker, Associate Architects.
Don Valley Porous Terra Cotta Fireproofing and 2,000,000 Don Valley Brick used.

DON VALLEY B

Montreal Agent, David McGill, 83 Bleury St.

Created A New Standard

POROUS TERRA COTTA FIREPROOFING
Required of These Important Building Materials

Evening Telegram Building, Toronto.
S. J. Curry, Architect.
Don Valley Brick and Porous Terra Cotta Fireproofing used.

DON VALLEY PRODUCTS fulfill the two most important requirements of the modern building. Don Valley Porous Terra Cotta Fireproofing, renders it absolutely safe, and Don Valley Bricks have the beauty of appearance that is so necessary a factor in present day construction. A striking proof of the high estimation in which Don Valley Products are held by Canada's foremost architects is furnished by the numerous buildings in which they have been used; these buildings being, in many cases, the finest of their kind in Canada.

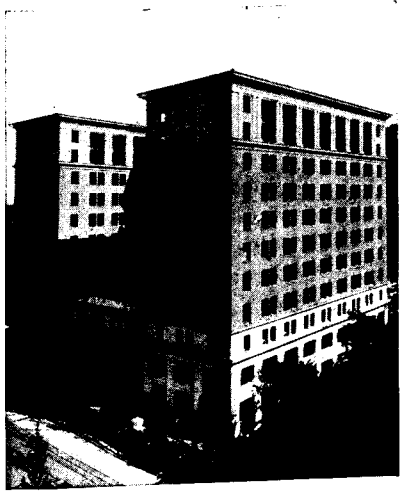
Traders Bank Apartments, Toronto.
F. S. Baker, Architect.
Don Valley Brick and Porous Terra Cotta Fireproofing used.

BRICK WORKS

Head Office, 36 Toronto St., Toronto.

THE EVERLASTING MORTAR

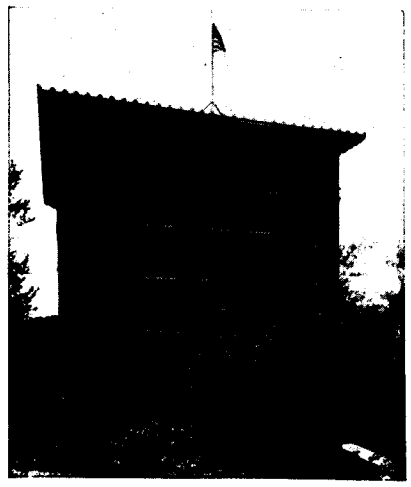
A composition of old fashioned lime and Calicium Aluminate that fulfills all the requirements for mortar for modern building.



Woodward Building, Washington, D.C.
"ALCA" Lime used for brick MORTAR

"ALCA" LIME

for Stuccoing, Brick Laying, Masonry, Plastering, etc. Is waterproof and plastic, and has great sand carrying qualities. Its pure white base permits of the working of any color scheme for stucco.



Civil Service Building, Washington, D.C.
"ALCA" Lime replaced white cement for brick mortar. Interior plastered with "ALCA" Lime

Alca Lime is shipped ready for use with the proper additions of sand and water. Prepared with and without the admixture of hair.

Write for Booklet and Prices

MEDUSA WATERPROOFING

For Permanent Results

An extremely fine, dry, white powder, which when mixed with Portland Cement, renders it absolutely waterproof. It is vastly superior to any liquid or paste waterproofing, being so much easier to handle, and so much surer in results.

Specify Medusa Waterproofing for any concrete work that will be subject to a severe water test. Its everlasting waterproofing effects are due to its being insoluble and unaffected by water even after years of contact.

Manufactured by

The Stinson-Reeb Builders' Supply Co., Limited

10th Floor Eastern Townships Bank Building, - - MONTREAL, P.Q.

ALEXANDRA WARE

REGISTERED TRADE MARK

SUPERIORITY PURITY DURABLE AS THE PYRAMIDS

A Standard Ideal Bathroom

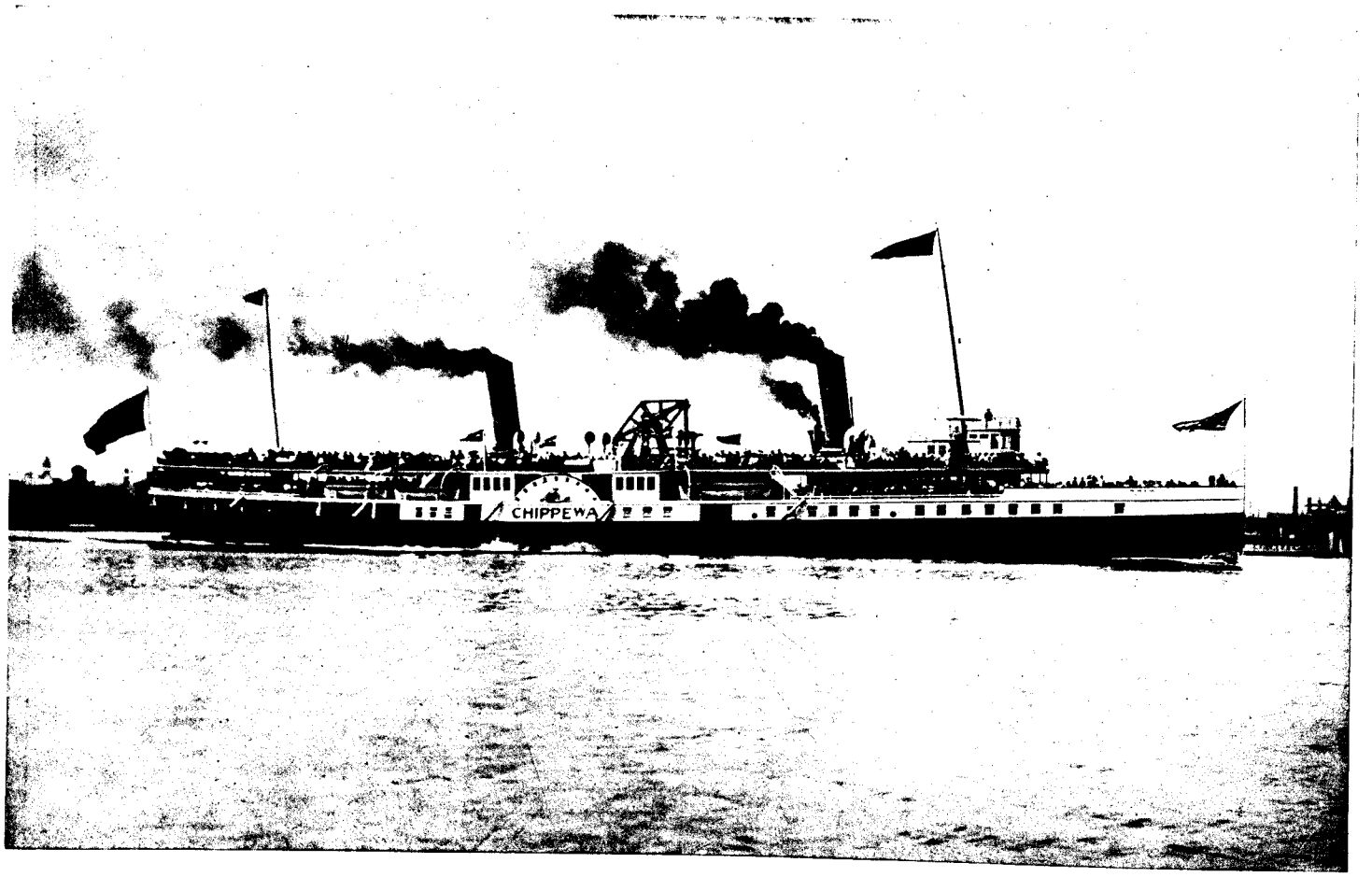
These products are made in Canada, by Canadian workmen, in a manufactory that is owned and controlled by Canadian capital. Superior Bathroom fixtures, adapted to every type and character of installation.

The Standard Ideal Company Ltd.

Sales Offices and Showrooms:
Toronto, Montreal, Winnipeg

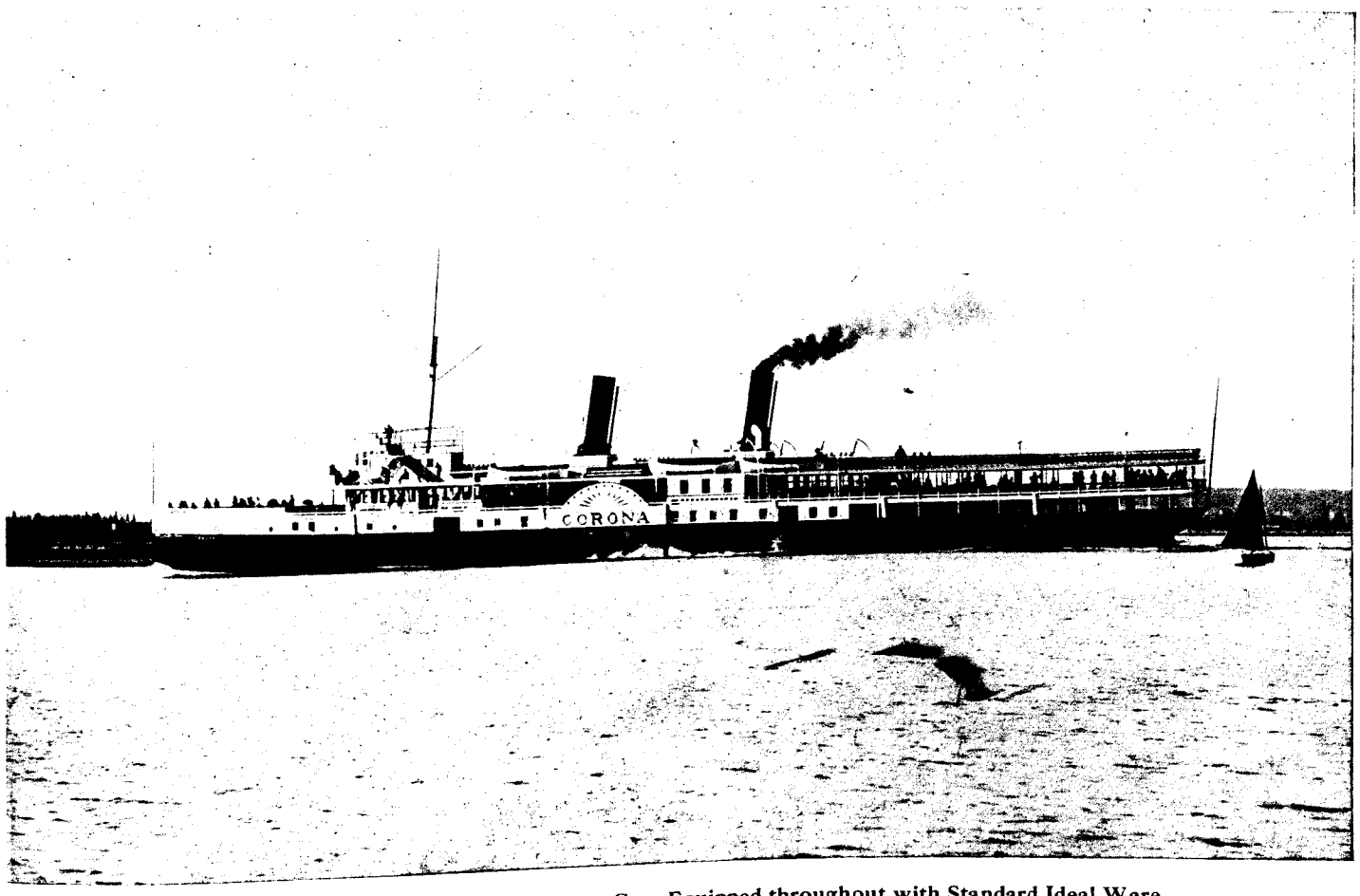
Head Office and Factories:
PORT HOPE, CANADA

ALEXANDRA WARE



Steamer "Chippewa," Niagara Navigation Co. Equipped throughout with Standard Ideal Ware.

THE extent and variety of the plumbing installations where "Alexandra Ware" has been used, is demonstrated by its use in the steamers of the Niagara Navigation Company's fleet. Its many points of superiority:—extreme durability, beautiful appearance, and improvement and refinement of design, have made it the standard of quality for Canada's foremost Architects. To specify "Alexandra Ware," means that the quality of the plumbing installation will be guaranteed to give perfect satisfaction.

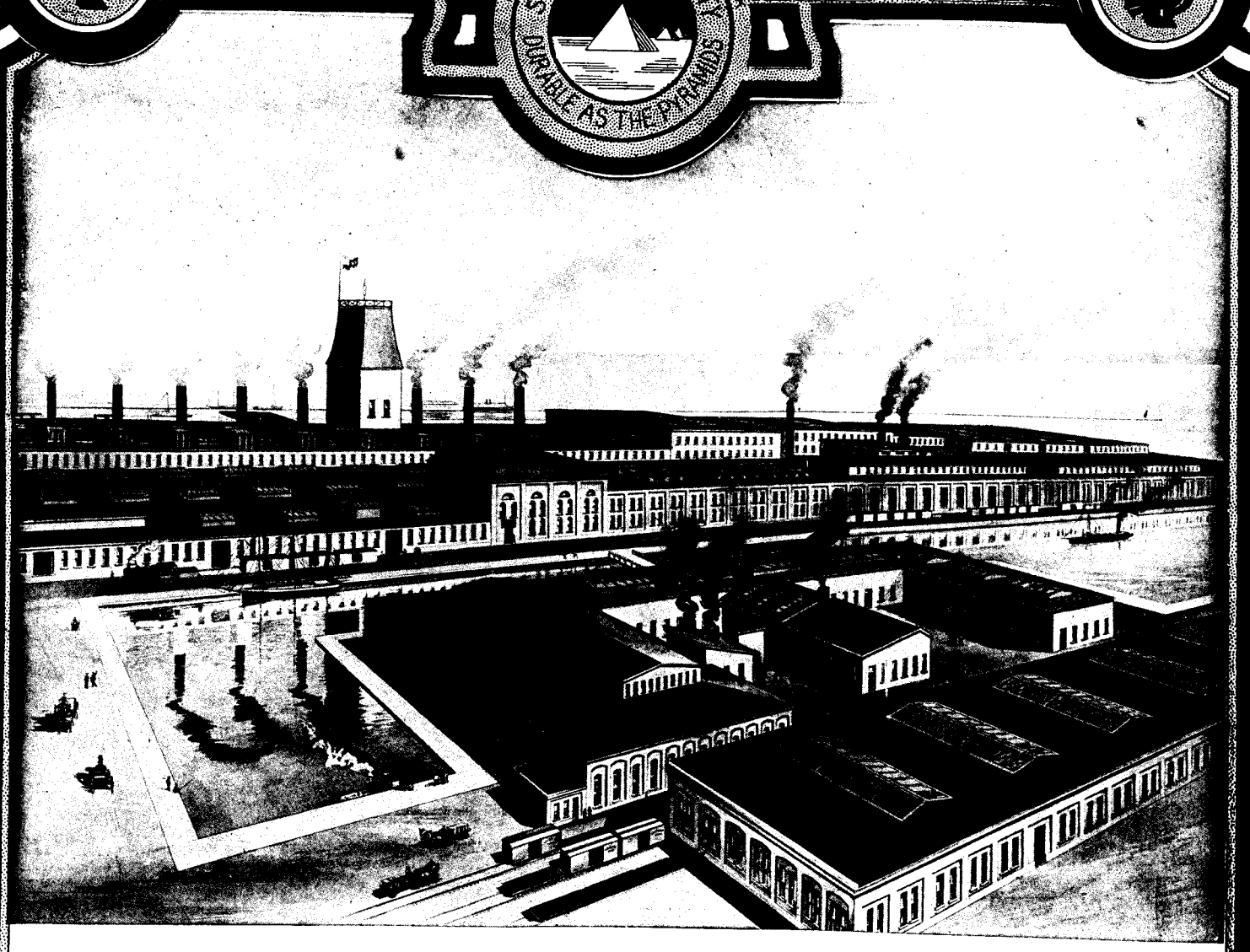


Steamer "Corona," Niagara Navigation Co. Equipped throughout with Standard Ideal Ware.

A NOTICEABLE feature of the extensive building operations now in progress throughout Canada, is the increased attention being paid to interior fittings and furnishings. Nowhere is this more noticeable than in the bathroom and general plumbing fixtures. The great advance in sanitary science has made this improvement necessary, and the beautiful white enamel ware products of the Standard Ideal Co., have made it possible for the Architect to obtain fixtures that harmonize with their surroundings and at the same time are the last word in economy, durability and utility.

ALEXANDRA WARE

REGISTERED TRADE MARK
SUPERIORITY PURITY
DURABLE AS THE PYRAMIDS



OUR HEAD OFFICE AND FACTORIES AT PORT HOPE, CAN., WHERE "ALEXANDRA" WARE IS MADE

The Largest Exclusive Cast Iron Porcelain Enameling Works under the British Flag.

500 HANDS EMPLOYED. CAPACITY 110 TONS OF IRON MELTED DAILY.

The Standard Ideal Company Ltd.

MANUFACTURERS OF CAST IRON PORCELAIN ENAMELED SANITARY WARE

HEAD OFFICE AND FACTORIES :

PORT HOPE, - - CANADA.

SALES OFFICES AND SAMPLE ROOMS

TORONTO 115-121 King St. East

MONTREAL, 44 Beaver Hall Hill

WINNIPEG, 156 Lombard Street

ALEXANDRA WARE

CONSTRUCTION

VOL. V NO. 8

CONTENTS FOR JULY, 1912

ILLUSTRATIONS

H. GAGNIER, Limited, Publishers

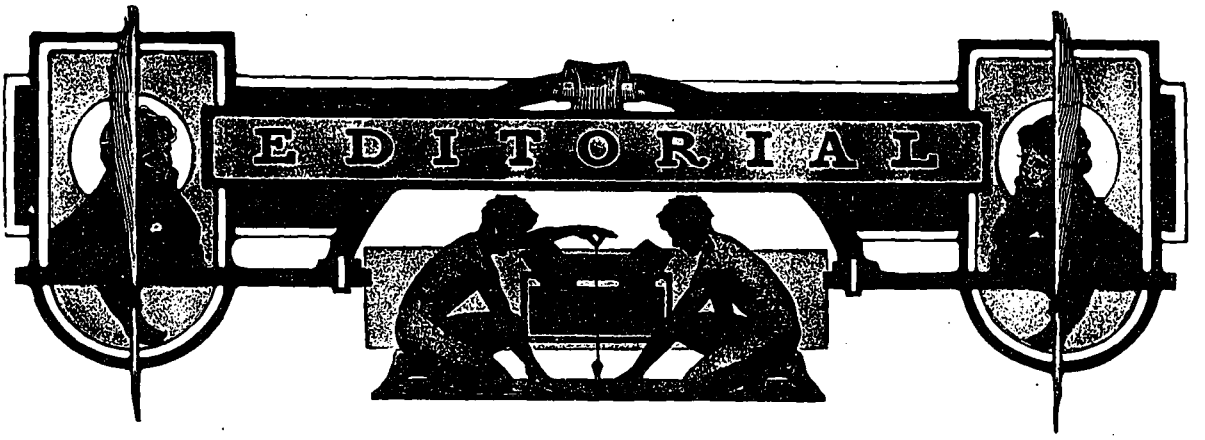
SATURDAY NIGHT BUILDING, TORONTO, CANADA

BRANCH OFFICES :

MONTREAL WINNIPEG CHICAGO NEW YORK LONDON, ENG.

INTERIOR OF THE OLD CHURCH AT PANAMA.

The first Arch in the foreground, standing as it has without even a keystone for three hundred years, is said to have been the means of finally deciding the United States authorities to utilize concrete construction in the locks of the Panama Canal. If this arch, flat as it is, and unsupported, could stand for three centuries amidst the shakes of earthquakes, the Engineers are of the opinion that their work will stand even longer.



¶ *The approaching erection of two great terminal stations at Toronto calls for the adoption of a permanent city plan.*

IT is high time that Toronto was placed in the hands of an authoritative civic commission, with a more or less arbitrary plan, instead of a plan which has no status and a commission that is only such in name with no status except that of citizens. This plan is adequate and the committee which drew it capable. It only requires adoption and appointment by the city to become effective, and the necessity daily becomes more urgent. As the transportation feature is the most important in the evolution of a city, the building of two depots as terminals for three great railroad systems makes action imperative. In the absence of plan these railways will build in locations, and on lines that are best suited as far as their opportunity and judgment of conditions will permit. As depots they will be adequate. But when the inevitable replanning of the city takes place, instead of the depots being planned to meet other details of the scheme the plan will be obliged to conform with the depots as they are erected. This will place the cart before the horse to such an extent that neither the railroads nor the city will have that perfect operation that would come through a joint plan made and followed to meet the requirements of both. The traffic congestion which prompts the building of stations is no more acute than that of the city, which calls for a thorough reconstruction, but the railroad is a business institution controlled by business men, while the city, with a greater interest, is controlled by elements that delay until forced to act by unbearable conditions. The stations to be soon built, the Grand Trunk on the bay front and that for the Canadian Pacific and Canadian Northern on the north border of the city, should be part of the general plan of the city. The railroad only controls, even though it is further concerned, the ground within its own right of way. The city should meet those plans with a liberal space provided for street traffic, so that the streets that lead to the stations will have a logical and adequate connection, and become part of the railway improvement. When the depots are constructed, and to the extent that the city's part in the programme is carried out and to that extent only, will the railway terminals prove efficient in service, no matter how wisely or liberally they are planned for the accommodation of the travelling public. The railroads have waited for several years for the city to evolve an adequate and authoritative plan, and except the sketches which have been made and from time to time are exhibited, nothing that the railroads can depend upon as an adopted plan has been presented. The solution of the dock and bay front, and the parking system is intimately related to the improvements proposed by the Grand Trunk, and should become one plan in effect. The widening and cutting through of streets and the clearing of an open place in North Toronto should be as intimately associated with the plan for the railway terminal in that portion of the city. As separate plans, carried out under different conditions, neither can have that full operation that would come from execution under one great plan. In order to accomplish this the only necessity is for the city to adopt a plan that cannot be altered by future administrations, and work towards its completion as circumstances will allow. But the time for action has come, and delay now will cost the city many millions of dollars in the future when the inevitable need for reconstruction arrives.

¶ *The new cities of Canada more progressive than the old evidenced by the attention paid by them to the subject of city planning.*

CALGARY was the only city in Canada, west of Toronto, represented on the fourth national conference on city planning held at Boston on May the twenty-seventh to the twenty-ninth. This visit of its representative, Mr. Lemon, secretary of the City Planning Commission will be extremely valuable to Calgary in the development of its projected plan for city arrangement. The new western towns are fortunate in that they have less mistakes of selfish and haphazard founders to rectify, but they are more fortunate in having a live, intellectual and progressive people to second and carry such projects as the planning for future growth. They are bright enough to see that to have wide and well arranged streets, open spaces and parks connected by boulevards, a centre axis where the public buildings, with an open space from which they can be approached or seen, all mean a continuous and permanent contribution of dollars to the citizens through the visitors and investors that are attracted, beside the economic value of a livable city where business

can be transacted with facility. The commercial value of beauty is so impressed on the investigator that the town planning conference is doing a valuable missionary work among those who see no use in civic beauty unless it pays in dollars. The first Canadian conference is to be held at Winnipeg on July fifteenth and those most conversant with the details of town planning are invited to give from their knowledge and experience such advice as will be valuable to the cities of Canada. When those who paint their houses, cultivate a lawn, keep an orderly back yard and "beautify" the surroundings of their houses "view with alarm" any movement that calls for a civic entrance and centre to its city, the widening of streets or the limitation of the height or artistic character of its buildings, it is too much to expect that the rank and file that have to be regulated by stringent sanitary laws will endorse a civic plan, especially for the future benefit of the city and its citizens.

¶ *The investment of Toronto money abroad and deficiency in suburban transportation at home the larger cause for the city's congestion.*

THE HOUSING problem in Toronto is in such an acute state that it is not surprising that there is a large amount of impatience and denunciation indulged in by the citizens generally. The general cause is the inertia which wrapped the city in its comfortable years, and the shortsighted and unpatriotic policy pursued by those in control, both financially and politically, in the present stress. The problem of housing has its ramifications and influences from the less than a living salary paid by the department stores to the crowded slum conditions that exist in several parts of the city. It is probable that the largest share of responsibility lies with the investing class, that seek to obstruct all widening of a home market, from the preference of a "bright Canadian boy" to an experienced foreign engineer, to a treaty by which the people can be supplied with cheap vegetables. Yet they see Toronto with probably the worst suburban car service, if it even can be indignified by the name, on the continent, and invest their money in one of the best in the United States. Running from fifteen to fifty-six miles into the most adaptable and most beautiful districts in Canada that surrounds Toronto on three sides, are three electric lines. There is a large population along these routes, yet the lines represent the cheapest, most abject excuses for transportation that can be imagined by those who have seen lines with less excuse for existing, but incomparably better, running from cities in the United States. The Toronto money that is invested in the street car lines of the Twin Cities alone would relieve the congestion, and make more wealth for the investor and give suburbs with all that the term means, to their home city. The restriction of flats seems unjust when they are so necessary, owing to the wall of inadequate transportation that keeps the working citizen within the limits. Instead of a broad right of way, double-tracked with ninety-pound rails, a substantial roadbed and adequate cars of modern construction, these three lines occupy a large portion of streets none too wide for regular traffic. The rails are sixty-pound and look as though they had been bought up as a job lot from some Western road thirty years ago. The track is hummocky, and the power so inadequate that a loaded car can barely make grades, and it must side-track and wait for the occasional car from the opposite direction. All this means that the city must be congested, flats must be built, people must be crowded into boarding houses, and the city must lose in population, because new factories will not start and others will move because better conditions can be easily found elsewhere. This is the housing situation in Toronto, and its amelioration lies in seeing it as it is and by a broad policy of proper investment and adequate planning to meet the situation squarely. If the Canadian investor does not see the opportunity, those in the United States cannot find a better field than by building three real electric lines out from Toronto for a distance of thirty miles, though even this investment might be stopped by the city refusing a "foreign" corporation an elevated or tunnel franchise to the centre of population. At least none of the three present lines would form any sort of competition if paralleled by a modern equipped electric service, and they would speedily be removed from the streets where they do not belong.

¶ *The value of interurban lines terminating at Toronto to the city and surrounding country rivalled by their worth as investments.*

FROM a point of investment the building of interurban electric lines is attractive, both directly and indirectly to the operating company. Engineers and financial institutions are governed largely by the population of the districts to be served and the number of inhabitants per mile of the proposed route in determining the advisability of constructing an interurban line. The environs of Toronto are thickly settled. The country is excellent for farming and ideal for residence. That city more than any other in Canada needs outlets for its population. As no financial or other proposition can be permanently successful that is one-sided, in its operation the reverse is also true; well-equipped double tracked lines, and there is a demand for three out of Toronto, would benefit the owners of property as much as the corporation. The speculative values put upon the land near the city will find its level through the rapid transit with more remote districts, and they in turn will rise in value to meet the increased facility of communication with the ctiy. With the superb hydro-electric supply of electricity the corporation operating the lines can obtain revenue from supplying power to the towns along the route and the industries of those towns will be correspondingly increased through the cheaper and better supply. As we have stated, the chief difficulty is in obtaining elevated or tunnel entrance and terminal facilities in the city. This is not an insurmountable obstacle, as no council would have the temerity to

obstruct an enterprise that means so much to the city's development. It is the main solution of the housing problem of Toronto, and upon the building of adequate interurban lines rests the future growth and prosperity of Toronto. The experience of other cities is that by developing the resources of the country through which it operates the interurban lines increase the revenue of the city and county. It is the greatest factor in building up the city, and no city can grow permanently without adequate suburban transportation service.

