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CONSTRUCTION

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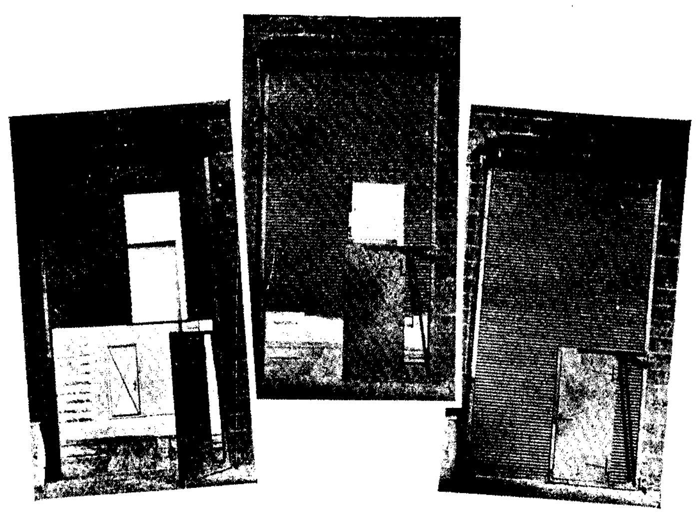

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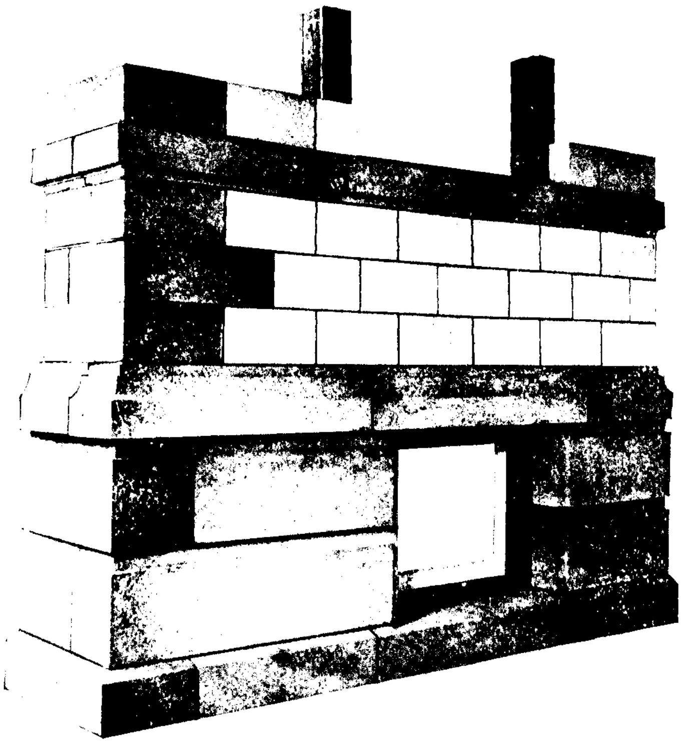

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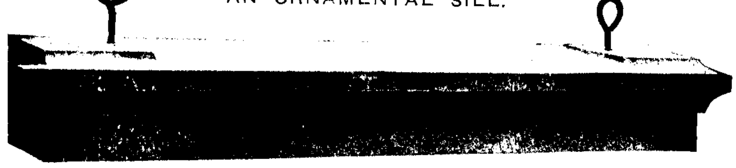

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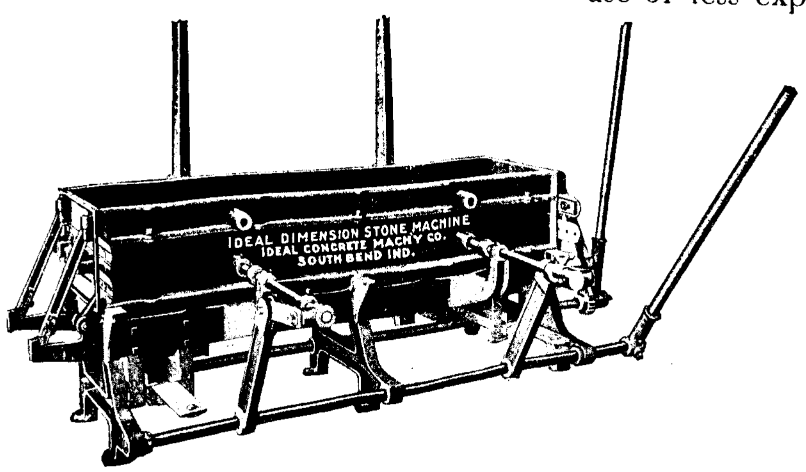

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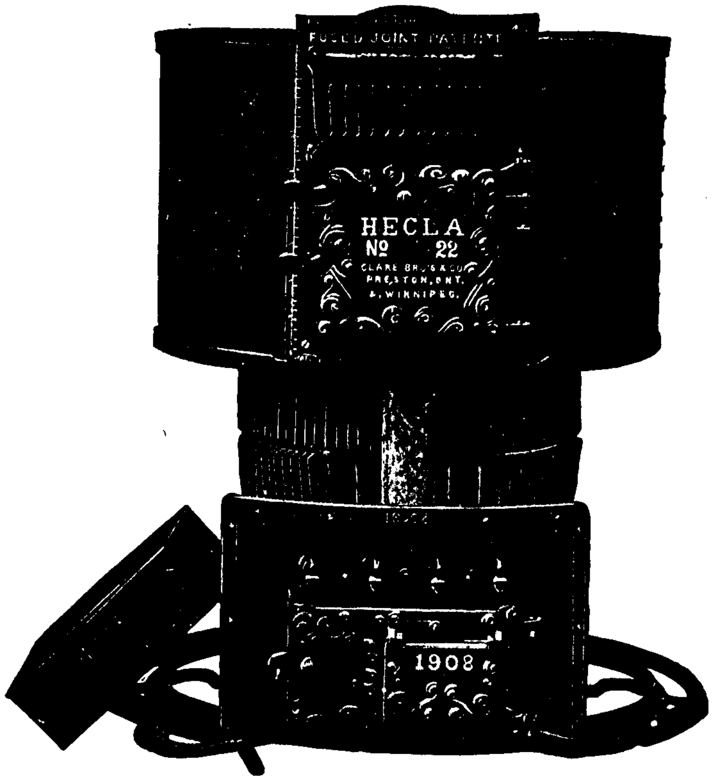

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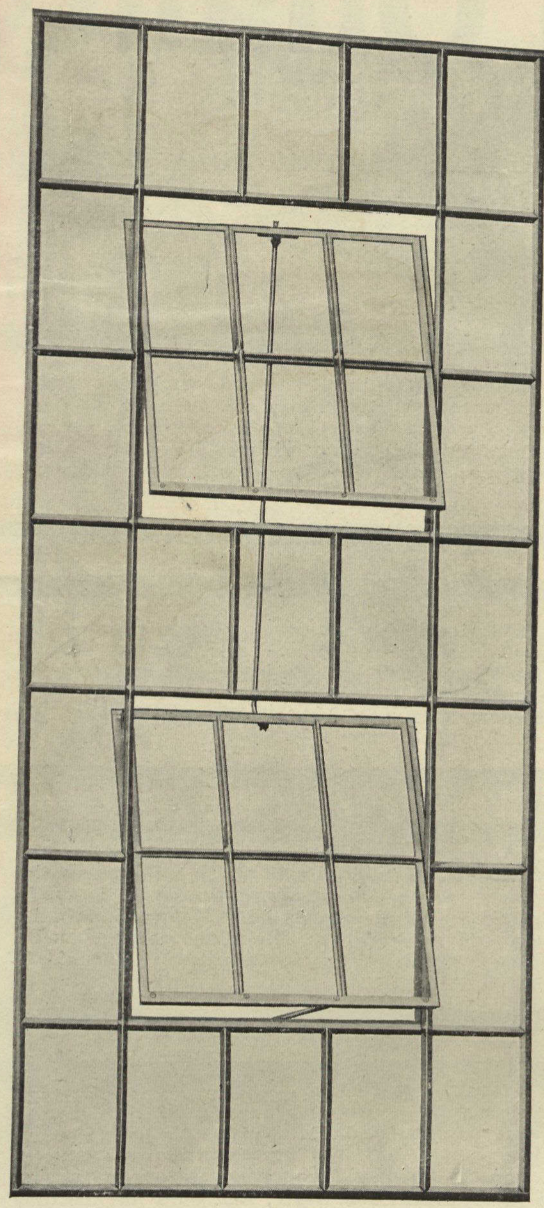

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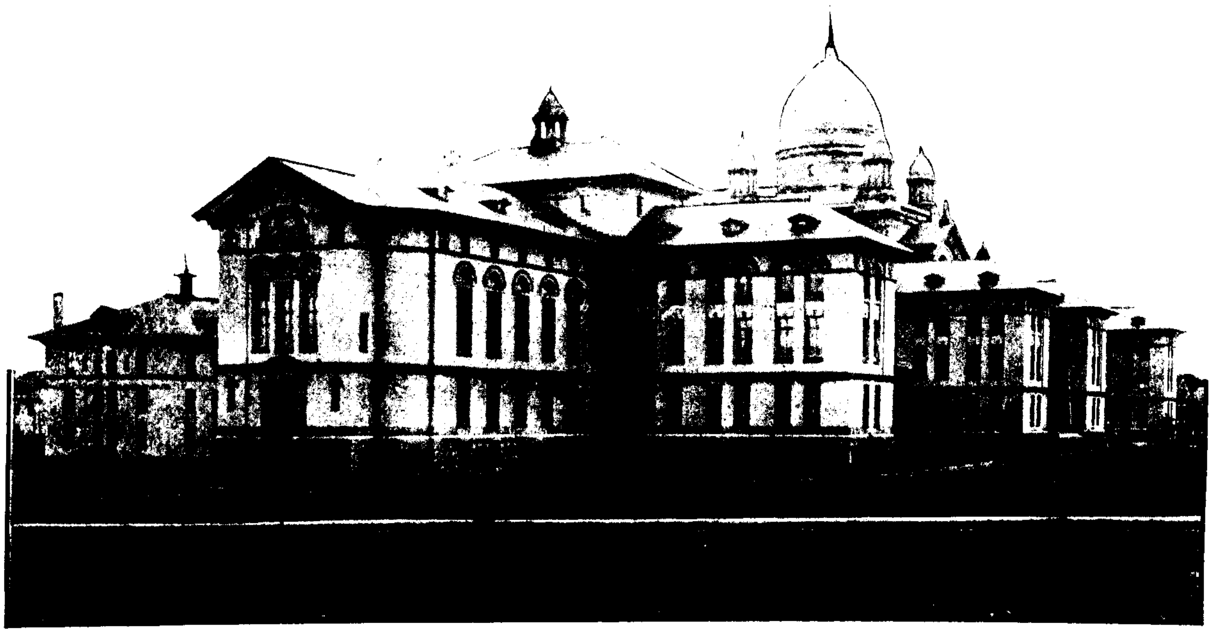

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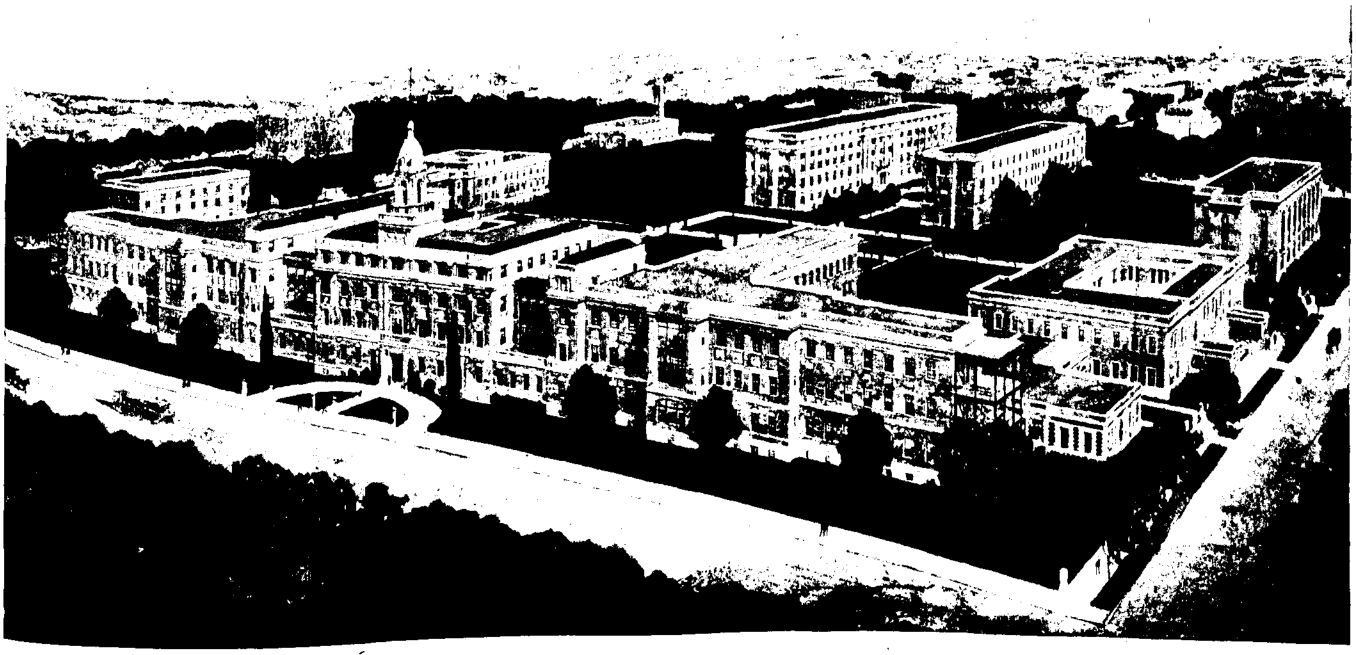
IN selecting the brick for this, the largest group of Hospital Buildings on the continent, the Architects, Messrs. Darling and Pearson, were determined to go to all necessary trouble and expense in order to secure a brick of a strength, color, texture and shape that would best carry out the architectural scheme, and at the same time possess to the greatest possible extent the strength and density so necessary in self-retaining walls of large structures. After having examined the samples sent by the largest brick manufacturers on the continent, DON VALLEY Products were selected. Our contract covers the facing brick, the backing brick and all the porous terra cotta fireproofing to be used in this immense group of buildings. Don Valley J.A.P. Semi-Vitreous Bricks are being used for the exterior walls of all these buildings, and the charming effect produced by their beautiful texture and variegated tones when laid up in the wall is one of the notable features of the whole architectural scheme. Don Valley J.A.P. Semi-Vitreous Bricks are made in Roman length and standard depth, Oriental face, and run in beautiful variegated tones in color, ranging from a flecked golden to deepest bronze and purple. These bricks represent the highest achievement in brick manufacture and are being specified by architects in all parts of Canada for their high-class structures.



Architects' Perspective, Showing bird's eye view of the Toronto General Hospital as it will appear when completed. 20,000,000 Don Valley Bricks will be used in these buildings. Don Valley J.A.P. Semi-Vitreous Bricks will be used for all exterior walls. Darling and Pearson, Architects.

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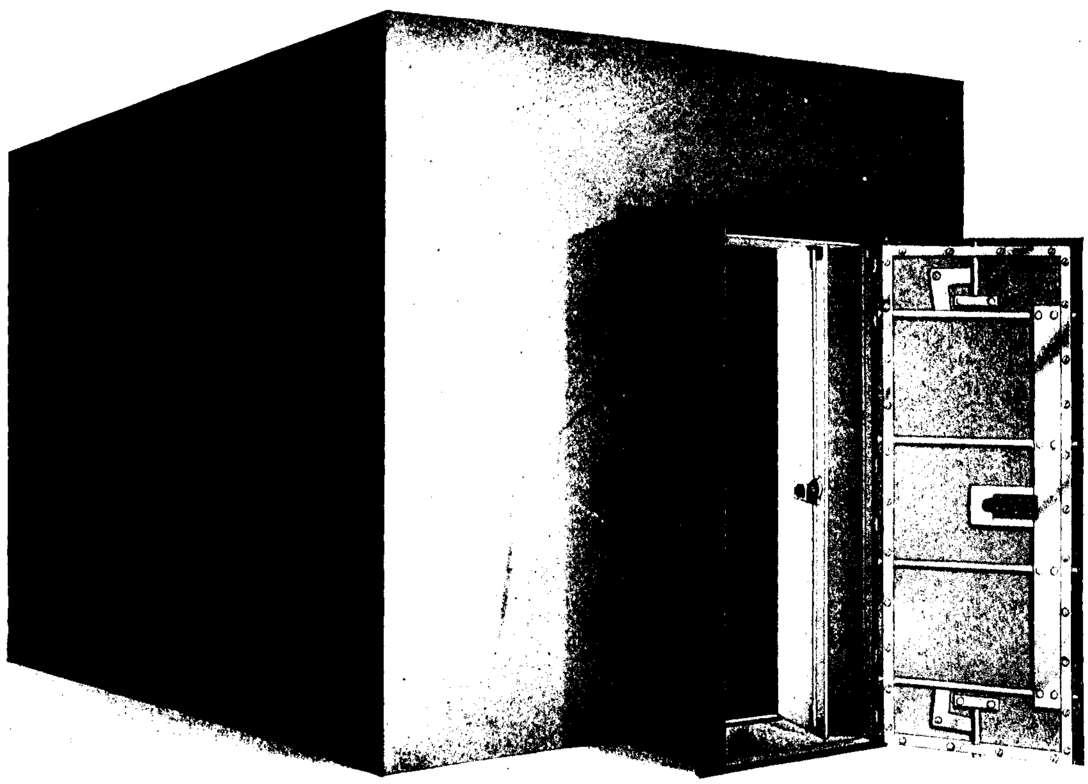

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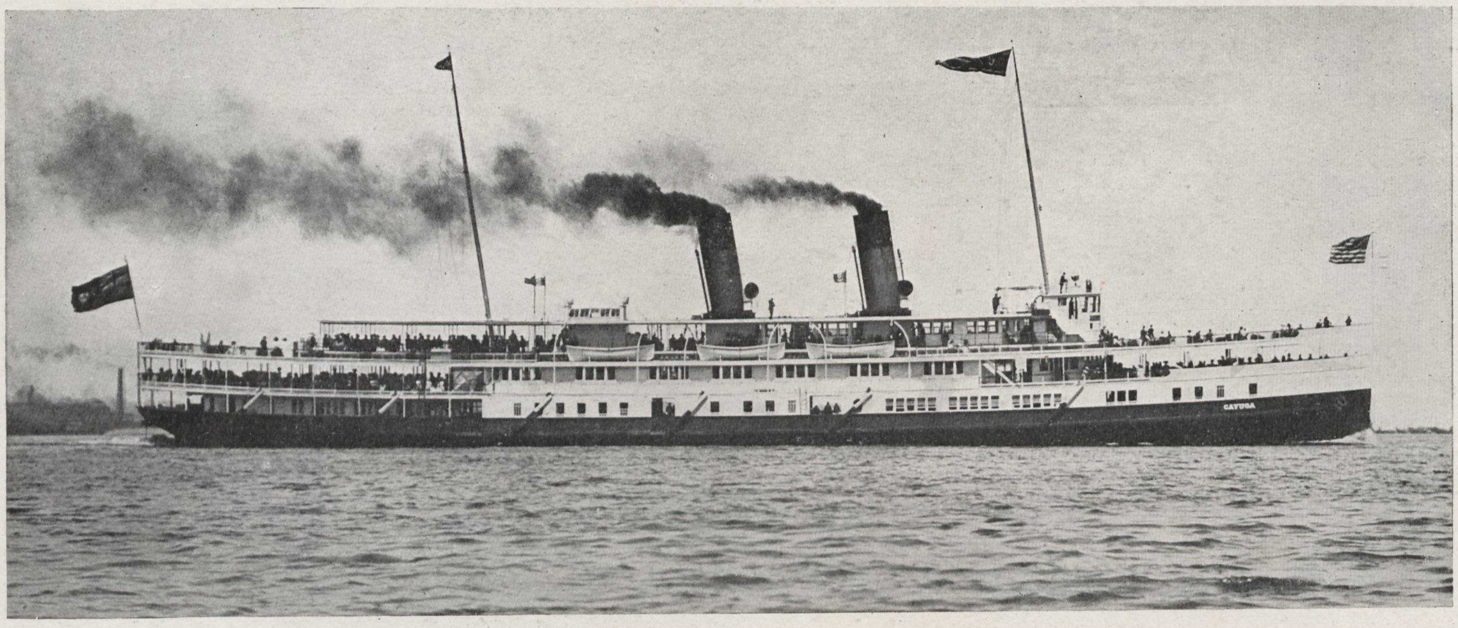
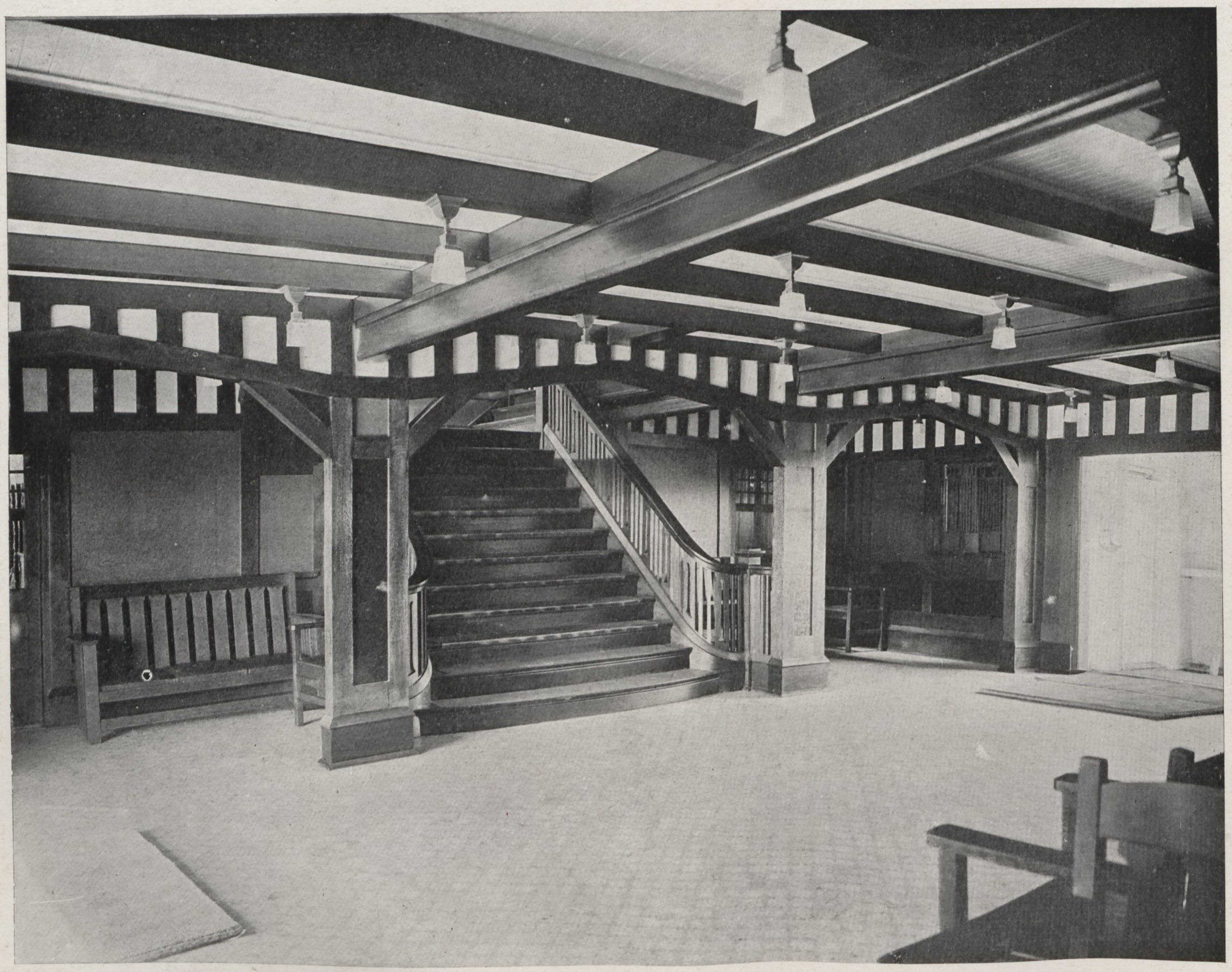
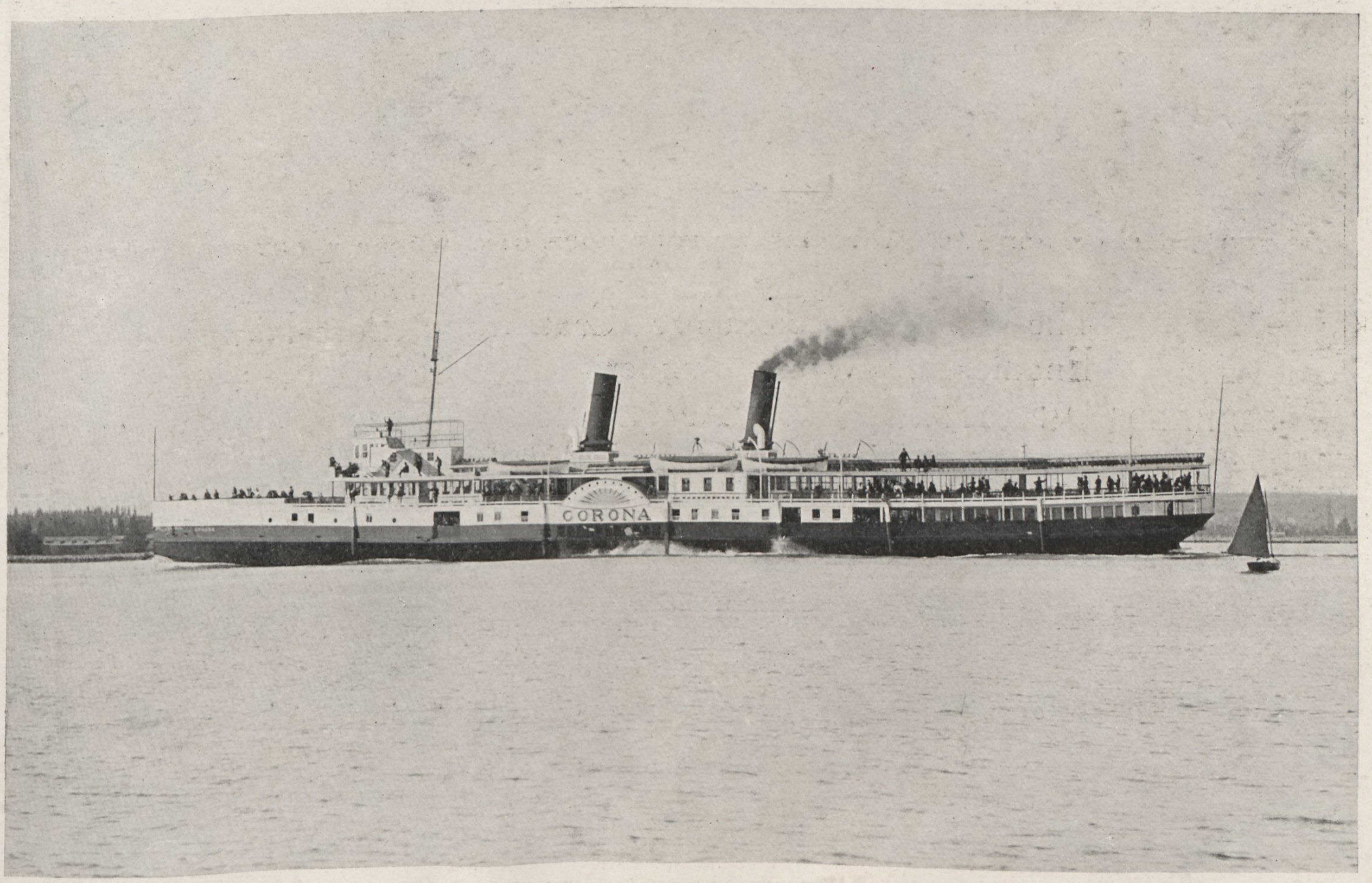




Steamship "Cayuga," Niagara Navigation Co. From several view points this Steamer is considered one of the most remarkable day boats on the Great Lakes. Architects, Bond and Smith, who designed and planned the interior, have been successful in creating what might rightfully be termed a "floating summer hotel." The whole atmosphere is one that tends to create a feeling of recreation and rest. Every convenience and comfort that is possible in a pleasure steamer has been provided in this boat, and the plumbing features and sanitary improvements throughout, which is one of the features of this remarkable boat, were manufactured by the Standard Ideal Co., of Port Hope.

Steamer "Chippewa," Niagara Navigation Co. Standard Ideal Ware was used throughout in this boat.



Steamer "Corona," Niagara Navigation Co. Plumbing fixtures, with which this steamer is equipped, were manufactured by the Standard Ideal Co., Port Hope, Canada.

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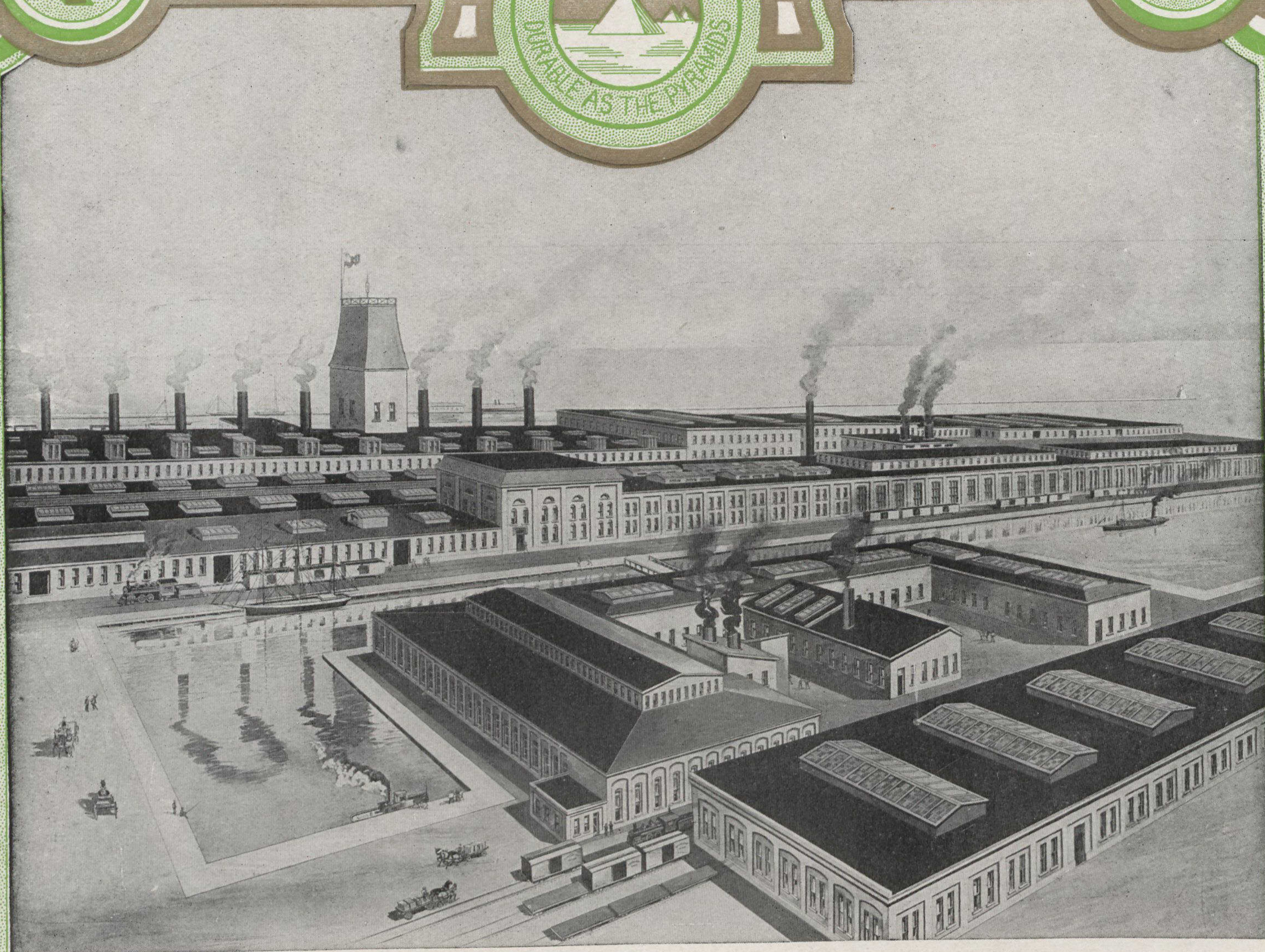

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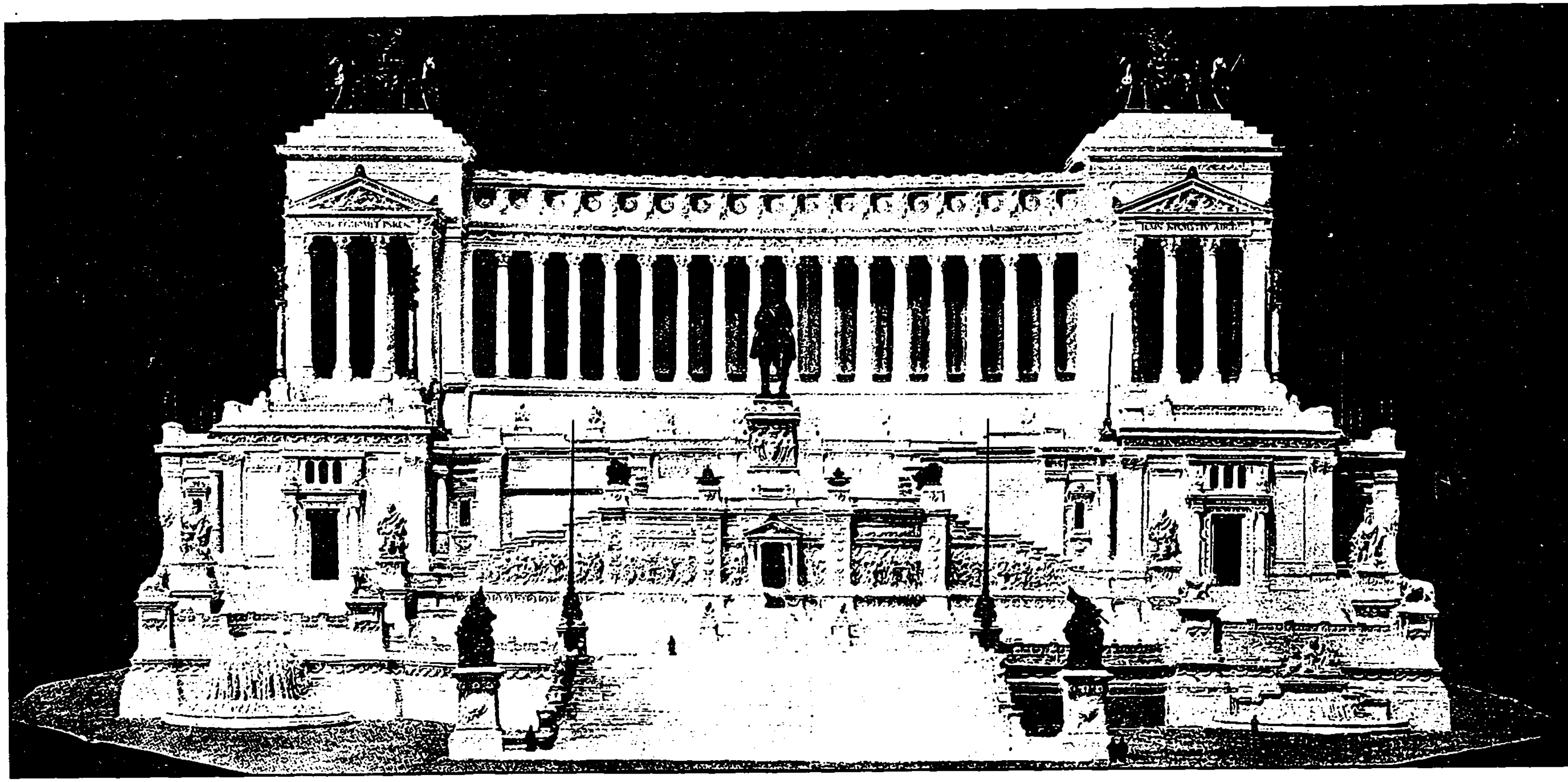
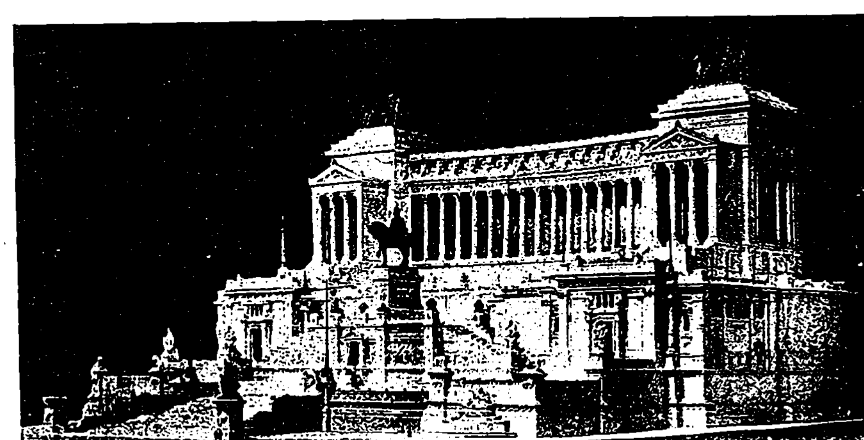
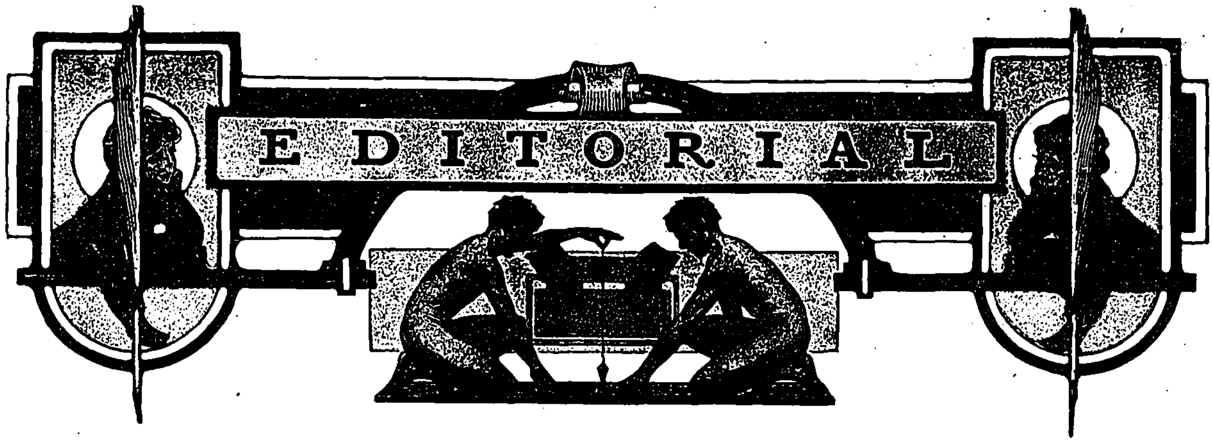


Front View, Victor Emmanuel Monument, Rome, together with View of Right Approach and General View from the Side.





