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CONSTRUCTION

A · JOURNAL · FOR · THE · ARCHITECTURAL
ENGINEERING · AND · CONTRACTING
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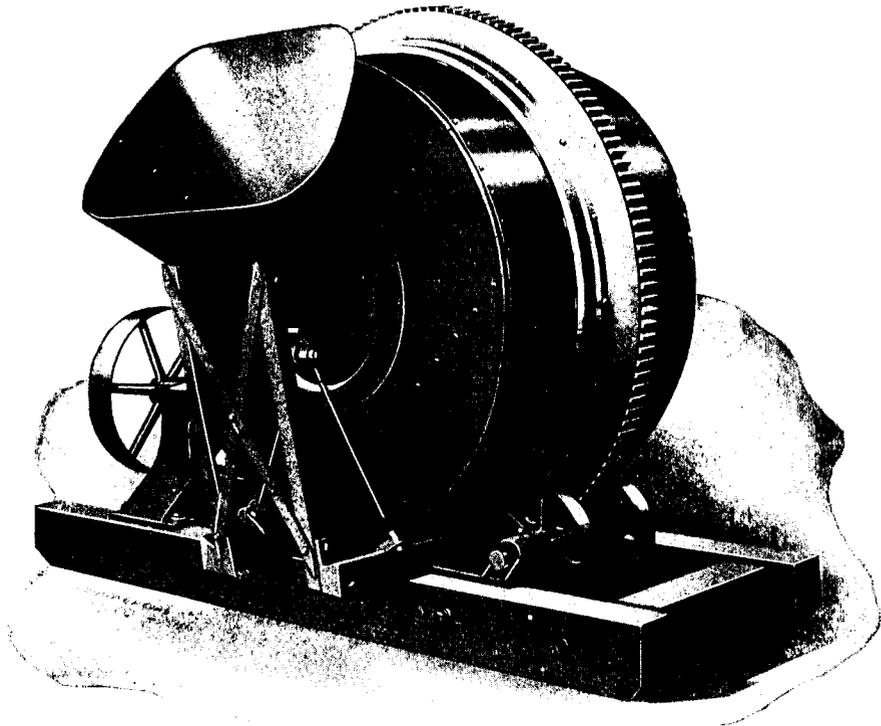
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Contractors—Longacher and Kelley, Elkhart, Indiana.

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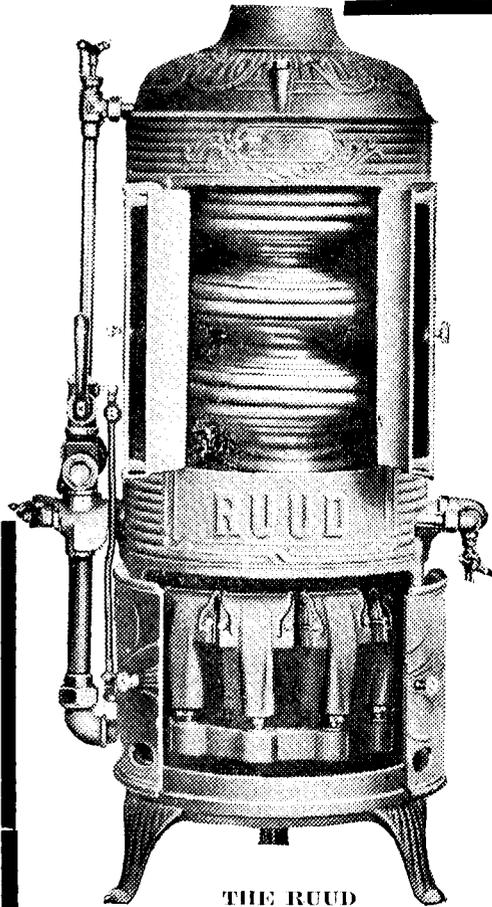
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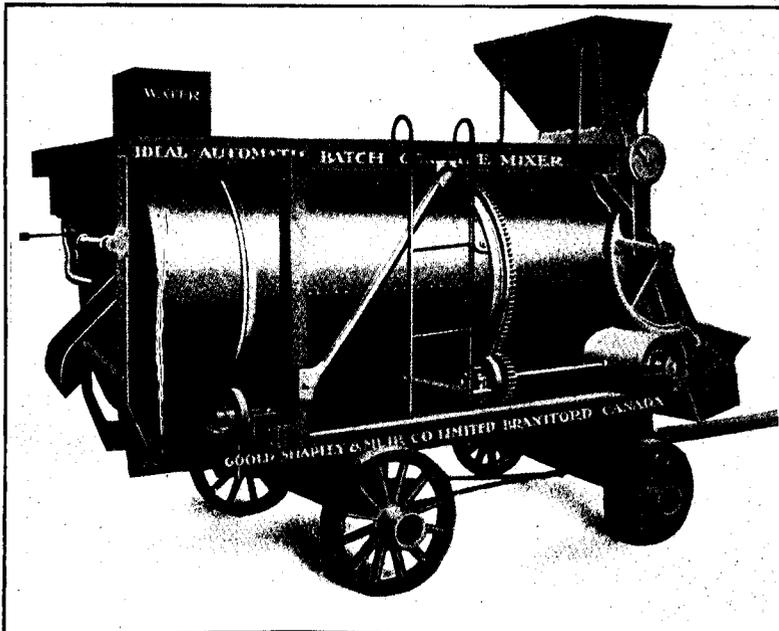
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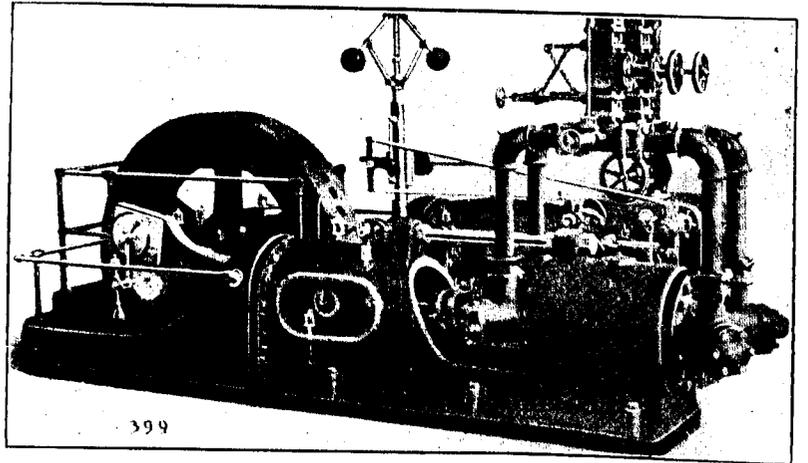


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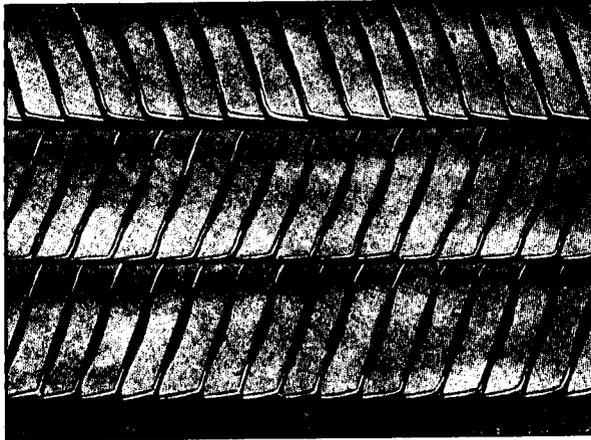
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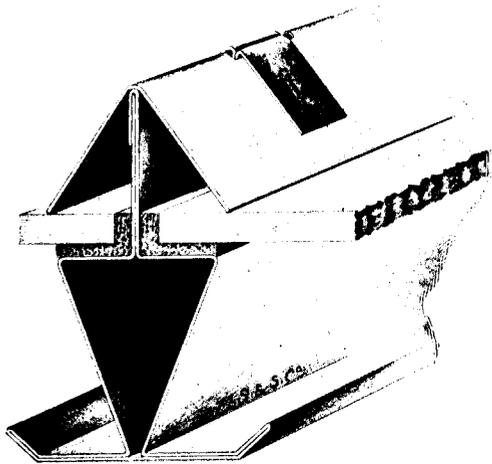


FIG. "C"

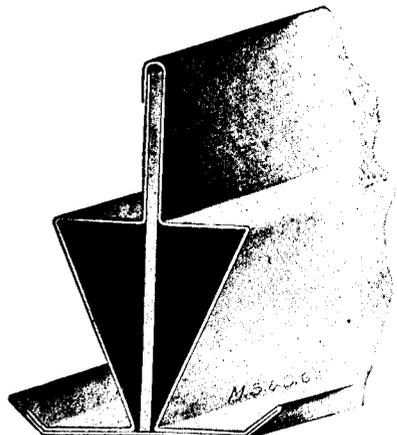


FIG. "E"

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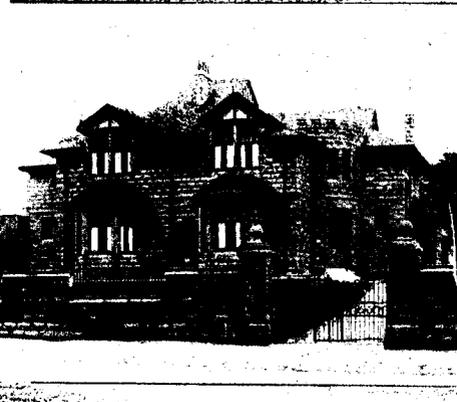
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These pictures illustrate the the building

Many Architects are under the erroneous impression that the architectural possibilities in concrete construction are limited. The accompanying illustrations of various types of residences afford an excellent idea of what can be accomplished in this direction. These houses, it will be noted, comprise the three branches in concrete construction in domestic architecture—the reinforced concrete residences, residences of concrete blocks, and cement plastered houses.

Canadian Architects will now understand why more and more of the leading architectural minds are becoming imbued with the desirability of concrete in the erection of handsome homes and stately and superb edifices.

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The Architect or Builder who specifies concrete construction is sure of several advantages if he orders his supplies from us.

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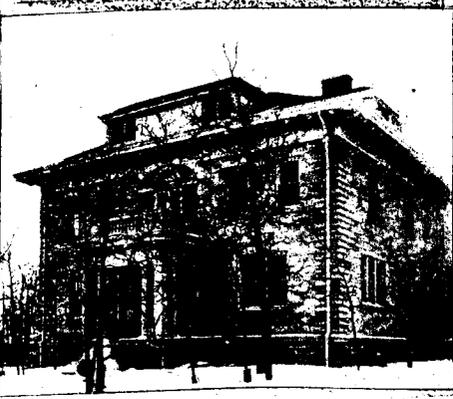
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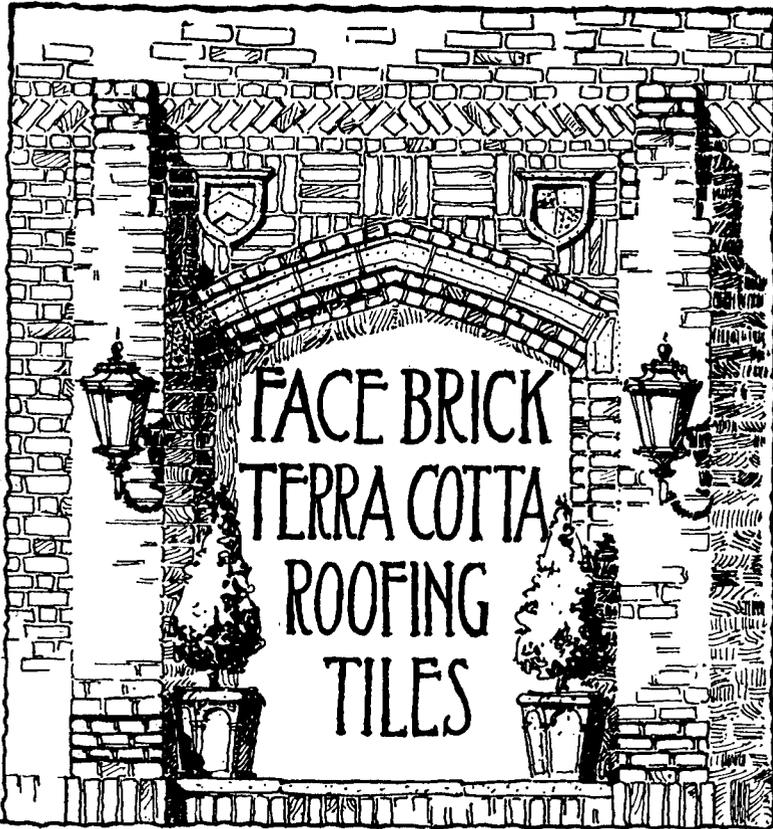
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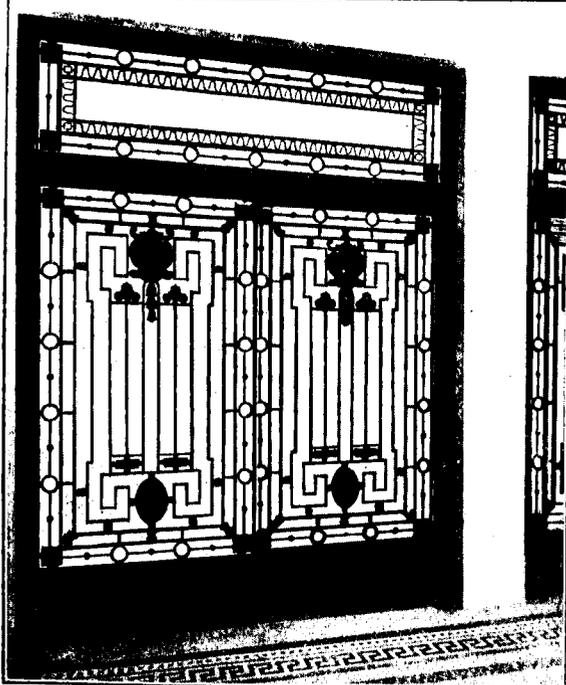
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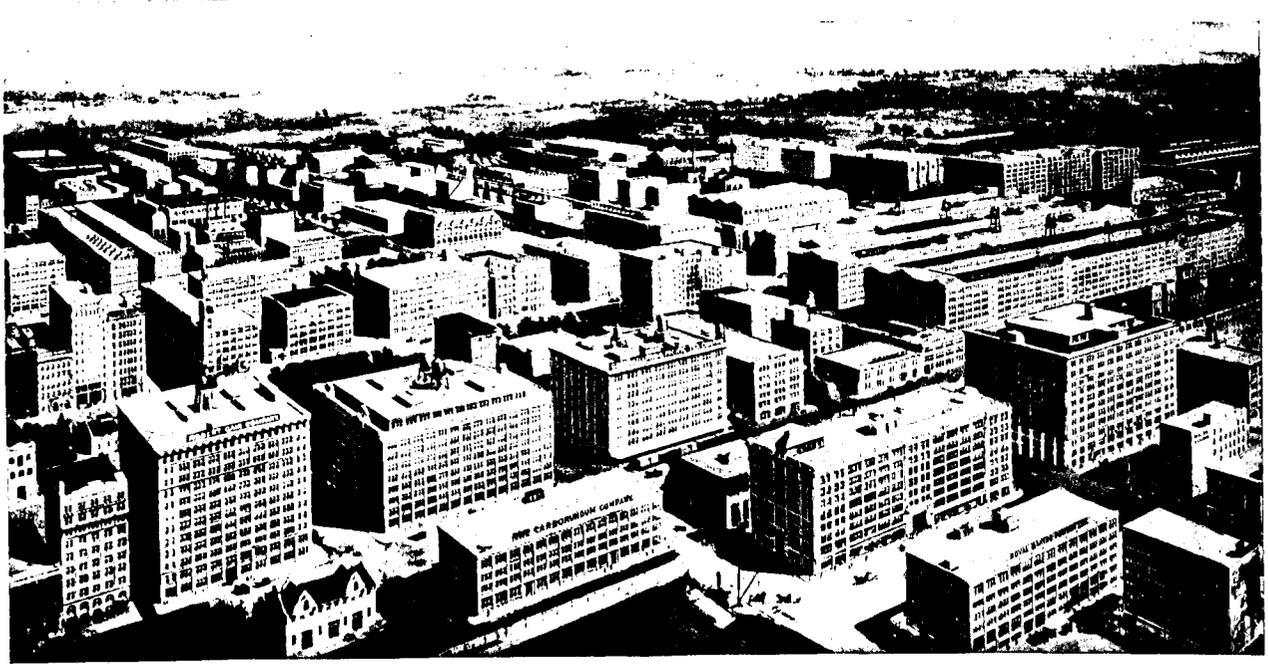
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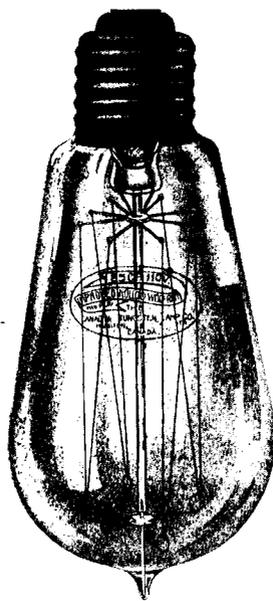
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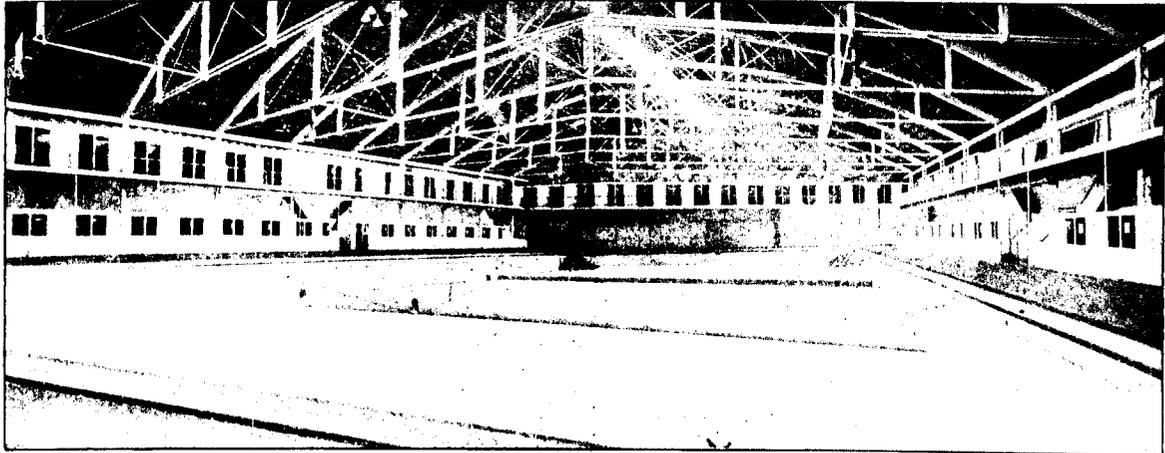
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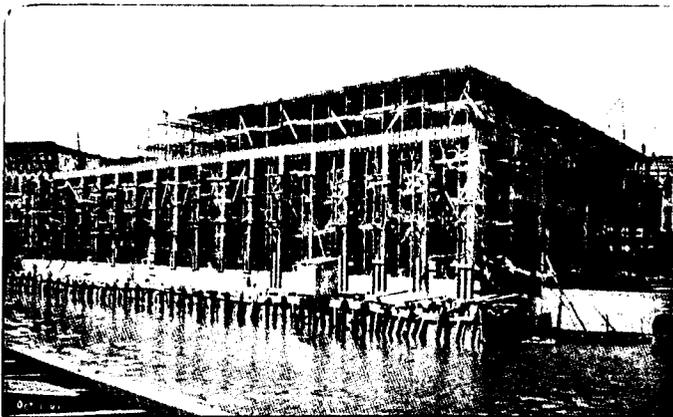
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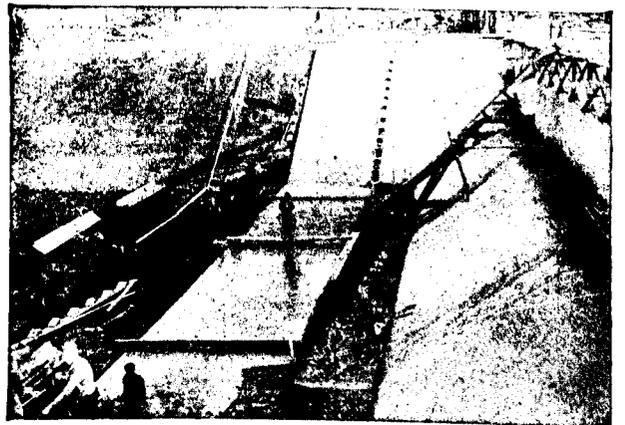
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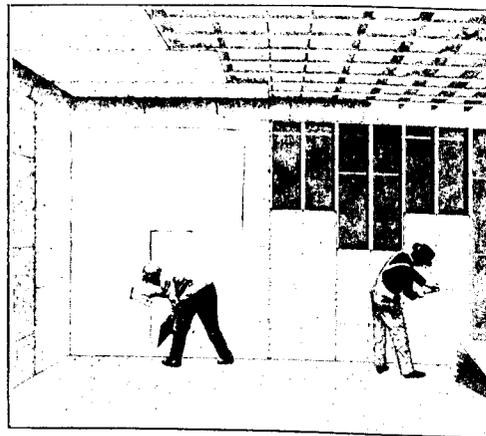
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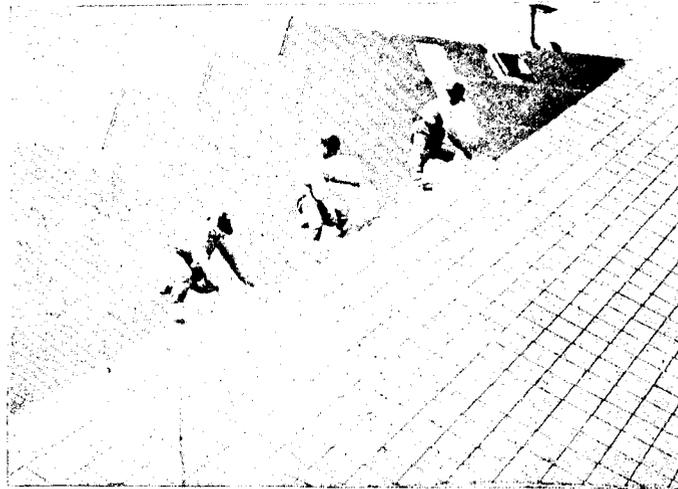
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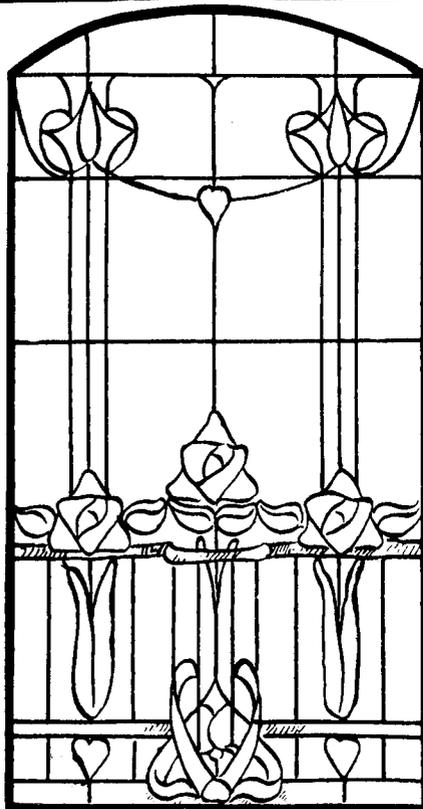
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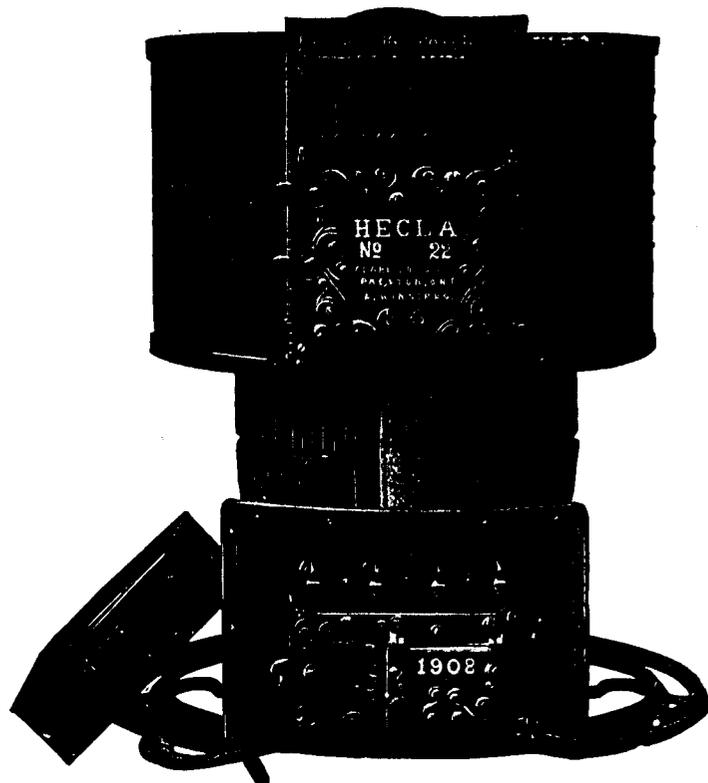
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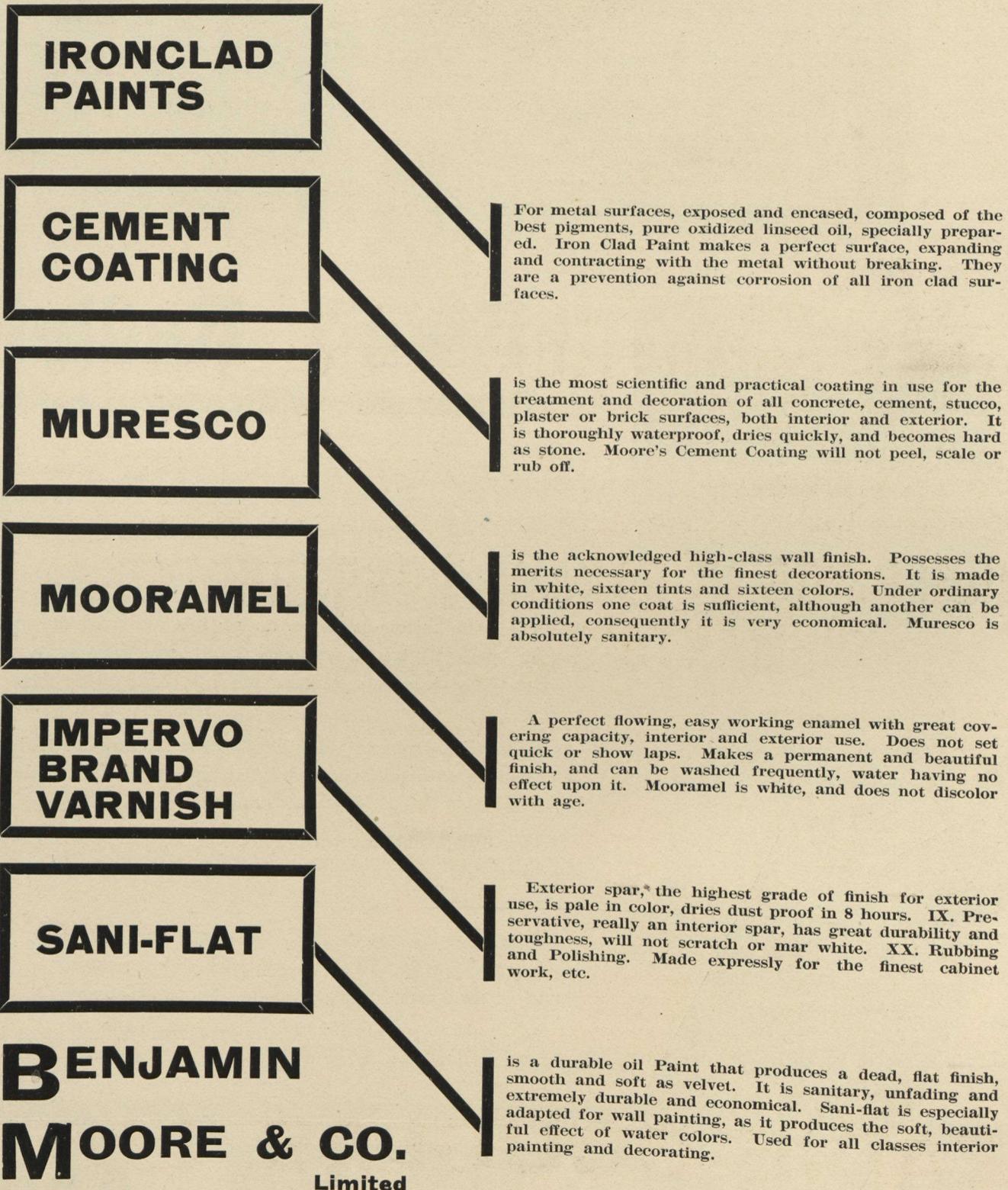
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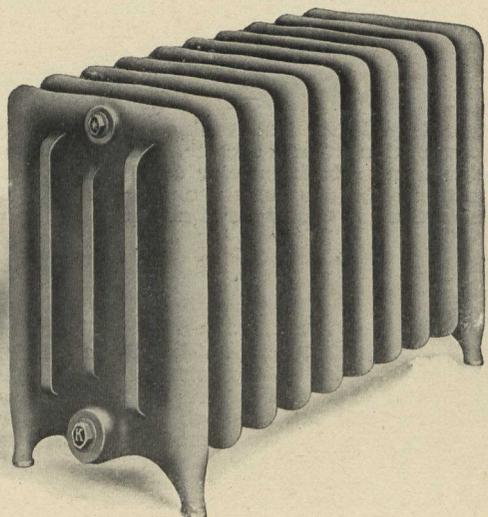
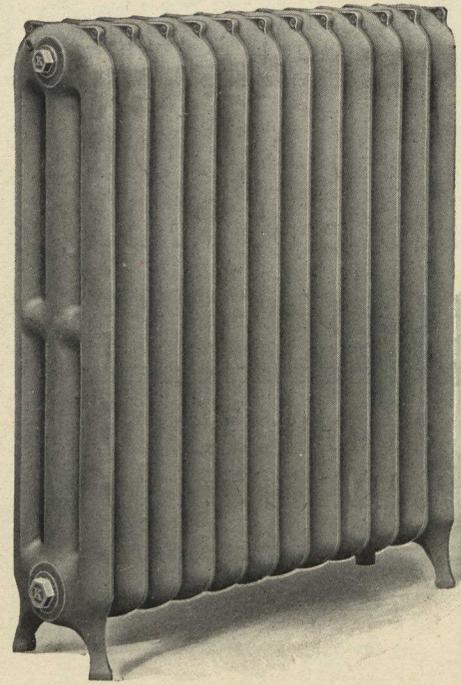
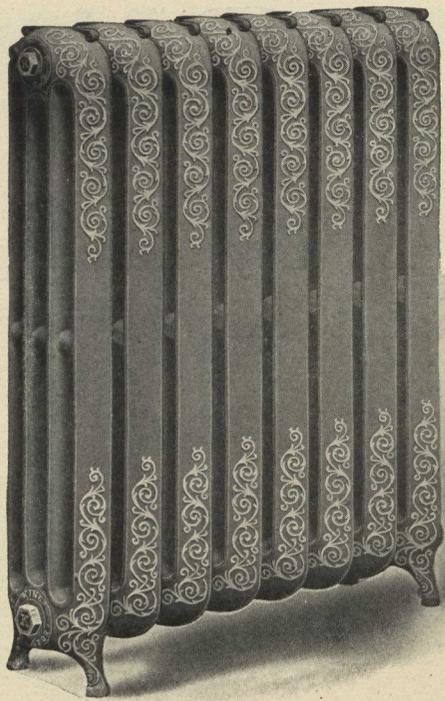
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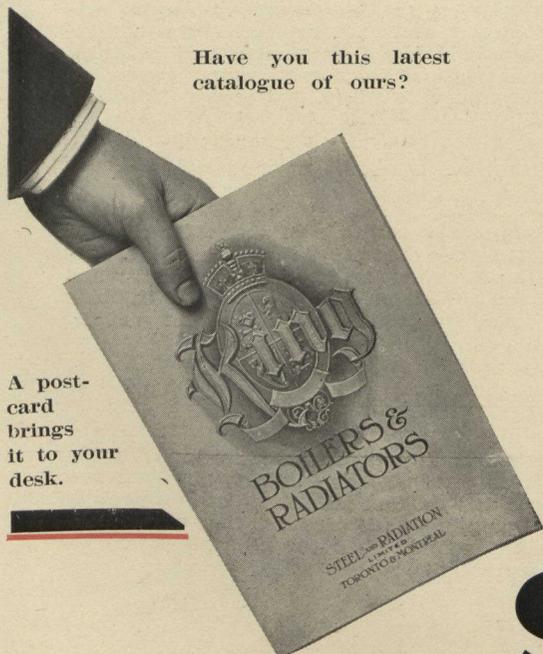
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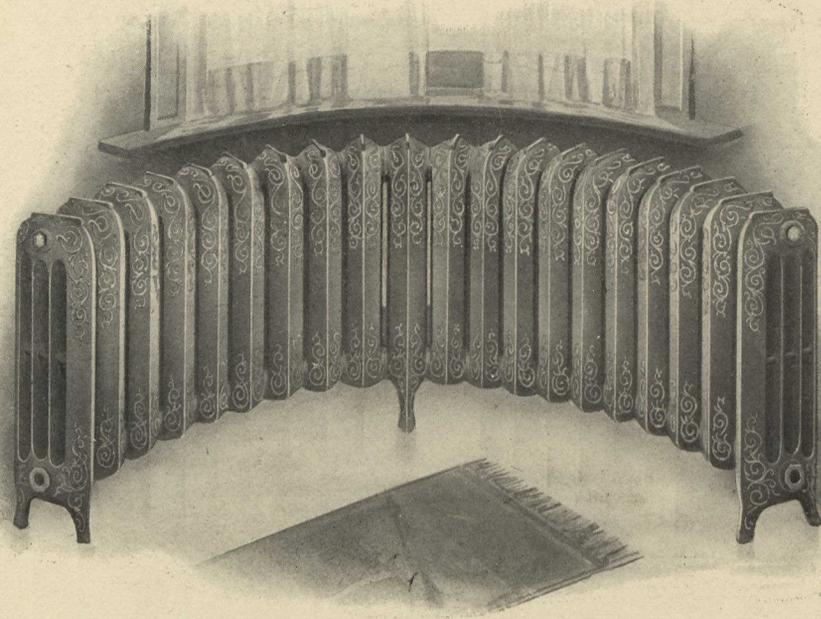
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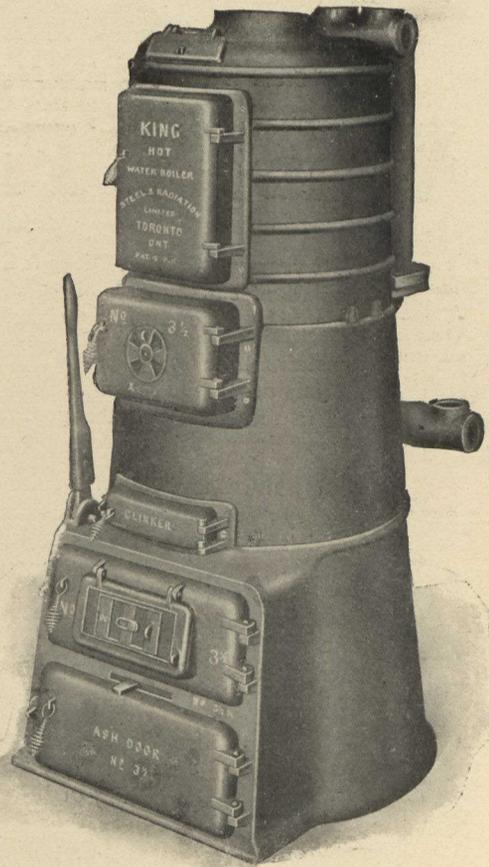
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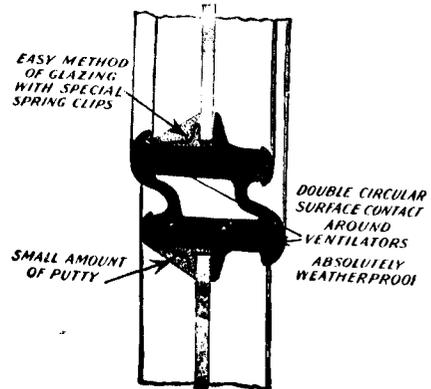
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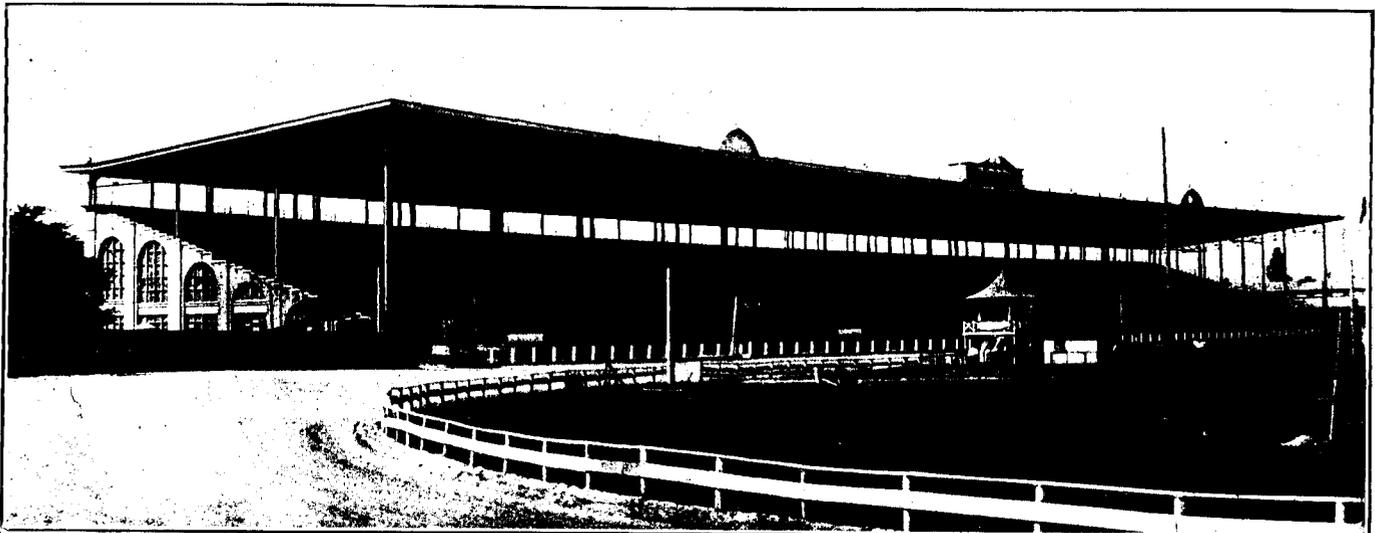
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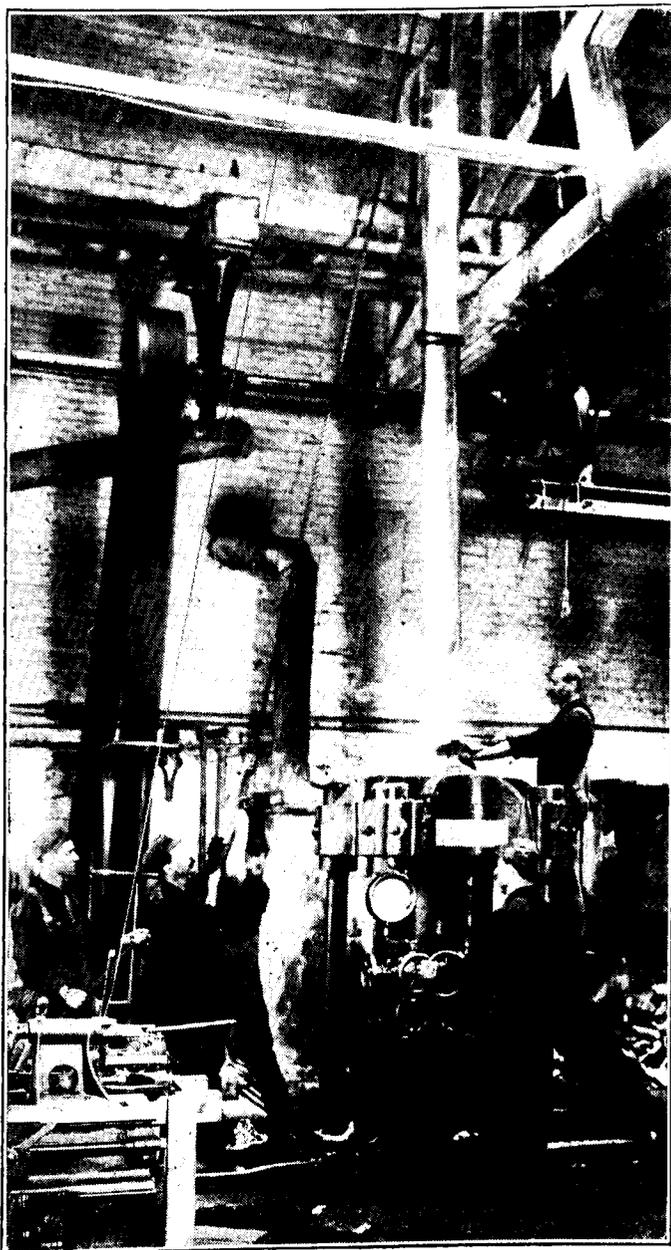
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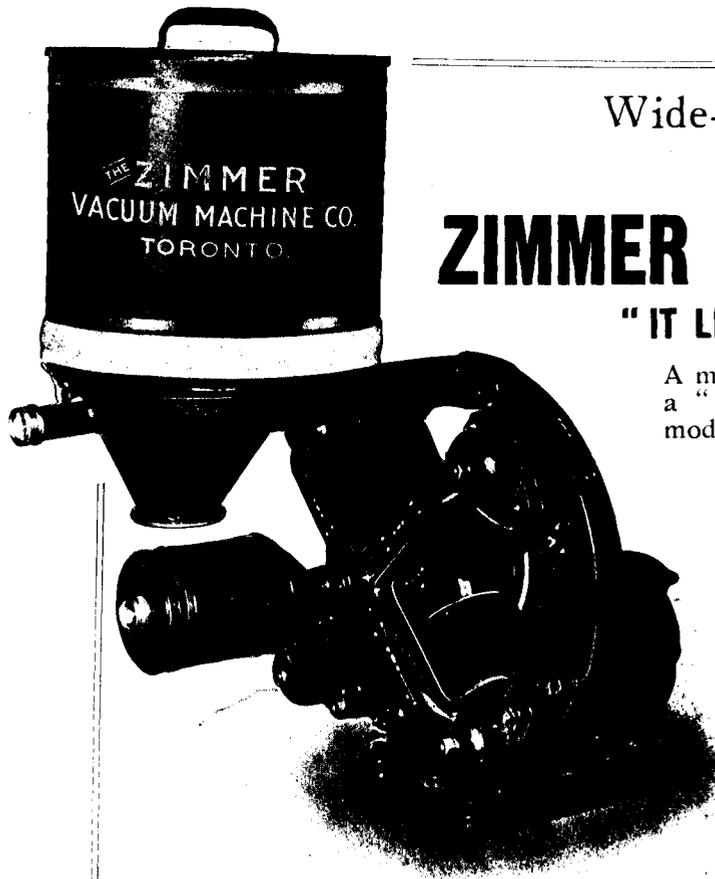
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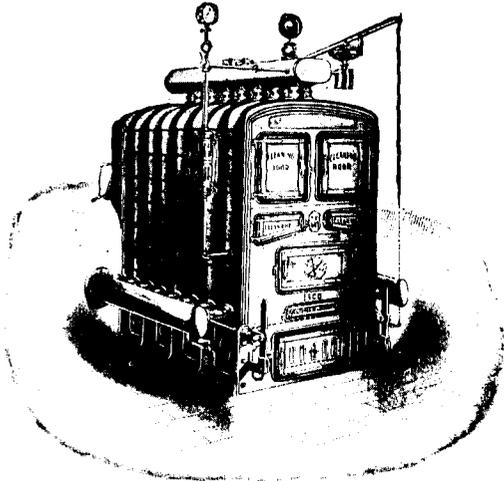
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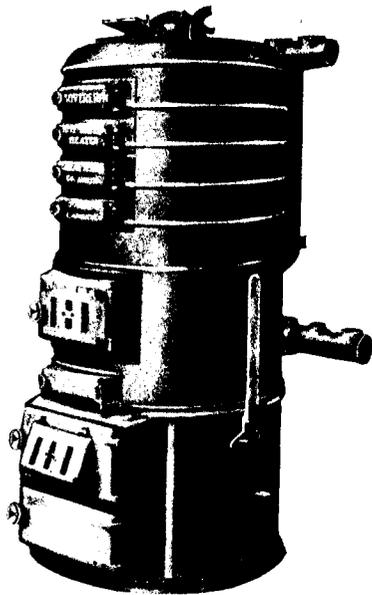
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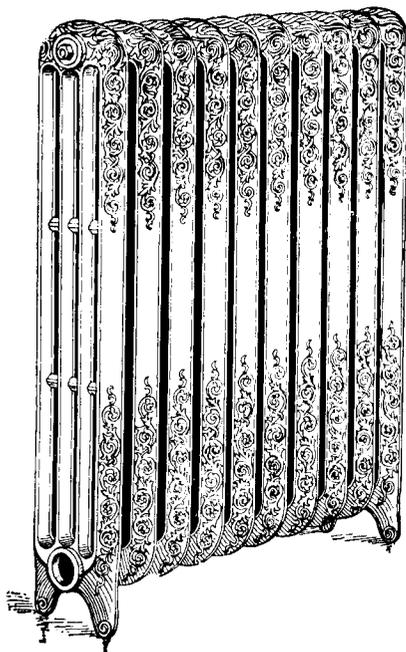
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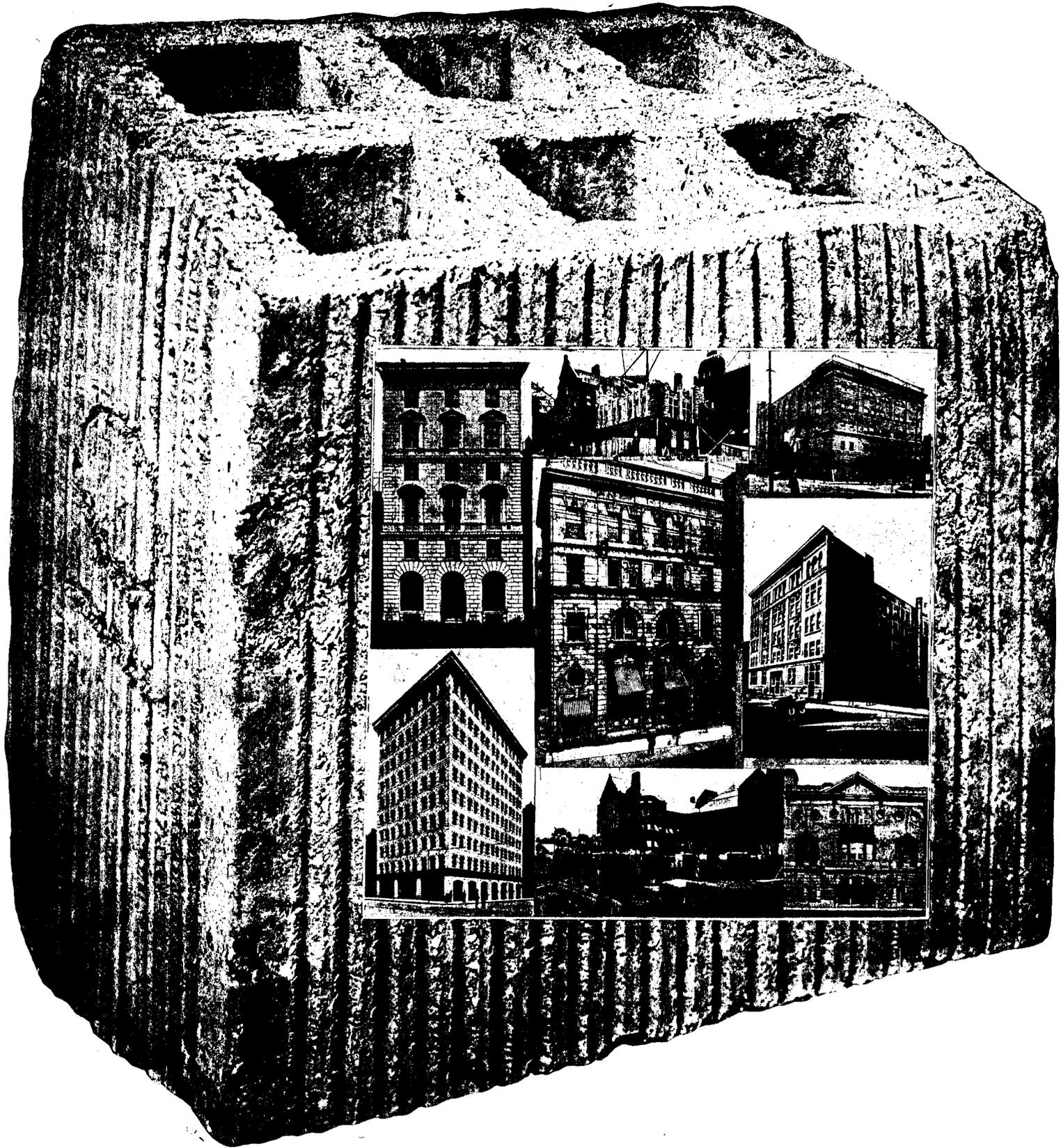
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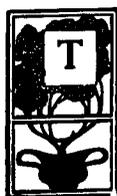
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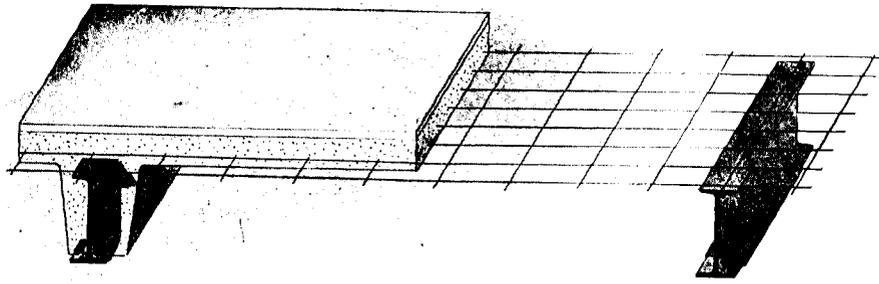
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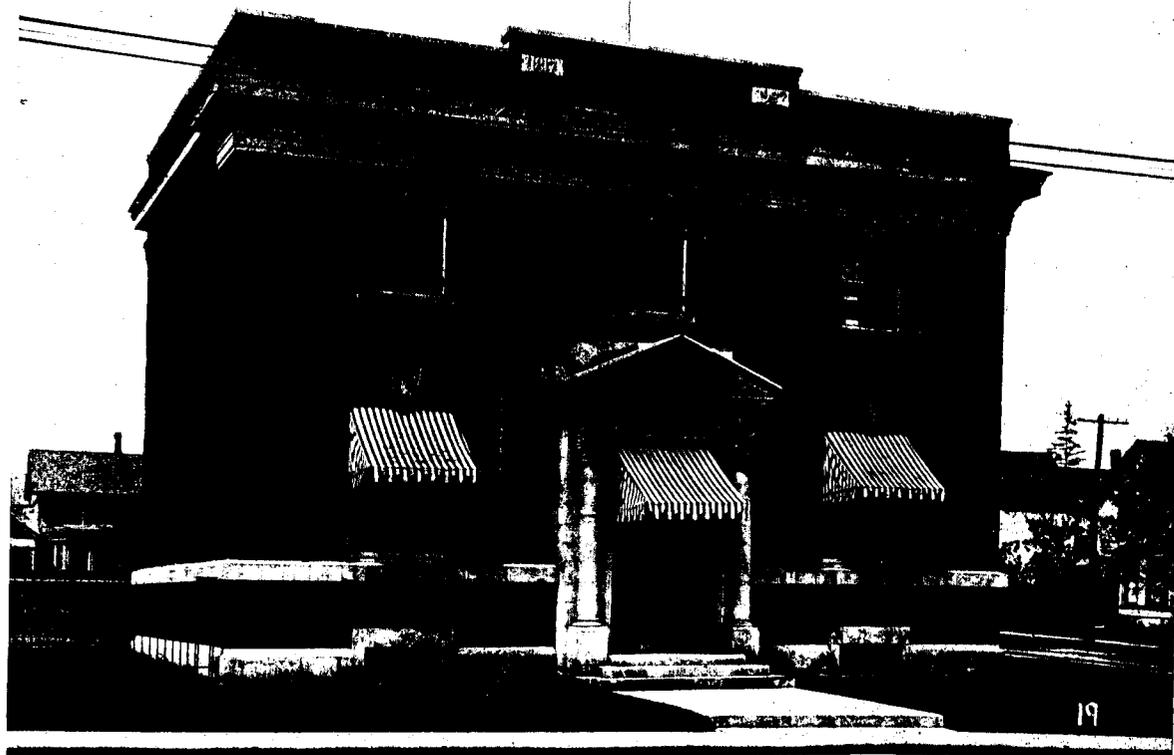
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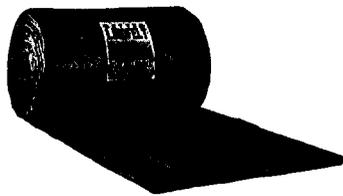
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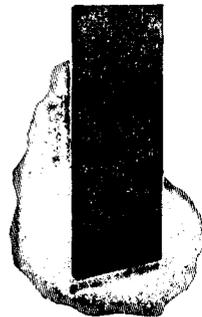
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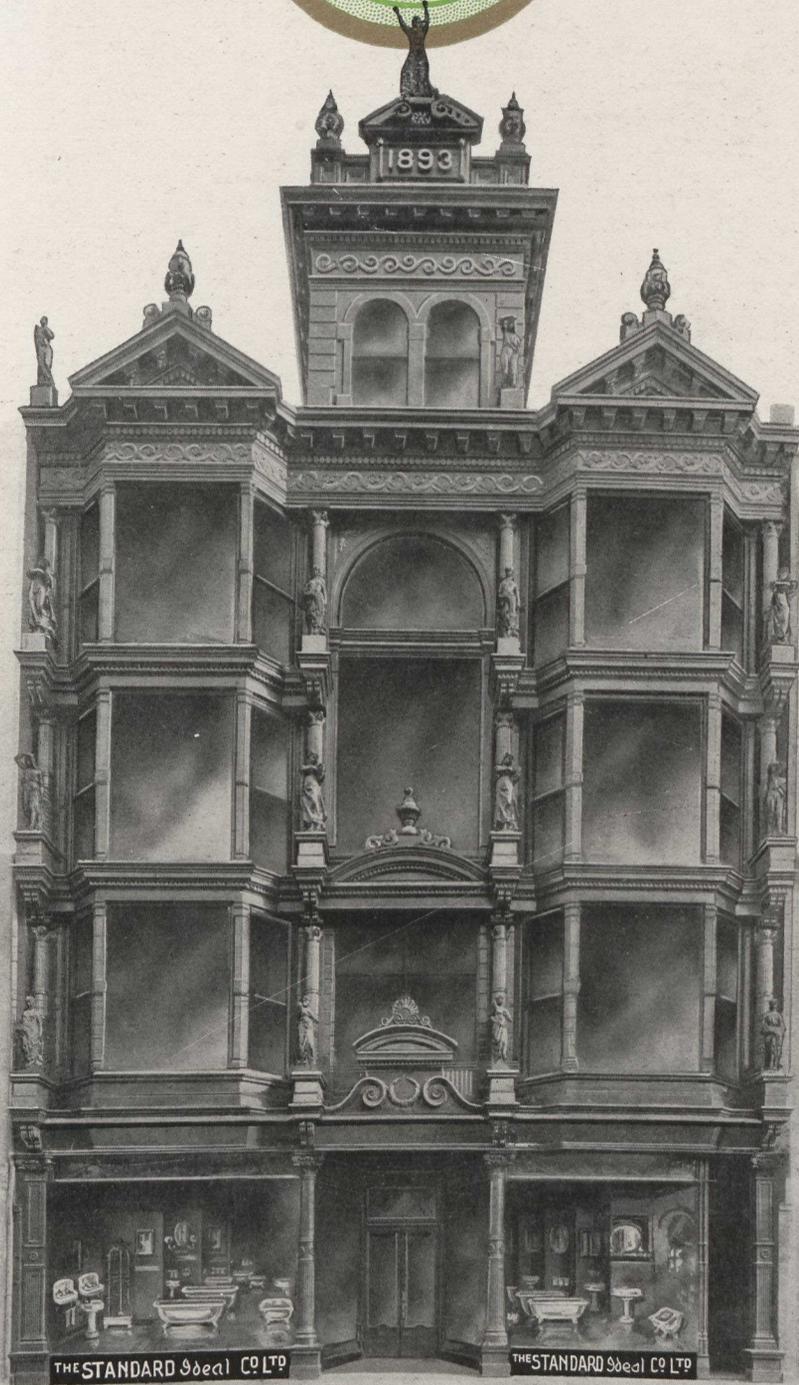
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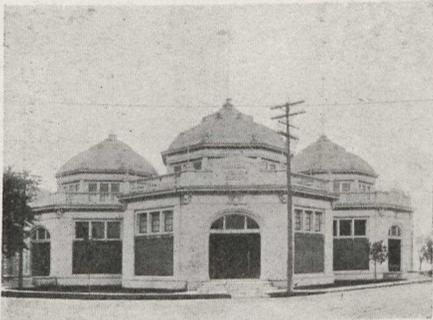