¶ *The necessity for a building for the preservation of historical treasures of Ontario's past voiced by the Historical Association.*

RECENT legislative action giving the Ontario Historical Society power to receive gifts and bequests brings forward the immediate need for a commodious fireproofed building for their reception. While there is very little of permanent historical interest in the province previous to 1812, the history of Ontario since that date is largely the history of Canadian development. These records are of value far beyond the provinces in which they are gathered, for until the federation it was the outpost province and within its borders the conquest of the West as well as the defence of all Canada was organized and maintained. The relics that are stored in private libraries and public records, none too securely guarded against moth and fire, should be gathered in one building belonging to the people and there remain a witness to future generations of the genesis of Canada and the province. The history of a people is the cement of its patriotic fabric and the present generation that has so many evidences of the past within reach should not deprive those of the future from possessing them through a refusal to build an adequate building for their preservation.

¶ *The plan presented by the Guild of Civic Art of Toronto for an important viaduct indicative of the general tone of public sentiment.*

FUTURE residents of Toronto will hardly appreciate the work, but they will see the results of the labors of those who now have an intelligent interest in the city's growth along lines of civic beauty as well as practical utility, when the Bloor street viaduct is completed. While there are a larger number of citizens headed by the Mayor, and represented by the Guild of Civic Art and the Civic Improvement Committee, who are unselfishly laboring in the general direction of making Toronto a beautiful and liveable city, the Bloor street viaduct scheme is their first and most signal victory. With four plans to be considered, the issue came direct between that of a straight line viaduct across the Don valley by the City Engineer and that prepared by an architect, John M. Lyle, advocated by CONSTRUCTION, and endorsed by the Mayor and these civic bodies. The verdict of the committee appointed by the Mayor to report on the four plans of construction was unanimously in favor of the latter plan. Instead of cutting across a beautiful valley the route is along the southern edge of a ravine, across a beautiful section of high ground, and then by the shortest possible viaduct across the valley, giving the route the double value of connecting an important street and preserving one of Toronto's most attractive residence sections. The reason why this plan was selected by the competent committee is obvious. The Engineer thought only of a direct route for transportation. The architect knew there were many other points of equal or paramount importance. The utilization of the side of a ravine for a boulevard, the connection with an important street at a logical intersection, the picturesque spanning of the valley where the viaduct would least detract from the general view, and all this accomplished with little disturbance of a well developed residence district and at the sacrifice of none of the transportation advantages supplied by the direct route. The decision has another importance in that it evidences the disposition of the community to listen to the advice of those who know in the rearrangement of streets, the development of its parks and boulevards, and in all other matters which the Guild of Civic Art stands for.

¶ *The revision of a building law such as is proposed for Toronto a serious work that must be compiled by experts.*

TORONTO has awakened to the necessity of revising its building laws, the incentive being the collapse of a wall in process of construction. True, the wall was properly designed and as far as can be ascertained properly built, and from conflicting and imperfect evidence seems to have gone to pieces without any one cause to occasion its disintegration. It would probably be found, however, that careless workmen in using a heavily loaded temporary derrick failed to keep the thrust from bearing upon a green wall. But the fact is only material in that it has suggested an inadequacy in the building ordinances. The revision of a city's building law is a serious proposition, and it is more than useless to attempt it except in the hands of a comprehensive committee representing every phase from its legal aspect to the department of labor. The representatives should be selected from the best architects, contractors, sanitarians and other experts in the particular lines of building construction in the city. Sufficient time should be given for a thorough digestion of the building laws of other cities, and consideration of the many elements that such a law must contain to meet the various conditions and purposes which relate to building construction. If Toronto is prepared to place the matter in the hands of such a committee, and will rely on its judgment when the work is completed, it will be well to make such revision. Otherwise the law had better stand as it is, for no one exception or accident should interfere with the operation of a law that is established, generally understood, and, in the main, operative.

DANIEL HUDSON BURNHAM

DANIEL HUDSON BURNHAM

DANIEL HUDSON BURNHAM, architect, of Chicago, died at Heidelberg, Germany, on June 1st, aged sixty-six. Mr. Burnham was born at Henderson, New York, September 4th, 1846, and at ten years of age became a citizen of Chicago. His architectural career commenced in the office of Major W. L. B. Jenney, and his co-partnership with John W. Root was formed while working in the office of Carter, Drake & Wight, architects. The firm began to lead in architectural work in Chicago in 1883, and until Mr. Burnham's death his reputation continued to grow in its connection with great undertakings. Through Root's designing ability a large proportion of the large office building work in the early days of high steel construction came to that office and has continued to the present, so that it is probable the firm of D. H. Burnham & Company, as it has been styled since Mr. Root's death in 1893, has designed and constructed more high office buildings with total outlay of a larger amount of money than any other architectural firm in the world. The succeeding partners were Charles B. Atwood, a designer of note, and Ernest Graham, an executive of exceptional ability and who now leads the firm with Mr. Burnham's two sons as partners, Mr. Atwood having died early in the partnership. It is, however, upon another line of work that the personal fame of D. H. Burnham will largely rest. As director of works of the Columbian Exposition held at Chicago in 1893, the gigantic undertaking of erecting the buildings, designed by other architects, called for a man of exceptional architectural talent, combined with an executive ability that knew no obstacle in the direction of success both in complete construction and in time limit. The buildings were ready on the time set and as general manager of all construction and arrangement, this most gigantic as well as unusual construction was accomplished.

Although absorbed at the close of this exposition by his private work, which was rapidly growing in volume and importance, Mr. Burnham saw that Chicago was fast outgrowing the facilities for business transaction and social comfort as it then existed, and produced the city plan that is complete as a plan, and the preliminary work of which is commenced on its lake front. It will, whatever be the outcome, stand as a monument to its originator in the years to come.

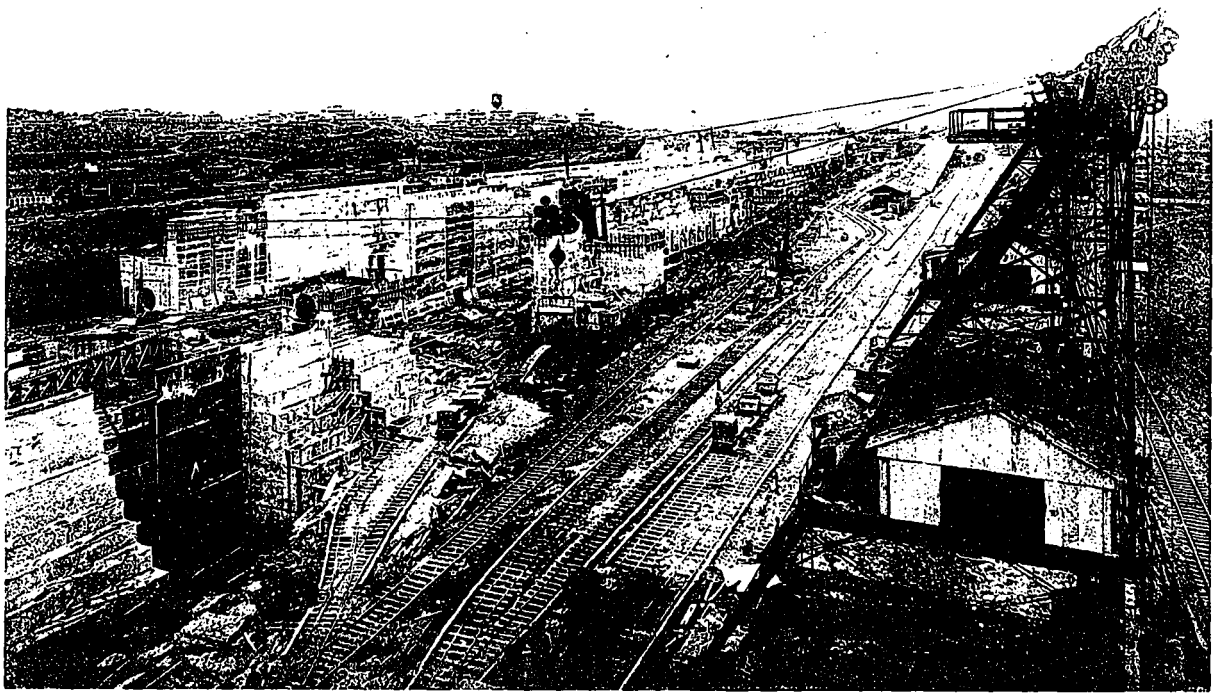
Mr. Burnham was made chairman of the Washington Plan Commission, and under his executive work the plan of Washington and L'Enfant was reverted to and worked out on moderate lines and existing conditions, so that the capital city of the United States will in its architectural unity and beauty vie with those of Europe. The Cleveland plan next occupied his attention, and as chairman of the Plan Commission of that city his work is already bearing evidence of his ability in bringing often complex conditions and stubborn obstacles under a united and composite rule. San Francisco called him, and just before the earthquake that destroyed a large portion of the city, a far-reaching and comprehensive plan was finished. The new possessions in the Philippine Islands called for a reconstructive plan for Manila, and Mr. Burnham at his own expense visited that city and planned its future construction as well as present alteration, and also planned a "Simla" for the American residents on the mountains at Bagnio. The civic plans of Minneapolis and of Portland were produced under his direction.

This is the record of the principal work in civic plan design that has occupied the attention of Mr. Burnham; work that progressed without interrupting one of the largest private practices in the country, and which has set an example for town planning that will be of inestimable value to the cities of the United States. It is not often given to a professional man to mean as much to a generation or a people as the works of D. H. Burnham signify to those who now mourn his loss, for in its potential quality, as well as accomplishment, that influence upon the future development of cities is direct as it is valuable. He was not an artist in the sense of execution upon the drawing, yet he knew art, and his appreciation for the beautiful gave to each of his endeavors the best in art, and he employed the æsthetic talents of other men in the working out of his great ideals. In the early days of the "skyscraper" when it was a new problem and its possibilities in a stage of development, John Root designed and he could plan, but in the friendly competitions which they usually held in laying out the plan, it was that by Mr. Burnham that was oftenest adopted as the plan of the building. His faculty for analysis, joined with a deep poetic conception of what was fittest, gave him his place among the world's greatest architects.

With his civic plans and his private work alike, a dominating trait of seeing and causing others to see, stands out as a most prominent characteristic, and his sudden death in Germany, while on a motoring tour, brought to an end a career full of accomplishments that still had great possibilities. His life was one of force, vision and magnetic influence, singularly combined with a fundamentally poetic temperament that was shown only to his intimates.

The architectural world has lost an effective and aggressive leader in all that makes for the livable and beautiful in cities, and upon this even more than his architectural designs his fame will rest.

Of architectural and art societies with which he was prominently identified, he took a leading part in the organization and conduct of the Western Association of Architects in 1884; was president of the American Institute of Architects in 1904-5; a member of the Illinois Chapter of the American Institute of Architects; chairman of the National Fine Arts Commission, and a director in the American Academy in Rome. His private and public work was confined to the United States, except in the instance of a department store in London, England, for a former Chicago client.



CONCRETE ON THE PANAMA CANAL.

View looking across the Gatun Locks toward the town of Gatun, which is seen in the distance. In the immediate foreground are the tracks upon which the concrete trains (operated by electricity) are run. On the left is seen three lock chambers.

CONSTRUCTION OF THE PANAMA CANAL

Abstract of an article contributed to the National Geographical Magazine by William Joseph Showalter, and additional notes and photographs collected in April, 1912, by Nelson Campbell Wilson, M.E.

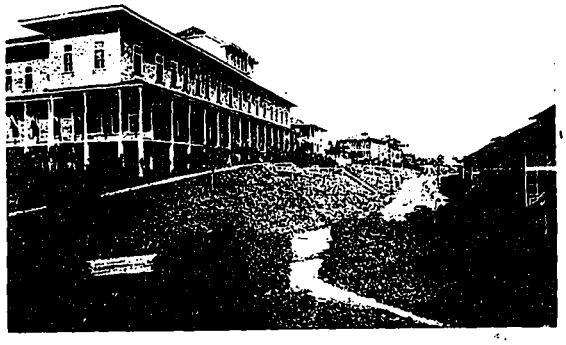
WHEN Congress asked for information as to the number of yards of material to be removed and the length of time it would take to remove it, the engineers, in a report characterized by optimism rather than pessimism, declared there were 103 million cubic yards of material to be removed, and that it would take nine years to do it. Since then enlargements in the bottom width of Culebra Cut, slides, and other conditions have forced the total amount of material to be excavated up to 195 million cubic yards. Under those original estimates it would take 17 years to complete the work. Yet the canal army, under the leadership of Colonel Goethals, will complete it in a little more than six years of actual, full-swing work.

In other words, the amount of material to be removed has been increased by about 90 per cent., while the time of removal has been cut down about 30 per cent.

In 1908 it was estimated that the total amount of material to be removed, as the project was then laid out, would amount to 135 million cubic yards, and that the total cost of the completed canal would be 375 million dollars. Since that time 60 million yards more have been added to the total excavations, and yet the prospect is that enough money will be left on this estimate, as a result of unexampled efficiency and economy, to build a new breakwater and perhaps to make a giant new storage reservoir at Alleluja.

Under what difficulties all of this has been done the world never will fully understand. Think of a farm

of 147 acres slipping foot by foot into the canal, and yet being taken out as a mere incident in canal construction! This is the aggregate acreage of the slides that have been slipping in and are being steam-shoveled out. Think of a rainy season where ten feet of water falls in ten months, and still the work goes forward with only slightly slacked speed! Think of having to dispose of nearly two million carloads of spoil annually, much of it upon dirt trains which have to be backed into seas of mud otherwise known as dumps! Then you will begin to appreciate what the brave army at Panama is doing.



The Administration Buildings, Culebra.

These temporary structures, which are virtually sliding into the canal cut, which is in the immediate foreground, contain all the plans, the staff of engineers, and other officers in charge of the work. In the background is seen the residence of Col. Goethal, chief engineer in charge.

In the Home Stretch.—In order to appreciate fully how rapidly the canal army is moving down the home stretch in its race against time, let us make an imaginary journey across the Isthmus, from Toro Point, Atlantic side, to Naos Island, Pacific side. First we pass the huge two-mile-long Toro Point breakwater, now being built out into the Caribbean to protect the mouth of the canal and Colon harbor from the violent "northers" which sweep down over that region during the winter months. It is now far out into the ocean and will be finished many a month before the opening date. On the east side of the canal line a second breakwater has been laid out, but it will be built only in the event that the Toro Point breakwater is unable to baffle the destructive seas single-handed.

We next enter that part of the canal which is being dug from deep water to Gatun, a distance of seven miles, at sea-level. When completed it will carry the ocean in to Gatun through a channel 41 feet deep and 500 feet wide. Already this channel is navigable to the light-draft vessels of the material-carrying fleet from Gatun, and the first five miles is practically completed. By the end of the calendar year it will be deep enough to accommodate the majority of ships which pass by way of Colon. Six months thereafter it will be completed and ready for even so huge a craft as the Olympic.

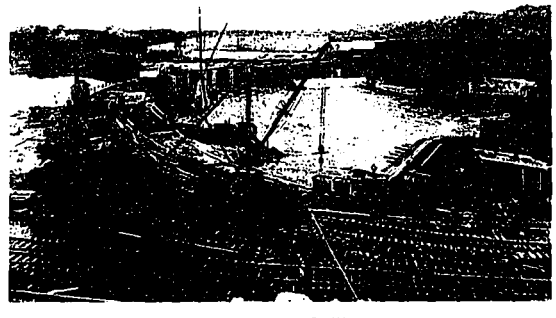
We next come to Gatun, where the great dam of the same name and the Atlantic-side locks are located. By the coming April the dam will be ready to hold 50 feet of water in check. Within twelve months thereafter it will be completed and ready for the maximum head of water, 87 feet. The work of the locks is being pushed forward so that they will be completed by the end of the calendar year, except for the installation of the operating machinery, and that will be completed five months later.

Passing through the locks, we next come to the channel through Gatun Lake. We find this now all but completed for a distance of 26 miles. By the first of May there will be nothing left to do with this stretch of more than half the total length of the canal but to put in the lighting equipment and other aids to navigation. Already the water is spreading over the bottom of the lower part of this section of the big waterway. Already Colonel Goethals is serving notice on the people who wish to see the canal while the magnitude of the work is still apparent that they had better visit the Isthmus soon. He says that belated visitors will wonder where all the work could have been done.

This 26-mile section carries us past Las Cascades and two miles into the great Culebra Cut. The next four miles represent the very backbone of the work yet to be done. In a comparatively few months there will be only about three miles of the cut above the requisite depth. Thirty steam shovels will be concentrated on that, and, if their present gait is maintained, within sixteen months proud old Culebra Mountain no longer can bid defiance to the age-long desire of men for a shipway through its vitals.

The only thing that might possibly happen to delay this work further would be unexpected slides, but they are provided against from the fact that by that time the water in Culebra Cut will be deep enough to float the big 20-inch suction dredges, which would be brought up through the locks and set to work. Before them the slides would disappear as a snow-bank on a balmy day.

Passing through Culebra Cut, we next come to the Pedro Miguel lock—called "Peter Magill" by the Americans on the Isthmus. Here the work is all but completed, except for the installation of the machinery, and that task is going forward in such a way that it will be in readiness before Culebra Cut is completed. The dam here—which is a small one, comparatively speaking—will be finished at an early date.



A View of the Spillway.

This spillway will control the waters of Gatun Lake, which is situated about midway between the Atlantic and the Pacific. Gatun Lake is the largest body of water (about 25 to 35 miles) on the route of the Panama Canal. These waters will be controlled by a series of 15 gates, three of which extend to the bottom level.

The next 2,000 yards or more of the canal will be

a small lake between the single flight of locks at Pedro Miguel and the double flight at Miraflores. This lake, which will cover nearly 1,200 acres, will be finished by the end of the present year. After passing through this lake we come to the Miraflores locks, and such unusual progress has been made on

Steam Pumps at Work.

Back of Las Cascades, about midway between the Atlantic and Pacific, these pumps keep clear the water from the steam shovels working on the lower level. This cut, when completed, will be about 200 feet deep.

them that, although the work could not begin on them until the Pedro Miguel locks were completed, the division engineer has announced that he expects to have the work on all the Pacific locks ready for the installation of the machinery before Thanksgiving Day. Already the contractors are putting in some of the gates and operating machinery.

After passing through the double flight of locks at Miraflores we find ourselves back at sea-level again. The dam connecting the Miraflores locks with the adjacent hills is not completed yet, and will not be until the early part of 1913, being kept open to let the dirt trains from Culebra Cut through on their way to the Naos Island dumps. Much of the material for this dam will be taken from the sea-level ditch from Miraflores to the sea. This portion of the canal will be completed fully eighteen months ahead of the official opening day of the big waterway. Already it is open to navigation for more than five miles inland from deep water. Only three miles out of the eight still remain uncompleted.

This rapid passage through the canal demonstrates how fast it is nearing completion. The entire channel is a little more than 50 miles long. About 37 miles of it, including the lock sites, are now down to its requisite depth, and, of the remaining 13, there are less than eight miles of really heavy work.

Work at Gatun.—There is perhaps no other work on the whole canal more interesting than that at Gatun. Here it is that one gets a view of some of the most stupendous work on the great waterway. Gatun Dam is now taking shape and soon will be up to its full height. To the tourist it is a most disappointing sight. When he approaches Gatun he inquires where the dam is, for, be it said, the slope of the structure is so gentle that few people recognize it as a dam. Take a yard-stick and elevate one end three inches above the other, and you have about the average slope of the down-stream face of the dam. On the up-stream side the slope would be represented, so far as the part under water is concerned, if you elevated the one end of your yard-stick four and a half inches higher than the other end.

The completed dam will cover some 400 acres of ground and will contain 21 million cubic yards of material—enough to make a wall of earth three feet high and three feet thick and reaching nearly half way around the world.

The dam has been full of surprises, but very different kinds of surprises from those which the pessimists were expecting. The site was for a long time called into question. When Colonel Goethals took charge he immediately put into effect a policy of not taking even the smallest thing for granted when he could prove a thing by actual test. After the assertion had been made thousands of times that there was an underground river flowing beneath the dam site, he honeycombed the whole area with borings and sunk a big shaft down to solid foundation, so that he could see with his own eyes. He found almost none of the conditions the fearful ones had pictured. But, in order to forestall all criticism, he planned the dam so as to include triple interlocking steel sheet piling across the valley, driven down to bed-rock, and a

The Lock Gates at Gatun.

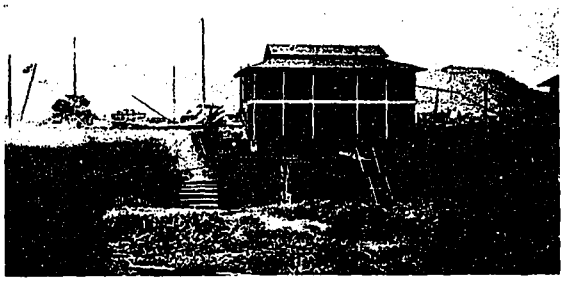
This is an excellent example of the score or more gates now under construction, as they appeared late in the summer of 1911. The comparative size of the men standing in the opening gives a good idea of their enormous size.

dam that should be 135 feet high—50 feet above the water level.

Then came the famous "collapse" of the dam, wired to the American press by a Panama newspaper reporter. People did not stop to think that there was as yet no dam there to collapse, and President Roosevelt was alarmed at the widespread uneasiness. It was this that led him to send the board of

engineers to the Isthmus, accompanied by President-elect Taft.

The net result of the trip was that the engineers declared the dam was being built needlessly high, and that there was no occasion whatever for the use of the piling. So it was cut down to 115 feet,



Laborer's Cottage.

Interesting as showing the type of houses furnished by the United States for the use of the canal laborers. These houses are very comfortable frame structures; and completely screened in. In connection with each house there are all necessary sanitary arrangements, including bath. The Government furnished these houses free of rent to the canal laborers, and furnished them with food from the commissary department at absolute cost to the Government.

and the piling was omitted. After all, the story that shook the confidence of the American people in the dam bore good fruit in the resulting saving in the construction of that dam. The only criticism of it to-day is that it is still larger than was necessary. Colonel Goethals admits that if he had been building it for private corporations he would have made it smaller. But "concede everything else to safety" has been his policy from beginning to end.

We see this same attitude in the matter of providing for the disposal of surplus water coming into Gatun Lake during the high stages of the Chagres River. The Gatun spillway is being built so that it can discharge 137,000 cubic feet of water a second, the water issuing at a speed of 35 feet a second.

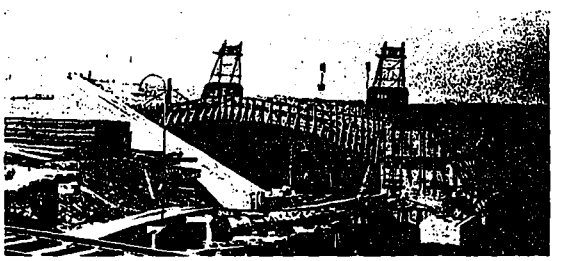
This will take care of the maddest flood that history records in the Chagres. In addition to this, the big culverts of the locks can be turned open and a flood of 170,000 feet a second is provided for. Yet the Chagres can flow at its highest known stage into the Gatun Lake for 5½ hours, with no discharge at all, and raise its level only one foot, and can raise seven feet without doing damage.

In other words, although the Chagres could do its worst for a day and a half, without a drop of water going over the spillway, without doing any damage, the canal authorities have arranged to pass out more water per hour than the Chagres can possibly bring down, and have not presumed at all upon that day and a half advantage over the Chagres.

Every Contingency Provided Against—Still another incident serves to illustrate the wonderful care that has been taken uniformly not to draw a rosier picture than conditions warrant. Colonel Goethals always declared that the material which would constitute the hydraulic core of the dam would be sufficiently impervious to water to prevent any dangerous seepage. But experience is proving that there is no seepage at all. A long pond is maintained at all times on the crest of the dam, and into this the big dredges are pumping millions of gallons of water. The clay settles and part of the water runs off. The remainder stays there, seeking out every possible crack and crevice, a sort of hydraulic stone-mason, who tightens up every minute space and offers a perpetual guarantee that when he finishes his work all will evermore be well.

Another illustration, showing how more than cautious are the responsible heads of the canal in their efforts to insure its integrity, is the provision against accidents in the operation of the locks. The fact that they are, so to speak, "double-tracked," so that even if things should go wrong in the one set of locks, the other set will be available, is in itself regarded as practically eliminating danger. But this is only an incidental precautionary step.

In order to guard against danger from a ship ramming the upper or lower gates, there is a heavy chain stretched across the channel, with the ends attached to giant hydraulic paying-out machinery. These chains and their paying-out attachments are strong enough to stop a 10,000-ton steamer traveling at the rate of five knots an hour. But even if they should fail to bring a vessel to a stop and it should ram down the outer gates, there would still be a second pair of gates across the channel. Not once in millions of times would the first gates be rammed, and



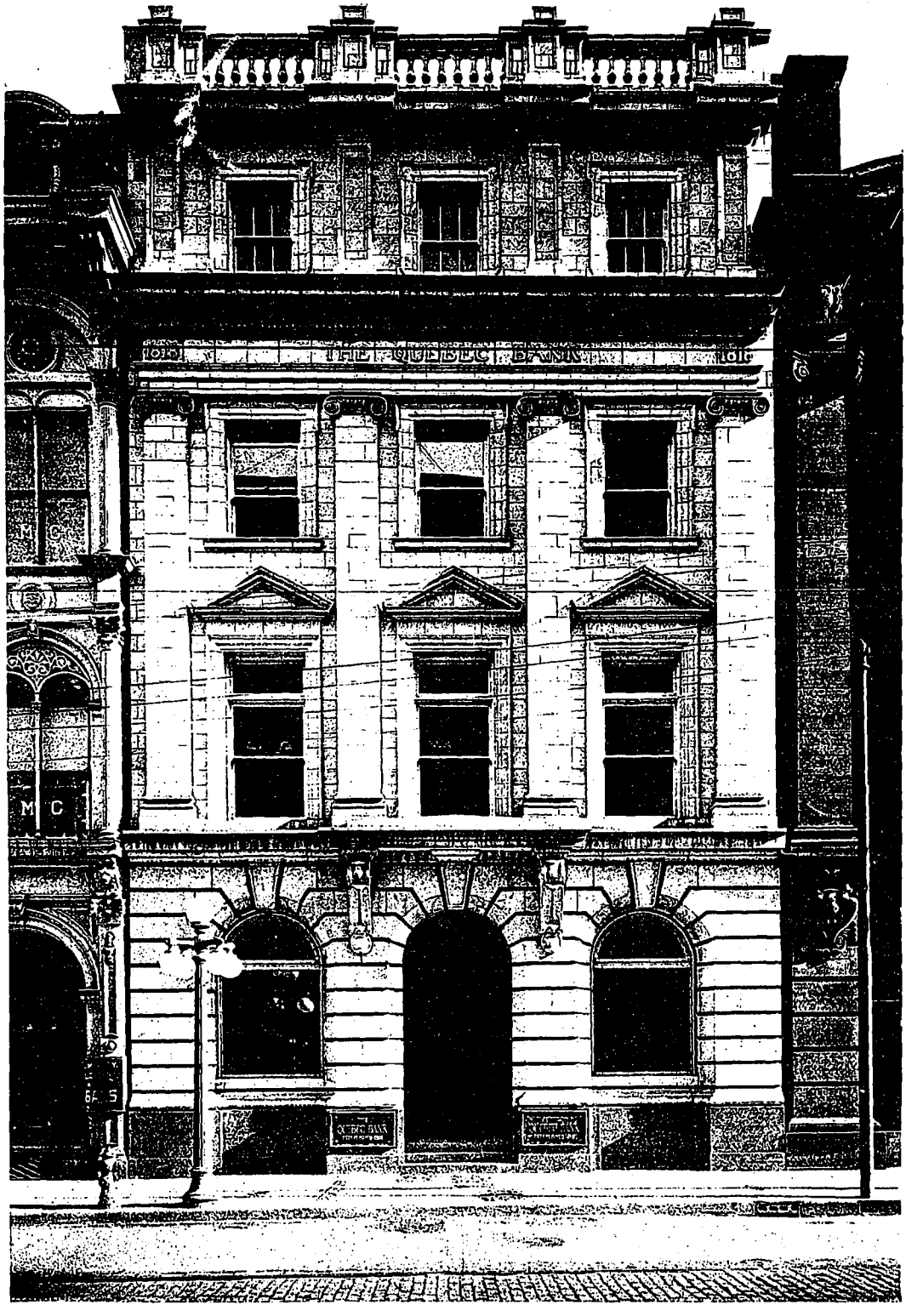
Concrete Transportation.