Building Statistics for June show that country is still moving on apace—Thirty-one cities record average gain of 40 per cent. over same month of last year.

AN AVERAGE GAIN of 40 per cent., representing a total investment of $1,992,258 as against $10,364,478 in the corresponding period of last year, briefly summarizes the building situation as based on operations undertaken in the thirty-one cities reporting to "Construction" for the month of June. Taking into account the tremendously heavy investment of the preceding month, the showing made clearly indicates that as regards structural development, the country in general is moving on apace. Twenty-two gains in all were noted in the thirty-one cities referred to, the totals in a large number of instances denoting a decidedly marked increase.

Winnipeg's total of $2,790,250 is the largest amount registered; Toronto's expenditure of $2,384,400 shows the next heaviest investment; and Calgary comes third with an amount of $1,826,250. Calgary's advance, in view of the high state of activity experienced in the month of May, reflects a most remarkable expansion; her increase of 186 per cent. being proportionately greater than that noted in the case of Winnipeg or Toronto, where the gains registered were 15 per cent. and 3 per cent. in order named. The West in fact moved along with its characteristic stride; the only two places to suffer a loss being Brandon and Vancouver, their respective decreases being 69 and 22 per cent. Vancouver's set-back can be attributed to a great extent to labor troubles affecting several branches of the building trades. So far Vancouver has a two and a quarter million dollars increase over the same period of last year; and according to a report from Building Inspector Jarrett, his department feel confident of an increase correspondingly as great for the next six months.

Saskatchewan witnessed heavy operations throughout, the investments ranging from $103,000 to $779,725 in the four principal cities. Saskatoon noted an increase of 301 per cent.; Regina an advance of 180 per cent., and Prince Albert and Moose Jaw respective gains of 283 and 699 per cent. In Alberta a like degree of prosperity was found in evidence, for aside from Calgary's gain, other increases noted are: Edmonton, 53; Medicine Hat, 393, and Lethbridge 5 per cent. In British Columbia, Victoria is ahead by 10 per cent. At North Vancouver the value of permits amounted to $55,415, and at New Westminster new work was started entailing an expenditure of $68,000. Neither of the two latter places submit corresponding figures, but it seems safe to assume, considering their respective populations, that both are substantially ahead.

The bulk of the decreases were centered in Ontario, five of the seven losses occurring in this Province, viz.: Fort William, 13; Berlin, 17; Brantford, 9; Stratford, 62; St. Thomas, 24 per cent. In several instances, however, the declines are of no serious consequence. On the other hand, Hamilton has a total of $618,675, netting a gain of 104 per cent., and Ottawa issued permits valued at $404,975, which is 33 per cent. better than her corresponding figures. Windsor advanced 306 per cent.; Guelph

	Permits for June, 1911.	Permits for June, 1910.	Increase, Per cent.	Decrease, Per cent.
Berlin, Ont.	$32,910	$39,975	......	17.68
Brandon, Man	22,825	97,950	......	69.55
Brantford, Ont.	99,095	109,145	......	9.21
Calgary, Alta.	1,826,220	573,846	218.24	.....
Edmonton, Alta.	357,929	233,670	53.17	.....
Fort William, Ont.	220,390	256,225	......	13.99
Guelph, Ont.	61,050	16,300	274.54	.....
Halifax, N.S.	52,000	21,630	140.40	.....
Hamilton, Ont.	618,675	301,885	104.93	.....
Kingston, Ont.	58,125	11,545	403.46	.....
Lethbridge, Alta.	94,960	90,005	5.50	.....
London, Ont.	44,756	38,586	15.99	.....
Medicine Hat, Alta.	83,575	16,925	393.79	.....
Montreal, Que.	1,780,860	1,585,284	12.34	.....
Moose Jaw, Sask.	665,300	83,190	699.73	.....
New Westminster, B.C.	68,800	......	......	.....
Ottawa, Ont.	404,975	302,000	33.2	.....
Port Arthur, Ont.	183,450	65,375	180.61	.....
Prince Albert, Sask.	103,675	27,050	283.27	.....
Regina, Sask.	716,025	255,318	180.61	.....
Saskatoon, Sask.	779,725	194,400	301.09	.....
Stratford, Ont.	12,400	33,000	......	62.43
St. John, N.B.	62,000	44,300	39.95	.....
St. Thomas, Ont.	23,350	31,050	......	24.80
Sydney, N.S.	98,247	69,789	40.77	.....
Toronto, Ont.	2,384,440	2,302,550	3.56	.....
Vancouver, B.C.	906,706	1,162,940	......	22.04
N. Vancouver, B.C.	55,415	......	......	.....
Victoria, B.C.	250,800	227,600	10.19	.....
Windsor, Ont.	126,330	31,075	306.53	.....
Winnipeg, Man.	2,790,250	2,413,700	15.60	.....
	$14,992,258	$10,636,278	44.65	...

274, Kingston 104, and London and Port Arthur noted increases of 15 and 180 per cent. in order named.

Montreal has the fourth largest amount noted, the aggregate value of new work amounting to $1,780,-860, which is 12 per cent. better than the same month last year. In the Maritime district the situation also showed an improvement. Halifax annexed a gain of 140 per cent.; Sydney one of 40 per cent., and St. John advanced 39 per cent.

Reports to hand give every indication of a large volume of work ahead, and it is quite evident that the present wholesome condition will see no change for at least some little time to come.

¶ *Architectural Collaboration—Well-known architect criticizes present method of conducting competitions—Would have selected architects co-operate on important work.*

MUCH HAS BEEN SAID with regard to architectural competitions, and we have had several which were unsatisfactory in Canada, together with one or two, that might be approved of by the profession. In connection with this particular difficulty in the architectural profession, F. W. Fitzpatrick, of Washington, has to say the following:

Worse than that, they are a veritable ill, and one that, like a cankerous growth, threatens to poison and perhaps destroy the entire body. Strange, too, how, just like so many other ills, we seek constantly to retouch it, gloss it over, perhaps minimize it and sometimes even make frantic efforts to better it, but never seem to even dream of boldly eradicating it!

Let me suggest something. No, nothing startlingly new or original, simply something quite old but forgotten, merely a resurrection of a cobweb antique, but one that in its time worked to a charm, and is to-day as fit as ever if we only have gumption enough to make it do duty instead of the frapped idea of "Competition."

Architectural competition never was, is not, and never will be an ideal way of selecting an architect. Not one owner in a hundred thousand has the qualifications necessary to a discriminating judgeship as to architectural merit; his selection is either a prejudiced personal one, or he is blandished by some trick of rendering, of glibness of tongue or vain promise of extraordinary or impossible achievement. If he selects a professional adviser it is rarely a great master, or a man of noted ability and keen sense of differentiation. The judge is seldom the peer—save in name—to many of the competitors and with all the prejudices, the whims, the narrowness of the individual to which is often added an impaired digestion. The successful comeptitor is usually not the one who even attempts to do his best for the owner, or who honestly endeavors to solve the problem, but rather the one who best knows the judge's whims, and is shrewd enough to cater or pander to them. If there is a board of award the case is but changed in detail—not in principle; you get a compromise between half a dozen or more personal prejudices, and that's all. At best a competition is a delusion and a snare, and too often it winds up in a mess or a scandal.

Once in a while, in a free-for-all competition, a great light, a new genius is discovered, but it happens so seldom that we hardly need to sit up nights watching for the new star. I have known something of that kind to happen but twice in the past thirty years, during which period I have been more or less actively intimate with competitions. Indeed there is scant opportunity for that sort of thing these days, as in most cases the big competitions, particularly those for public buildings, are "restricted." The eligible competitors are naturally the most successful practitioners and the big jobs seem to be, quite by accident, of course, portioned out with arithmetical precision and rotation.

Now then, instead of all this, that rarely conduces to the best results architecturally, why not call for "collaboration" instead of the farcical so-named "competition"? If the number of competitors can be limited, then certainly an owner may with equal justice select the local or other architect—in whose integrity and ability he may have confidence—to construct his building, to let contracts and all that sort of thing and then invite and pay one, two, four or more other architects to come in and collaborate with that one, pick his design to pieces, doctor it up, lambast it generally and then hammer it into shape. They'll evolve something worth while, too; and it's so much more sensible than the competition notion. Especially for Government work. In that the Government is adequately, if not admirably equipped with supervising architect and all the necessary machinery for superintendence, contract,giving and all details that are infinitely better administered generally than is the case with private work. And surely is the Government architect more intimate with departmental needs than any outsider can be and in better position therefore to plan the structure to fit its purposes. So instead of going through the motions of competition, why not try and get our legislative bodies to pass a bill authorizing the executive departments to invite and pay five or six architects to collaborate upon each new building, to discuss the design with the supervising architect, to work together to get up something useful and beautiful and that will be the result of their united energies, skill and experience?

We have at least one or had one glorious example of what could be accomplished by collaboration, an example that yielded such vastly superior results to any "competition" that had ever gone on before it that it is a marvel, indeed, that it did not take deeper root in our ways of doing things architectural. I mean the Chicago World's Fair. There a splendid corps of architects was kept together, harmonized, led, scolded by that prince of organizers and executives, Burnham, and their united work gave us a group of buildings that for beauty, unity and adaptability has never been surpassed or even equaled for modern times, nor in classic antiquity. Those buildings were a lovely dream, they lifted one above the sordid things of earth, idealized that exposition, were its chiefest charm and fascinated the bucholic plainsman as well as the most cultured traveller.

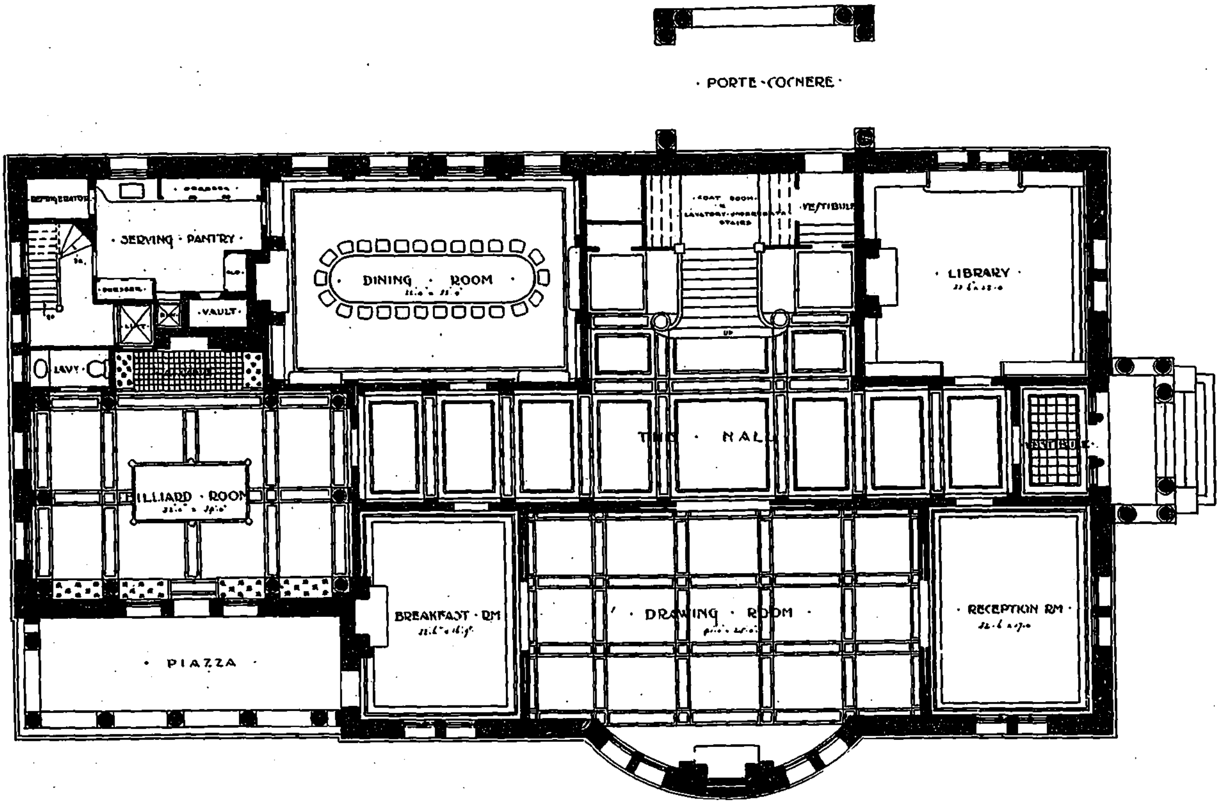
COLLABORATION, that's the word. Why not try it again?

Rebuilding of Towns in the Porcupine District—New buildings will undoubtedly be of a more substantial character than those destroyed by recent fire.

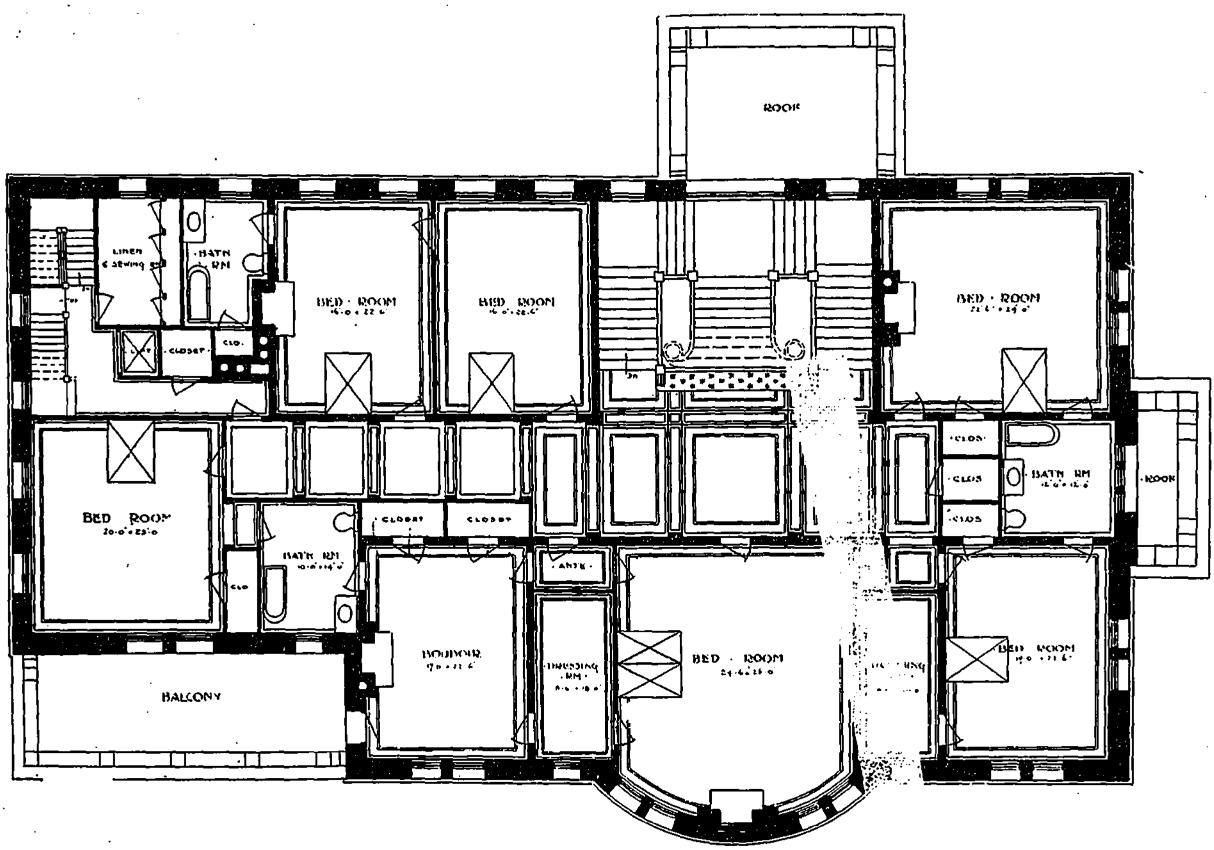
THE DISASTER which recently overwhelmed the Porcupine district is invariably the fate which overtakes all new mining camps, although as a rule the death list is less appalling. It is the sacrifice which the pioneer usually makes on the altar of progress. Hastily shapened and poorly constructed, the character of buildings to be found were such as would fall easy prey to a much lesser conflagration than that which visited the north country. Added to this is the fact that towns like Cochrane are not sufficiently advanced to have stringent building regulations, and such improvements as a reliable water service, and properly organized and efficiently equipped means to cope with a situation of even less serious proportions. Even many of the more important municipalities are inadequately provided for in this respect. Toronto, for instance, with its metropolitan manners, was confronted during the recent hot spell, when it found its water works overtaxed and its reserve supply in its reservoir being drained, with a state of affairs sufficiently alarming to bring under immediate consideration of the Board of Control the advisability of taking prompt steps to double the capacity of the new filtration plant, and to bring the wate- supply serviee up to a higher standard in general. For several days during this period, everything was as dry as tinder, and had a fire of any magnitude broken out dire consequence would have likely followed. So anything different from what happened in Northern Ontario could hardly have been expected. It seems like a misfortune of this kind is due before the authorities of the new towns are thoroughly awakened to their full responsibilities. Cochrane and the neighboring places are rebuilding, and it is likely that they will rebuild along more substantial lines. There will be a demand for better materials, more exacting building regulations, a more adequate water supply system, and better organized facilities for fighting fire. The old adage regarding "the ill wind" will undoubtedly hold good. It did in the case of Cobalt, Fernie and Campbellton. The rebuilding of these towns effected a vast improvement in every respect. Cobalt to-day boasts of a number of substantial buildings, including a five-story structure of reinforced concrete, and it is only to be expected that the towns in the Porcupine district will rise from their ashes in a much improved state. True, some buildings are again being hastily erected in order to meet pressing needs for immediate accommodations, and these some day will likely suffer the same fate. Most of the buildings, however, will unquestionably be built of better materials and be more substantially constructed, and what is more, will in a number of cases be more thoughtfully considered from an architectural standpoint. A prophecy has already gone forth to this effect.

THE AESTHETIC TREATMENT OF CONCRETE

SIMPLICITY OF INTENTION in constructional design may issue, says Professor Beresford Pite, F.R.I.B.A., in a native or spontaneous æsthetic quality. For example, an undesigned beauty reached without treatment is often attained by such a structure as the Forth Bridge or a ferro-concrete silo. Again, mediæval architecture grew up as a constructive method without æsthetic purpose, and yet achieved results of great beauty. Consequently, he asked, "Is not the opportunity given by the new process of reinforced concrete building one that could be utilized for the erection of the much-desired original and modern style of architecture? Are the new material and method together sufficient motive?" It had to be asked whether truthfulness of design to constructive purpose and elemental soundness of proportion were in themselves sufficient to provide that pleasantness to the eye which is desiderated. Four conclusions might be safely drawn: First, we have no instinctive guidance towards an unbiased originality for a concrete architecture; second, abstract principles like those invoked of proportion are of no assistance; third, superficial treatments, as by color, are insufficient for architectural expression, though valuable in assistance; fourth, the texture of concrete surfaces modifies and imparts special character to any forms employed for architectural purposes. Therefore, while modern considerations of utility develop æsthetic qualities, the scholarly and critical analysis and employment of traditional architectural forms suitably modified for execution in concrete is the proper method for the æsthetic treatment of concrete. A historical review of the development of some characteristics of Egyptian, Greek and Roman architecture furnishes proofs of the non-relation of æsthetic treatment to direct constructive facts. Idealized representations of ancient types form the basis of both Egyptian and Greek characteristics, while the Romans frankly separated the decorative from the practical purposes of architecture. In Gothic art, however, the constructive craftsman was the artist, and the development of decoration is integral with building craft. Modern novelty of constructive method does not remove a necessity for study of architectural development. The latter will aid adaptation and modifiation, and thus pave the way for development. At home we still are safely and timidly putting brick and stone fronts to concrete buildings. There is a great future before concrete building, and it deserves that close and patient architectural study which, deriving from the past, will give certainty to the future æsthetic treatment of the material.—"Journal of the Society of Architects," London.



Plan of Ground Floor, Montreal Residence—Showing the Hall Scheme with its Open Staircase Arrangement, and the Relative Position of the Various Rooms. E. & W. S. Maxwell, Architects.



Plan of First Floor, Montreal Residence—Showing the General Placement of Bed Rooms, Dressing Rooms, Clothes Closets and Baths. E. & W. S. Maxwell, Architects.

View from Main Approach, Montreal Residence.—Designed by Messrs. E. & W. S. Maxwell.

A MONTREAL RESIDENCE IN RENAISSANCE DESIGN

By E. & W. S. MAXWELL

Interior luxurious in the character of its appointments. Treatment of various rooms carried out to bring the whole together in a scheme of exquisite color and decorative harmony.

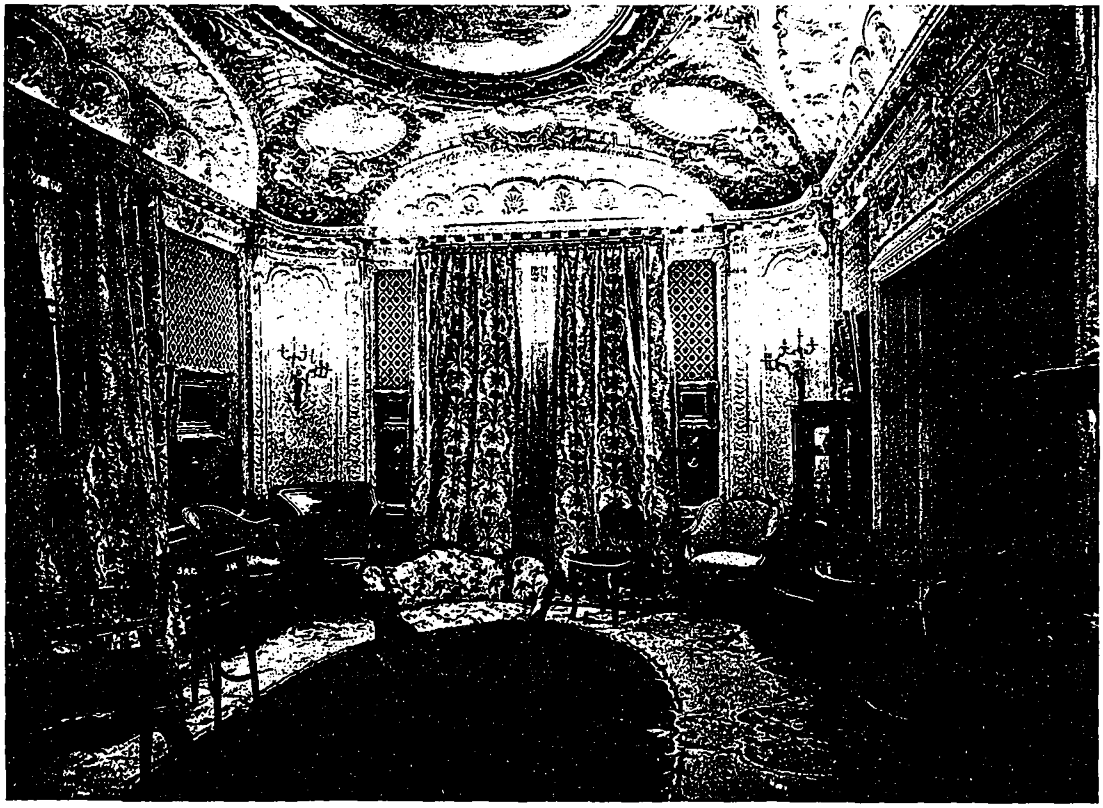
THE LUXURIOUSLY appointed residence designed by Architects E. & W. S. Maxwell, which is illustrated in the accompanying views, cannot only be referred to as Montreals most noteworthy example of recent domestic work, but as an instance of residential architecture combining dignity of character and richness of detail, it can probably lay claim to being the finest and most costly building in that city of this particular type. It is a residence such as any designer or owner might look upon with the highest degree of complacency, so beautiful is it in treatment, and so thoroughly has every part been considered to bring the whole together in a scheme of exquisite color and decorative harmony. The exterior, which is designed in Renaissance style, is executed in grey cut stone with a judicious and subdued use of sculptured detail.

The above view shows the house from the main approach, while the interior arrangement is explained in the accompanying plans. The hall, which is Early French in treatment, is finished in dark oak, with panelled wainscotting, and walls of old Flemish tapestries in a red and green woollen weave. In this part of the house the art of the wood carver has been effectively brought into service to reproduce the architects' detail, an exceptionally splendid example of his handiwork being seen in the beautifully carved and perforated staircase. The window above the landing is filled in with antique Flemish fifteenth century glass; the rugs are of Persian make with red centres; while the furniture, which is antique in most cases, has been carefully selected to correspond with the general color and decorative effect.

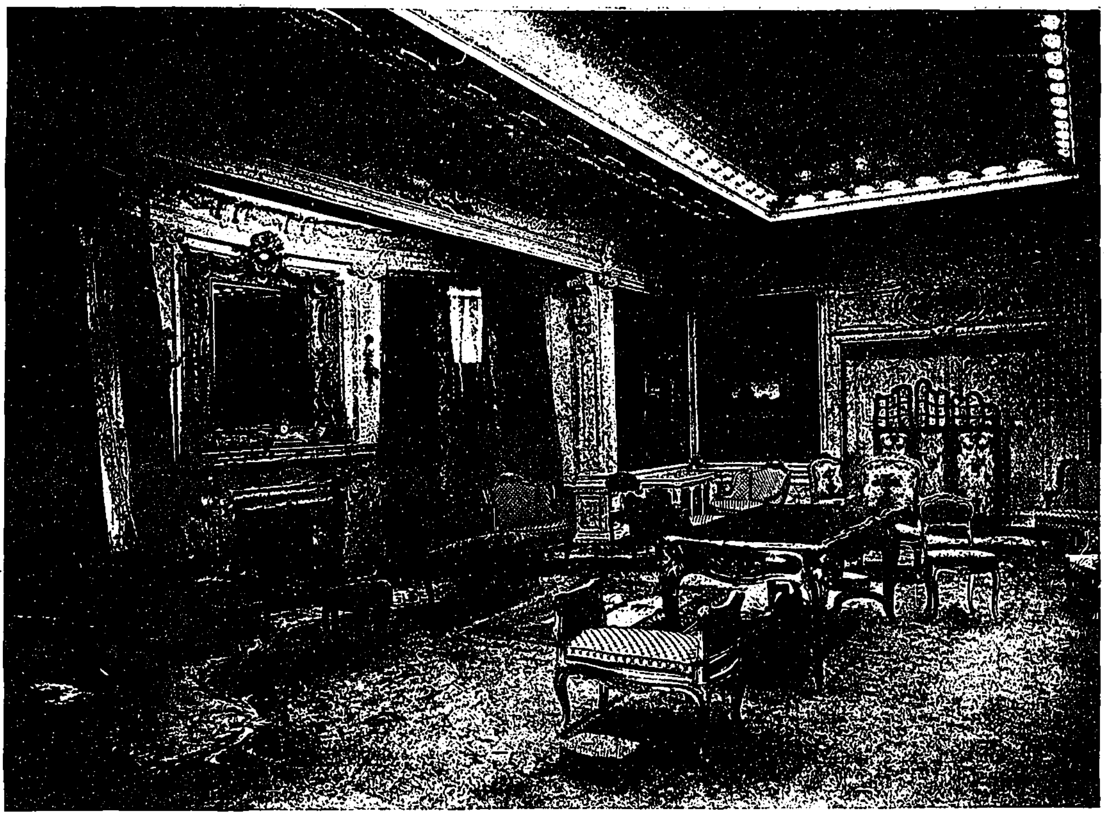
To the right on entering is the reception room, a Louis XV. interior, finished with green silk wall panels, and lavishly decorated with carved ornament. Apart from the rich luxuriousness of the scheme of this room, an interesting feature to which attention might be called, is a supplementary lighting scheme, so arranged in the cornice as to be invisible.

The drawing room, which adjins the interir, is in character with the decorative period immediately preceding (Louis XIV.), although the scheme shows considerable modification in treatment. Here what might be also regarded as an invisible lighting arrangement has been worked out in conjunction with the beams forming the ceiling panel. The wall covering of this room is rose colored silk; the wood-

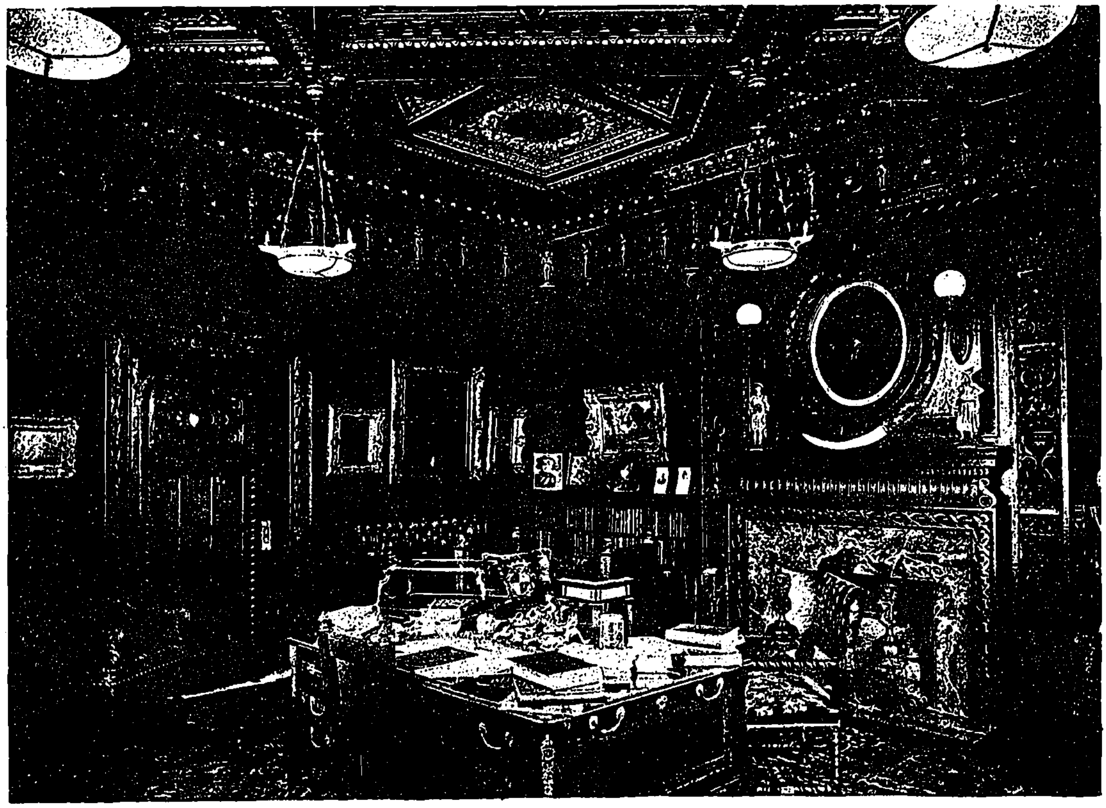
Entrance Hall, Montreal Residence—Designed in Early French Style with Elaborately Carved Staircase and Woodwork. The Entire Scheme is in Dark Oak, with Old Flemish Woolen Tapestries in Red and Green Above Wainscotting and Antique Furniture to Correspond. The Windows are of the Fifteenth Century Flemish Glass. E. & W. S. Maxwell, Architects.



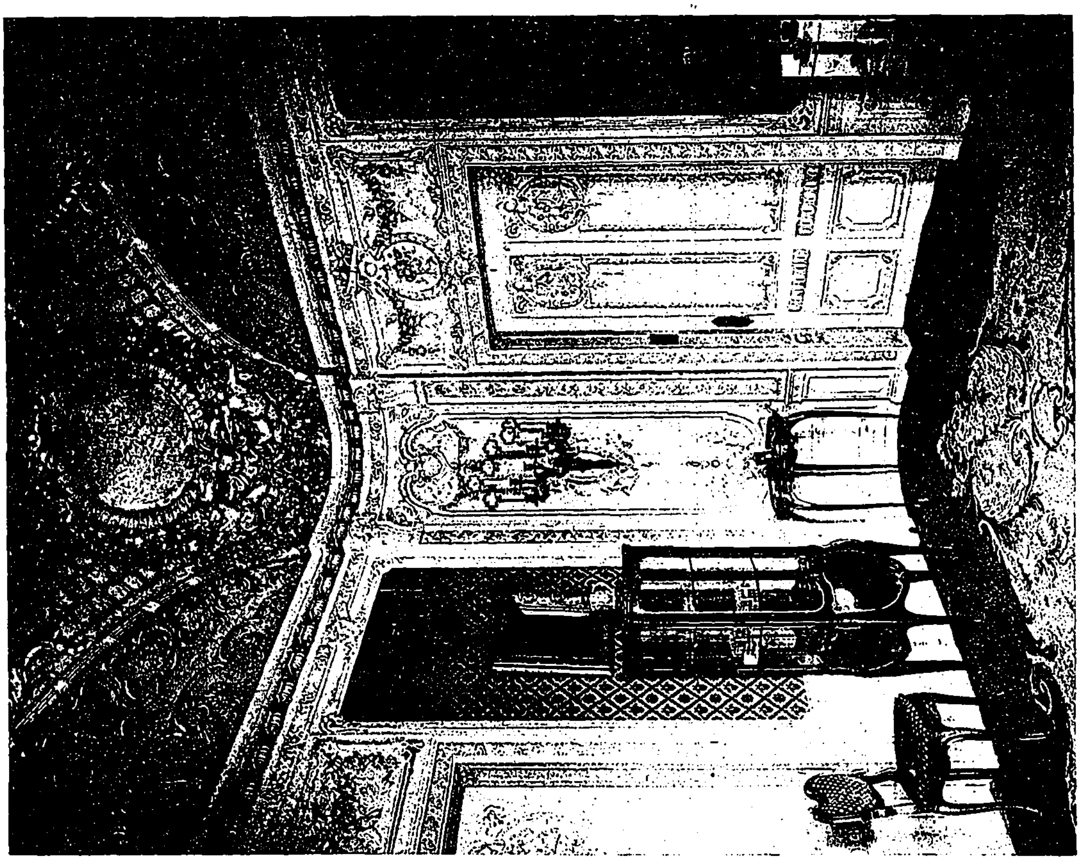
Louis XVI. Drawing Room, Montreal Residence—Showing the Carved Decoration and Green Silk Walls. A Feature of the Room is a Supplementary Lighting Scheme so Arranged in the Cornice as to be Invisible. E. & W. S. Maxwell, Architects.