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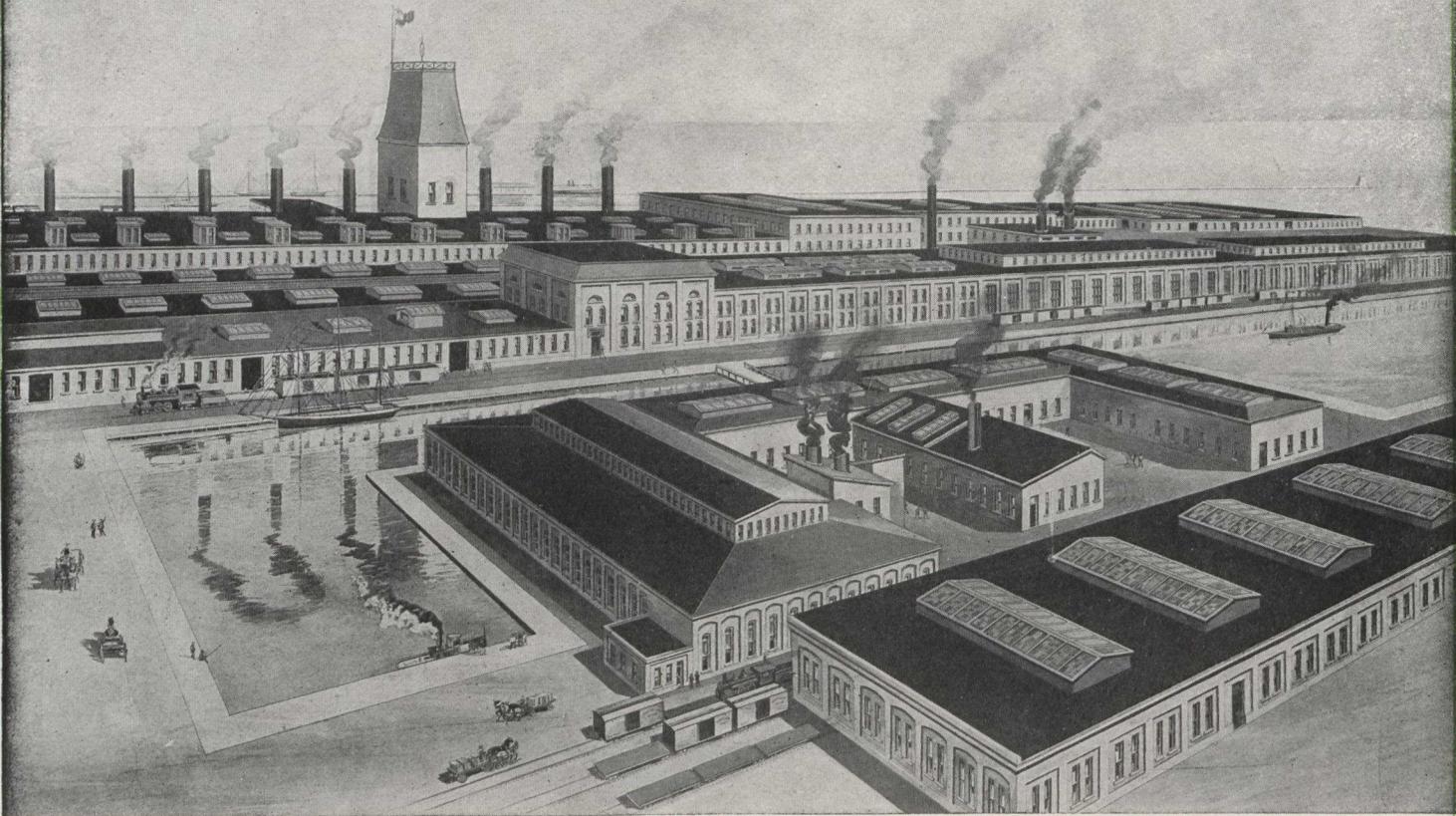


Process Building, Canadian National Exhibition. George W. Gouinlock, Architect.



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Vol. 4

TORONTO, SEPTEMBER, 1911.

No. 10

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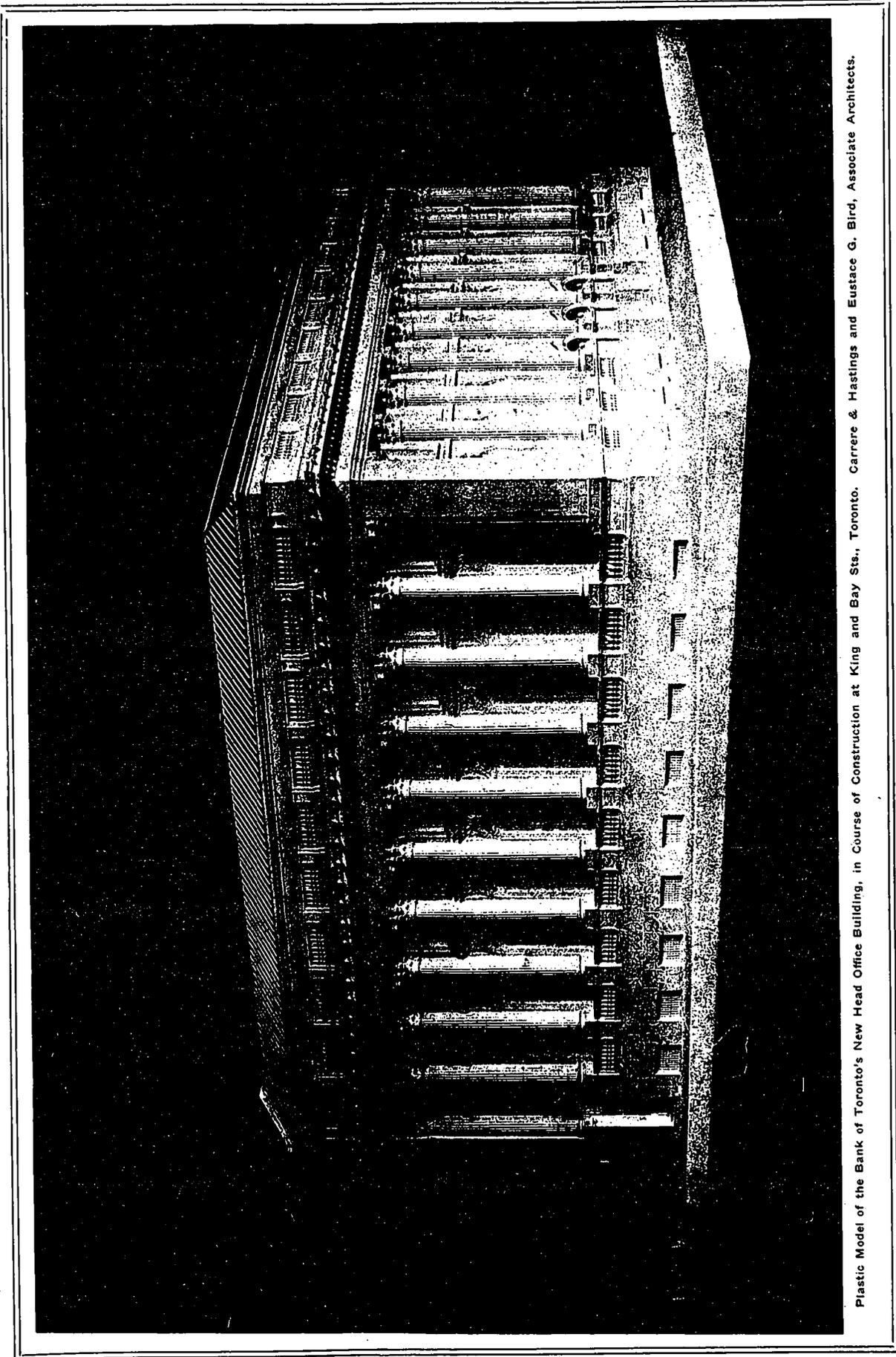
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TORONTO CANADA

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MONTREAL—Board of Trade Building. LONDON, ENG.—Byron House, 85 Fleet St. E.C.



Plastic Model of the Bank of Toronto's New Head Office Building, in Course of Construction at King and Bay Sts., Toronto. Carrere & Hastings and Eustace G. Bird, Associate Architects.



Q Building statistics for July—Returns from thirty-three cities show substantial progress, with an average gain for the month of 23 per cent.

WITH A TOTAL INVESTMENT well in advance of that noted in the corresponding period, July adds another substantial increase to the heavy list of gains that have already characterized operations in the building line so far this year. From returns to hand, in fact, there is every sign that the country in general is still forging ahead at its much accustomed gait, with no indication of a halt of any consequence occurring for some little time to come. The value of new work undertaken in the thirty-three cities reporting to "Construction," amounted to \$12,952,067 as against \$10,266,276 for the same month last year, the average gain as based on the comparative figures amounting to 23 per cent. Aside from the decrease noted in the case of Montreal, all the principal cities exceeded their former figures, while in many of the secondary centres a marked degree of progress was strikingly in evidence.

As in the previous month, Winnipeg, with an investment of \$2,787,100, has the largest amount registered, although Toronto, with a total of \$2,786,529, is but a slight margin behind, the increase noted being 161 and 42 per cent in order named. Vancouver comes next in this respect, her expenditure of \$1,108,378, representing a gain of 73 per cent., clearly indicating that this city has fully recovered from the labor troubles which for a short period embarrassed its progress. The West, in fact, with the exception of the loss of 33 per cent. recorded in the case of Lethbridge, experienced a cycle of unbroken gains. From the standpoint of increase per cent., Brandon (gain 562 per cent.) is well in the lead, her growth for the month being proportionately greater than of any other city in the list. Saskatoon and Regina, where respective increases of 397 and 97 per cent. were registered, the investment for the month was over \$600,000. Moose Jaw and Prince Albert in the same Province, are also well ahead, the advance noted being 281 per cent. and 97 per cent.

in order named. In Alberta, operations were likewise undertaken on quite an extensive scale. Calgary made an investment of \$817,980, representing a gain of 57 per cent.; Edmonton issued permits amounting to \$404,909, while Medicine Hat noted an increase of 250 per cent. At Edmonton, according to a report to hand, work has been seriously held up for the past three months owing to a shortage of cement. However, this material is now being received in larger quantities, and a number of large buildings at present under consideration, are shortly to be projected.

In British Columbia, in addition to Vancouver's gain previously mentioned, Victoria is ahead by 50 per cent., while the totals at New Westminster, (\$134,112) and North Vancouver (\$196,415), both of which fail to submit comparative figures, show a very satisfactory state of activity and development.