Part of the work at the Atlantic end of Gatun Locks; also showing method of transporting concrete to the point at which it is to be used.

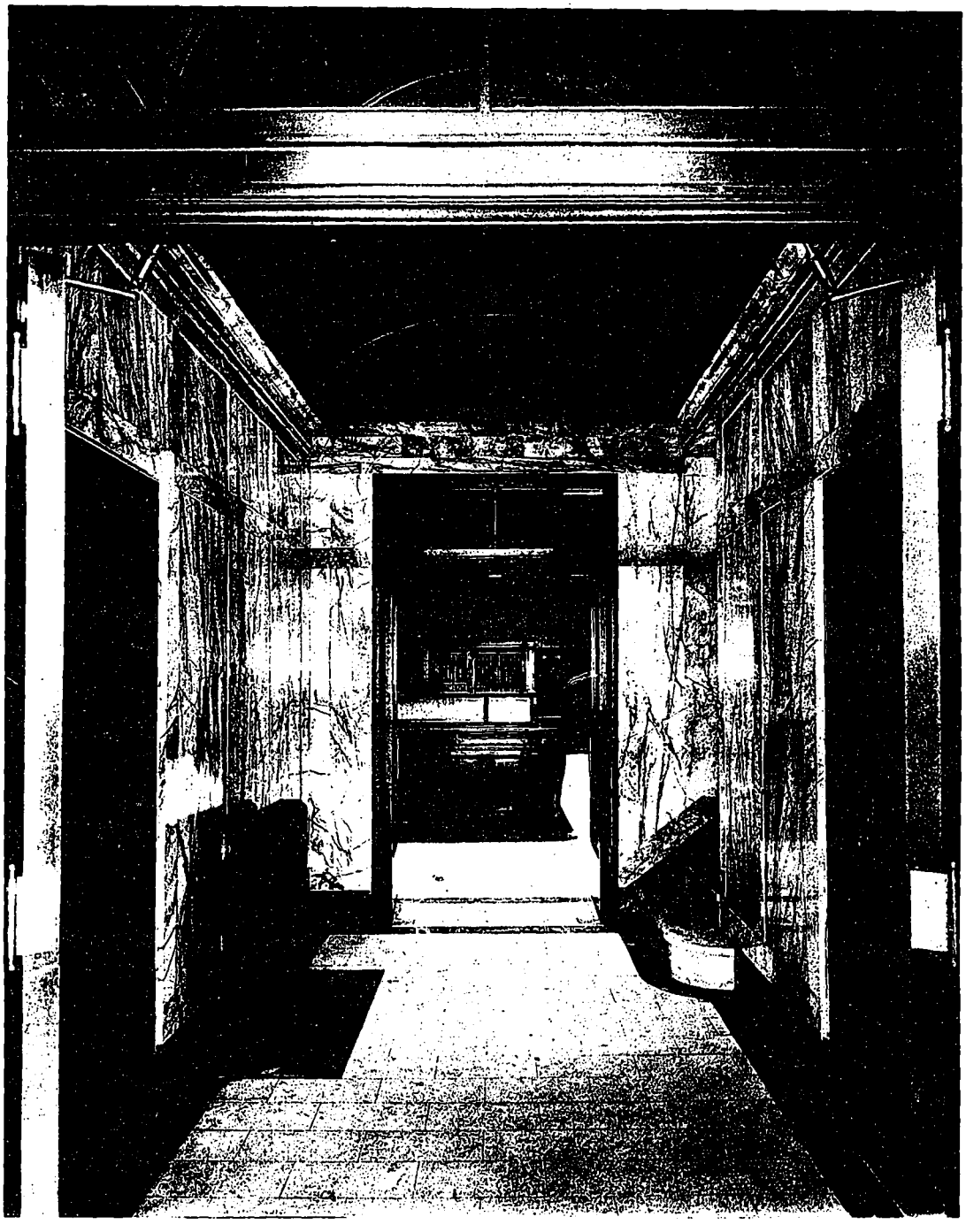
as for the next pair, it is almost beyond possibility that they should be reached by the vessel and forced open.

But suppose the chain failed to stop the ship, then that the outer gates also failed, and then even that the almost impossible should happen—the second pair of gates rammed: even that contingency is amply provided against. A large cantilever bridge will be ready at all times to be swung across the channel. From this there would be let down a series of nickel steel wicket girders into the madly rushing waters. The lower ends of these girders would engage a sort of offset in the lock floor, making a series of small, nearly perpendicular railways, on which large steel sheets mounted on rollers would be let down. By the time all of the girders and sheets of steel were in place, there would be an effective steel dam interposed to replace the damaged gates. Such an emergency dam is to be found at the Soo locks. Although it had grown so rusty by disuse that it could not be operated by power when an accident did happen, it was placed in position by hand and effectively served its purpose.

But even here the manifold precautions to make impossible serious accidents in lock operation do not

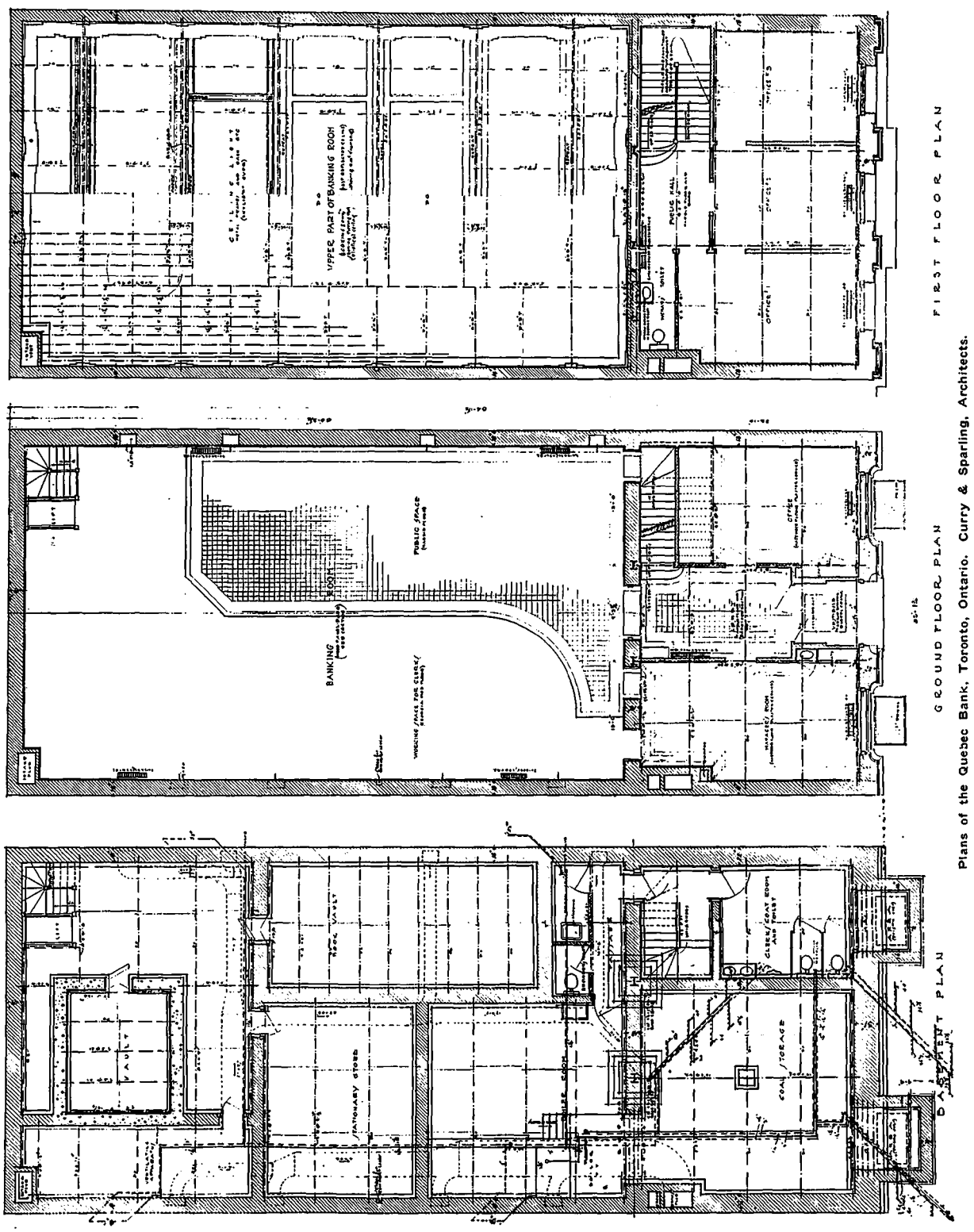


The Quebec Bank, Toronto, Ontario. Curry & Sparling, Architects.

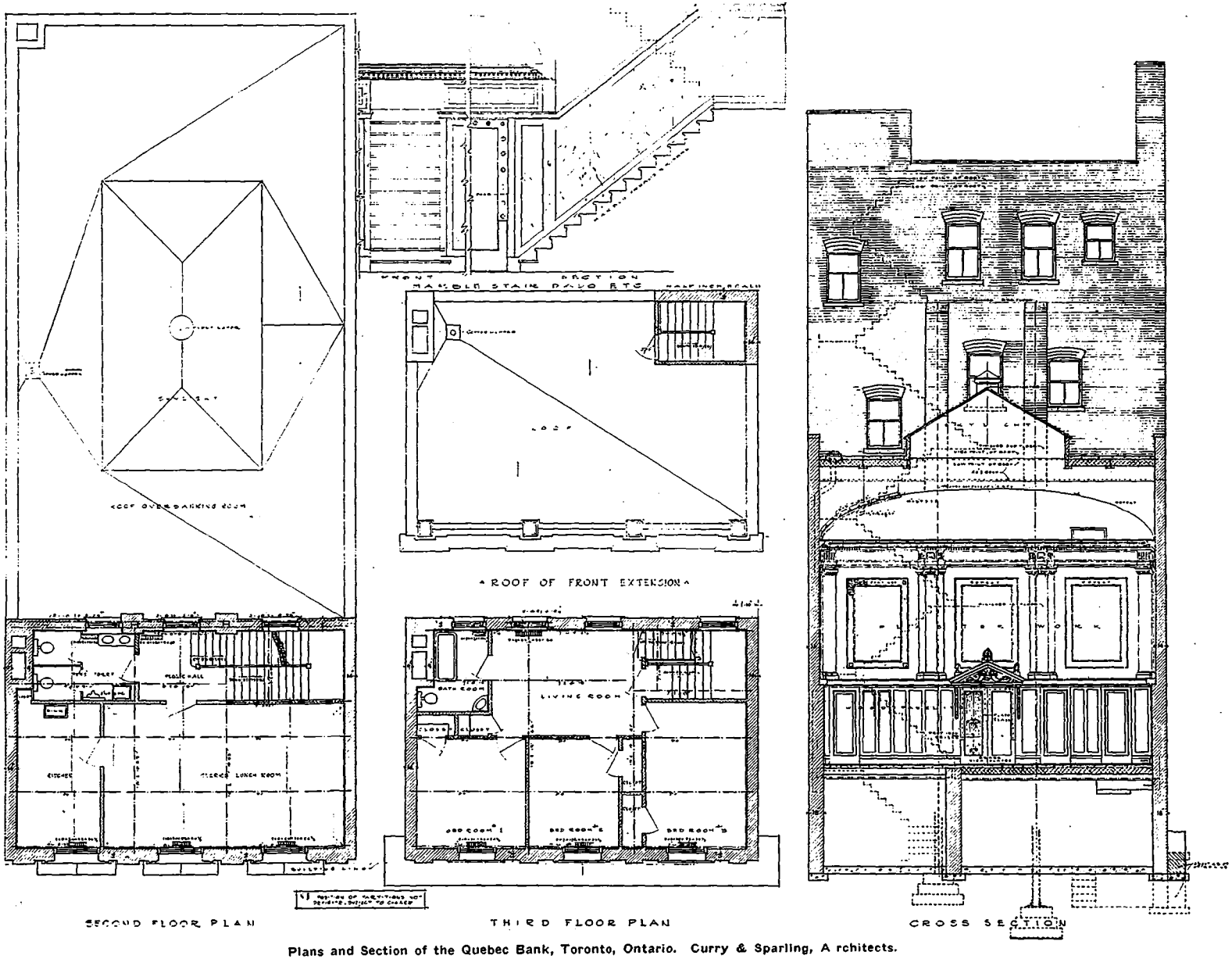


Entrance to the Quebec Bank, Toronto, Ontario. Curry & Sparling, Architects.

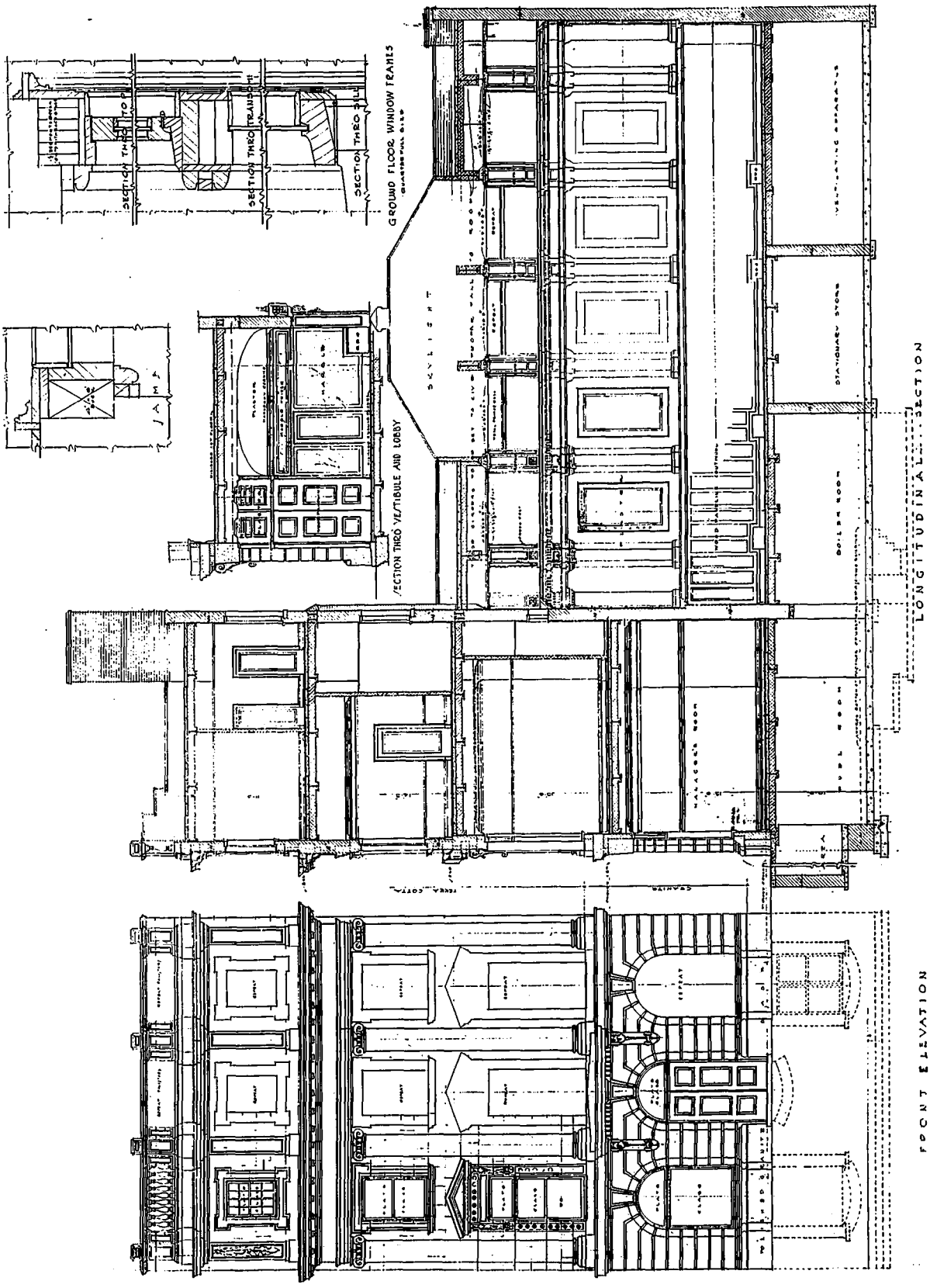
Interior of the Quebec Bank, Toronto, Ontario. Curry & Sparling, Architects.



Plans of the Quebec Bank, Toronto, Ontario. Curry & Sparling, Architects.



Plans and Section of the Quebec Bank, Toronto, Ontario. Curry & Sparling, Architects.



Elevations and Section of the Quebec Bank, Toronto, Ontario. Curry & Spar ling, Architects.

stop. Statistics of lock canals show that perhaps 90 per cent. of the accidents in lock operation arise from vessels entering and leaving locks under their own power. There seems to be an impossibility to get shipmasters to respond to every signal given exactly as given and at the instant given.

To secure the proper co-ordination between the ship itself and the lock machinery at Panama, it has been

The Transfer of Material.

One of the travelling cantilever cranes used in transferring sand from stock pile to concrete mixer on the left.

decided that no ship shall be allowed to negotiate the locks under its own power. Therefore a series of electric towing engines will be installed on the side walls of the locks. When a ship approaches, it will be brought to a standstill outside the locks. Then four of these towing engines will be attached to it by means of hawsers—two at the stem, to pull it into the locks, and two at the stern, to hold it back and to stop it at the proper time. No canal on earth now in operation has more than half as many precautions to insure successful operation as the Panama Canal will have.

Remarkable Efficiency.—One of the most remarkable phases of the work of building the Panama Canal has been the unparalleled development of engineering efficiency. For instance, the cost of steam-shovel operation has been cut from 11.5 cents a yard to 8.88 cents a yard. The cost of hauling away the spoil has been cut down from 18.54 cents a yard to 15.22 cents, although the distance of transportation has increased from 8 to 12 miles. A ton of dynamite has been made to do twice as much work in 1912 as it did in 1908. They save $50,000 a month by shaking their cement bags.

When Colonel Goethals took charge of the work at Panama the incessant and insistent demand of the people at home was that he should "make the dirt fly." He recognized that if the canal were to command the support and confidence of the people during its construction, "making the dirt fly" would have to be the first aim of the canal diggers; the cost of making it fly would have to become a secondary consideration. How well he succeeded is shown by the tremendous results of 1908—37 million cubic yards of material removed.

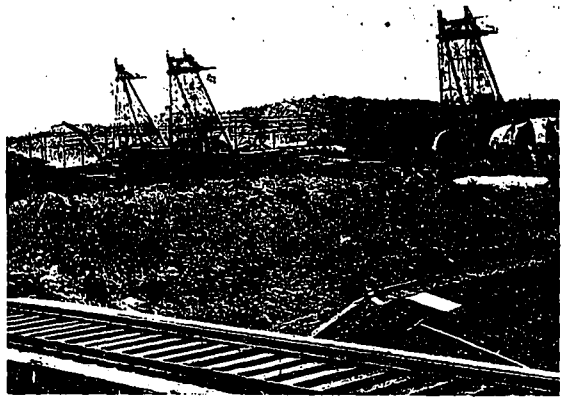
Thereafter one heard little talk about making the dirt fly, and the Commission were then able to bend their energies to the work of making it fly economically as well as to making it fly fast. A tightening-up process here, the elimination of lost motion there, the invention of some time-saving device at another place—all served to make the operations more economical and to save millions of dollars. So great has been the progress in developing efficiency on the Isthmus that they have cut the cost of excavation in Culebra Cut by more than one-third.

The Use of Concrete.—Nowhere else in the world has there ever been such a vast amount of masonry constructed on any single engineering project as is being built in the locks and spillways of the Panama Canal. In times gone by the masonry of all great projects, like the Pyramids of ancient times and the Assuan Dam of to-day, was made of natural rock; at Panama they make artificial rock, and make it so fast that one scarcely can believe his eyes. The concrete required on the whole project amounts to more than four and a half million cubic yards.

This is enough to build up an airline street from New York to Washington, with six-room houses on both sides. Those houses would furnish shelter for a population the size of the city of Indianapolis, taking the census returns of the number of people to the average American dwelling as the basis.

Expressing the magnitude of the project in another way, it would make a regulation sidewalk nine feet wide by six inches thick, reaching more than twice around the earth.

The locks at Gatun require two million cubic yards of concrete. Those on the Pacific side, being built with two flights at one place and the third at another place, require nearly 200,000 yards more than the single trip flight at Gatun. The Gatun spillway claims approximately a quarter of a million yards.



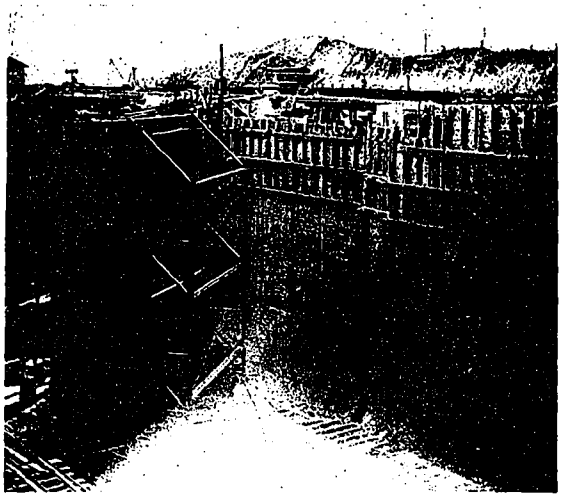
Part of the Work at Gatun.

Travelling towers used to support the cables on which concrete is carried from mixer to point at which it is to be deposited. Collapsible steel centres at right of picture.

Nowhere else in the world does one get a more vivid impression of the versatility of concrete than on the Panama Canal. They are using it to make the giant locks, and with equal success in constructing the huge piers and docks at the ends of the big waterway. They have been trying out a cement gun to shoot cement—sand and water, mixed as it passes out of the nozzle—against the sides of the Culebra Cut, to form a coating of solid artificial rock, although the experiment has not proved as much of a success as

had been hoped. They are building lighthouses and other aids to navigation out of concrete, and have even gone so far as to build barges of this material.

Nowhere else in the world is there to be found such extensive concrete mixing plants or such remarkable machinery for handling the material. Millions of barrels of cement had to be carried to the Isthmus and millions of yards of stone had to be quarried and crushed at Ancon and Porto Bello. Sand by the hundreds of barge-loads had to be brought from islands in the Atlantic and the Pacific to keep filled



A Lock Gate.

A close view of one of the gates, looking down from the top of the wall.

the seemingly insatiable maws of dozens of giant mixers, which receive some ten tons of sand, cement, crushed stone, and water, whirl them around for a minute in a sort of digestive process, and then dump the mass out in the shape of unhardened artificial stone.

Many new problems in concrete construction have been worked out at Panama. The effect of sea water on concrete, the time of setting for such huge masses, and a dozen other matters, upon which depended the stability of the locks and the integrity of the waterway, had to be met. All of them were met in the spirit of accepting nothing as proven until it was proven by actual physical test.

The world is now in the age of concrete, and the Panama Canal must go down into history as the greatest effort man ever has made and perhaps ever will make to simulate the processes of geologic ages and do in days what nature required unreckoned years to accomplish.

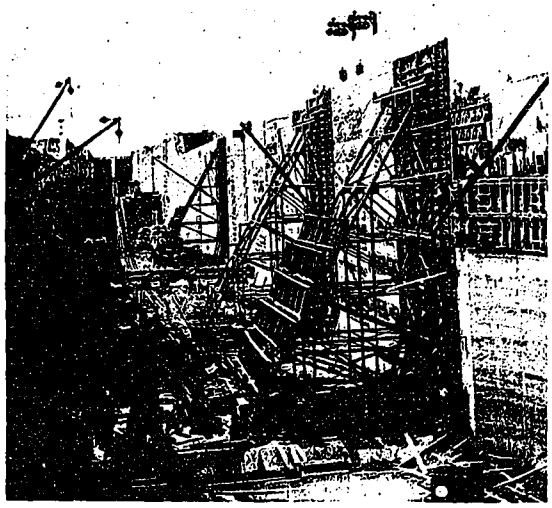
Sea-Level Canal Impossible.—As one who originally believed that a sea-level canal should be built, I freely acknowledge my belief to-day that if we had undertaken such a waterway, we would have retired defeated and disappointed, as did the French. The work on the present project has absolutely vindicated the judgment of those who opposed a sea-level canal. In the first place, the width of the waterway perforce would have been so narrow that it could readily have been blocked by some future Hobson with a Merrimac. In the second place, only God knows how much material would have had to be taken out of Culebra Mountain before its sides would have stopped slipping into the cut. In the third place, there would have had to be tidal locks, which would have been in more danger of being put out of commission than the present ones. In the fourth place, there would have had to be a higher dam at Gamboa than there is at Gatun, and a fairer mark it would have been for the æroplane. No one ever leaves the Isthmus now without registering a vow of thankfulness for the wise course that was pursued in making it a lock canal. It is so obvious that the veriest layman can see it.

PRESENT ASPECT OF THE CANAL.

By Nelson Campbell Wilson.

In briefly reviewing the present aspect of the Panama Canal and the zone under the influence of its governmental control, the attention of the critical observer is singularly attracted to the fact that a greater degree of credit for the success in bringing the work of the canal to its present stage is due to the sanitary department under Colonel Gorgas than to the engineering department, though by this I do not wish to detract in the least from the ability of that department, which is almost beyond praise.

The defeat of the French was primarily through sanitary causes. The engineers themselves say that if the French had known as much about sanitation as we do, they could have completed the canal. The sanitary department under Gorgas has cleaned up the Isthmus to such an extent that, instead of being, as it was ten years ago, one of the most unhealthy places in the world, it is now one of the



View of a Triple Lock.

This photograph is possibly the most interesting and comprehensive of the series, as it shows the complete length of one of the triple locks. This one is at Gatun, where the ship is raised to a height of 85 feet in the three locks. The figures of men shown in this photograph give perhaps a better idea of the magnitude of the work than mere dimensions.

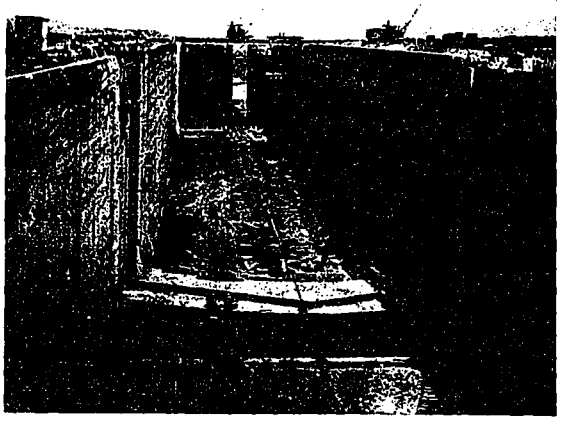
most healthy; and the death rate on the canal zone is now less than in the average city in the United States. Yellow fever, typhoid and malaria have been absolutely eliminated.

During my stay in the canal zone, I did not see or hear a single mosquito, and flies were so scarce that

they were looked upon more as a curiosity than a nuisance. Considering the trouble that we have with flies and mosquitoes in the United States and Canada, and the climatic conditions, you may be able to conceive faintly of what it means to absolutely exterminate them in a tropical swamp fifty miles long and ten miles wide, and yet this has been done by the United States in the short time that they have had charge.

The magnitude of the work being done on the canal is so great that it can not be appreciated in a few minutes, or even in a few days. It is somewhat like the first sight of Niagara Falls in that respect.