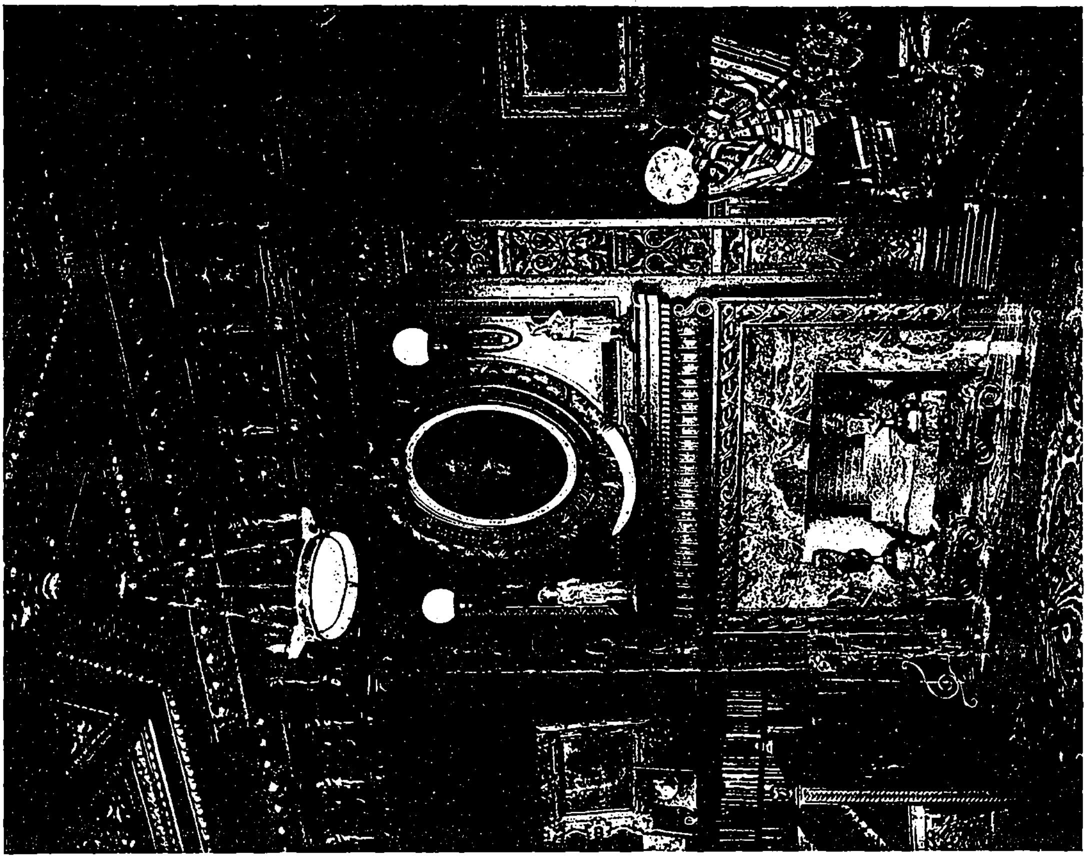
Drawing Room, Montreal Residence—A Louis XIV. Interior, Modified in Treatment. Here the Lighting Scheme is Arranged in the Beams, and is Almost Invisible. The Walls are in Rose Colored Silk, and the Mantel is in Marble. The Painting Above the Fireplace is by Sir Joshua Reynolds, Inset in a Frame Designed by the Architects, E. & W. S. Maxwell.



Library, Montreal Residence—Finished in Rosewood in French Renaissance Style. E. & W. S. Maxwell, Architects.

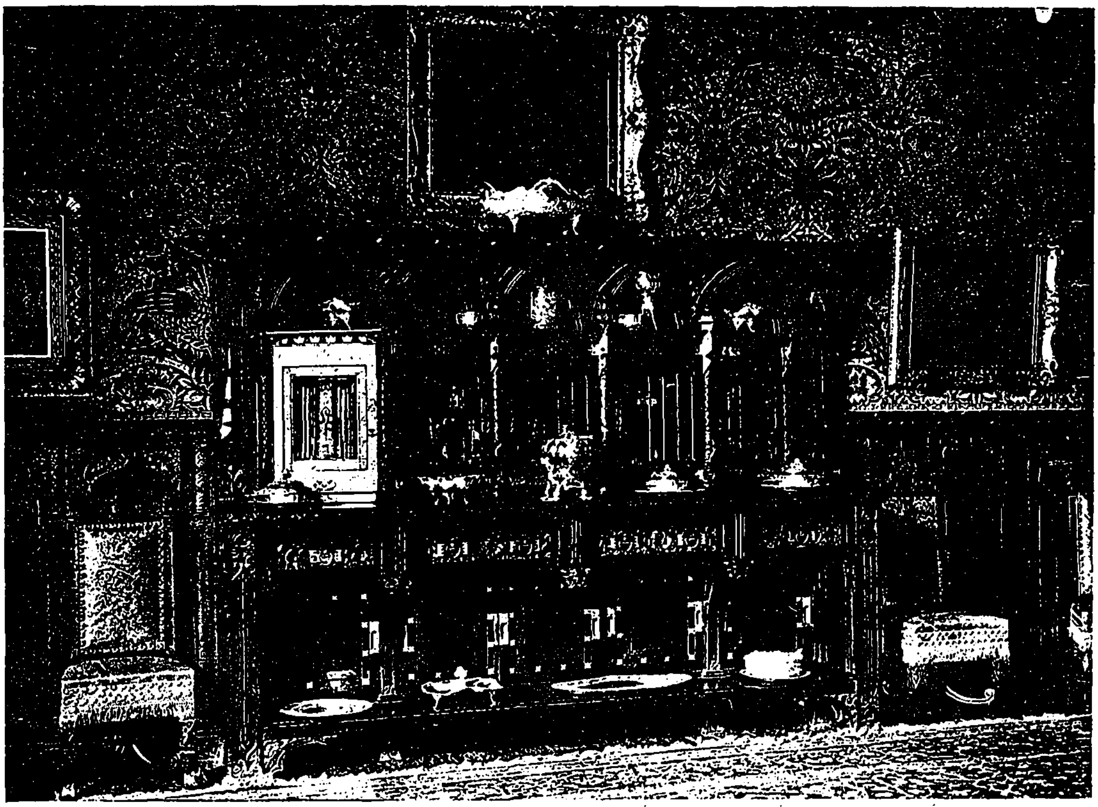


Detail of Door, Reception Room, Montreal Residence. E. & W. S. Maxwell, Architects.

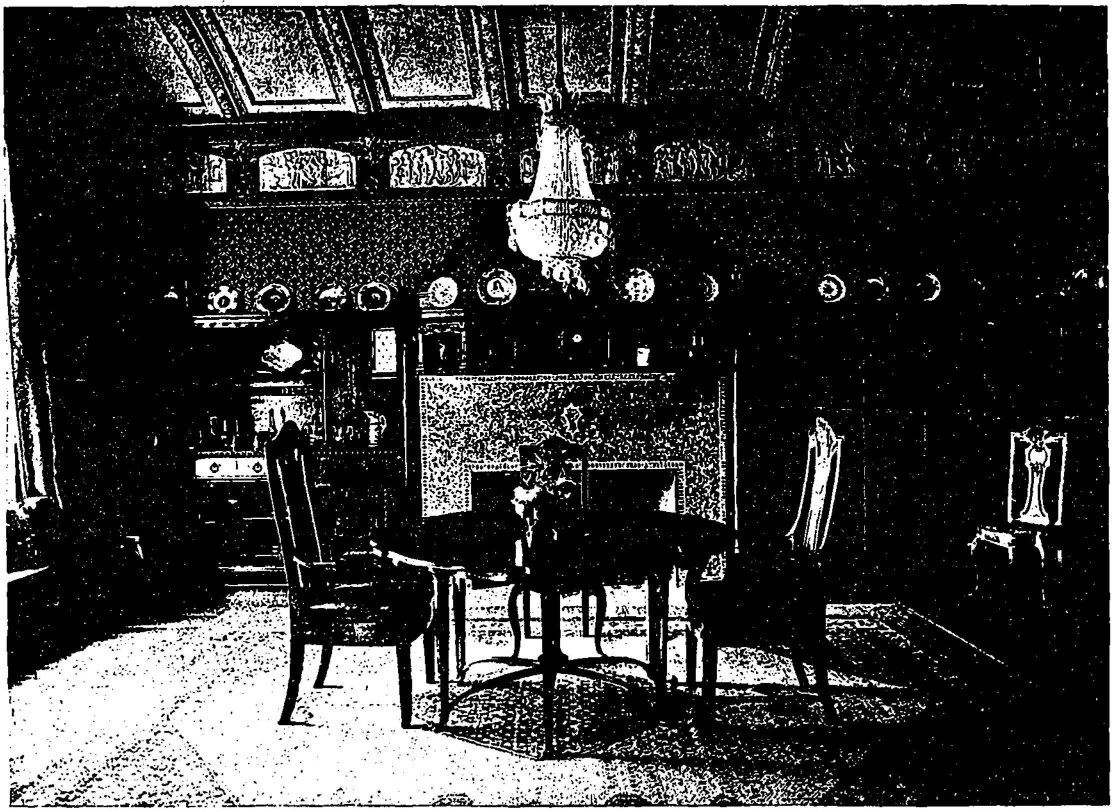


Detail of Mantel in Library, Montreal Residence. E. & W. S. Maxwell, Architects.

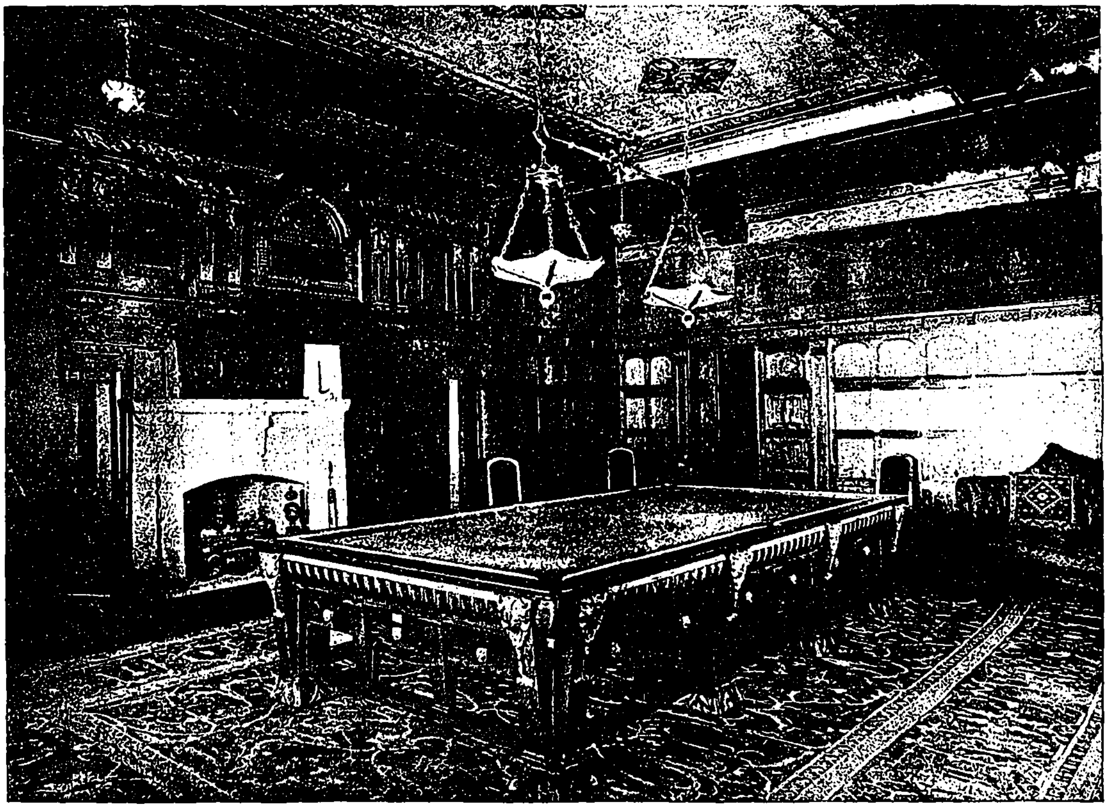
Dining Room, Montreal Residence—Carried Out in Gothic Style with Blue Handwoven Tapestry Walls, Mahogany Panelling and Carved Stone Mantel. The Lighting Fixtures are in Old Steel, and the Furniture was Designed as an Integral Part of the Scheme. E. & W. S. Maxwell, Architects.



Hand-Carved Sideboard, Dining Room, Montreal Residence. E. & W. S. Maxwell, Architects.



Breakfast Room, Montreal Residence—Finished in Tiger Wood with Figured Frieze, and Glass Mosaic Faced Fireplace. E. & W. S. Maxwell, Architects.



Billiard Room, Montreal Residence—Here the Scheme is in Old English, or Pollared Oak, with a Leather Frieze and Decorative Stone Mantel.—the Detail of Ornamentati on Being Rather Celtic in Origin. E. & W. S. Maxwell, Archi- tects.

work is painted; and the painting above the marble fireplace, which is by Sir Joshua Reynolds, is inset in a frame designed by the architects.

In the library, which is finished in rosewood, a French Renaissance treatment has been adopted, the walls being covered with a wine red figure on a dull gilt ground. An interesting part of the scheme is the marble mantel, with a painting by Sir Joshua Reynolds above. A detail view of this mantel is shown in a separate illustration. In this room, and in the other interiors as well, the furnishing and decorating was carried out under the immediate direction of the architects.

Some very excellent furniture designed by the architects as an integral part of an unusually attractive Gothic scheme, is to be seen in the two views of the dining room: no two pieces of carving being alike. The room has windows of antique Flemish glass, and is most beautiful in the character of its appointments. The panelling is in mahogany, and the walls are of blue hand woven tapestry by Wm. Morris & Company; while in harmony with the richness of the general effect are the stone fireplace, and the electric fixtures which are fashioned in old steel.

The two remaining views show the treatment of the breakfast and billiard rooms. In the billiard room, which is placed at the end of the hall, the detail of ornamentation is rather Celtic in origin. Here the scheme is carried out in Old English, or pollared oak, with a leather frieze and decorated stone mantel. In the breakfast room the mantel is faced with glass mosaic, the panelling and plate rail being in tiger-wood, with a figure frieze modelled by G. W. Hill, the sculptor, above. The furniture in this room was also designed by the architects.

CALCUTTA'S ELEVATED WATER TANK

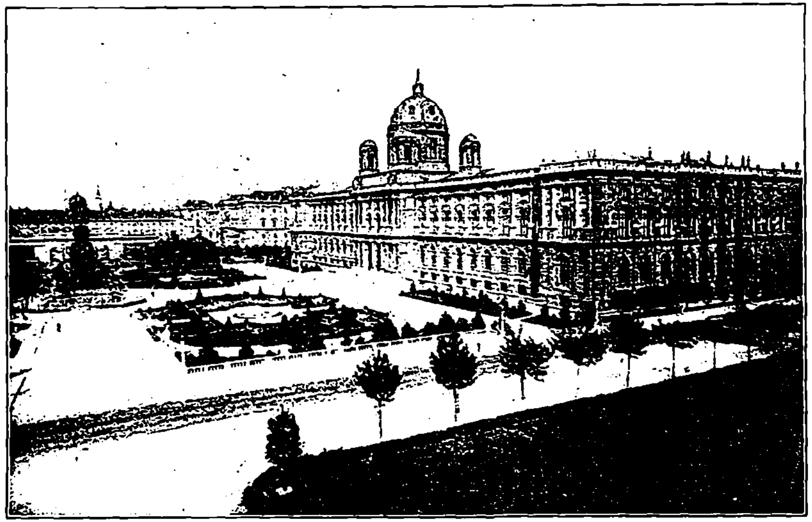
THE TANK AND MAINS for the new overhead reservoir erected at Tullah (India) to supplement the water supply of the city of Calcutta, have been completed and the new system is now in operation. This tank, to which previous reference has been made in these columns, is the largest receptacle of its kind in the world, being 320 ft. square and 16 ft. deep. It is supported by a framework of steel, embedded 2½ ft. in concrete, which is 90 ft. high, and covers an area of 2 1-3 acres. The total weight of the reservoir as it stands to-day, full of water, is about 72,000, the water alone weighing 43,000 tons and the tank bottom 800 tons. There are 32 miles of steel joists in the vertical columns and bracings, and in the foundations there are 20 miles of steel joists and tiebars.

The capacity of the tank is about 9,900,000 gallons of water, and the ordinary daily consumption of Calcutta is estimated at 30,000,000 gallons. The tank is designed to act as a balancer and to assist the pumps when they can not send sufficient water into the mains to meet the demand. In a tropical city like Calcutta there is naturally a tremendous fluctuation between the minimum and maximum of the daily demand, varying from the rate of 7½ gallons per head of the population at night to 75 gallons per head during the day when the need of the city is the greatest, and the system employed heretofore of pumping direct into the mains has not been elastic enough to meet this demand. During the night, when the pumps are providing more water than is to act as reserve. Then, when there is a great required, the excess quantity will go into the tank demand during the day and the mains can not be kept full by the pumps the reserve supply from the tank comes into operation automatically. When the demand that the pumps can not meet relapses the full pressure from the pumps into the mains automatically cuts off the flow from the tank, and this flow comes into operation again immediately the pumps are not keeping the mains full.

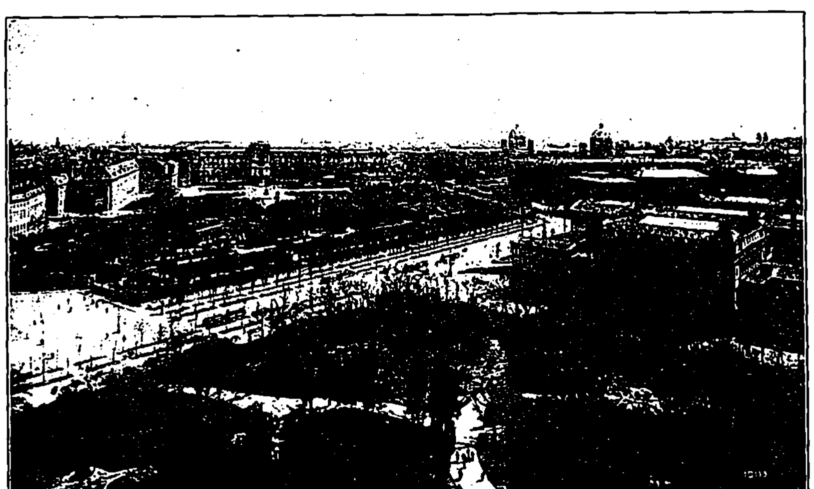
One main, 6 ft. in diameter, conducts the water 30,000 feet from the tank to the extreme north end of Circular Road, and a second, 5 ft. in diameter, conducts it 18,000 ft. from that point via Circular Road and Dhurrumtollah to the corner of Wellington square and Wellington street. These mains are, of course, supplemented by a network of smaller mains making direct delivery throughout the various streets of the city. The total cost of the tank, new mains, and new installation, etc., has been about $1,550,000.

WE SHOULD HARDLY EXPECT to learn much of the arts of civilized life from the tribes of central Asia, yet it seems they make better brick than we turn out. The barbarians employ the same material that we do, and curiously enough, the thing that imparts superiority to their process of brick-making is one of the powerful agents of Western civilization—steam. When the Asiatics have baked their bricks for three days, the opening of the oven is closed with felt which is kept wet, so that the bricks, intensely heated, are enveloped in steam. The process causes a remarkable change in the character of the bricks. From red they turn grey, and at the same time acquire a remarkable degree of toughness and hardness. Although porous, they give out a sound when struck, like that of clink-stone; and they are said to resist the efforts of weather much better than do the bricks of Western make. Necessity was the mother of invention in this case, for the climate in which these ingenious Mongols live is subject to great extremes of temperature, having a disastrous effect upon bricks made by the ordinary process.—Scientific American.

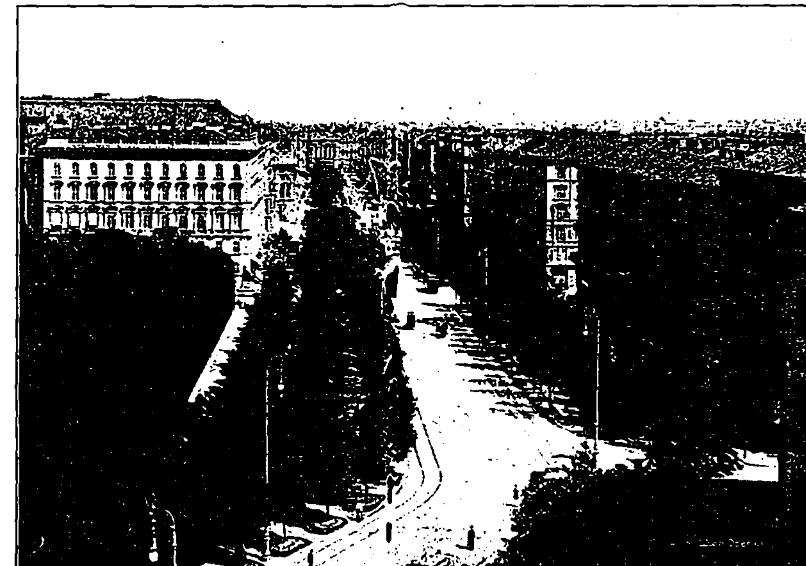
SOMETHING LESS than a century ago there was a tax on building brick in England, and in order to evade it the brick were made of larger and larger sizes. These were used for cellars and other concealed places. To stop this fraud an act was passed in the reign of George III. fixing the legal size of brick. Early in Queen Victoria's reign the tax was taken off, and brick may now be legally made of any size whatever, but any change from the standard size would bring about great inconvenience. All calculations for building are made on this standard, and the London building acts have practically fixed it at 9x4½x3 inches for all time.



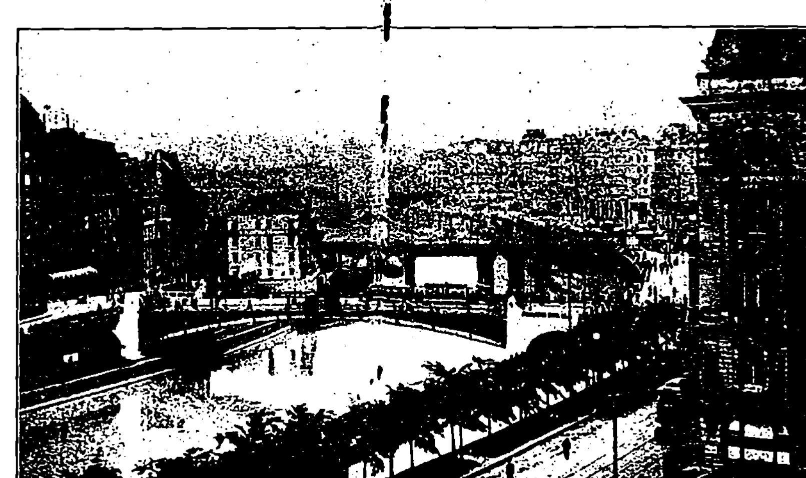
2.—THE MARIA THERESIA PLATZ, VIENNA.
Taken from the Royal Stables.



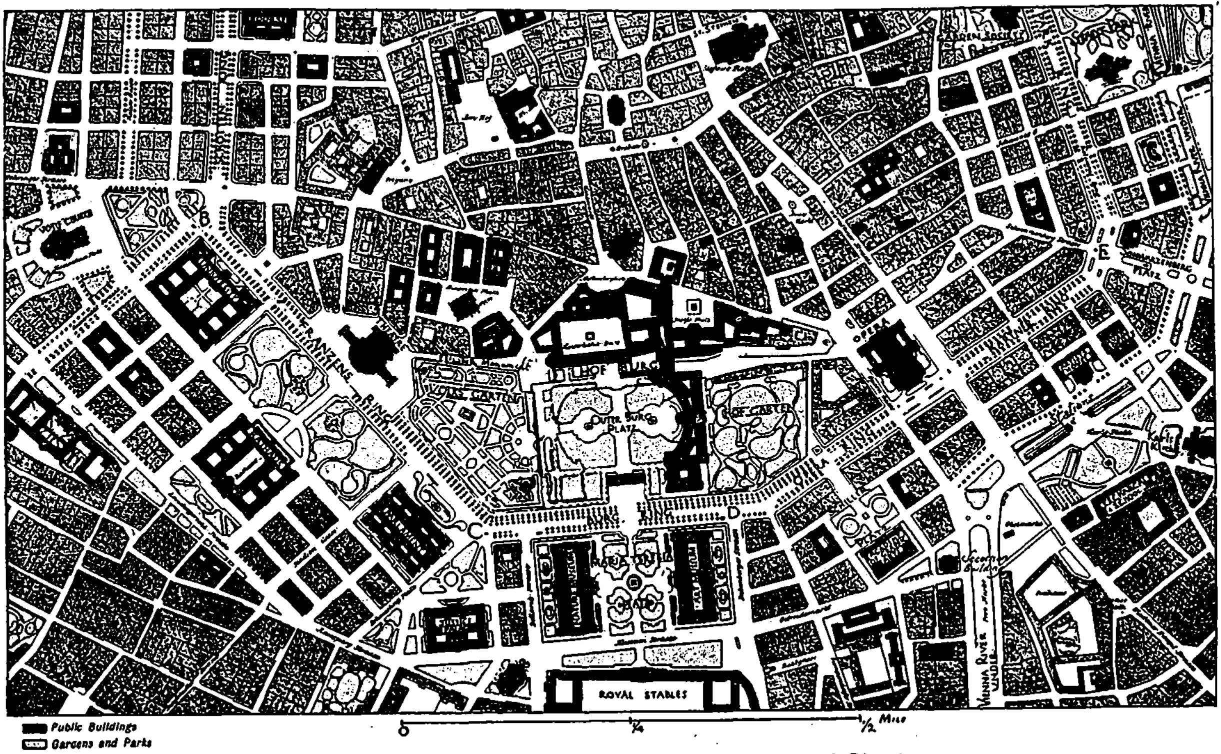
4.—THE FRANZENS RING, VIENNA.



3.—THE OPERA RING, VIENNA.



5.—THE FRANZ JOSEF QUAY, VIENNA.



1.—Plan of Vienna, Showing the Western Part of the Inner Town and Ringstrasse.

CITY PLANNING AS CARRIED OUT IN VIENNA

The Ringstrasse and relation of public buildings to the principal arteries of traffic. Points of merit claimed for plan adopted.

MUCH ATTENTION has been given to the city of Vienna by reason of the recent consideration of the question of town planning and the physical improvement of cities. Statement has been made that Vienna is the most perfectly planned city of Europe. Maps, models and photographs showing the arrangement of streets, the grouping of buildings and the general appearance of the three concentric girdles, the inmost of which, portions of the city have been shown at the various city planning conferences in support of this statement.

The most noticeable features of the city plan are known as the Ringstrasse, was formerly occupied by a wall surrounding the inner town. The accompanying diagram shows the western part of the inner town and Ringstrasse. This circular street, with the radial intersecting streets, forming main arteries of traffic, and the groupings of the public buildings about the Hofburg, or Royal Palace, are the points of merit which are claimed for Vienna's city plan.

The Ring is made up of a number of sections bearing distinct names, as follows: The Schotten-Ring, so called from the monastery of Scottish Benedictines situated in the old town near by; the Franzens-Ring, in front of the Royal Theatre; the Burg-Ring, in front of the Royal Palace; the Opera-Ring in front of the Royal Opera; the Kaertner-Ring; the Park Ring, in front of Stadt Park, and the Stuben-Ring. The remaining space completing the Ring is occupied by the Franz Joseph Quai, on the Danube canal.

The criticism has been made that the Ringstrasse offers an obstruction to transportation and to the development of the city. Just why the latter should be true is not apparent, unless it is a factor of the question of transportation. And with the number of transverse streets shown, it is evident that transportation may be readily taken care of. However that may be, the opportunity offered for the effective grouping of buildings, and the space allowed for inner town parks and gardens, should compensate for a slight check on transportation.

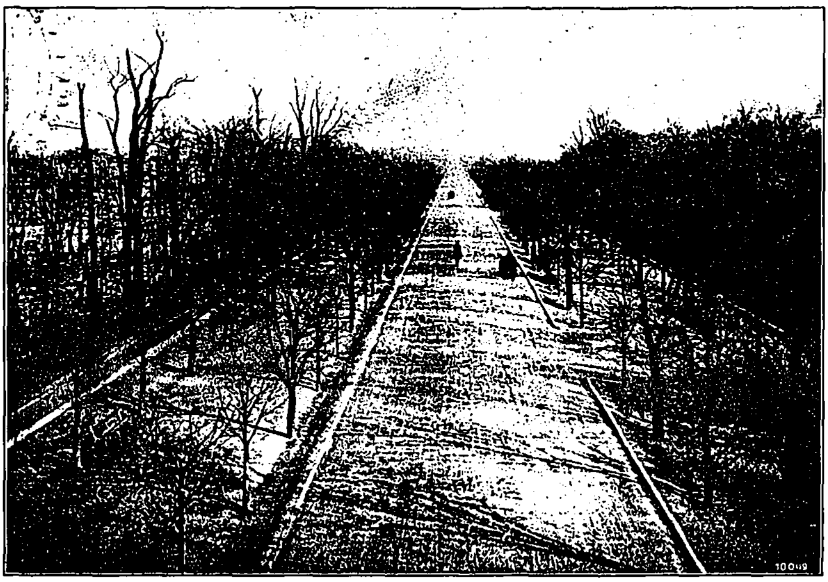
The grouping of public buildings is an admirable feature of the Vienna plan. All of the group situated with the Franz Joseph Quai as a background are made to centre upon the Hofburg and the two imperial museums, which, with the outer Burg Platz and the Maria Theresia Platz, form two inclosed squares. The squares form the central feature of the two symmetrical rings fronting on the Franzens-Ring and the Opera and the Kaertner-Rings. The original conception of this plan is due to the German architect, Gottfried Semper, and the building was carried out by Baron Hoolnauer. Photograph 2 shows the Maria Theresia Platz, as seen from the royal stables, with the Art Museum on the right. The formal garden is characteristic of those within the Ringstrasse.

In laying out the other main side of the Ring an attempt has been made to place an important building in the centre of each, on the side of the inner town. The placing of the Theatre and the Opera centrally on either side of the Hofburg is in accordance with this plan, and is an excellent piece of symmetrical grouping; but owing to their distance apart, this feature cannot be fully appreciated when viewed from the Ring. Photograph 3 shows a portion of the Opera-Ring. As will be noted from the plan (photograph 1), the wing along the Franzens-Ring has been more developed than the other; the Parliament building, the University and the Rathaus (city building) having been constructed on this first named portion, making it symmetrical upon the Theatre as a centre. Some idea of the effect of this grouping may be gained by reference to photograph 4, which shows a view looking towards the Hofburg from the Rathaus across the Franzens-Ring and Volks Garden. The intervening space between the Rathaus and Franzens-Ring is laid out in twin parks, with a central avenue between. The criticism has been made that the large forest trees in these parks tend to obscure the effect of the grouping of the buildings, as viewed from the ground level. This effect is not noticeable from the photograph shown. A great deal more intelligent treatment is evident in the wing dominated by the Theatre than in that of which the Opera forms the central feature. In the latter, the two important groups formed by the Academy of Graphic Arts with the Schiller Platz and the Technical School and the Karls-Kirche have been allowed to become widely separated by blocks of office buildings, so that their effect is entirely lost. The Technical School and Karls-Kirche, facing the Artists' House and the Music Society, form an independent group, the Vienna River, which flows between them, having been covered to form Karls Platz and a garden in front of the Technical School. The grouping of buildings on other portions of the Ring does not follow any consistent plan, such as characterized those previously mentioned, but it is hoped that in time a more orderly arrangement may be effected.

The base of the Ringstrasse is formed by the Franz Joseph Quai, a portion of which is shown in photograph 5. It is in the form of an irregular curve, following the line of the Danube Canal, and with the convex side towards the Hofburg, except near the Schotten-Ring, where a slight bend in a contrary direction forms a small park. The buildings along the Quai form a fairly level horizontal line, and the banks have been improved after the manner shown by concrete walls. The bridges are by no means remarkable, but are consistent and artistic.

There are, as may be noted, a number of small parks or town gardens within the Ring. These vary from the small patches in front of the Palace of Justice to the wooded park known as Stadt Park. They are in most cases laid out after the formal fashion noted in the photograph of the Maria Theresia Platz, but in some cases they are characterized by the picturesque "English manner," with well-grown, unrestricted trees and rich, thick foliage.

The Prater, not shown on the plan, is the true town park of Vienna. It is divided into three parts; the first, known as the Wurstel Prater, contains the milder amusement devices found at our state and county fairs; the second is dominated by the rotunda, erected for the exposition and preserved for exhibition purposes; and the third consists of natural woods and water. Extending through the Prater is a tree-lined drive three miles long, known as the Haupt-allee. Photograph 6 shows the Haupt-allee, or long drive through the Prater, with the walks and parking at either side. A number of other gardens and parks owned by the city or belonging to the royal grounds may be found throughout the city, but, excepting the Prater, they are of value only for their appearance, as they offer no such advantages as are demanded in American parks, namely, shade and plenty of green grass.



6.—The Long Drive Through the Prater, Vienna.

The streets are generous in width and well planned, though in some cases wretchedly paved. The accompanying cross-sections show a number of the principal streets. As will be noted, ample space is provided in each case for all classes of traffic. The Ringstrasse is symmetrically laid out, with roadways on either side of the central roadway and separated from it by a tree-lined promenade and riding track. The effective means of screenings the sunken railway along the Gurtelstrasse may be noted. The idea of avoiding the unsightly appearance generally noted in

7.—Ornamental Tramway Poles, Vienna.

street railway appurtenances is shown in photograph 7, flower baskets having been provided on the trolley standards and an artistic design for the base substituted for the straight, unsightly pole so common in America.

The Stadtbahn, or Metropolitan Railway, follows along the canal for five miles. The promenade, which forms a part of the gardens, is immediately over the railway and supported on columns in such a way that one side, towards the canal, is open to provide light and air.

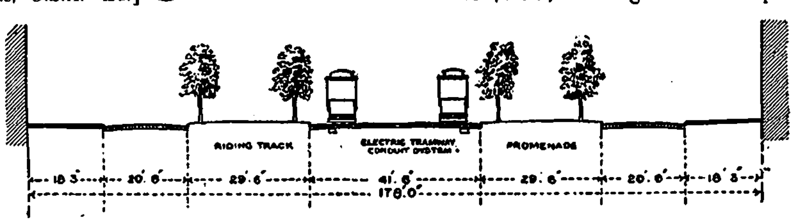
Taken in its entirety, the Vienna plan has much to recommend it to those interested in city planning, thought in some cases the carrying out of ideas has been unsuccessful.

[The above text, together with the illustrations used, is published by special arrangement with the "Municipal Engineering," Indianapolis, U.S.A.—Ed.]

IF A SCHEME now being promoted by certain New York interests comes to a head, the American metropolis will have within another year a $2,000,000 building designed exclusively for the display of automobiles, motor boats, æroplanes, and kindred products. The preliminary plans call for a structure that is remarkable in many ways. It provides for a building of eleven stories, having a starting and landing track for flying machines on the roof, as well as an artificial lake 60 by 125 feet for demonstrating motor boats. One of the structural novelties will be a moveable floor the same size as the centre court of the building, which may be raised or lowered, thus permitting any large exhibition to have one vast unbroken area on the ninth floor, with the tenth and eleventh floors serving the purpose of galleries. The site which the promoters have in view is close to the downtown business district. The ground floor of the building is to contain modern shop, and the seven floors immediately above are intended for individual showrooms. In the basement will be a magnificently appointed "rathskeller" capable of accommodating 6,000 persons.

A NEW CONCERN, known as the Edmonton Portland Cement Company, and having a capitalization of $15,000,000, has been incorporated. The company will erect a plant at a point 140 miles west of Edmonton, with a view to developing the large deposits of marle in that district. Work on the buildings is to be started at once, and it is expected the mills will be in operation within a year's time. The directors of the company are: Lieutenant-Governor G. H. V. Bulyea (chairman), J. H. Gariepy, Jas. A. McKinnon, Dr. W. D. Ferris, Ald. J. E. Lundy, S. H. Smith, A. Driscoll, J. H. Morris, W. S. Heffernan (secretary). The head office will be in Edmonton.