Ontario experienced a steady advance in general, although four of the losses noted occurred in this Province. Peterborough and Port Arthur have respective decreases of 20 and 81 per cent., while Stratford and St. Thomas are behind to the extent of 37 and 9 per cent. in order named. On the other

	Permits for July, 1911	Permits for July, 1910	Increase Per Cent	Decrease Per Cent
Berlin, Ont.	\$ 23,955	\$ 19,800	20.98	.....
Brandon, Man.	132,230	19,960	562.47	.....
Brantford, Ont.	76,287	61,825	23.39	.....
Calgary, Alta.	817,980	520,098	57.27	.....
Edmonton, Alta.	474,909	460,066	3.22	.....
Fort William, Ont.	225,175	156,200	44.15	.....
Guelph, Ont.	28,695	7,250	295.79	.....
Halifax, N.S.	43,350	65,150	.....	33.47
Hamilton, Ont.	285,500	268,500	6.33	.....
Kingston, Ont.	36,151	35,818	.93	.....
Lethbridge, Alta.	56,120	84,520	.....	33.61
London, Ont.	93,726	37,700	148.61	.....
Medicine Hat, Alta.	85,275	24,300	260.92	.....
Montreal, Que.	1,657,761	3,385,360	.....	51.04
Moose Jaw, Sask.	309,850	81,200	281.58	.....
New Westminster.	134,112	.....	.....	.....
Ottawa, Ont.	262,575	202,500	29.66	.....
Peterboro, Ont.	24,340	30,725	.....	20.78
Port Arthur, Ont.	31,500	174,475	.....	81.95
Prince Albert, Sask.	79,225	40,100	97.56	.....
Regina, Sask.	602,115	305,030	97.39	.....
Saskatoon, Sask.	629,125	147,275	327.18	.....
Stratford, Ont.	10,032	16,000	.....	37.30
St. John, N.B.	28,300	77,100	.....	63.30
St. Thomas, Ont.	19,500	21,500	.....	9.31
Sydney, N.S.	126,860	45,169	180.85	.....
Toronto, Ont.	2,786,529	1,953,285	42.66	.....
Vancouver, B.C.	1,108,378	639,530	73.31	.....
N. Vancouver, B.C.	196,415	.....	.....	.....
Victoria, B.C.	335,376	222,290	50.87	.....
Windsor, Ont.	43,640	37,950	14.99	.....
Winnipeg, Man.	2,787,100	1,065,600	161.55	.....
	\$12,952,076	\$10,266,276	23.66%	gain.

hand, Ottawa has a total of \$262,575, netting a gain of 29 per cent. Hamilton issued permits valued at \$285,500, which is 6 per cent. better than July of last year. London advanced 148 per cent.; Guelph 295 per cent., and Fort William 44 per cent. Other gains are Berlin 20 per cent., Brantford 23 per cent., and Windsor 14 and Kingston 1 per cent.

The aggregate value of new work undertaken at Montreal, which has the fourth largest total noted, amounted to \$1,057,761; and while the comparative figures show a loss of 51 per cent., it must be taken into consideration that the month of July in 1910 was one of the greatest building months that Montreal ever experienced. Judging from the amount of work in prospect, this city will witness fall operations that will measure up in every way to the marked activity of the period immediately preceding.

Of the three Maritime cities reporting, Sydney, where the investment was \$126,860, is the only place to show an increase, Halifax and St. John sustaining losses of 33 and 69 per cent. in respective order.

Q "On to Ottawa"—Ontario Association of Architects to hold this year's convention at the "Capital City"—A hearty welcome and interesting programme awaits visitors.

FOR THE FIRST TIME in several years the Ontario Association of Architects will hold their annual convention at Ottawa, instead of Toronto, the time decided on being Sept. 13-15 inclusive. Announcements notifying those who are identified with the Association have already gone forth, and the members are asked to arrange their business and personal matters with a view to being on hand at the appointed time. The choice of Ottawa as a place of meeting could hardly be improved upon, especially so as the convention is to be held at a season of the year when the city is to be seen at its best. Ottawa has undergone a number of important changes within the past few years, and those who take advantage of the trip will find much in the way of new buildings and civic improvements that should prove both interesting and instructive. That a royal welcome awaits the visitors is quite evident from the preparations that are being made by the Ottawa members. The programme which has been arranged by the local chapter, provides for a number of delightful entertainments, including several sight-seeing jaunts in and about the Capital, and a prospective fishing trip up the Ottawa River. Nothing, in fact, is being left undone that can in any way contribute to the success of the occasion and make it one of the most notable gatherings in the history of the Association.

AGENDA.

Wednesday, September 13th.

- 9.30 a.m.—Business Meeting in the Lecture Hall of the Carnegie Library, Metcalfe St. Adjournment till time to be agreed upon.
- 1.30 p.m.—Lunch at the Laurential Club.
- 3.30 p.m.—At City Hall, Complimentary Drive at the courtesy of the Corporation of the City of Ottawa.
- 8.00 p.m.—Central Canada Exhibition, Complimentary tickets to grounds and Grand Stand at the

courtesy of the Central Canada Exhibition Association.

Thursday, September 14th.

- 9.30 a.m.—Business Meeting in the Lecture Hall of the Carnegie Library, Metcalfe St.
- 10.00 a.m.—Paper by Prof. Corelli, of Toronto University.
- 11.30 a.m.—Auto ride up the Gatineau to Farm Point. Lunch at Summer Cecil. The Autos for this trip to be supplied by several private citizens.
- 8.00 p.m.—Dinner at the Golf Club. Arrangements will be made for private car to Golf Club.

Friday, September 15th.

The programme for this day has not been definitely decided upon, but, providing it is agreeable to the majority of members, arrangements will be made for a trip up or down the Ottawa, the business meeting to be held on board the boat. The trip up the Ottawa is deemed to be the most preferable, in that arrangements could be made for about four or five hours' fishing.

(Subject to change.)

This year, as in the past, the Association has a large volume of business to transact. A number of important subjects dealing with the welfare of the profession will come before the convention for consideration, and all members who can possibly attend should be on hand to participate in the daily sessions. As the convention is to be held during the week of the Ottawa Fair, reduced rates may be had on all railroads. It is the intention to arrange for a special car service leaving Toronto on the 10 p.m. train of the C.P.R. on the night of Sept. 12th, so that all who intend making the trip via Toronto can avail themselves of this arrangement. The active part the Association has taken in elevating the profession in Ontario, and its growing usefulness in promoting a better standard of architecture, should make the slogan: "On to Ottawa," resound in every part of the Province and bring forth an attendance that will give the meeting the full co-operation and support of the individual members, and thus enable the Association to more quickly realize the high ideals it is endeavoring to attain. Members who anticipate making the trip via Toronto, should notify either President A. F. Wickson or Secretary Herbert E. Moore, of their intention, so arrangements can be made to include them in the party which will leave Toronto at the above stated time.

Q More anent architectural competition—Architect F. W. Fitzpatrick makes a few more pertinent remarks regarding unfair condition under which architects compete.

IN A RECENT ISSUE of "The Architect and Engineer," Consulting Architect F. W. Fitzpatrick has the following to say about "Competitions":

Happening to glance over that "Competition" article of mine in your April issue, it just occurred to me that perhaps an illustration or two added might emphasize the point I tried to make, that an architect is indeed silly to enter into such contests unless he has a "cinch," and then he becomes somewhat akin to a "crook" or at least a party, "an accessory before the fact," to a full-fledged fraud upon his brethren who haven't the "cinch."

You see, conditions are such that in some way or another I know the details, the wiggings of most competitions some time or another, before, during or after. I would not go into one direct for a farm. If the practising brethren insist upon going in, in spite

of what has been preached to them and what they must know of their own experience and probably in spite of my specific warning and advice to keep out, why, I can't very well hold them back by force, and if in going in they want to pay me real money to help them get up something particularly nice it certainly is hardly up to me to decline, though I feel, if I don't really know, that it is a forlorn hope. For the man with the cinch doesn't need to produce superlative results—he'll get it whatever sort of a design he may have. But all that is neither here nor there. We were considering concrete illustrations of the beauties of competition.

During the past month I have had a finger in eight, not little, insignificant affairs, but good, big, full-grown, important chaps.

No. 1, an architectural advisor affair. All designs rejected and the "advisor" employed to go ahead with the work—based upon the best features submitted by the competitors!

No. 2. No advisor. Sixteen designs submitted, three liked very much and invited to re-compete, and a foregone conclusion that one of the three, a relative of the President, will get the job, but the other two will receive moderate prizes.

No. 3. No advisor. Twenty-six designs. Award to a manifestly inferior design because its author was known to the board and had been a crony of the chairman for twenty-five years. To remonstrations it was answered that they cared more to have an "architect" they knew than they did for any pretty plans. Each competitor must have spent nearly \$1,000 in the work.

No. 4. Rather close of kin to No. 3. Indeed, they are all cousins german. Award made to one who had done a lot of private work for the board. Design much criticized, and justly. Board calmly asked what the kick was about. Hadn't the others the privilege of sending in designs? The law said they should, but the law didn't forbid the award being made to any one they wanted and they had agreed to give the job to Mr. So-and-so long ago.

No. 5, rather amusing. Eleven designs received at the appointed time. Most of the competitors there anxious for a decision. Informed that no decision could be given for two weeks. Architect No. 12—a dear friend—called in in the evening, shown all the drawings and told to get busy and have a design in before two weeks. Of course the job will go to him.

No. 6. A very important building, some really clever designs and beautiful drawings. One chap, though, sends in a very ordinary, hackneyed plan and hastily drawn but accompanied by twenty or more plates of New York skyscrapers from the architectural journals and the statement that he'd be glad to build that building according to any one of those plates! The gall of the creature, and those "designs" were gravely examined and commented upon and compared to the specially made ones, too! The affair is not settled yet, but I have the assurance of the board that it will go to Mr. X, he being the oldest and best established local architect. But what

about the designs, the relative merits and so on? Oh, well, Mr. X will be instructed to incorporate in his design any especially meritorious features in those other drawings and he certainly, having had so much experience, can get up something quite satisfactory even though his first sketch may not be very fine. They have the utmost confidence in him!

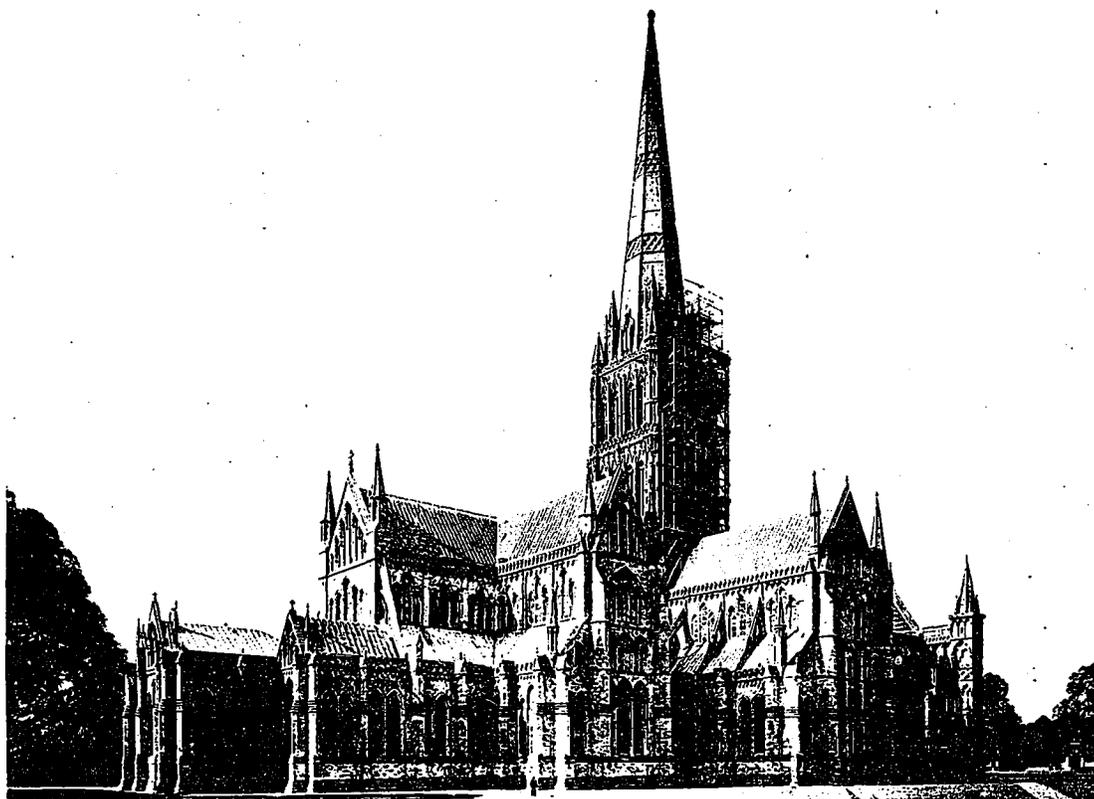
No. 7. A rather ancient story. Plans received, commented upon and returned with thanks. Decided not to build this year, just wanted to see what could be done with the lot and if the work goes ahead next year the same competitors will again be given a chance, thank you!

No. 8. A school. Competition invited. No notice given as to especial and unusual intentions of award, each competitor expected to get a show at a \$200,000 job at the regular commission. When it was all over the three best designs "in the estimation of the board" were kept and their authors offered \$500 each for them. The board had decided to have its regular superintendent make the plans and use a combination exterior from those three designs!

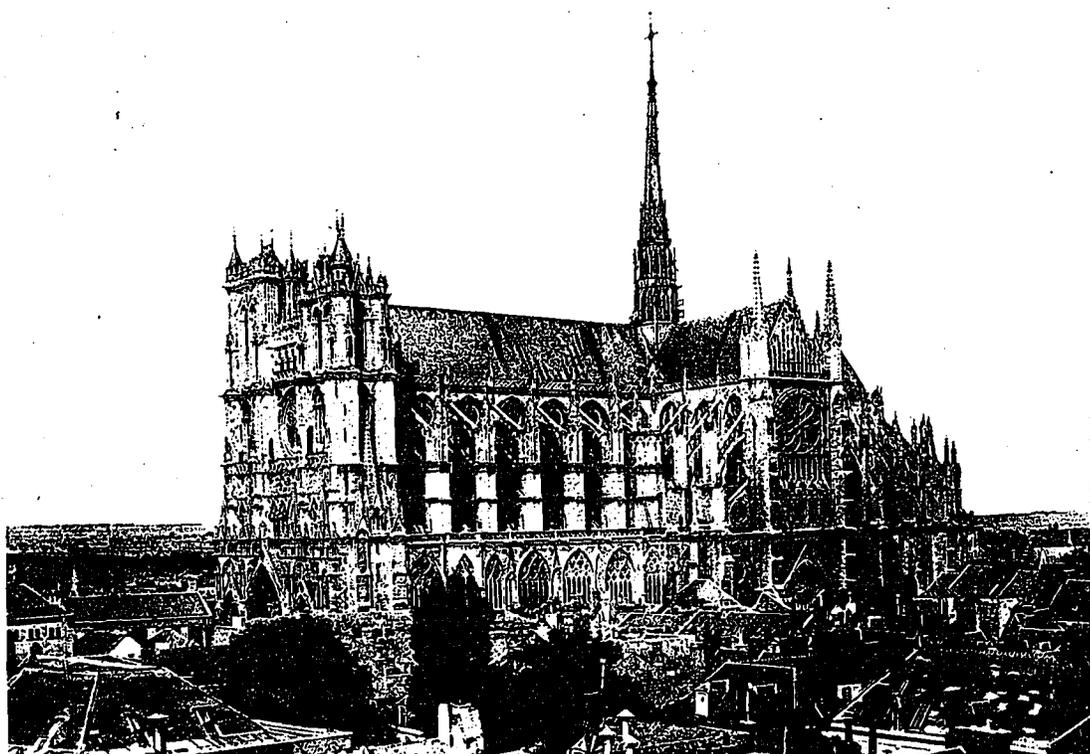
And how much nearer really just, unprejudiced, unjockeyed are the competitions managed according to the rules laid down by the A.I.A.? And even if the thing is unjockeyed and left to professional advisers it's a lottery, a game of chance, the special whim the strongest adviser, essentially a jury trial, and who with a perfectly good case wants to leave it to the tender mercies of the impressionable jury? An instance: a big competition some time ago, three judges, big guns but not wonderful designers, agreed upon an award. Forty-two of forty-eight other architects, just as capable as the judges, entirely disagreed with the latter and thirty-six of them placed the third man first. Still, a good deal like using wood in construction though realizing it is dangerous, combustible, foolish and extravagant, the competition idea has become a habit, ingrowing, silly, almost criminal. We all realize that *collaboration* is infinitely more sensible, more honest, less costly and better in every way, but it'll take the dear profession another twenty years of hard knocks to get out of that fool habit. Its will be done.

WORD HAS BEEN RECEIVED that Herbert P. Rugh, Union Bank Building, Winnipeg, has consolidated his business with Ross & MacFarlane, of Montreal, in respect to their western business, under the firm name of Ross & MacFarlane, architects, of Montreal and Winnipeg, retaining Mr. Rugh's present offices. Mr. Rugh will be manager of the Western office and have charge of all Western work, including, besides his own, the Selkirk Hotel in Winnipeg for the Grand Trunk Railway, and large hotels in Edmonton and Prince Rupert.

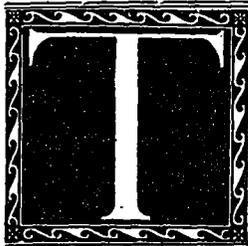
CORRECTION.—In the article on the construction of the A. E. Rea's Company Building, Montreal, appearing in our previous issue, the eighth line, page 81, should have read " $w =$ the uniformly distributed load on 1 ft. length of the beam," instead of " $w =$ the bending movement $= \frac{w l^2}{8}$ where $w =$ the total weight supported." Also, the name of the author should have been given as B. L. Nares instead of B. T. Nares.



Salisbury Cathedral from Northeast Viewpoint. Built 1220-1266. Tower and Spire Added in the 14th Century.



Southwest View of Cathedral, Amiens, Exterior Built 1220-1257.



THE MASONS' ART OF THE MIDDLE AGES

By PHILIP J. TURNER, F.R.I.B.A.

Paper read before the Quebec Association of Architects. Revised and condensed by the author and published by special arrangement.

THE TITLE of my paper deals more particularly with the so-called Gothic (or "Romanesque") Architecture of the years 1150-1550. The subject being a large one, this article is confined to the study principally of the technical or constructional side of the Art of the Workman-in-stone, and it is not an attempt to give an essay or the history, of the rise and fall of Gothic architecture.

When one attempts to analyze or dissect the methods of construction adopted and the reason for such forms one cannot fail to be impressed with the skill shown by these masters of their trades, and to find that the masons' art of the Middle Age is an intensely interesting one.

Though there are examples of great constructional skill and points of interest in the many civil, military, and domestic buildings that still remain, it was in the large churches and cathedrals that masons found their greatest opportunities of showing what could be accomplished in the handling of stone; in fact, it was the cathedral, the largest, the most comprehensive and the most popular form of the Christian Church that brought out the full development of the masons' art of this period we are considering. The architecture of the Middle Ages not only reached its highest perfection in the cathedrals, but it was in the strictest sense an architecture of churches primarily. Viollet-le-Duc has given a profound and exhaustive

illustration of French Architecture of this period. He has shown that architecture consists primarily in a peculiarly structural system, a system which was a gradual evolution out of the arched Roman through the Romanesque, and that its distinctive characteristic is that the whole scheme of building is determined by, and its whole strength is made to reside in, a fully organized and frankly confessed framework rather than in walls. This framework, made up of piers, arches, and buttresses, is freed from every unnecessary encumbrances of walls, and is rendered as light in all its parts as is compatible with strength, the stability of the structure depending *not* upon inert massiveness (except in the outermost abutments) but upon a logical adjustment of active parts where opposing forces neutralize each other and produce a perfect equilibrium. It is a system of balanced thrusts in contradistinction to the ancient system of inert stability. Gothic architecture is such a system carried out in a finely artistic spirit. The earliest development of ribbed vaulting, together with a functional grouping of supports, may be taken as the tangible beginning of the Gothic system.

Nearly every constructive member of a Gothic building exists in a rudimentary form in a vaulted Romanesque structure, but the ultimate possibilities of an organic framework are not worked out in Romanesque art.



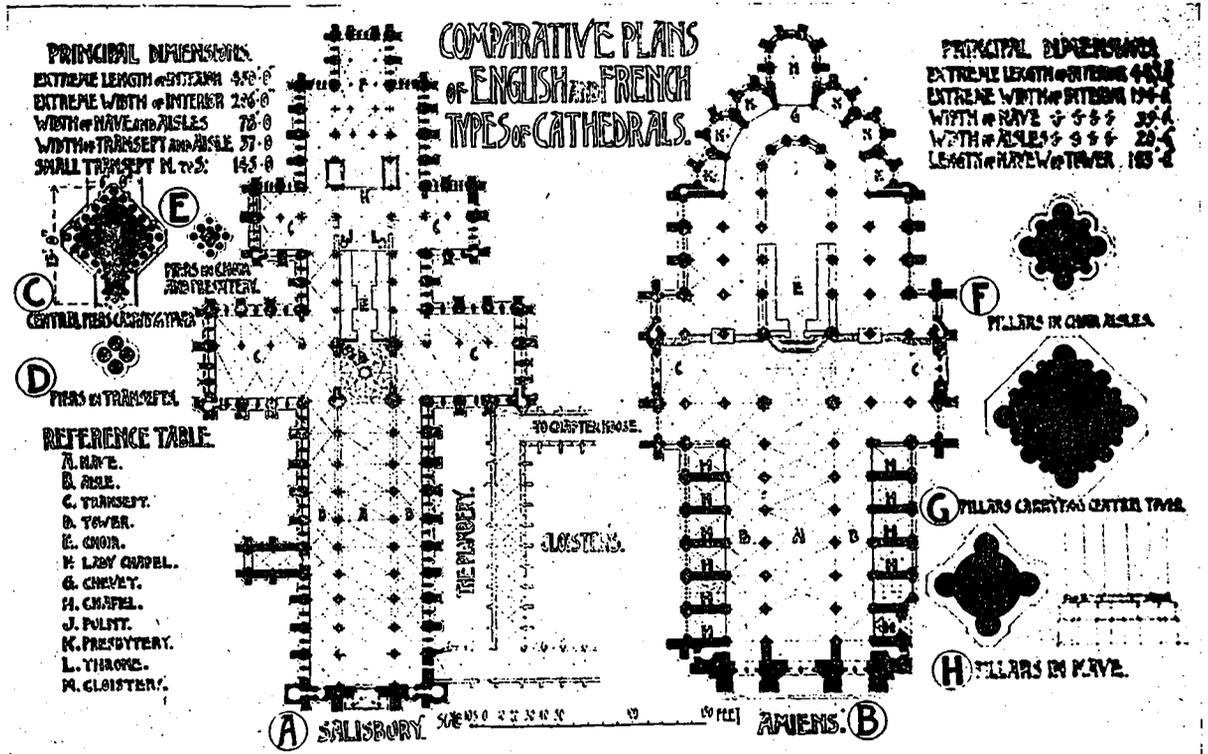
Brass Memorial Tablet to Hugo Libernius, a Master-Mason of the 13th Century, Buried at Reims. He is Represented in His Academical Dress and Cap of Office, Holding a Model of His Building and Measuring Rule. A Pair of Compasses, Set Square and Other Symbols of His Profession are also Represented. (From Lethaby's "Medieval Art.")

The whole keystone of Medieval Art is found in the use of *arch construction* which comprises the vault and its supports and it is this latter that is especially admired when considering the skill shown by these masons of bygone days.

It is one thing to put up a vault, and another to induce it to stay up, and so are found closely connected with the vault, the development of the whole machinery of buttresses, pinnacles and flying buttresses. In the Romanesque and Norman work, low buildings with thick walls and piers and small windows, is the order of the day, but in a few years the masons develop their architecture to the other extreme and

istent development, stone is balanced on stone, vault springs from vault, interlacing tracing sustains brilliantly dyed glass, towers stand firm as cliffs, spires are flung into the air like fountains. In these buildings all may be explained as devised for ritual use and for the instruction of the people; all as material and structural necessity, all as traditional development, all as free beauty and romance in stone. From whichever point of view we may approach them, the great cathedrals satisfy us, and their seeming perfections are but parts of a larger perfection.

"Nothing is marked, nothing is clever, nothing is



Comparative Plans of Amiens and Salisbury Cathedrals—These Are Examples of Typical French and English Cathedrals Erected at the Same Time and are Interesting as Showing Very Distinct Differences. Though Practically of the Same Length, One notices that Breadth and Height Were Always the Aims of the French Builders; While the English, Modest in These Respects, Relied More on Length in Proportion. The Latter Could, in Consequence, Afford to Give Their Main Transepts Considerable Projection and to Add Eastern Transepts. The Ideals Striven For on One Side of the Channel Were Not Those Striven For on the Other. If Asked Which is Right and Which is Wrong, There is Only One Answer. Each Building is a Law unto Itself, and unto Itself Alone. There is a Reason for Every Difference. In the Typical English Cathedral it is Found that the Height Both of the Nave and Aisles is About 2½ Times Their Span. Amiens, 46 Ft. Wide, Would, if Built on English Proportions, Have Been 114 Ft. as it is, but it is 140 Ft., or Three Times Height of Span. Height Enough Could Have Been Obtained Without Raising the Building to Such Great Height. Partly From Ambitions of Masoncraft, Partly from Exalted Ideas of Design, the Boundaries of the Material were Far Outpassed. The Result Was a Series of Buildings Surpassing All the Other Work of Man, in Which the Builders Reached Forward to and Attained Not Only the Beautiful but Sublime. Nowhere Does One Feel So Much the Greatness and the Insignificance of Man. Man, Who Built These Towering Vaults, is Crushed and Overwhelmed by His Own Work. (From Fletcher's "Gothic Architecture"). See Illustrations on page 48 and 51.

lightness in every detail takes the place in the latter buildings. It is a wonderful transition, and one wonders how it all comes about. "The growth of these great cathedrals," says Mr. Lethaby in "Mediæval Art," seems to have been built on such a scale, that they might almost gather the entire adult population of the city within their walls. As to these marvellous buildings, the half of their glories and wonders cannot be told. They are more than buildings, more than art, something intangible was built into them with their stones and burnt into their glass.

"The work of a man, a man may understand; but these are the work of ages, of nations. All is a con-

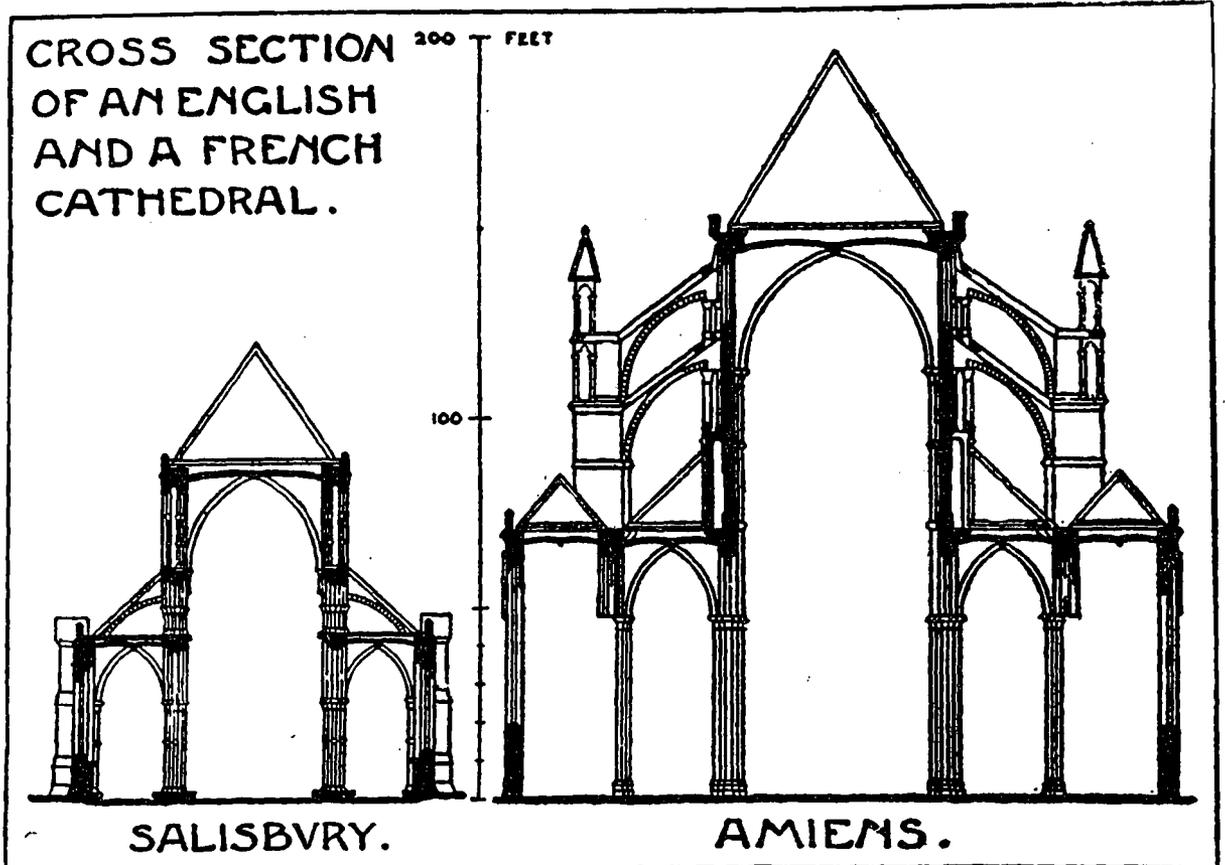
individual, nor thrust forward as artistic; they are serene, masterly, non-personal like works of nature, indeed they are such, natural manifestations of the minds of men working under the impulse of a noble idea."

In such a church the arcades of the interior which maintain the vault, circle round the altar and abut against the western towers. By means of vigorous ribs of stone which spring from the pillars and spread over the internal area, a light web is suspended, so that the great space is covered by a tent of stone, one of the most wonderful of man's inventions. The push of these ribs, collected at certain points, is met by exterior abutting arches, called "flying buttress-

es," which, acting as props, carry the weight to the ground, and thus counterpoise the thrusts of the interior. The interspaces between the several points from which the vaults spring are practically relieved from work, and here the windows were put. As generation after generation, the masons worked away in perfecting their scheme of construction, every part of the fabric was gathered up into a tense stone skeleton. This resulted in, or was itself occasioned by, another idea which aimed in turning the whole inactive wall space into windows, so that the cathedral became a vast lantern of tracery; then, by picturing the spaces by means of transparent

stone cutter, ran all through the building. The architect himself was simply a master-mason, i.e., he was himself a mason by profession. He was not isolated in an office, he was at once architect and builder. As long as the architect was the master mason, he was not bound by his own plan. He carried his plan in his head and on the scaffolds of his building he changed it at will and freely oftentimes as he went along.

The monasteries had early taken every means to qualify large bodies of men to practice the arts; they had organized and maintained schools where art and science were taught; where architecture, sculp-



Cross Section of a Typical English and French Cathedral Built at the Same Period, 1220 A.D. (From Simpson's "Gothic Architecture.")

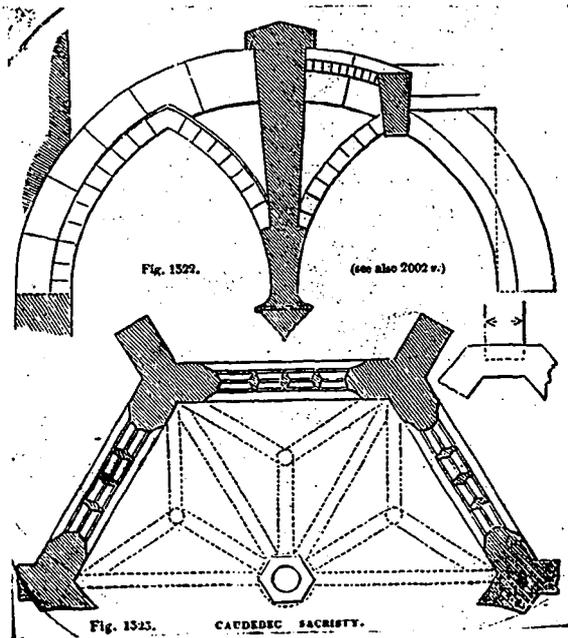
jewels of glass, the interior was lighted by angels and saints innumerable. In these porches and screens were placed hundreds of statues, all parts of a connected scheme, an encyclopædia of nature, history and theology.

As Romanesque architecture was for the most part monastic and feudal, and the builders were attached to the soil, in Gothic on the other hand we find an architecture of towns, guilds and masters who were free to pass from place to place.

In looking at these buildings one naturally desires to know something of the designers and the workmen, how they lived, and the way they carried out their work, but our information is somewhat scant. To understand an old cathedral we must begin with the union in one person of the artist and the artisan. The picturesque variety springing from the creative capacity of the individual mason, and the individual

ture and painting were cultivated under guidance of traditions, which regulated the leading forms of production, while yet they left some scope for the free play of new ideas. A large percentage of the revenues of sees were devoted to the work of building the great cathedrals. The Canons helped with their share, the nobles and rich burghesses gave large sums, and the people contributed what they could, sometimes their chattels, sometimes their money, or else their time and strength to transport the materials required. It is said, for instance, that the columns for the Church of St. Denis were dragged to the site from the quarries of Pontoise (some 14 miles distant) by the faithful themselves harnessed to the carts. We stand aghast at the great outburst of the building art in these times, especially when one thinks of the small size of the population in those days. Henry III., especially, must have been a

veritable building maniac, only happy when he was engaged in building operations. Sufficient evidence makes it clear that interest in building and other forms of art was universal in the Middle Ages. In many places we find amateur carvings done by



Caudebec Sacristy near Rouen—A Daring Piece of Construction. The Keystone is Suspended by Locking Between the Voussoirs of a Strong Semicircular Arch. The Length of the Pendant Stone is 17 Feet 6 Inches, and the Thickness at the Top Where Locked is 30 Inches. The Voussoirs are 3 Feet Deep, the Small Pointed Arches or Ribs that Form the Groining of the Hexagonal Vault Spring from the Side Walls and the Ornamental Knob of the Pententive and are Perfectly Independent. The Abutments of the Semicircular Arch, which Has a Radius of 12 Ft., are Formed by Solid Walls Continued for Some Length in the Direction of its Diameter. The Sides of the Building are 12 Ft., and the Height from the Pavement to the Springing of the Ribs is 18 Ft.

prisoners of rank as at the Tower and Guildford Castle, and these show the same characteristics as other examples of contemporary art.

Architects.

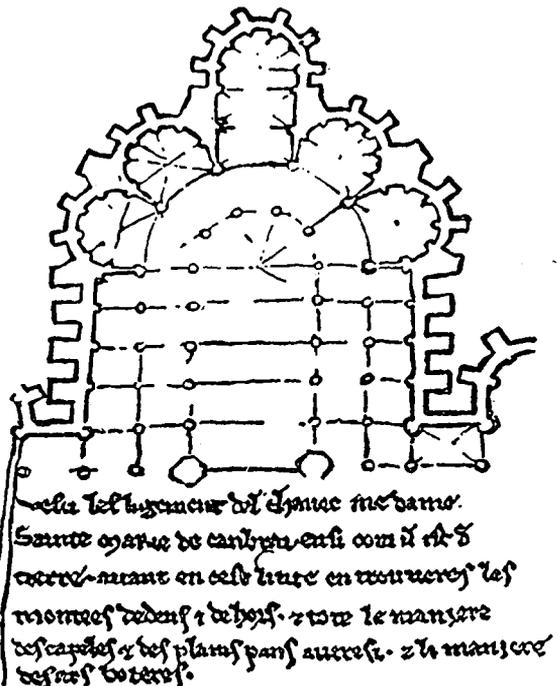
Up to the middle of the twelfth century the monks themselves had been the architects; they had designed, superintended the erecting of, and in most cases found the money for the churches. The monasteries were at that time the centre of intellectual artistic life. In the schools attached to the larger ones were trained priests and laymen alike. The men thus trained either worked on the church and buildings of the monastery, or, if found worthy were sent by the monks to superintend building operations for them in other countries, sometimes in far distant lands.