Figures giving the number of cubic yards of material removed from Culebra Cut do not convey any idea

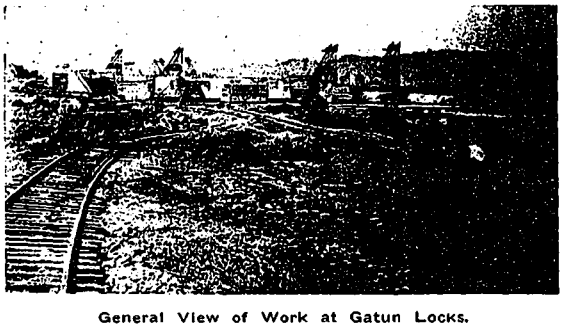


One Half of a Lock.

One of the Pedro Miguel Locks, looking towards the Pacific, with partially completed gates at one end; in the foreground is shown the position in which the intermediate gate will be placed midway. The entire lock is seventy-nine feet high, one hundred and ten feet wide, and one thousand feet long. All of the locks are one thousand feet long, but they are all supplied with intermediate gates, so that a saving of water can be effected in locking vessels of less than five hundred feet in length; and also making it possible to lock through two small vessels at the same time.

to the ordinary mind; but if the material removed were placed on a space equal to the ordinary city block, and built straight up in the form of a monument, the top would be approximately more than a mile higher than the top of the highest mountain above sea level.

The steel gates in the different locks weigh approxi-



General View of Work at Gatun Locks.

View from Gatun Lake. The land shown in the foreground of the photograph will eventually form the bottom of Gatun Lake.

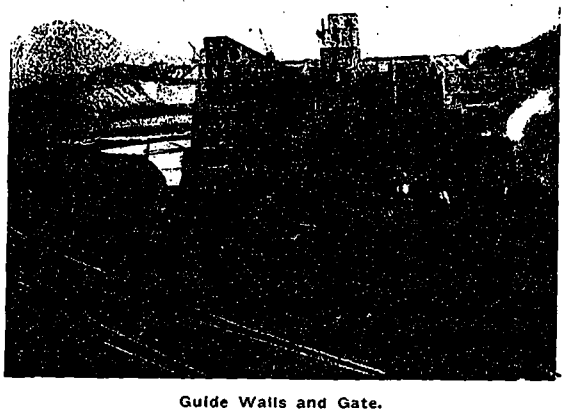
mately 66,000 tons. If these gates were piled on top of each other like a pack of cards, they would form a pile 644 feet high, or somewhat higher than the Singer Building. If they were piled end to end they would reach a height of one and one-quarter miles. These figures will probably give a better idea to the ordinary reader than a simple statement of cubic yards or pounds.

As the Gatun Dam is different from the ordinary dam to which we are accustomed, there is possibly

A Sample of Concrete.

A view of part of the concrete work at Pedro Miguel, taken from the railroad. Note comparative size of man on top of the wall.

not one person in a thousand who has any idea of how it is constructed. In round figures this dam is one-half mile wide at the base, and almost two miles long, and is built up to an elevation of 150 feet above mean sea level. The only concrete work used in the dam is in the spillway. The dam is practically continuing the mountain range across the gorge formed by the Chagres River. The rock blasted from Culebra Cut and other cuts was distributed from this area in two immense parallel walls, leaving a space of several hundred yards between the two walls. The space between these



Guide Walls and Gate.

Present condition of the guide walls at the entrance of Pedro Miguel Locks. At right of this picture is shown one of the gates not yet entirely completed.

two walls was filled in by a hydraulic fill. The material being supplied by the means of hydraulic dredges, which pump the clay and sand from the channels being dredged into the space between the two rock walls, thus forming an entirely watertight hydraulic core. Thus the entire dam has been constructed of waste material, which, had it not been placed in that position, would have had to be hauled to some other location further distant.

CONSTRUCTION

A · JOURNAL · FOR · THE · ARCHITECTURAL ENGINEERING · AND · CONTRACTING INTERESTS · OF · CANADA

ROBERT CRAIK McLEAN, Editor

H. GAGNIER, LIMITED, PUBLISHERS
Saturday Night Building
Toronto. - - Canada

BRANCH OFFICES:
MONTREAL—171 St. James Street
WINNIPEG, MAN.—13 Royal Bank Building
LONDON, ENG.—17 Cockspur St., S.W.
CHICAGO—People's Gas Building
NEW YORK—156 5th Avenue

CORRESPONDENCE—All correspondence should be addressed to "CONSTRUCTION," Saturday Night Building, Toronto, Canada.

SUBSCRIPTIONS—Canada and Great Britain, $3.00 per annum. United States, the Continent and all Postal Union countries, $4.00 per annum, in advance. Single copies, 35c.

ADVERTISEMENTS—Changes of, or new advertisements must reach the Head Office not later than the fifth of the month preceding publication, to ensure insertion. Advertising rates on application.

CONTRIBUTIONS—The Editor will be glad to consider contributions dealing with matters of general interest to the readers of this Journal. When payment is desired, this fact should be stated. We are always glad to receive the loan of photographs and plans of interesting Canadian work. The originals will be carefully preserved and duly returned.

Entered as Second Class Matter in the Post Office at Toronto, Canada.

Vol. 5 Toronto, July, 1912 No. 8

CURRENT TOPICS

AS MUCH of the information in regard to the current matters of only passing importance in cities comes through the comments in the daily press, those interested are apt to obtain only a partial view, where an investigation would probably change the entire aspect. Therefore it seems that though a number of cities like Victoria are discussing civil improvements in one particular unit, that this belongs to a well devised general plan that is held in the background. Victoria for instance, is discussing wharfs and water front, and latterly the building of a "civic centre building." The discussion seems to be like that over the bargain counter and depends on cost rather than proper location. There is not even implied reference to making this centre an axis for a general civic plan, though of all the units in such a plan, this instead of cost, is the most vital feature. This is all the more singular after men like Moulson, Nolan, Olmsted, and other civic plan experts have gone through Canada, and everywhere expounded the doctrine of the civic plan in its correct interpretation. These men have shown that the plan in all its bearings, comes first, and after it is well studied and adopted, it is time, and only then, to talk about individual units in that plan. In spite of this, we see cities everywhere acting as one might who bought a lot in the suburbs, and on his first visit realized that a garage for his machine would be required. He immediately has one built at the most convenient place for entrance from the street. He then finds that a cottage for his caretaker is necessary and that is built next to the garage. Finally, he decides to build his house, and then finds that the buildings have been placed on the ground that is the logical position for his residence and they have to be removed. . All because he did not have the whole lot and its buildings planned before any work was done. As a rule men are sensible enough to do this, but when it comes to a city, they think only of the immediate want and how cheaply it can be obtained. In city planning, more than in anything else, the cheapest is the most expensive in the end, from water supply and sewers, to the widening of streets for traffic, or the construction of public buildings and the most expensive item is the money saved by starting any one improvement without a general plan that considers all and makes each a component part of the entire scheme.

* * *

WINNIPEG is organizing a competition that should engage the best efforts of the best professional talent in Canada. It has been decided to open the designs for the projected $2,000,000 City Hall to competition among, and confined to, the architects of Canada. The programme is in process of formation and though the details are not yet decided upon, it is proposed to offer five prizes: $5,000 to be given as a first prize; $4,000 second, and $3,000 each to the three designs next in order of selection. The jury will consist of three members; the Royal Institute of British Architects, the Royal Architectural Institute of Canada, and the Manitoba Association of Architects, each appointing one member. CONSTRUCTION reserves comment until the programme issued, but if it is prepared in the right spirit, with proper conditions and safeguards, this should prove a successful and attractive competition.

* * *

GRAND TRUNK PACIFIC plans for this year include active work on projected hotels at important points on the transcontinental line. Besides the magnificent structure, the Fort Garry, to be erected at Winnipeg, equal to and of the same general design as the Hotel Laurier at Ottawa, the plans for the hotel which is to be erected in Edmonton have been completed and the contracts will be issued shortly. This hotel will be about 150 rooms and will cost about $750,000. A similar hotel will be built in Regina and plans are now being prepared. Plans have also been prepared for the first of the mountain hotels at Miete Hot Springs. This will be a very complete building and will offer all that is to be desired to tourists and mountain travellers. Work is also being proceeded with on the plans for another large mountain hotel in the vicinity of Mount Robson, the highest mountain in the Canadian Rockies, and which towers above the Grand Fork valley

about eleven thousand feet and is thirteen thousand seven hundred feet above the sea level. This location will be the most beautiful and the most attractive mountain resort on the continent of America. Plans have also been prepared and inspected for the new mammoth hotel at Prince Rupert and work on it will be proceeded with shortly. The building of first-class hotels for the accommodation of the travelling public simultaneous with the completion of the transcontinental line is not only commendable, but evidences the strong business management and broad conception of the Grand Trunk Pacific Railway.

* * *

THE VALIDITY of the Toronto apartment house law received its first test recently before the Board of Control, and the result will indicate the probable operation of the law. An architect sought permission to erect an apartment building in a residence district. The project was opposed by a large majority of the residents of the immediate neighborhood and the permit was refused, the structure being deemed an undesirable addition to the district. Another similar request was made for a permit to erect an apartment house in another residence district. This application was opposed by twenty-two, was favorable to four, and two were indifferent. This application was refused. A third request for a permit was granted, as out of twenty-one owners, ten were opposed, ten were indifferent, and one favored the proposal. This indicates the probable interpretation of the law which prohibits the erection of apartment houses in residence districts. The permit will be withheld or granted according to the disposition of the resident owners in the neighborhood.

* * *

THE LIMITATION of the number of houses allowed to the acre, demanded by some local authorities in England, takes form through an attempt to justify the area of the ground plot to the size of the house occupying the site. A scale that has been drawn up as allowable is as follows: "Houses not exceeding, when cubed at 6 pence, $1,000, not to exceed fourteen to the acre; not exceeding $1,400 in cost, twelve to the acre; houses cubed at thirteen cents, and costing $1,500, not to exceed eleven to the acre; houses costing $4,500 and cubed at fourteen cents, not to exceed eight to the acre, while the average over the entire subdivision could not exceed seven to the acre, gross measure."

* * *

COMPLETION of the federation of all the architectural bodies in the Dominion will be made upon the assembling of the Fifth Annual Convention of the Royal Architectural Institute of Canada, which will be held at Ottawa, in the Public Library, on Monday, October 7, 1912, when the present council of the Royal Institute will transfer all the assets and affairs of the Institute to a new council composed of delegates of the various associations of architects of the Dominion, as per the conditions of the new charter of the R.A.I.C. sanctioned by Parliament on the 1st April, 1912. This will consummate the federation for which the promoters of the Institute have been working since the formation of the society in 1907. This convention at Ottawa in October should be the largest and most representative gathering of architects throughout the Dominion, ever held.

* * *

THE CIVIC Federation of the United States, after investigating the returns of the public and private enterprises of Great Britain, find that the advantage is wholly on the side of the municipal undertakings. They earn large car revenues at lower cost per mile, provide much larger allowances for renewals, depreciation and sinking funds, pay higher wages and provide better service. Not only this, but the chief concern of city and town councils is to extend and cheapen municipal services, and so increase their value to the general community. In the disposal of sewage also, British cities have shown themselves ready to experiment and introduce innovations. Recently the Bradford council installed a plant costing about $300,000 for the purpose of extracting grease from the city sewage. Last year's sales of the product netted $132,500 of revenue, and recently a newly-invented machine was installed to extract the grease from condemned meat and carcases. The residue from the process was found to be valuable as a fertilizer, and finds a ready sale among farmers and has even been exported profitably to France and South American countries.

* * *

DRAFTSMEN in Vancouver are entering drawings in the Society of Beaux Arts Architects classes, the problems of which are open to draftsmen in the United States and Canada. The advantages of the study of the problems and the emulation engendered by the competitions have been a great benefit to the draftsmen in the United States, and the advantages of the training should be appreciated by the guild throughout Canada. While the problems are academic in nature and French in feeling, and do not give a large latitude to independent design, the training is of the greatest value to the draftsmen whose days work gives little scope for imagination and development of independent thought. In the absence of an opportunity for the training of the schools, the work of the Society of Beaux Arts Architects is most beneficial in every locality where the earnest students can secure enough co-operation to establish an atelier to give the study its proper direction and facility.

* * *

A CASE at law has developed at St. Catharines, Ontario, of which the trial judge stated that in thirty-five years' experience he never had occasion to deal with one of similar nature. It is, however, common in larger cities, or would be if the law in the case was not generally understood. The suit is for $40,000 damages against the owner of a new building, the ten foot concrete foundations to the piers for which centred on the lot line. The contractor claimed that this was necessary in order to build to the line. Of course, it was necessary if he built to the line, but the building could have been built ten feet narrower and avoided the encroachment. When Marshall Field, and L. Z. Leiter, of Chicago, dissolved partnership,

they divided two lots on LaSalle and Adams street. That belonging to Mr. Leiter was occupied by a building up to the lot line. When Mr. Field leased his lot to the W.C.T.U. for the Temple building, Mr. Leiter would not allow the footings to encroach upon his property, and in order to build to the line a series of cantilevers was introduced to hold the wall. It was understood that there could be no encroachment without the consent of the adjoining property owner. Great care should be taken by builders in their surveys as damages are sure to follow the slightest encroachment by foundations, without an agreement between the owners similar to that relating to a party wall. The north wall of the Auditorium building in Chicago, is cantilevered (and was the first case of "skeleton steel construction" in Chicago), for the same reason, and while no case of encroachment and consequent damages collected can be here cited, the point is one in which due caution should be exercised.

* * *

VANCOUVER will have an example of a properly conducted architectural competition in that arranged for securing an architect for the new city police headquarters. A. A. Cox, F.R.I.B.A., has been engaged as assessor to prepare the competition programme and doubtless will also act as advisor in judging the competition. The successful architect will receive a commission of five per cent. upon the completed $175,000 structure; and second, third and fourth prizes of three, two and one hundred dollars will be awarded. It might be intimated for the education of the scribe who states in the News-Advertiser that "they do not necessarily bind themselves to follow his (the assessor's) recommendations in regard to the plans selected," that if the programme (which is the invitation to compete) does not give the work to the successful architect the good ones will stay out, and if architects accept it by entering plans the programme is a contract, and can be enforced in the courts. That "goes" in the United States and ought to be good law in Canada.

* * *

THE LARGEST water supply enterprise yet planned in Canada is reported from Saskatchewan. A combination of interests, including the Province, the Grand Trunk Pacific, Canadian Pacific and Canadian Northern Railways, are considering the diversion of the south Saskatchewan River to supply pure water to Regina, Moose Jaw, Weyburn and other cities of the province. It is estimated that three hundred million gallons will be available without detracting greatly from the flow of the river, and about thirty thousand horse power can be developed. The work, which is estimated at twenty-million dollars, will include a dam and a distributing system. As pure water for cities is worth all it costs, there can be no doubt of the value of this undertaking to the building up of the provinces.

* * *

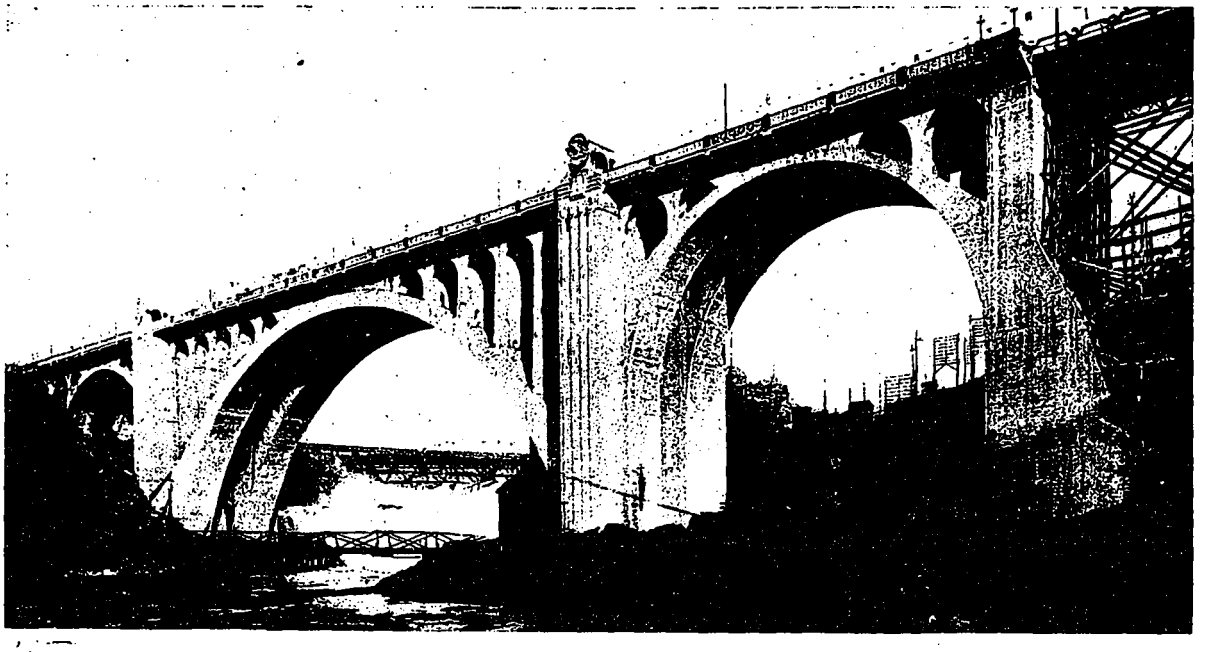
A PROVISION in the Regina building law in the interest of safe construction makes it obligatory on the part of the contractor to obtain a certificate of inspection on all buildings before the lathing is commenced. The following is the clause in the by-law: "When ever any building is ready to lath, the owner, contractor, or other person in charge of the work, shall notify the inspector of such fact, giving the number of the building permit under which work is being performed; and it shall be the duty of the inspector within three calendar days after receiving such notice, to inspect the building and ascertain whether or not firestops, bridging, chimneys, fire places, and other parts have been constructed in accordance with the provisions of this by-law, and no lathing shall be done on such building within three calendar days after the giving of the notice above provided for, unless the building has been previously inspected and approved by the inspector."

* * *

THE WARNING given by CONSTRUCTION to the Minister of Education for British Columbia, that the inadequate competition programme for the provincial university would result in mediocre buildings, caused the programme to be amended in the particulars that were most objectionable. CONSTRUCTION has been notified by the Education Office that (1) The time for sending in the plans has been extended to November 1st, 1912; (2) Any architect who was actually practising in the Dominion on the 21st February, 1912, when notice of the competition was made public, may be a competitor; (3) The assessors will be the Minister of Education, the President of the University, the Chairman of Convocation, two British Columbia architects not competing, and Mr. W. T. Caroe, of London, England.

* * *

LONDON is to have a new building ordinance and a new building inspector, whose duty it will be to see the law carried out. It will appoint a "practical builder" rather than an architect, and will pay one thousand dollars a year for the service, one hundred dollars a month being deemed extravagant. London is supposed to be a city, as it has a mayor and aldermen, but it has much advancement to make before it emerges from the village class. Its wise men rank with those of the Toronto Horticultural Society, who favored "a nice bright Canadian boy" rather than a professional landscape engineer for the office of park superintendent. And yet important structures are being erected in London and the lives and property of the people are placed in the hands of a "practical builder" who will do the work for a thousand dollars a year when he could earn more shingling roofs. The objection is not against the builder, architect or business man that may be appointed, but the evident ignorance of the necessity for an inspector possessed of a high order of experience and knowledge of all forms of architectural work. London had better save the thousand dollars and trust to her architects and builders to do their work according to usage and the ordinances.



The Monroe Street Reinforced Concrete Bridge at Spokane, Washington.

A PROPER TYPE OF REINFORCED CONCRETE BRIDGE

A combination of reinforced concrete bridge engineering, architectural design, and civic energy, produces an exceptional bridge at Spokane, Washington.

THE Monroe street bridge of Spokane, Washington, which is shown in the photograph, reproduced through the courtesy of Municipal Engineering, is remarkable for a number of features. It has one of the largest monolithic concrete arches in the world; it was constructed in record time by the city and under the day labor system, and it possesses a beauty of design seldom found in the larger bridges.

In 1907 the plans for the proposed bridge were prepared by Charles McIntyre, who was then city engineer, but construction was started under direction of City Engineer J. C. Ralston. The structure which this bridge replaced was a steel bridge, which became so weakened under traffic that it was found necessary to remove the street railway tracks before the bridge was finally abandoned. All the plans and drawings were made in the city engineer's office, and great credit is due to that department for the choice and execution of the design.

All the preliminary work upon the bridge was done under direction of Mr. Ralston, but owing to the fact that other bridge work interfered, the actual construction was not begun until Morton Macartney became city engineer. Mr. Macartney had been first assistant under Mr. Ralston. Professor Wm. H. Burr, instructor in civil engineering at Columbia University, checked the plans before construction work started.

The main arch of the bridge is of monolithic concrete, 281 feet in length, and the over-all length is 784 feet. A wooden trestle approach, shown at the right of the photograph, will later be replaced by an earth fill. With the trestle approach, the entire length is 965 feet.

The clear height above the water is 130 feet; the width over all is 68 feet, carrying two 9-foot sidewalks and a 50-foot roadway. The sidewalks are supported on cantilevers capable of supporting a dead load of 500,000 pounds at the centre of the arch. The floor system is of steel, incased in concrete. About 25,000 cubic yards of concrete were used in the job.

The main arch is of the turn-ribbed segmental style. The rise of the intrados is 113 feet 9 inches, and the width of the ribs at the crown is 16 feet, flaring to 19 feet 9 inches at the haunches. The thickness at the crown is 6 feet 9 inches. The smaller arches are constructed of two segmental spans, 120 feet long, with four ribs, each 6 feet wide by 3 feet 3 inches thick at the crown, and are connected in pairs by a 6-inch soffit wall. The spandrel and north arches are semi-circular, with spans 17 to 17 feet 6 inches, with spandrel columns 3 feet 6 inches thick.

The roadway is handsomely finished by a decorative railing and by archways which are placed over the sidewalk on both sides, at the two piers. These arched stations are attached to the walls of the stations on the sidewalk side, and on the roadway sides are modeled concrete buffalo skulls. Ornamental lighting standards are placed along the roadway on both sides, spaced 8 feet apart. These poles support white ball globes and tungsten lamps. The driveway is paved with wood blocks treated with carbolineum.

As was stated, the bridge was constructed under the day labor system. Owing to the fact that the cost of labor in all lines was greatly increased shortly after the start of the job, the estimate fell far short of the actual cost of the bridge. The labor cost

alone was $220,723, the greater part of which was paid for carpenters upon the form work. When the different classes of labor raised their prices, the carpenters increased theirs from $3.50 to $5, so that some idea may be gained of the difference which was made between the estimate and the cost, due to the increased scale.

The preliminary construction was carried on by means of aerial tramways, and later a wooden trestle was constructed. The collapse of this trestle, and the consequent injury to a number of workmen, led to the planning and construction of a steel false work, by means of which the main arch was completed. The cost of this steel trestle was about $40,000, but as it may be used in constructing future bridges, its price was not a total loss. A unique feature of the construction was the method adopted of separately completing each segment in the arches before putting them in place, which is a departure from the customary method of building the molds and then filling in the concrete.

The net cost of the bridge, after credits have been made for machinery and supplies on hand, is $487,000, and the gross cost was $535,000. The time of construction, excluding delays, was twenty-three months.

TECHNICAL SCHOOL COMPETITION

Programme under which the Toronto Board of Education secured a design through a competition between representative Canadian Architects.

CONSTRUCTION would like to call attention to the programme as well as the drawings, in the Toronto Technical School competition, as it illustrates the excellent results obtained through a thoroughly organized competition along professionally approved lines. Seventeen architects accepted the programme conditions and presented competitive drawings. The competition was won by Ross & MacFarlane, of Montreal; Brown & Vallance, of Montreal, taking second, and Charles S. Cobb, of Toronto, third prize. The conditions of the competition as set forth in the programme, are as follows:—

CONDITIONS FOR THE COMPETITION FOR THE SELECTION OF AN ARCHITECT FOR THE TECHNICAL SCHOOL BUILDING IN THE CITY OF TORONTO.

TERMS OF THE COMPETITION.

Promoters.—1. With the approval of the Board of Education of the City of Toronto, the Advisory Industrial Committee are the Promoters of this Competition.

Restriction.—2. The Competition is restricted to Architects or firms of Architects practising in Canada.

First Prize.—3. The first prize in this competition shall be the commission for designing and superintending the erection of the proposed building at such time as it shall be proceeded with, on the usual terms and as hereafter set forth. One thousand dollars shall be paid to the winner within fifteen days of the announcement of the award, the sum being merged in the amount of the Commission when the work goes on.

Other Prizes.—4. The authors of the designs placed second and third in order of merit by the Assessors shall receive the sums of eight hundred dollars ($800.00) and five hundred dollars ($500.00) respectively within fifteen days of the announcement of the award.

The Assessors.—5. The Board of Assessors consists of the following:

Dr. A. C. McKay, Principal of the Toronto Technical School.

Mr. Percy E. Nobbs (Nobbs & Hyde), Professor of Architecture, McGill University, Montreal.

Mr. A. Frank Wickson (Wickson & Gregg), President of the Ontario Association of Architects, Toronto.

The award of the Assessors shall be accepted by the Promoters.

The Professional Assessors are responsible for the conditions herein set forth.

In reporting the award the Professional Assessors may make such recommendation to the Promoters as to improvements in the winning scheme as their study of the problem may suggest, but any suggestion subsequent to the award report which the Professional Assessors may furnish shall be given as honorary advice.

The Award—6. The award shall be made within twenty (20) days of the date set for the sending in of the drawings. The drawings shall be exhibited in Toronto with the names of the authors marked thereon for three or more days immediately subsequent to the award. All drawings shall be returned to the Competitors immediately on the close of the exhibition.

Intention.—7. The Promoters desire to receive in this competition a carefully studied general scheme, intelligently illustrated in the competition drawings, the execution of which would realize the requirements hereinafter set forth.

One Scheme Only.—8. No competitor shall submit more than one scheme for the solution of the problem in this competition.

In the event of the results of the competition tending to show that the sum available is inadequate to provide the accommodation required, the Assessors will give due consideration to plans involving in their opinion an expenditure in excess of the sum herein named.

PREPARATION AND DELIVERY OF COMPETITION DRAWINGS.

Drawings Required.—1. The following are the drawings required and no others are to be submitted:

(a) Block plan 1′=1/32″ scale.

(b) Floor plans for each storey and roof plan, 1′=1/16″ scale.

(c) Sufficient sections to clearly illustrate the scheme proposed, 1′=1/16″ scale.

(d) Elevations to illustrate the scheme proposed, 1′=1/16″ scale.

(e) A perspective drawing showing a view of the proposed building from the S.W. set out to 1′=1/8″ scale at the nearest corner with the horizon line taken eight (8) feet above the ground level.

Rendering.—2. The drawings shall be rendered as follows: All drawings shall be on white paper mounted on linen or calico. Each competitor's set of drawings is to be on sheets of uniform size with moderate margins. Two plans, sections or elevations, are preferred on one sheet for the convenience of the assessors. The plans and sections shall be rendered in India ink (black and watered) with walls blacked in solid. The elevations shall likewise be rendered in India ink, and watered ink; pencil and lamp black wash may be used at will to present work on different planes. openings, shadows. and the textures of materials in elevation and section drawings.