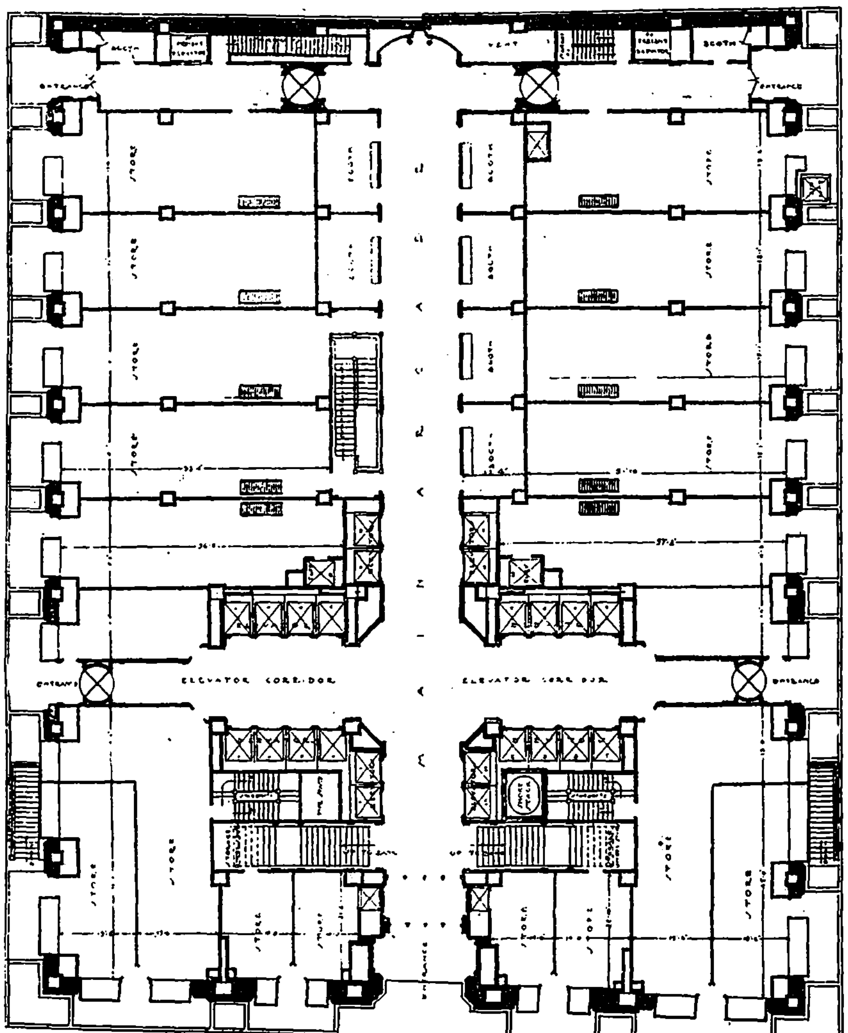
LARGE NEW SHOPS are to be established at North Bay by the Canadian Pacific Railway. Over $500,000 is given as the probable expenditure.



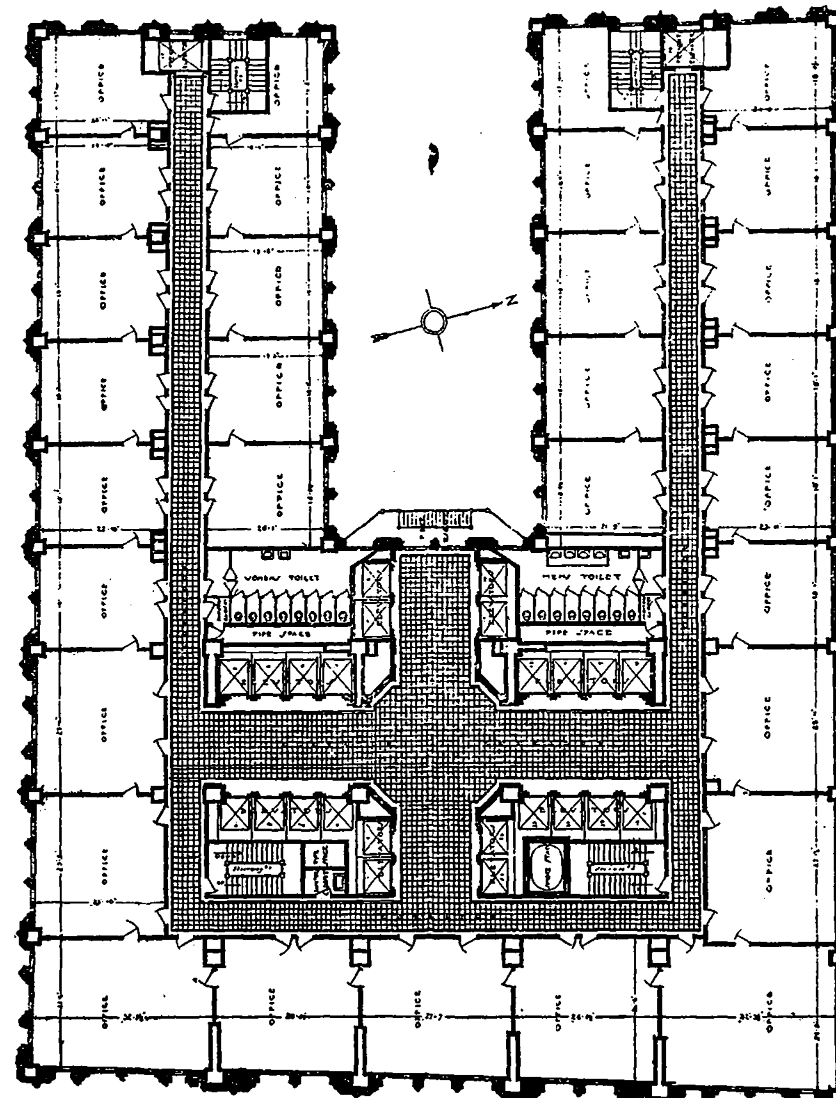
— SECTION. I. —
THE RINGSTRASSE

— SECTION. 2. —
FRANZ JOSEFS QUAY

Diagrams, Showing the Width and Arrangement of the Ringstrasse and Franz Josef's Quay.



Ground Floor Plan, Woolworth Building, New York City. Cass Gilbert, Architect.



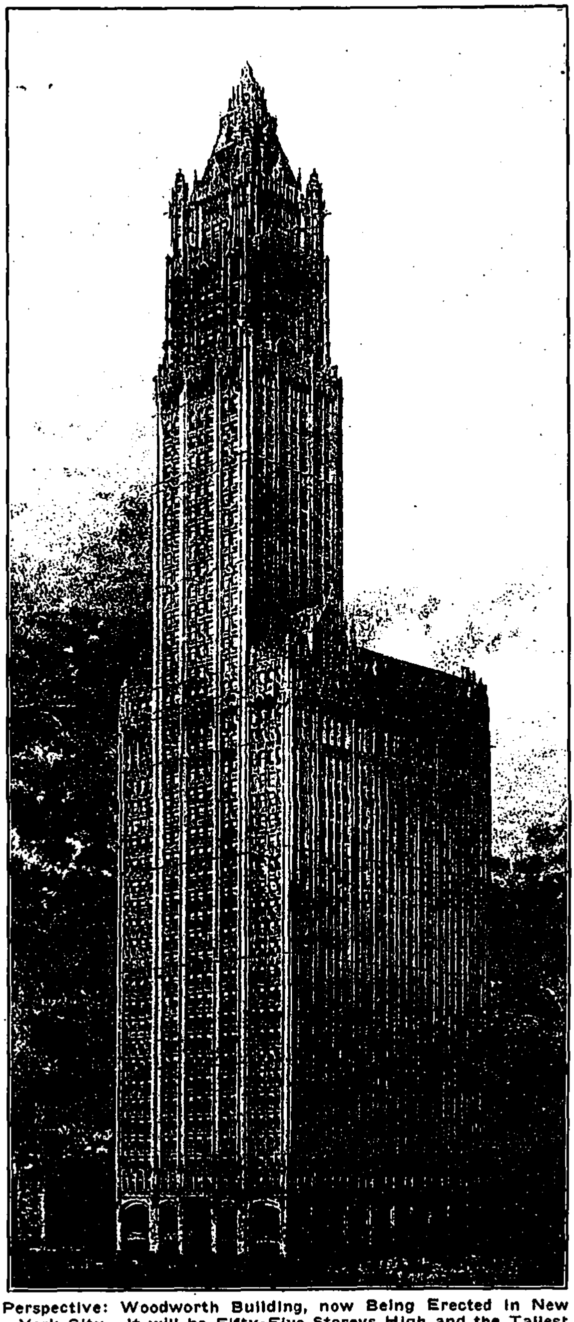
Typical Office Floor Plan, Woolworth Building, New York City. Cass Gilbert, Architect.

A MODERN OFFICE BUILDING OF FIFTY-FIVE STOREYS

The Woolworth Building—New York's latest venture in skyscraper construction—will tower 750 feet above level of sidewalk.

A QUARTER of a century back, the twenty-storey building was regarded as a marvel of architectural skill and daring. To-day in the Singer Building and the Metropolitan Tower of New York, the forty-five and fifty-storey building is an actual accomplishment, and yet the fact that the great height attained in these structures is to be exceeded may well cause one to wonder where the limit in this direction really lies. New York's latest undertaking in skyscraper construction is the Woolworth Building, of which a perspective view and floor plans are shown herewith. This building, which is now in course of construction, will occupy the entire block west of Broadway between Park Place and Barclay street; the frontage on Broadway being 152 ft. 1⅜ in., and that on the other two streets 197 ft. 10 in. and 192 ft. 6 in., in order named. Not only will it be a notable structure from an engineering standpoint, but as regards plan and architectural treatment it will probably surpass any building of a lofty character that has so far been erected.

The principal feature of the building will be its great tower, 86 ft. by 84 ft. square, which will rise twenty-six storeys above the main structure, and bring the total elevation of the building up to a height of fifty-five storeys. This tower will terminate with a great electric lantern, placed 750 ft. above the level of the sidewalk. The main portion of the building will be twenty-nine storeys high, with two storeys in the gables at the north and south front, making it thirty-one storeys at its highest point.



Perspective: Woodworth Building, now Being Erected in New York City. It will be Fifty-Five Storeys High and the Tallest Office Building in the World. Cass Gilbert, Architect.

On the exterior, the construction will be of stone and terra cotta, to which Gothic detail has been adapted; although the architectural treatment of the building will of necessity, owing to the frequent and regularly recurring window openings, and the fixed location of the steel columns and girders, be somewhat different in character from the Gothic buildings such as are to be found in the Old World.

The ground floor, which is laid out for stores, will also have an arcade with openings on Broadway, Park Place and Barclay street. This arcade will contain a large number of attractive shops, modern in appointment and having fronts entirely of plate glass. On the Park Place side will be a banking floor or mezzanine storey, which will be occupied by one of the large banking institutions of New York. The upper portion of the building will be occupied entirely by offices with the exception of the twenty-eighth floor, which is laid out in modern club apartments.

Below the ground floor will be modern safety deposit facilities together with a restaurant, rathskeller, a barber shop and a number of storage rooms, several of which will connect directly with the stores above. All the machinery, coal compartment, refrigerating plant, power plant, electric generators, filtration plant and other mechanical equipment will be placed in the sub-basement. This part of the building will also accommodate the lower portion of a large swimming tank which is to be installed adoining the baths in connection with the barber shop.

The total cubical contents of the building, measured from the top of the caissons, exceed 13,200,000 cubic feet. The caissons extend down to bed rock, and are from 110 ft. to 130 ft. below the level of the sidewalk. These caissons are of enormous dimensions, some of them being as great as 19 ft. in diameter; the contract which was awarded last November calling for one of the largest undertakings of this kind ever executed. It was deemed imperative for so great a building as this that the foundation should be absolutely clear, and above any possible question as to efficiency, so a very considerable portion of the cost of the building is represented in the foundaton work alone.

Needless to say, the construction of the building will be fireproof throughout, and that every precaution has been taken to make it one of the best constructed and safest buildings on the continent. Four self-contained stairways are provided from the roof to the level of the street. Duplicate self-contained stairways are provided in the tower, in addition to which there is an outside fireproof staircase in the court accessible from the corridors of each wing. These self-contained stairs are entirely separated from the corridors and office spaces by fireproof walls and by wire glass doors. In this manner, the possibility of fire, or of smoke in event of the ignition of any inflammable material in any of the offices, spreading from one part of the building to the other is reduced to a minimum.

Provision has been made for thirty-four elevators, of which twenty-four are arranged near the Broadway entrance in four groups of six each. At the west end of the building there will be two large freight elevators available for passenger service. Provision has also been made for additional minor elevators for the bank, stores, observation gallery, etc. These elevators are likewise self-contained, being separated from the corridor by iron and wire glass doors. In short, every precaution has been taken to render the building absolutely fireproof and of the high class construction in every respect. In connection with the tower, provision has been made for a look-out gallery for visitors at the fifty-fourth floor level.

The building was designed and is being erected under the supervision of Mr. Cass Gilbert, architect, New York, and the consulting engineer is Mr. Gunvald Aus, also of that city.

CODE OF ETHICS OF TRANSVAAL ASSOCIATION

THE FOLLOWING IS THE CODE of ethics adopted by the Association of Transvaal Architects: (1) No member should have any financial interest in or combine any other business with that of architecture, such as building, contracting, house and estate agency, auctioneering, or mercantile pursuits. (2) No member should receive directly or indirectly any royalty, gratuity, or commission on any patented or protected article used on work that is being carried out for his clients without the authority of such clients. He should be at liberty, however, to issue certificates or recommendations for payment for such goods by his clients. (3) No member should participate in or be the medium of payments made on his clients' behalf to any builder, contractor, or business firm without the authority of his clients. He may, however, issue certificates or recommendations for payment for same by his clients. (4) No member should guarantee an estimate or contract by personal bond, nor be a party to a contract with a contractor, except as direct employer or under special circumstances with the concurrence of his client and the contractor. (5) No member should attempt to supplant or compete against another architect after definite steps have been taken towards his employment. (6) No member should advertise in any publication or in any other way than by a card or plate, giving name, address and profession. It is undesirable to do so on boards or hoardings on buildings in course of construction. (7) No member should criticise in public print the professional conduct or work of another architect, except over his own name. (8) No member should furnish designs in competition for private or public work, except under conditions previously approved by the council of this or other recognized institute. (9) No member should submit drawings in competition unless designed and prepared under his personal supervision, nor should any member attempt to secure work for which a competition remains undecided. (10) No member should deviate from the rules of practice and scale of charges authorized by a recognized institute without first consulting the president or council of such institute.

POLES USED IN CANADA 1910

THE FORESTRY BRANCH of the Department of the Interior has compiled statistics dealing wiwth the poles purchased in Canada during 1910. The total number of poles purchased was 782,841, or an increase of 118 per cent. over 1909. The total value of these poles at point of purchase was $1,043,874, and the average price of poles was $1.33 or less by 6 cents than the price per pole in 1909. Steam railroads, telephone and telegraph companies used 95 per cent. of these poles, the remaining 5 per cent. being used by electric roads, power and light companies. Ninety-seven per cent. of the total consumption were cedar poles, which for their cost give better service than any other wood. At present none of these poles are treated or preserved by any method, in which respect we are far behind the United States. The United States using in 1909, 3,738,740 poles at an average cost of $1.89 or at 50 cents more per pole than it cost in Canada, found that it paid them to use preservative methods. During the last three years the treatment of poles has advanced rapidly, so that in 1909, 15 per cent. of the total number were treated by the creosote or other methods. This is an increase of 67 per cent. over the number treated in 1908. At present the United States have 87 timber treating plants, while Canada has none. It is to be hoped that this great inequality will soon be done away with, and that pole users in Canada may take up this cheap and rational method of securing greater service from the poles used and thus lessening the

CONSTRUCTION

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

Ivan S. Macdonald, Editor and Manager

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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.

Vol. 4 Toronto, August, 1911 No. 9

CURRENT TOPICS

MONTREAL'S FIRST BUILDING of all-marble construction will be the Mount Royal Hotel, a ten-storey structure which Peter Lyall & Sons, the contractors, will begin next season. The marble to be used is being cut at the Missisquoi quarries near Phillipsburg, Que., and over 65,000 cubic feet in all will be required.

* * *

EDMONTON AUTHORITIES are considering the erection of a new city hall. At a recent meeting held by a special committee of the Council, Mayor Armstrong strongly advised that competitive plans be invited at once. The rapid growth of the city has made the present municipal building inadequate, and even now new accommodations will be required before a new building will be available.

* * *

A FEATURE OF THE EXHIBITION to be held in San Diego, California, in 1915, will be a "Mission City" consisting of a series of buildings modelled after the architecture of the Spaniards who settled that State in the early days. The scheme is now being worked out by Mr. Bertram G. Goodhue, one of the most capable architects in this particular type of design, and when given materialistic form should prove an attraction of no little interest to the many visitors who will undoubtedly be in attendance.

A NEW STEEL ARCH BRIDGE to replace the present cantilever structure crossing the gorge from Niagara Falls, Ont., to the American side, is contemplated by the railroad interests in control of the structure. The present bridge is regarded as being insufficient in size to accommodate the increased heavy traffic.

* * *

AS A RESULT of a motor garage fire which recently brought about the destruction of over $100,000 worth of property, the commission now at work revising the building by-laws of Vancouver has decided to make provisions in the new regulations that will require all buildings of this type in the future to be of fireproof construction.

* * *

THE OLD HOTEL DIEU at Lyons, France, which was founded in the sixth century, is shortly to be replaced by a large general hospital to be established in connection with the medical department of the University at that place. The new institution, it is said, will be unequalled as regards arrangement and sanitary equipment by any hospital in the world. It will cover a site of about 40 acres, and contain accommodations for 1,300 patients.

* * *

ONE OF THE BROAD SLOPES of Mont Gringuez, France, is reported to have become detached from its foundations, and to have moved over a distance of nearly a quarter of a mile, carrying with it the soil, meadows and woods, and covering up in its passage roads and bridges that stood in the way. A chestnut grove has travelled 500 feet without suffering any apparent damage, but many small lakes have been formed by the damming of the waters.

* * *

IN THE NEW ART GALLERY which is now being erected on Sherbrooke street at Montreal, the Art Association of that city will shortly have study and exhibit features vastly superior to those afforded in the old quarters on Phillips Square. The galleries are said to be exceedingly well lighted and excellently arranged, with the wall construction such as to prevent damage to paintings and hangings from moisture or excessive heat or cold. The construction work is now approaching the final stage, and the building, it is expected, will be opened in the near future with an important exhibition.

* * *

MADISON SQUARE GARDEN, so familiarly known to Canadians visiting New York city, has been sold to a syndicate and will shortly be replaced by a twenty-five storey commercial structure. The building was first opened twenty-one years ago and has since that time been the home of almost every big convention, attraction and amusement that has come to contribute to the life and events on the Island of Manhattan. Sanford White, whose tragic death occurred within its walls a short time back, was the architect of the building, and up to the present time it has stood as a fitting monument to his ability as a designer.

THE FOURTH ANNUAL GENERAL Assembly of the Royal Architectural Institute of Canada will be held at Montreal, on 3rd and 4th October, 1911. A very interesting programme is being prepared which will include matters of interest to every architect in the Dominion. Every Canadian Architect is cordially invited and is welcome at all sessions and entertainments, whether a member of the Royal Institute or not. This is the best opportunity to visit the metropolis of Canada, and the Montreal architects have proposed a Royal welcome. The programme will be sent early in August to all architects and will contain all the particulars concerning the assembly.

* * *

FOREIGN CITIES are being invited, through the American diplomatic and consular service, to participate in the International Municipal Congress and Exposition at Chicago, September 18 to 30, this year. The exhibits of the exposition will be furnished by both municipalities and commercial concerns, the former demonstrating the ways and means of the operation of a city in such great departments as education, charities, streets, police and correction, fire, city planning, public health and recreation, drainage, taxation, budget making, public utilities, etc. The congress will assemble experts from this and other countries in municipal activities and in voluntary philanthropies with civic aims. It is expected that President Taft will address the congress.

* * *

AN EVENT OF IMPORTANCE to the building interests of the United States, is the National Building Material Exhibition to take place at Madison Square Garden, New York city, September 9th to 16th inclusive, The object of the exhibition is to promote a higher standard of construction by affording an opportunity for architects, material firms and the public to get closer in touch with one another, with a view to comparing the relative merits of the various products and appliances offered in connection with building work. An interestng feature of the show will be a series of demonstrations by ex-Fire Chief Croker, on methods of fire prevention. The fact that the project is warmly endorsed by prominent members of the architectural profession as well as by the larger manufacturing and building concerns, practically assures the affair being a huge success. A similar undertaking in connection with the Canadian National Exhibition, held annually in Toronto, as previously suggested in these columns, would be a sensible and timely step—and one that would do much to bring about an improved type of construction in general. If an early move was made in this direction, Canada would be but little behind her neighbor in this respect, as the forthcoming exhibition at New York will be, practically, the first of any great scope and importance held in the United States. It is nothing new, however, in Great Britain and European countries, and the character of the building and comparatively light fire losses, clearly shows it.

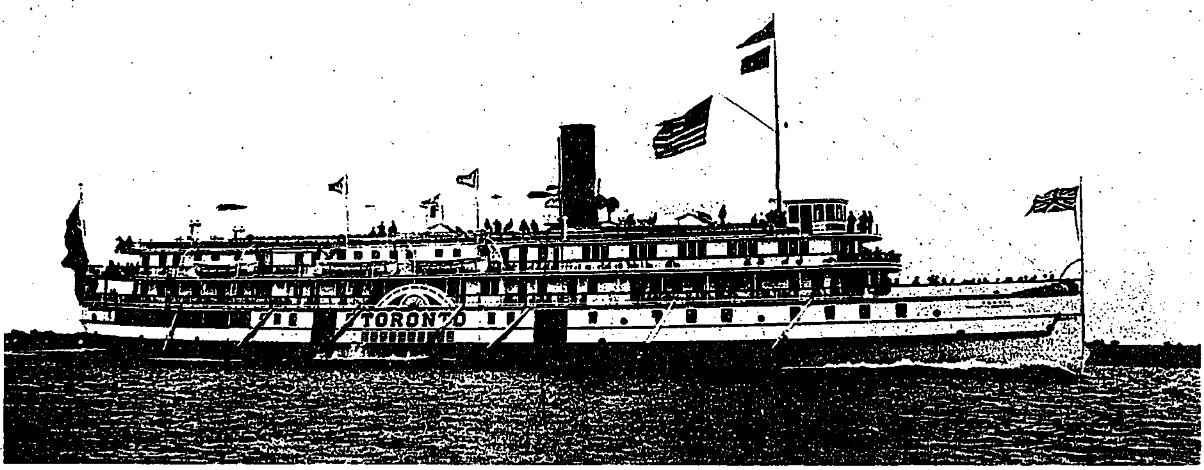
GLASS SUBJECTED TO the crushing test, says a contemporary, is harder than granite. It has a resistance of 1,800 tons per square ft., while that of granite is 750 tons, limestone 625 tons, brickwork 60 tons, and concrete 97 tons. In view of these figures it is surprising that glass has not before entered into serious competition with the other building materials. Glass bricks are being introduced for a number of purposes, and they are recommended for their strength and hardness of surface, which is a guarantee against chipping and cracking, and entirely sanitary under all conditions.

* * *

A NEW PROCESS of French origin, for the seasoning of wood by electricity, is described by a British technical journal as follows: A large tank is filled with a solution containing 10 per cent. of borax and 5 per cent. of resin, with just a trace of carbonate of soda. In the bottom of the tank is a lead plate which is electrically connected to the positive pole of the dynamo. The timber to be treated is stacked on this plate, and when the tank has been filled another plate is superimposed and connected to the negative pole of the dynamo. When the current is switched on it passes through the stack of wood between the two plates, and in its passage it is said to drive out the sap in the timber and deposit borax and resin in its place, completely filling up all the pores and interstices. When the process is completed the timber is removed and dried, after which it is ready for use. It is claimed that the timber submitted to this treatment, no matter how green it may be, becomes completely seasoned.

* * *

A CORRESPONDENT of the "Builder," London, gives an account, in a recent issue of that publication, of a new method of preserving stone from disintegration, invented by M. Jousset, a native of Tours, France. The process, which is the result of a long series of experiments and is still a secret one, is said to have nothing in common with the well-known silicate washes and sprays. It is claimed for the new treatment that, in its operation on stone deteriorated by time and moisture, it successfully reconstitutes it, by restoring the elements which the "nitromonad" or nitrifying microbe has removed; the process of petrification, investing the old stone with the hardness and resistance of granite or marble, endows it with a durability under exposure to weather at least equal to that of newly quarried stone. It also incorporates the outer portions treated with the sound core within in such a manner as to leave no room for fear that they will separate from it later. Experiments with the new process have been carried out at Tours on a portion of the stone work of the Cathedral known as Preau de St. Gatien or Cloitre de la Psalette, and member of the Archaeological Society of Touraine, who examined the results last January, found that the arch of the cloister with its mouldings and scroll work, thus treated, had resumed the appearance and constituency of new stone recently cut.



S.S. "Toronto," Richelieu and Ontario Navigation Company.—A. Angstrom, Naval Architect.

THE ARCHITECTURAL SIDE OF THE MODERN PASSENGER BOAT

Some interesting interior schemes that have been carried out in several of the more important steamships operated by Canadian lines.

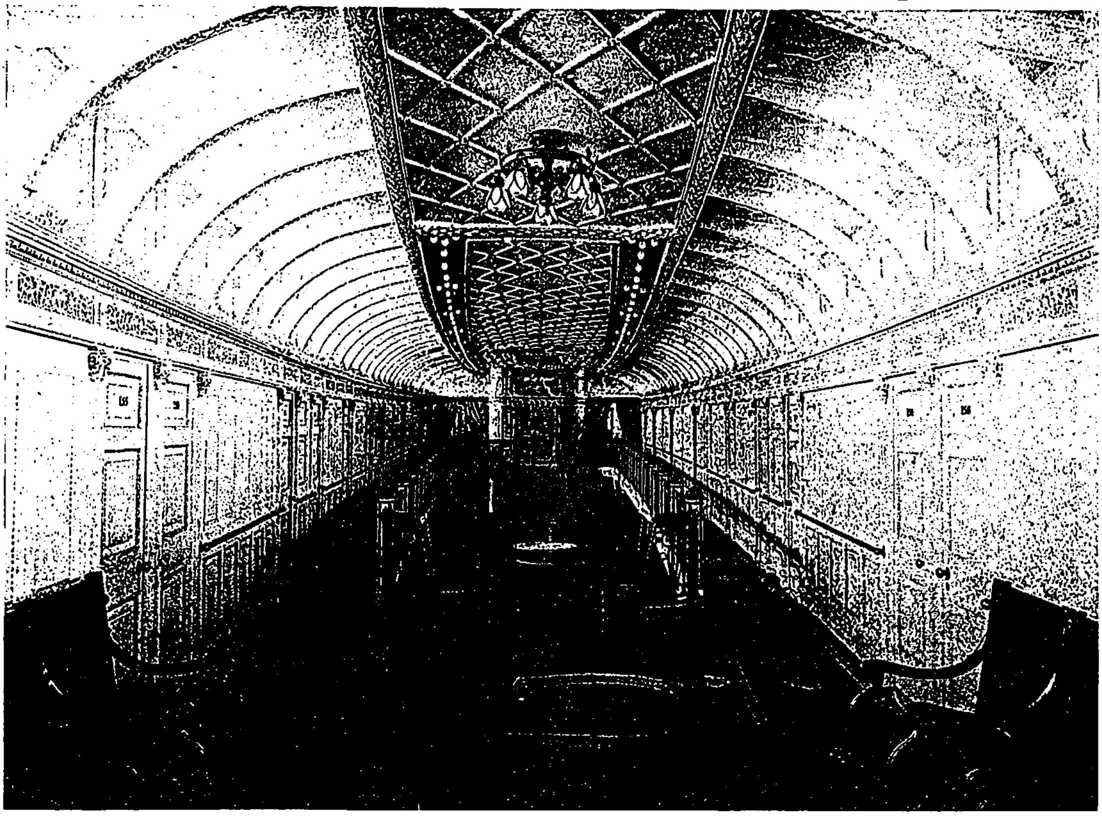
NOT ONE IN TEN of the many thousands who annually travel the great lakes and upper St. Lawrence, possibly ever stops to consider the extent to which decorative architecture has entered into the interior scheme of the modern passenger and excursion craft. A still less number perhaps has any conception that the architect has anything to do with this class of work—especially the same architect who has something to do with the designing of buildings ashore. And yet, if the average person would exclude from his mind the fact that he is on the water, he might find it difficult, colloquially speaking, to "know whether he was on land or at sea," so decidedly, indeed, is the feeling of domesticity expressed in the scheme as to make the interior decorative character of the modern lake boat not unlike that of a well appointed modern hotel. The great change that has taken place in this respect is more apparent when one takes into consideration some of the early steamships still in service, whose interiors were arranged by the boat designer and finished by the carpenter and painter. By comparison, these older boats bear the same relation to the more recent crafts, that the early habitation does to the better considered residential structure of the present time. Fortunately in steamship construction as in residential work, a new order of things has come to obtain. The naval designer and the architect now work in association, the former as before dictating to a great extent the general arrangement of the boat, while the latter applies his artistic ability to make it more habitable and more inviting in general appearance.

Nothing more is required to demonstrate what is being accomplished in this direction than the several steamships comprising the fleet of the Richelieu and Ontario Navigation Company, operating between Toronto and eastern points. The steamer "Toronto" is a particularly noteworthy example to which attention might be called. Take for instance the illustration of the main entrance hall with its vast and roomy effect, and note how distinctly it contrasts with the utilitarian scheme that the older boats employed. This hall, with its interlocking rubber tiling, high mahogany panelling, and frieze of Canadian historical subjects, is a most pleasing introduction to the character of appointments which greet the eye of the traveller as he rises between the stately columns and graceful balustrades of the broad, easy ascending stairs. The frieze, to which additional reference may be made, is executed in a staff of caen stone. It is a beautiful specimen of the modeller's art, depicting important events and periods in Canadian history, viz.: "Portaging up the St. Lawrence in the Early Days," "Frontenac arriving at Fort Frontenac," "Trading outside Fort Rouille," and "Tecumseh in Council," the figures being in low relief.

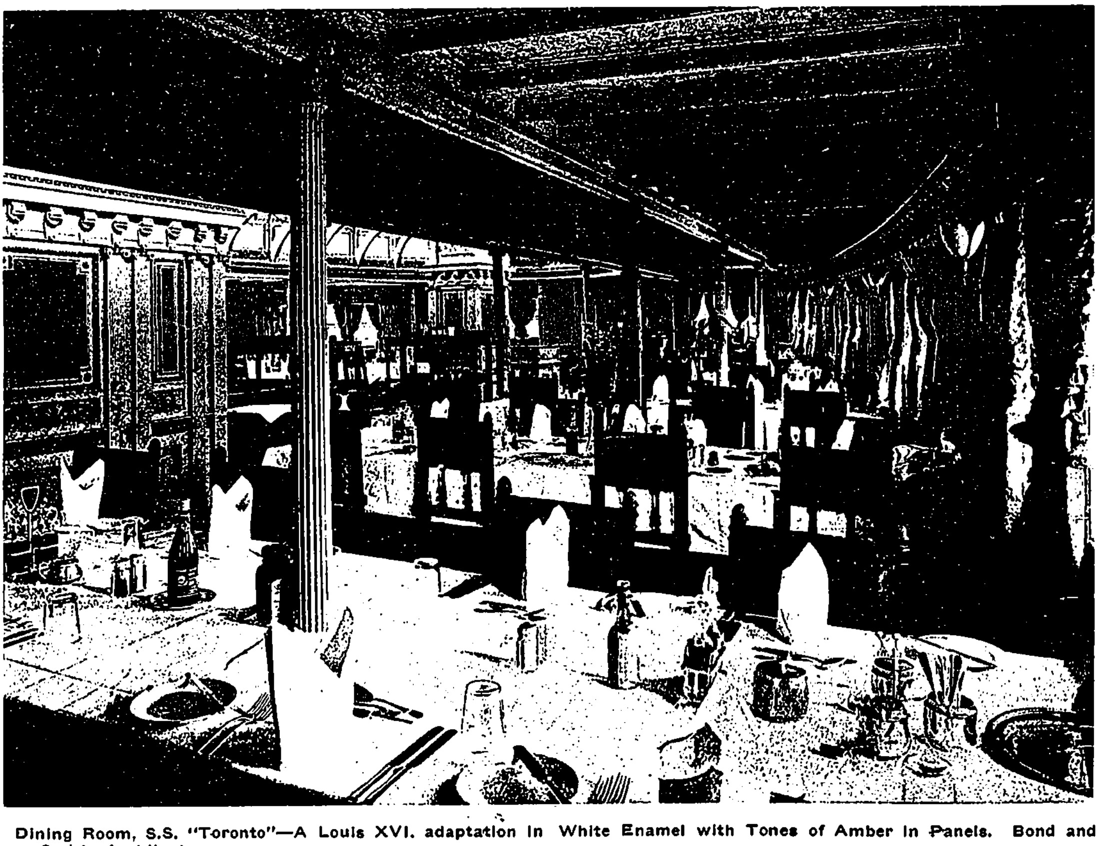
From this part of the boat one passes to the main saloon, which, together with the gallery above, is carried out in a treatment characteristic of the period

Main Entrance Hall, S.S. "Toronto"—Finished in Mahogany with High Wall Panelling Having a Frieze of Canadian Historical Subjects Above.—Bond and Smith, Architects.

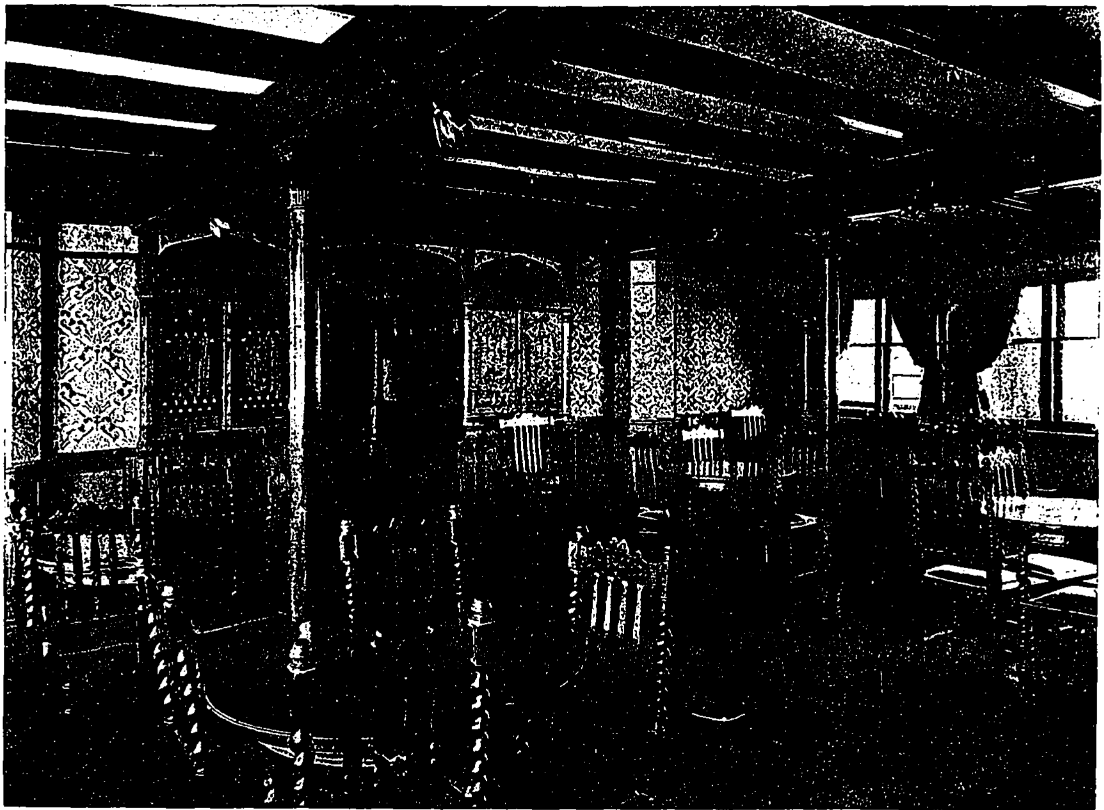
Corner in Main Entrance, S.S. "Toronto"—Showing Detail of Panelling and Wall Scheme.—Bond and Smith, Architects.