Gradually the teaching of apprentices in finely technical matters passed from the monks to the lay master-masons, as it was natural that when the bishops, chapters and people took the building of cathedrals into their own hands, they should prefer laymen as their head workers. Many of these had received in the monastic schools the best education the times could provide, and were as well read as the majority of clerics and nobles. Some of these master-masons were attached to cathedrals, some to towns, while others took service with high nobles or

with the king. That they were skilled craftsmen is undoubted, capable of executing themselves all work required; they had served their apprenticeship, and that in the Middle Ages meant that they had mastered the technicalities of their trade.

But it does not follow that when they reached the proud position of master-mason they continued to work with their hands as they had done when younger. They had higher work to do; they dictated the plan and general ordinance—the first essentials without which no building can be carried out satisfactorily—drawing them on parchment or paper sufficiently well to make their meaning clear to the workmen under them.

The modern architectural draughtsman may smile at the execution of some of these drawings, but they served their purpose. That so few of them have been preserved is owing to the fact that they were regarded merely as a means to an end, as all architectural drawings should be, and when the end was accomplished, their utility ceased. The full size details were drawn on the spot, probably on boards, either entirely by the master himself or merely corrected by him. Whether the man who did work of this description should be termed architects, or masons, or masters of the work, is an academical question which hardly requires discussion, except that the term "mason" is confusing, inasmuch as it conveys a totally wrong idea of the position these men



Copy of Drawing by Villars de Honnecourt of Cambrai Cathedral—This is One of an Interesting Collection of Sketches made on Parchment in the 13th Century. The Note on the Illustration makes Mention that the Sketch of the Chevet of Cambrai Cathedral was Made as it was Being Erected at the Time of Villars' Visit to the Building. (From Lethaby's "Mediaeval Art.")

occupied. The laymen who in the thirteenth century took the place of the monks of the previous centuries were men of substance, held in high repute by their patrons and town folk, and artists in the true sense of the word.

The post of master-mason to a town or to a cathed-

dral was a high and responsible one, descending in some cases from father to son. The spirit of the age was such that there was no fear of the workers in different crafts being out of harmony. The mason had confidence that the painter would not want to apply his color and gilding on the wrong mouldings, and that the glass stainer would not try and ignore the design of the window. By the beginning of the thirteenth century there was absolute sympathy between all branches; and to this sympathy is largely owing the beauty and completeness of the medieval cathedral.

To the infusion of secular blood in the twelfth century is due in a great measure the enormous strides made in France in architectural composition and design between 1150 and 1220.

The monk designer was by no means a recluse, living a life of seclusion within the cloister walls; but his training had saturated him with traditional methods, which he found it difficult to discard. The lay designer, on the other, although he might have served his time in the same school, was outside monastic life, and mixed freely with all sorts and conditions of men. The result was inevitable, gradually old ideas gave place to new, the traditional methods of ornamentation, methods based on old classic or Byzantine designs, were supplanted by fresh ones. Tradition was treated reverently—as it must be if good art is to result, but nature and not tradition became the governing factor for ornament and figure sculpture. Owing to this the differences between the carvings executed at the beginning of the twelfth century and those of fifty years later, are even greater than the structural changes which took place during the same period.

Gothic architecture has been called "the perfection of vault construction in stone," a system of mechanism maintained by thrust and counterthrust. In the Middle Ages it was the constructional features

themselves to which an attractive form was given, although many, if not most, of the architectural features were founded primarily on structural necessity, yet others were the expression of artistic invention and of æsthetic requirements. In seeking to diminish the size of the piers and the thickness of the walls, it was necessary for the architects of this period to find a mode of construction more homogeneous and more capable of resistance, and to avoid the expense of labor which the carrying of any material of large size involved. The walls, therefore, became of

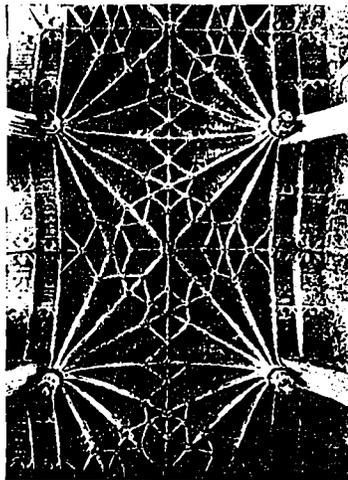
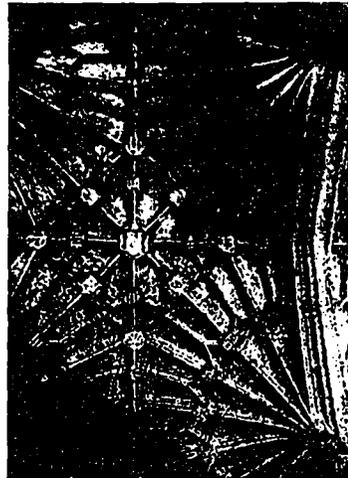
secondary importance, their places being occupied by stained glass windows, and the support of the structure was effected entirely by means of buttresses or short walls placed so as to best resist the thrust of the vaulting

Buttresses.

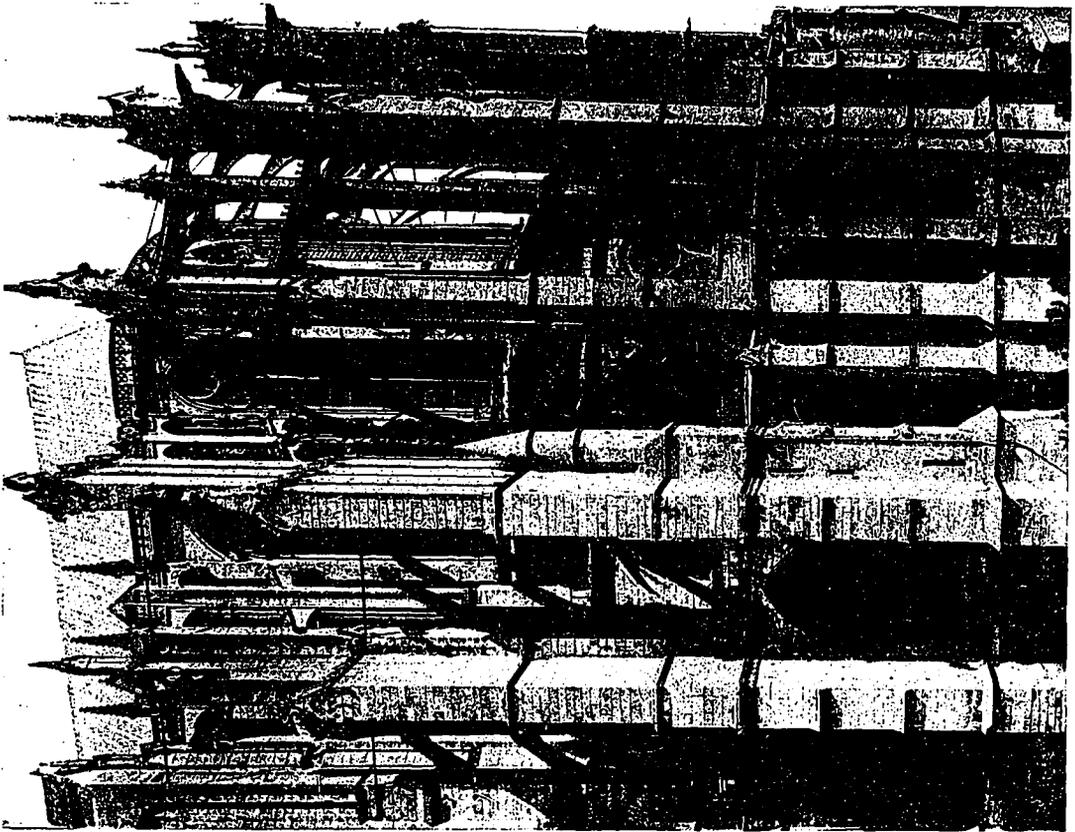
As said before, the function of buttresses was to strengthen the walls and counteract the thrusts of the arches. It was immaterial whether they were placed inside or outside the buildings. The builders of England and Northern France were quick to perceive the artistic advantage of the former. (1) Outside buttresses give scale; (2) They form strong vertical lines and thus help to convey the impression of height; (3) They give the mason his

opportunity. No part of a church throughout the Middle Ages received more care and thought than these strengthening props.

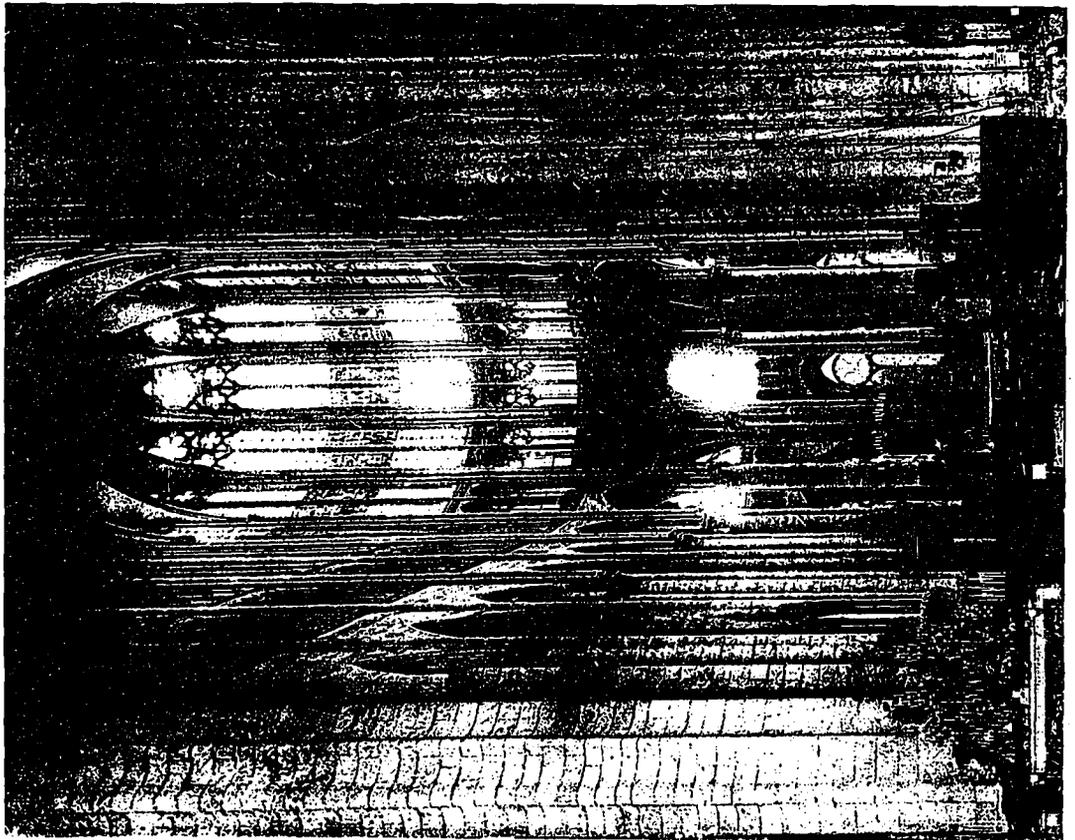
In the flying buttresses there is given to the building an appearance of vigor and active force, which nothing else can effect, but when employed extravagantly they create a feeling of unrest. There was no hard-and-fast rule to determine the relative position of the flying buttresses to the vault. The builders judged from experience, from failures and from successes. In the majority of examples the top of the intrados of the arch of the flying buttress, where it butts against the nave or choir wall, is approxi-



Upper Two Views—Vaulting at Oxford Divinity School, A.D. 1445-1480. Lower Two Views—Vaulting at Oxford Cathedral Choir, A.D. 1478-1503. These are Good Examples of Lierne Rib Vaulting. It Will Be Noted that the Pendants of Each Transverse Arch are But Two of the Voussloirs of the Arch, Greatly Elongated. (From Bond's "Gothic Architecture.")



Exterior of Choir, Beauvais Cathedral (1337-1347).



Interior of Choir, Beauvais Cathedral (1337-1347).

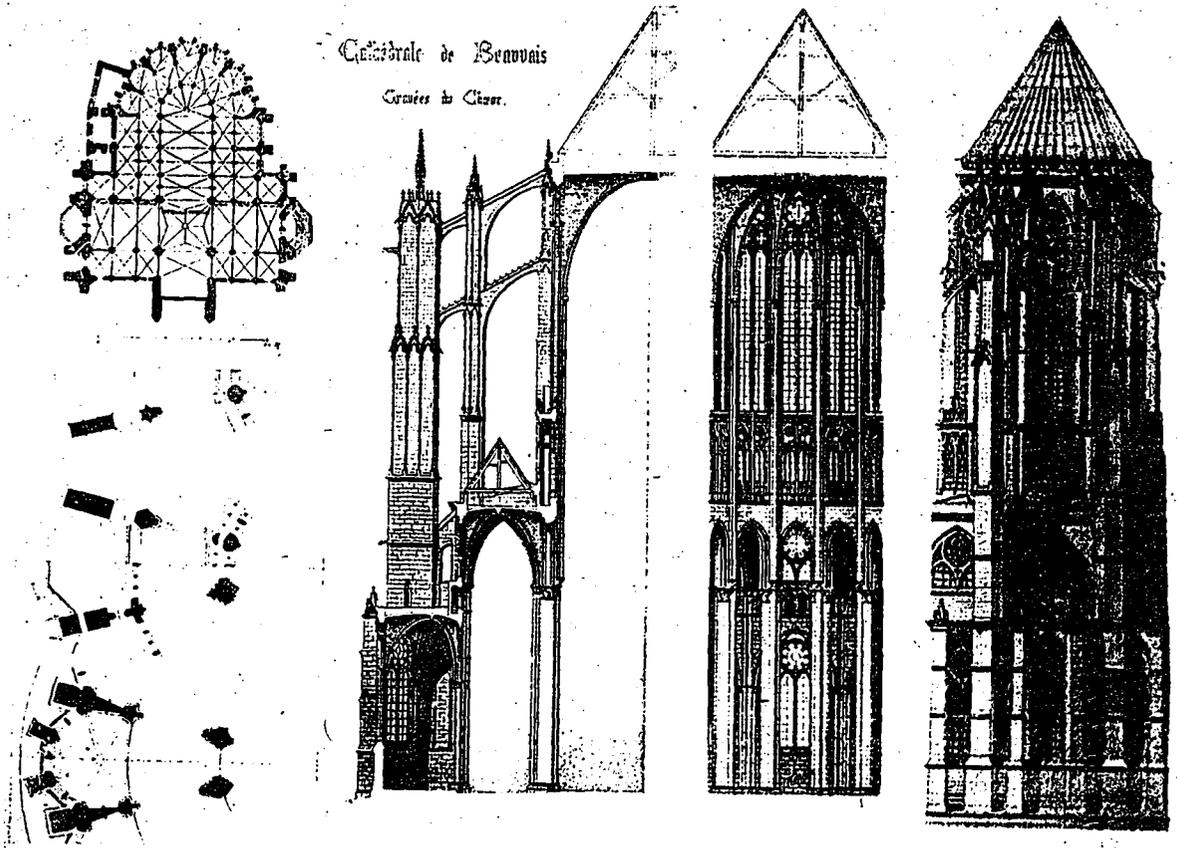
mately on a line with the top of the *tas-de-charge*. Upper buttresses were frequently used merely as stiffeners to the walls.

Tas-de-Charge.

A common method of construction in the vaults of the Middle Ages is that of building an arch in *tas-de-charge*. In this the lower part of its curve is merely corbelled out, and consists below of courses of horizontal blocks, each upper course projecting further forward than the course below it. It may extend upwards as much as one-third of the height of the vault. The advantages in using this construction was that the weight from above was brought

- (5) Flying buttresses transmit thrusts to abutments.
- (6) Abutments weighted by pinnacles can be smaller than when unweighted.

The generative principle of Gothic architecture was economy of stone. Labor was cheap, stone was dear, every care was taken to lessen the cube of stone. Any amount of labor might be expended on ornament, as little as possible on ashlar. The masons had grown up on this tradition. The constructional members are totally independent of the filling in and all windows, etc., might be removed. Such light construction as may be seen in some of the cathedrals may be deemed perhaps somewhat non-architectural, the masonry being made almost as



Beauvais Cathedral, the Mightiest and Most Daring Piece of Masonry in the World. The Chevet Was Begun in 1247 and Finished in 1271. The Dimensions of This Building are Enormous. The Crown of the Vault is 150 Ft. Above the Pavement, and the Exterior Ridge Rises to 210 Ft. The Width of Central Span is 45 Ft. and Span of Bays Vary From 29 Ft. 6 In. to 25 Ft. 9 In. Between Centres. This Building Has Been Called the Last Work of Gothic Art, and It Is Interesting to Follow Out How the Whole Seems Balanced and Kept in Position by the Series of Vaults, Arches, and Flying Buttresses. (See page 54.)

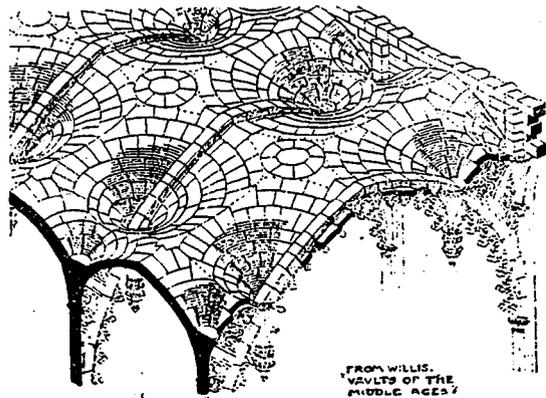
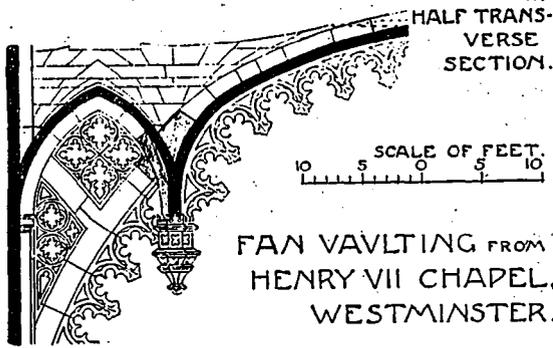
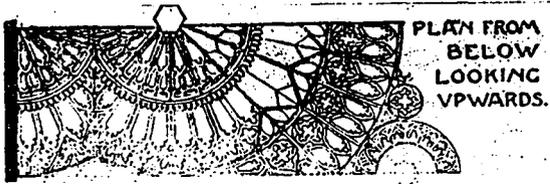
down on to horizontal blocks which could not slip—the span of the real arches with radiating joints is much reduced—and there is also an economy in centering.

Summary.

The principle of thrust and counterpoise may be briefly summed up as follows:—(1) The *tas-de-charge* unites all thrusts and consolidates them at given points. (2) The *tas-de-charge* itself offers resistance to thrusts and also decreases the amount of thrust inasmuch as the space and height of the live portion are lessened. (3) A high wall above the point of pressure tends to divert lateral thrust into vertical. (4) Pinnacles act in the same way.

pliable and ductile in design as if it were metal. Though such work has stood for years, the eye desiderates something more, solidity as well as stability, and this in its later phases, the Gothic preponderance of voids fails to give. The unsubstantiality of skeleton construction was, however, largely counteracted by opacity of glass. A church with white glass seems but a collection of stone scaffolding; with stained glass, even if it be one great lantern, like King's College Chapel, Cambridge, an apparent solidity is produced that reassures. Nothing in the whole history of architecture is so unsatisfactory as an Amiens in white glass, nothing so delightful as that same church filled with stained glass, provided that the glass be good.

In architectural design the advance was perpetually in the direction of increasing loftiness. The spirit, as such, it associated itself naturally with the mechanical contrivance which could most effectively adopt itself to the concentration of a living purpose.



Fan Vaulting in Henry VII's Chapel—The Most Intricate Piece of Work Ever Carried Out in Masonry and a Perfect Example of Technical Skill. The Elaborate Construction is Shown Cleverly in the Illustration. The Main Arches Have Voussoirs 3 Ft. 6 Ins. Deep, and the Pendants Which Form Part of the Arch are About 16 Ft. Deep and 5 Ft. Wide. The Small Side Arch Serves by its Connection With the Wall, to Weight and Stiffen the Arch Where it Would be Most Required, that is, Towards the Springing.

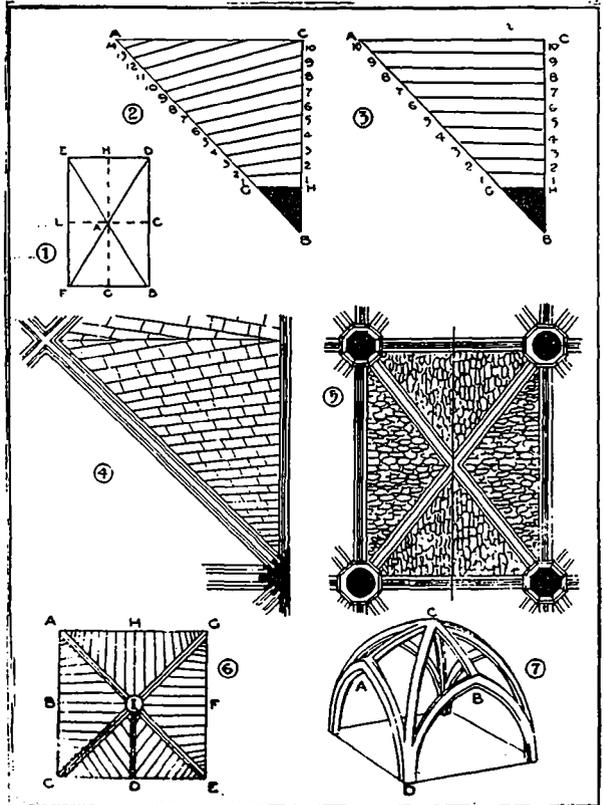
French art achieved this purpose most resolutely in vertical expression; nothing has ever been built that can compare with the vaults and buttresses of Amiens, or Beauvais, or with the spires of Senlis or Coutances.

The geometrical ease of bringing, by use of the pointed arch spans of different widths to an even height was more taken advantage of than thought out in the designs of the mediæval artist. In paper architecture as we build nowadays, ease of construction may depend on exactness of setting out. If we go into the clerestory passage and look along an unrestored bay of twelfth or thirteenth century vaulting, the contortion of its curvatures are such as would seem quite indecorous to a modern mason, for the rib radius is varied in every stone and just as haphazard seem the angles of the rib springings. To the observer on the ground these irregularities though noticeable, have no distressing effect of con-

tortion; on the contrary, they give that play of surface which has the emotional value of artistic texture. Was the Gothic artist conscious of these irregularities as defects? Very likely, but he had other matters of greater moment in his ambition, and mere geometrical accuracy was a small thing in comparison.

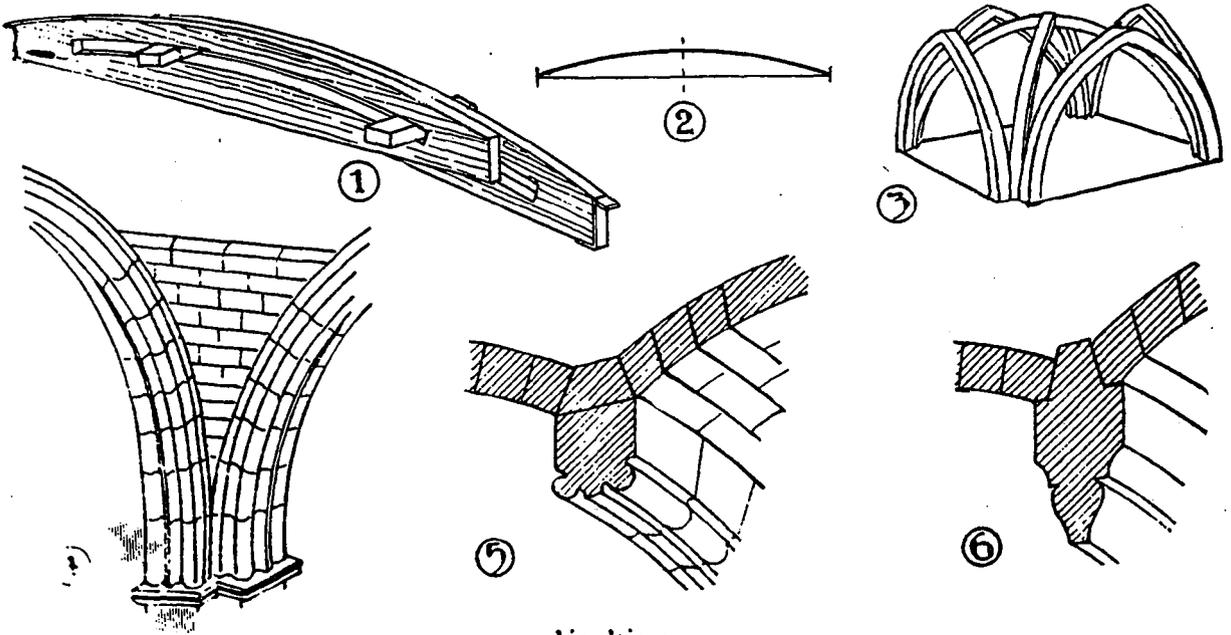
All through the development of their architecture the mediæval mason considered how he could economise centering, for this was an important matter. Scaffolding poles no doubt were cheap and plentiful, but in the Middle Ages it was an absolute necessity to build with the aid of as few planks as possible. That is why the arches were always built up in orders. (See illustration.)

We see the mason's ingenuity of saving centering in the construction of his vaults, as only centering would be required for the ribs of the vault. When these were set, each cell or web could be filled in one at a time. Even though a light plank construction would be required for this, a still further ingenious device was invented called the "cerce" (see illustration) to economise woodwork which consists of two planks fastened together, so arranged that one would slide on the other, forming a sort of extens-



Details of Vault Construction (From Bond's "Gothic Architecture")—2 and 3 Show Respectively the English and French Methods of Stone Filling Between the Vault Ribs. 4—A Vault at St. Saviour's, Southwark. Note the Irregular Stone Jointing at the Ridge, Which Originated the Use of Ridge Ribs in English Work.

ible plank or templet. Two men working together could easily manage such a centre. The objection, however, to this theory is that although possible when the course of infilling does not exceed say, 10 feet, the top courses of many of the great French



Vaulting.

Details of Masonry (From Bond's "Gothic Architecture")—1—The Cerce. 2—Springing of Ribs in Romanesque Work. 5—A Romanesque Vault Rib. 6—A Gothic Vault Rib.

vaults are double that width and this would entail a centre too heavy to be managed by hand. These upper centres, though, were very likely laid on single boards propped up temporarily from a light scaffolding below. Quick-setting mortar would be used, and workmen after setting a course in one compartment could pass on to a course in another, giving the first time to set.

Thus we see the filling in between the ribs is always arched and of a light construction and necessarily of ashlar. The web varies in thickness from 4 inches to 8 inches. In some of the early vaults a kind of concrete is laid on the extrados.

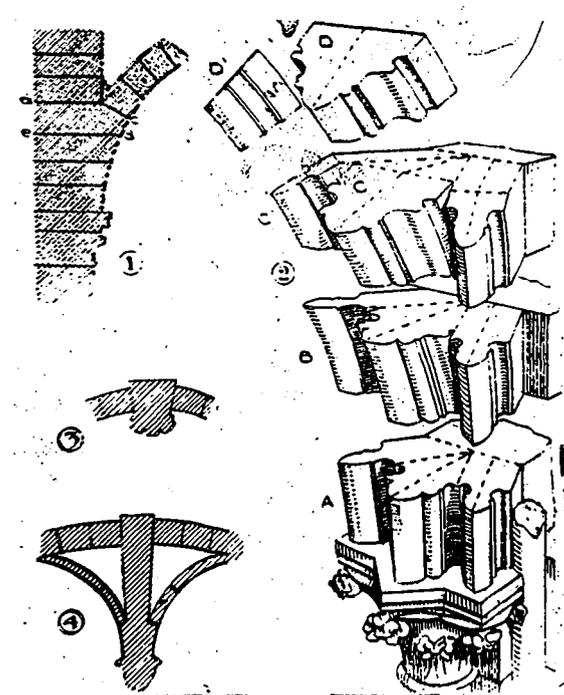
A great advantage of rib vaulting was that in a severy of several cells, each cell was independent of its neighbor. In the groined vault if fracture occurred in any part of it, the safety of the whole vault was imperrilled.

Another advantage was that there was a very considerable amount of elasticity in the shell of such a vault. If owing to pressure and strains, the diagonal ribs of the vault were thrust apart a little, the arched courses would sink; if the diagonal were fixed nearer together they would rise, and all this without necessarily causing the vaults to fall, owing to the fact that the end

stones of the vaults were not bonded to the ribs or arches on which they rested, the arches being usually rebated to receive the filling in, the cells of the vault had a good deal of "play."

The increase of the number and variety of ribs and the consequent form of the vault, is a fascinating study. The French architects do not show such variety as the English in their vaulting. The first named generally kept to the quadripartite or sexpartite form, but the English soon added a number of intermediate ribs across the webs which were probably added to avoid long courses and to facilitate the building of the webs, and also to support the ridge ribs.

It was for the latter reason more than any other that the French masons never used these intermediate ribs (or tiercions) as ridge ribs with them were almost unknown and this is easily to be accounted for from the fact that the French had quite a different method of laying the filling-in of the stones to form the webs, than did the English. This is best shown by the diagram. (P. 56). In French work each stone is cut to fit. In English same sized stones are used throughout, which is cheaper and more expeditious but a ragged joint at the ridge is the result. The Englishmen's method



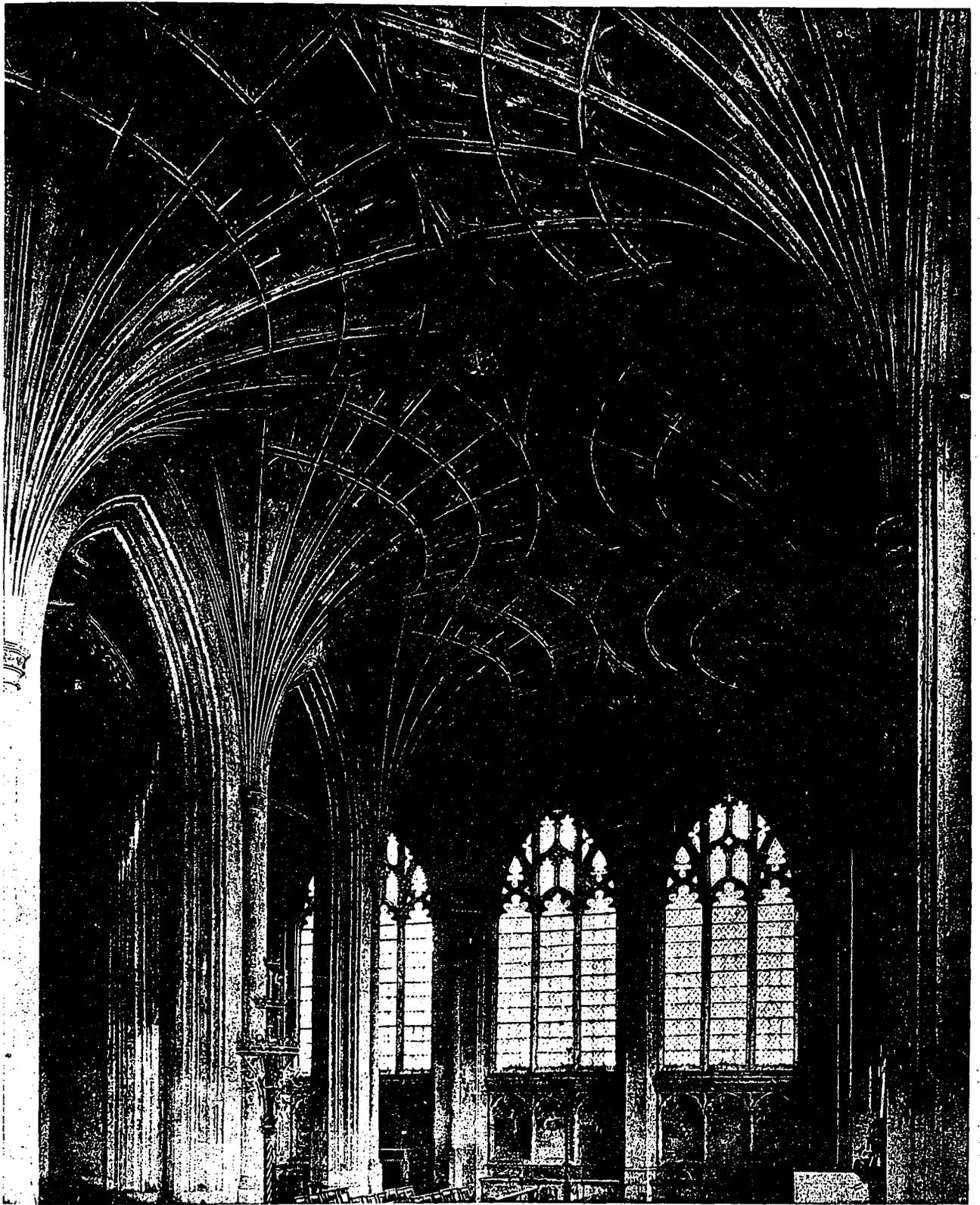
1 and 2—The Tas-de-Charge Method of Construction. 3—Key stone. 4—Pendant.



Lincoln Cathedral Chapter House—A Good Example of 13th Century Vaulting to an Octagonal



Flying Buttresses at Notre Dame, Paris—A Daring Piece of Arch Construction.



Detail of Vaulting in Retro-Choir, Peterborough Cathedral. A notable example of the Mason's Art. Executed in the XV. Century.
CONSTRUCTION, SEPTEMBER, 1911.