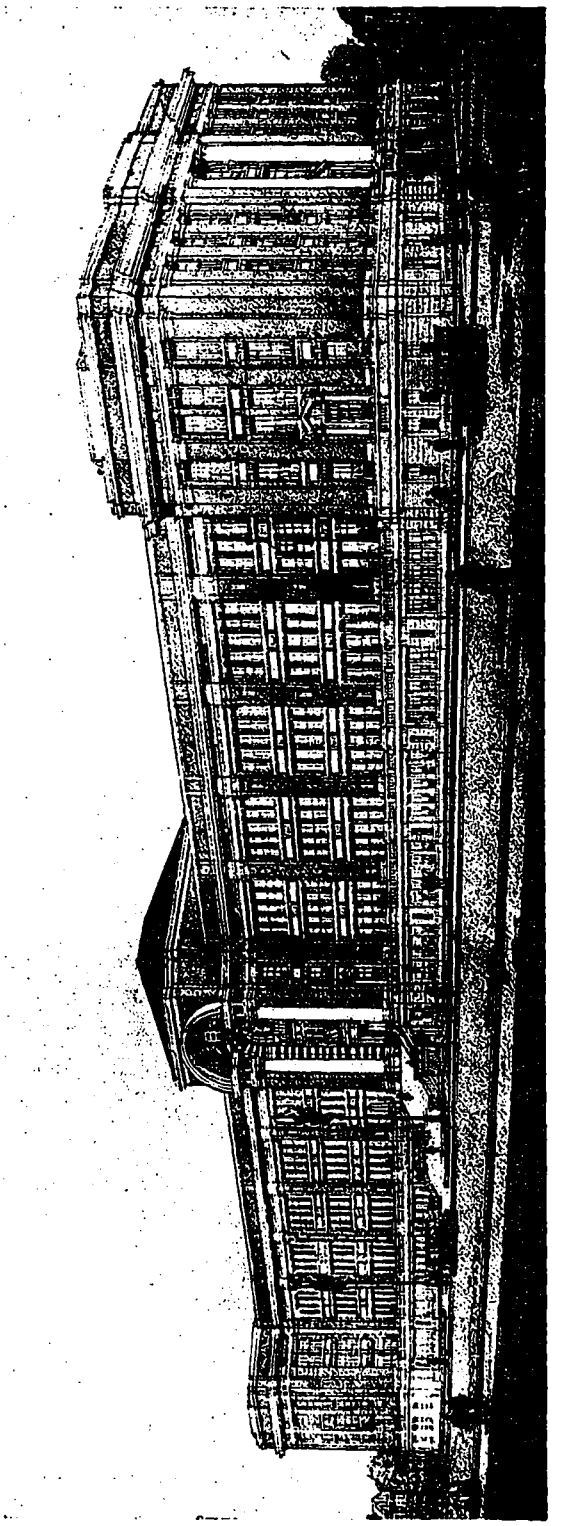
The perspective drawing may be rendered in pen and ink, in pencil or in monochrome wash.

All rooms and corridors shown on the plans shall be figured for dimensions and area.

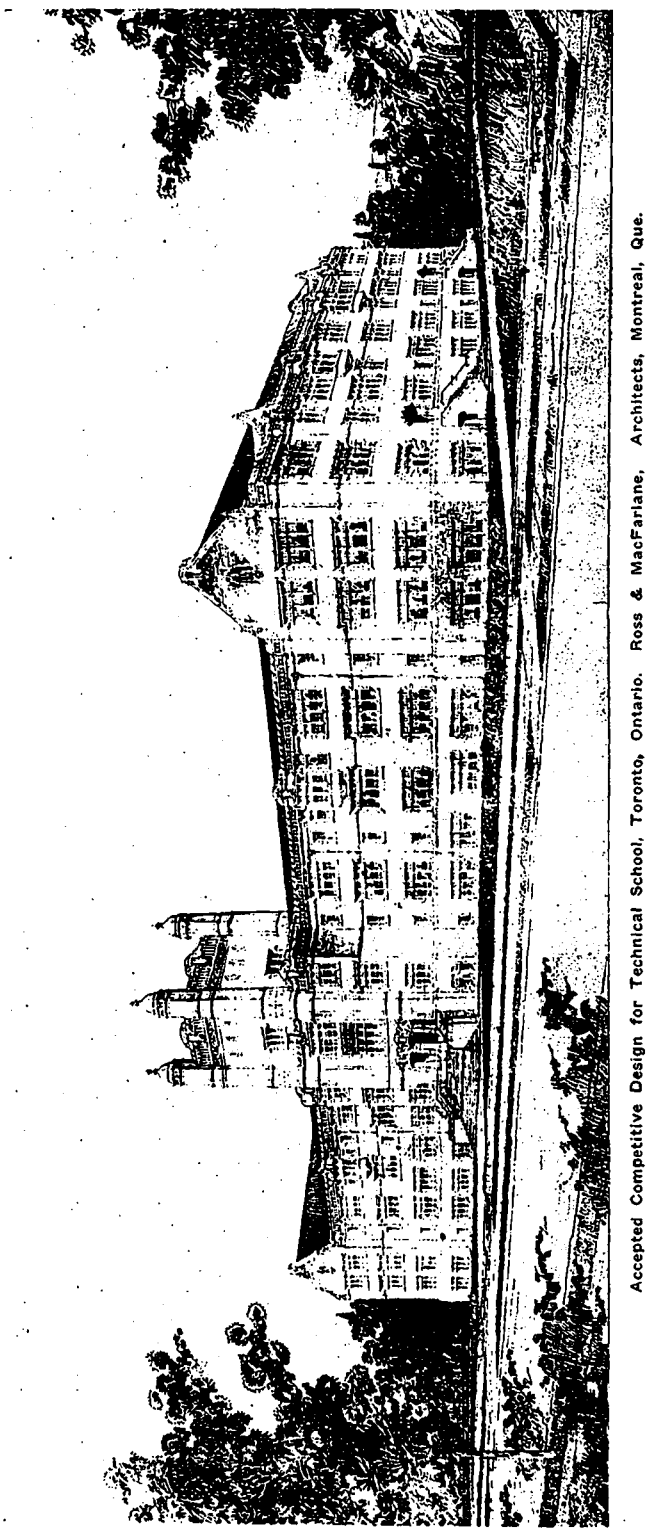
The titles of the drawings shall be in Roman capitals; all other lettering, notes and figures shall be in plain block type.

The drawings shall be sent in a plain portfolio.

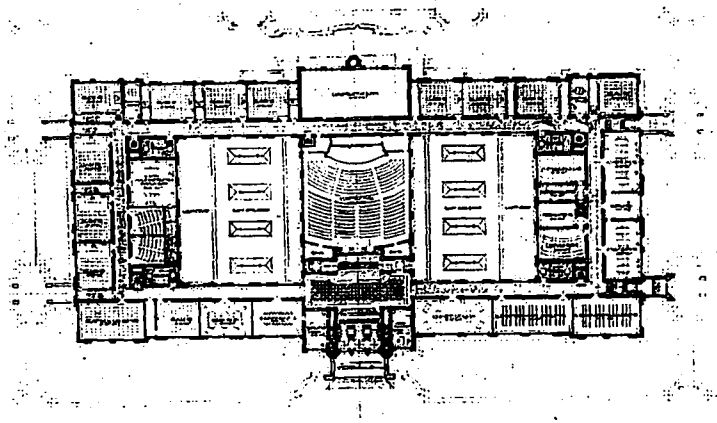
Statement of Cube.—3. The competitors shall submit with



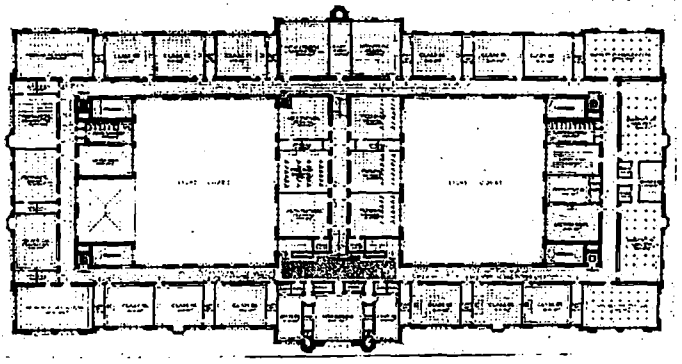
Third Prize Competitive Design for Technical School, Toronto, Ontario. Charles S. Cobb, Architect, Toronto.



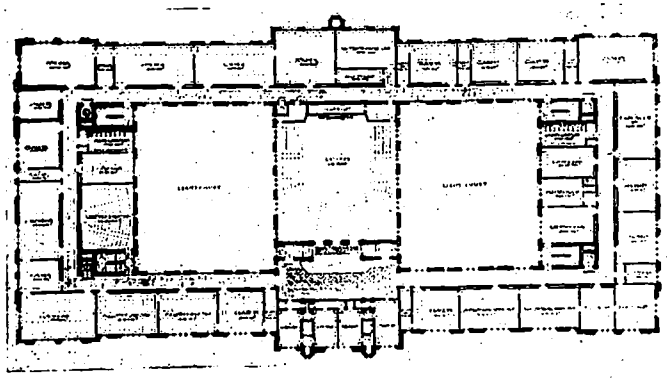
Accepted Competitive Design for Technical School, Toronto, Ontario. Ross & MacFarlane, Architects, Montreal, Que.



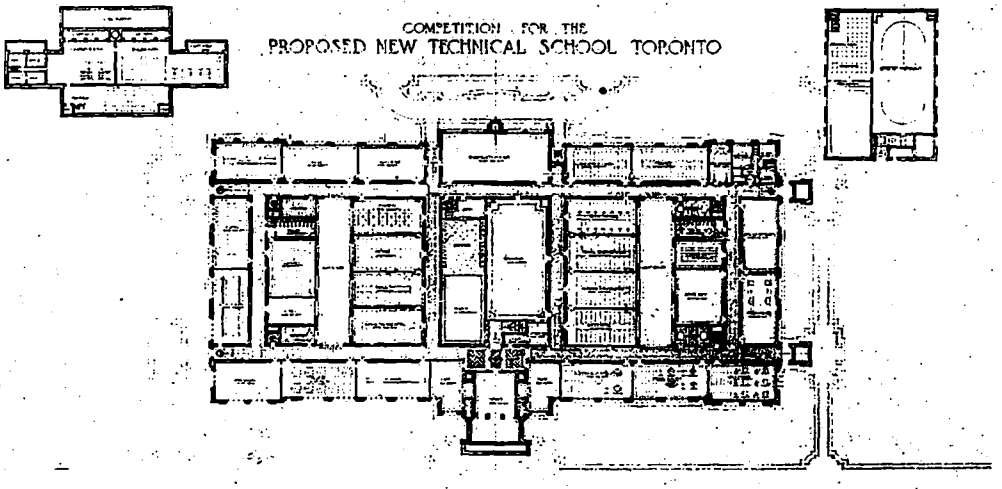
FIRST FLOOR PLAN



Third Floor Plan.

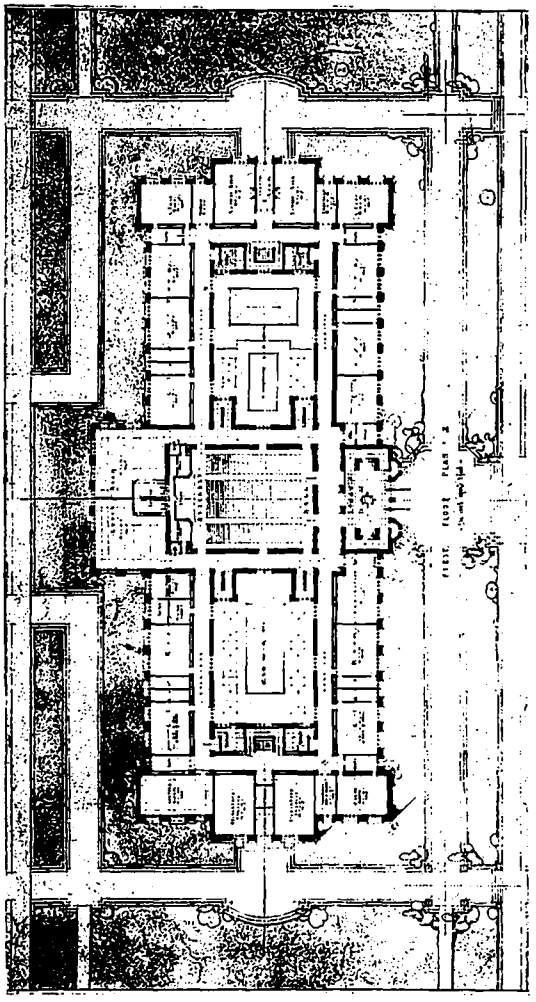


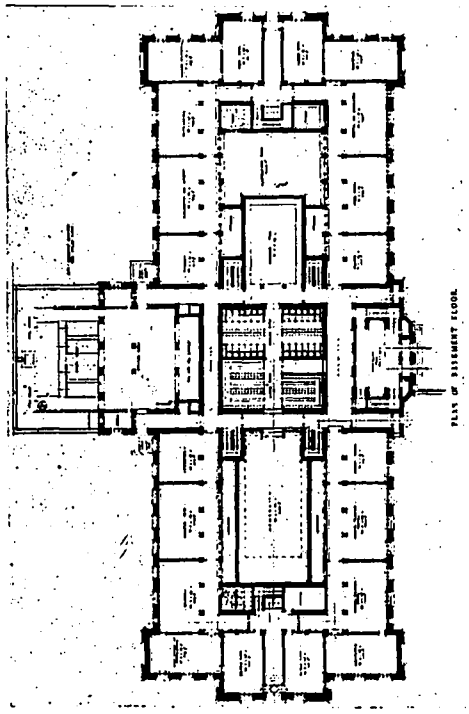
Second Floor Plan.

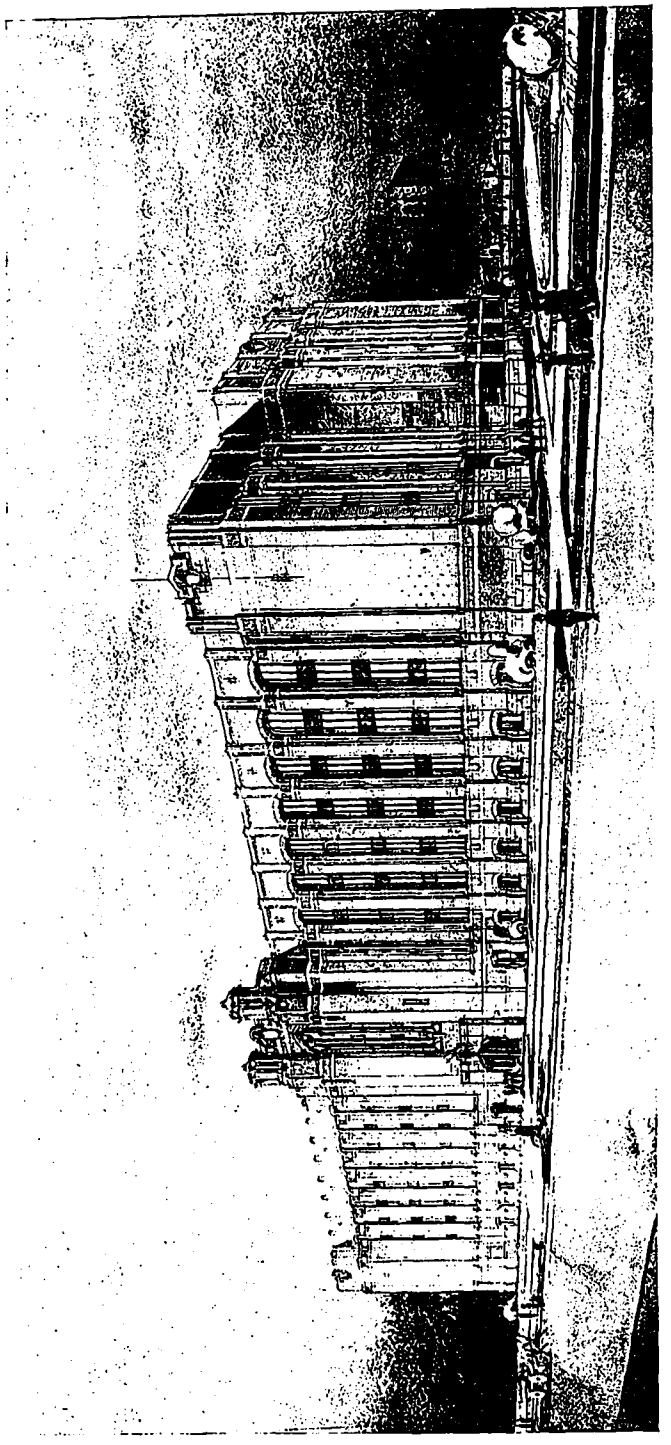


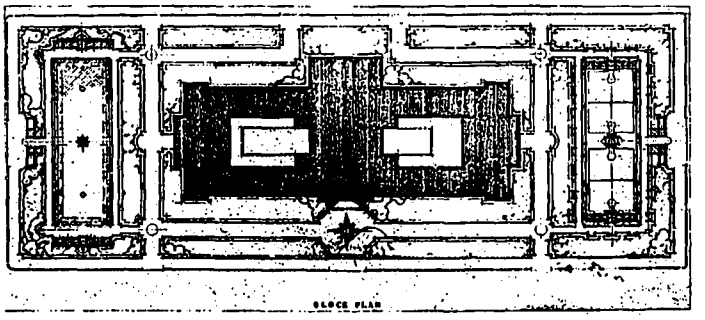
GROUND FLOOR PLAN

Plans of Accepted Competitive Design for Technical School, Toronto, Ontario. Ross & MacFarlane, Architects, Montreal, Que.

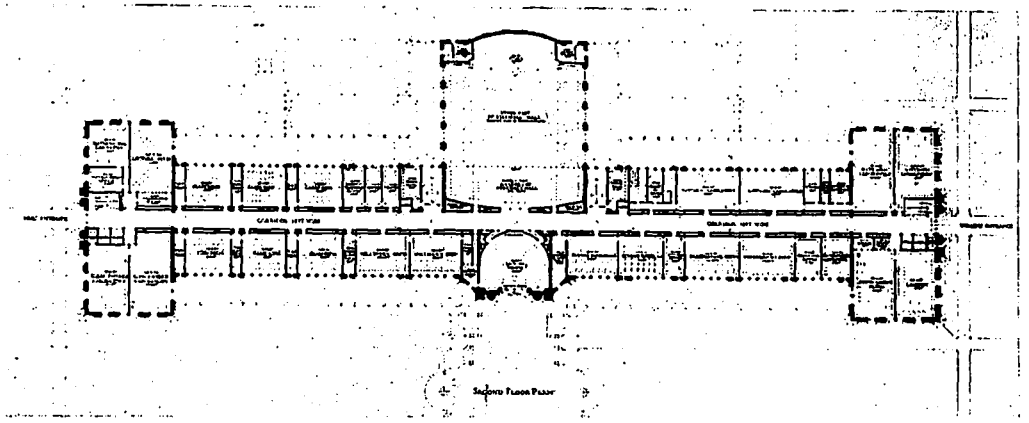


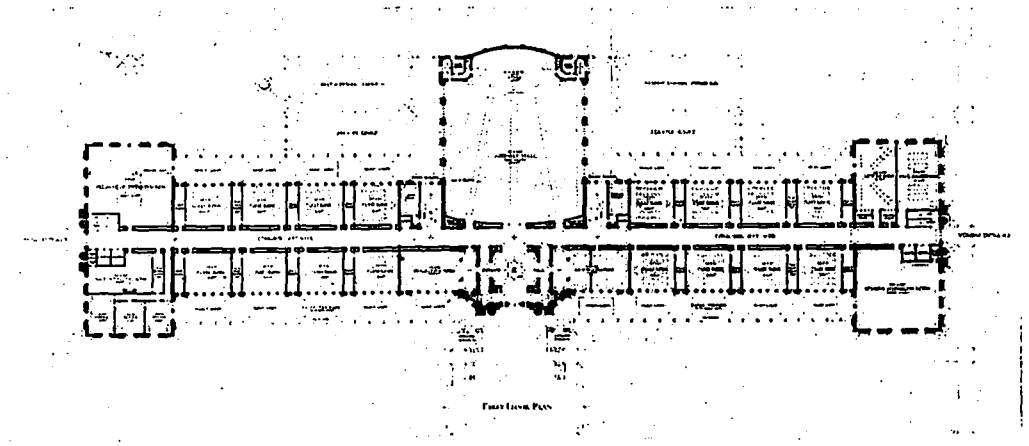


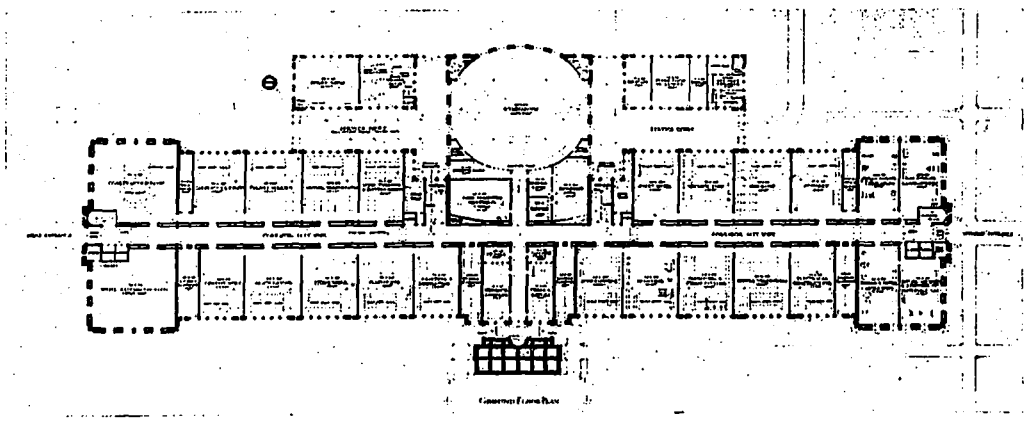




Second Prize Competitive Design and Plans for Technical School, Toronto, Ontario. Brown & Vallance Architects, Montreal, Que.







Plans of Third Prize Competitive Design for Technical School, Toronto, Ontario.
Charles S. Cobb, Architect, Toronto.

the drawings a brief, typewritten, unsigned statement of the cubic contents of the whole building, with explanations of the method followed in working out the cubic contents and an explicit statement of the rate at which the various floors of the building are estimated to cube, together with the total cube and the total cost. No description of the planning or construction is required in this statement.

Name of Author.—4. The drawings must have no mark, device, ornamental frame lines, handwriting or other means of identification of authorship. With each set of drawings there is to be enclosed a blank sealed envelope containing the name of the author, together with a statement that the design and *all the drawings* have been prepared on his own premises under his personal supervision. These envelopes will not be opened till the award has been made.

Disqualification.—5. Any infringement of these regulations or disclosure of identity of authorship to the assessors, individually or collectively, shall be held sufficient ground for exclusion from the competition.

Questions.—6. Intending competitors are advised to inform Dr. McKay of their addresses in order that any further information published, bearing on this competition may be furnished to them. All questions asked by competitors must be addressed to Dr. A. C. McKay, Principal, Technical High School, Toronto, within fifteen (15) days of the date of issuing these conditions, and all questions asked, together with the answers of the professional assessors, shall be sent to all known competitors within ten (10) days thereafter.

Date for Sending In.—7. The drawings and the statements, as called for in clause 3 above, shall be enclosed in a sealed envelope containing the competitor's name, shall be again enclosed in a second sealed covering, addressed and delivered by express to Dr. A. C. McKay, Principal, Technical High School, Toronto, between 9 a.m. and noon on Saturday, June 15th, 1912.

Architect to Revise Scheme as Required.—1. The Architect who shall be awarded the work shall, if required, make such changes in his competition plan as shall be necessary to meet the views of the Advisory Industrial Committee.

The Architect's Services.—2. After the plans have been finally accepted by the Advisory Industrial Committee, the Architect shall prepare working drawings and specifications and shall supervise the construction of the building. Subject to the approval of the Advisory Industrial Committee, he shall have control of all matters of arrangement, design and execution.

Drawings and Specifications.—3. All drawings and specifications as "instruments of service" shall remain the property of the Architect, but one record copy on tracing linen of the contract drawings, together with a set of specifications, all amended to correspond with the work as carried out, shall be furnished to the Advisory Industrial Committee on the completion of the work.

Clerk of Works.—4. The Architect shall appoint a Clerk of Works approved by the Advisory Industrial Committee. The Architect shall regulate the duties of the Clerk of Works and shall have power to discharge him for cause. The Clerk of Works shall devote his whole time to the works, and shall be paid by the Advisory Industrial Committee.

The Engineers and the Architect.—5. The Advisory Industrial Committee shall appoint a professional Engineer or Engineers to instal the power, mechanical equipment, heating, ventilating, illuminating, plumbing and other appliances, and the fees for such engineering entailing advice, drawings, specifications and superintendence of the installation, shall be paid by the Advisory Industrial Committee. The Architect shall consult with the Engineers on the general lay out of their equipment and the construction of the ducts, foundations and other matters incorporated in the Architect's drawings and specifications.

The Architect shall receive 2½ per cent. commission on the cost of all the contracts for the aforementioned engineering work as a recompense for his services in consulting with the Engineers and meeting their requirements in the arrangement of the building, as shown on his plans and described in his specifications. The engineering work is estimated meanwhile to cost about one hundred thousand dollars.

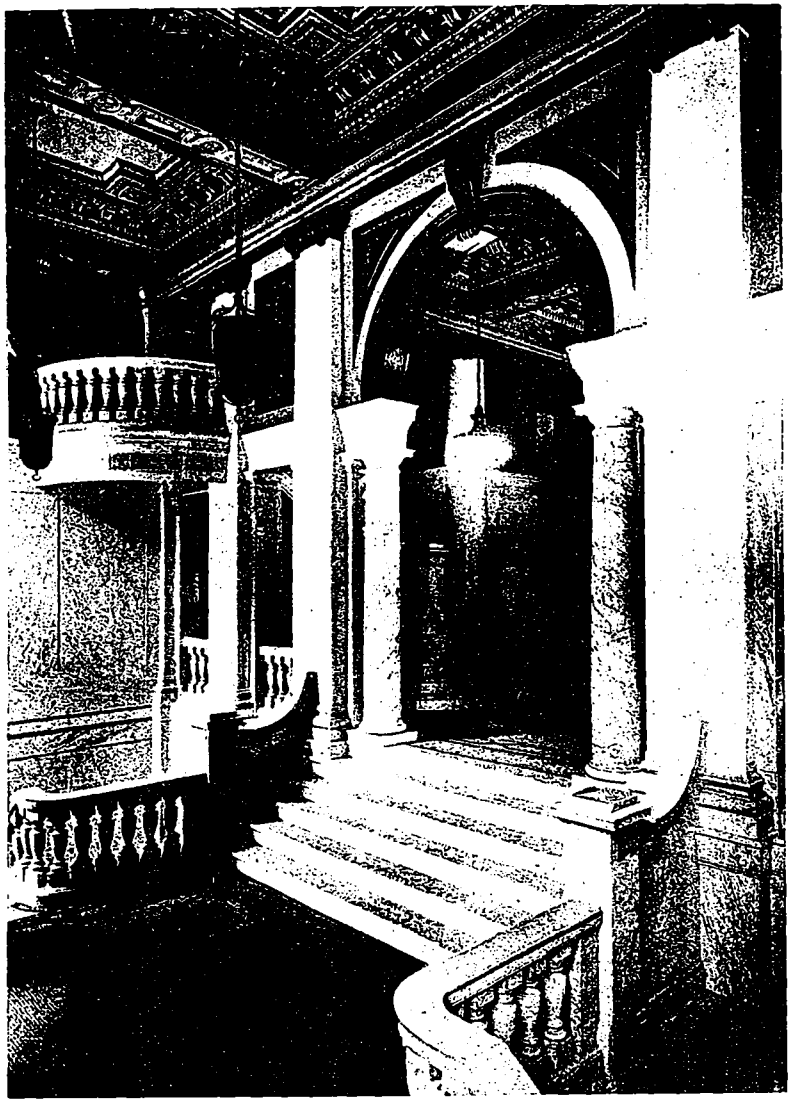
Architect's Commission.—6. The Architect shall receive for his services the usual commission of 5 per cent. on the whole cost of the building proper, as distinct from the engineering work above described. The equipment of the building will be arranged for directly by the Advisory Industrial Committee. The sum at the disposal of the Advisory Industrial Committee for the building proper is seven hundred thousand dollars ($700,000.00).