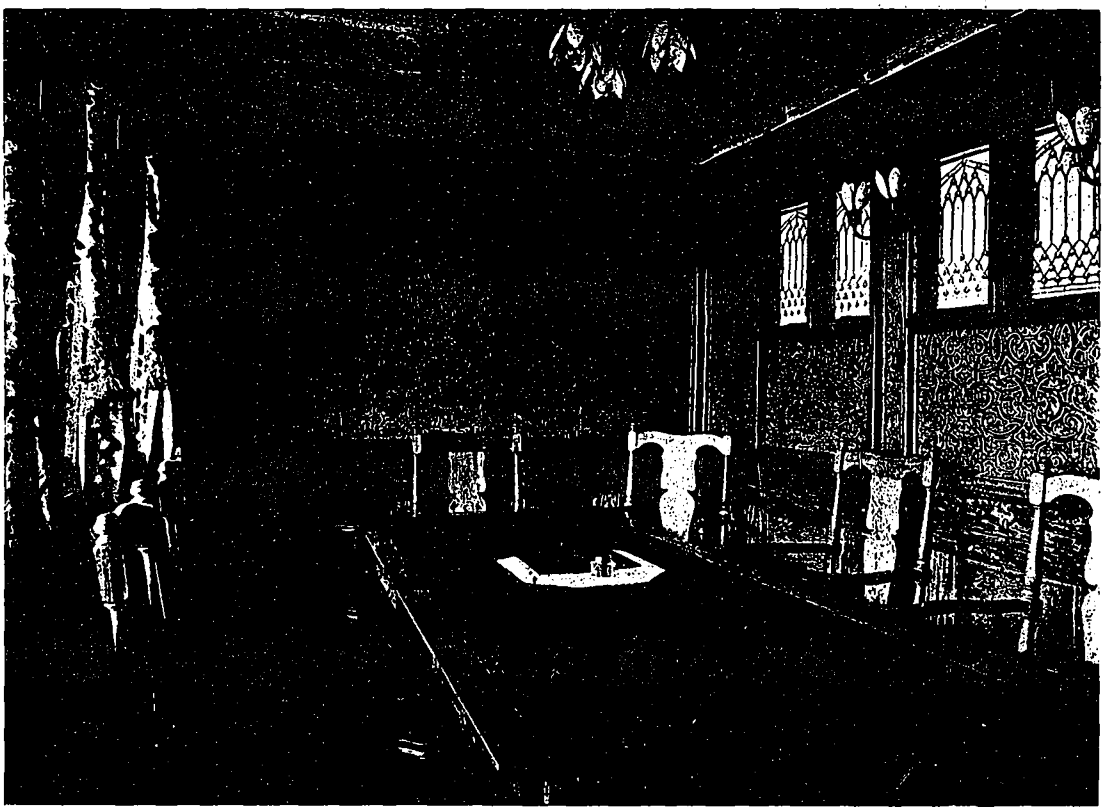
Gallery in Main Saloon, S.S. "Toronto"—Showing a Treatment in the Period of Francis I., with White Enamel Panelling and Effects.—Bond and Smith, Architects.



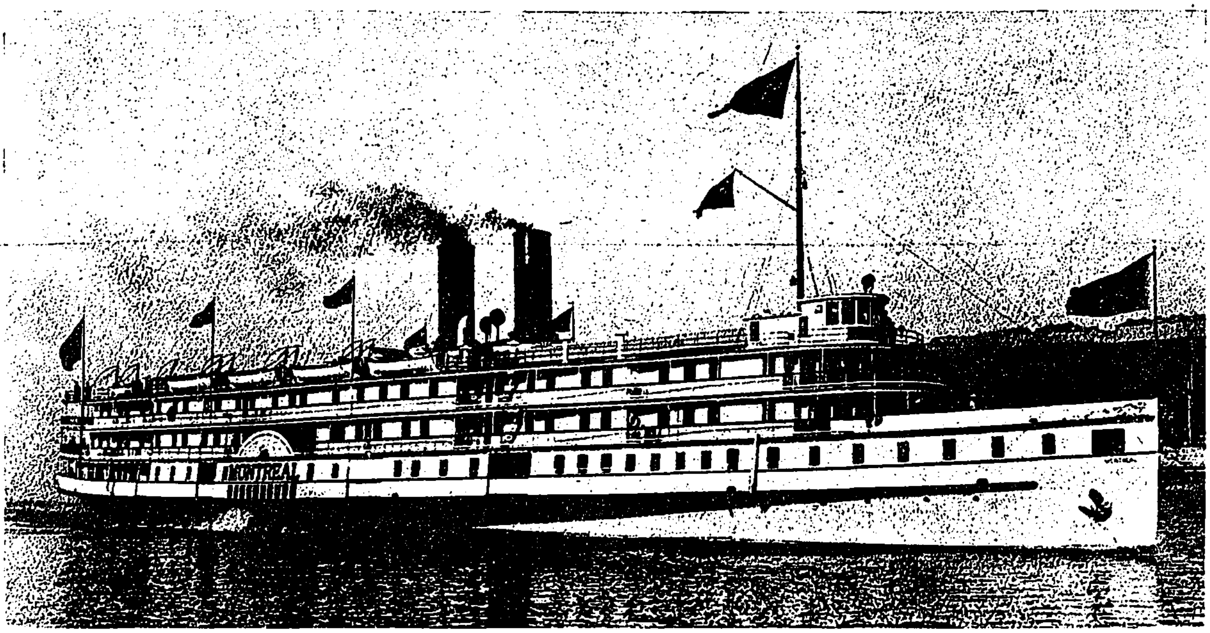
Dining Room, S.S. "Toronto"—A Louis XVI. adaptation in White Enamel with Tones of Amber in Panels. Bond and Smith, Architects.



Smoking Room, S.S. "Toronto"—Decorated in Oriental Styl e with Green Stained Chestnut Woodwork and Richly Stencilled Walls.—Bond and Smith, Architects.



Writing Room, S.S. "Toronto"—Finished in Mahogany with Leaded Glass Window and Decorated Walls.—Bond and Smith, Architects.

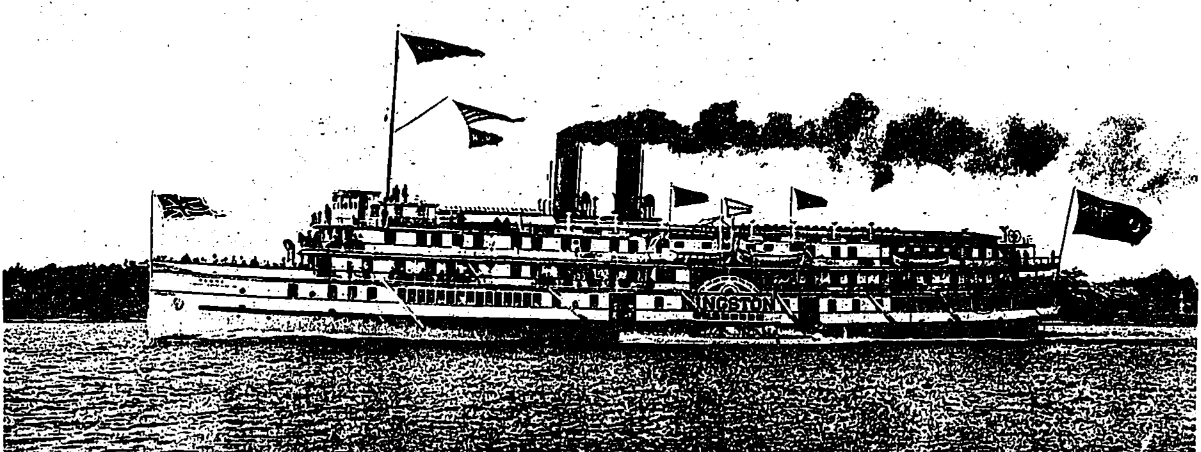


S.S. "Montreal," Richelieu and Ontario Navigation Company.—A. Angstrom, Naval Architect.

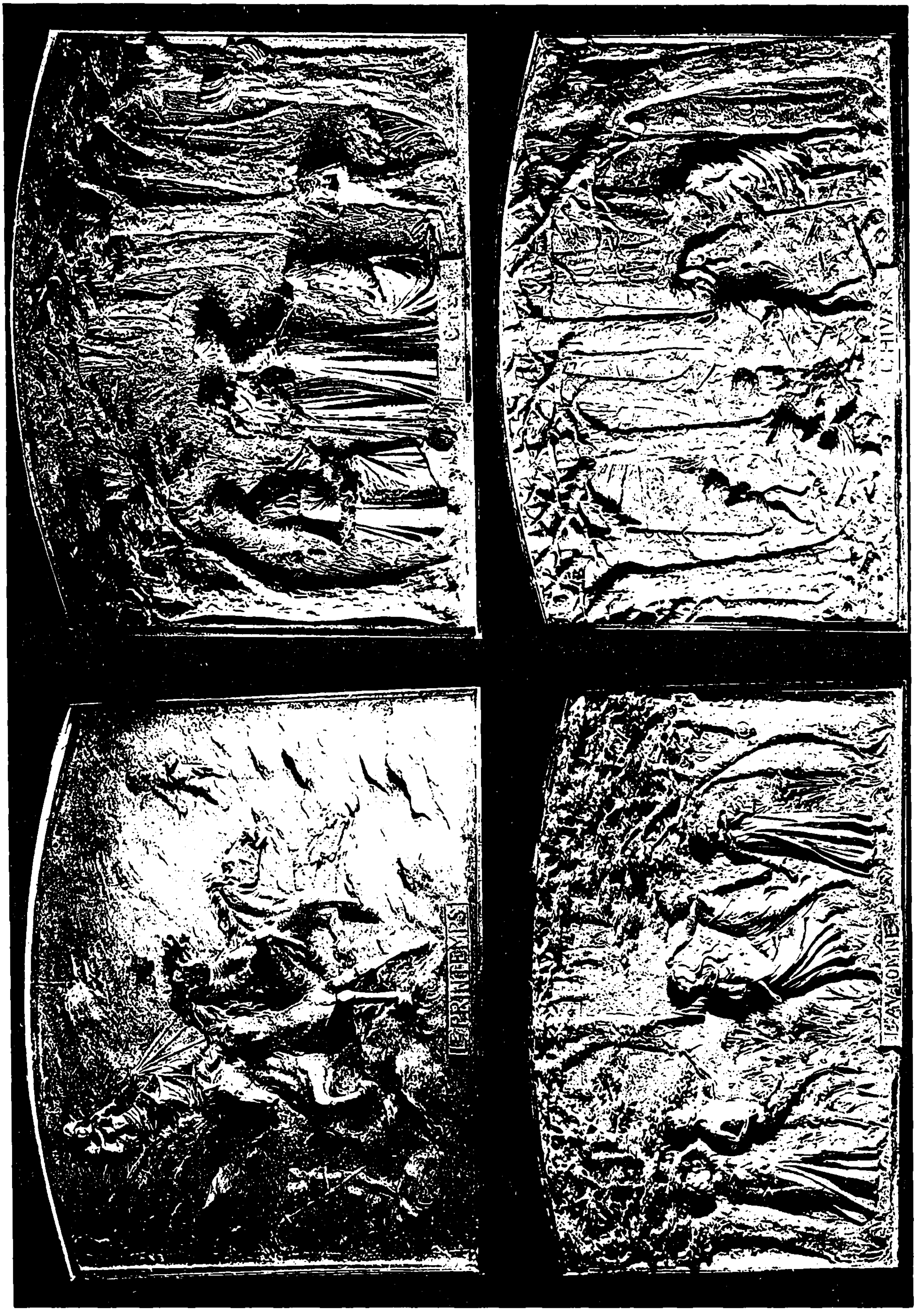
of Francis I., with white enamel panelling and effects. Both here and in the Louis XVI. dining room, which is finished in white enamel with richly embellished walls inset with amber-toned panels, the general atmosphere is one of luxury and refinement. The great care given to the detail of furnishings, can be better appreciated when it is known that the furniture, fixtures and carpet were made after the architect's designs.

Careful attention to detail is also in evidence in the smoking room, which is decorated in Oriental style with beamed ceiling, green stained chestnut woodwork and richly stencilled walls; and again in the writing room is finished in mahogany with leaded glass windows and decorated walls. In contemplating the accompanying photographic illustrations, it would be difficult without knowledge of the fact, to regard these two interiors as part of the scheme of a modern boat, so closely do they resemble rooms of similar character in the well appointed hotel or club.

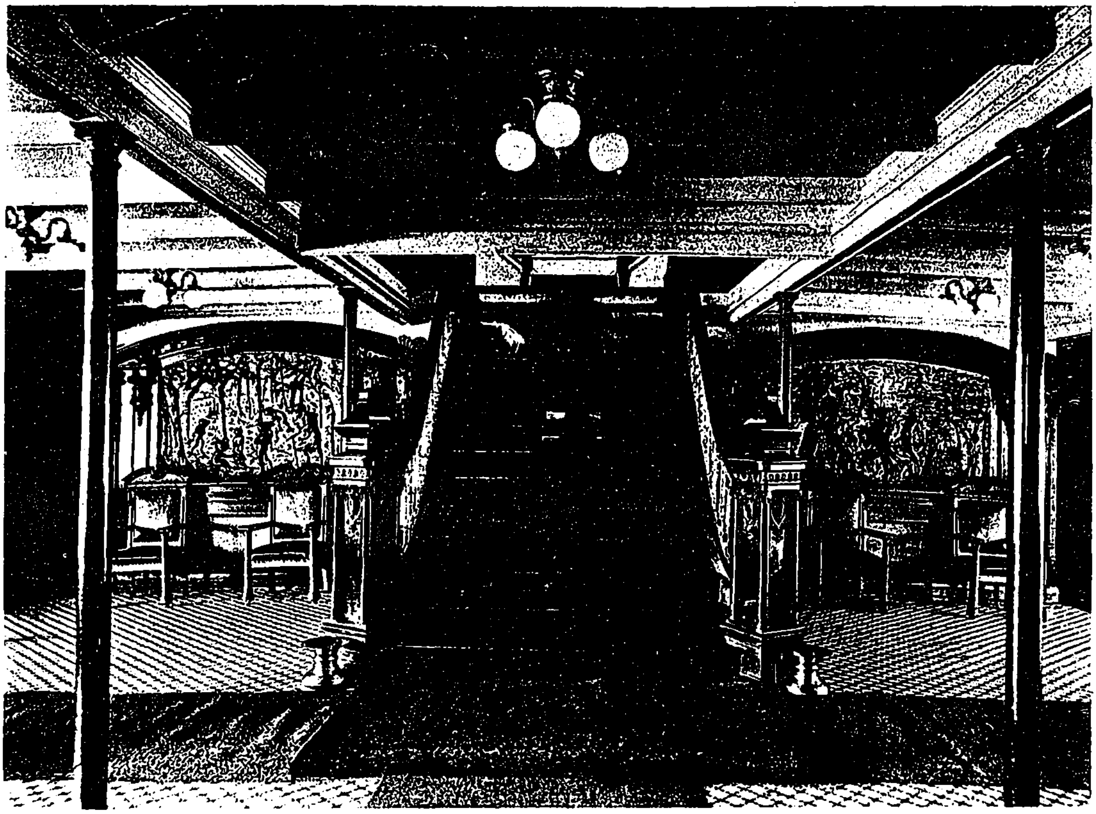
It is not intended in the limited space available to go fully into the decorative character of the steamships immediately under observation, but to point out by illustration and minor reference several interesting schemes that have been carried out, and the marked departure from the purely utilitarian that has been effected through the architect's skill. And it must be said that the architect has not hesitated to enlist the services of his fellow worker in the allied arts when necessary to develop some especial feature essential to the success of his work. For instance, in the main entrance hall of the S.S. "Montreal," which is carried out in the Modern French style with mahogany woodwork, is a series of panels representing the "Four Seasons," modelled by J. S. Bank, the Toronto sculptor; while at the head of the staircase leading to the gallery of the main saloon is a



S.S. "Kingston," Richelieu and Ontario Navigation Company.—A. Angstrom, Naval Architect.

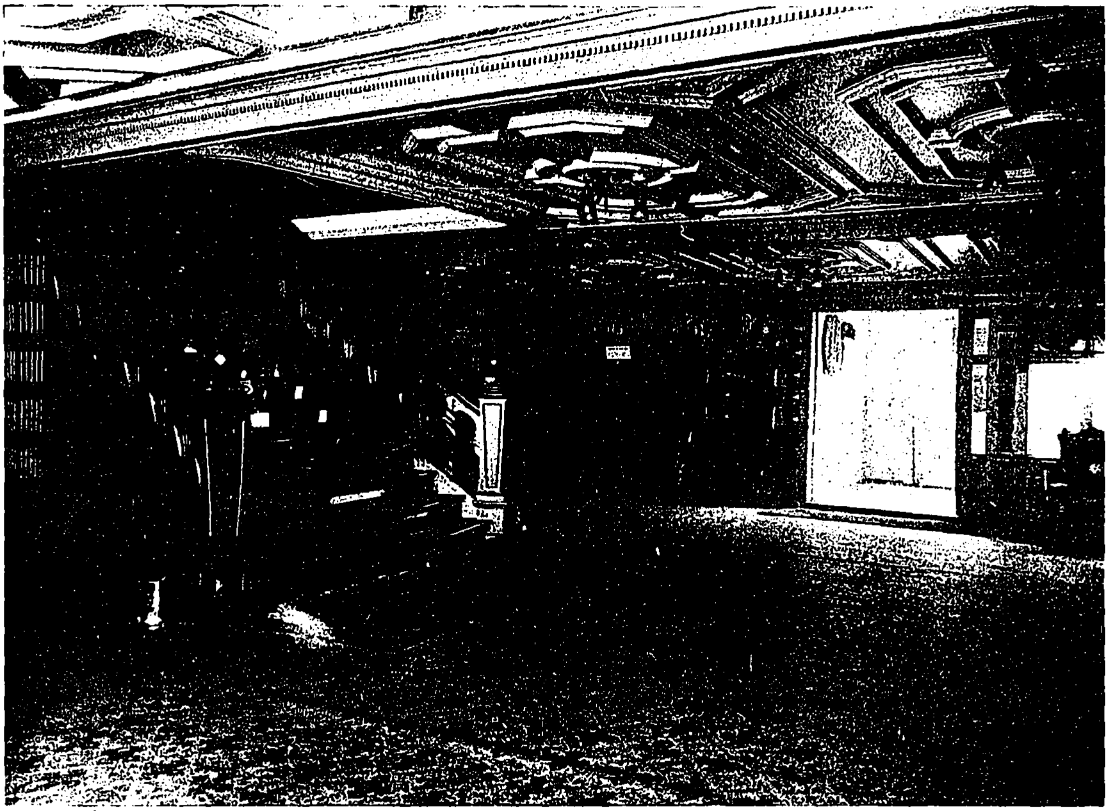


Wall Panelling, Representing the Four Seasons, Main Entrance Hall, S.S. "Montreal." Modelled by J. L. Banks.

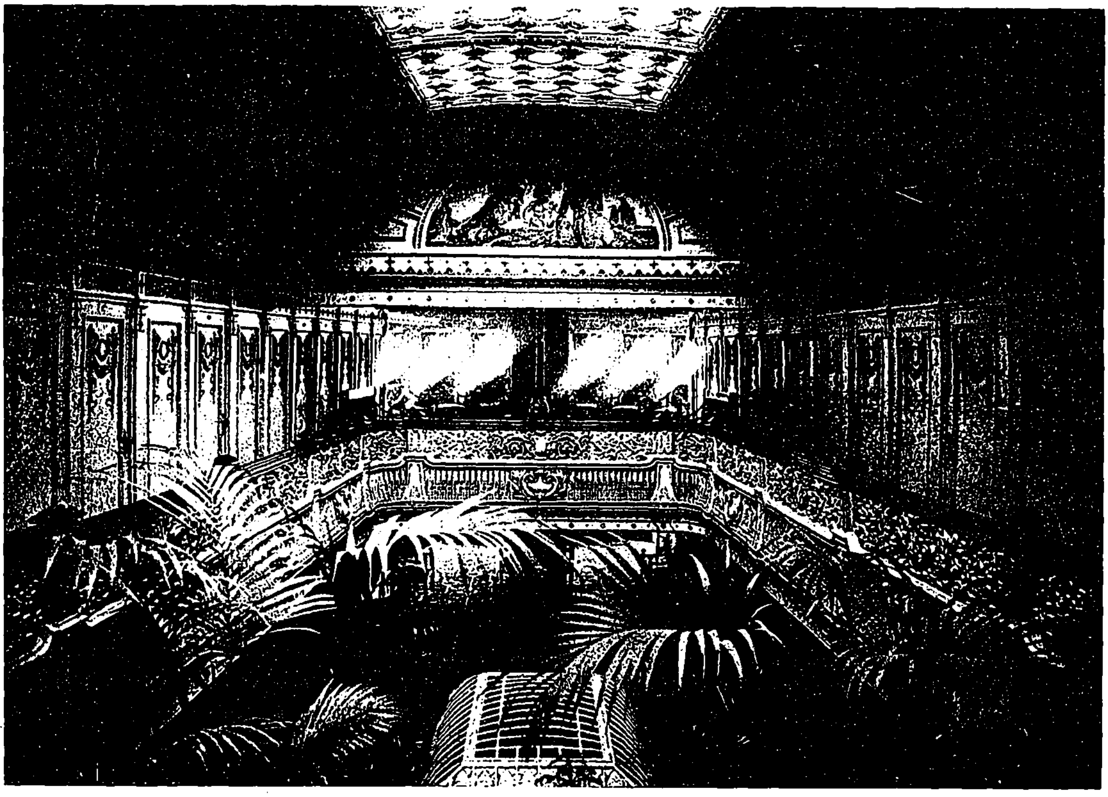


Entrance Hall, S.S. "Montreal"—This View Shows Two of the Four Wall Panels Representing the Seasons. The Style of Treatment Here is Modern French and the Woodwork Mahogany.—Bond and Smith, Architects.

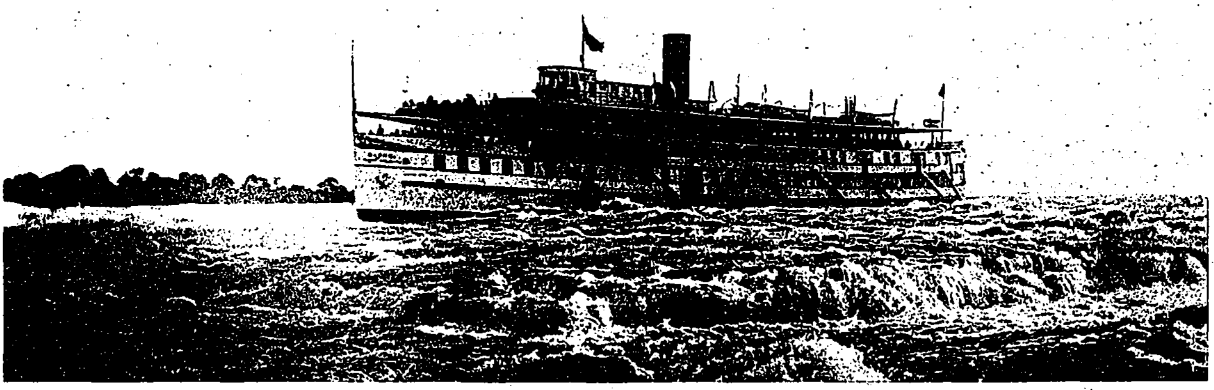
Gallery, S.S. "Montreal"—Decorated in Louis XV. Style. The Portrait of Cardinal Richelieu at the Head of the Staircase is by Sugar Coté.—Bond and Smith, Architects.



Main Entrance Hall, S.S. "Kingston"—In Decorative Character of the Jacobean Period, with Dark Oak Panelling and Heraldic Frieze in Staff.—Bond and Smith, Architects.



Midship Saloon, S.S. "Kingston"—Carried Out in Empire Style with Coffered Ceiling Having Lighting Scheme in Panels. The Mural Painting at the End is by F. C. Challener, R.C.A.—Bond and Smith, Architects.



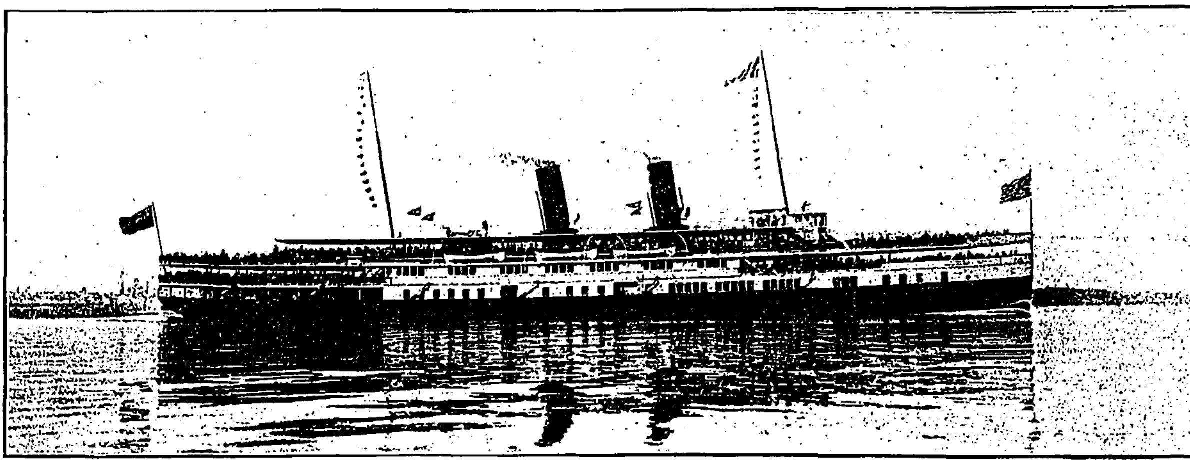
S.S. "Rapids King," Richelieu and Ontario Navigation Company.—A. Angstrom, Naval Architect.

painting of Cardinal Richelieu by Sugar Cote, a well-known Canadian artist, which adds interest to the Louis XV. scheme. The dining room of this boat, which is not included in the illustrations, is in character with the entrance hall, being in Modern French style, decorated chiefly in tones of green.

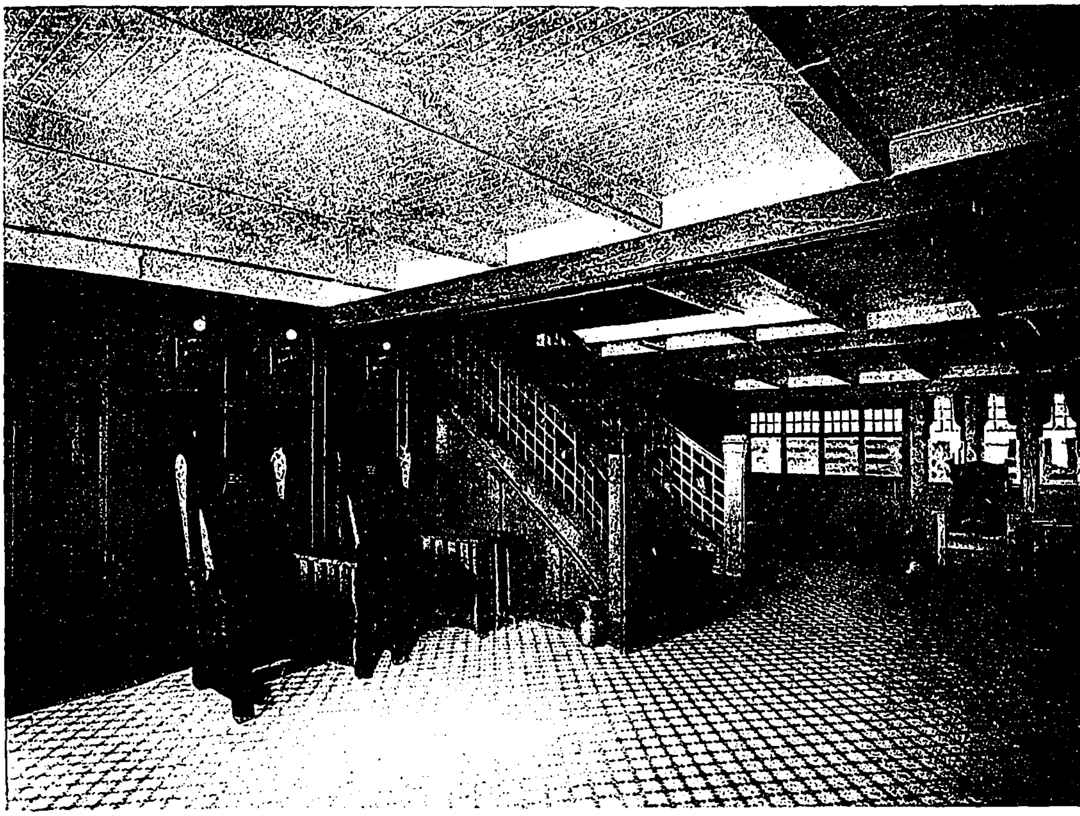
In passing, a brief reference should be made to the two photographic views of the interior of the S.S. "Kingston," for no member of the Richelieu and Ontario fleet is more magnificent in its general appointments. The Jacobean entrance hall, panelled in dark oak with heraldic staff frieze and rich ceiling, is indeed a beautiful interior; but even here the scheme fails to equal the decorative character of the midship saloon, which is carried out in Empire style and lighted from above by a coffered ceiling having a mural painting by F. C. Challener, R.C.A., above the cornice at either end. Throughout the boat, the rooms are palatial in their appointments, the dining room being decorated in Georgian style with the color schemem in mahogany and white.

A treatment somewhat varied from any of the interiors of the above boats, is seen in the S.S. "Rapids King," also owned by this company, which is carried out entirely in Modern Mission style with the main entrance hall in oak stained a very dark brown, and rich wine color panels. An interesting feature of this steamer is the promenade deck, which is arranged as an enclosed observation room and finished with dark oak with a light colored beamed ceiling.

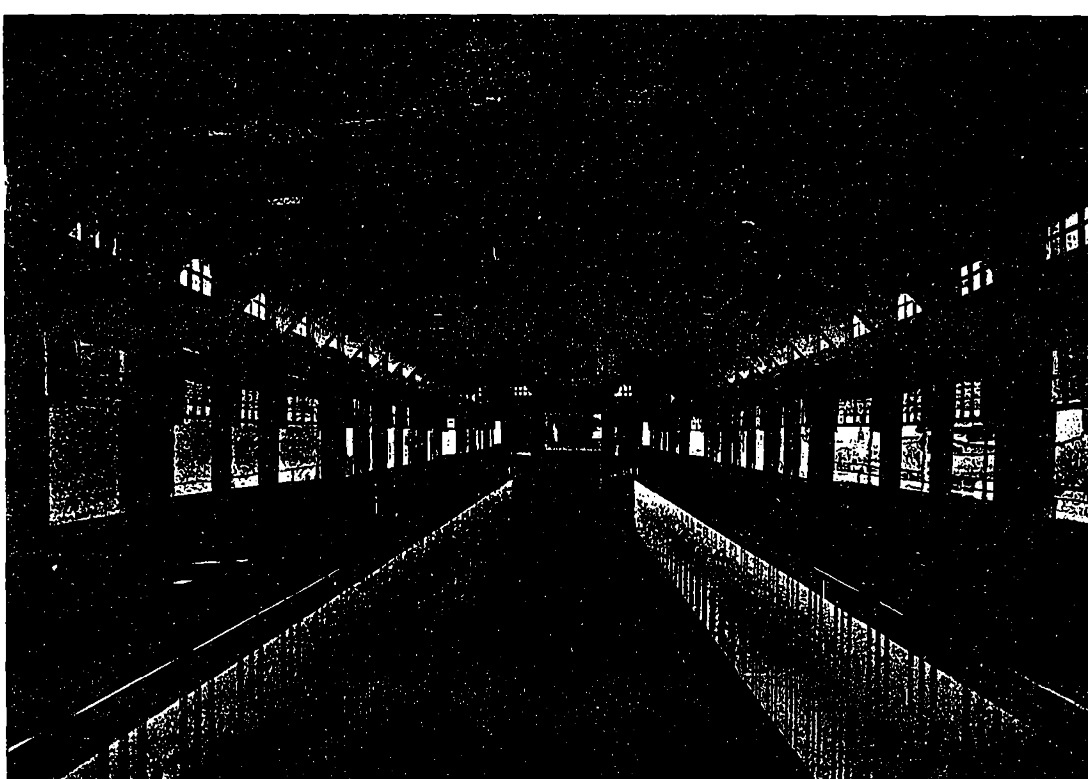
Another boat which shows an interesting treatment in the Modern Mission style is the S.S. "Cayuga," of the Niagara Navigation Company line. The scheme of rooms throughout have a most pleasing domestic character; the various interiors being carried out in different oaks and harmonious color combinations. The entrance is finished in green stained oak with panels of similar tone; the promenade deck in Flemish oak with panels of brown; and the smoking room is in dark oak with brown panels and white painted dome ceiling. In the dining room dark bog oak is employed, the panels having subdued tones of green; the generally quiet scheme of the room being given a bright relief by the red curtains at windows. A feature of this room is the built-in sideboard which can be seen quite distinctly in the accompanying view.



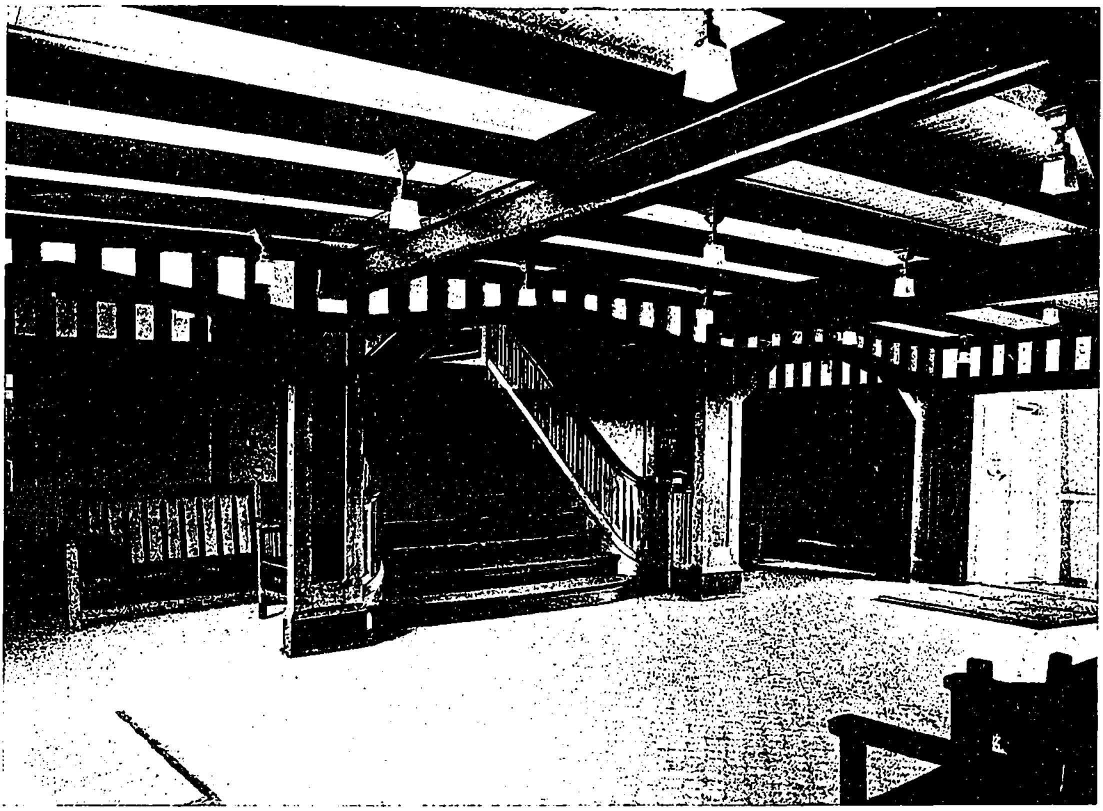
S.S. "Cayuga," Niagara Navigation Company.—A. Angstrom, Naval Architect.