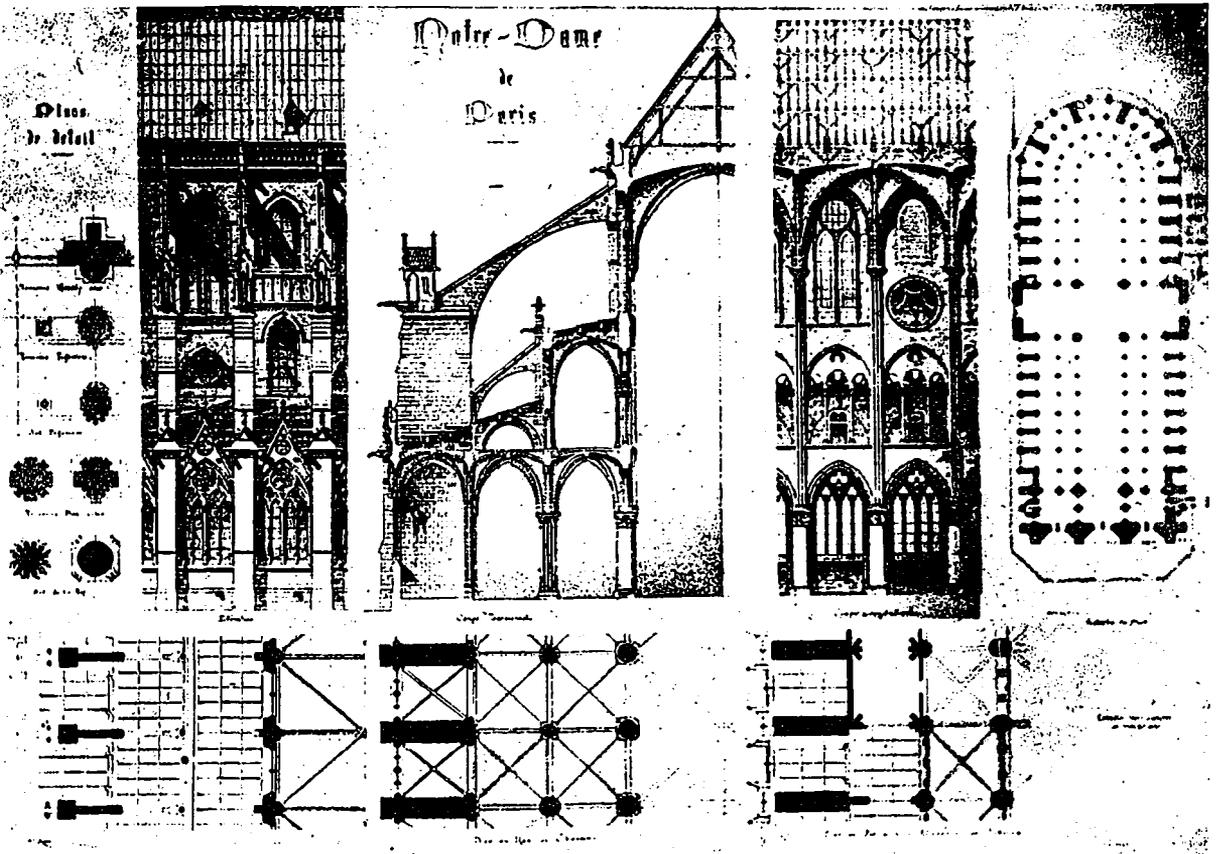
quired the adoption of the ridge rib with a number of saw-like teeth cut in its side to receive the ends of the top courses of the web.

The original idea of a vault as consisting of a framework and a filling-in between of small stones, was before long lost in a web of liernes which covered the whole surface of the vault. The next development, in perfectly natural and logical sequence, threw it over altogether, and resulted in an ashlar stone vault in which rib and panel are worked on one and the same stone. One result of the change was that the vault once more became of one substance.

It had not the homogeneity of the Roman concrete vault, but it exercised far less thrust than the strongly

ing," which was presented at a recent meeting of the British Concrete Institute, stated that a circular was issued in 1909 by the Concrete Institute asking for observations on the question whether rusting of steel takes place when covered by concrete, and was sent to 1,000 engineers and others engaged in concrete construction. Only 111 replies were received. Forty-seven contained results of definite observations, in which 26 cases of rusting had come under notice, and in 43 cases no rusting had been found.

As a result of these investigations the committee has arrived at the following conclusions: Reinforced concrete is as durable as plain concrete in any situation, provided that certain precautions are taken in



Notre Dame de Paris—Illustrating the Bold Use of Flying Buttresses. (See also Page 58.)

ribbed vaults of the thirteenth and fourteenth centuries. It also consequently required less abutment and thus was born the fan-vault, the masterpiece of English masonry, the wonder of foreign lands. It is an essentially English design, and an appropriate ending to the centuries of vault development. In a moment, as it were, the history of the vault had been revolutionized.

The builders delighted with their new form indulged in many charming fancies, including the carrying down of the ribs so as to form pendants. The whole of the stone work in these vaults is put together with as an unerring science and precision as the parts of a stone engine or an astronomical instrument.

* * *

THE REPORT of the science standing committee on the "Rusting of Steel Inside a Concrete Cover-

construction. The cement, sand, stone, etc., must be of good quality and must be carefully and thoroughly mixed and scientifically proportioned, so as to be practically waterproof and airtight. The mixture must be fairly wet and must be well punned into position to minimize voids. The aggregate known to have a chemical action on steel should be used. The aggregate should all pass through a $\frac{3}{4}$ in. mesh. The concrete covering should never be less than $\frac{1}{2}$ in., and with round or square bars the covering should not be less than the diameter of the bar. In structures exposed to the action of water or damp air the thickness of covering should be increased at least 50 per cent. or the size of the aggregate should be reduced so as to ensure a dense skin. Structures exposed to very severe conditions should have the concrete covered with some impervious coating.

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Vol. 4, Toronto, September, 1911 No. 10

CURRENT TOPICS

RECENT ADVICES STATE that the rebuilding of the Campanile at Venice is now practically completed, and that the Sansovino logietta has been restored with great fidelity from the fragments into which it was shattered by the fall of the tower.

OLD WOOD CAN BE IMITATED by subjecting new material of this character to the action of moisture and ammonia. This is claimed to be the best method adopted. It is the process employed in the manufacture of antique furniture.

IT IS ESTIMATED that railway improvements in Western Canada this season will involve an expenditure of \$45,000,000 and the continuous employment of 30,000 men and 10,000 teams, and that the accomplishment will be the construction of 2,800 miles of new track.

IN REFERRING TO THE DELAY occasioned in the construction of many business blocks at Vancouver through the carpenters' and stonemasons' strike, a Vancouver paper says that in a number of cases owners have instructed their architects to substitute terra cotta for stone work originally intended. It is also stated that in anticipation of a growing demand for this material a company is being formed to manufacture terra cotta, so as to get it cheaper than the imported article.

A NEW DEEP WATER DOCK which will take five years to construct, is to be built on the Thames by the authorities of the Port of London. (Eng.). The carrying out of the project will entail an expenditure estimated at \$10,750,000. Work is to be started early in 1912.

A PRESS DESPATCH states that the largest storage warehouse docks on inland waters will shortly be constructed at Port Arthur, Ontario, by the Canadian Storage Corporation, Limited. The docks will be 800 ft. long, and the warehouses and concrete buildings will be seven storeys high, and be built in two units, costing \$400,000 each. The first warehouse is to be started at once.

ARTICLES OF INCORPORATION have been granted to the Kennedy Construction Company, a new Quebec concern, which will have its headquarters in Montreal. Those interested are: Messrs. James Kennedy, of La Tuque; Chas. D. French, of Foster; St. George Harvey, of West Shefford, contractors, and G. A. Campbell, advocate, of Montreal. The capitalization of the company is \$250,000. It will carry on business as general building and railway contractors.

STRANGE AS ANY CONNECTION between the two may seem, plaster construction has done much to increase the importation of needles into China within the past few years. This somewhat novel condition is explained by the fact that the average Chinaman fancies a nice plaster decoration on the ridge of his roof, and, in order to keep it free from crows which have heretofore made it their regular lighting place, a sort of *chevaux-de-frise* has been adopted by placing needles in the plaster while wet, with the points outward. This has proven such a successful device that needles for this purpose are being employed in large quantities. According to the Acting British Consul at Chungking, no less than 334,700,000 needles were imported by the Chinese in 1910—an increase of 31,963,000 over any previous year.

THE GOVERNMENT OF URUGUAY has instituted a competition, open to native and foreign sculptors alike, for designs for a monument to Gen. Artigas, victor of the battle of Las Piedras and hero of the Uruguayan War of Independence in 1811. This memorial statue is to be placed in the Independence Square of Montevideo, and 100,000 pesos (\$103,400) has been appropriated to be paid to the successful contestant who shall supply the statue upon award of the Uruguayan Centenary Commission. All models must be submitted before December 31, 1911. Designs have also been requested for a monument commemorative of the dawn of Uruguayan independence, and 20,000 pesos (\$20,680) will be paid to the successful sculptor. This second monument, which is to be allegorical in its nature, will be erected at the city of Mercedes, in western Uruguay.

OPERATIONS HAVE BEEN STARTED

at the new plant established by the Sandstone Brick and Sewer Pipe Company at Sandstone, Alberta, the production at the present time being 40,000 bricks per day. The output is to be doubled within the next few weeks, when a second kiln which is being installed is completed. Already a number of large orders have been secured by the new concern and it is likely that the capacity of the plant will have to be increased to a considerable extent before very long. Mr. F. Prendergast, formerly with the Blairmore Brick Company, is in charge of the plant. The company's head office is in Calgary.

* * *

THE NEW PROVISION in the Montreal building by-law which demands the employment of fire-proof materials in the construction of all important buildings, went into actual operation shortly after it was passed, when Building Inspector Chausse refused a permit for a large auditorium that did not comply with the regulations in this respect. It is the intention of the Building Department to vigorously enforce the new enactment, which provides in part as follows: All theatres, orphanages, boarding schools, schools having more than one storey above the basement, schools with dormitories, hotels, asylums, houses of refuge, hospitals, departmental stores, apartment houses, containing more than seven lodgings, apartment houses having more than three storeys above the basement, and all buildings over sixty feet high and having more than four storeys above the basement, hereafter erected or altered, shall be built or altered with fireproof materials, as provided in sec. 97 of said by-law No. 260.

* * *

THE ENGINEERS' SOCIETY of Western Pennsylvania have been conducting a series of experiments on different classes of brick. It was found that with mixtures of magnetite and marble with kaolin the refractoriness of the magnetite brick decreases as the amount of clay increases, and the same applies to the addition of lime. With mixtures of alumina and silica, additions of kaolin bring down the melting point of pure alumina considerably below the normal value of about 2,000 deg. C., and if quartz be added with 9.1 per cent. alumina the melting point is reduced to about 1,566 deg. C., after which a very small amount of alumina raises the melting point rapidly to 1,790 C.—the melting point of pure silica. In the case of a silica brick with a certain amount of clay introduced as a binder, it was found that as the amount of clay is increased the refractoriness rapidly falls off after the added amount reaches 6 per cent. This points to the desirability of making brick either very high in silica or entirely of clay. Other investigations indicated the effect of potash, soda, lime, magnesia and iron on the melting point of clay. Slight additions of the fluxes named reduced the melting point, the reduction being proportionate to the quantities added.

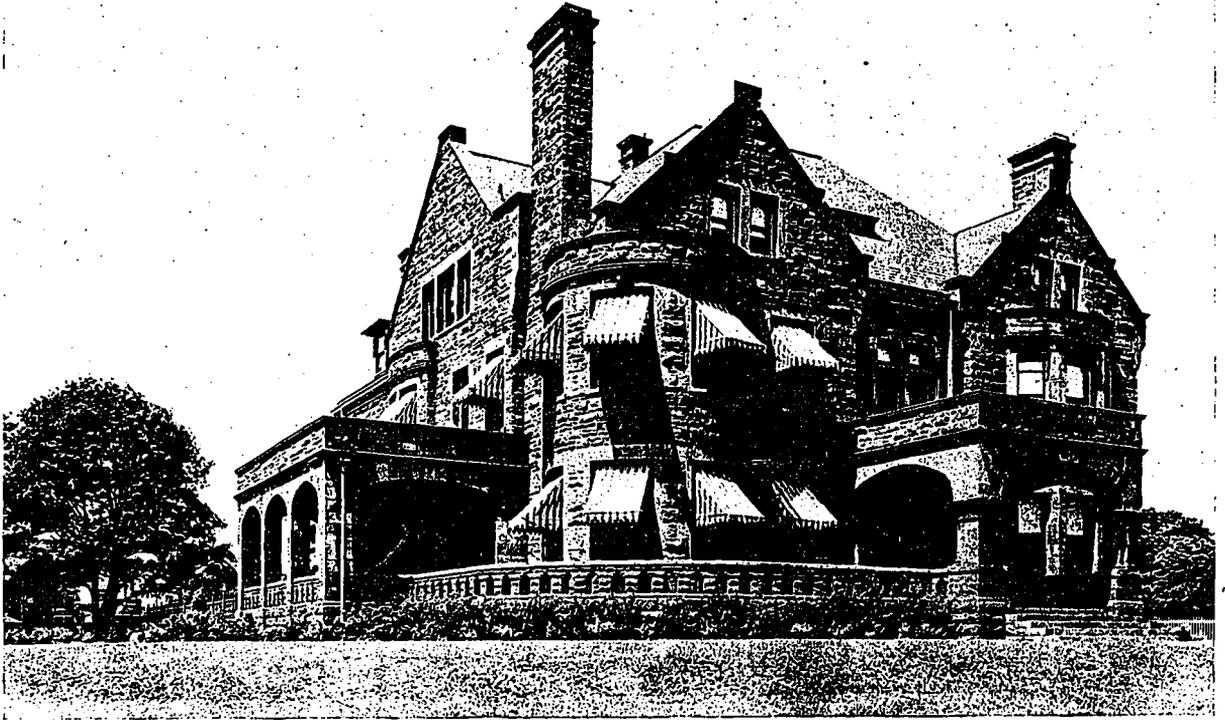
ACCORDING TO THE LONDON TIMES, a large number of architects have already applied to the Australian High Commissioner's office for sets of the maps and other information as to the Yass-Canberra district, with the intention of sending in designs for the laying out of the future Commonwealth capital. Prizes of \$8,700, \$3,500 and \$2,500 are offered for the best designs, which have to reach Melbourne by January 31, 1912. The documents now available are to be supplemented by a model or relief map on the scale of 400 feet to the inch; and one of these maps will also be exhibited at each of the other centres, where designers are invited to apply: Ottawa, for Canada; Wellington for New Zealand; Pretoria and Cape Town, for South Africa; the British Embassies in Paris, Berlin, and Washington; and the consulates in New York and Chicago.

* * *

EXCAVATIONS on the pyramids of King Sakhure, dating back to the year 2600 B.C., brought to light some metal pipes used for water mains, surrounded by a thick coat of mortar. The analysis of this mortar of 4500 years of age showed the following results: Insoluble matter 9.95 per cent.; Soluble silicon dioxide 0.31; Iron oxide 0.70; Aluminium oxide, 0.47; Sulphur trioxide 21.18; Carbon dioxide 18.20; Water 10.89. This makes the mortar about 45.54 per cent. gypsum and 41.36 per cent. carbonate of lime with 13.10 per cent. insoluble matter. This agrees with other mortars discovered in Egypt which settles the question as to the composition of the mortars. Some said that the ancients used lime mortars with sand aggregate, others contended that they used only gypsum or plaster mortar containing more or less carbonate of lime.—Tonindustrie Zeitung.

* * *

GLASS IS OF VERY ANCIENT origin, having probably been discovered by the ancient Egyptians about the year 6000 B.C. But it is to the Chinese we owe the discovery of the beautiful stained glass of the early times, says the London Pottery Gazette. The first glass staining was done by this race about 2000 B.C., according to some authorities, and not until after the Christian era, according to others. At any rate, however, the art was original with the Chinese. The Egyptians made sham jewels of glass at least 5,000 or 6,000 years B.C. In some of the most ancient tombs, scarabs of glass have been found imitating rubies, emeralds, sapphires and other precious stones, and glass beads found broadcast in three parts of the globe were quite possibly passed off by Phœnician traders upon the confiding barbarian as jewels of great price. Of the use of glass in windows there is not very ancient mention. The climate of Greece or Egypt, and the way of life there, gave little occasion for it. But at Herculaneum and Pompeii there have been found fair-sized slabs of window glass, not of very perfect manufacture, and probably at no time very translucent.



Residence of Edward Gurney, Esq., Situated on Walmer Road, Toronto, George W. Gouniack, Architect.

R ESIDENCE OF EDWARD GURNEY, Esq., WALMER ROAD TORONTO

A luxuriously appointed modern stone house in modified Romanesque design.
Description of interior scheme and features of plan.

AMONG THE MANY noteworthy homes that have been built in Toronto within the past few years, is the large stone residence of Edward Gurney, Esq., on Walmer Road. The style of architecture adopted is Romanesque, modified to conform with the conditions and climate of Canada, and refined to a simple solidity that is not lacking in grace. The materials employed in the exterior construction are Credit Valley sandstone with grey Indiana limestone trimmings and a green slate roof.

While luxuriously appointed and dignified in its general treatment, the interior is devoid of that feeling of formality which too often characterizes and detracts from that essentially domestic character so important and necessary to the success of a residential building. Instead, the scheme is one in which the decorative detail and the furnishing have been so considered as to make either the room *ensuite*, or the

individual interiors taken separately, decidedly home like and inviting in appearance.

The main hall is carried out in a dignified late Elizabethan style, with pannelled oak walls, finished with a decorative frieze and ceiling beams in the same wood. The mantel at the end with its rich detail, is in character with the decorative treatment of this period; as is also the staircase in the stair hall to the right, which is an exquisite example of the wood carver's art.

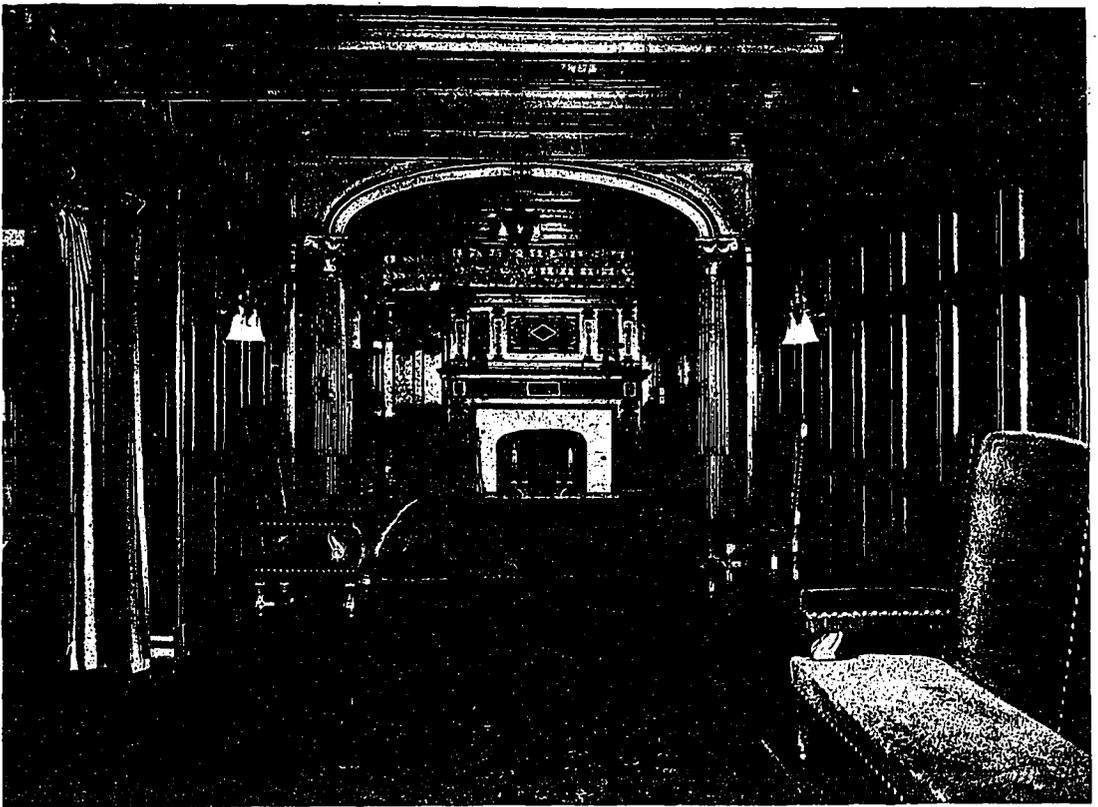
The drawing room which is to the right on entering, is a Louis Quinte interior, having an elaborately decorated ceiling, rich hangings, and a beautiful marble fireplace; while the library, which has a moulded ceiling in geometrical design, and the reception room are finished in Southern mahogany, which together with the leaded glass of the book-cases and the marble faced mantels, speaks eloquently if silently, of dignity and culture linked with every degree of convenience and comfort.



Drawing Room, Residence of Edward Gurney, Toronto. George W. Gouinlock, Architect.



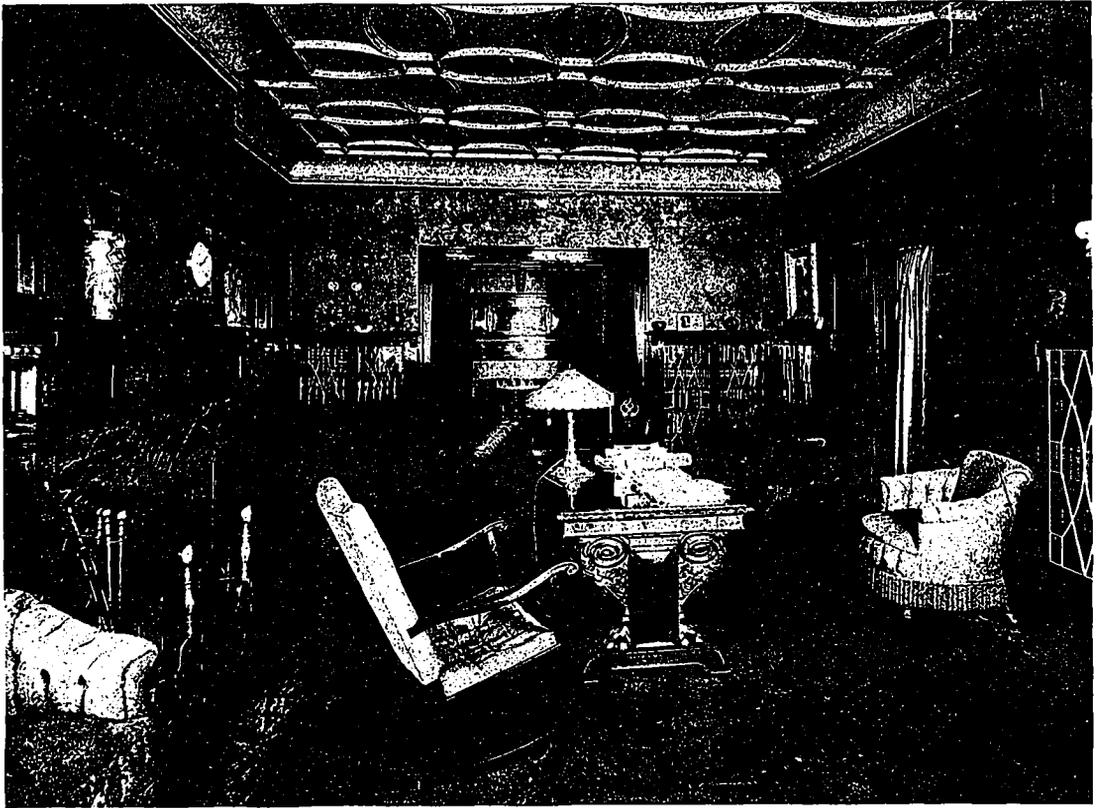
Reception Room, Residence of Edward Gurney, Toronto. George W. Gouinlock, Architect.



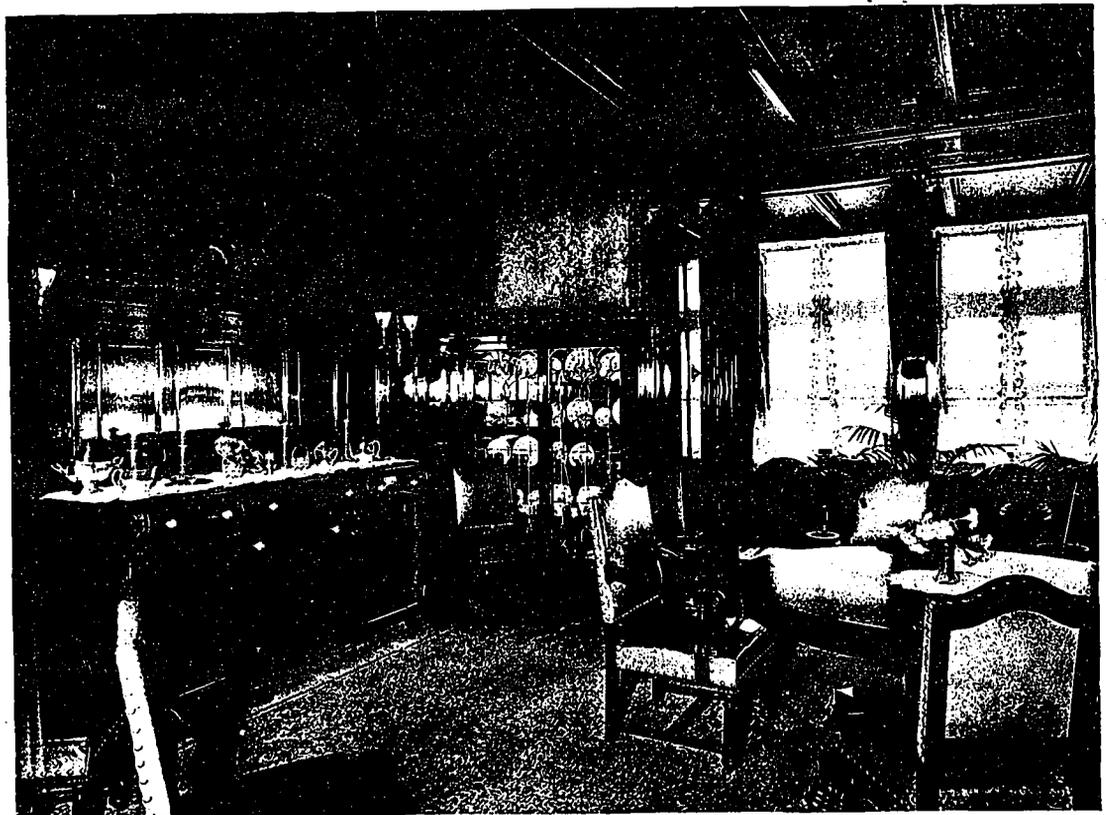
Entrance Hall and Fireplace in Late Elizabethan Treatment, Residence of Edward Gurney, Toronto. George W. Gouinlock, Architect.



Staircase Hall, Looking Toward the Dining Room, Residence of Edward Gurney, Toronto. George W. Gouinlock, Architect.



Library, Residence of Edward Gurney, Toronto. George W. Gouinlock, Architect.

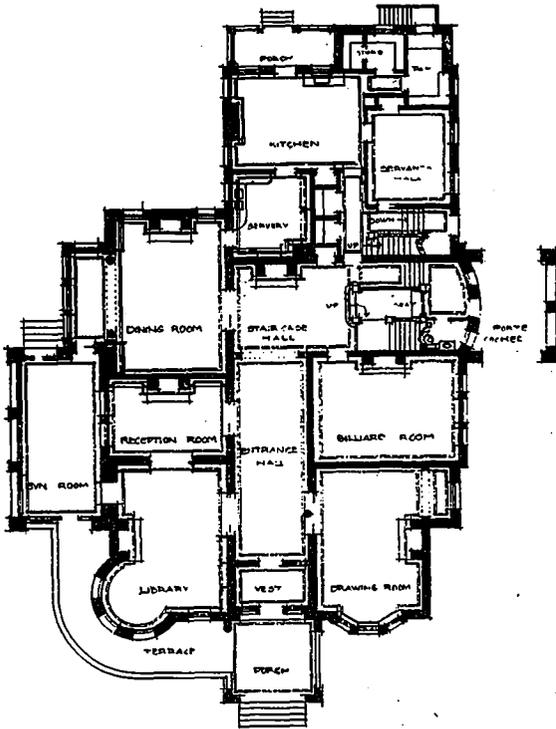


Dining Room, Residence of Edward Gurney, Toronto. George W. Gouinlock, Architect.

As regards the plan, the layout of the house presents an interesting arrangement with all the main rooms opening on the large hall. The dining room which is conveniently connected to the kitchen by a large servery, is also finished in mahogany with richly panelled walls, beamed ceiling and a hand painted frieze in oils. The furniture here was especially designed to form an integral part of the architectural scheme; two exceptionally noteworthy pieces being

a good sized sewing room at the front of the hall, together with ample wardrobe space, and a large linen room at the rear of the house.

The house was designed by and erected under the supervision of Architect George W. Gouinlock, and the various branches of the work were executed by the following firms: Cut stone and masonry, Page & Co.; carpenter and joiner work, J. C. Scott & Co.; slating, H. Williams & Co.; plastering, H. R. Whetter; electric wiring, phones, etc., W. J. McGuire, Ltd.; heating and plumbing, Kieth & Fitzsimons Co.; painting and glazing, Jos McCausland & Son; mantels, McLaughlin-Gourley, Ltd.; ornamental glass, Robt. McCausland, Ltd.; hardware tiling, etc., Brooks-Sandford Hardware, Ltd.; structural steel work, McGregor & McIntyre; marble and tile work, O'Keefe-Sandford Ltd.; carved caps, McCormack & Carroll.

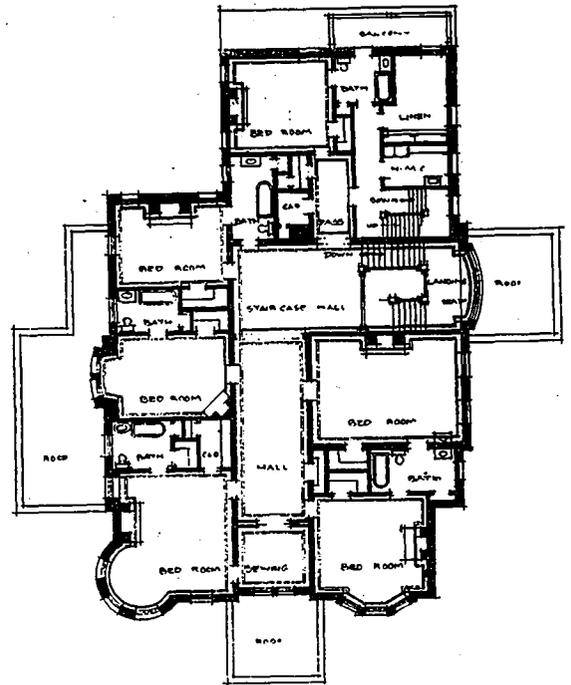


Ground Floor Plan, Residence of Edward Gurney, Toronto. George W. Gouinlock, Architect.

the beautiful sideboard and the china cabinet, seen in the accompanying view. Both this interior and the library have doors leading to the large sun room which overlooks the well-kept spacious grounds.

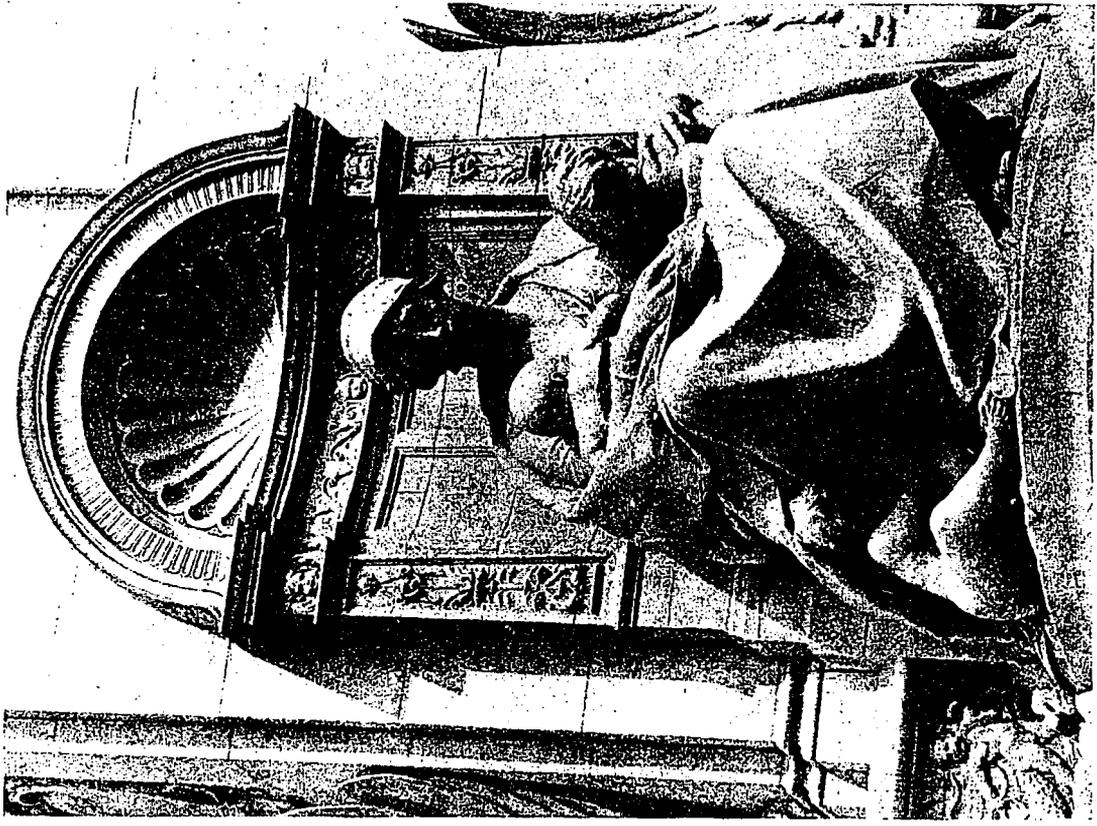
Aside from the main entrance, access to the hall is obtained from the porte cochere through an entrance at the rear of the stair hall. The billiard room which adjoins the dining room is also entered from the stair hall, the door being so placed as to keep this interior well apart from the other rooms, and yet make it convenient from the main portion of the house. The service department, as will be seen from the plan, is commodious and well arranged, with a large kitchen provided with a built-in refrigerator, ample store and pantry space, and a servants' hall and staircase.