OTHER ILLUSTRATIONS

THE SUBURBAN residence illustrated, designed by Charles P. Band, Toronto, is a combination of brick with stucco and half timber in the gables, somewhat restless in design, yet showing an evident intention to provide for comfort and convenience in the plan. Since the word "stucco," once expressive of a plaster of paris mortar applied as a surface to the brick or stone wall has become synonymous of any plaster or cement surface, it is well to explain that now it usually indicates a cement plaster applied to wire lath and finished in any manner of surface or color the design may call for. The dining room has a broad bay window facing the south, and another window fronting the west, which give a generous sunlight throughout the day, while a luxurious fireplace and tiled mantel at one side, speaks of firelight comfort in the evenings. A unique feature is the large space given to the hall, with its raised alcove adjoining the stairway, with cushioned seats and bay window, giving a general welcoming homelike effect that adds much to the attractiveness of the interior.

THE HEAD office building for the Toronto General Trusts Corporation, Toronto (George W. Miller, Architect), is planned to accommodate a general trust business in which it acts as general financial agent with a safe deposit vault department for the security of valuables. The building is eight stories in height, designed in renaissance style, the exterior executed in Doulton Terra Cotta. The three lower floors are devoted to the business of the Corporation, and the five upper floors occupied by legal and financial firms. In the design and plan of the interior, not only the strength and elegance of the material used, but the plan is complimentary to the purposes of the building. On the first floor are the general offices and the manager's and secretary's rooms, the latter occupying positions at either side of the entrance. There is a broad vestibule executed in white veined marble, from which marble stairways lead to the security vaults below and to the board room and accounting department on the second floor. Contractors for masonry, Page & Co.; steel work, Hamilton Bridge Co.; carpentry, J. McKenzie; plastering, R. C. Dancy; ornamental iron, Canada Foundry; iron stairs, Canada Ornamental Iron Co.; painting, Linington; roofing and galvanized iron, A. Matthews; terra cotta, Doulton Co.; tiling, J. L. Vokes Hardware Co.; heating, plumbing, ventilating and wiring, Bennett & Wright Co.; marble, Hoidge Marble Co.; vaults and safes, J. & J. Taylor; electric fixtures, Sterling Bronze Co.; elevators, Otis-Fensom Co.; hollow tile, National Fireproofing Co.

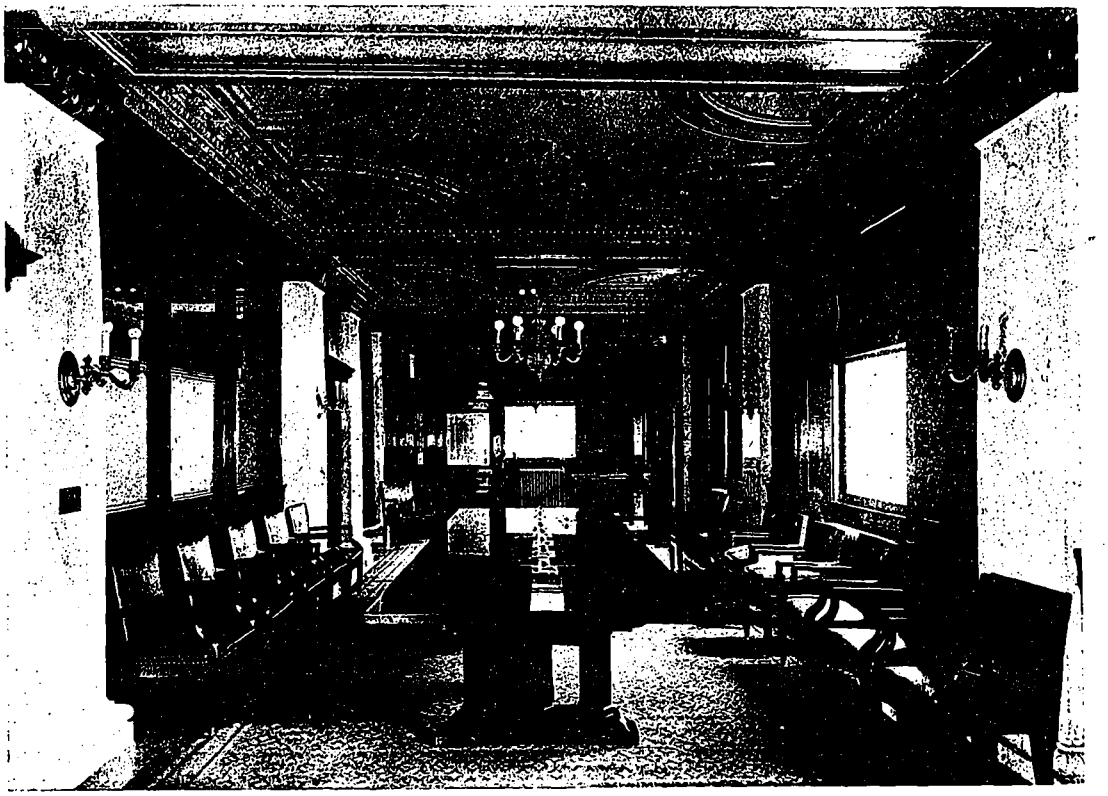
Toronto General Trusts Corporation Building, Toronto, Ontario. George W. Miller, Architect.



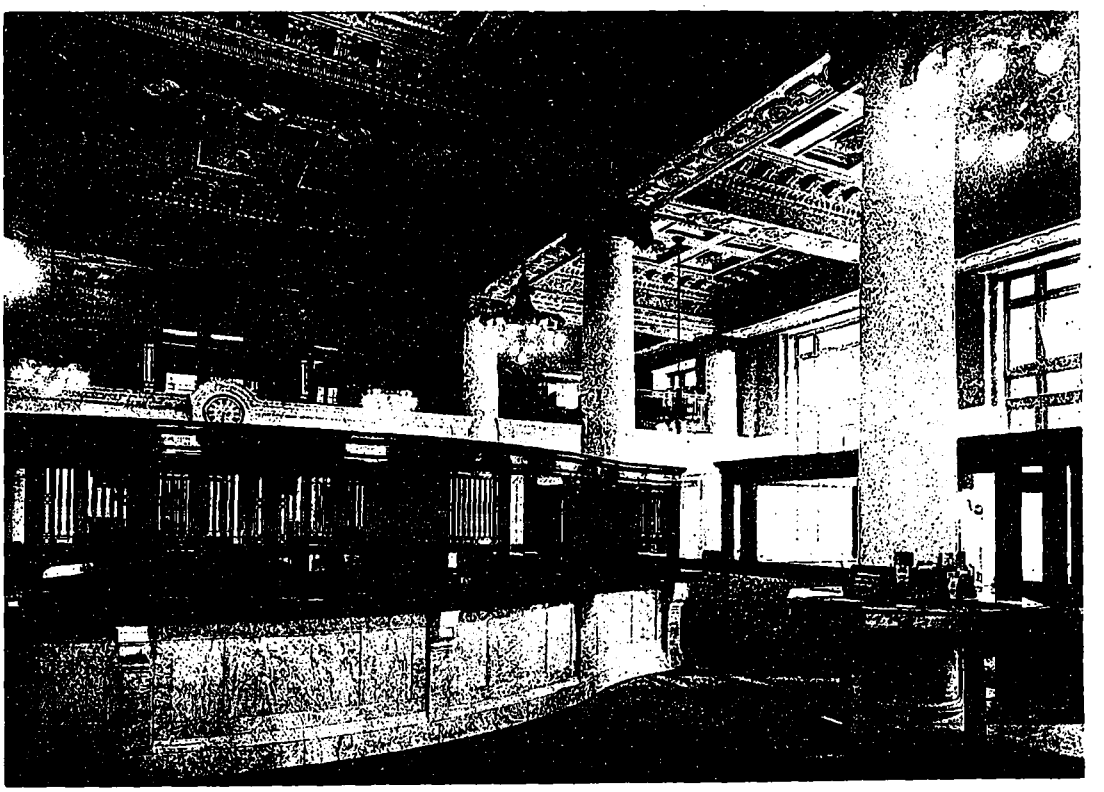
Entrance.

Vestibule Stairway.

Toronto General Trusts Corporation Building, Toronto, Ontario. George W. Miller, Architect.

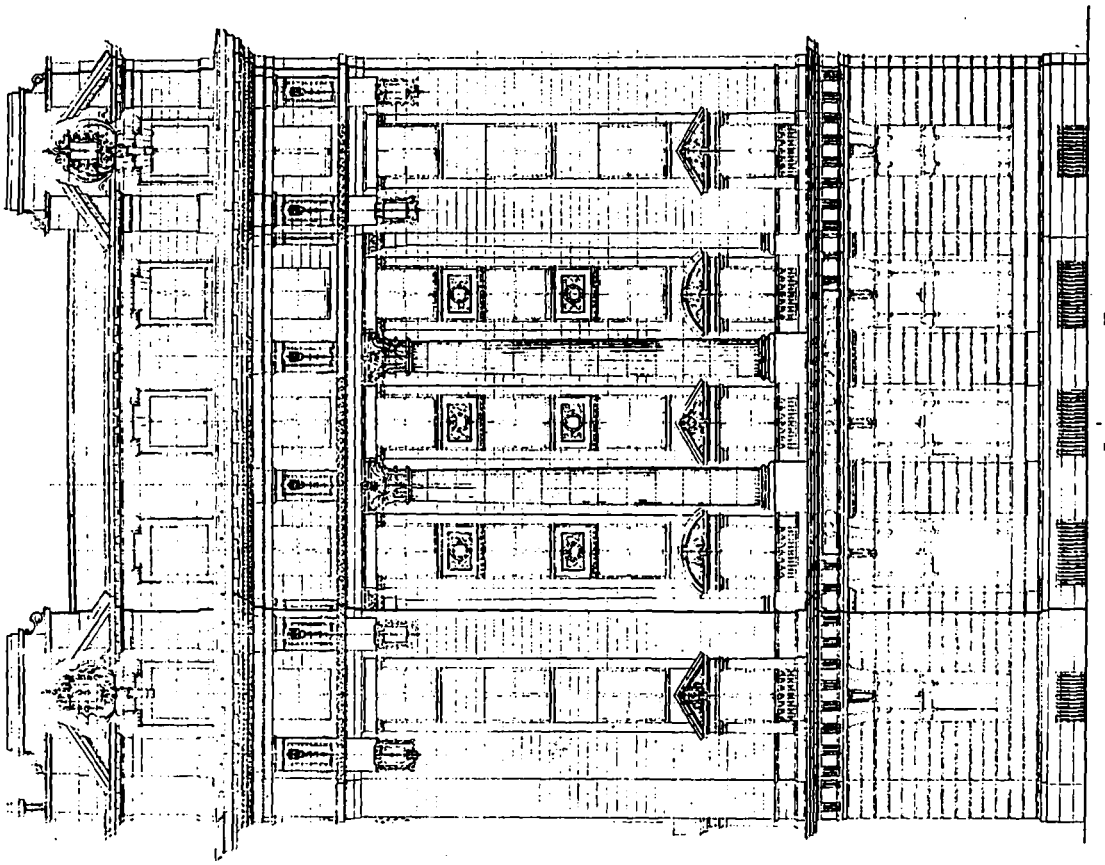


Board Room.

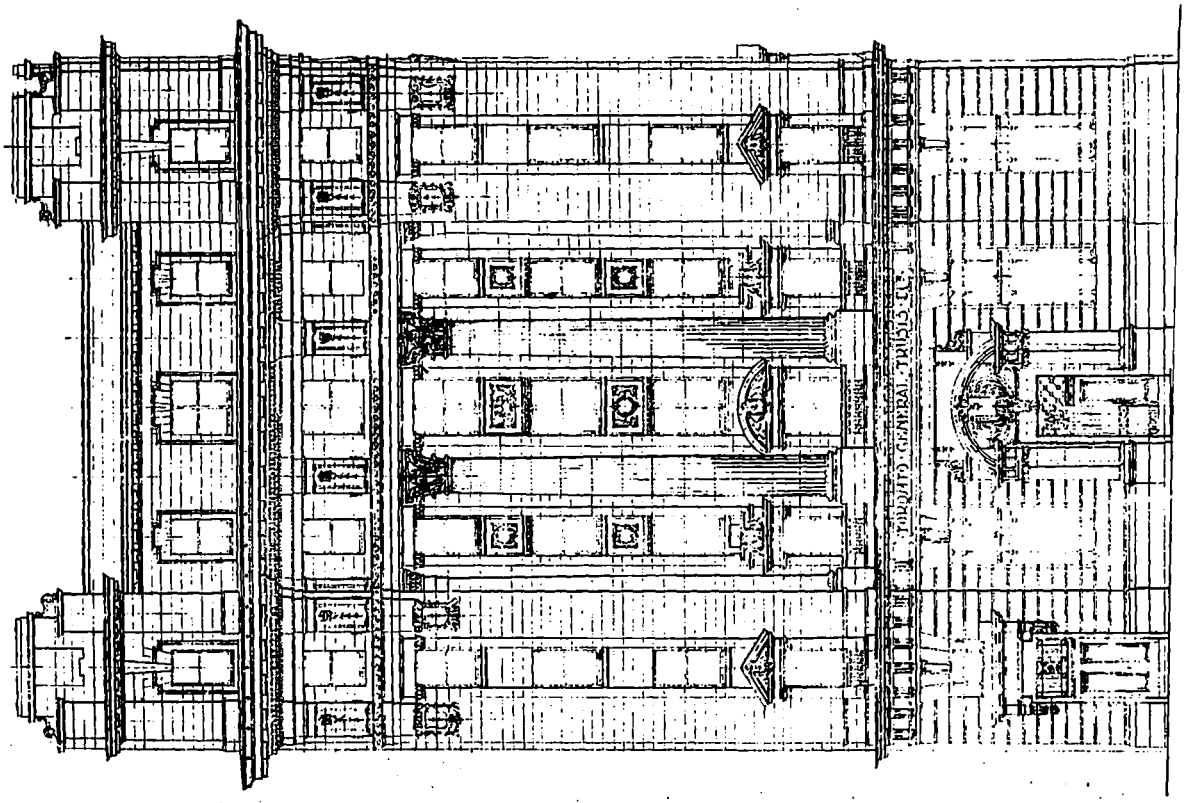


General Offices.

Toronto General Trusts Corporation Building, Toronto, Ontario. George W. Miller, Architect.

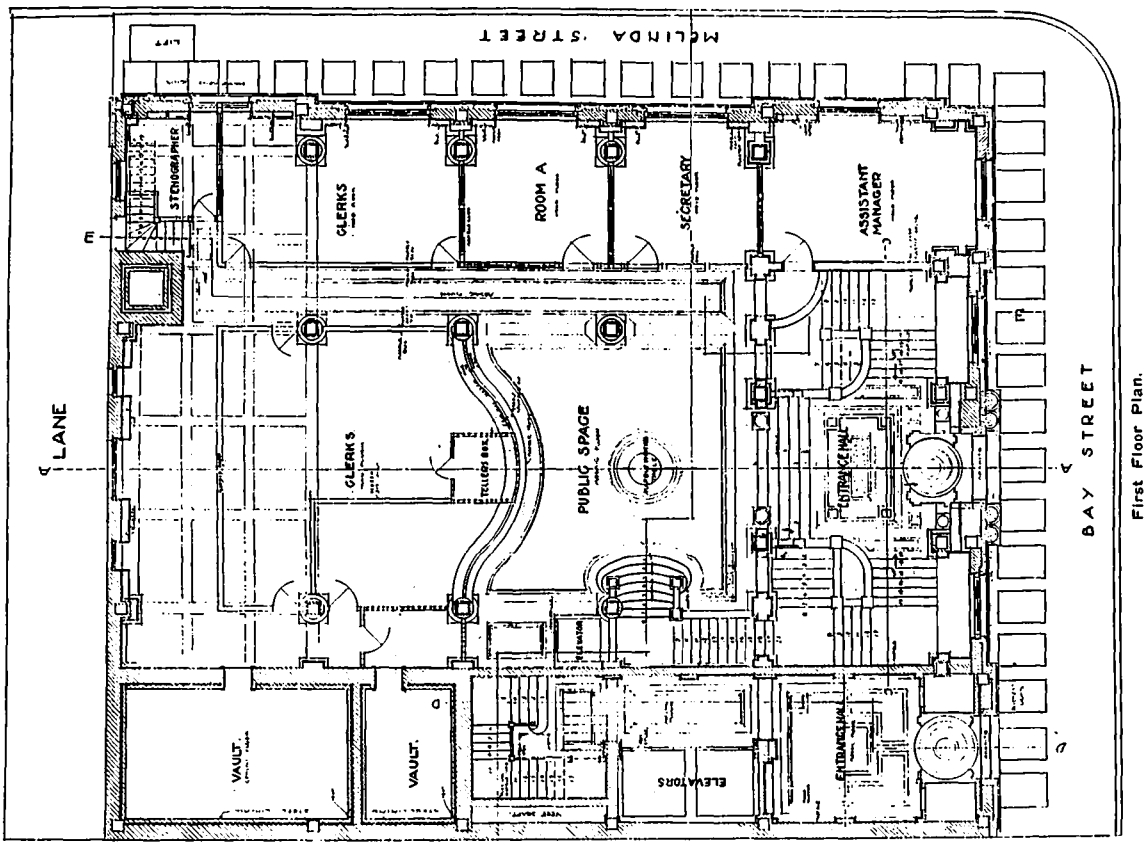


Elevation on Melinda Street.

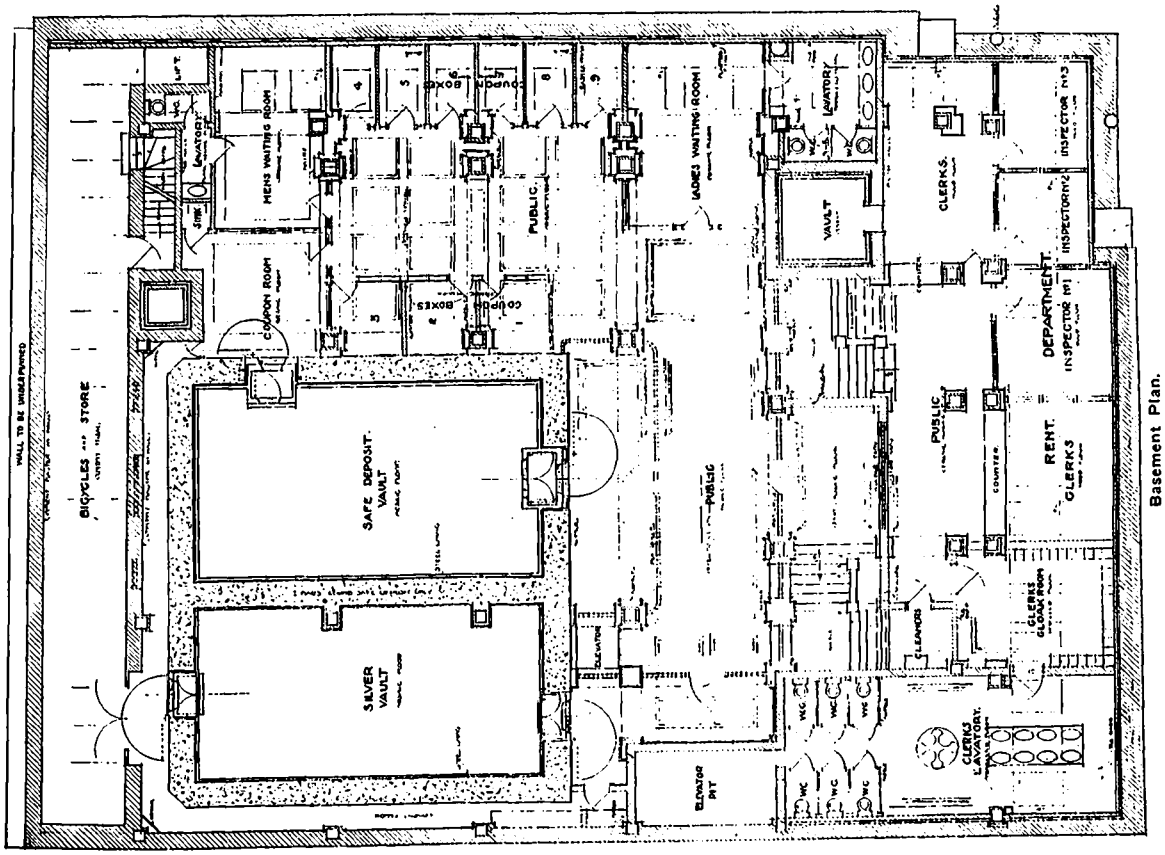


Elevation on Bay Street.

Elevations of Toronto General Trusts Corporation Building, Toronto, Ontario. George W. Miller, Architect.

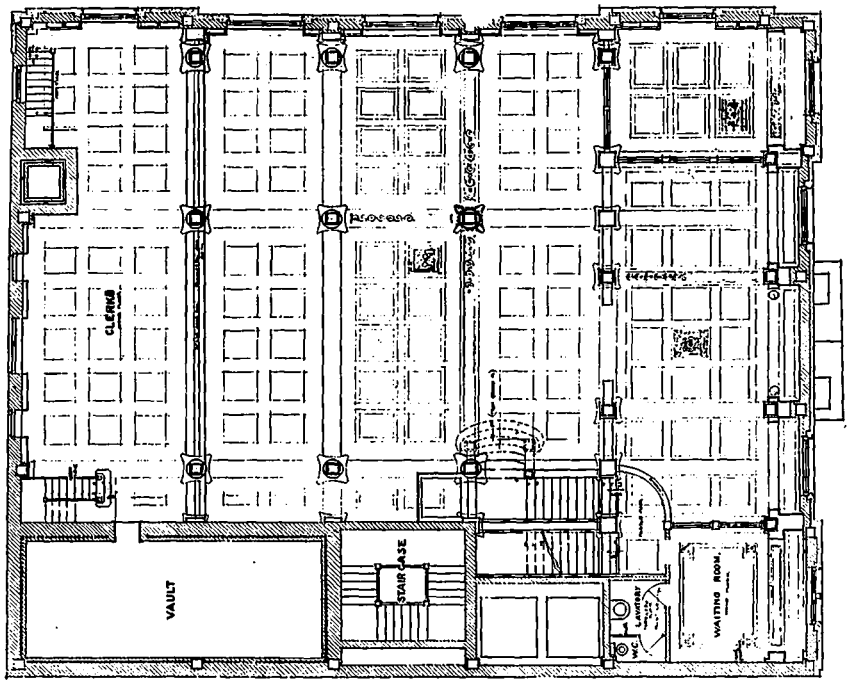


First Floor Plan.

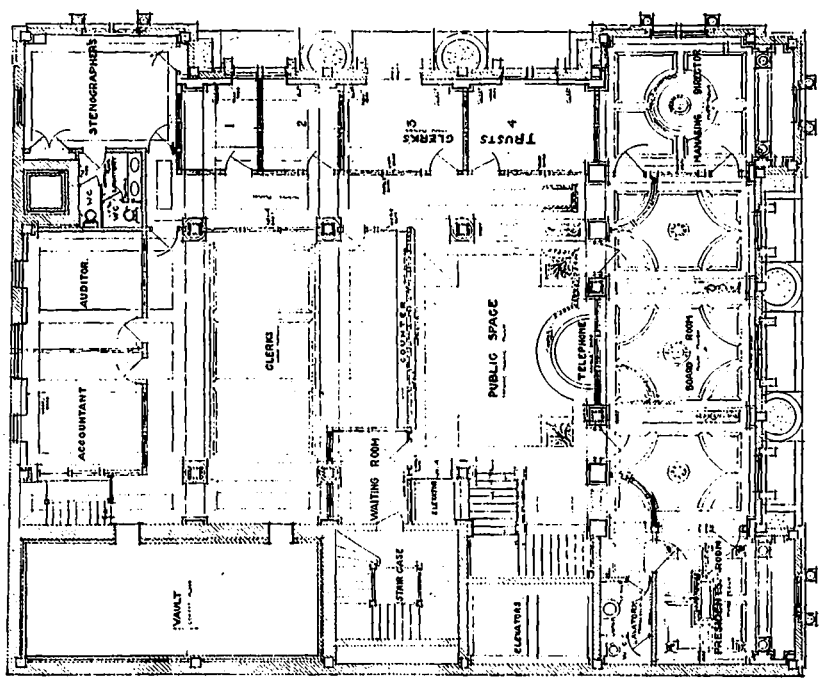


Basement Plan.

Plans of Toronto General Trusts Corporation Building Toronto, Ontario. George W. Miller, Architect.

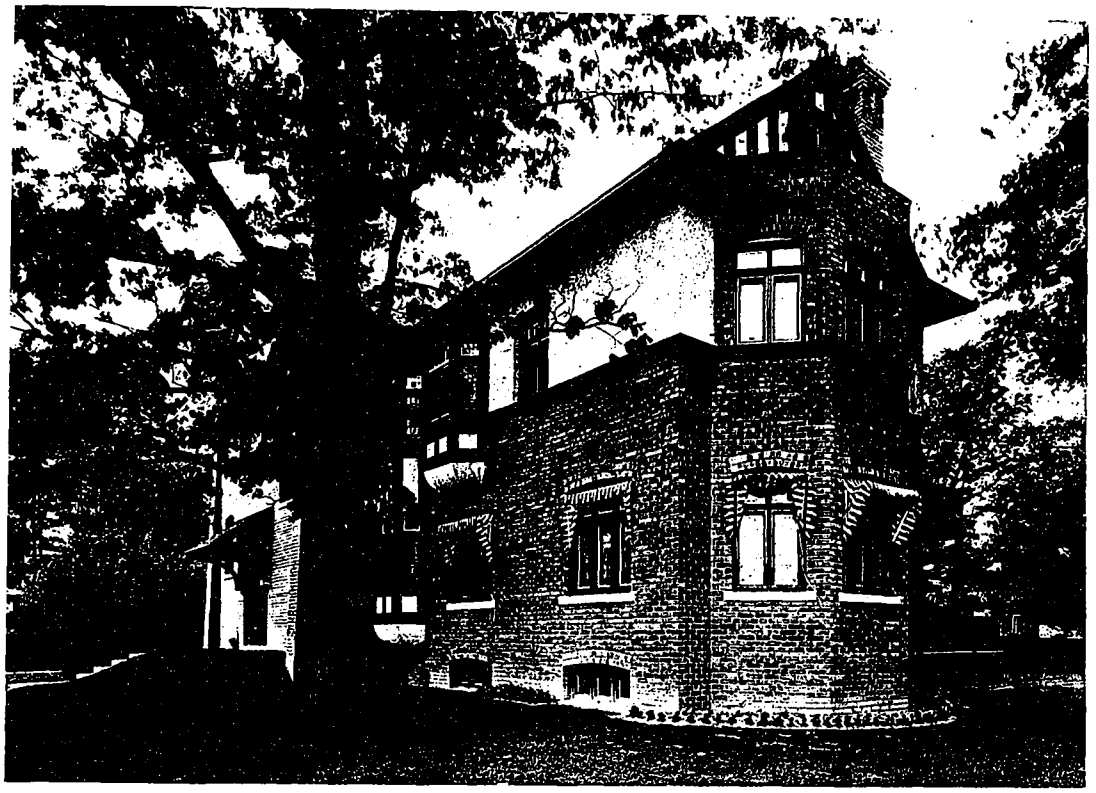


Plan of Mezzanine of First Floor.