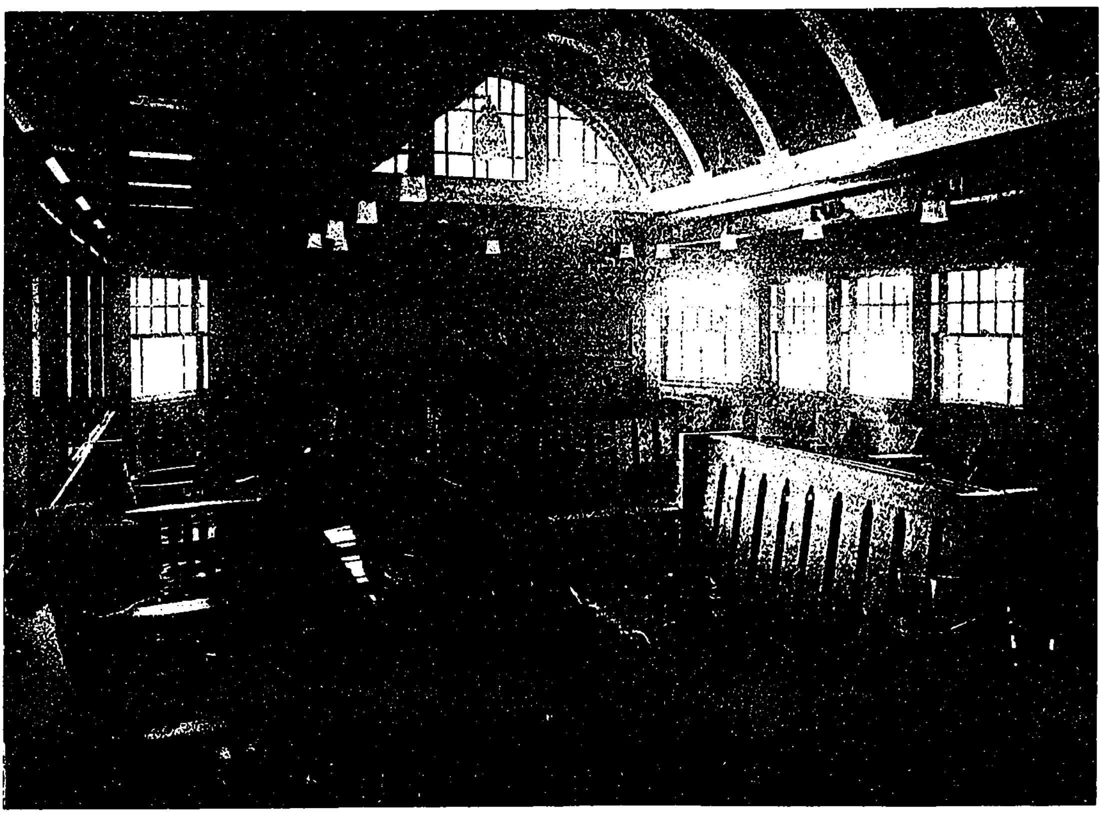
Main Entrance Hall, S.S. "Rapids King"—Finished in Oak Stained a Deep Dark Brown, with Rich Wine Colored Panels, —Bond and Smith, Architects.



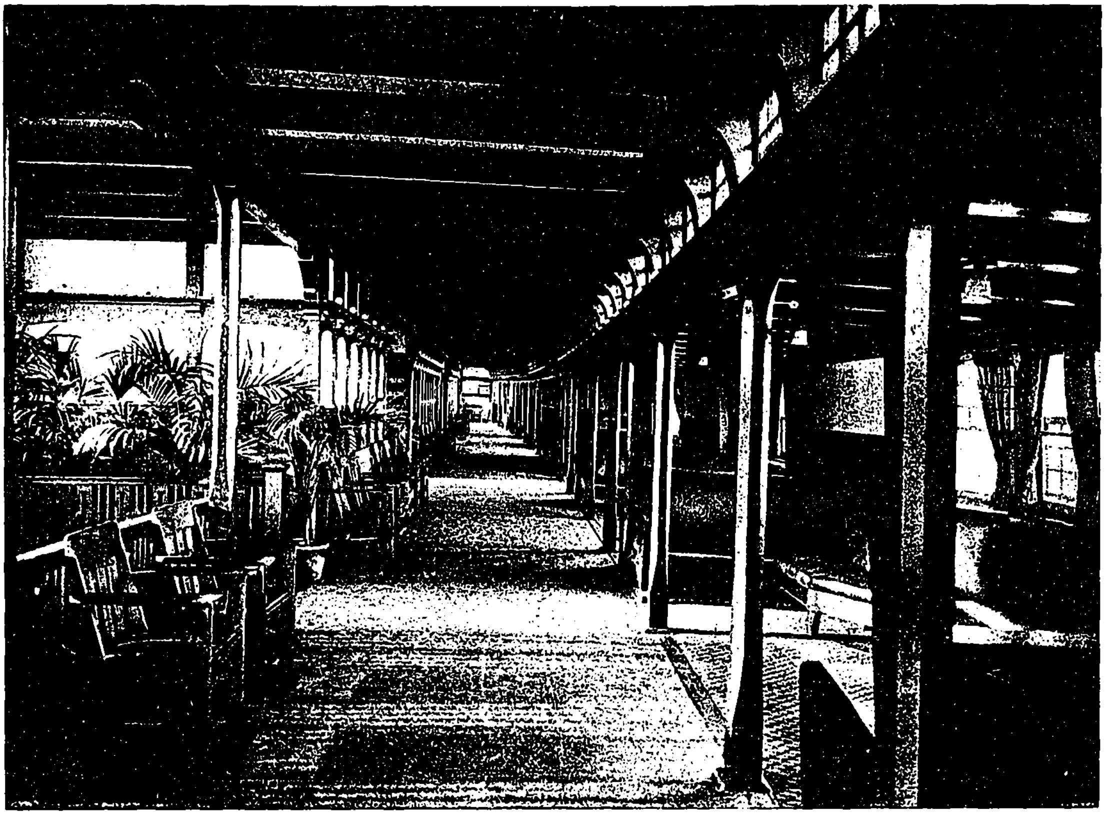
Promenade Deck, S.S. "Rapids King"—Arranged as an Enclosed Observation Room.—Bond and Smith, Architects.



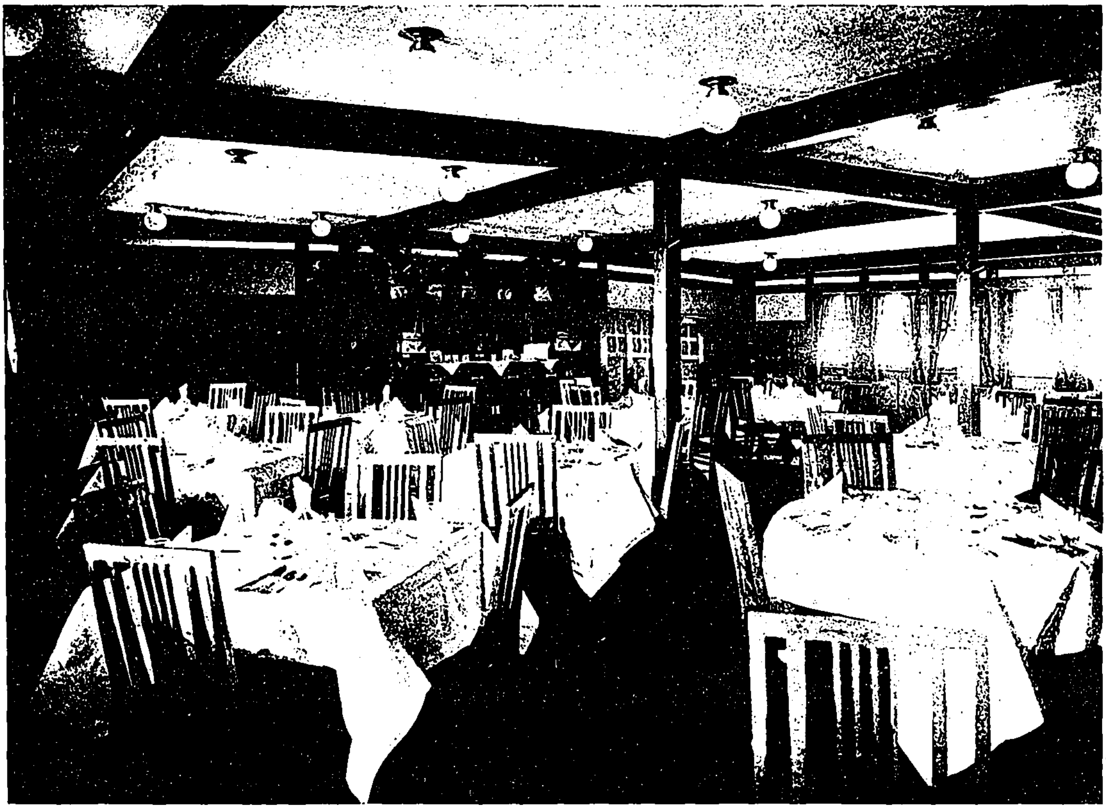
Entrance Hall, S.S. "Cayuga"—Designed in Modern Mission Style with Vari-Toned Green Wall Panelling and Green Stained Oak Woodwork to Correspond.—Bond and Smith, Architects.



Smoking Room, S.S. "Cayuga"—Carried Out in Dark Oak with Brown Panels, and White Painted Woodwork in Dome Ceiling. Bond and Smith, Architects.



Promenade Deck, S.S. "Cayuga"—Here the Scheme is in Vari-Toned Brown Panelling, and Dark Oak Woodwork.—Bond and Smith, Architects.



Dining Room, S.S. "Cayuga"—Finished in Dark Bog Oak with Subdued Tones of Green in Panelling and Red Curtains. The Sideboard at the Back is a Noteworthy Feature.—Bond and Smith, Architects.

The A. E. Rea Company's Building, University Street, Montreal, Occupied by Goodwins Limited.—A. F. Dunlop, Architect.

THE A. E. REA COMPANY'S BUILDING, MONTREAL

By B. T. NARES

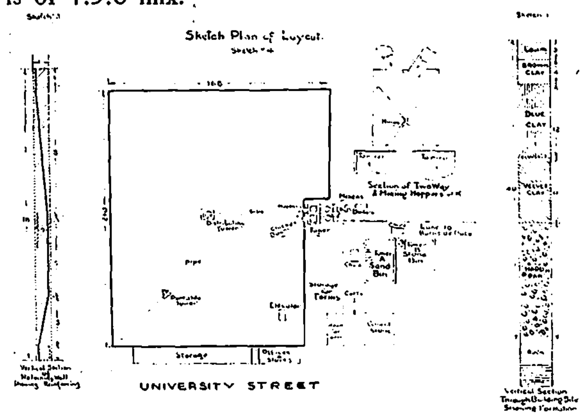
Built of reinforced concrete. Some details of its construction, together with description of contractor's plant equipment and method of carrying out work.

THE NEW STORE BUILDING of the A. E. Rea Company, Montreal, has a frontage on University Street of 155 feet, and extends through to Victoria Street—a distance of 210 feet. It is of re-inforced concrete construction throughout, with the exception of the foundations, which are of plain concrete, and consists of three storeys and a basement, with provision for an addition of five more storeys at a subsequent date. The exterior of the building is finished in terra cotta and marble, with copper spandrels, and the interior is plastered and finished with hardwood floors, marble bases and mahogany window frames and fittings.

The finished basement floor is at a depth of 18 feet below street level, the first floor is 20 feet high, with a mezzanine floor (for offices, telephones, etc.) 21 feet wide along the north side of the building. The second floor is 16 feet and the third floor 15 feet high from floor to floor. The fire escape stairs are enclosed by a curtain wall of re-inforced concrete, as a protection against fire, the doors also being fire doors of approved design.

The excavation for the cellar and foundations commenced on the 3rd of May, 1910, and was practically completed by July the 25th—a period of 64 working days and thirty-four nights, with an average over the total time of two hundred and sixty-seven cubic yards per ten hour day. At the end of this time there were only some 1,500 cubic yards left, part of which was used for the back filling around the retaining walls, and the rest was taken out by means of a small wheel truck and a sloping gang way. The main part of the excavation, consisting of 26,200 cubic yards, was done by the use of automatic excavators. A section of the ground to bed rock is appended, which shows the nature of the material removed. (See sketch No. 1.)

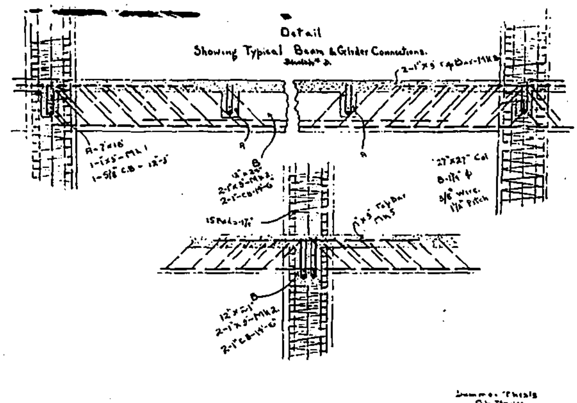
The building is founded on 96 piers with spread footings resting on hard pan, which was found at a depth of 30 ft. below the street level. Borings taken at three widely separated points over the site showed that an almost level layer of hard pan overlay the bed rock for an average depth of 20 feet The test holes were sunk 16 feet into the rock to make absolutely sure of its solidity. The appended section was obtained from the borings taken, and shows the distribution of the different strata. The bearing value of the hard pan was taken as 8 tons per square foot. The load to be supported by each pier was 400 tons—so that the necessary area is 50 square feet. The footings were made 7 ft. 6 in. square, giving a capacity of 450 tons per footing. The footings were made 3 ft. thick to take care of the bending and shear stresses transmitted to them. From the footings to the basement floor, piers 5 ft. square were put in, the compressive strength of plain concrete being taken as 400 lbs. per square inch. Dowels were left for the joint with the basement columns, there being enough steel to take care of any possible side thrust causing shear across the heads of the piers. The concrete in the foundations is of 1.3.6 mix.



Sketch 1.—Vertical Section Through Building Site. Sketch 2.—Vertical Section of Retaining Wall. Sketch 4.—Plan of Layout.

The excavation for the foundation piers was done by hand. Two inch tongued and grooved spruce sheet piling, 16 ft. long was first driven in a square around a yoke 7 ft. x 7 ft. outside measurement, by the use of a 4 in. Ingersoll-Rand Sheet Pile Driver, driven by steam from a boiler in the basement, and the interior was then shovelled out by hand. An accompanying progress view shows some of the caissons already sunk, and one (rear of view) just being started, as well as part of the sheet piling used as a temporary retaining wall, being put in place for driving. (See photograph No. 4.)

The retaining wall in the basement has a depth of 18 feet and a thickness of one foot (see sketch No. 2). It is designed as a vertical beam, fixed at the top by the ground floor slab and at the bottom by a horizontal beam running along the tops of the exterior piers. The pressure of the clay was assumed at one-third of water pressure—20 lbs. per square foot—so that 360 lbs. is the concentrated load to be supported by one foot of the wall. The resultant acts at a point about one-third the height of the wall, and the re-inforcing is designed to suit. The end reaction at the bottom is calculated at 240 lbs., but as the wall will have to hold back an indeterminable amount of water in wet weather, the beam at the base is designed to carry a distributable load of 360 lbs. per horizontal foot of wall. The vertical re-inforcing consists of one inch round rods spaced 4 in. centre to centre, and sufficient five-eighths and three-quarter inch round rods are used horizontally to act as spacers and to take care of any temperature stresses. The horizontal footing beam is incorporated in the wall and re-inforced with four one and three-eighths inch round rods. The wall is waterproofed with Trus-Con Waterproof Paste, furnished by the Trussed Concrete Steel Company. This paste was mixed with the water used in the mixer, in the proportion of one part of paste to 12 parts of water. The cost of the

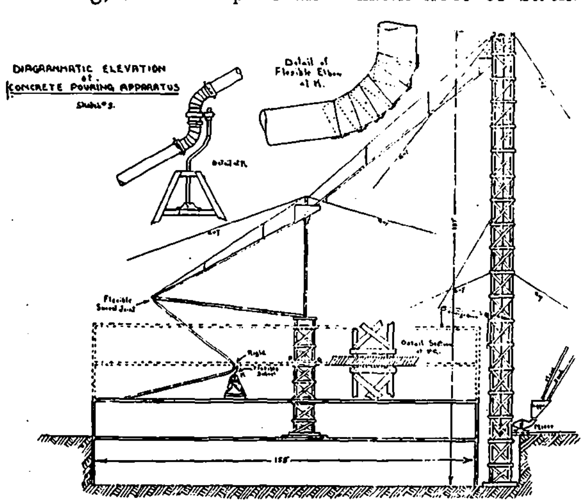


Sketch 3.—Showing Typical Beam and Girder Reinforcing and Connection.

waterproofing was very small, as it went on while the concrete was being mixed.

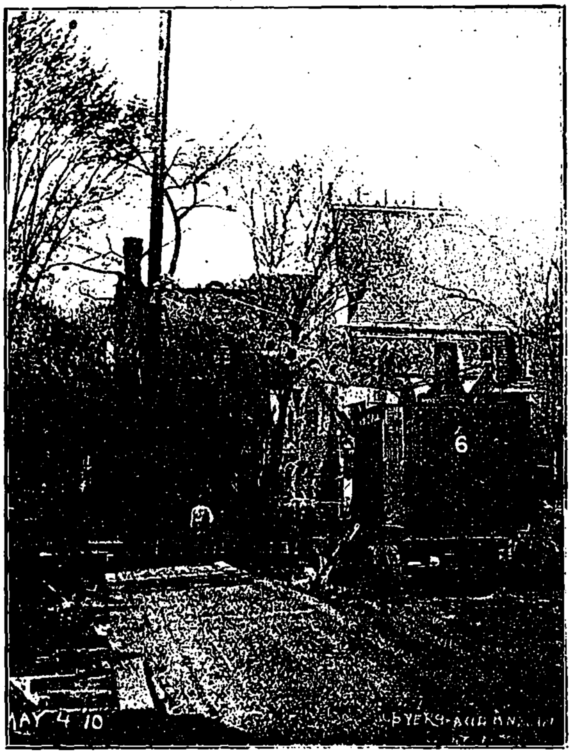
The shores which held back the earth were carried in to the second row of caissons, and the wall forms were built around them. They were taken out when the ground floor and wall had set, and the holes filled with a rich concrete.

The basement floor consists of a layer of cinders 12 ins. deep, a 5 in. slab of stone concrete reinforced with No. 6 Kahn Rib Metal, 4 ins. of cinders, in which sleepers are laid, to take rough spruce boarding, and on top of all a finish floor of birch.



Sketch 5.—Diagrammatic Elevation of Concrete Pouring Apparatus.

Drainage under this floor is provided for by a system of tile farm drains, increasing gradually from 4 in. to 8 in. in diameter, leading to a sump, from which the water will have to be constantly pumped. This is necessary because the new basement is below the street sewer level. The other floors are finished with 5 ins. of cinder fill and the rough and finished flooring; this form of construction having been adopted to make the building as sound proof and to conceal the electric conduits and sprinkler pipes.



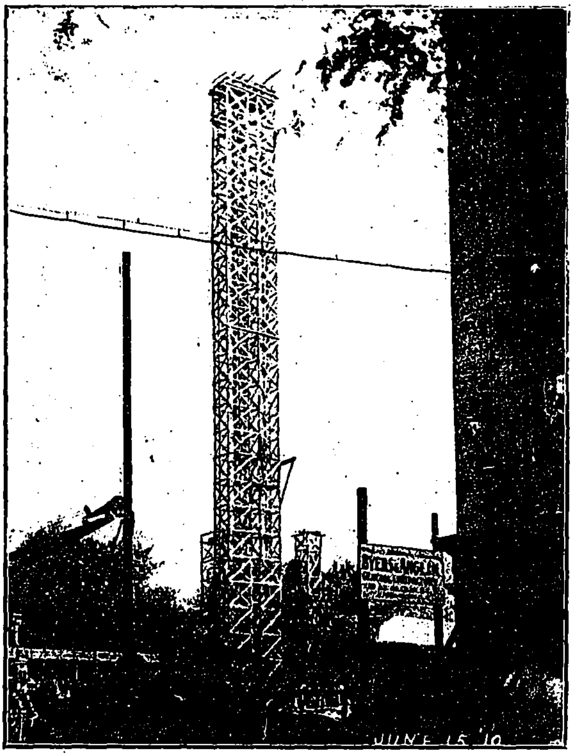
Progress Photograph 1.—Showing Excavator Beginning Work on the Site.

All the columns in the building are square, with the exception of the ground floor columns, which are octagonal. They are reinforced with vertical steel rods, hooped with three-eighth in. spiral hooping, having a pitch of 2 ins. The concrete inside the hooping is figured to stand 750 lbs. per square

Progress Photograph 2.—Showing Excavator in Operation.

inch in compression, and there is a minimum thickness of 2 ins. of concrete covering the steel, as protection against fire, the strength of which is neglected. The ratio Fs to Fc is taken as 15. The capacity of the steel will therefore be 750 x 15 equals 11,250 lbs. per square inch. The basement columns were figured as follows:—Outside dimensions, 30 x 30 ins. Core diameter equals 26 ins., cross section area of concrete equals 531 square inches. Load taken by concrete equals 531 x 750 —400,000 lbs. Cross section area of one—1⅛ in. round rod equals 0.994 square inches. Cross section area of 15—1⅛ in. round rods equals 14.9 square inches. Load taken by steel equals 14.9 x 11,250 equals 199,000 lbs. Therefore total load taken by column equals 599,000. Total load on column equals 600,000 lbs. It might be noted here that the footings were designed to carry 400 tons, but the design was later changed.

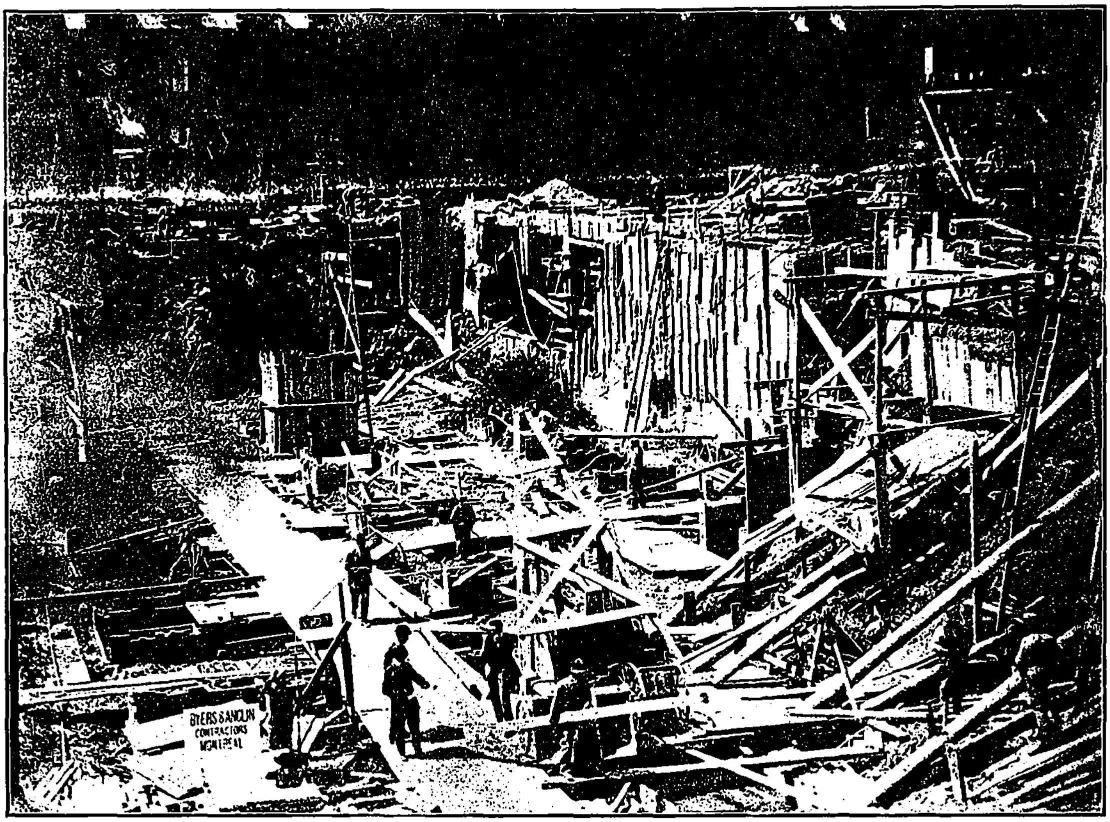
All other columns were designed similarly, allowing for a 5 per cent. reduction in the live load from floor to floor. The exterior columns are reduced by



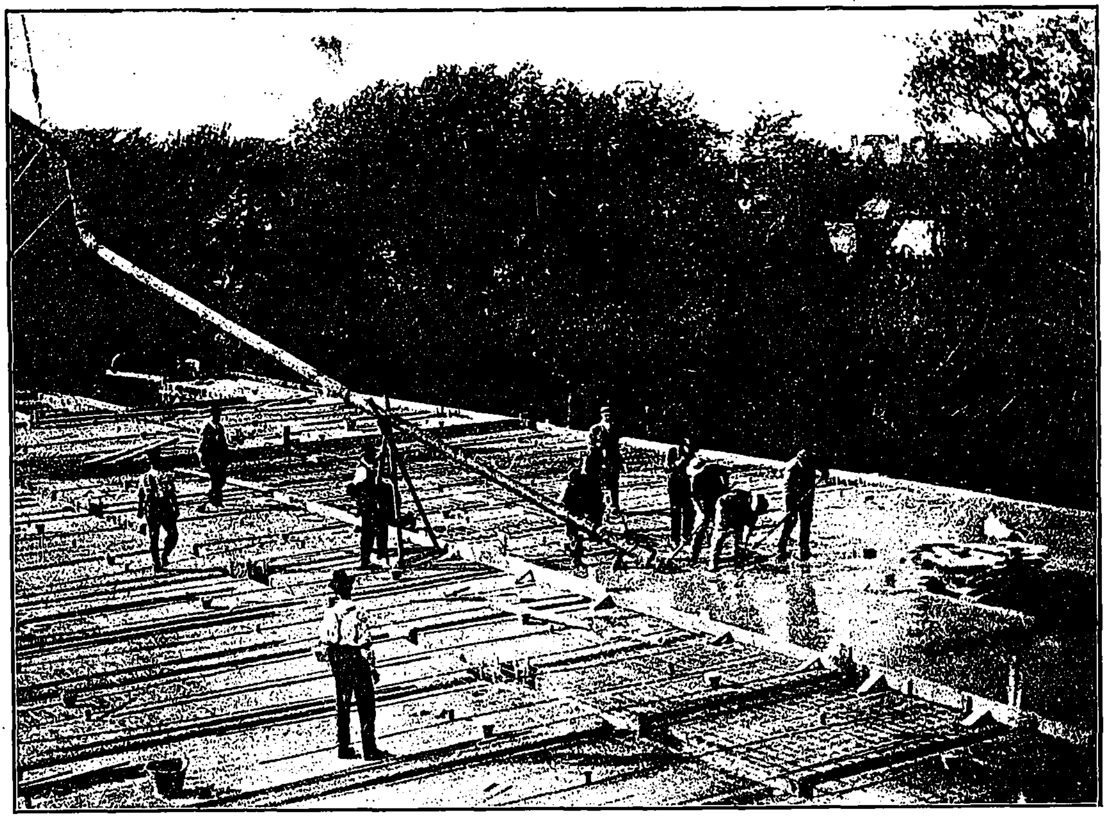
Progress Photograph 3.—Showing Main Tower Nearing Completion, with Stone Tower to Left Immediately Behind, and Sand Tower to Right. The Detail of Excavator Jib, Mast, Swivel Connection and Locking Lever is Seen at Extreme Left.

20 per cent. because, apart from the load imposed by the wall, they only carry half the floor load that the interior columns are subjected to. The live load on the ground floor was assumed as 105 lbs. per square foot, the dead load of concrete was taken to be 150 lbs. per cubic foot, and as the floors are 4 ins. thick, the dead load per square foot of floor will be 50 lbs. The weight of the cinder fill and wood flooring was assumed as 20 lbs. per square foot, so that the total load that the floors are designed to carry is 175 lbs. per square foot, with the 5 per cent. reduction in the live load already noted. The beams are figured to carry their own dead load, in addition to the floor load.

The floor slabs are figured as simple beams between the ends of the flanges of the T beams. They consist of a 4 in. slab of 1.2.4 mix, reinforced with ⅜



Progress Photograph 4.—Showing the Start of Sheet Piling Retaining Wall at Rear Centre, with Excavators at Work to Left.



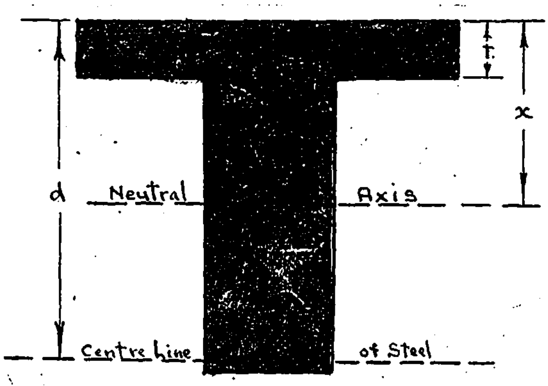
Progress Photograph 5.—Showing the Delivery Pipe and Flexible Elbow Used in Pouring the Concrete, and the Method of Breaking Off the Work.

in. round rods placed 6 ins. centre to centre, separated by ⅜ in. distance rods spaced 2 in. centre to centre, and at right angles to the reinforcing.

All girders are figured as being continued, and the bending moment is taken as $\frac{wl^2}{12}$, except for those running to exterior columns, in which case the bending moment is assumed as $\frac{wl^2}{8}$, where w equals the total weight to be supported by the beam, and l equals the span of the beam in feet.

The method used in figuring was as follows:—

Let N equal $\frac{Es}{Ec}$ equal 15 where Es and Ec are the ratios of elasticity of steel and concrete resp ectively.



Let Fs equal extreme fibre stress of steel equal 16,000 lbs. per square inch.

Let Fc equal extreme fibre stress of concrete equal 600 lbs. per square inch.

Let X equal distance from top of flange to neutral axis.

Let d equal distance from top of flange to centre line of steel.

Let y equal distance from top of flange to centroid of compression.

Let t equal thickness of flange.

Let A equal cross-section area of steel.

Let M equal bending moment in beam.

$$\text{Then } X \text{ equals } \frac{N \times Fcd}{Fs \text{ plus } (N \times Fc)}$$

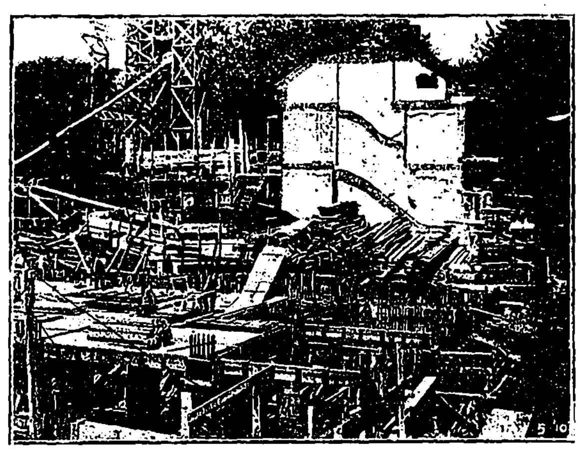
$$y \text{ equals } \frac{(3x-2t)}{(2x-t)} \; x \; \frac{t}{3}$$

$$\text{and } A \text{ equals } \frac{M}{Fs\ (d-y)}$$

Sketch 3 shows typical beam and girder reinforcing and connections.

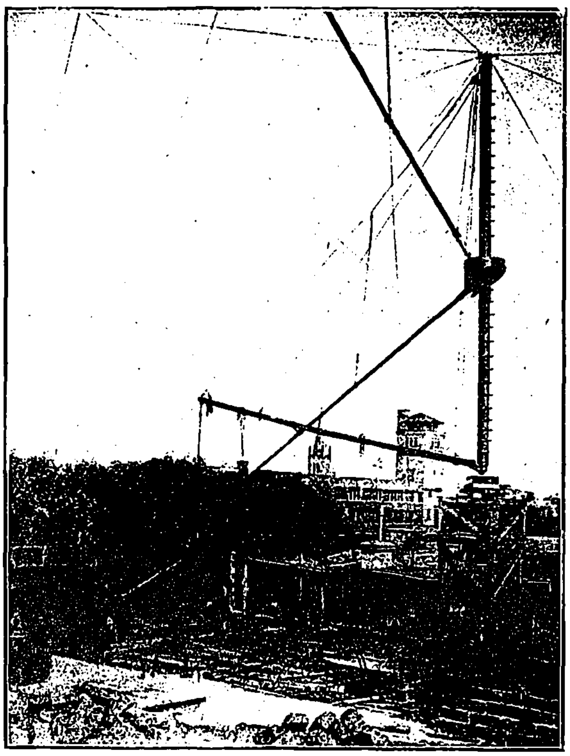
The sketch plan of the general layout of the job is appended (see sketch 4) with the diagrammatical elevation of the concrete pouring apparatus, and only a brief explanation is necessary.

The cement was stored in a vacant house beside the sand bin and was conveyed to the mixer in a small overhead truck, like those used in stables for handling feed, etc. It only required two laborers to keep the mixer supplied by the use of this apparatus, which carried eight bags at each trip and eliminated the labor of three men. The stone and sand carts drove in by the lane from Burnside Place and dumped over chutes in the driveway which led to hoist buckets in the bases of the towers "A" and "B" (see sketch 4 and photograph No. 4). From these buckets it was dumped, either into the storage bins or directly into the mixers; just the right amount for a batch being elevated at one time, and either of the mixers being fed at will by means of a hopper having a "flip-flap" door (see detail, sketch No. 4), which directed the streams of stone or sand from their pipe lines into hoppers above the two mixers. The sand, stone and cement for one batch were put into these hoppers together, and then the charge fed to the mixer. From the mixers the concrete was carried up through a twin tower (see sketch No. 3) to hoppers placed sufficiently high to give a slope of 30 degrees to the pipe line used in the pouring. These hoppers had a stop gate at their opening into the pipe line, controlled by a hand lever, so that the concrete could be admitted gradually—otherwise there was a possibility of the pipe choking. As the work increased in height and distance from the base of the tower the hoppers were raised. In order to pour the third floor the main towers were built 187 ft. above the basement



Progress Photograph 6.—Taken Thirty-Three Days After the Excavation Was Started.

floor. In the centre of the job a main distributing tower was built 50 ft. high above the already concreted ground floor, having a spread footing to distribute its weight, and on the top of this a guy derrick was placed with a vertical mast 50 ft. high, and a 60 foot boom, so pivoted that the whole could be revolved in a circle on top of the tower. Near the top of the vertical mast a circular hopper was placed. This hopper had a slanting bottom and a hole through its centre through which the mast passed. It revolved with the mast and delivered concrete, through a pipe opening at its lower side, in any direction (see photograph No. 7). From the top of the twin towers, which were braced back suitably, a cable was slung to the top of the distributing tower mast, and from this cable a line of pipe was hung by vertical slings. The pipe was rigidly connected to the lower of the two hoppers on the twin tower and fed into the circular hopper on the distributing tower. From the cable joining the end of the boom to the top of the mast a line of pipe was slung from the circular hopper to an elbow, which fitted snugly over the end of the boom, from

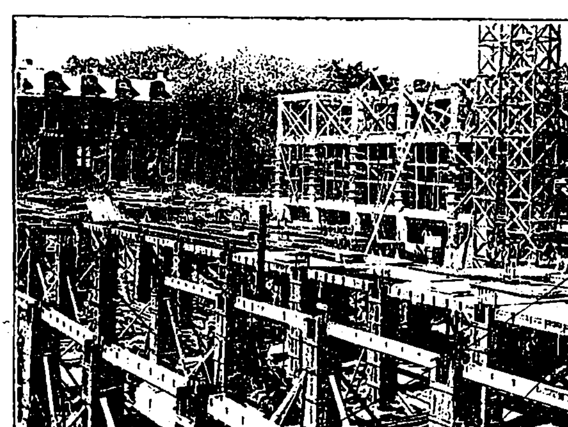


Progress Photograph 7.—Showing Distributing Tower at Work.

this elbow which had a swivel joint and a flexible elbow in it, so that the lower part of the pipe could be moved in any direction, the pipe continued to the pouring level, being supported half way by a small portable tripod tower about 12 ft. high, there being another swivel joint and flexible elbow at this point. This tripod was only necessary on the lower floor. In the pouring of the upper floor, in order to shorten the pipe line, it was not carried to the end of the boom; but was fastened, as shown in photograph No. 7. The central distributing tower was so built that only the four corner posts passed through the successive floors (see detail at P.Q. Sketch No. 5), and after it was taken down the holes in the concrete were easily filled. The pipe was of No. 10 black iron, 7 in. in diameter, in 16 ft. lengths. The lengths were made of slightly smaller diameter at one end, so that they would fit one into the other, being bolted together by means of angle iron hoops riveted on at the ends. The sections of each length were double riveted to give stiffness. The elbows were made of the same weight of black iron, the flexible ones being made up of short lengths of pipe slightly cone-shaped, fastened together, so that the small end of one length fitted loosely inside the large end of the next, and could move inside it to a limited extent, the whole being prevented from bending through too great an angle by having lengths of chain riveted on as a stop (see detail sketch No. 5). Photograph No. 5 shows the spreading of the concrete as it comes from the pipe and the method of breaking off the pouring at half span. A Chicago boom was placed on one side of the twin tower and used for hoisting re-inforcing steel through a stair way opening and a temporary elevator was erected in one of the elevator openings for bringing up forms and other material to the upper floors. The rest of the plant consisted of five boilers, supplying steam to the two mixers, two steam sheet pile hammers, a pulsometer and steam syphon for keeping the cellar dry, and the machinery for operating 7 hoist drums.