On the first floor the arrangement is equally as commendable as that of the floor below; a large I shaped hall corresponding in situation to the one previously described, forming the central feature. There are six bedrooms in all, each of which has a large fireplace and an adjoining bath. The treatment here is in delicately designed wall papers with harmonizing hangings and appropriately designed furniture; each interior having a pleasing individuality of its own. In addition to the rooms mentioned, is

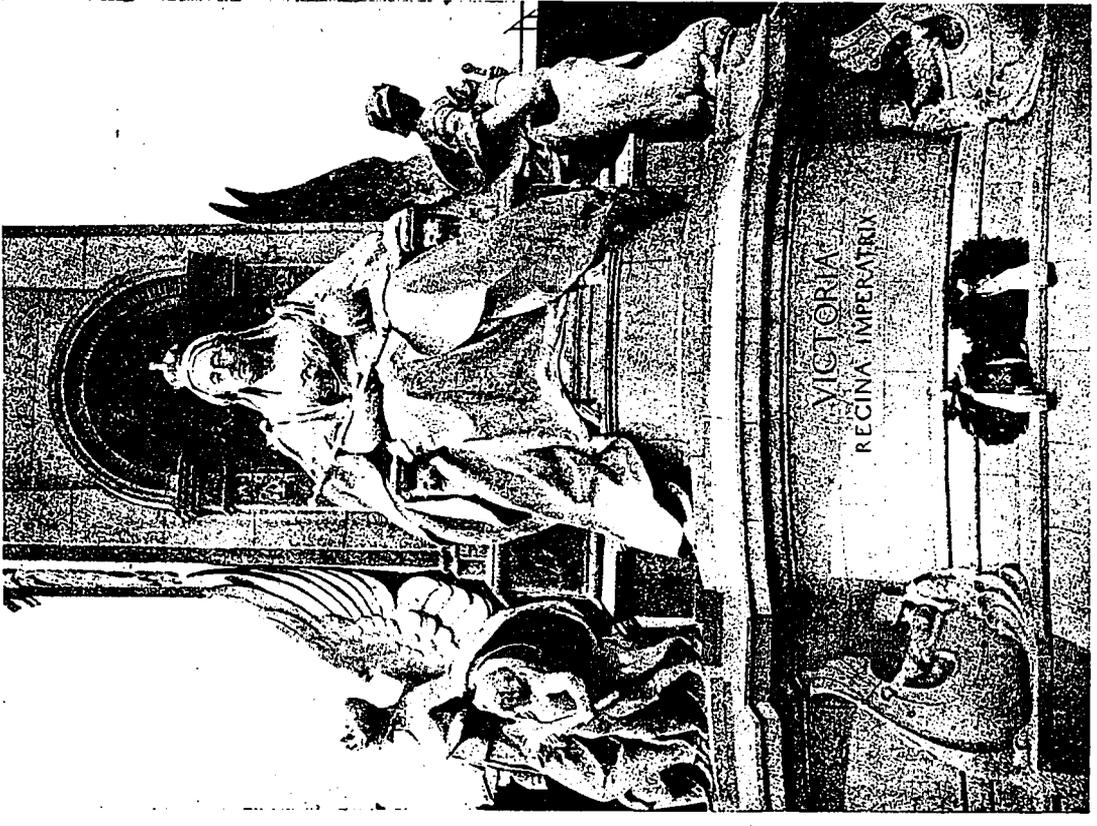


First Floor Plan, Residence of Edward Gurney, Toronto. George W. Gouinlock, Architect.

ASBESTOS is known in China principally by two names, "shi-mien," which means "stone cotton," and "pu-huimu," the literal meaning, of which is "not ash wood," or wood which will not burn. Up to the present time it has been little used, and has been regarded more as a curiosity than an article of utility. Valuable deposits, however, have been found in the vicinity of Kuantien, a small town lying about 45 miles northeast of Antung, and it now seems that an attempt is now being made to put this commodity to proper use. Already three mines, each employing thirty men, are in operation, but as yet the mining is done in a desultory and primitive manner. The workers are mostly farmers, who devote only their spare time to mining, and use simply hammers and chisels, and gather only the asbestos which lies near the surface.



Group Representing "Motherhood."



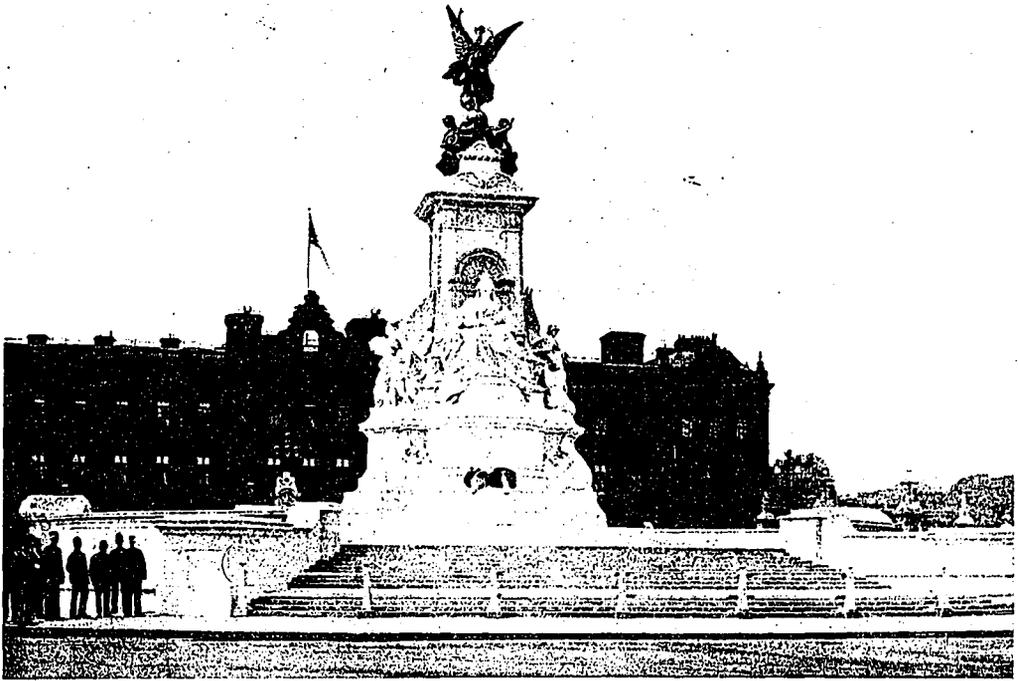
The Principal Figure.

THE QUEEN VICTORIA MEMORIAL

Description and critical analysis of imposing monument erected before Buckingham Palace.—Republished from the "Architectural Review."

PROPERLY SPEAKING, the National Memorial to Queen Victoria in front of Buckingham Palace includes the whole scheme of gates, piers, and gardens, with the Memorial as central feature, and the processional roadway—the straightened and widened Mall—that leads to the triumphal archway at Charing Cross. But for the present purpose the description must be confined to

closure, instead of keeping them outside. It was obvious at the time what the effect of such a change would be, and as a result it means that the spectator has to stand in a whirl of traffic. But, setting aside such considerations of the scheme as a whole, attention may be centred on the Memorial itself, for which Sir Thomas Brock is entirely responsible. It has already been the subject of a good deal of criticism, some of which is not a little flavored with bitterness. After all, if names are an engulfing attraction to the throngs who make the turnstiles at Burlington House go merrily around year after year, they are just as much masters to the critics. The adage about giving a dog a bad name finds very pointed illustration here, and we are afraid the sculptor of the Queen Victoria Memorial has experienced more than an abundance of attention from those who were prepared to vilify his Memorial before they had even



Queen Victoria Memorial—General View from the Southeast.

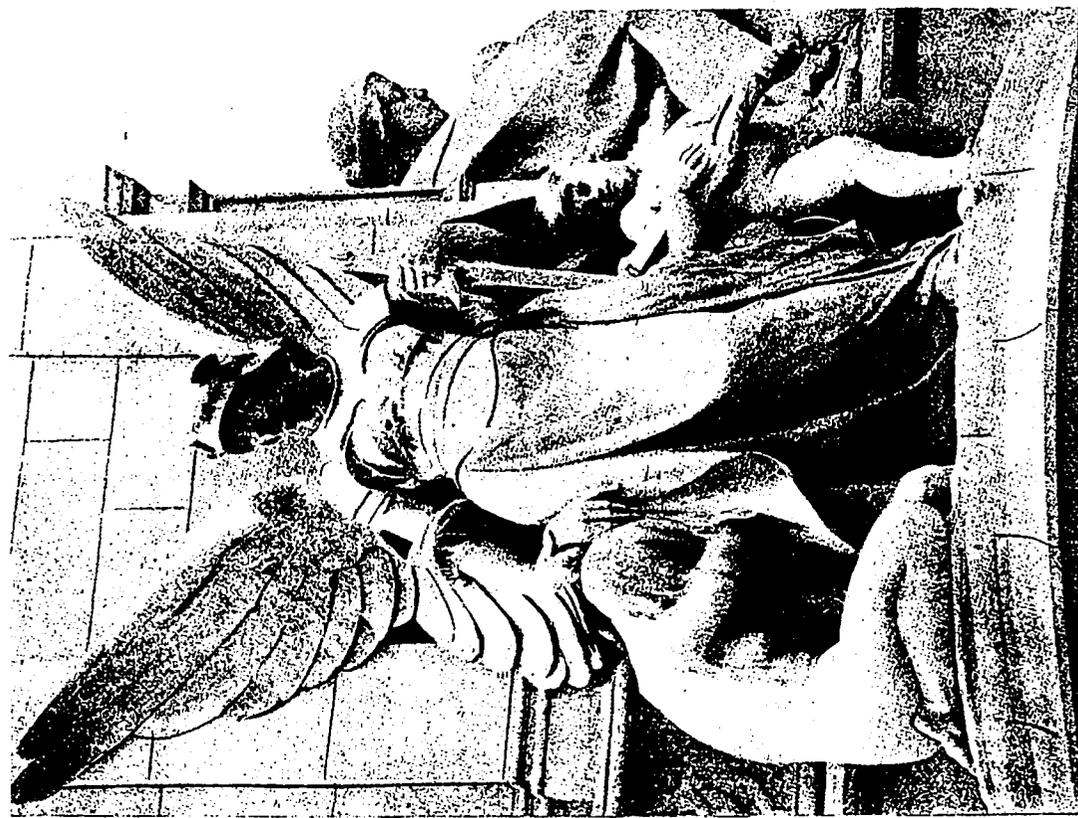
the memorial statuary group, which was unveiled by His Majesty the King on May 16th. In referring to this, however, as the focus of the whole scheme, one cannot avoid recalling to memory the original scheme by Sir Aston Webb, which was selected ten years ago in the limited competition that was held. The perspective showed a spacious semi-circular area enclosed by a double colonnade connected to pavilions, and having water-basins and parterres. The necessary funds for this effect, however, were not forthcoming, and the scheme had to be shorn of many of its features, the enclosing colonnades being represented in the finished work by low balustrades, and the parterres reduced to quite a commonplace gardener's affair. But the greatest mistake in the alteration of the scheme was undoubtedly the bringing of the roadways from Buckingham Palace Road and Constitution Hill *within* the en-

seen it. We have no intention of taking up the cudgels on his behalf, but the importance of this work at least claims that it shall receive fair criticism; and it is with the object of presenting it in a thoroughly adequate form that the accompanying photographs have been taken.

It must be admitted that Sir Thomas Brock has not, in this work, done anything exceptional, and the criticism that some of the figures have a too-pervading air of the studio-model has, we think, a good deal to support it. At the same time there is some notable work, in particular the boy figures, which are very pleasingly disposed, and the figure of Queen Victoria herself, which certainly is regal and imposing. The crowning figure of Peace we do not much care for, as it is of a type which is very familiar; but the figure of "Courage" below it, on the north side, is very finely grouped, strong in its lines, and worthy



Group Representing "Truth."



Group Representing "Justice."

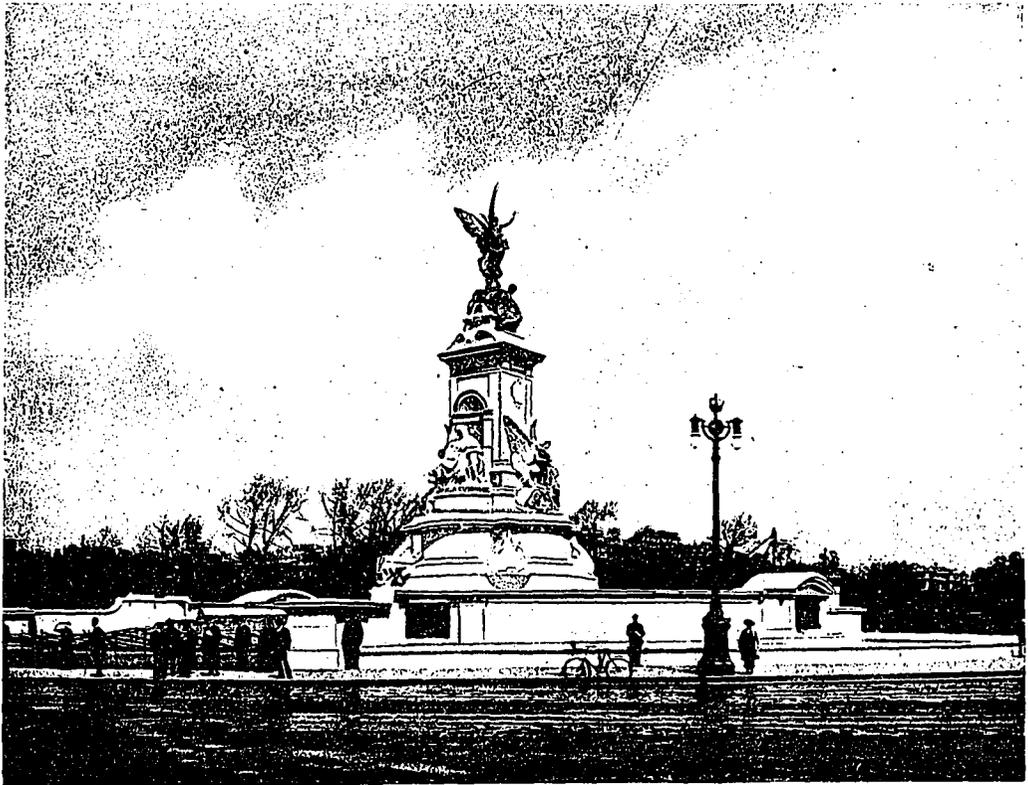
of a sculptor who has achieved a considerable reputation.

The low-relief sculpture around the base is, in our opinion, not good. There are few sculptors who have ever achieved success in this direction. Nor can anything be said in praise of the architectural detail. It is, in fact, the worst feature of the Memorial, being of an Italian Renaissance type, with a plethora of bad motifs. The Memorial, however, certainly masses up well, and, if it does not reach any great position as an imaginative work, is imbued with a good deal of stately feeling in keeping with the great ideas it embodies.

At the time of the unveiling, Sir Thomas Brock gave to *The Times* an account of the genesis of his idea for the Memorial and some account of its develop-

ment; and as the sculptor himself is best qualified to explain his own work, his words may here be included. He says:

"I believe that a meeting of the Executive Committee, after the preliminaries had been arranged, decided unanimously to ask me to undertake the work. I was sent for by Lord Esher and informed of their decision. They thought that they might thus get a work which would have more harmony and rhythm than they could expect if a number of sculptors were engaged upon it. I felt great diffidence in undertaking the commission, fearing that I might not be able to do justice to so great a theme; but I thought that at least I could try, and so I began my preliminary sketch-model. It was intimated to me that the committee would like me to travel for a year and examine the great examples of the monumental sculpture of Europe. I felt, however, that if I were to do so before having determined on a general scheme I should be somewhat bewildered on my return, and that the result would not embody the expression of my own personal feelings. This being so, I decided to proceed with my model, which was done to a very small scale, but was sufficient to convey a fair idea of my proposals.



The Monument as it Appears From the Southwest.

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being decorated by mermaids and tritons. It also appeared to me that this base should likewise be emblematic of the courage and wisdom of the people, which are suggested by the reclining allegorical figures over the fountains, on the one side representing the Navy and Army, typifying courage, and on the other side Science and Art, symbolizing intelligence.

"To carry this idea further I placed on the pedestals flanking the steps at the front and back of the monument groups of colossal figures supported by lions—in the front, on the right a figure of Peace and on the left a figure of Progress; and at the back, facing the Palace, figures of Labor, Agriculture, and Manufacture. These, I felt, would represent all the qualities of the nation upon which Monarchy must depend for its security.

"The central feature, which rises to a height of 82 feet above this foundation, I devoted entirely to those qualities which made our Queen so great and so much beloved. The statue of the Queen I placed in front, seated enthroned with Orb and Sceptre and looking towards the heart of the great city whose people she knew and loved so well. On the right of the great pedestal I placed a group of Justice, and on the left a group of Truth. I felt that she was just, and that she sought the truth always and



The Summit "Victory," with Supporting Figure of "Courage."

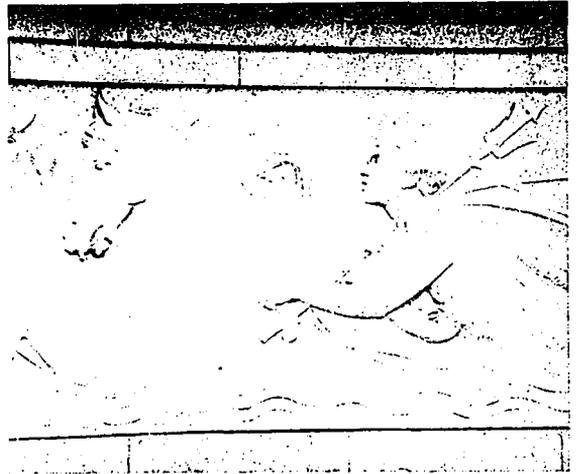
in all circumstances. At the back I placed a group of Motherhood, symbolizing her great love for her people.

"Above, ornamenting the main corners front and back, I placed eagles, emblematic of Dominion, and on the superbase figures of Courage and Constancy; and rising from above, on an orb, a figure of Victory with outstretched wings, with the right arm uplifted, and holding in her left hand a palm branch.

"The small sketch-model of this Memorial was completed a few months after Queen Victoria's death in 1901. The fact that it had so far reached maturity became known almost accidentally to King Edward, who paid me the honor of a visit to my studio to inspect it. His Majesty was favorably impressed by the conception, and made certain critical suggestions to which I deferred, and which are embodied in the Memorial as it exists to-day.

"I then proceeded with a more elaborate model to a

scale of one-tenth the full size. This was completed and approved by King Edward in the summer of 1902. It was then that His Majesty realized the magnitude of the work, asking me how long it would take to complete. When I mentioned ten years he replied, 'Why, we shall all be in our graves by that time.' I did not see my way, however, to name any earlier date, but as a matter of fact it is not more than nine years since the work was actually begun. I must now leave the Memorial to the judgment of my own and future generations, but I feel it incumbent upon me to say that whatever that judgment may be, the entire responsibility for the work rests with myself; for no artist could have been accorded greater freedom or treated with more complete confidence than I have enjoyed at the hands of the Memorial Committee."



Detail of Low Relief Sculpture Around Water Basin.

As already indicated, there has been no lack of criticism—there never is—and from the columns that have been written about the Memorial a few excerpts are given below in respect of what may be called an endeavor to judge the work fairly and without prejudice.

"Sir Thomas Brock, in choosing the form of monument to Queen Victoria, set himself a task of extraordinary difficulty," says a writer in *The Morning Post*. "The figure of Her Majesty had to be distinct, predominant, and the sculptor has insisted on this necessary predominance somewhat at the expense of artistic coherence. Viewed from the front the Queen is in perfect scale with the groups of 'Truth' and 'Justice' on either side. But when examined from the north or the south side of the structure all sense of perspective is lost. The symbolical figures referred to are actually nearer to the eye than is the statue of the Queen; yet her figure is so much larger in proportion that unity of design is upset. The figure of the Queen, judged by itself, is on the whole splendid. The upper part, in particular, has great dignity. The front face is, perhaps, a trifle severe for the great-hearted lady who for so many years ruled the British Empire by love and kindness, but in profile the features are noble and sympathetic. The Memorial is sure to be extremely popular. It comprises all the factors that appeal to

national pride and sentiment, and they are presented with a power hitherto absent in British monumental sculpture."

Another writer in the same issue says: "In our notice of the base of the Memorial we praised its breadth and nobility of scale, the magnificent sweep of the basins which repeats the curves of the sculptured pediments, and the various figures in high-relief and in the round. On the panels sea-maidens, tritons, and children sport with joyous abandon on sea-horses, dolphins, and nautilus shells, all excellent in composition. The movement of the figures has a swing and swish that suggest the seas ruled by Britannia, but the Gothic waves respond to the force of neither moon nor wind, and the living waters in the basins emphasize their archaistic rigidity. The success of the lower part led us to believe that the monument when complete would be an imposing achievement, superb in scale and noble in decoration. And our faith was not lessened as the scaffolding rose to the sky. Within the wooden posts and beams seemed to be space enough for the display of these qualities. But now that the Memorial is uncovered we find unfulfilled the early promise of a really great monument. The scale, the general proportions of the architecture, are splendid. The figures disappoint. There has been no great effort to break from the spiritless bounds of convention. 'Truth' is partly draped, wings spread from her shoulders, a mirror rests on her right arm, her left foot tramples a serpent. Then there are a naked child and a seated figure. This group is weak in rhythm, confused in line, and, save for the mirror, it might represent anything but 'Truth.' 'Justice,' which faces north, is known by her sword; 'Motherhood' by her children. From the artistic point of view 'Motherhood' is the finest group. It is broad and monumental in treatment. The idea is concentrated in a harmonious design of not very striking originality. The gilded figures which surmount the Memorial are the least impressive of all. They fail in the monumental sense of design. They seem to be modelled with the elaboration of statuettes. Distance and atmosphere resolve objects into silhouettes that express character and emotion with unmistakable truth. Detail in a work of art should never disturb the fecundity of a distant mass; and it is this insistence on unessential fact that robs the figure of 'Victory' of illusion. This 'Victory' appears to be insecure in her position. Seen in front, the wings and drapery seem to be overbalancing the figure. From almost every point of view we find in these figures awkward angles instead of buoyant or triumphant lines, and the gilt gives a heavy prominence to the forms that diminishes the suggestion of height." With regard to the time occupied in completing the Memorial it may be stated that the lower portion was ready to be opened to public view in May, 1909. This part included the marble basins, retaining walls, sculptured panels, granite paving, steps, plateau, and bronze electric lamps. In this portion of the Memorial there are about one thousand tons of Carrara marble and eight hundred tons

of granite. Each basin measures 190 feet in length by 24 feet in width and 2 feet in depth. Shallow wells in the gravel at the end of the lake in St. James' Park, and the lake itself, supply the water for the cascades, the quantity required being 108,000 gallons an hour. Engines erected at the pumping stations in St. James' Park provide the power, and after the water has passed through the cascades and basins it returns to the lake. The chief engineer to His Majesty's Office of Works is responsible for these admirable arrangements.

The central architectural portion of the monument was executed and erected by J. Whitehead & Sons, Limited, and the architectural marble-work of the lower portion by Walton, Goody, and Cripps, Limited.

COMPOSITION FLOORING IN GERMANY.

SAWDUST AND LIKE WASTE products heretofore regarded as useless are now being utilized to no little extent in Germany in the manufacture of building products. Especially has a marked advance been made in the manufacture of composition flooring. One flooring of this character is made from a solution of magnesium chloride, to which pulverized magnesia and sawdust are added in proper proportions, the resultant composition on hardening possessing many of the qualities of both wood and stone. When the sawdust is omitted the combination of the other two ingredients forms a white, absolutely solid, artificial stone. Some of the floorings are mixed on the spot and laid soft on the space to be covered, while others are molded into plates and delivered ready made. Flooring of this kind varying from 23 to 25 millimeters (0.905 to 0.984 inch) thick costs 7.50 marks per square meter (\$1.785 per 1.196 square yards) laid. As magnesium chloride is hygroscopic, these floors may become damp if the proportions of the composition are not carefully determined upon, and the salts thereby precipitated are injurious to wood and iron. Every manufacturer has his own recipe and undertakes, naturally, to overcome this quality of the principal raw material. The cheaper grades of flooring are colored to resemble linoleum or mosaic pavements, and, in many instances, have given entire satisfaction during a considerable term of years. The emigrant halls of the Hamburg-American Line at Hamburg are paved almost entirely with this composition. Floors thus made are more elastic than cement floors, are much warmer, and preserve a smoother surface. Under the fire test this type of flooring chars, but does not burn, and is a poor conductor of heat. Manufacturers of the artificial wood plates also use cork waste as well as sawdust, and produce an infinite variety of building materials, including floorings, wainscoting, and roofing plates.

EXCAVATION has been started for the new Winnipeg General Hospital. The building will be of fireproof construction and modern from the standpoint of sanitary equipment. It will cost \$500,000.



The Carling Building, Sparks Street, Ottawa, Occupied as a Departmental Store by the Murphy-Gamble Company. C. P. Meredith, Architect.

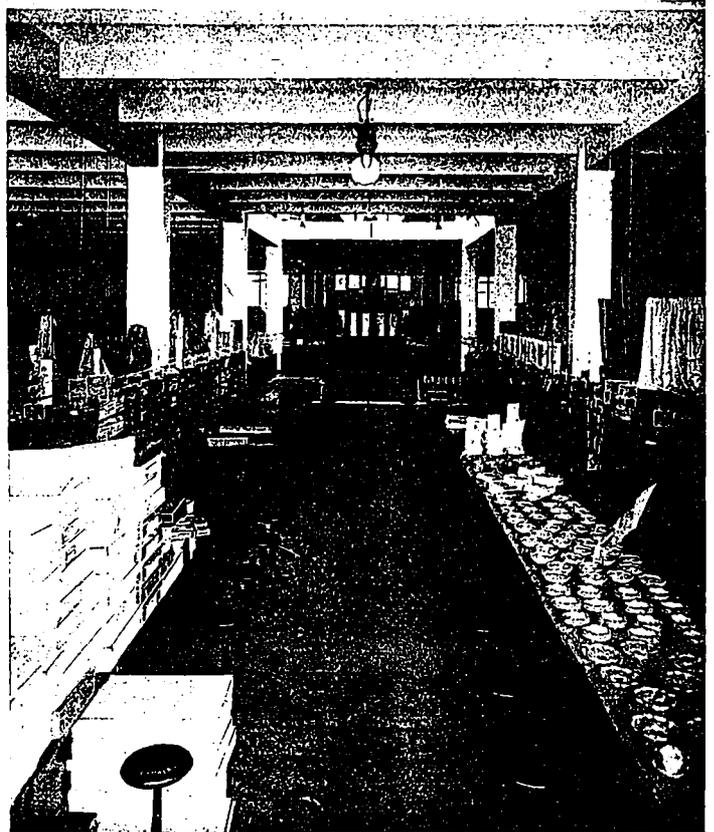


THE CARLING BUILDING. OTTAWA.

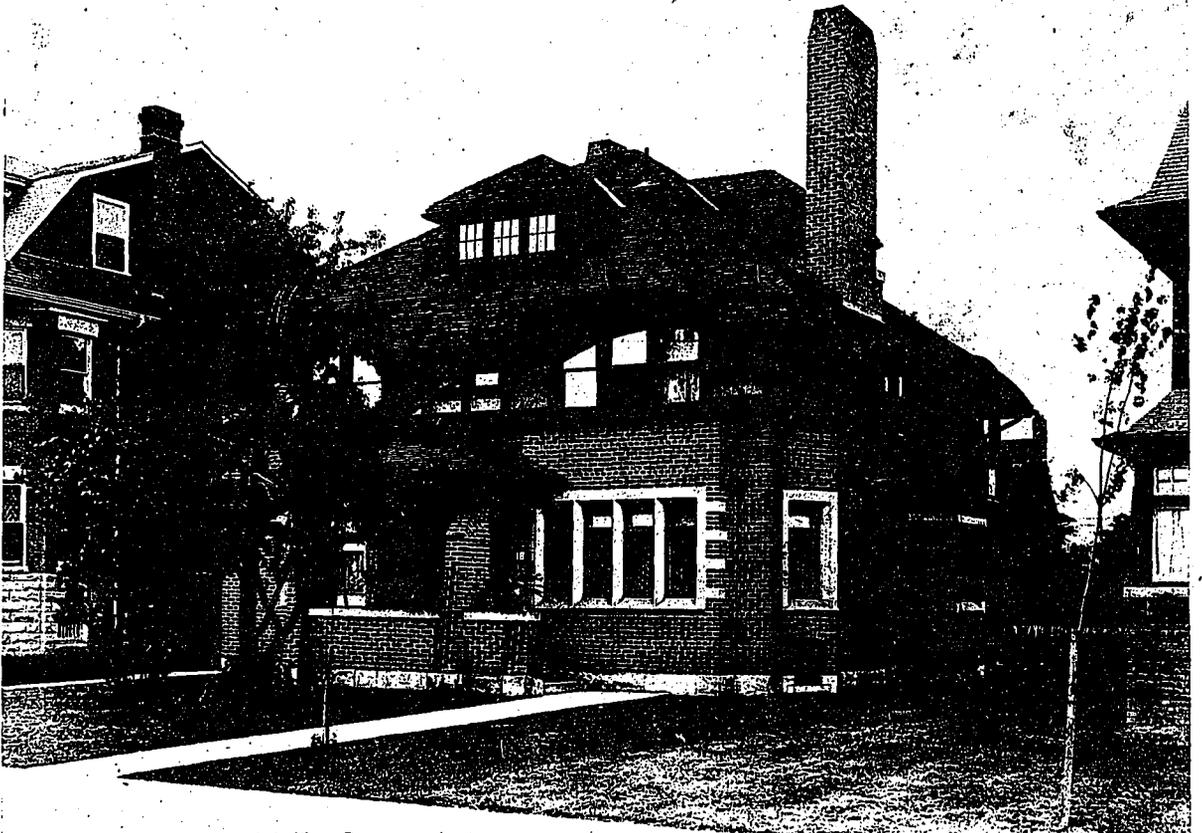
Built of reinforced concrete, with Roman stone facing. Scheme of fenestration admirably adapted to lighting and window display purposes.

THE CARLING BLOCK, or as it is perhaps more popularly known, the Murphy-Gamble Building, is regarded as Ottawa's most modern departmental store, and is one of the several important business structures erected in that city according to approved methods of fireproof construction within the past couple of years. It extends through from Sparks to Queen Street, a distance of 200 feet, and is of reinforced concrete construction, faced with Roman Stone and fitted with metal sash throughout. No material is employed in any part of the entire structure that is of an inflammable nature. The front of the building shows some very interesting details in artificial stone, and a particularly commendable scheme of fenestration which admits of an exceptionally well lighted interior, in addition to an arrangement that is splendidly

adapted to window display purposes. The lower view shows the interior on the ground floor and the arrangement of girders and columns. This is typical of the floor arrangement throughout, the light well being situated about equidistant from either end of the building. At the present time Ottawa has a number of important changes in its building by-law under consideration, and it is said that when the proposed revision is made, few cities on the Continent will have a better or more exacting set of regulations. The construction of the Carling Building, however, anticipates any demand the new provisions might make. From a structural standpoint, it has been most thoroughly considered in every respect, and is about as fireproof as modern building science has made possible. The floors, columns and walls are reinforced according to the Expanded Metal Fireproofing Company's system of reinforcement; and this concern, which has since become amalgamated with other important interests under the name of Steel and Radiation, Limited, also supplied the metal window sash which is used throughout. The building was designed by and erected under the supervision of Architect C. P. Meredith, of Ottawa.



View of Interior on Ground Floor—Showing the Arrangements of the Beams, Columns and Girders. C. P. Meredith, Architect.



Residence of Mrs. M. E. Webb, Lynwood Avenue, Toronto. A House with a Unique Individuality and a much more Attractive Architectural Scheme than is Usually Found in Average Houses of the Square Type. Wickson & Gregg, Architects.



**BRICK HOUSE
WITH A UNIQUE
INDIVIDUALITY**

Novelty of effect successfully introduced in connection with a scheme that is well proportioned, dignified and simple in general character.

A WRITER in a contemporary which devotes considerable of its space to architectural subjects, in an article published some little time back, deploring the lack of individuality in modern residential work, stated that most houses of the square type varied but little in design, or that at least they differed only in minor essentials and detail. Evidently this remark was made in reference to the class of houses erected by the speculative builders, for it must be admitted that in the work of bona fide architects, many examples are to be found which vastly differ from one another, both as regards scheme and treatment. The residence of Mrs. M. E. Webb, illustrated herewith, may be taken as a specific instance of a house of the square type in which both a distinct individuality and a picturesque quality are manifestly evident. The exterior with its buttressed porch piers and half timber work is char-

acterized by what might be termed a modern English feeling; and while novelty of effect exists to a degree, it is happily introduced in connection with a scheme that is beautifully proportioned, dignified and simple in general treatment. Indeed, the roof with its overhanging curved eaves—suggestive of a thatched covering—gives a unique character to the design, and together with the artistic entrance and windows, and the simple color combination worked out with red brick and harmonizing tones of greys and browns, makes the exterior of the house decidedly attractive and hospitably inviting in appearance.

The accompanying plans are quite explanatory of the interior. They show a layout that is practical in arrangement, with well-placed rooms and a somewhat open scheme. One feature worthy of note is the arrangement which brings the coat room, china closet, laundry chute and pantry all conveniently within a compact space. Attention might also be called to the wardrobe and individual toilet adjoining the bed rooms. The wall scheme of the rooms is quiet in tone and in decidedly good taste. In the reception room the treatment is in a pleasing champagne color; while in the living and dining rooms, both of which have bay windows, the decorations consist of a vari-tone green wall pattern with a



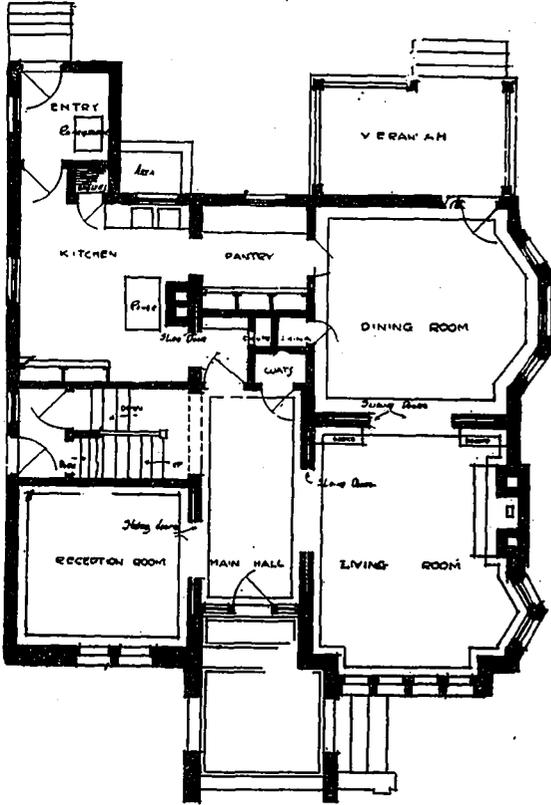
Living Room, Residence of Mrs. M. E. Webb, Toronto. Finished in Quarter-Cut Oak, with a Green Pattern Wall Scheme and Cream Colored Ceiling. Wickson & Gregg, Architects.