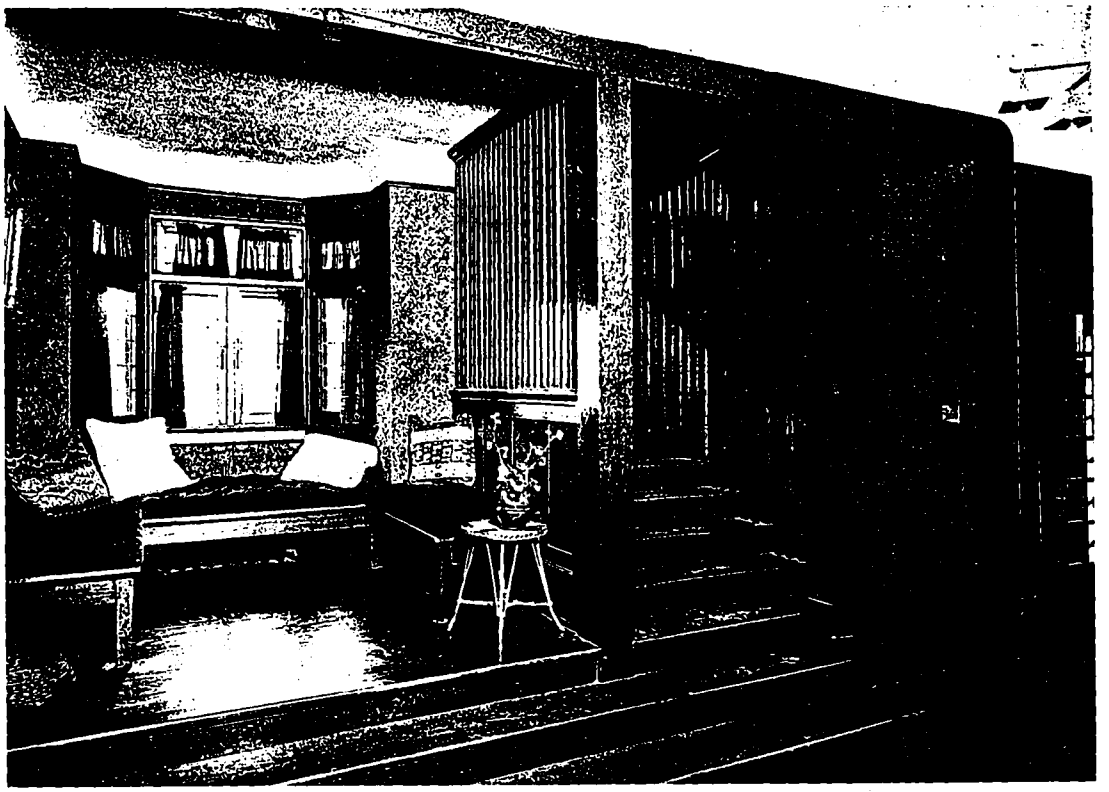


Second Floor Plan.

Plans of Toronto General Trusts Corporation Building, Toronto, Ontario.
George W. Miller, Architect.



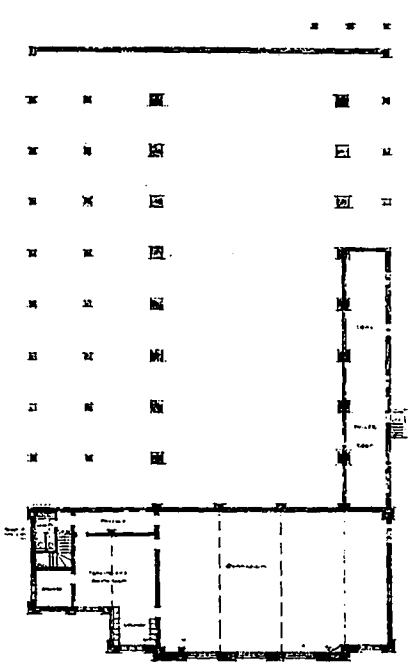
Residence on Forest Hill Road, Toronto, Ontario. Charles P. Band, Architsct.



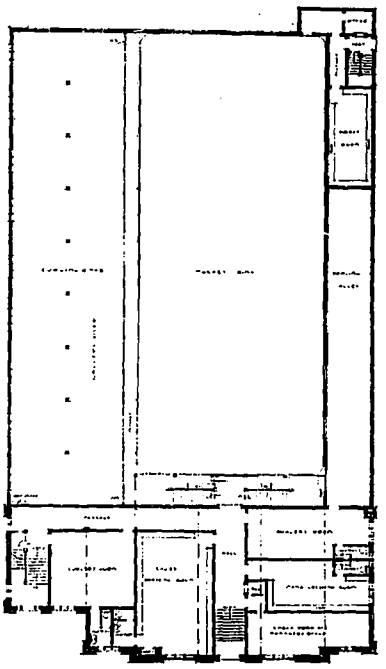
Hall.

Living Room.

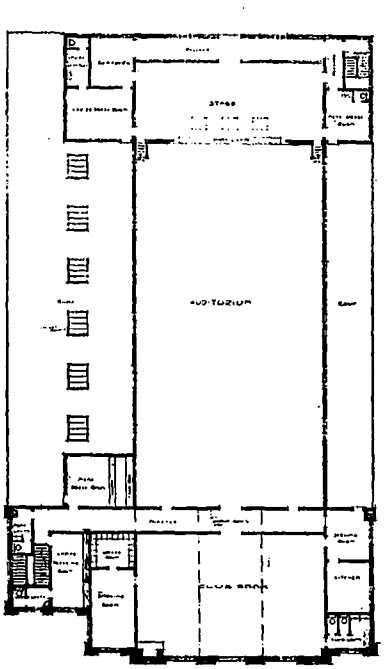
Residence on Forest Hill Road, Toronto, Ontario. Charles P. Band, Architect.



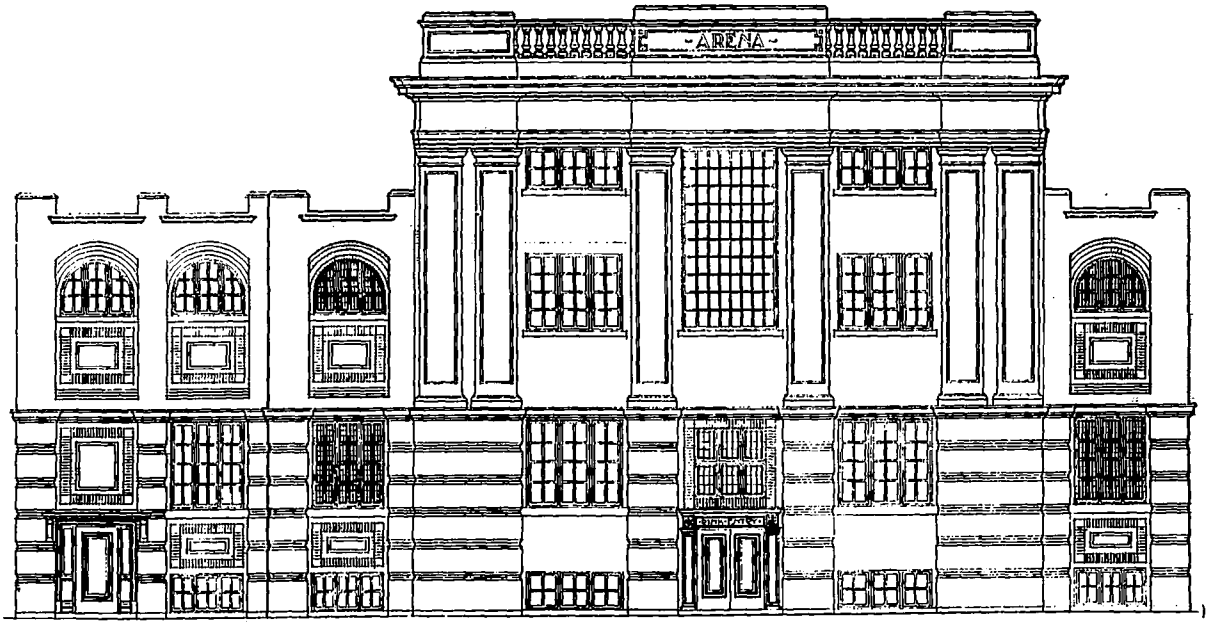
Basement Plan.



Ground Floor Plan.



First Floor Plan.



PROPOSED ARENA AT OAKVILLE, ONTARIO. BOVELL & MOLESWORTH, ARCHITECTS, TORONTO.

The new Arena to be erected at Oakville, Ontario, is designed to provide a place for athletics and social amusements for a small community. It comprises a clubhouse and social gathering place for the townspeople, and a rink for hockey and curling and other athletic forms of recreation. There are three rinks in all, two for curling and one for hockey one hundred and twenty-five by one hundred and fifty feet. A bowling alley and a completely equipped gymnasium are also features planned to complete the scheme. The bowling alley and gymnasium will occupy a well lighted and ventilated basement. On the first floor will be an auditorium, with stage, and dressing-rooms, and seating accommodations for eight hundred. The exterior will be carried out in brick with cut stone trimmings.

CONCRETE SUBSTRUCTURAL WATERPROOFING

A paper, confined generally to the waterproofing of foundations, with occasional reference to the character of materials commonly in use at the present time, read before the architects of Winnipeg by J. R. Wickle, C. E.

THE COST of the proper waterproofing of a building bears but a slight percentage of the total cost of the completed structure, and architects and engineers have recognized the fact that the use of good materials, giving permanent results, are the only ones which they can afford to employ, if only as a matter of good economy. The use of pitch and kindred products is gradually being abandoned for the reason that such materials disintegrate when in contact with moisture and are affected by alkalies and other substances in the soil which rapidly destroy them. Therefore, it must be apparent that such materials should be used which are unaffected by the conditions peculiar to the foundation.

Two methods are open to the architect preparing his waterproofing scheme. The first is the membraneous or seal method, which consists in surrounding the entire foundation with an impenetrable envelope interposed between the structure and the water or moisture to be kept out. The "integral" method is that by which the waterproof agent becomes absorbed into and integrated throughout the concrete mass, or through the cement plaster, or concrete so completely as to render the mass, or plaster, impregnable to the attacks or penetration of water or dampness.

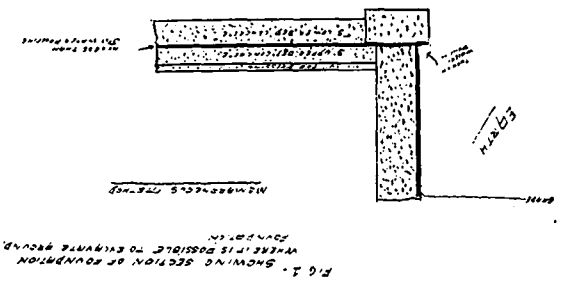
For your consideration we will first take up the membraneous system. Where the term "foundation" is used, it is understood to be that of concrete in accordance with the general practice. The matter of heads pressure, and so forth, will be referred to only in a general way, as the object of this paper is not to dwell upon the engineering features of the substructure, but to discuss the waterproofing systems used and employed in this connection. The conditions under which the work is to be done will, to a large extent, determine the method to be used. In considering the membraneous treatment let us assume that our footing course has been placed. The next step is to lay the waterproofing over the footings, using no less than three ply of good felt bonded by means of a good bitumen. Bitumens which require heating are the ones used most advantageously in this connection. Binders of the sort will remain relatively tacky, and will not crack or break, due to any subsequent settling of the foundation. Having laid this damp course, the waterproofing will be carried up the outside of the foundation wall to six inches above the grade line. Where only ordinary seepage exists, the use of a heavy asphaltum damp-proof paint applied on such walls will be sufficient, but should the walls be left in very rough shape, a bituminous plastic which is applied with a trowel should be substituted for the liquid damp-proof paint as suggested above. This last treatment dispenses with the safety coat of cement mortar which is necessary as a protection to the waterproofing in back-filling on completion of the work. In placing the waterproofing over footings the felt should project at least six inches on either side of same in order to make connection with the waterproofing to be carried over floors and the exterior side of the wall. The floor waterproofing is laid between upper and lower beds of concrete, the concrete being laid in such a manner that the top bed of same will resist any hydrostatic pressure which may develop from below. To illustrate: Supposing the total thickness of concrete to be placed for floors is seven inches, a three-inch bed would first be placed on which will be laid the waterproofing, the same number of plies being used as laid over footings. Upon this three inches of concrete will be put, as an upper bed, and a one-inch top dressing of cement and sand, say 1 to 2 mix, to provide a wearing surface for the floor. This floor waterproofing is made continuous by joining the felt with six inches of same projecting from the footings and up the walls. The method is simple, but is not always permanent, except that you employ such materials as will be unaffected by the expansion and contraction of the foundation. The architect or the contractor will see that the connections are properly made as between the wall waterproofing and the floor waterproofing, for it is at this point that trouble usually develops. Irish felt is considered one of the best reinforcing agents for substructural waterproofing, and, to-day, materials of this kind which are on the market compare very favorably in price with the domestic paper, in fact I believe a number of imported felts to be cheaper. Where considerable pressure is to be met with at least six ply of felt should be installed. In many cases automatic pumps or ejectors are erected in connection with a sump pit in order to keep the water around the foundation below the floor level. This installation, however, is optional, for waterproofing done in a careful manner as I have outlined, with an eye to the selection of proper materials on the part of the architect, will be reliable in the most acute cases. Where ordinary seepage occurs, a stratum of a plastic bitumen can be substituted for the felt. If the foundation adjoins that of another structure it is evident that the felt cannot be placed on the outside of the foundation walls, without first laying up a brick wall on the outside of the bearing wall to sustain the waterproofing. In instances of this kind, it depends upon the conditions whether this scheme should be preferred to the integral method.

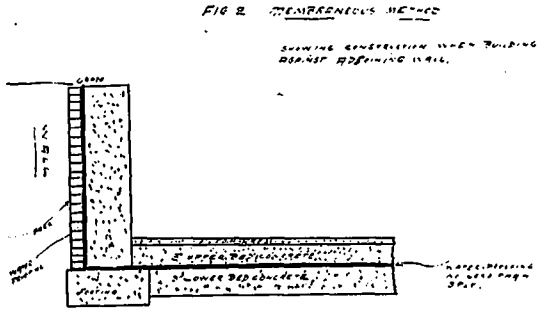
Figure No. 1 shows the construction where it is possible to excavate around the outside of the entire foundation.

Figure No. 2, we have a sectional foundation, built against an adjoining wall, using the membraneous treatment, but you will note we have had to sacrifice space in order to build a brick-retaining wall upon which to place the waterproofing. In the membraneous installations where there is considerable

water to be resisted, or kept out, it is necessary to place pumps in the excavation for the purpose of keeping the water away during the process of the treatment, for we must bear in mind that all surfaces to be waterproofed must be in a practically dry state, otherwise it will be impossible to secure adhesion between such surfaces and the waterproofing.

Coming to the integral method, it is, perhaps, well to touch upon the character of materials now largely





in use. In the laboratory or in very careful practice, it is possible to obtain a voidless concrete by using properly graded aggregates with the cement. A concrete thus obtained is waterproof, but in every-day work, taking into consideration the human equation, the probabilities of securing an absolutely dense concrete, are too utopian for consideration in this paper. Owing to the porous nature of concrete, many tests have been conducted with the object of securing a medium to overcome this porosity with an absolutely voidless concrete as the ultimate. Some materials on the market are liquid in form, and we are advised they do not act as void fillers, but simply increase the cementative properties of the cement without affecting the volume of concrete and have for their object a closer relation between the cement and the aggregate. This is explained as bringing into service the full colloidal possibilities of the cement. Frequently hydrate of lime is used for the purpose of waterproofing concrete. It is my opinion that this is not a successful agent, unless the lime can absorb oxygen or slack. In plastering, for instance, the object of using three coats of lime mortar is to give the lime sufficient surface to take up oxygen and fulfil its purpose. Take a sixteen-inch wall, for instance, waterproofed by the use of lime; it will only be waterproof on or near the surface where the lime has the opportunity of becoming active. In the interior of such wall we find this agent in an unslacked state, having absolutely no chance to assist the cement, and is a loafer on the job. It will be seen that unless all parts of the mass can receive the full advantage of the active lime, that the purpose of the agent cannot be fulfilled.

Experiments have been conducted in the laboratories in some of the large universities of the United States, which bear out my contention. Other materials now in use act as void fillers, the products of themselves being inert and water-repelling. As to affecting the strength of the concrete, they are for the most part neutral. Materials of this kind are simple in their application and are extensively used. A concrete mass so waterproofed will lose its capillary value for attracting water. Having selected the material, the next question to decide is, shall we incorporate it throughout the entire concrete body, or use it in an interior plaster coating? If we decide the former, all that is necessary is to put in the waterproofing when mixing the concrete, and the other details of construction can be carried on without further regard to the waterproofing except to observe the manufacturer's directions as to mixing and so forth, and leaving no part of the substructure untreated. The question is often brought up as to what assurance we have that the material be properly mixed. If the workman is not careful in mixing his concrete he will not secure a good concrete, and by the same token he will not secure a waterproof concrete. On the other hand, a careful workman will be as careful in adding his waterproof compound as he will in mixing his concrete. The fact that many perfect jobs executed by following manufacturer's directions and without his supervision, is a test to the merit of these waterproofing factors. The advantages of the integral method are quite apparent. No need to build a retaining walls to receive the waterproofing when building against an adjoining wall. Another service, and a great one, which the integral method performs is exemplified when trouble develops in a foundation. Excavating around the outside of foundation walls, and applying asphaltum, serves only to keep the water from the structure at that point, while it is a natural course for the water to find its way through the footings and floors. The best that we can expect from such a treatment is a waterproof wall down to the footings, and water will come up through the footings and floors. In other words, we must secure continuity of the waterproof course. The solution of the problem and the only practical way of obtaining such a continuous surface is an interior application whereby the waterproofing can be placed over all walls and floors, and thus successfully resist the penetration of water at all points.

In discussing the membraneous method I mentioned that the waterproofing would need to be placed between the water to be combatted and the structure, but in the application of the integral method as a plaster coating, this is not necessary. For the purpose of explanation, let us consider a concrete foundation with seepage occurring at different points. It is not possible to apply the waterproof coating as described, on a surface continuously wet and by water under pressure, so as in all problems in waterproofing, the first step will be to keep the water

below the floor level during the process of waterproofing. One of the methods commonly employed for this purpose is known as "bleeding the wall"—that is, inserting iron pipes in the wall at points where the entrance of water is most apparent, these bleeders being placed so as to permit the pumping of the water from the outside wall to a point below the level of the surface to be waterproofed. Having done this, the next step is to make all surfaces to be treated sufficiently rough to receive the plaster coating. This can be done by hacking, followed by an acid wash, which, in turn, is washed off with clean water after the effervescence ceases. The use of acid (common muriatic acid) or acids in powder form used for this purpose act upon the lime in the cement and expose the silicate particles of the concrete. Then we apply our waterproof plaster coating, which is a coat of either 1 to 2 or 1 to 3 mixture of cement and sand, having the waterproof agent mixed in. This applied on the walls in a three-quarter inch coating and on the floors in a coating at least one inch in thickness, will accomplish the result after the waterproofing is set up; then it is possible to seal the bleeders. As to the adhesion between the waterproof coating and the concrete, this bond will resist any pressure which may develop. Many large jobs have been waterproofed by such a scheme as I have described. The waterproofing is ever in sight and the installation can be made on a brick foundation wall, with practically as good results as can be obtained on a concrete wall.

In conclusion, you yourselves can best determine the method to be employed based upon the local conditions. A suitable caption would be, suit methods to conditions and material to methods, and with this ever in mind, and without pre-supposing the nicety of workmanship guaranteed in ordinary labor, we are able to get good results.

CANADIAN ARCHITECTURAL EXHIBITION

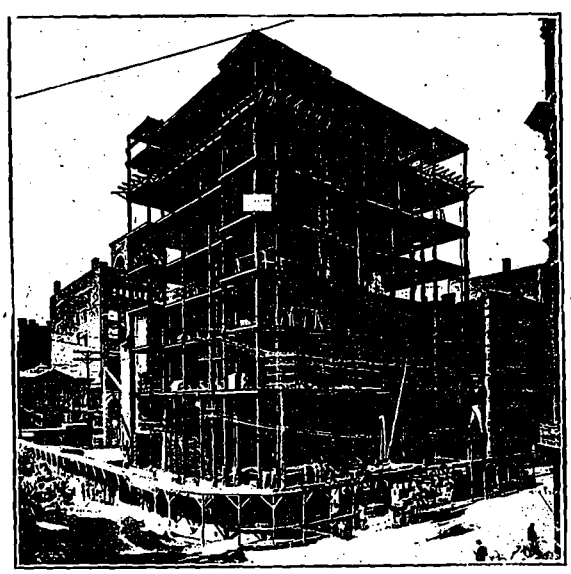
The Sixth Annual Exhibition of the Toronto Society of Architects—a representation of designs confined to the productions of Canadian architects.

THERE is no reason why an architectural exhibition should be international except because of the view-point, and perhaps comparison of method, but the architectural problems of the United States and Canada are so similar that the presentation of home-work exclusively becomes at once logical and comprehensive.

The sixth annual exhibition of architectural drawings and photographs presented under the auspices of the Toronto Society of Architects was held at the Toronto Public Library in June, and was a fairly representative collection, though it is hoped that the next will contain a larger representation from the far Western cities. The exhibition included some three hundred subjects contributed by forty architects and the general interest in current architecture was augmented by photographic reproductions of historic Canadian buildings and old architecture. Without going into detail, the most striking feature of the exhibition was its freedom from copying or suggestiveness in design. The Canadian architect seems to be working out his own problems in his own way, and while some of them are new and display the crudeness that results from unfamiliarity, there is generally a compensating strength to the design that gives it a breadth and purpose in the solution that is effective as it is often interesting.

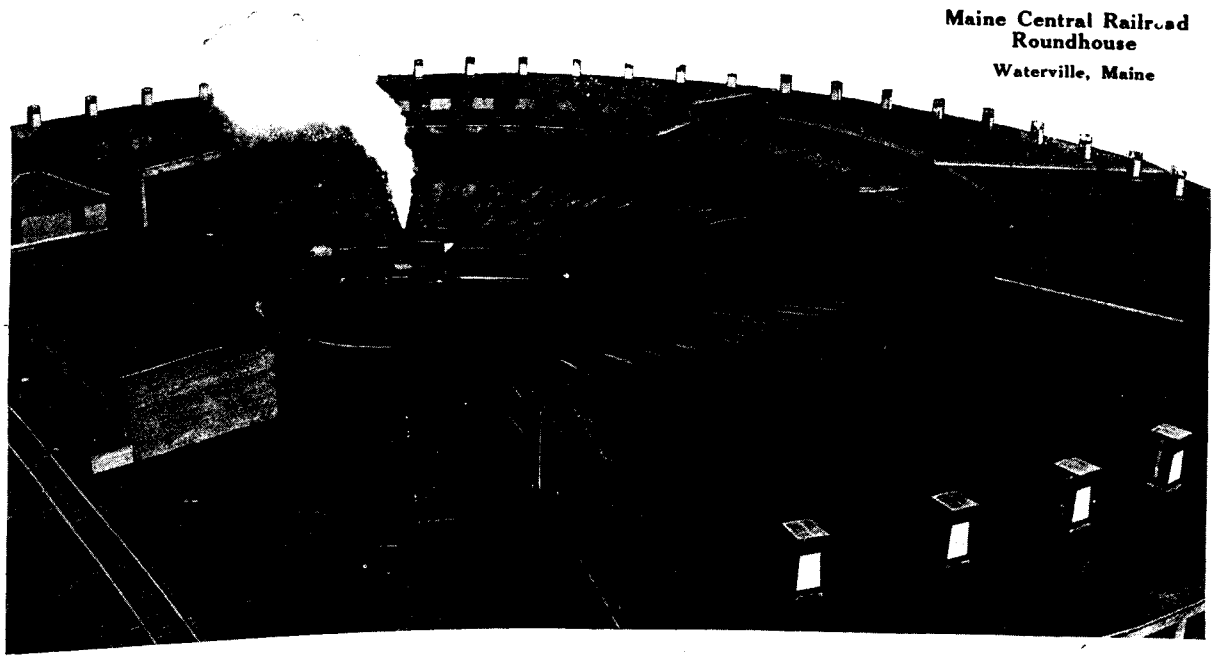
The educational effect of such an exhibition is so important that next year should see it much more representative, of not only what Canadian architects can do, but what they have done. To this end a strong committee should begin its collection in the fall, and arrangements made to the end that when once collected, it should be kept together and sent to the principal cities of the Dominion. It would not be too much in this event to ask that the educational department of the Dominion Government give its official sanction and financial help so that once a year the people of Canada will have placed before them the work of Canadian architects in whose work is found the evidence of the advancement of the country in art and wealth importance.

AN EXCELLENT example of the practical efficiency and permanency of hollow tile fireproof construction is shown in the accompanying construction photograph of the Toronto General Trusts Corporation building. This building was made secure from fire by the use of hollow tile manufactured and



installed by the National Fireproofing Company of Canada, Limited. The floors throughout are of the flat arch type almost universally used in office buildings, which, beside the fireproof security given the building, have the advantage of speed and safety in installation, an important feature which is evidenced by the constantly increasing use of the flat arch.

Barrett Specification Roofs



Maine Central Railroad
Roundhouse
Waterville, Maine

The Railroad Test

THE hardest kind of a building to roof successfully and economically is a railroad roundhouse.

Such a building is exposed to heat inside, condensed vapor from above and below, as well as acid fumes of coal smoke and the constant dropping of cinders and sparks on the surface. All this, in addition to the ordinary wear and tear of the weather.

Only one type of roofing can stand up under such conditions successfully and that is a Barrett Specification Roof.

Its low cost makes it attractive to begin with and the fact that there is no maintenance expense such as painting or coating, makes the net cost per year of service far below that shown by any other roof covering.

The reasons which make Barrett Specification Roofs particularly desirable for roundhouses make them even more desirable and economical when used on manufacturing plants, warehouses, apartments, in fact, on all flat-roofed commercial structures.

Every architect, engineer and owner should have a copy of The Barrett Specification with tracings for use in future building plans and we are pleased to mail same, free, on request to our nearest office.

Special Note

We advise incorporating in plans the full wording of The Barrett Specification, in order to avoid any misunderstanding.

If any abbreviated form is desired, however, the following is suggested:

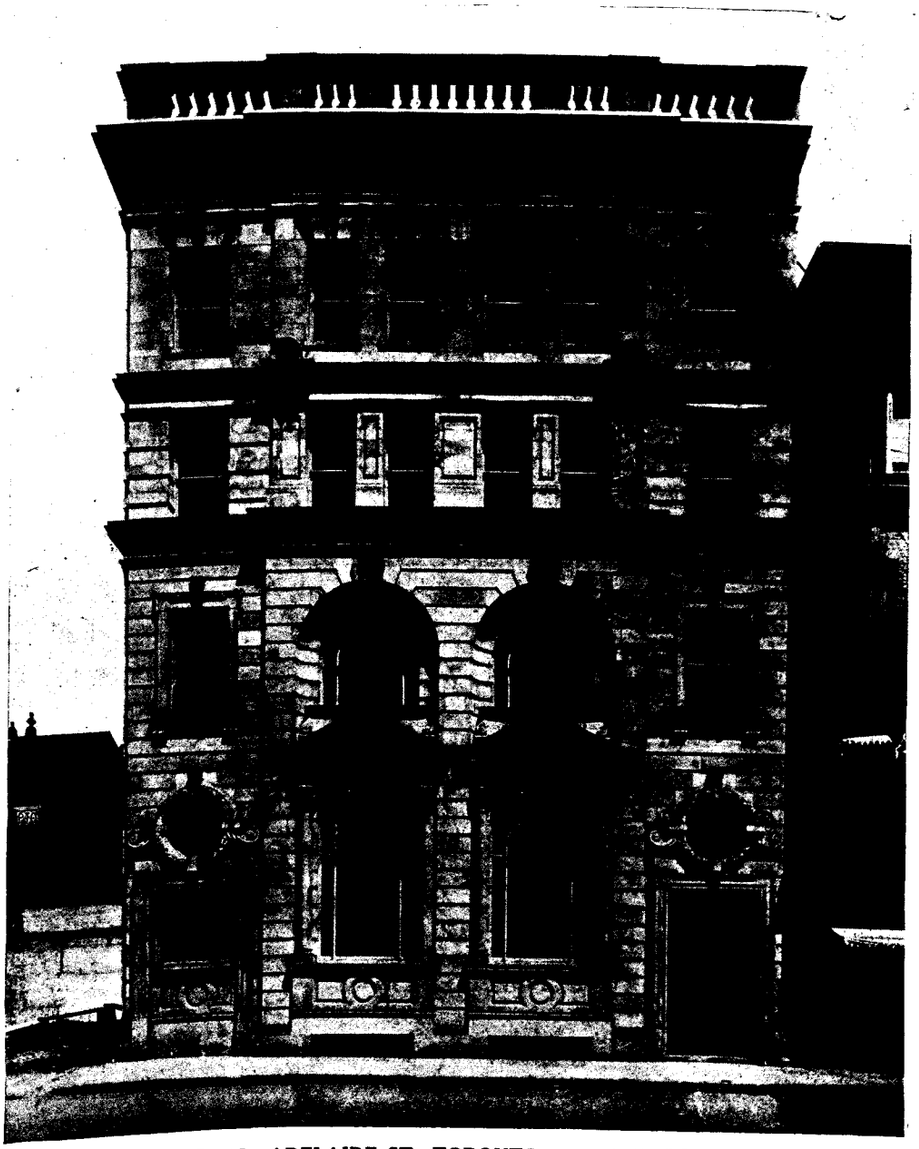
ROOFING—Shall be a Barrett Specification Roof laid as directed in printed Specification, revised August 15, 1911, using the materials specified, and subject to the inspection requirement.