There are in all 8,000 cubic yards of concrete in the building, 2,000 cubic yards of which are plain concrete, used in the foundations, the rest being all reinforced. The pouring of the reinforced concrete started on the 28th June, and was finished on the 4th October.

The forms for the columns, beams and floors were made at the yard of the Montreal Lumber Co., from material supplied in the proper lengths. A great deal of wastage of lumber and cleaning up of rubbish was in this way avoided, and time and room were saved. Also a saving in cost was effected, as milling to size costs $3.00 per M., and by hand costs about $8.00 per M. Triangular beading was placed in all angles, and all corners were bevelled off, so that there would be no sharp angles in the concrete. One set of forms for the ground floor and one for the mezzanine were made, and these were cut down and used over again for the other floors. As this method of placing concrete is quite new

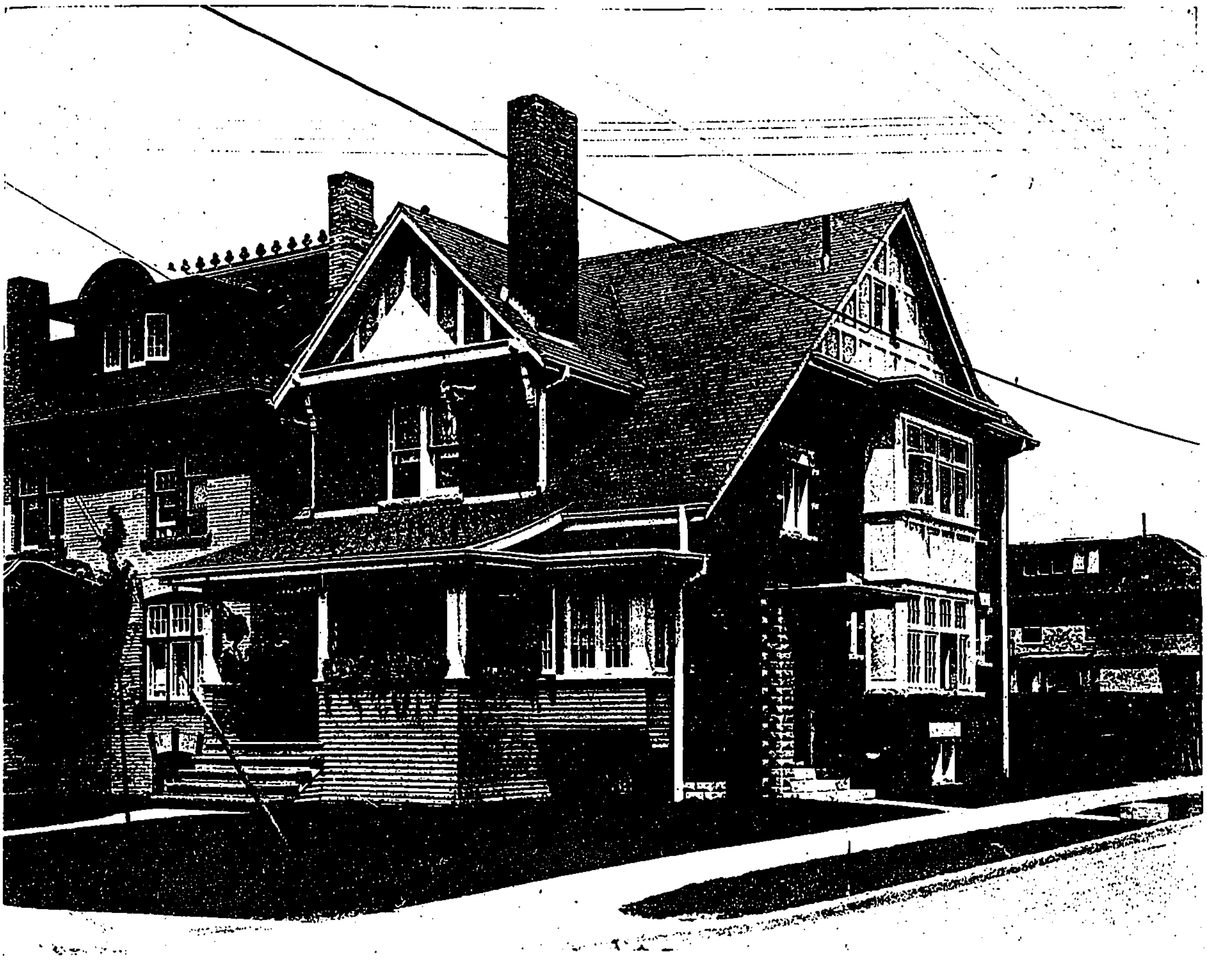


Progress Photograph 8.—This View, Taken Thirty-Three Days After the Eycavation was Started, Gives an Adequate Idea of the Headway Which Was Made in Carrying Out the Work.

and has never before been tried on a building of this size in Canada, it is very probable that with further experience the cost of plant can be cut down to almost half, and that of labor very considerably.

The cement used was supplied by the Canada Cement Co. from their Lakefield mills. Kahn bars were used for the beams.

(*Concluded on page 84.*)



Residence of Dr. C. S. McVicar, Corner of Roncesvalles Avenue and Walter Street, Toronto—An Attractively Designed Moderate Size House, Built of Hard Dark Red Stock Brick, with Slate Roof and White Painted Woodwork. J. H. Galloway, Architect.

A MODERATE SIZE CORNER HOUSE OF BRICK CONSTRUCTION

Plan provides for doctor's suite in addition to compact household arrangement. Waiting Room and Surgery such as can be easily converted to domestic use.

LAST MONTH we published a half-tone view, together with floor plans and elevations of a low cost city dwelling built on a narrow lot between two adjoining structures. In this instance, we illustrate the residence of Dr. C. S. McVicars, a moderate priced house with two exposed elevations, situated at the northwest corner of Roncesvalles Avenue and Walter Street, Toronto. As in the case of the former house, it was necessary for the architect, in order to design a structure that would come within the amount set aside by the owner, to work out the scheme with simple materials, and along the lines of strict economy. The exterior, which is noteworthy in its treatments, shows an interesting roof arrangement and small well placed windows, although much of the success of the scheme depends upon the color combination and the character of materials used. The walls of the house, for instance, are built of hard dark reddish brown stock brick, taken from near the fire holes at the outer edge of the kiln, and burnt almost to a point of vitrification. They are much darker in color than the brick generally used, being almost a black, with a peculiar reddish tint, and of somewhat rough texture. In contrast to the pronounced depth of this tone is the white painted woodwork, and the grey of the cement stucco gables and stone trim. The roof is covered with a grey-green slate, and the clapboarding of the verandah is stained a reddish brown to correspond with the brick work of the walls.

The interior of the house, as explained by the plans in the accompanying supplement, is arranged to give the owner accommodations well suited for medical practice and domestic purposes. The patients enter through the side entry, which, together with the staircase, separates the waiting room from the surgery; both of these rooms being so placed as to interfere as little as possible with the remainder of the household. The dining room and kitchen, which are provided with built-in cupboard and workboard, are situated to give convenient service; while the stairs in the kitchen makes it unnecessary for anyone going from this part of the house to the upper floors to pass through the hall. The dining room is finished in oak, with panelled wainscotting, plate rail and cornice, and oak is used for the main stairs and the trim in the principle rooms, the floor being of hardwood. Should it be desired at any time to use the entire house for domestic purposes, the surgery could

Living Room, looking toward the Hall and Side Entry—Residence of Dr. C. S. McVicar, Roncesvalles Avenue and Walter Street, Toronto. J. H. Galloway, Architect.

be converted into a library, and the waiting room made into a small reception room or den.

On the second floor are two bedrooms, a bath room and a good size sitting room with an open fireplace, and ample wardrobe and closet facilities have also been provided. This floor is finished in pine painted white, as is also the attic, which contains two additional bedrooms and a large storage room.

In the basement, which has a cement floor, is a furnace room, cold storage, laundry, and the usual offices.

The building is heated by a hot water system, and has both gas and electric lighting. It was erected at a complete cost of $5,600, the general construction following the usual specification for buildings of this price, the frame work being of selected hemlock, and the foundation of brick. The house was designed by Architect J. H. Galloway, and built by E. P. Atkinson, both of Toronto.

REA BUILDING—Continued from page 82.

The following is an average from tests made by the Milton Hersey Co. Laboratory on nine samples of the cement used:—

Soundness—Satisfactory.
Final set—6 hours 36 minutes.
Initial set—4 hours.
Fineness test—Sieve No. 100, 33 per cent.
Fineness test—Sieve No. 200, 19.1 p.c.

Tensile Tests.

Neat Cement—Water equals 23 per cent. One cement—3 Std.—qts. sd.—water equals 10 per cent.

	24 hours.	7 days	28 days	7 days	28 days
Min. equals	344	742	710	266	326
Max. equals	495	844	846	315	419
Aver. equals	432	779	790	293	379

So far as inspected the sample passed the specifications of the Canadian Society of Civil Engineers.

Specimens of the steel used were tested at the McGill University Laboratory and the following is an average of six tests on specimens ranging in size from 3/8 inch to 1 3/8 inch in diameter:

Average yield point equals 34,140 lbs. per sq. in.

Average ultimate strength equals 56,570 lbs. per sq. in.

Average actual maximum load equals 57,100 lbs. per sq. in.

Average p.c. of elongation in 8 in. equals 33 p.c.

Average p.c. of reduction of area equals 61 p.c.

In order to expedite the construction of the building, as much of the work as possible was carried along simultaneously. The excavation was started at one side while demolition was still going on on the other side of the site, and as soon as there was enough room the caisson work was started and kept up behind the excavation. Almost half of the ground floor had been poured before the excavation was finished on the far side. At this same time the steel and forms for the mezzanine and first floors were being erected, and so on throughout the whole construction. Mr. A. F. Dunlop was the architect of the buildings, and Byers & Anglin, the general contractors.

Dining Room, Residence of Dr. C. S. McVicar, Roncesvalles Avenue and Walter Street, Toronto. J. H. Galloway, Architect.

THE DEVELOPMENT OF THE GOTHIC VAULT

By C. R. HOWLAND

The early and transitional stages in the evolution of important constructional features leading up to the final perfection of the present Gothic system.

HISTORICALLY the vault is the most important structural feature of Gothic cathedral architecture, for it was through the efforts made to solve the problems of its erection that the fundamental law of the system, the functional grouping of supports, was developed.

When the builders of the thirteenth century grasped the value of the vault in spanning wide spaces, and attempted to employ it in the naves of their churches, they came face to face with this mechanical and artistic difficulty—they could not rely upon inert mass for the equilibrium of such large piles as they were contemplating; they must seek a less clumsy means of sustaining the tremendous vault-thrusts.

They did not need to look for new constructive principles. Two quite efficient—balanced thrust and concentration of strains upon isolated points of support—they had inherited from the building methods of older times; for not only did all the constructive members of the Gothic church exist in the earlier Romanesque, but even the Romans had known the use of arches and vaults exerting side thrusts that were met by external abutments, and neutralized by downward pressure upon the walls operated on, and had been familiar also with the mode of sustaining vaults by a framework.

The task that lay before the mediæval architect of the Gothic school was, therefore, merely to re-apply old principles in a novel way, to solve through them a new and difficult problem—the successful elevation of immense vault formations.

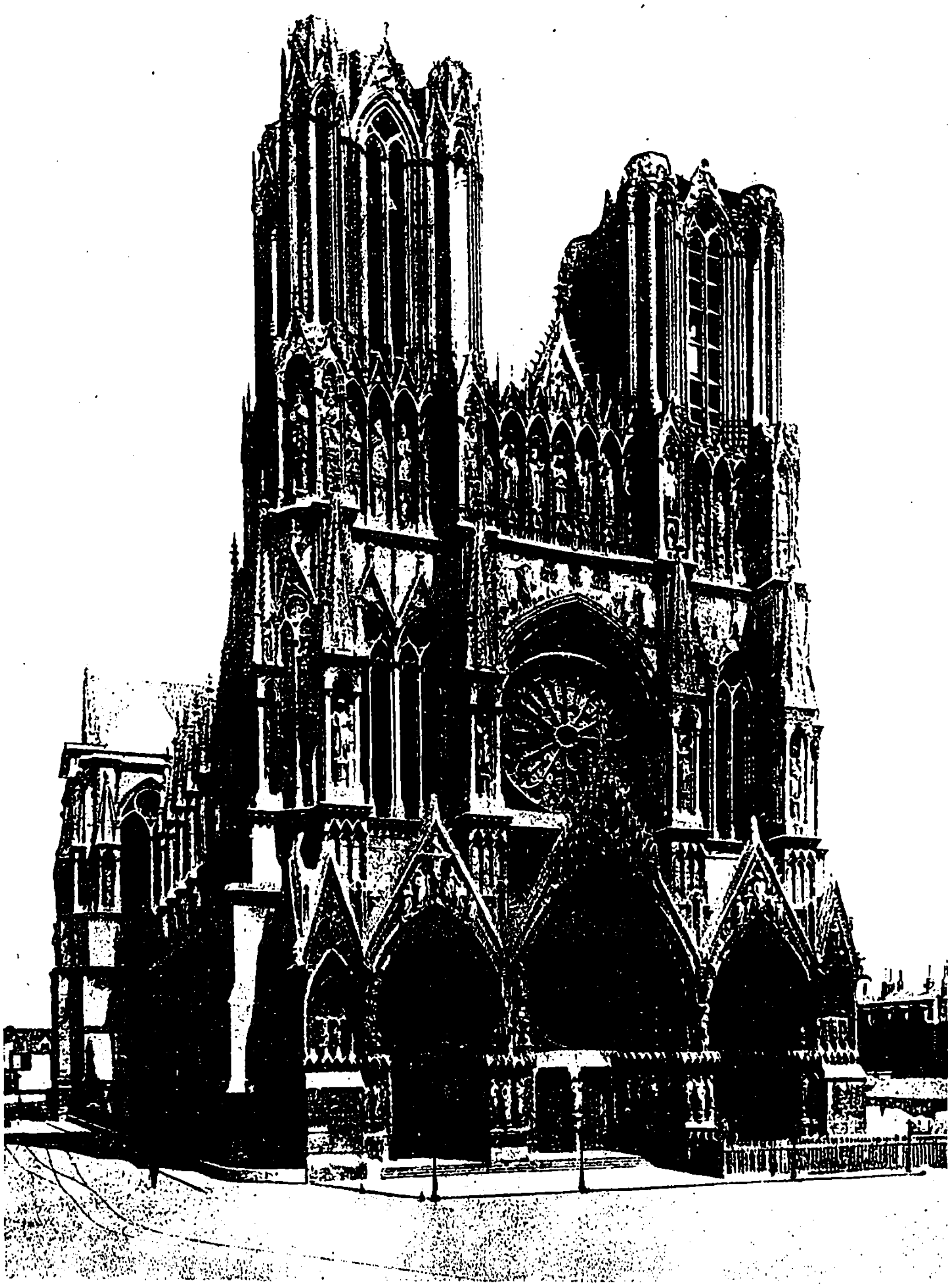
In Roman and Romanesque days the structural elements enumerated had been used in a purely rudimentary manner, especially the systems of external and internal supports. The buttresses, for instance, were not in Roman edifices confessedly functional members, devised to meet with economy and efficacy a lateral pressure; on the contrary an effort was made to disguise them, either by planning buildings in such a way that some of the enclosing or dividing walls should stay the vaults, or else by employing vast walls which would secure stability by their inert mass. Occasionally engaged columns were placed on the outside of walls at points where stress would naturally be met, but they were employed merely for a decorative purpose.

There was an advance in the system as the Romanesque builders improved the art of construction. The engaged columns were replaced by pilaster strips, which were used partly for ornament and partly to stiffen the walls, less massive than similar Roman formations had been. These pilasters had not sufficient projection to bear much vault pressure, but they were capable of enforcing the aisle walls against vaults of little span. They were of considerable importance historically, for they marked the place where in erections of this kind the walls required additional strength; and later they developed into true buttresses, when Romanesque builders found, in beginning to vault the nave, that the pilaster buttresses, which had been adequate to stay the walls of the vaulted aisles, were not equal to the thrusts of vaults of greater span. The expedients adopted to increase the resistance of the clear-story buttress developed the principles that were to re-create by a gradual evolution the Romanesque style into the Gothic. Nor was the elementary character of the internal supports less marked than that of the exterior system in Roman and Romanesque buildings. The framework supporting the vaults was buried in the thickness of the masonry, instead of made to project from, or even to appear upon, the vault's surface.

The beginning of Gothic dates from the earliest functional grouping of supports in the twelfth-century churches of San Michele of Pavia and San Ambrogio of Milan. The growth of the rudiments embodied in these Lombard structures is not, however, to be traced through Italian monuments of architecture. We must go north of the Alps to study the transitional stages to the final perfection of the Gothic form.

This is the natural sequence: The Italians, for their part, had a style, which, inherited from their ancestors, had gradually become modified to meet their needs. The people north and west of the Alps, on the other hand, had up to this time blindly imported building forms which were not well suited to their climate and their race. Unbound by classic traditions, and dissatisfied with the existing architecture, the latter were ready to seize upon and to grapple with an artistic problem, through the solution of which a suitable system might be built up. Therefore, when the rudiments embodied in the Lombard churches were transmitted to the north they were accepted and developed logically in accordance with climatic and local conditions, and in a manner expressive of the distinctive genius of the people.

The earliest Gothic movement was confined to the Ile-de-France, a region now largely included in the departments of the Seine and the Oise. Later it had rather wider boundaries, which embraced the royal domain of the Capetian Dynasty and portions of the adjacent provinces of Champagne, Burgundy, Orleans, and Berry. Throughout this section the movement was general and spontaneous, although some localities were more apt than others at grasping the value of the principles imported from Italy. To study adequately the evolution of Gothic from Romanesque we must consider buildings that antedate what is generally regarded as the transition period, monuments of the twelfth century, which are essentially Romanesque, containing only elements of the Gothic, showing merely the beginning of a movement toward an independent structure that will have in every part an artistic as well as a mechanical value.



Rheims, West Front.

The more important problems involved in the development of the style can be best realized by following a brief outline of the primary growth of the system of external supports. An early form of the flying buttress appears in the twelfth-century Abbaye-aux-Hommes at Caen. Here an attempt was made to enforce the vaults, the groin-arches of which are curves of low sweep exerting strong lateral thrusts, by springing a demi-vault from the top of the aisle walls to abut it against the nave walls under the aisle roof. This concealed flying buttress was illogical, and essentially inefficient, for only a fraction of its strength met the thrusts of the vaults, the rest being wasted upon the walls between the piers where no props were required. The level of abutment was, moreover, lower than the point of greatest thrust. The strength of this constructure, therefore, resides necessarily as much in the inert mass of its wall as in its system of abutments.

The next step is seen in the development of the flying buttress at the Abbaye-aux-Dames at Caen, and in Durham Cathedral. Here the demi-vaults were sprung from the aisle walls opposite the piers, and abutted at the piers only at the points where the thrusts of the vaults were gathered. These arches were not quite effectual; their point of abutment was too low, and much of the strain of the vault-thrust consequently fell upon the walls. Therefore, inasmuch as they are neither well adjusted nor externally apparent, these abutting arches, although true flying buttresses, are not the logical members of Gothic architecture.

In order to appreciate that the evolution of the other components of the Gothic building involved similar difficulties, we have only to reflect upon the absolute interdependence of the parts of the Gothic edifice. The shape and performance of each of these constructive elements are vitally affected by the nature of others with which they are related. The configuration of the vault determines the character of its supports; upon the shape and disposition of the buttresses depend largely the equilbrium of the structure and its artistic effectiveness; the piers share the labor of the buttresses, and supply to the rib members functional support; the rib system, as it appears in its perfected form, constructed quite independent of the vault, serves as a strong centering, and prevents any rupture occurring in one part of the vault from spreading to other cells; and at the same time, built as it is with each of its ribs resting upon an individual stay, it carries out the principle of functional grouping of supports which the buttresses and piers observe.

The first definite stage in the development of true Gothic begins with the introduction, as a constructive device in vaulting, of the pointed arch, which had up to this time been used only as an ornamental feature in windows and doors; for, lessening materially the difficulties with which architects had to contend, this innovation marked the beginning of a sure and rapid advance. In the first place, because it exerted a less-powerful thrust than the round-arched vault, its external stays could be considerably reduced.

Through the experiments that resulted, the flying buttress was brought more directly to bear upon the points of greatest pressure. To meet these points, which were higher than those upon which the abutting arches of the Abbaye-aux-Hommes and Durham Cathedral had operated, it was necessary to spring flying buttresses over the aisle roofs, and make them marked external features. Examples of this form we find in Saint-Remy at Rheims, Saint-Leu-d'Esserent, and Saint-Germain-des-Pres at Paris. This important improvement of external supports the pointed arch supplemented by melioration of the vault form itself. Through its use it became possible, with a given span, to erect the crown of the vault to any level. Thus groined arches could be erected over the oblong compartments of the naves without either doming or stilting, a thing which had been impossible with the round-arched vault, with its compartments separated merely by transverse ribs.

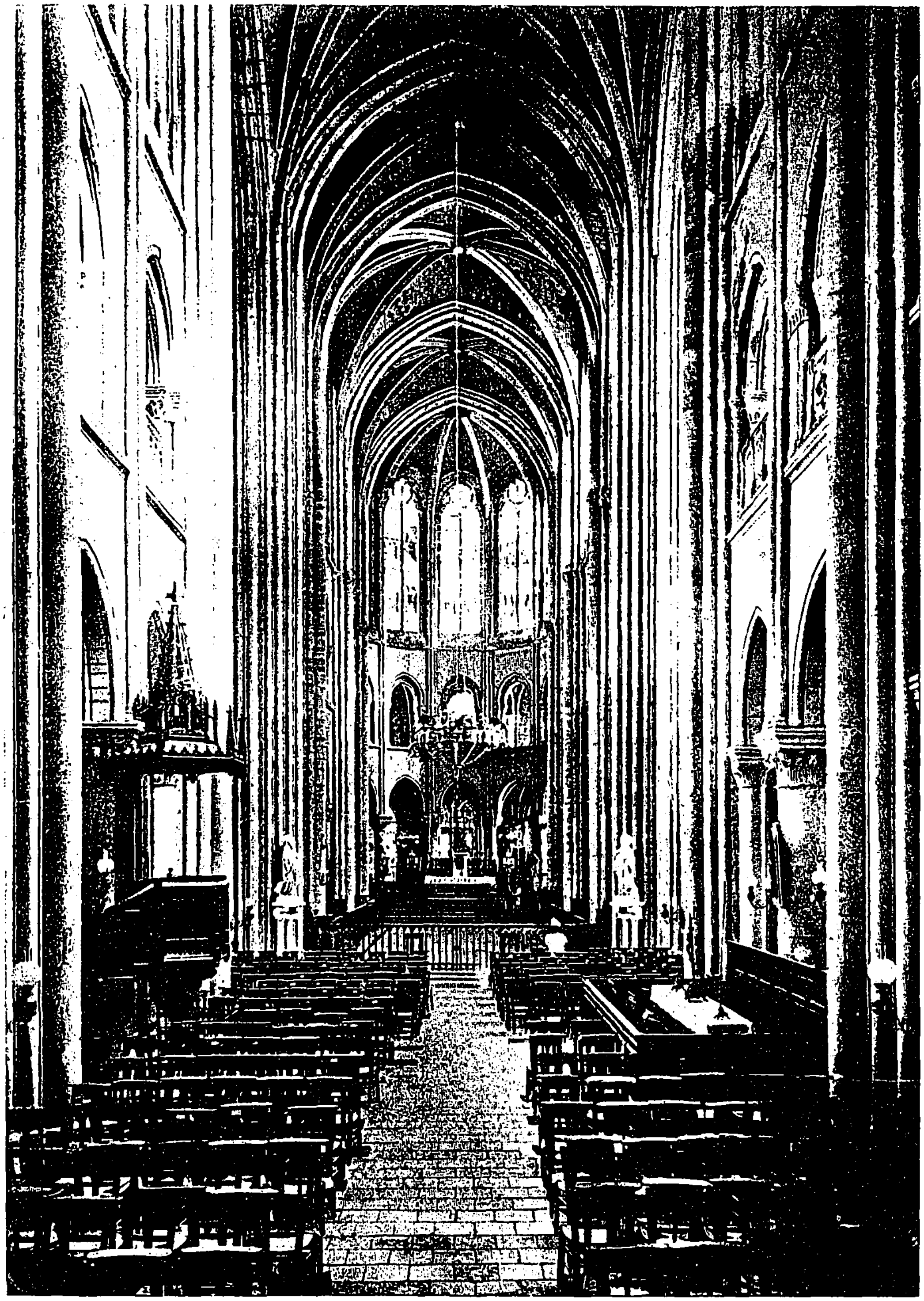
The early Gothic method is seen in its inception in the ground-storey vaults of the eleventh-century Tbbey Church of Morienval, near Crepy-en-Valois; and is found in its complete character in the later Abbey Church of Saint-Denis, which dates from 1137 to 1141. In spite of the fact that the system employed in the apsidal aisles of the church at Morienval was awkwardly and incompletely carried out, two important principles were introduced—the use of the pointed arch and the curving of the diagonal vault ribs. The pointed arches were poorly conceived and adjusted, and show plainly that they were introduced as a result of experimental efforts to vault successfully a curved oblong space; and that they were not used because their form was admired for its artistic value. As for the vault ribs, one is missing, and the other—a heavy, round-arched one—is not well applied.

The advance upon Morienval made in the church of Saint-Denis is so great that it would seem as if there must have been intermediate progressive steps, although we are not able to trace them. In the well-developed apse and choir aisles which at Saint-Denis replace the rudimentary apsidal aisles of Morienval the vaults are adequately executed, and are sustained by a full rib system of which the transverse and longitudinal members are pointed, and the diagonals, round-arched, strengthen the groins by their vigorous projection. By the intersection of the ribs far above the crowns of the enclosing arches the vault cells are much domed. Thus the rib system is not only independent, but it performs as well a new office, in that it determines the forms and constitutes the strength of the vaults, a function which, so far as it is possible to discover, it had never fulfilled up to this time.

These vaults of Morienval and Saint-Denis are, it must be remembered, ground-storey vaults of small dimensions. The efficacy of the constructive members adopted can be better estimated by the degree of success of their application in the vaults and vaulting systems built on a larger scale.

Although chronological sequence cannot be accur ately determined, it would seem that the cathedrals of Senlis and Noyon were erected very soon after the Abbey Church of Saint-Denis. The original choir vaults of Senlis must have been the very earliest of any considerable scale that were constructed upon the Gothic principles above noticed. The configuration of this vault is of special significance. The shape and arrangement of the supporting piers indicate that the original vaults, which have since been replaced, were sexpartite, a form regarded by many authorities as th eearliest used.

Just what the initial progress of sexpartite vaulting was in France proper it is not possible to ascertain, sinec hardly any vaults built upon this model prior to those of the Cathedral of Paris, which was completed about 1180, remain on the Ile-de-France. Much may be learned, however, concerning the early development of this form from the sexpartite



Senlis, Looking East.

vaults of the Norman churches at Caen. Those of the Abbaye-aux-Hommes, which date from the beginning of the twelfth century, are certainly among the first, if they are not, indeed, the very first, sexpartite vaults built. They are not truly Gothic; their rib system, lacking longitudinal or wall ribs, is not complete, nor is it independent, for its ribs, instead of disposing the form of the vaults, are themselves determined by their forms; moreover, the transverse ribs are round-arched and the diagonals elliptical, and they violate the Gothic law by exerting the maximum instead of the minimum thrust. Without doubt, nevertheless, they furnish the pattern upon which the Gothic sexpartite vault was later built up. The laternal vault cells, on account of the positions and the curves of the intermediate and diagonal ribs, take on a new character, which is, in a rudimentary manner, Gothic, for twisted surfaces are necessary to cover the triangular spaces enclosed by these ribs and the clearstory wall. Still, because of the peculiar upright elliptical form of the longitudinal arches, these superficies are not especially pronounced, and give an awkwardness of effect not characteristic of the similar twisted surface of the Gothic system. This feature is very important, since it was upon this concentration of thrusts at the highest possible point that the compactness of the pier, which is so essential to the Gothic system, depends. Probably the adoption of this particular kind of vault at the Abbaye-aux-Hommes was due to the unusual arrangement of the piers, which have alternately a single engaged shaft and a shaft coupled with a broad pilaster—a method derived from the Lombard churches, which exhibited a reciprocal disposition of piers.

Whether or not the principle of the sexpartite vault and its appropriate system was really discovered and rudely embodied merely by accident in the Abbaye-aux-Hommes at Caen, it certainly became frunitful at once on the Ile-de-France, where it was consistently worked out to its perfection. In the cathedral at Senlis, where the piers alone indicate by their shape what must have been the rib skeleton regulating the construction of the vault, the full artistic and scientific value of the constructive law had been educed.

From the present remains it is not possible to decide what the external means of abutments of the high vault swas at Senlis; and as there are no evidences that any flying buttresses, sprung over the aisle walls, existed at this period, it seems probable that the heavy piers, reinforced by the triforium vaults, sustained the thrusts. The main piers, made up of square members and engaged vaulting-shafts, were excellent, both in their functional grouping and in their expression; but, being very massive, they took up too much room. In the erection of these component parts, a new skill in masonry is shown in the selection and in the handling of material, a factor very important in the growth of the Gothic system. Indeed, in every particular this cathedral illustrates strikingly the logical course by which the style attained its final effectiveness; for while the interior, though heavy in its proportions, is frankly Gothic, the exterior is peculiarly Romanesque. In this manner the French Gothic grows, from within outward, developing organically by a gradual perfecting of its essential framework, and leaving outer details as a last consideration.

At the contemporaneous Cathedral of Noyon, the choir, although larger in its scale, and built in a manner somewhat lighter and freer, resembles in many particulars that of Senlis. The vaults, which have been preserved to the present day, are quadripartite in oblong compartments. Therefore the vaulting-shafts and piers succeed one another in a uniform series, instead of varying alternately. The vaults are but slightly domed, since only their transverse ribs are pointed, and the round-arched longitudinal ones are stilted so much that their crowns are brought up to almost the same level as the crowns of the diagonal members. The transverse and diagonal ribs are respectively supported by three vaulting-shafts, which rest on the capitals of the ground-storey piers. The ground-storey piers of the choir proper are plain round columns with a single engaged shaft. The single columns of the sanctuary are more slender than those of the choir, and are monolithic with a slight entasis; their capitals are pure Gothic in their functional adaptation to the peculiar structural conditions. The means of external support cannot be determined with accuracy, inasmuch as the buttress system has been reconstructed; it is probable, however, that true Gothic flying buttresses were sprung over the aisle walls to abut against the high clearstory.

The Gothic principles, already far advanced in this choir at Noyon, are more completely carried out in the nave of the same church, where the lighter proportions of shafts and piers and the greater magnitude of openings, evince a better understanding of the freedom afforde dby the ne wconstructive method. Further evidence that a distinct stage of advance had been effected mav be found in the choir of Saint-Germain-des-Pres, Paris, the nave of Saint Stephen's at Beauvais, the churches of Saint-Leu-d'Esserent and Saint-Martin at Laon, and other similar edifices, which were undoubtedly of about this same period.

In the greater cathedrals o fthe latter part of the twelfth century and of the beginning of the thirteenth—the cathedrals of Paris, Laon, Chartres, Bourges, Rheims, and others—we may study the surprisingly rapid development of the Gothic style to its highest perfection. Of these edifices, the Cathedral of Paris is the first in which a systematic application of the Gothic principles is distinctly shown; and the efficiency of the system could not be better illustrated than in the nave, the vaulted stone roof of which has stood intact for seven hundred years. Its vaults are sexpartite in form. The cells are entirely governed by the sustaining ribs, of which the longitudinal are pointed and the diagonals semicircular. The latter intersect at a point higher than the level of the crowns of the transverse ribs, the intersections of which are, in turn, higher than the crowns of the longitudinal members; in consequence the vaults are distinctly domed, assuming a form almost universal at that time. The lateral vault-cells are naturally oblique to the axis of the nave, and their surfaces are very irregular on account of it. This peculiarity Moore, in his "Gothic Architecture," explains as follows:

"More or less obliquity and irregularity of surface is a constant and necessary characteristic of true Gothic vaults, even of those which are quadripartite. Gothic vaults are never simple intersecting pointed vaults. The new constructive principles do not permit of such forms. Gothic vault-forms do not permit of description in geometric terms. They vary acording to the spans, the altitudes, the curves, the points of springing of the arches that compose the rib system, and it is by the forms and relation of these arches only that such vaults can be described. In the vaults of Paris the filling-in consists of successive courses of arched masonry reaching from rib to rib over each triangular space of the plan. The beds of these successive courses are not parallel one with another, but incline variously according as the mason found necessary or convenient in developing the twisted concave surfaces required by the varying spans and positions of the ribs. In early vaults like those of Paris the courses usually have considerable rise near their springing, from the longitudinal rib toward the diagonal; and they become more level as they approach the crown of the vault, where they are more nearly parallel. But perfectly parallel they hardly ever can be where each course is properly a surface which is concaved in all directions. The masonry of these vaults, especially in the choir, is perfectly faced, and closely jointed."

We see the progress of the style continued at Paris —the slender vaulting shafts rest upon the immense capitals of the cylindrical columns which constitute the ground-storey piers, and by the attenuation of these supports the inner space of the edifice is considerably increased. The equilibrium of the building is maintained entirely by the opposing action of thrust and counter-thrust. Originally there were double flying buttresses; the piers which divided the double aisles rose above the roof to meet each the head of a flying buttress, that sprang from the outer buttress to span the outer aisle, and to support another flying buttress, which in turn sprang over the outer walls to abut against the great piers. In fact there is but one defect in logic in this building: an incongruity between the sexpartite vaults and the form and magnitude of their sustaining piers; this, moreover, seems to have resulted from changes made in the building after the construction had reached the springing of the vaults.

The difference between the Cathedral of Paris and contemporary erections of a similar character was merely in unessentials, which varied according to local taste and individual architectural genius. In no two are the structural parts arranged exactly alike, but in all of them is shown a clear apprehension of the new style.

The system made further progress as the thirteenth centry advanced. One of the first improvements effected was in the construction of the ground-storey pier. The plain round columns, which at Paris and Laon had replaced the huge and inconvenient but entirely adequate piers of Senlis and of Noyon, had been found unsatisfactory, since they failed to afford independent supports for the various members of the superstructure. This defect was remedied in a pier built for the nave at Paris, a pier which was essentially Gothic in its construction, since it provided continuous support from the pavement for all the vaulting members. From this time forward the continuity of the members, from the pavement upwards, was invariably observed in Gothic buildings; this does not mean that each vaulting member had an individual support from the pavement, but that each group of the superstructure rested upon an independent ground-storey shaft. Furthermore, after the beginning of the thirteenth century, sexpartite vaults, which had up to this time been the popular form, yielded their place to the quadipartite vault. Much improvement was, however, effected in this form. The long longitudinal round arch was replaced by the pointed arch, which had been employed in the sexpartite vaults of Paris, and in similar buildings of the same period; and the excessive doming of these early vaults was done away with, by bringing the crown of all the arches more nearly to the same level. The rib system of these later edifices is, in the number and function of its members, closely correspondent to that of the finished earlier system—it is quite complete in its constructive members and in its independent pier supports; but ridge ribs and surface ribs are not yet introduced. In a word every member of a Gothic building is now logically conceived and adjusted, but excellence in treatment of detail is not invariable in dealing with minor structural exigencies.

We have yet to see the fullest distinctive perfection of the Gothic system fully realized in the Cathedral of Amiens, begun in 1220, which is, in its scale, the finest in France. Here there is a grand summing-up of all the Gothic principles, efficiently and artistically applied.