Dining Room, Residence of Mrs. M. E. Webb, Toronto, Which is Similar in Treatment to the Above Interior. Wickson & Gregg, Architects.

simple plate rail and cream tinted ceilings, the fire-place being in red brick with white mortar joints. The entire woodwork, trim and flooring, is in quarter-cut oak, including the hall and staircase. To say

the manufacturing buildings erected were designed by architects. Their services were not considered necessary. No value was placed on architectural qualities or general appearance, and the shop manager, whose knowledge of the requirements of space, arrangement of machinery, stock, etc., was and is undisputed, together with the builder, appeared to supply all the knowledge necessary to a successful enlargement of plant or the building of a new one. If some problem of difficult foundations or unusual roof construction presented itself the engineer of the works could ordinarily furnish a solution that at least provided a safe and secure structure. As long as the manufacturing building was considered simply as a shelter for necessary machinery and operatives, such a disposition of the problem of its construction as indicated above was probably satisfactory. But with the development of the country and the growth of culture which bring with it an appreciation of architecture and all forms of art, the realization that this unusual order of things resulted in structures that were blots on the picture and offensive to good taste, became quite general. The natural and logical course to pursue under such circumstances was to place the design of these utilitarian structures under the jurisdiction of men whose training and experience has qualified them to fully meet the requirements of good architectural design, and at the same time by consultation with those who have knowledge of the practical manufacturing requirements sacrifice no



Ground Floor Plan, Residence of Mrs. M. E. Webb, Toronto. Wickson & Gregg, Architects.

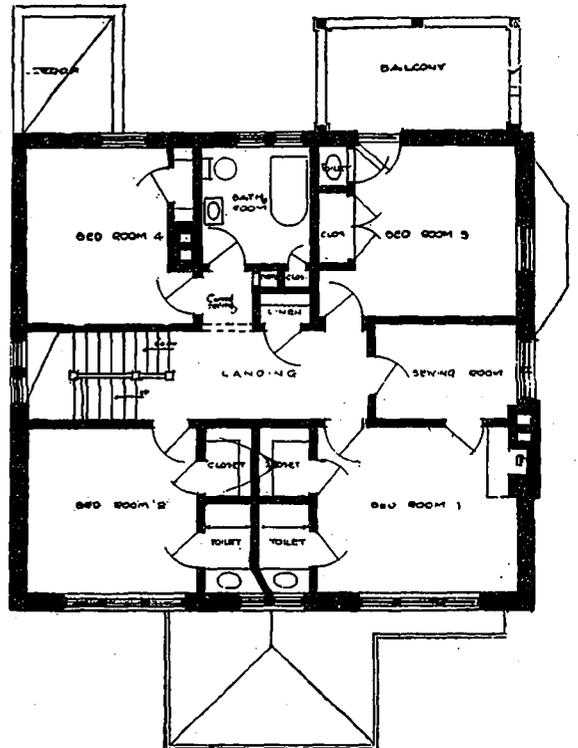
the least, the house in general has much to commend it. It is well planned, original in design and liveable and inviting in every way. Messrs Wickson and Gregg, Toronto, were the architects.



CONSIDERATION OF THE AESTHETIC IN FACTORY DESIGN

Doctrine of good architecture spreading, manufacturers now realize that a well designed building is a good investment.

IT IS AN UNDOUBTED indication of progress in a people when they are not only willing to allow, but are beginning to demand, some measure of aesthetic consideration in the design and arrangement of even their most utilitarian structures. Such evidence of progress, says the "American Architect," is now found practically throughout this country. The development architecturally of no class of buildings has been more rapid than that to which manufacturing buildings belong, and through this development we find a general acceptance of the doctrine that good architecture is a good investment. Probably no longer than a decade ago less than 10 per cent. of



First Floor Plan, Residence of Mrs. M. E. Webb, Toronto. Wickson & Gregg, Architects.

important detail of construction or plan that would lend convenience or economy to the operation of the finished plant. As a result it is probably safe to assert that under present-day conditions, less than 10 per cent. of manufacturing buildings erected

worthy the name are built without aid, counsel or advice from architects.

In satisfying a popular demand for better, more artistic buildings and in many cases their own desires to provide physical comforts, and a degree of mental satisfaction and pleasure to employees, by supplying most modern building equipment and beautiful surroundings, manufacturers have discovered that they have apparently conserved their own interests. Evidence everywhere accumulates that the highest grades of goods are manufactured where the health and comfort of the employees are given greatest attention, and where the buildings and environment supply the greatest measure of physical and mental comfort and happiness. In fact, good architecture as a commercial asset is so indisputably established as to need no defence or explanation from the owner or investor. It is not often that a group of men can contribute to the progress and artistic development of a country, improve immeasurably the conditions of a very large class of workers and greatly enhance their own properties by a single departure from an old and established practice; but this seems to have been the net result of the change made by manufacturers in placing the designing of their buildings and plants in the hands of competent architects with instructions and authority to make them an ornament to the neighborhood in which they are erected, a source of pride, satisfaction and pleasure to the owners and a place where employees can do their work under healthful, comfortable and pleasant conditions. The circumstance is worthy of more than passing thought and notice.



SPECIALIZATION AS IT APPLIES TO THE ARTS AND CRAFTS

Fine architecture possesses a sense of life which makes it distinct from mechanical construction, building and engineering.

TO BECOME EXPERT in the practice of art, it is undoubtedly necessary to choose a branch of art that directly appeals to us, and to devote our whole energies to the mastering of it. In making this choice, a contemporary points out, and in restricting our investigations and studies, very careful judgment is needed. It is without doubt advisable to commence to handle, as soon as possible, the material in which we intend ultimately to express ourselves, but there must always be a liability to confine ourselves within too narrow limits in our study. As a result we discover, probably only too inconveniently late, that some faculty needed to achieve distinction in our work has not been adequately developed. In our day, essentially the day of specialists, this happens with an appalling frequency. It would be well, therefore, that our rising artists and craftsmen should be warned in time of the serious consequences that depend upon the degree to which they restrict their training.

It is true, to an extent that is not readily appreci-

able, that all branches of applied art call, in the first instance, for a balanced faculty, commanding the delicate qualities of form, tone, color, composition, etc. It is a serious mistake to assume, for instance, that an art in which pigments or colored materials are not used does not require the fine sense of color that can be best developed by the study of painting. A good general training is, therefore, the first necessity, and the application of a knowledge of these general qualities, form, tone, etc., to the special branch of art selected must come second.

Then, again, in choosing our special branch of art, many pitfalls await us.

Remember that the separation of art and craft from one another is impossible. Without a mode of expression there can be no art, and the crafts are the modes of expression. Art and craft, by being inseparably united, produce a work of art. They are dependent upon one another equally, each upon each, and good art without good craft, or good craft without good art, are alike impossible. It matters not what branch of art is selected, from picture painting to pavement making, it must be studied as art, and it must be studied as craft, and the two must be brought together into inseparable unity. We should not be misled by the fact that, to-day, among picture painters a true craftsman is so rare; that among pavement makers an artist is so rare. Both are instances of false specialization, which limit the possibilities of achievement.

In this connection remember that designing, as a separate branch of art, is impossible except when the work is to be done by mechanics instead of craft. And, incidentally, works produced by mechanics should not be confused with works of art. The design, for instance, from which a woven fabric is made may be a work of art, but the fabric is a work of mechanics.

Remember, that in a material and the mode of manipulating it there resides the law of the art applicable to it. That this law is so extremely subtle that only by experience in the use of the material can it be known. That without this knowledge there can be no good designing, and a design for one material cannot be fully determined in any other material.

It should also be borne in mind that the separation of sculpture and architecture from one another is impossible; that the two together constitute the art of expression in solid form; that sculpture deals with this as it approximates to the representation of nature, and architecture deals with it as it approximates to abstract conceptions. In fine sculpture, architecture or expression by abstract form is present, and renders it monumental; and in fine architecture, a sense of life, the principle of life in form, is present, and makes it "architecture" as distinct from mechanical construction, building, or engineering. What have come to be regarded as separate arts are really inseparable, and were not separated in the days when the finest architecture and sculpture were produced.

Remember that all work in relief or round form, as, for instance, furniture, metal work, etc., calls for

that knowledge of form secured by the study of sculpture and architecture. Remember that the separation of ornament and structure from one another is impossible; that all ornament is essentially dependent on structure; that all good structure has in it sense of ornament. Remember, above all, that success in any applied art depends primarily upon a knowledge of form and power of draughtsmanship.

METHODS OF BUILDING IN EGYPT

Abstract from interesting paper read at a recent meeting of the Royal Institute of British Architects, by Ernest Richmond, Licentiate.

THE MANNER OF LIFE in an Egyptian town or village, to which the houses give outward expression, is as far removed from modern European life as the houses themselves are ill-adapted to European requirements. The Egyptian word for house is derived from a root meaning to pass the night. The buildings look as if they were never repaired, and many of them as if anything short of reconstruction would be impossible. Their dilapidated appearance is to be largely attributed to the condition of the surface rendering of the walls.

The prevailing physical conditions of the country may be said, broadly speaking, to arise, on the one hand, from the annual miracle of the Nile flood, and, on the other, to the daily miracle of the Egyptian sun. During the flood season a building's foundations are in water or in mud; and, after the Nile has fallen, on hard-caked clay. These changes do not take place without some effect upon the foundations and superstructure. (There is also an extensive range in temperature, not only between winter and summer, but between night and day, producing stresses greater than a wall can resist. Further, the atmosphere is remarkable for its dryness. The floor of Egyptian towns has not been laid down by the Nile, as is the case of the surrounding cultivated land, but has in the first instance been deposited by man, with the object of attaining a ground-level for buildings above the reach of floods. The levels of towns and villages have progressively risen through the ages. A desert site may be sandy or rocky; in the former case the watering of the gardens around the house may result in foundation settlements.

In both the ancient buildings and the mediæval monuments of Egypt the tendency has been to keep the foundations as near the surface as possible. In ancient Egypt there can hardly be said to be any foundations at all, and no attempt has been made to obtain equal intensities of pressure upon the ground or to restrict the intensity to as low a unit as possible. The foundations of the mediæval buildings in Cairo are taken well below the ground-level, but

never to a depth sufficient to reach the level of permanent saturation. The depth depended, probably, on that of the surface rubbish, which, in a comparatively modern town such as Cairo, was not great enough to involve much excavation. Modern Egyptian builders also dig until they get through the surface earth and reach the naturally deposited alluvium, or, as they term it, the "black mud." In the ancient towns, to dig down to the original ground would be out of the question, and in excavating in such places a rule of thumb is followed by the natives. For two-storey houses they dig to a depth of two metres and a half, and for three-storey houses three metres or three metres and a half. Buildings in the highest parts of ancient towns must necessarily stand upon foundation beds of "made" earth compacted only by time.

The original building material in Egypt was mud brick. This material is still used to a very large extent; and although, for important work, it has been replaced by stone and burnt brick, yet the traditional conception of walling derived from mud-brick construction has remained, throughout history, inherent in the Egyptian builder; and it is therefore possible to detect through all Egyptian work—ancient, mediæval, and modern—the dominating presence of those ideas which originated from mud-brick construction. The wall of a building in sun-dried brick and mud mortar is a fairly homogeneous structure; stability is secured not by bond but by thickness, such as is obtained by three or more walls side by side. In modern Egypt one, in fact, of the most noticeable features of native methods of walling is the absence of bond.

In native practice, the materials now most generally used throughout Egypt are burnt brick and mud brick. Rubble stone is also employed, but principally in Cairo and Alexandria, owing to the proximity of convenient quarries. The tendency of an Egyptian mason, if left to himself, when using rubble stone, is to break it into small pieces approaching the size of bricks. The native-burnt brick is usually very rough; it is made of a mixture of mud and chopped straw cast in moulds, then built into clamps and burnt. The just proportion of width to length, necessary for bonding purposes, is not considered, nor is much attention paid to burning the bricks evenly. The materials used for the composition of mortars are Nile mud, fat lime, the dust resulting from crushing burnt bricks, sand, gypsum, and, lastly, "kosremil," which is the residue or ash of a fuel composed of street sweepings used for heating native baths. Various mixtures are used, depending on the locality and on the riches or poverty of the building-owner. The mortar must be prevented from drying too quickly and thereby crumbling to dust instead of hardening. The need for damp in walls built in mud mortar is exemplified by the objection on the part of many native builders to damp-proof courses.

With the materials described above thin, well-bonded, homogeneous walls would neither be safe nor practicable. The Egyptian rarely, if ever, builds a

wall less than half a metre thick. If rubble stone is used the masons work in pairs, one man on one side of the wall and his colleague on the other. Except that each proceeds at more or less the same pace, there is little connection between their work. There is no through bond. Practically two thin walls are constructed independently, and the space in between is filled with smaller stones and large masses of mortar. The mortar, if it is of mud, kosremil, and fat lime, and if it keeps fairly damp, hardens rather than sets. On the hardening of the mortar, more especially on the outside of the joints, the stability of the wall largely depends, and, in order to fortify the outer joints and to render them as capable as possible of serving as small retaining walls to any inferior mortar which may have turned to powder instead of hardening, it is common to bed in the surface joints small pieces of stone. When fat lime and sand mortar is used the same practice is often followed, for it is recognized that this mortar sets only on the face. If the wall is constructed of brick hardly any more attention is paid to bond than in the case of a rubble-stone wall. The same mortars are used solely to provide beds on which to place successive courses of brick. A more or less systematic appearance of bond is given to the face, but the principle is not extended to the interior. Each course is constructed by laying bricks side by side about one centimetre apart; the vertical joints between the bricks are purposely left open. Native-built brick walls, like those in rubble, are rarely if ever less than half a metre thick. Such walls, whether of brick or rubble, and standing upon a foundation bed liable to frequent movements, would of course soon collapse unless the entire absence of bond in the masonry itself were not supplemented. The bond necessary for giving some degree of stability is provided by means of horizontal pieces of timber placed over and under all openings and forming lintels and sills. Ranges of these timbers are carried round the building, and similar ranges are bedded in the walls at the levels of floors and roofs, where they form plates to receive the joints; and other timbers are placed, apparently promiscuously, in any position, independent of opening or levels of floors and roofs. The amount of timber judged necessary depends on the nature of the land built upon, more being used in buildings upon "made" soil, or in soil with an admixture of sand, than in those constructed on the black alluvium.

The surface of the wall is, when finished, provided with a rendering very generally composed of fat lime and sand, to protect the outer joints of the masonry from the destructive influence of the sun and wind. The joints would, without it, become cracked and gradually destroyed, and so prepare for the gradual collapse of the building owing to the escape of the dried and crumbled mortar in the interior of its walls, unless built so phenomenally thick as to be disproportioned to an ordinary building.

The main characteristics of a wall such as that described appear to be its elasticity and the capacity it possesses to adapt itself in a certain measure to

movements, both those in the foundation bed, caused by the rise and fall of the sub-soil water, and those in the superstructure itself, caused by stresses set up by changes of temperature. But such methods cannot produce a building which will not soon after completion begin to show signs of dilapidation. To maintain it in a state of repair considered essential by European or those influenced by European ideas is impossible. The defects being obvious, it is not difficult to propose remedies whereby a more solid, a healthier, and a more fire-resisting building could be erected.

Up to a few years ago it was usual to lay down a thick raft of concrete. This method is now largely replaced by driving concrete piles about three metres apart and connecting the tops with beams of reinforced concrete on which the walls are laid. Broad-spreading foundations of reinforced concrete have also given good results. The introduction of new methods is by no means an easy task, nor is the result invariably successful. It has been found that it is not easy to determine the degree of rigidity which must not be exceeded. Almost as great inconvenience may be caused by too rigidly building a wall or roof as by one which is too loosely put together. Of the boundary walls, for example, enclosing various groups of buildings erected on a desert foundation near Cairo, some were built in bricks and cement mortar, others in bricks and local fat-lime mortar. Those built in cement mortar cracked vertically at intervals of from five to 20 metres throughout their length, while those built entirely in lime mortar were undamaged. It may be added that some walls were built in lime mortar, but with the top course of brick on edge set in cement mortar where this was done the cracks occurred about five metres apart; the cracks extended only through the top three or four courses.

There has been, and still is, a tendency to neglect the effects of temperature changes and to design without reference to them. Modern materials and methods are not unattended by dangerous, or at least highly inconvenient, results in Egypt, owing to the temperature conditions. It is a question yet to be answered how far the modern tendency towards thinness and homogeneity of construction are applicable in that country. This question can only be answered by continued experiment and research. In Egypt there is, as yet, no established tradition capable of providing a suitable and complete guide when building for the fulfilment of modern needs. It is not, then, surprising that European builders have met with some experiences neither happy nor expected. The problem before them is of a two-fold nature. How, on the one hand, to build so as to fulfil modern requirements in regard to stability, fire-resistance, health, maintenance, and repair; and, on the other, to keep within the limits imposed by local physical or climatic conditions. To find the middle way, and to make a satisfactory harmony between the local conditions and requirements of foreign origin must be an object of the architect as well as of other workers in Egypt.



Residence of J. T. Eastwood, Lynwood avenue, Toronto. Ewart G. Wilson, Architect.

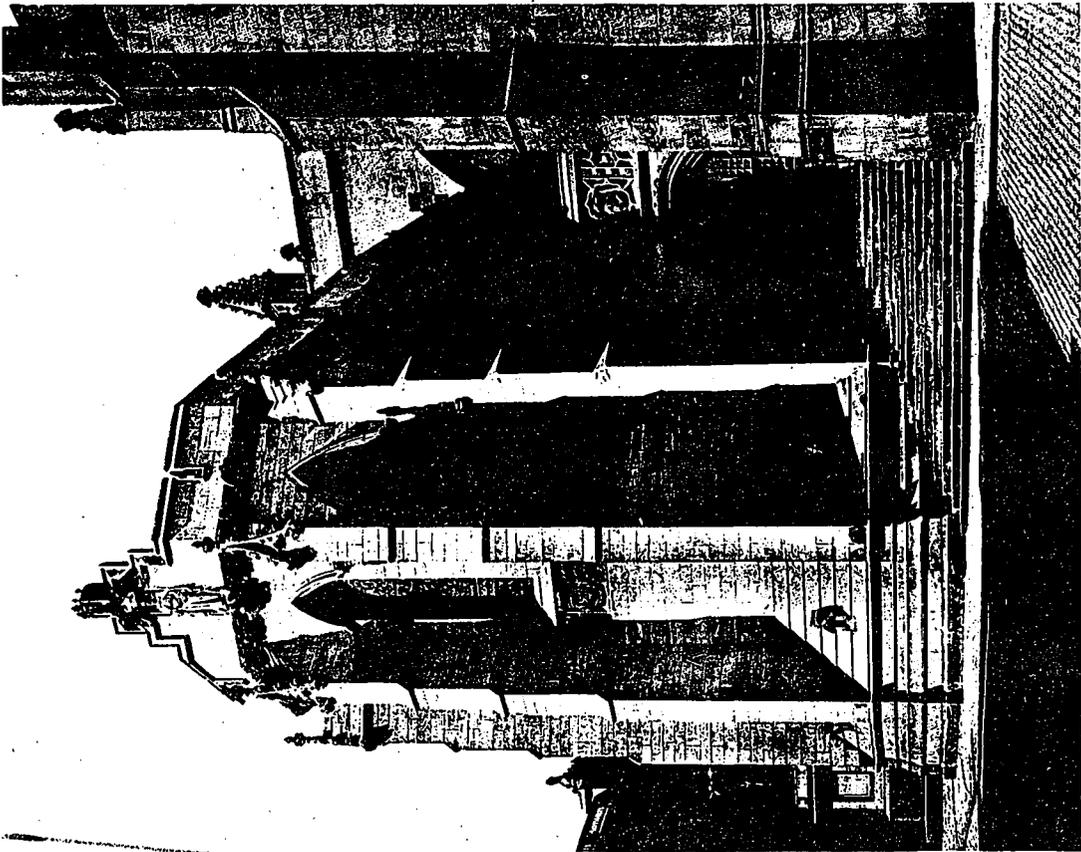


COMPACTLY
PLANNED CITY
RESIDENCE

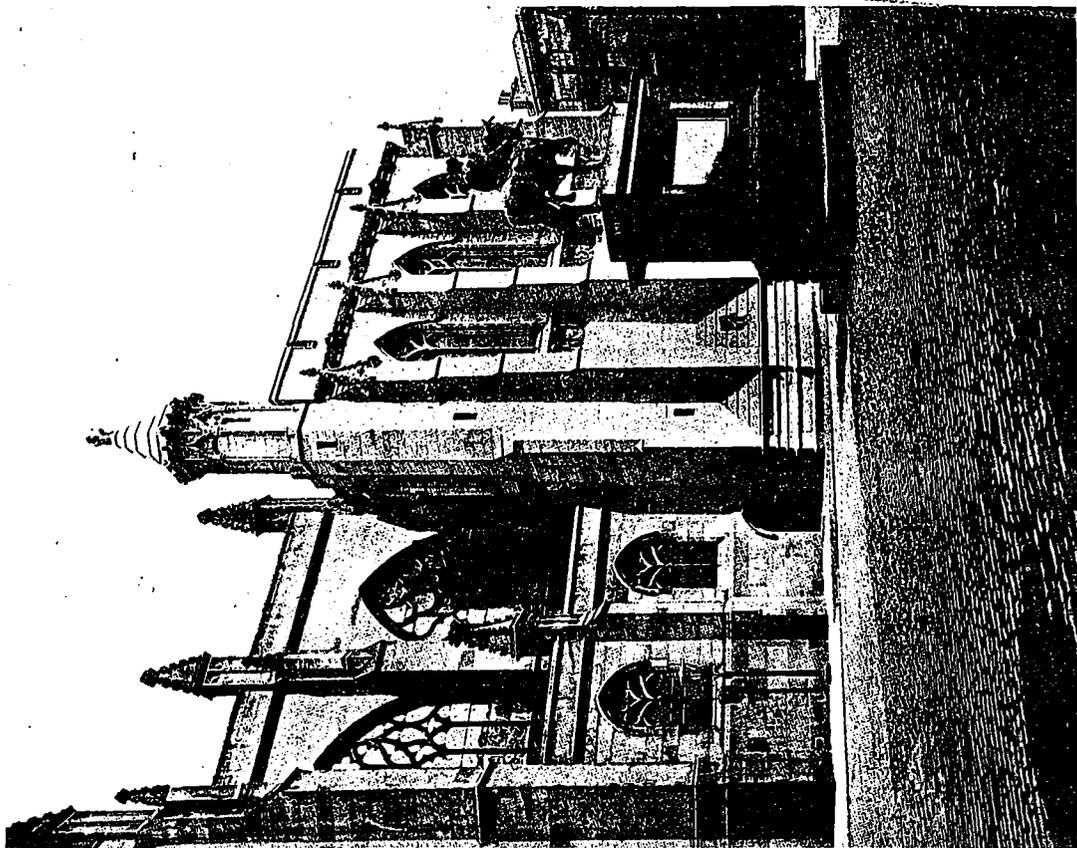
Interior scheme conveniently arranged with the various rooms so placed to give ready access from one part of the house to the other.

COMPACTNESS OF PLAN and convenience of arrangement, two important considerations in the successful designing of a ten or twelve roomed house for the average city lot, are well in evidence in the residence of J. T. Eastwood, Lynwood Ave., Toronto, illustrated above. The exterior, which is modern in its lines, is carried out in dark red brick with dark mortar joints, Ror-characterized by any particular style of design, it is at least, taking into account the investment and accommodation, well considered and substantial in character. An examination of the plans in the accompanying supplement shows a simple and convenient scheme with a centrally placed hall giving direct access to all parts of the house, and the rooms so situated as to give ready communication from one interior to the other. Both the hall and the staircase which has an oriel window at landing, and the dining room, are finished in quarter cut oak. In the dining

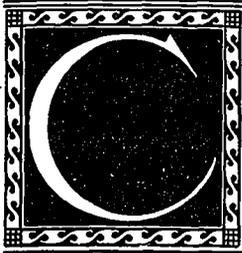
room, which has a recess space opposite the bay window for the sideboard, the ceiling is beamed and the walls are panelled to a height of 8 ft. 6 ins., and finished with a simple plate rail and stucco freize. At the rear, conveniently situated between this room and the kitchen is a large pantry equipped with built-in shelves and cupboards, the detail of which is shown in the two accompanying drawings. The living-room which is finished with a plastered ceiling and corbelled plate rail, has a large Roman brick fireplace, while a similar feature executed in tile, with a mantel made to detail, is found in the reception room which is carried out in white enamel. Behind the staircase is a small second hall, leading from the main hall to the kitchen, and giving access to the stairs connecting with the basement where the boiler room, laundry and usual storage compartments are to be found. On the first floor are three good size bed rooms with well arranged wardrobe accommodations. While not shown on the plan, the large bedroom at the front, which is now used as a sitting room, has a tile fireplace similar in design to one in the reception room. All the rooms on this floor are finished in white enamel with the exception of the sitting room, which is in quarter cut oak. Attention might be called to the toilet arrangement in which the bathroom, which is finished with a tile-dado and floor, and the closet accommodation, are kept separate from each other within a compact space.



East End, Chapel of The Thistle, Edinburgh. R. S. Lorimer, A.R.S.A., Architect.



South Front, Chapel of The Thistle, Edinburgh. R. S. Lorimer, A.R.S.A., Architect.



HAPEL OF THE KNIGHTS OF THE THISTLE

Beautifully appointed edifice erected in connection with St. Giles Cathedral, Edinburgh. Description of its plan and architectural features.

THE CHAPEL of the Knights of the Most Noble and Ancient Order of the Thistle, which was opened at Edinburgh, by His Majesty, King George, on July 19th, is situated at the south-east corner of St. Giles Cathedral, and was erected from the designs and under the supervision of Mr. Robert Stodart Lorimer, A.R.S.A., in association with a body of select craftsmen. The construction of the chapel brought to a consummate state, a scheme in which the late Sovereign, Edward VII, held a cherished interest. As will be recalled by those who are familiar with the project, the late Earl of Leven and Melville, subject to the terms of his will being strictly followed, left a sum of £40,000 with which to restore Holyrood Chapel as a chapel for the Knights; but as restoration, in the view of those best capable to judge, would have meant complete reconstruction, the Holyrood scheme was wisely abandoned, and the money reverted to the estate. Subsequently, however, the young Lord Leven and Melville offered his portion of the £40,000—amounting to between £20,000 and £25,000—in furtherance of a duly authorized scheme. The architectural plan finally adopted admirably solves various problems connected with the cathedral as a place of worship and the restricted space in Parliament Square.

Architecturally the chapel, 35 feet long by 18 feet wide, aims to carry on the style of the stonework of the old unrestored portions of St. Giles', for it was inadvisable to heed the stifled Gothic of the main edifice as venerated by Burns in 1850. To conform with the exigencies of space, which happily coincide with imaginative appropriateness, the dominating sense, especially within, is one of height. On the exterior, the plain surfaces of the sensitively-flushed grey stone is divided by buttresses, which correspond with the vaulting-ribs between the bays inside. At the top of the buttresses Mr. Lorimer has introduced a few grotesques, such as at one time doubtless peered from the structure of the Cathedral. Below the windows are carved in stone the coats of arms of the sixteen existing knights, while at the east end are figures of the Patron Saint of the Order, St. Andrew: the arms of its founder, and its reviver, James VII. and Queen Anne; and below the window the Royal Lion. Within, the value of what has been called the spiritual dimension—height—is enhanced by means of contrast. Through the round arched doorway of about 1640, which to excellent purpose, has been introduced into the new structure

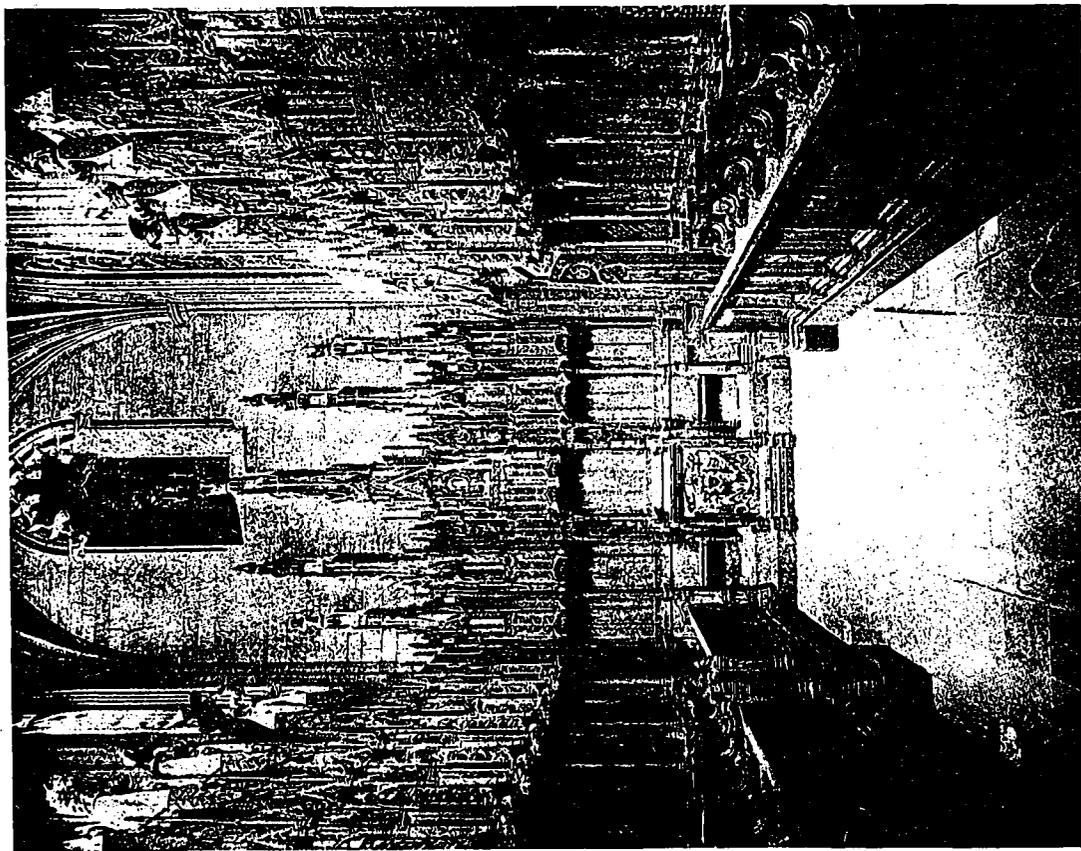
approximately at the place where was formerly the Royal entrance to the Cathedral, there is reached the low ante-chapel, its vaulting heavily bossed. The restriction here of the upper space serves to compress into their smallest limits mental and emotional activity, as a preparation for the immediate succeeding experience. It is from this low ante-chapel that we pass through a doorway richly carved with the Leven and Melville coat of arms, into the soaring Chapel proper, over 40 feet high. Its plain walls have been made solidly beautiful both by the subtly varied color and markings of the stone, taken from the Cullalo Quarry, near Aberdour.

Concerning the treatment of the interior, the "Builder," London, to which we are indebted for the accompanying illustrations, says: The linen-fold panelling, which lines the aspidal end, is peculiarly successful in point of design, execution, and the quality and color of the wood. Throughout the woodwork the clear-cut but by no means inhuman precision of the workmanship upholds the freshness of the design. The chair of investiture is placed on a granite step, and the lion and the unicorn on the octagonal uprights on either hand can be distinguished, and on either side of the chair the hanging lamps of wrought steel in the form of an angel holding a torch, with pendants of the "Pelican in her Piety" (a device which recurs frequently, being symbolical of knightly virtues) in spherical form below. On the right hand is seen the Dean's chair, with its plain *prie dieu*; on the left the lectern, with four "butresses" terminating in the emblems of the Evangelists. The underside of the canopy of the chair is richly panelled and carved, and in a niche is placed an allegorical winged figure, with a spear, treading on and overcoming the dragon, Evil. The canopy is octagonal in form. The floor is of Ailsa Craig granite varied in color, set in a simple pattern, with squares at regular intervals of Iona marble. It forms an admirable complement to the brown woodwork and light-colored stone. The quality of the woodwork is perhaps best seen in the detail view of the King's stall at the west end.

The only existing examples of ecclesiastical woodwork in Scotland of any importance are the few stalls at Dunblane Cathedral and the woodwork in King's College, Aberdeen, and, consequently, the architect, though reverencing tradition, was left almost unaided and free, and the design, as eventually carried out, was evolved partly from drawings and partly from models, a large shed being erected in the



The East End and Chair of State, Chapel of The Thistle, Edinburgh. R. S. Lorimer, A.R.S.A., Architect.