THE PATERSON MFG. CO., Limited

MONTREAL TORONTO WINNIPEG VANCOUVER ST. JOHN, N.B. HALIFAX, N. S.

ART STONE

(TRADE MARK REGISTERED)



CANADIAN BIRBECK BLDG., ADELAIDE ST., TORONTO. GEO. GOUINLOCK, ARCHITECT.

WHEN the most prominent Canadian Architects specify Art Stone for their important work it will be readily seen that it has other qualities besides low cost to recommend it. This beautiful white reproduced sandstone cannot stain, and being thoroughly reinforced, can be used in larger blocks, and is stronger than natural stone. We have facilities for producing any designs, and can promise prompt deliveries for any work, however large. Agents in all principal cities.

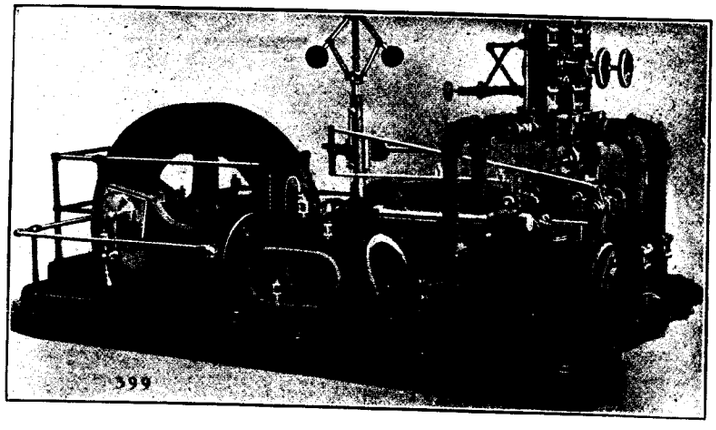
Canadian Art Stone Co., Limited

353 Pape Avenue, Toronto

S. F. M. SMITH, Eastern Townships Bank Building, Montreal. D. J. MACKENZIE, Ottawa, Ont.

Ice Making and Refrigeration Machinery

THE YORK MANUFACTURING COMPANY SYSTEM of Ice making and Refrigeration supplied and installed for ice-making plants, cold stores, abattoirs, packing houses, breweries, dairies, hotels, apartment houses, etc.—We make a specialty of *Small Machines for Small Plants* suitable for butchers, dairies, fish and game dealers, etc.—We supply Horizontal and Vertical Compression Plants, also Absorption Plants.—Ammonia Fittings and Supplies are kept in Stock.—*We are prepared to render Architects and Engineers in any portion of Canada expert advice and assistance on all work wherein ice-making or refrigeration apparatus is to be installed.*



Nonpareil Corkboard Insulation

FOR COLD STORAGE WAREHOUSES, abattoirs, breweries, creameries, dairies, ice plants, fur storage vaults, refrigerators and in fact any character and type of refrigerator work, NONPAREIL CORKBOARD INSULATION is pronounced by the most eminent engineers and authorities to be without an equal. It has all the properties and advantages of a perfect insulating material; *lowest heat conductivity; slow burning and fire resisting; solid and compact, occupying minimum space; non-absorbent of moisture; free from rot, mold and offensive odors; easily installed and practically everlasting—its first cost the only cost.*

Further Particulars and Catalogues on request

The Kent Company, Limited

713 Canadian Express Building = Montreal, P. Q.

A DIRECTORY FOR ARCHITECTURAL SPECIFICATIONS & CONTRACTORS' SUPPLIES & MACHINERY

Adamant Plaster.
Stinson-Reeb Builders' Supply Co.

Air Washers and Humidifers.
Eadie-Douglas, Ltd.
Sheldons, Limited.

Architectural Bronze and Brass Work.
Dennis Wire and Iron Works Co., Limited.
Meadows, Geo. B. Co.

Architectural Iron.
Canada Foundry Co., Ltd.
Dennis Wire and Iron Works Co.
Meadows, Geo. B. Co.
The Pedlar People.
Metal Shingle & Siding Co.

Architectural Stucco Relief.
W. J. Hynes.

Architectural Terra Cotta.
Toronto Plate Glass Imp. Co.

Artificial Stone.
Eadie-Douglas, Ltd.
The Canadian Art Stone Co.
The Roman Stone Co., Ltd.

Asbestos Products.
Asbestos Mfg. Co.
Canadian Johns-Manville Co.
A. B. Ormsby, Ltd.
Phillip Carey Co.

Bank and Office Fittings.
Burton & Baldwin Mfg. Co.

Bank and Office Railings.
B. Greening Wire Co.
Canada Foundry Co.
Dennis Wire and Iron Works Co.
Meadows, Geo. B. Co.

Bank and Office Window Blinds.
B. Greening Wire Co., Ltd.
Dennis Wire and Iron Works Co., Limited.
Meadows, Geo. B. Co.

Bath Room Fittings.
James Robertson Co., Ltd.
Standard Ideal Co., Limited.
Johns-Manville Co., H. W.

Bent Glass.
Toronto Plate Glass Importing Co., Ltd.

Belting.
Mussens, Ltd.
Gutta Percha & Rubber Mfg. Co., Limited.
Canadian Fairbanks Co., Ltd.

Blowers.
Sheldons, Limited.
Canadian Fairbanks Co., Ltd.

Blow and Vent Piping.
A. B. Ormsby, Limited.
The Pedlar People.
Metal Shingle & Siding Co.

Boilers.
Mussens, Ltd.
Steel & Radiation, Ltd.
Clare Bros.
Dominion Radiator Co., Ltd., Toronto.
Goldie & McCulloch Co., Ltd.
Pease Foundry Co., Ltd.
Taylor-Forbes Co., Ltd.
Consumers' Gas Co.

Brass Works.
James Robertson Co., Ltd.
Kerr Engine Company.

Brick and Terra Cotta.
Don Valley Brick Works.
E. F. Dartnell.
Eadie-Douglas Co.
Gibb, Alexander.
Stinson Reeb Builders' Supply Co., Ltd.
Waite-Fullerton Co., Ltd.,

Bridges.
Canada Foundry Co.
Dominion Bridge Co.

Builders' Exchange.
Winnipeg Exchange.

Building Paper and Felts.
Asbestos Mfg. Co.
Alex. McArthur & Co., Ltd.
Bird, F. W. & Son, Hamilton.
The Pedlar People.
H. W. Johns-Manville Co.
Metal Shingle & Siding Co.
Phillip Carey Co.

Building Supplies.
Waite-Fullerton Co., Ltd.,
Mussens, Ltd.
Bird, F. W. & Son, Hamilton.
Eadie-Douglas Co.
E. F. Dartnell.
Stinson Reeb Builders' Supply Co., Ltd.
The Pedlar People.
Canadian Fairbanks Co., Ltd.
Metal Shingle & Siding Co.

Caps for Columns and Pilasters.
The Pedlar People.
W. J. Hynes.
Metal Shingle & Siding Co.

Cars (Factory and Dump).
Mussens, Ltd.
Sheldons, Limited.

Cast Iron Columns
Canada Foundry Co.
The Pedlar People.

Cement (Fireproof.)
Alex. McArthur & Co., Ltd.
Canada Portland Cement Co.
Dartnell, E. F.,
H. W. Johns-Manville Co.
Rogers, Alfred.
Stinson Reeb Builders' Supply Co., Ltd.

Cement Block Machinery.
Ideal Concrete Machinery Co.
London Concrete Machinery Co.
Mussens, Ltd.

Cement Brick Machinery.
Ideal Concrete Machinery Co
London Concrete Machinery Co.
Mussens, Ltd.

Cement Machinery.
Steel & Radiation, Ltd.
Ideal Concrete Machinery Co.
London Concrete Machinery Co.
Mussens, Ltd.

Cement Tile Machinery.
Mussens, Ltd.
Ideal Concrete Machinery Co.
London Concrete Machinery Co.
Stinson-Reeb Builders' Supply Co.

Chimney Construction.
Waite-Fullerton Co., Ltd., Winnipeg.
Eadie-Douglas Co.

Coal Chutes.
E. F. Dartnell.

Cold Storage and Refrigerator Insulation.
Kent Company, Limited.
Linde British Refrigerator Co.
F. W. Bird & Son.
Phillip Carey Co.

Columns.
J. R. Eaton & Sons.

Concrete Contractors.
Bowes & Francis.

Concrete Construction (Reinforced)..
Canadian Seigwart Beam Co.
Steel & Radiation, Ltd.
The Pedlar People.
Trussed Concrete Steel Co.
Metal Shingle & Siding Co.

Concrete Mixers.
Canada Foundry Co.
E. F. Dartnell.
Ideal Concrete Machinery Co.
London Concrete Machinery Co.
Mussens, Ltd.
Canadian Fairbanks Co., Ltd.
Wettlaufer Bros.

Concrete Steel.
B. Greening Wire Co., Ltd.
Clarence W. Noble.
Dennis Wire & Iron Co.
Steel & Radiation, Ltd.
The Pedlar People.
Trussed Concrete Steel Co.
Canadian Fairbanks Co., Ltd.
Metal Shingle & Siding Co.

Conduits.
Conduits Co., Ltd.
The Pedlar People.

Contractors' Machinery.
Mussens, Ltd.
Canadian Fairbanks Co., Ltd.

Contractors' Supplies.
Waite-Fullerton Co., Ltd.,
B. Greening Wire Co., Ltd.
Eadie-Douglas Co.
E. F. Dartnell.
Kent Company, Limited.
Mussens, Ltd.
Stinson Reeb Builders' Supply Co., Ltd.
Phillip Carey Co.

Cork Board.
Kent Company, Ltd.
The Can. H. W. Johns-Manville Co., Ltd.
Phillip Carey Co.

Corner Beads.
Steel & Radiation, L
The Pedlar People.
Metal Shingle & Siding Co.

Cranes.
Dominion Bridge Co., Ltd
Mussens, Ltd.
Canadian Fairbanks Co., Ltd.
International Marine Signal Co., Ltd.

Crushed Stone.
Stimson-Reeb Builders' Supply Co.

Cut Stone Contractors.
The Canadian Art Stone Co
E. F. Dartnell.
The Roman Stone Co., Ltd.

Damp Proofing.
R. I. W. Damp Resisting Paint Co.
Ault and Wiborg Co.
Glidden Varnish Co.
Machen and Hebron.
Johns-Manville Co., H. W.
Phillip Carey Co.

Decorators.
Fred G. Roberts & Co.

Deposit Boxes.
Goldie & McCulloch Co., Ltd.
J. & J. Taylor.
Canadian Fairbanks Co., Ltd.

Doors.
Burton & Baldwin Mfg. Co.
J. R. Eaton & Sons.

Drills (Brick and Stone).
Mussens, Ltd.

Drying Appliances.
Sheldons, Limited.

Dumb Waiters.
Otis-Fensom Elevator Co., Turnbull Elevator Co.

Electro-Plating.
Dennis Wire and Iron Works

Electric Wire and Cables.
B. Greening Wire Co., Ltd.
James Robertson Co., Ltd.

Elevators (Passenger and Freight).
Otis-Fensom Elevator Co.
Turnbull Elevator Co.

Elevator Enclosures.
B. Greening Wire Co.
Canada Foundry Co.
Dennis Wire and Iron Works
Meadows, Geo. B. Co., Ltd.
Otis-Fensom Elevator Co.,

Enamels.
Ault & Wiborg Co.
Berry Bros.
Benjamin Moore Co.
International Varnish Co.
Imperial Varnish & Color Co.

Engines.
Consumers' Gas Co.
Mussens, Ltd.
Goldie & McCulloch Co., Ltd.
Sheldons, Limited.
Canadian Fairbanks Co., Ltd.

Engineers.
Standard Structural Co.
Duckworth Boyer Co.

Engineers' Supplies.
Steel & Radiation, Ltd.
James Robertson Co., Ltd.
Sheldons, Limited.
Kerr Engine Company.
Mussens, Ltd
Canadian Fairbanks Co., Ltd.

Exhaust Fans.
Sheldons, Limited.

Engineers and Contractors.
Consumers' Gas Co.
Bishop Construction Co.

Expanded Metal.
Clarence W. Noble.
Steel & Radiation, Ltd.
Galt Art Metal Co.
Stinson-Reeb Builders' Supply Co
The Pedlar People.
Trussed Concrete Steel Co.
A. C. Leslie & Co., Ltd.
Metal Shingle & Siding Co.

Expansion Bolts.
Ogden, J. Edward.

Fire Brick.
E. F. Dartnell.
Stinson-Reeb Builders' Supply Co.

Fire Sprinklers.
General Fire Equipment Co.
Vogel Co., of Canada, Ltd.
McGuire, W. J.

Fire Extinguishers.
A. B. Ormsby, Ltd.
Vogel Co., of Canada, Ltd.
General Fire Equipment Co.,
Johns-Manville Co., H. W.

Fire Escapes.
Canada Foundry Co.
Dennis Wire and Iron Works
Meadows, Geo. B. Co.

Fire-Place Goods.
Carter & Co., Ltd.
Dennis Wire & Iron Co., Ltd.

Fireproofing.
Clarence W. Noble.
Don Valley Brick Works.
E. F. Dartnell.
Eadie-Douglas Co.
Johns-Manville Co., H. W.
National Fireproofing Co.
Steel & Radiation, Ltd.
Port Credit Brick Co.
The Pedlar People.
Trussed Concrete Steel Co.

Fireproof Steel Doors..
Phillip Carey Co.
Metal Shingle & Siding Co.
Dennis Wire & Iron Co., Ltd.
Mussens, Ltd.
Allith Mfg. Co.
A. B. Ormsby, Ltd.
Stinson-Reeb Builders' Supply Co.
The Pedlar People.
Steel & Radiation, Ltd.
Metal Shingle & Siding Co.

Fireproof Windows.
A. B. Ormsby, Ltd.
Galt Art Metal Co.
Hobbs Mfg. Co.
Stinson-Reeb Builders' Supply Co.
The Pedlar People.
Metal Shingle & Siding Co.

Flooring.
Bird, F. W. & Son, Hamilton.
Eadie-Douglas Co.
Seaman, Kent Co., Ltd.
J. R. Eaton & Sons.

Furnaces and Ranges.
Geo. R. Prowse Range Co.,
Steel & Radiation, Ltd.
Clare Bros.
Pease Foundry Co., Ltd.
Taylor-Forbes Co., Ltd.
Consumers' Gas Co.

Galvanized Iron Works.
A. B. Ormsby, Limited.
Sheldons, Limited.
The Pedlar People.
Metal Shingle & Siding Co.

Galvanized Iron.
A. C. Leslie & Co., Ltd.
Metal Shingle & Siding Co

Glass.
Consolidated Plate Glass Co.
Hobbs Mfg. Co.
Toronto Plate Glass Importing Co., Ltd.

General Contractors.
Bowes & Francis.

Grille Work.
Dennis Wire & Iron Co., Ltd.
Steel & Radiation, Ltd.
J. & J. Taylor.
Meadows, Geo. B. Co.

Hangers.
A. B. Ormsby, Limited.
Allith Mfg. Co.

Hardware.
Allith Mfg. Co.
Taylor-Forbes Co., Ltd.

Hardwood Flooring.
Canadian Fairbanks Co., Ltd.
Siemon Bros.
J. R. Eaton & Sons.

Heating Apparatus.
Consumers' Gas Co.
Kerr Engine Company.
Clare Bros.
Dominion Radiator Co., Ltd.,
C. A. Dunham Co.
Steel & Radiation, Ltd.
Goldie & McCulloch Co., Ltd.
Pease Foundry Co., Ltd.
Sheldons, Limited.
Taylor-Forbes Co., Ltd.

Heating Engineers and Contractors.
Sheldons, Ltd.

Hoisting Machinery.
Mussens, Ltd.
Otis-Fensom Elevator Co.,

Hinges.
Taylor-Forbes Co., Ltd.

Hydrants.
Kerr Engine Company.

Iron Doors and Shutters.
J. & J. Taylor.
Dennis Wire & Iron Co
Metal Shingle & Siding Co.

Iron Stairs.
Canada Foundry Co.
Dennis Wire and Iron Works
Meadows, Geo. B. Co.

Iron Supplies.
Kerr Engine Company.

Illuminating Engineers.
Consumers' Gas Co.

Insulation.
Bird, F. W. & Son, Hamilton.
Kent Company, Limited.
The Can. H. W. Johns-Manville Co., Ltd.
Phillip Carey Co.

Interior Woodwork.
Burton & Baldwin.
Seaman Kent Co., Ltd.
J. R. Eaton & Sons.

Jail Cells and Gates.
Dennis Wire and Iron Works Co., Limited.
Goldie & McCulloch, Ltd.
J. & J. Taylor.

Joist Hangers
Taylor-Forbes Co., Ltd.
Trussed Concrete Steel Co.

Lamp Standards.
Canada Foundry Co.
Dennis Wire and Iron Works
Canadian Tungsten Lamp Co.
Seaman, Kent Co.

Lath (Metal).
B. Greening Wire Co., Ltd.
Clarence W. Noble.
Steel & Radiation, Ltd.
Galt Art Metal Co
Stinson-Reeb Builders' Supply Co.
The Pedlar People.
Trussed Concrete Steel Co.
Metal Shingle & Siding Co.

Laundry Tubs.
Toronto Laundry Machinery Co.

Leaded Glass.
Hobbs Mfg. Co.

Marble.
James Robertson Co., Ltd.
E. F. Dartnell.
Missisquoi Marble Company.
The Holdge Marble Co., Ltd.
Dominion Marble Co.
Lammers & Carleson.
J. Ringborg, Noirksping, Sweden.

Metallic Sash.
Steel & Radiation, Ltd.
Hobbs Mfg. Co.
Metal Shingle & Siding Co.

Metal Shingles.
Galt Art Metal Co.
The Pedlar People.

Metal Store Fronts.
E. F. Dartnell.
Dennis Wire & Iron Co
Hobbs Mfg. Co.
Metal Shingle & Siding Co.

Metal Walls and Ceilings..
A. B. Ormsby, Limited.
C. W. Noble
The Pedlar People
Metal Shingle & Siding Co.

Mill Work.
J. R. Eaton & Sons.

Municipal Supplies.
Mussens, Ltd.

Non-Conducting Coverings.
Ault & Wiborg.
H. W. Johns-Manville Co.
Phillip Carey Co.

Ornamental Iron Work.
Turnbull Elevator Co.
Steel & Radiation, Ltd.
Canada Foundry Co.
Dennis Wire & Iron Co., Limited.
Meadows, Geo. B., Ltd.

Packing (Steam).
H. W. Johns-Manville Co.

Packing.
Gutta Percha & Rubber Mfg Co.
Canadian Fairbanks Co., Ltd.
Phillip Carey Co.

Paints—(Steel and Iron).
Brandram & Henderson.
Glidden Varnish Co.
E. F. Dartnell.
Machan and Hebron.
International Varnish Co.
Imperial Varnish & Color Co.
R. I. W. Damp Resisting Paint Co.
Solomon & Spielman.

Paints and Stains
Brandram & Henderson.
E. F. Dartnell.
James Robertson Co., Ltd.
International Varnish Co.
Berry Bros. Ltd.

Perforated Steel.
B. Greening Wire Co.

Pipe Covering.
Canadian Johns-Manville Co.
Kent Company, Limited.
Phillip Carey Co.

Plasters.
W. J. Hynes.
Brandram & Henderson.
Johns-Manville Co., H. W.

Plaster Corner Beads.
The Pedlar People.
Metal Shingle & Siding Co.

Plate and Window Glass.
Consolidated Glass Co.
Hobbs Mfg. Co.
Toronto Plate Glass Importing Co., Ltd.

Plumbers' Brass Goods.
Steel & Radiation, Ltd.
James Robertson Co., Ltd.
Standard Ideal Co., Limited.
Canadian Fairbanks Co., Ltd

Plumbing Fixtures.
James Robertson Co., Ltd.
Standard Ideal Co., Limited.

Pneumatic Tools.
Mussens, Ltd.

Porcelain Enamel Baths.
James Robertson Co., Ltd.
Standard Ideal Co., Limited.

Radiators.
Steel & Radiation, Ltd.
Dominion Radiator Co., Ltd.,
Taylor-Forbes Co., Limited.

Refrigerating Machinery.
Kent Company, Limited.
Linde British Refrigeration Co., Limited.

Refrigerator Insulation.
Bird, F. W. & Son, Hamilton.
Metal Shingle & Siding Co.
Kent Company, Limited.
The Can. H. W. Johns-Manville Co., Ltd.
Phillip Carey Co.

Radiator Valves.
Steel & Radiation, Ltd.
Kerr Engine Company.

Reinforced Concrete.
Steel & Radiation, Ltd.
Noble, Clarence W.
The Pedlar People.
The Canadian Siegwart Beam Co., Ltd.
Trussed Concrete Steel Co.
Metal Shingle & Siding Co.

Relief Decoration.
W. J. Hynes.

Roofing Paper.
Alex. McArthur & Co., Ltd.
The Pedlar People.
F. W. Bird & Son.
Johns-Manville Co., H. W.
Phillip Carey Co.
Metal Shingle & Siding Co.

Roofing.
Asbestos Mfg. Co.
Bird, F. W. & Son, Hamilton.
H. W. Johns-Manville Co.
Paterson Mfg. Co.
Philip Carey Co.
Metal Shingle & Siding Co.

Roofing (Slate).
Waite-Fullerton Co., Ltd., Winnipeg.
A. B. Ormsby, Limited.

Roofing (Tile).
Waite-Fullerton Co., Ltd., Winnipeg.
E. F. Dartnell.
The Pedlar People.
Metal Shingle & Siding Co.

Rubber Tiling.
Gutta Percha & Rubber Mfg. Co., Limited.

Safes, Fireproof and Bankers.
Goldie & McCulloch, Limited.
J. & J. Taylor.
Canadian Fairbanks Co., Ltd.

Sanitary Plumbing Appliances.
James Robertson Co., Ltd.
Standard Ideal Co., Limited.

Sand and Gravel.
Sand and Supplies, Ltd.

Sand Screens.
Steel & Radiation, Ltd.
B. Greening Wire Co. Limited

Screens.
Watson-Smith Co., Ltd.

Shafting Pulleys and Hangers.
Goldie & McCulloch Co., Limited.
Canadian Fairbanks Co., Ltd.

Sheet Metal.
A. C. Leslie & Co.
Metal Shingle & Siding Co.

Sheet Metal Workers.
Sheldons, Ltd.
A. B. Ormsby, Limited.
Galt Art Metal Co.
The Pedlar People.
Metal Shingle & Siding Co.

Shingle Stains.
James Robertson Co.
International Varnish Co

Sidewalks, Doors and Grates.
Dennis Wire & Iron Works Co.

Sidewalk Lifts.
Otis-Fensom Elevator Co.,

Sidewalk Prisms.
Hobbs Mfg. Co.
International Supply Co.

Slate.
James Robertson Co., Ltd.

Sound Insulation.
Philip Carey Co.

Stable Fittings.
Dennis Wire & Iron Works Co., Ltd.

Staff and Stucco Work.
Johns-Manville Co., H. W.
W. J. Hynes.

Steam Appliances.
Steel & Radiation, Ltd.
Kerr Engine Co.
Sheldons, Ltd.
Taylor-Forbes Co., limited.
Canadian Fairbanks Co., Ltd.

Steam and Hot Water Heating.
Steel & Radiation, Ltd.
Sheldon, Ltd.
Dominion Radiator Co., Ltd.,
C. A. Dunham Co.
Taylor-Forbes Co., limited.

Steel Casements.
Steel & Radiation, Ltd.

Steel Concrete Construction.
Steel & Radiation, Ltd.
Noble, Clarence
The Pedlar People.
Trussed Concrete Steel Co.

Steel Doors.
Dennis Wire & Iron Co., Ltd
Mussens, Ltd.
A. B. Ormsby, Limited.
The Pedlar People.

Structural Iron Contractors.
Canada Foundry Company.
Dennis Wire & Iron Co., Ltd.
Dominion Bridge Co., Ltd.
Hamilton Bridge Co.
Reid & Brown.
Structural Steel Co., Ltd.
Toronto Iron Works.

Store Fixtures.
Burton & Baldwin Mfg. Co.

Telephone Systems.
Northern Electric & Mfg. Co.

Structural Steel.
Canada Foundry Company.
Sheldons, Ltd.
Mussens, Ltd.
Dennis Wire and Iron Works
Dominion Bridge Co., Ltd.
Hamilton Bridge Co.
Reid & Brown.
Structural Steel Co., Ltd.

Terra Cotta Fireproofing.
Carter & Co., Ltd.
Waite-Fullerton Co., Ltd., Winnipeg.
Don Valley Brick Works.
Eadie-Douglas Co.
E. F. Dartnell.
Missisquoi Marble Company

Tile (Floor and Wall).
Carter & Co., Ltd
Waite-Fullerton Co., Ltd.,
E. F. Dartnell.
Smith Marble & Construction Co.
Asphalt & Supply Co.

Vacuum Heating Systems.
C. A. Dunham Co.

Varnishes.
Ault & Wiborg Co.
Berry Bros., Ltd.
Brandram & Henderson.
International Varnish Co.

Vaults and Vault Doors, Fireproof and Bankers.
Goldie & McCulloch Co., Ltd.
J. & J. Taylor.

Valves.
C. A. Dunham Co.
Steel & Radiation, Ltd.
James Robertson Co.
Kerr Engine Co.
Taylor-Forbes Co.
Canadian Fairbanks Co., Ltd.

Ventilators.
Sheldons, Limited
Metal Shingle & Siding Co.

Wall Finishes.
E. F. Dartnell.
Berry Bros.
International Varnish Co.
Brandram & Henderson.

Wall Hangers.
Taylor-Forbes Co.

Waterproofing.
E. F. Dartnell.
Ideal Concrete Machinery Co.
Mussens, Ltd.
Ault & Wiborg Co.
Bird, F. W. & Son, Hamilton
Eadie-Douglas, Limited.
Stinson-Reeb Builders' Supply Co.
R. I. W. Damp Resisting Paint Co.
Glidden Varnish Co.
Johns-Manville Co., H. W.

Waterworks Supplies.
James Robertson Co., Ltd.
Kerr Engine Co.
Mussens, Ltd.
Standard Ideal Co., Limited.
Philip Carey Co.

Wheelbarrows.
Mussens, Ltd.

White Lead, Putty and Oils.
International Varnish Co.
Brandram & Henderson.
Glidden Varnish Co.

Window Guards.
Dennis Wire & Iron Co., Ltd
Steel & Radiation, Ltd.
B. Greening Wire Co. Limited

Wire Rope and Fittings.
B. Greening Wire Co. Limited
Mussens, Ltd.
Otis-Fensom Elevator Co

An Index to the Advertisements