Of just what are the characteristic features of a fully developed Gothic cathedral structure we can gain a clear idea from Moore's excellent summary:

"1. The plan consists of a nave, the eastern portion of which forms the choir, with side aisles (sometimes single, sometimes double), and a transept, usually also with aisles. The nave and the aisles terminate at the east almost invariably in either a semicircle or a polygon, around which the aisles are continued. At the west the termination is square, the aisles of this end terminating in towers. The nave is separated from the aisles, and the aisles when double are separted from each other by rows of piers which support the superstructure. The whole is enclosed on the ground-storey by a thin wall, beyond which, opposite the piers, are the far-projecting and massive buttresses.

(*Concluded on page 92.*)

THE VENTILATING AND HEATING OF SCHOOL BUILDINGS

Excerpt from annual report of Dr. H. B. Mapleton, M.A., Medical Health Officer to the Newton Abbot Rural and Urban Council, England.

AMONG THE MANY conditions affecting school life, which have of late years received attention, the question of ventilation is, from the sanitary point of view, of the first importance. Medical inspection of the children is now an established routine procedure, and the logical consequence—treatment of abnormal conditions—is on the threshold; these constitute curative measures, which are generally placed first in public estimation. But in many cases disease will be avoided, and in others the treatment of it greatly facilitated, if the preventive side of the question—the environment of the children—is also thoroughly attended to. Five hours, or nearly half the day, are spent in the schoolroom, and, therefore, the condition of the air breathed should have at least as careful consideration as food, clothing, or any other necessity of life. Now, in practically all schools except those of the most modern construction, the arrangements for ventilation are suitable for warm weather only—that is to say, that a tolerable condition can only be obtained by the free opening of windows—and if the external temperature is low, this means that either warmth or air purity must be sacrificed, a Hobson's choice of evils, in which the former, being more immediately appreciated, has usually the first attention. The danger is most insidious, because the air in a room, if fairly pure to start with, becomes deteriorated so gradually that nothing is noticed by the occupants till an extreme condition is reached.

The effects of such a daily dose are indeterminate, and it would be hardly possible to define them exactly in any given case, or even group, of children, but, speaking generally, several may be mentioned: —(1) The vitality of the growing child, which depends to a large extent on a freely oxygenated and pure blood supply to the tissues, is adversely influenced. (2) This loss of vital power produces in its turn susceptibility to the invasion of any infective germs—such as those of phthisis, diphtheria, scarlatina, etc., which may be present, and with all the care possible such cannot be altogether excluded when children are collected together in the schoolroom. (3) The infection itself is more concentrated and a larger dose received. (4) The central nervous system, equally needing pure blood for its proper operation and development, suffers; the children are less receptive in regard to their lessons, and public money is thus wasted. (5) Education should comprise sanitary instruction, and to teach children that the closed window is necessary, or even desirable, contravenes one of the first principles of health.

In this country, where winters are for the most part mild, the problem is perhaps easier and less costly in solution than a more rigorous climate would entail, but even here, if anything like ideal conditions are to be obtained, certain structural alterations in most of the older schools, and not a few of comparatively modern ones, would seem necessary. Ventilation is, as a rule, obtained by casements below and swing sashes above, combined with a few Tobins' tubes or Sheringham valve inlets—mostly of such limited area as to be of very little use; in many of the former the air before entering passes through long pipes, which contain the dust of years, and are inaccessible for cleansing purposes. Ceiling outlets, on the other hand, are, if of any size, of real value, and these in most cases have been provided. It is, however, difficult to discriminate between inlets and outlets, and, as far as my experience goes, they act at different times in both capacities, according to external air movements. The casements and swing sashes when opened, especially if cross ventilation—the most important object—is attempted, are liable to create draughts, which in anything but calm and warm weather become unpleasantly noticeable; and even under favorable conditions a good deal depends on the susceptibility of the individual teacher. The position of the school also constitutes another factor; a building on apparently a most healthy and desirable site is, ipso facto, more exposed to air movements, and thus an external benefit becomes an internal disadvantage, because it encourages at certain times the closed window.

Heating is inseparably connected with ventilation: in all but the most modern schools this is effected by stoves—either open or closed—and these, however effective in a comparatively small living room, cease to be so in any large building. The area near the fires may be—and often is—over warm, while more distant parts are not warm enough. Children feel a low temperature more than the teacher, inasmuch as the former—some of whom are, perhaps, insufficiently clothed—are sitting still most of the time, while the latter is continually on the move; moreover, children, especially the younger ones, endure in silence.

It may be said that stoves and open fires assist ventilation by drawing away vitiated air; this, however, only operates to a height of 4 feet or 5 feet, and, moreover, tends to create draughts, which affect the lower extremities of those exposed to them. With a view to ascertain local conditions in these matters, I made during the latter part of the year some tests of the air and temperature in the Newton schools, under various climatic influences. Each school was visited, and a test of the air made in every class-room; the external and internal temperature was taken, and the floor space, cubic area, and ventilation accommodation per head at the time of visit worked out. The apparatus used for the air test had of necessity to be simple, and one giving a quick result, both because of the number of tests involved, and also to avoid disturbing the lesson. Lunge and Zeckendorff's was the method employed. In this process a measured quantity of standard solution of carbonate of soda tinted pink with phenolphthalien, is put in a bottle, and the air to be tested pumped through by means of a syringe of known capacity. When the soda is neutralized by the carbonic acid, the color is discharged, and the amount of air necessary to effect this calculated. The change is soon apparent if the air is impure, and, on the other hand, under anything like normal conditions, the color is difficult to discharge. Thus the actual percentage of carbonic acid is determined; the results are very fairly reliable, and any errors arising from slight deterioration of the solution are favorable to the schools. A test was made on each occasion in the open air as a control. It is generally estimated that the normal atmosphere contains .4 parts per 1,000 of carbonic acid, but that the "permissible" amount may range up to .6 without harm; indeed, a slight increase, where many persons are congregated indoors, is unavoidable. On the other hand, anything approaching .8, where the excess is due to respiration, is perceptible to the senses of anyone entering from fresh air, and begins to be actively deleterious.

It is not that this small quantity is in itself poisonous, but where it results from respiration, waste organic matters from the lungs and bodies are also present. These constitute the real danger, and they are most readily estimated by the carbonic acid, to which they bear a constant proportion.

It will be seen that the conditions varied widely in the different schools, and even in the different class-rooms. Floor space, for instance, ranged from 6.5 to 21.5 sq. ft. per head, while it was under 10 in nine class-rooms; cubic area in the former case was only 93, and in the latter 300, but it was under 100 in two rooms only. Available area of ventilation, including all inlets and outlets (so-called) and open window space, reached 170 square inches per head in one class-room, while in another the figure was only 19; three show 22—very little more. It is generally estimated that each person should have 48 inches (24 inlet and 24 outlet), but in seventeen rooms this was not attained at the time of my visit.

The results of the carbonic acid test, without being wholly unfavorable, were sufficient to show that attention is needed in the matter, especially when it is considered that they were made under climatic conditions which could have made no severe demands on effective ventilation and heating systems. The estimated quantity of carbonic acid was below the permissible amount of .6 in eleven rooms, while .8 per 1,000 was reached in nine more, excluding two in which the gas had been alight for a considerable time previously, which discounts the figures to some etxent in their case; the remainder were between the two. Owing to the delicacy of the standard solution, it is probable that the figures are all slightly under-estimated, but they represented the apparent freshness (or otherwise) of the air as perceptible on entering, most accurately; all rooms in which .8 was approached were distinctly stuffy and unpleasant. I found that the chief factor of influence was the presence or absence of cross window ventilation, rather than cubic space or floor area per head, though, of course—other things being equal—these had their due effect.

THE DEVELOPMENT OF THE GOTHIC VAULT—Continued from page 85.

"2. The vaults, whose plan and construction determine the number and arrangement of the piers and buttresses, are furnishe dwith a complete set of ribs, namely, transverse ribs, diagonal ribs, and longitudinal ribs. These ribs are independent arches, of which the transverse and longitudinal ones are pointed, while the diagonals are usually round; and upon them the vault masonry usually rests—the one never being incorporated with the other.

"3. The ribs spring from slender shafts, compactly grouped, and often detached, though having their bases and capitals incorporated with the great piers which rise from the pavement, through successive storeys, to the nave cornice. Each one of these piers is a compound member consisting of a central body, with which are incorporated all the vaulting shafts, besides the columns which carry the pier arches to the ground storey, and those above which carry the arches of the triforium, and finally the buttresses of the clearstory. Upon the piers are concentrated all the side pressures of the vaults, but these side pressures are so neutralized by the buttressing that the piers require only to be massive enough to bear the weight of the vaults.

"4. The clearstory buttresses which receive the thrusts of the nave vaults are reinforced by flying buttresses springing over the aisle roofs and rising from the vast outer buttresses, which are incorporated with the respond piers of the aisles.

"5. The walls, required for the enclosure only, are reduced to the minimum of thickness, and are confined to the ground-storey and to the spandrels of the arcades. The apertures fill the whole space laterally between the piers."

Such a logical composition as this which Moore has described is that culmination of Gothic art—the Cathedral of Amiens.

A CORRESPONDENT reminds us of two notable figures in English history that ought to have been connected with the roofing industry, viz., Wat Tyler, Will Rufus (Wat Tyler will roof us). He adds the name of a more recent historical character, Slatin Bey (slate-in bay).—Exchange.

CHANGE OF ADDRESS

THE MONTREAL ADDRESS of the Standard Ideal Company, Limited, is now 44 Beaver Hall Hill. New offices have also been opened in Winnipeg at 76-82 Lombard street. In connection with both places are modern show rooms, in which the company displays its "Alexandra Ware," which is being extensively adopted throughout the Dominion by architects and owners desiring the best type of plumbing fixtures.

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B. Greening Wire Co. Limited.
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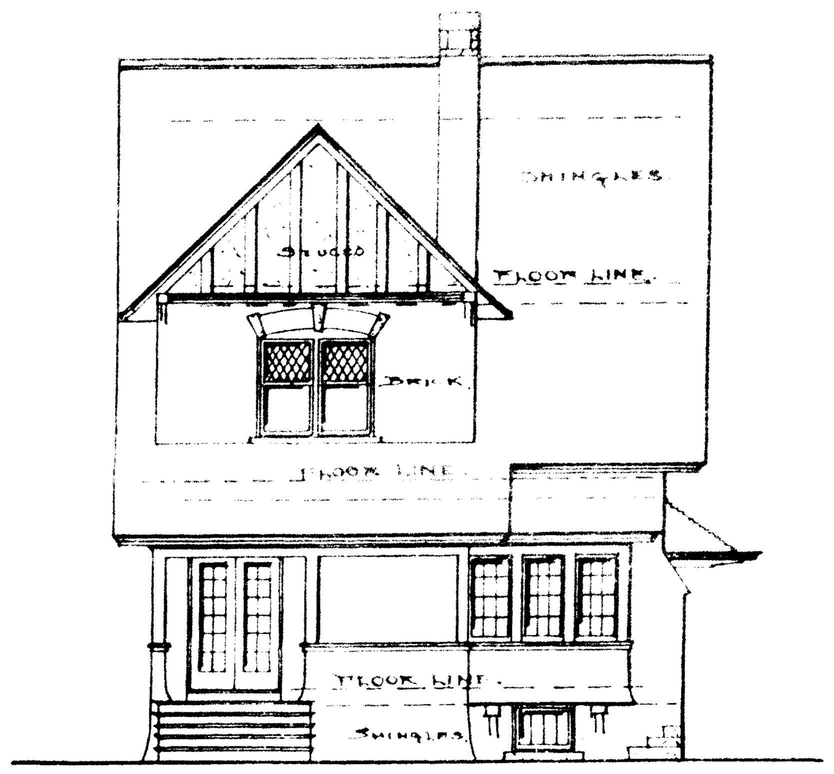
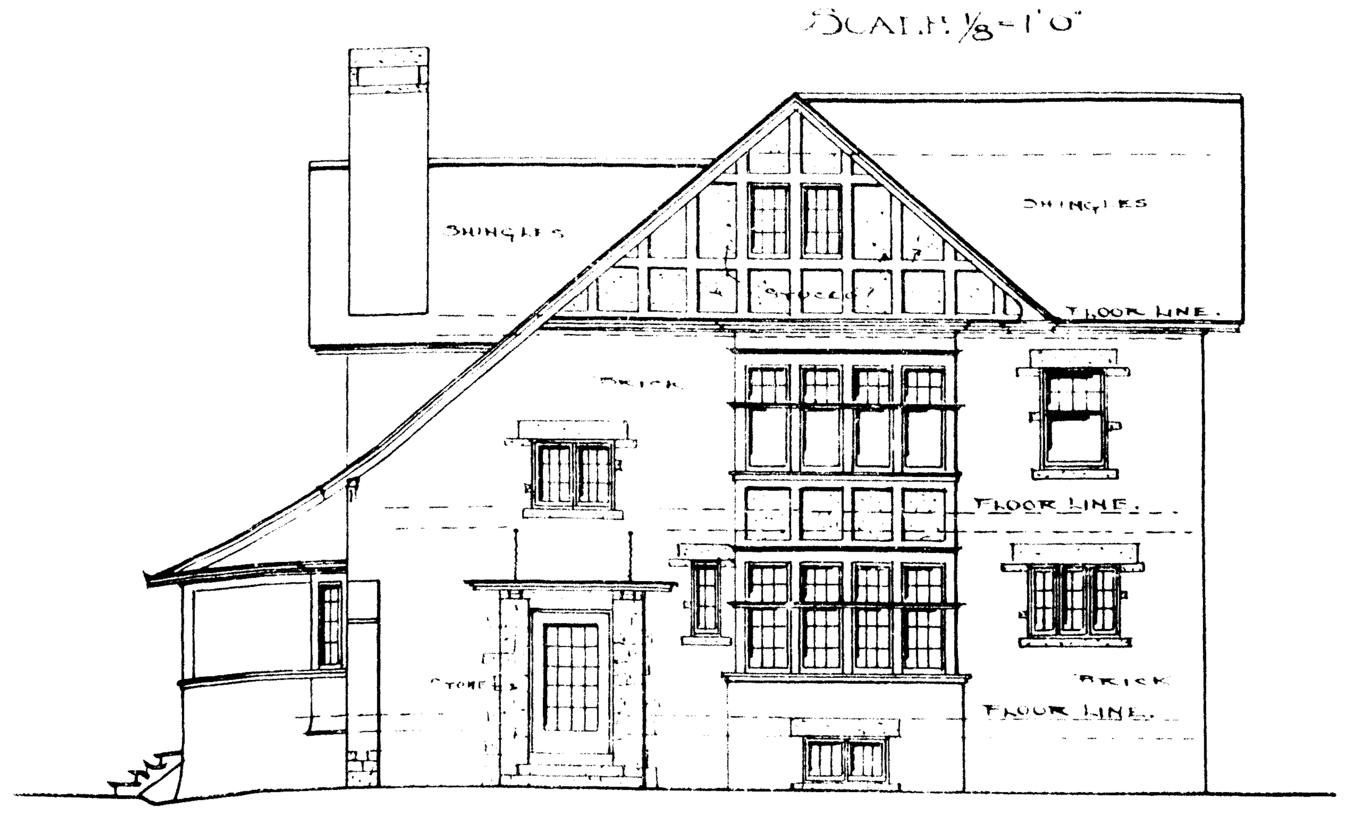


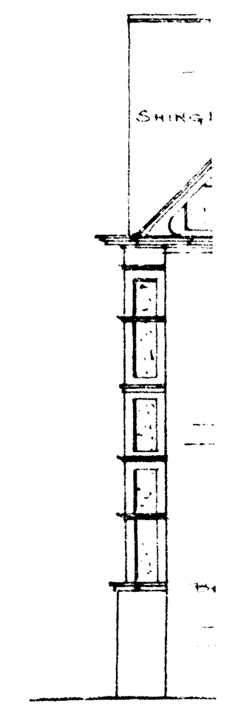
FRONT ELEVATION

SCALE 1/8"=1'0"



EAST ELEVATION.

WEST ELEVATION.

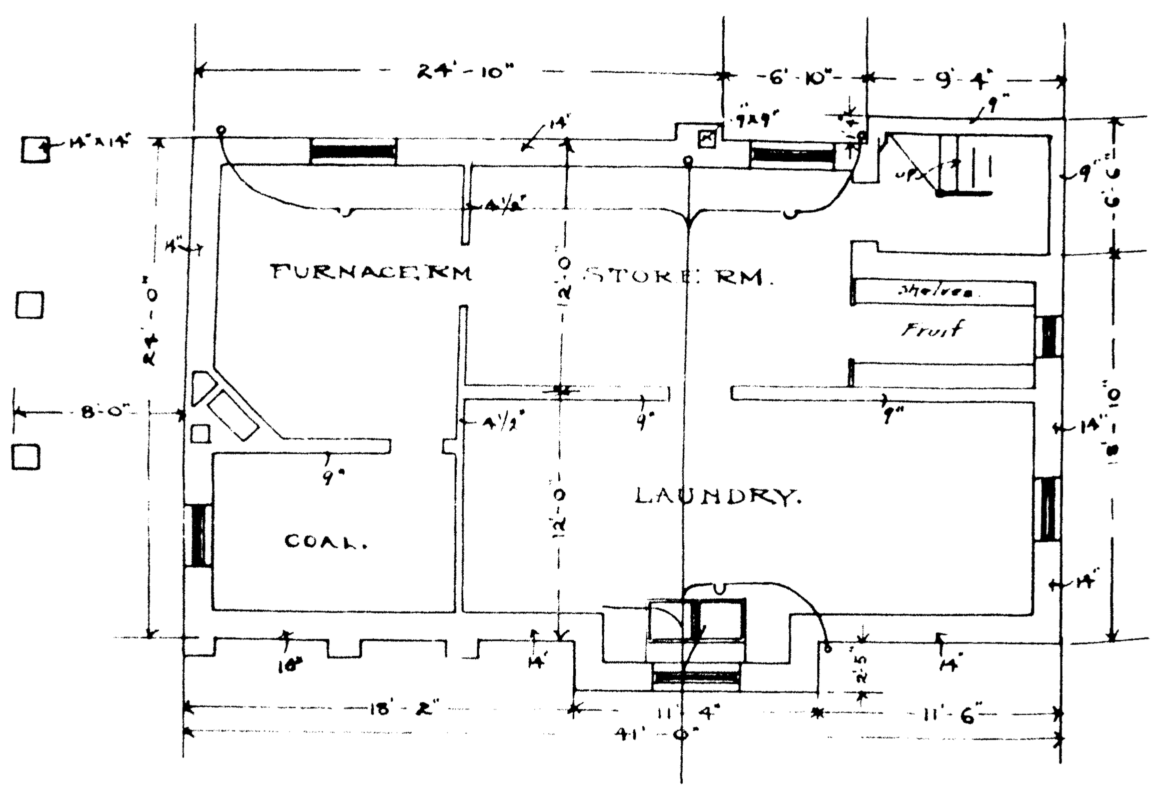


RESIDENCE of
Dr. C. S. McVicar, Toronto
J. H. Galloway, Architect

Supplement to

CONSTRUCTION

August 1911. Vol. 4, No. 8.



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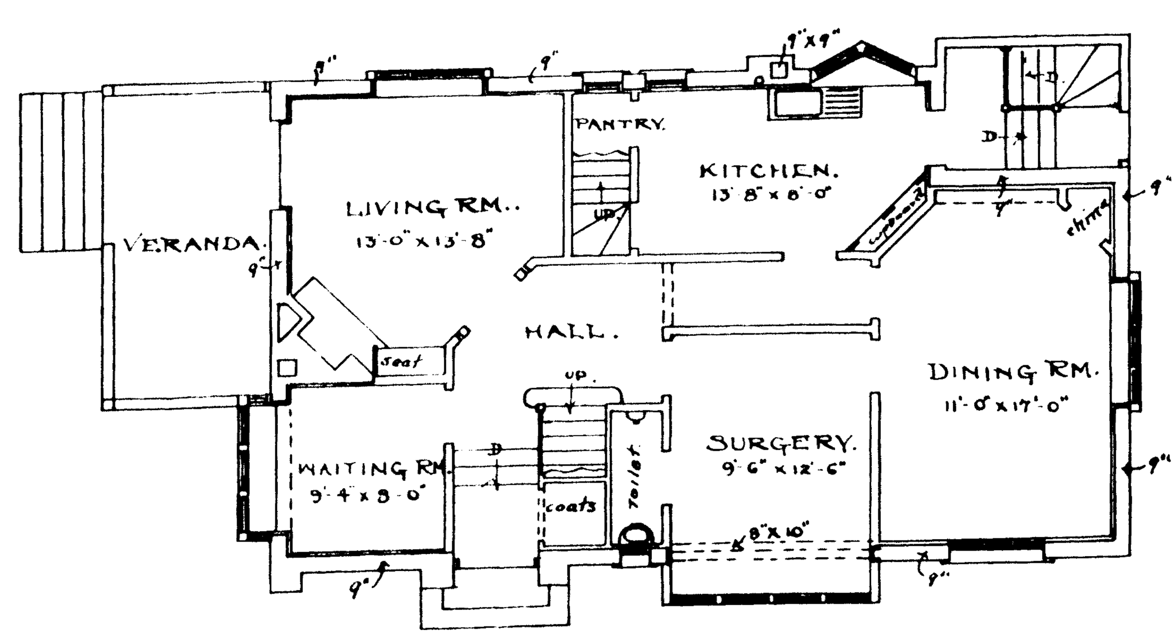
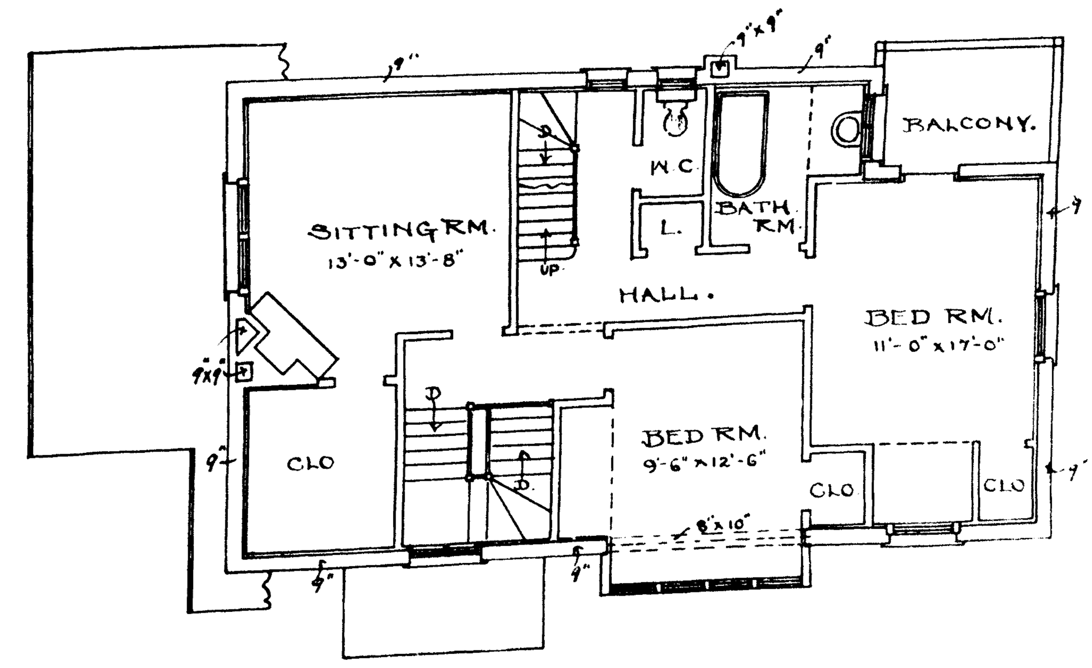
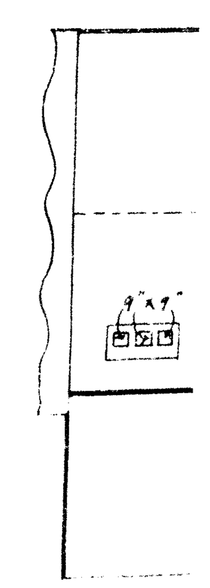


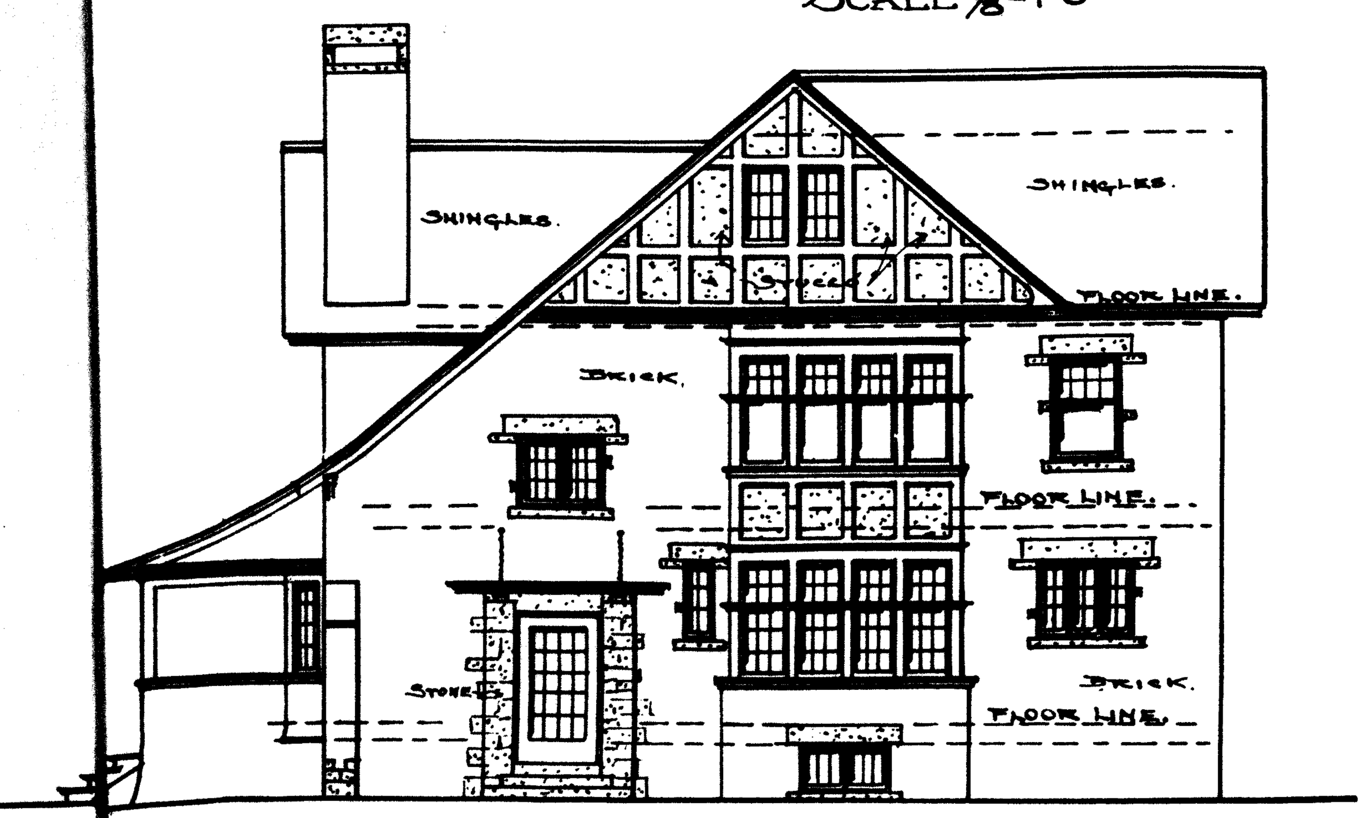
GROUND FLOOR



FIRST FLOOR.



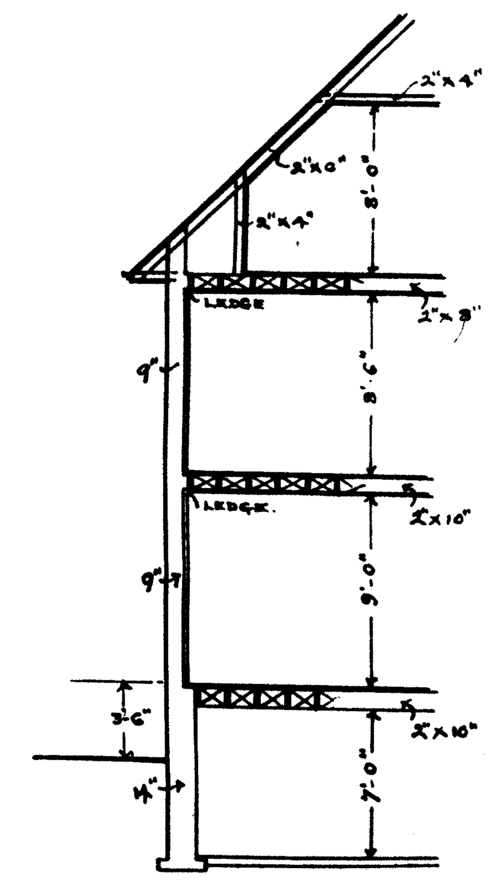
SCALE 1/8 = 1'-0"



EAST ELEVATION.

WEST ELEVATION.

REAR ELEVATION.



SECTION.

Supplement to CONSTRUCTION

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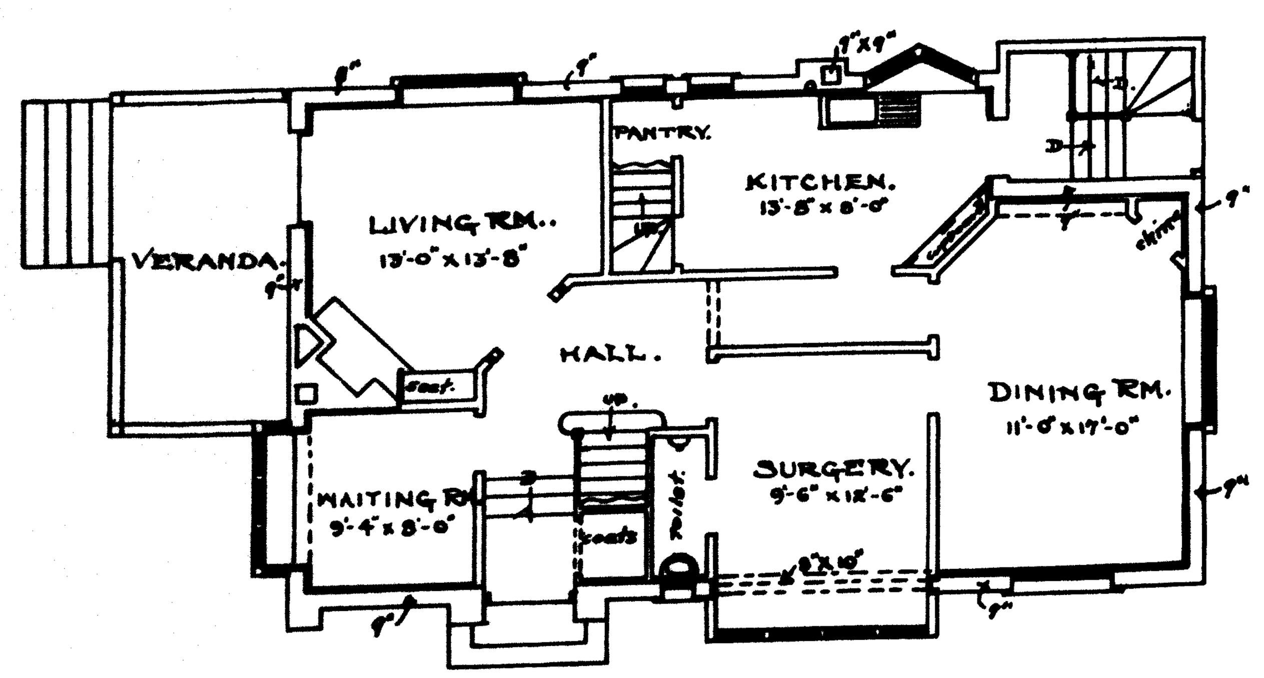
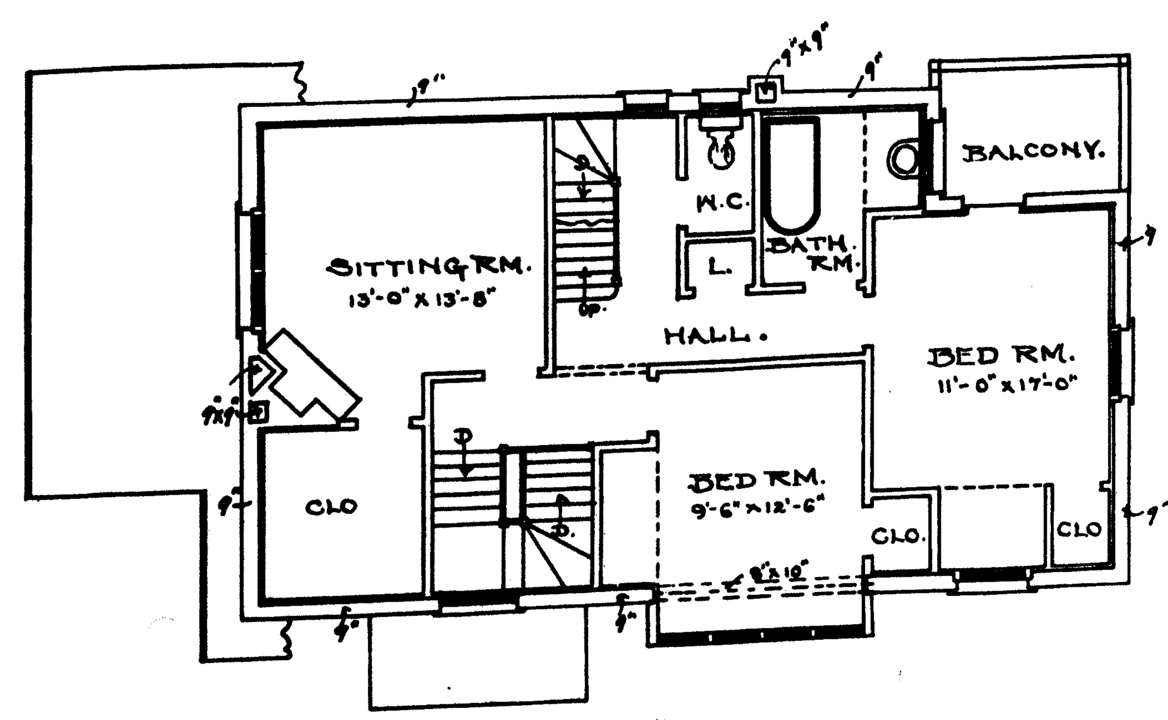
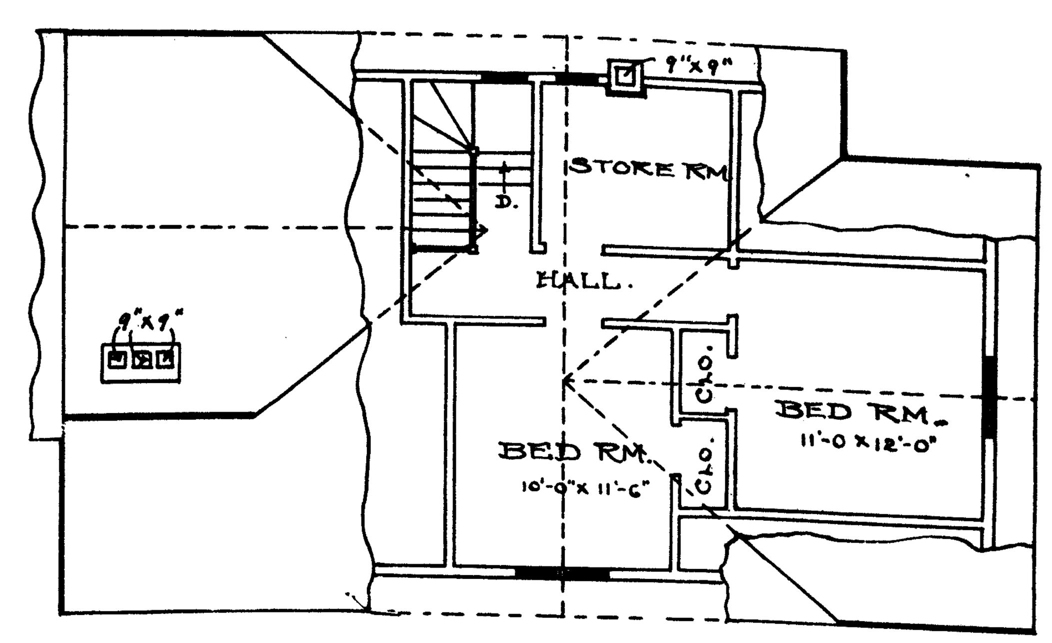
Plans 1/8" Scale
Elevation " "
For Description see page 83



GROUND FLOOR



FIRST FLOOR.



ATTIC.