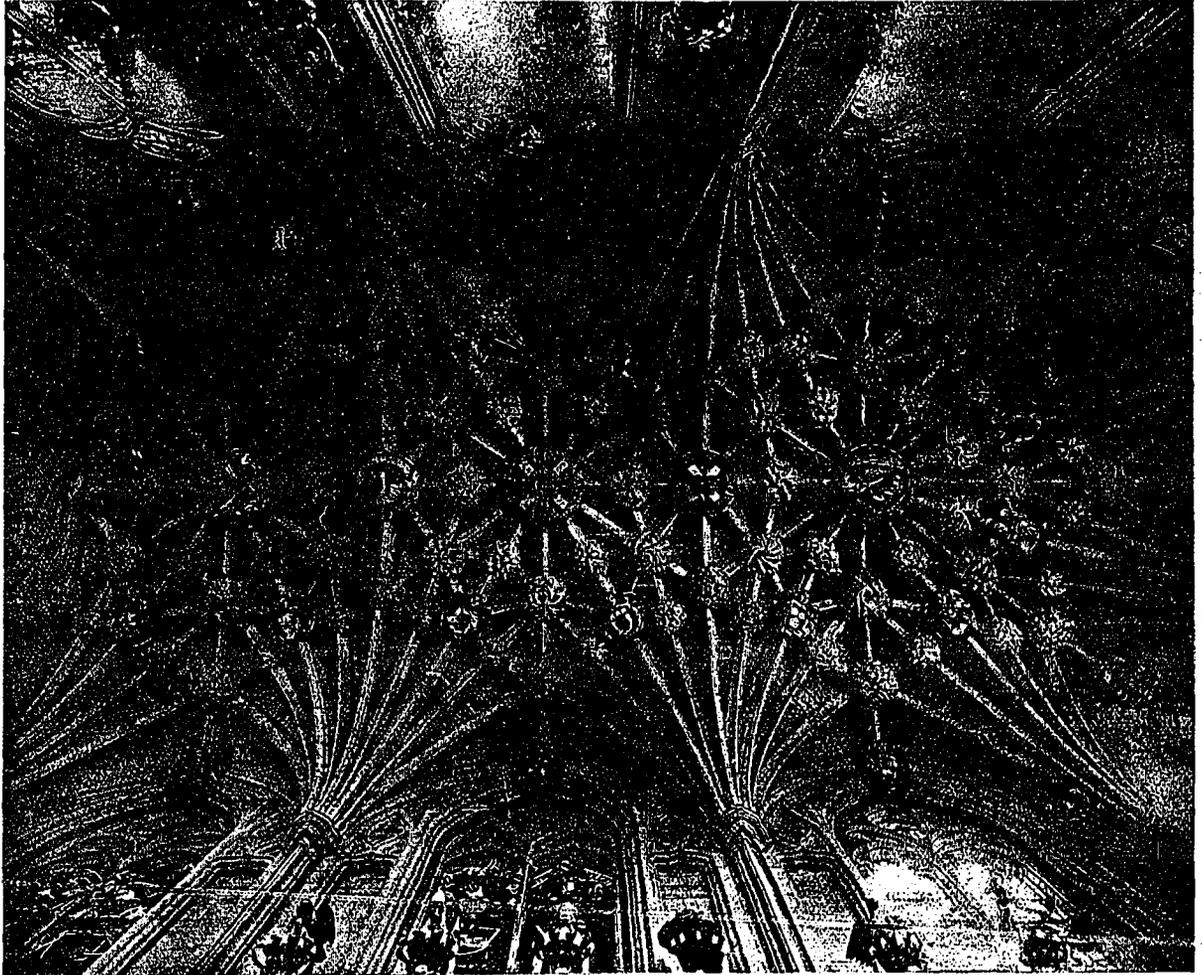


The King's Stall, Chapel of The Thistle, Edinburgh. R. S. Lorimer, A.R.S.A., Architect.

building yard, where models were prepared—the design growing and changing as possibilities and limitations became apparent to the architect and the carvers, with whom he has worked continuously for the last fifteen years. The decorative motives employed, where they are not heraldic or appertaining to ecclesiastical allegory, are drawn from themes in Nature—the thistle, the vine, the rose, the acorn, and so forth, so treated as to make a coherent scheme of natural symbolism throughout.

The dais on which the Royal stalls at the west end are set is about 1 ft. 4 in. in height, His Majesty's seat in the centre being a little higher than the Prince

met, the coronet and crest, and the mantling peculiar to the knight concerned. These achievements, in combination with the stall-plates in Champeve enamel, give color and an ordered variety of inestimable value. The windows, necessarily at a great height from the floor, to clear the stalls, also give color, but of a more accustomed sort. Each with the exception of the small west window and the central one of the eastern apse, are double-light windows, heavily tracieried at the top. The square west end has one small window, with very deep embrasures obtained by setting it in an exceedingly fine oriel. The hexagonal apse has three windows, and the

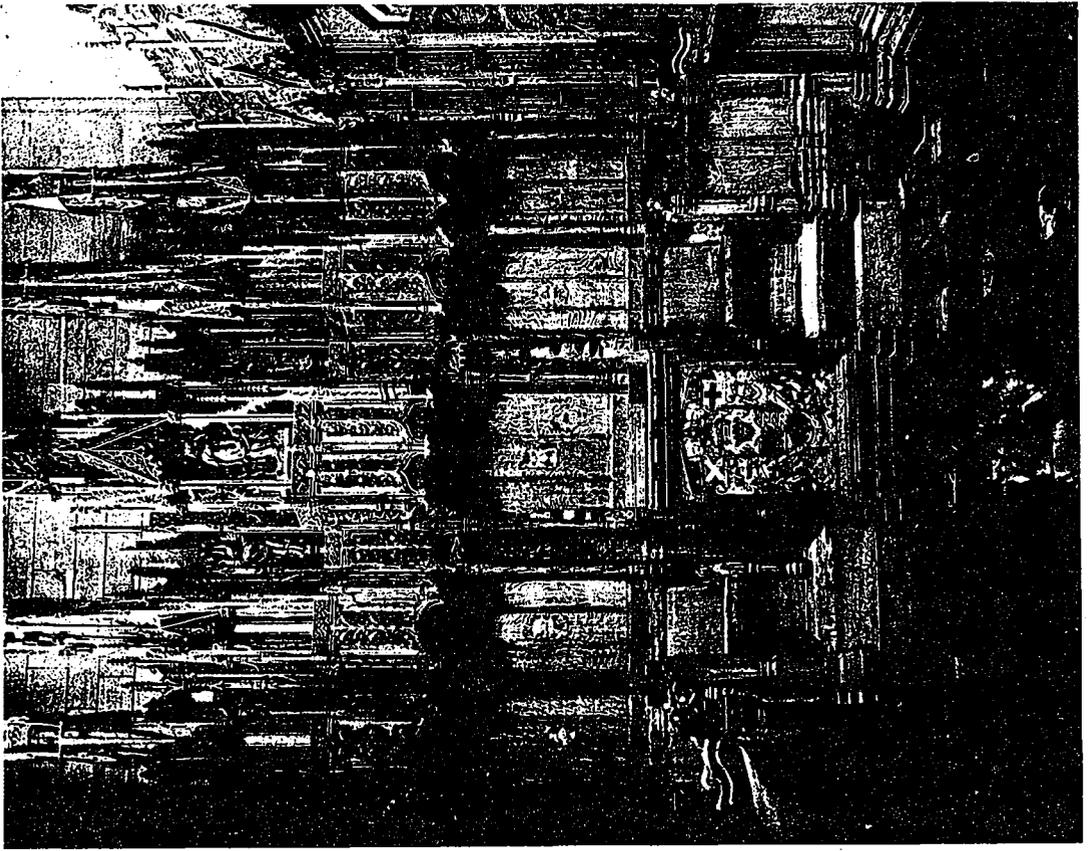


Detail of Vault, Chapel of the Knights of the Thistle, Edinburgh. R. S. Lorimer, A.R.S.A., Architect.

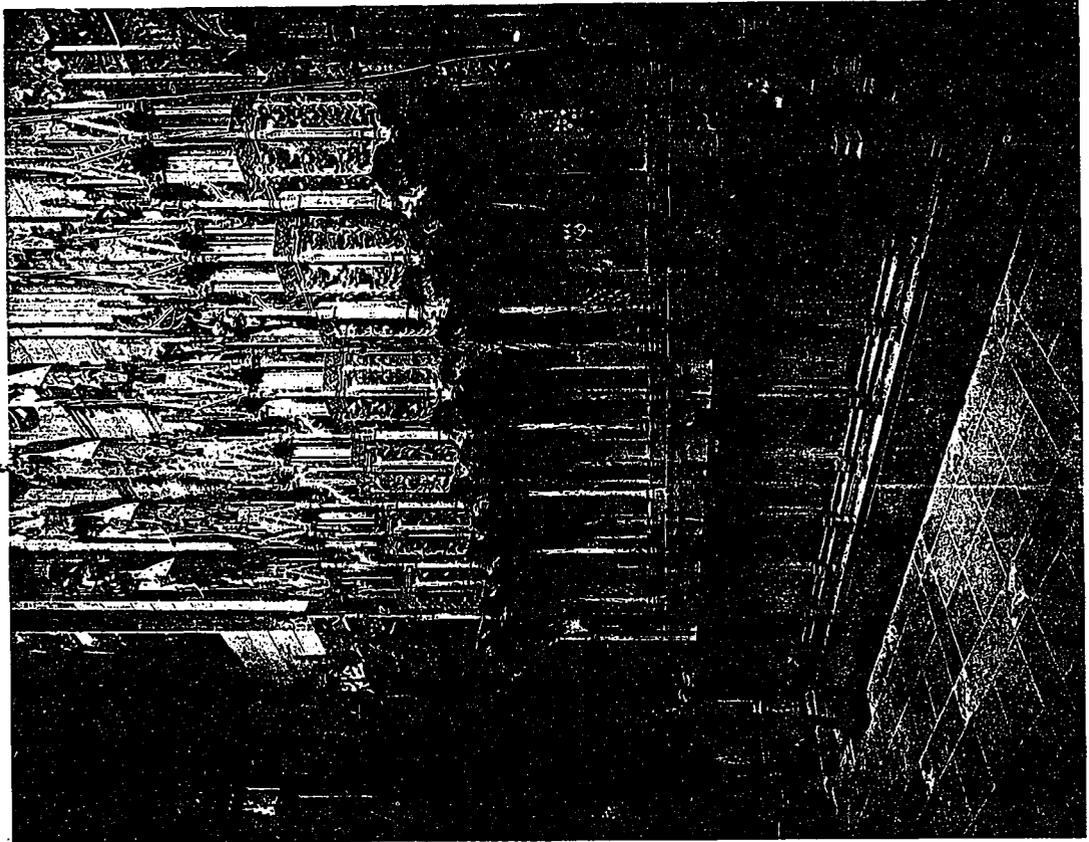
of Wales' and the Duke of Connaught's on either hand, and above, the "stepped" arrangement of the canopies, seen best in the view showing the whole chapel, is happy in the effect it gives of additional dignity to the Monarch's seat. In this canopy may be seen St. Margaret of Scotland, leading children, while on either side, but hidden in the photograph, are St. Kentigern, with the model of his cathedral, and St. Columba in full canonicals, and with the robin perching on his wrist. The height from the floor to the top of the King's canopy is 33 ft., whereas that of the side stalls is only 25 ft. Each is surmounted with the "achievement" of the Knight for whom it is destined, consisting of the sword and hel-

met, the coronet and crest, and the mantling peculiar to the knight concerned. These achievements, in combination with the stall-plates in Champeve enamel, give color and an ordered variety of inestimable value. The windows, necessarily at a great height from the floor, to clear the stalls, also give color, but of a more accustomed sort. Each with the exception of the small west window and the central one of the eastern apse, are double-light windows, heavily tracieried at the top. The square west end has one small window, with very deep embrasures obtained by setting it in an exceedingly fine oriel. The hexagonal apse has three windows, and the

south side three and the north only one—by a happy inspiration which chose to fill the two western bays with colored panels in relief, and so avoid a distressing conflict of cross light, and induce a sense of attachment to the larger structure of St. Giles on that side. Each double window carries in clear colored glass the name and arms of two of the knights. The one-light eastern window is dedicated to St. Andrew. The west window, in a color scheme of gold and brown, carries the Royal arms, according to the Scottish quartering, and underneath those of the Prince of Wales and the Duke of Connaught. The roof is founded on late XVth century examples, which time is by many people considered to be the



Detail of King's Stall, Chapel of The Thistle, Edinburgh. R. S. Lorimer, A.R.S.A., Architect.



Knight's Stalls, Chapel of The Thistle, Edinburgh. R. S. Lorimer, A.R.S.A., Architect.

zenith of the Gothic style, as the roofs of that period read as real constructive builder's stonework, which cannot be said of the fan tracery type of vault which came later. The aim has been to keep the stonework strong and vigorous, partly because the Scottish Gothic never attained the exquisite refinement seen in some English examples, and also because modern work is often too timid in scale as compared with old. As regards the bosses, the main bosses at the apex of the chapel roof represents the Royal Arms, St. Giles, St. Andrew, the Jewel of the Order of the Thistle, and the large boss at the intersection of the apsidal end of the chapel, the "Pelican and her



Entrance from the Ante-Chapel—Chapel of the Knights of the Thistle, Edinburgh. R. S. Lorimer, A.R.S.A., Architect.

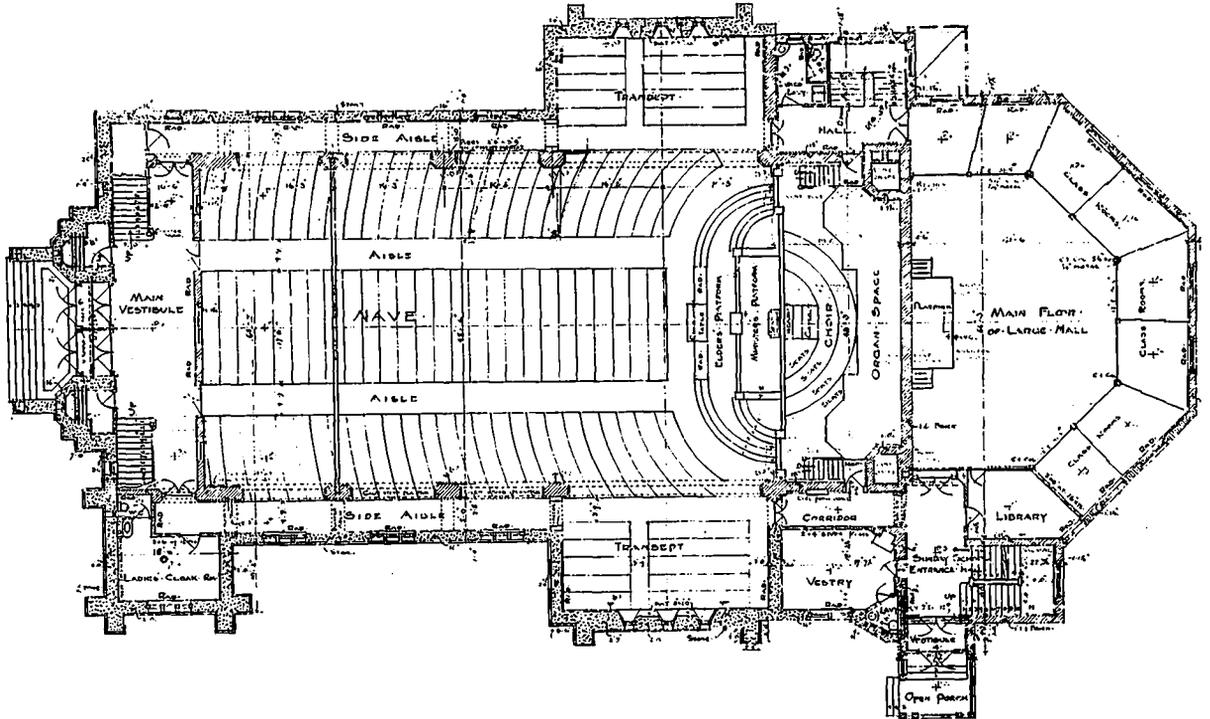
Piety." The bosses that are not heraldic are treated with some definite motive from Nature in the manner noted above concerning the canopies. The ante-chapel is 25 ft. in length, by 14 ft. It is vaulted in two bays, and, like that of the chapel proper, its vault may be described as groined vaults, richly ribbed, having main ribs, transverse, tierceron, and lierne ribs with carved bosses at all intersections.

CANADIAN SLATE.

AN ACCOUNT of the slate deposits and the slate industry in Eastern Canada is included in a report recently issued by the Geological Survey Branch of the Department of Mines, Ottawa. According to this publication, that portion of the Province of Quebec which lies south of the St. Lawrence River is traversed in a north-easterly direction by a series of serpentines and related rocks, known as the serpentine belt. This belt is important for its production of asbestos—a large part of the world's supply—and for the deposits of chromite, soapstone,

copper and antimony, which it is known to contain. The principal quarry of roofing slate now in operation in Canada and some promising bodies of marble are also intimately associated with the igneous rocks of this belt. Slate of good quality, both for roofing and other purposes occurs in several places in the Ordovician and Cambrian strata adjacent to the serpentine belt. In a number of these places quarries were opened between 30 and 50 years ago, but most of them have long since been closed from one cause or another, principally, it would appear, from an insufficient market at the time they were operated. At the present time these conditions have apparently changed for the better, and the slate deposits might properly receive renewed attention. The imports of slate into Canada for the year 1908 had a value of \$131,069, while the slate produced in Canada during the same year, all of which came from this district, was valued at \$13,496. The Ordovician slates are dark, or bluish grey in color, and have an excellent cleavage, nearly vertical, which may be at any angle to the bedding planes. These slates have been quarried at Danville, Corris, Brompton, Melbourne and New Rockland. The last mentioned quarry is the only one at present in operation in Eastern Canada. The slate produced is of excellent quality. The new Rockland quarry has been operated almost continuously since 1868. During the past eight years it has been worked by Messrs. Frazer and Davies under a lease from the New Rockland Slate Company. Some 35 men are employed, two steam drills and three derricks are in operation, steam and water power are used. Only roofing slate is now made. The quarrying is done in open pits, the work being cut down in benches. While working on higher levels in a deep pit, the waste rock is allowed to accumulate to some depth in the bottom in order to lessen the loss from breakage of good slate by falling into the pit after blasting. The Cambrian slates are green and reddish or purple in color, and where there is a mingling of these colors a handsome mottled slate results. The green color is that known as the unfading green. They split less smoothly than the dark slate, having a coarser texture and are frequently not so strong. The quarries that have been opened usually show large bodies of slate free from quartz veins and sometimes having different colors in different parts of the same pit.

RECENT TESTS at Sandy Hook, of the resisting power of reinforced concrete as a defence against high-powered projectiles confirm the calculations of the penetrating power of the twelve-inch gun. A concrete wall twenty feet thick, heavily reinforced with steel beams, was pierced by a twelve-inch projectile fired at high velocity. The blow delivered was sufficient to penetrate twenty-two inches of armor plate, and the reinforced concrete withstood the attacks so well that it will probably be used in the construction of the new west coast defence fortifications in the Philippines. A similar attack is to be made with the fourteen-inch gun.

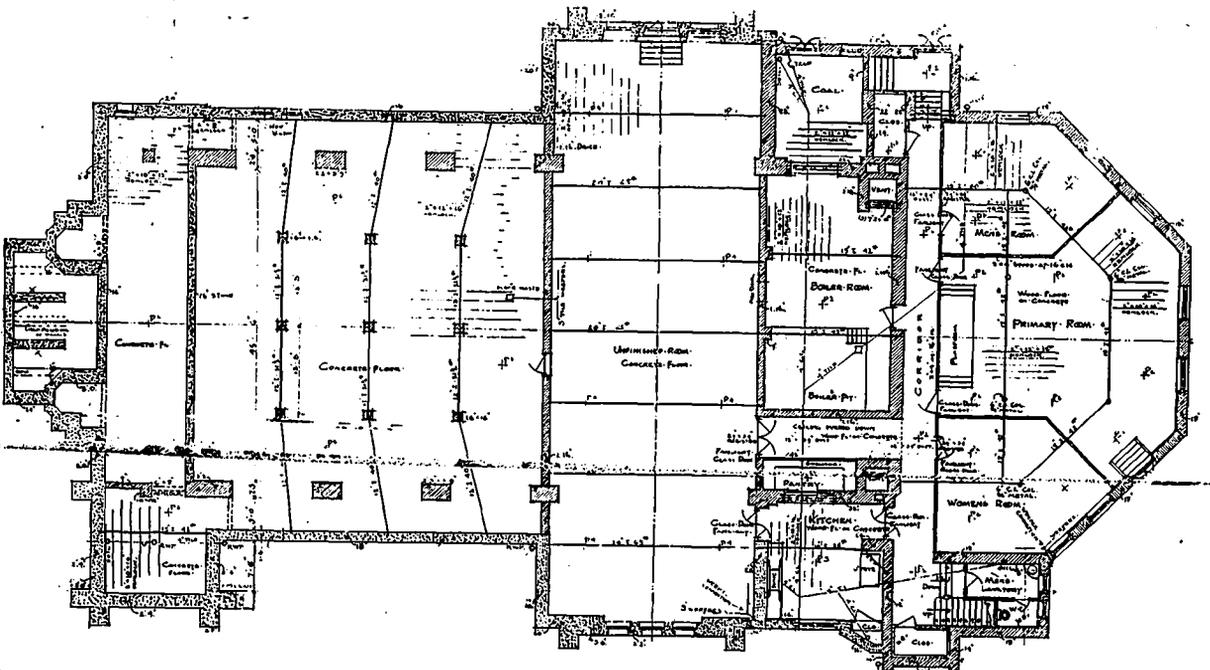


Ground Floor Plan, New Deer Park Presbyterian Church, Toronto. Sharp & Brown, Architects.

CEMENT BUNGALOWS.

ARCHITECTS AND HOME-BUILDERS have discovered, of late, that cement can be adapted to the construction of the bungalow with distinct success. Following this discovery, many bungalows of this kind are being erected in various parts of the country, and when skill and good taste are exercised in designing them, they present a very

homelike and attractive appearance. Indeed, the indications are that cement will be one of the most common materials used in the construction of bungalows during the years to come; for the bungalow, as a type, has become firmly entrenched in the esteem of the people who desire simple and unpretentious homes, while cement has been established as one of the most valuable building materials known.—Sub-urban Life.



Basement Plan, New Deer Park Presbyterian Church, Toronto. Sharp & Brown, Architects.



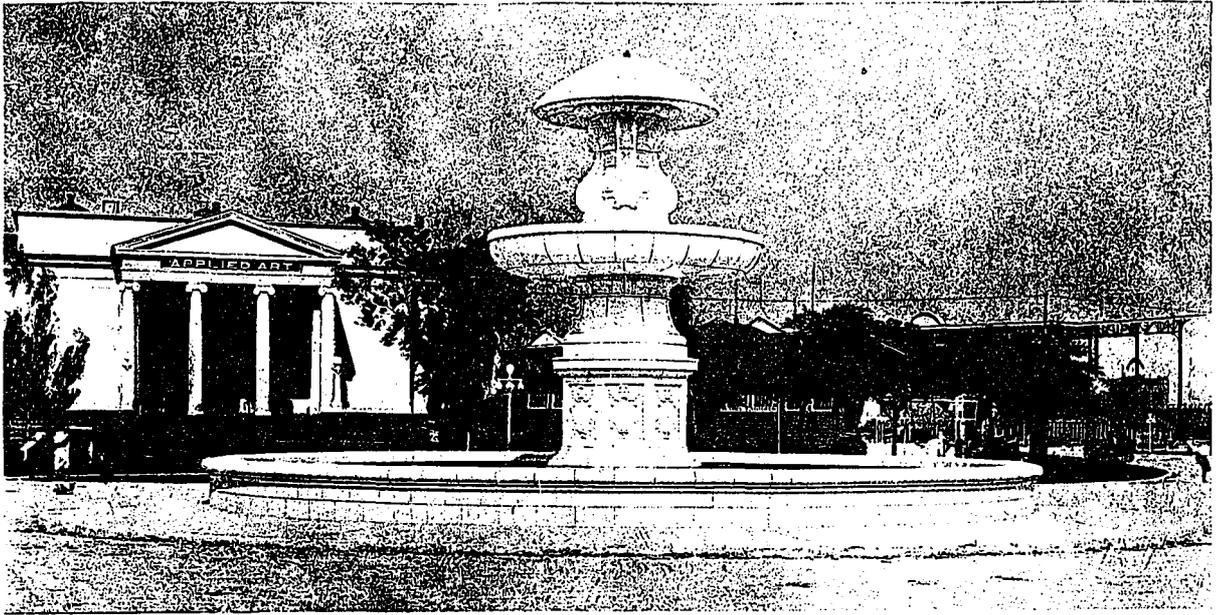
Perspective of New Edifice Now Being Erected for the Deer Park Presbyterian Congregation, at the Corner of St. Clarens Avenue and Foxbar Road, Toronto. Sharp & Brown, Architects.

THE DEER PARK
PRESBYTERIAN
CHURCH, TORONTO

New edifice now in course of construction interesting in scheme and plan. Will provide accommodations for 1,050 worshippers.

THE NEW EDIFICE for the Deer Park congregation, which is now in course of erection on St. Clair Ave., Toronto, presents an interesting scheme in that the plan is more of an ecclesiastical type than is usually found in Presbyterian churches. The nave, which terminates in a choir and organ recess or chancel, has a long effect with a gallery extending across the rear end only. The lighting of the nave is through windows in the clerestory which is carried on an arcading. In that the side aisles only are outside of the piers of the arches, the arrangement is such as to give an entirely unobstructed view of the pulpit and the choir from any part of the edifice. The roof of the building, which is vaulted and intercepted by the vaulting of the transepts, will be of stucco plaster with molded ribs running down to carved brackets on the side walls, while the arches and arcading will be finished and jointed in caen stone cement. As regards seating, the church will accommodate 1,050 worshippers. The Sunday school, which adjoins the church on the south, is divided into class rooms for the primary and

Bible class departments, the rooms and the large hall about which they are grouped, having a total seating capacity of about 500. This part of the building has an outside entrance of its own, and can also be entered from the main edifice through corridors placed at either side of the choir and organ space. In the basement of the building is a large recreation or social hall, which is fitted up with a modernly equipped kitchen and pantry. This part of the building also contains the boiler room and men's wash room. In planning the edifice, provisions have been made for future extension of the primary and ladies' departments in the wing west of the Sunday school, shown on perspective drawing. The church and Sunday school are of Credit Valley stone of a warm buff color in hammer squared rubble, with Indiana stone trimmings on the ground floor, and terra cotta trimmings and tracery windows above. The main roof is carried on steel trusses and is finished with slate. The tower is 80 feet high, and the parapet and pinnacles are of terra cotta. The structure is being erected from the plans, and under the supervision of Architects Sharp & Brown, Toronto, and the firms connected with the various branches of the work are as follows: Mason work, Leslie & Killer; carpenter work, Geo. Nicholson; plastering, Thos. Fitzgerald; plumbing and heating, W. J. MacGuire & Co.; electric wiring, Geo. Beattie; roofing, G. Duthie & Sons; painting and glazing, J. McCausland & Sons; terra cotta work, Chillias & Black; Steel metal work, W. Davis & Son.



The new Gooderham Fountain which forms an Attractive Feature on the Main Concourse at the Canadian National Exhibition Grounds.

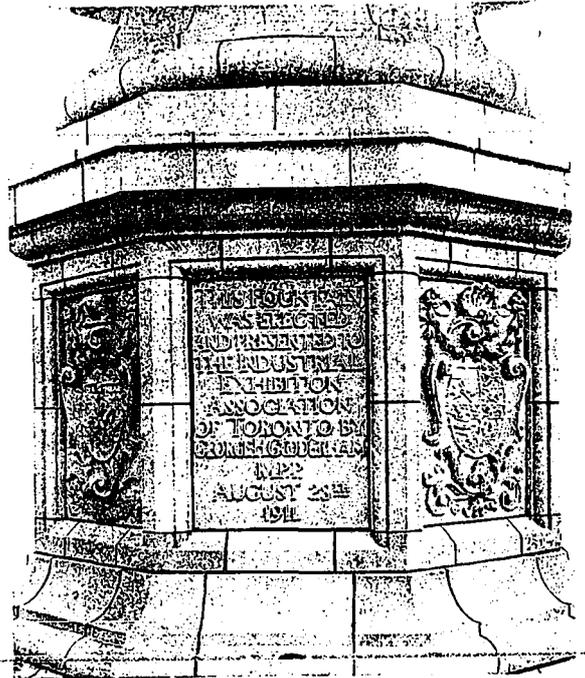
THE NEW FOUNTAIN AT THE EXHIBITION GROUNDS, TORONTO

Reproduced in terra cotta from one of two similarly designed fountains by Michael Angelo in front of St. Peters', Rome.

NO ATTRACTION at the Canadian National Exhibition this year is being more generally admired, or exciting more favorable comments, than the new Gooderham Fountain which stands on the main concourse between the Gallery of Applied Arts and the Manufacturers' Building. The consensus of opinion is that it is a beautiful piece of work, and a credit to its donor, Mr. George H. Gooderham, President of the Board of Directors, who presented it to the City of Toronto on the opening day as a permanent feature of the Exhibition Ground, as well as a tribute to the skill and workmanship of those who were entrusted with its execution and erection. The fountain, with one exception, is an exact copy of one of the pair of similarly designed fountains erected by Michaelangelo in front of St. Peters at Rome. Instead of the papal emblems, the shields on the octagonal base represent the British, Dominion, Provincial and City coat of arms, with one of the eight spaces taken up with the presentation plate. Aside from this one deviation, the exact design with its chaste detail, has been reproduced with the greatest care and fidelity. The fountain is built entirely of "Carrara" terra cotta, which derives its name from the resemblance which its semi-glazed appearance bears to the soft grayish tone which white Carrara marble, such as is used in the original fountain, takes on in time. This terra cotta is manufacturer by a secret process and was

supplied by Doulton's Ltd., an English firm, for whom Chillas and Black, of Toronto, who secured the contract and supervised the erection, are the Canadian Selling Agents.

From the base to the top of the semi-spherical cap, which crowns the terminating pedestal, the height of



Detail of Octagonal Base—Showing Two of the Seven Shields and Presentation Plate.

the fountain is 25 feet, while the enclosing wall of the basin which surrounds it, is 44 feet in diameter. It is a gift of which the city might well feel proud and as a piece of decorative work in terra cotta, few examples can be found which are its equal.

PARIPAN.

IT IS NOT GENERALLY known that disease germs can be projected 40 feet by a speaker, yet according to a statement made by Mr. F. Sturgeon, 34 Yonge St., Toronto, agents for Randall Bros., at their exhibit of Paripan in the Stove Building at the Canadian National Exhibition, this fact has been satisfactorily established. As his authority, he quotes an extract from the "London Times," the well known English newspaper, which is as follows: "The British government investigations as to the spread of disease, such as epidemics of diphtheria in schools, and of influenza in the House of Commons, have proved that the cause is attributable to bacterially-contaminated moisture, projected from the mouth when speaking. Experiments show that persons infected with, or convalescent from contagious and infectious diseases, and carrying the bacilli on the mucous membrane of the mouth and throat, can project them a distance of 40 feet. A specially prepared plate having been placed upon the Cabinet Minister's box in the House of Commons, a speaker's throat was inoculated with a special, but harmless and easily recognized bacillus (*B. prodigosus*), subsequent examination proving that no less than 83 colonies of this particular bacillus had been formed upon the prepared test-plate, and this from the mouth and throat of one speaker only! This statement is employed as an argument by Mr. Sturgeon to show the need of the use of "Paripan," which is a lacquer enamel finish, having a hard, dense, sanitary surface, in building of a public and semi-public character. This enamel, it might be said, has been in use in some of the most world-famed hospitals, for ten to 15 years without being renewed, during which time it has been washed down regularly without in any way affecting its color or sanitary advantages. The diagrams showing the surface of "Paripan," and also the panels which are being exhibited, make the advantages claimed for this product fairly obvious to the naked eye. Unfortunately, most of the "Paripan" exhibits have been delayed owing to the strike in England, but as these will probably arrive before the end of the week there will still be an opportunity for interested parties to view them.

HEART-SHAPED MIXERS.

AS IN PAST YEARS, a large number of visitors at the Canadian National Exhibition were attracted by the display of Wettlaufer Bros., who demonstrated in a practical way nine different sizes of their new improved concrete mixers in a large tent opposite the Machinery Hall. The many claims made for "Heart Shaped" mixers seem to be well substantiated by the increasing orders which the sales department of this firm is recording year after year. One of the more important undertakings on which they are being used at the present time, is the manufacture of cement poles for the Hydro-electric system, which are to be seen throughout the residential sections of Toronto and towns in the province. So far over 12,000 poles have been manufactured and at the present time the contractors are turning them

out on an average of 250 a day. "Ask those who are using the Wettlaufer mixer, they'll tell you," is the confident manner in which this firm invites prospective customers to investigate the merits of their product; and it must be said that at the Exhibition grounds there were among those who stopped at the Wettlaufer tent, a large number of contractors and engineers who readily gave their endorsement. Prices, testimonials, etc., will be mailed to any interested party writing this firm at any of the addresses found in their advertisement in this issue.

SOME RECENT CONTRACTS.

RECENT WORK SECURED by the Bishop Construction Company of Montreal and Toronto, includes the new building to be erected by the Herald Publishing Company, at the corner of Craig and St. Alexander Streets, Montreal. This structure is to be of reinforced concrete, seven storeys high, with about 12,000 square feet to the floor. The outside walls are to be finished in brick and terra cotta, with metal sash and frames for all openings. The elevator wells will be encased in hollow tile, and all interior partitions will be of reinforced concrete. When completed, the building will be one of the most modernly equipped fireproof structures in that city. Messrs. Brown and Vallance, of Montreal, are the architects.

Another contract of recent date is the D. M. Ferry Building, Windsor, Ont., which is to be erected at a cost of \$72,500, after plans by Henry Mason, Architect, of Detroit.

The company has one of the largest and most efficient working organizations in Canada, and it is admirably prepared to render architects a prompt engineering service, and to execute important contracts in any part of the country.

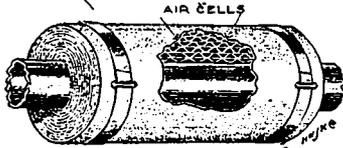
THE NATIVE STONE used for building construction in Bermuda, is of peculiar formation, being the result of the work of coral and other sea creatures through the countless ages since a volcanic disturbance at the bottom of a very deep sea first sent up, with many subsidences and subsequent upheavals, the island that for nearly 300 years has now remained without perceptible change. This stone is soft and friable, hardening with exposure. It is cut out with handsaws and, with a coating of cement, becomes waterproof. It is used principally for building and for garden walls. A very hard stone of this class is found in limited quantities; crushed or broken it makes excellent road ballast.

THE LINDE BRITISH Refrigeration Company of Canada, with head offices at Montreal, will hereafter be known as the Linde Canadian Refrigeration Company. The change in the name, however, will in no way alter the personnel of the company, or affect in any particular the construction of its well-known refrigerating machinery. This firm is purely Canadian, and it is the only concern in the Dominion engaged in this particular line of manufactory.

IT IS A MISTAKE, says "Insurance Engineering," to suppose that premiums paid for fire insurance suffice to replace what has been destroyed by fire. The conflagration losses in San Francisco, Baltimore, Paterson, Toronto, and in hundreds of smaller places, during the past ten years, were not paid from the premiums collected in each of those cities or towns, but from funds contributed by the entire country. Without this help, San Francisco, for example, would have been compelled to raise several hundreds of millions of dollars for building purposes, with little security to give. The fire waste is a tax on all. Shifting the burden of fire prevention and fire protection onto the community is selfish and unbusinesslike. No man can conduct a business without dealing with others. Conditions in American cities are such that personal neglect frequently spreads disaster to one's neighbors. A personal interest in fire prevention on the part of every man, woman and child will quickly bring relief from the fire waste to the entire country.

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The greatest factor in economical heating is an efficient pipe covering. When steam or hot water are delivered through uncovered or poorly insulated pipes the loss by radiation and condensation, and the consequent waste of fuel, is enormous. Unfortunately, radiation and condensation cannot be observed, consequently many who realize the necessity of covering pipes do not realize that many pipe coverings are but little better than none and are only deceiving.

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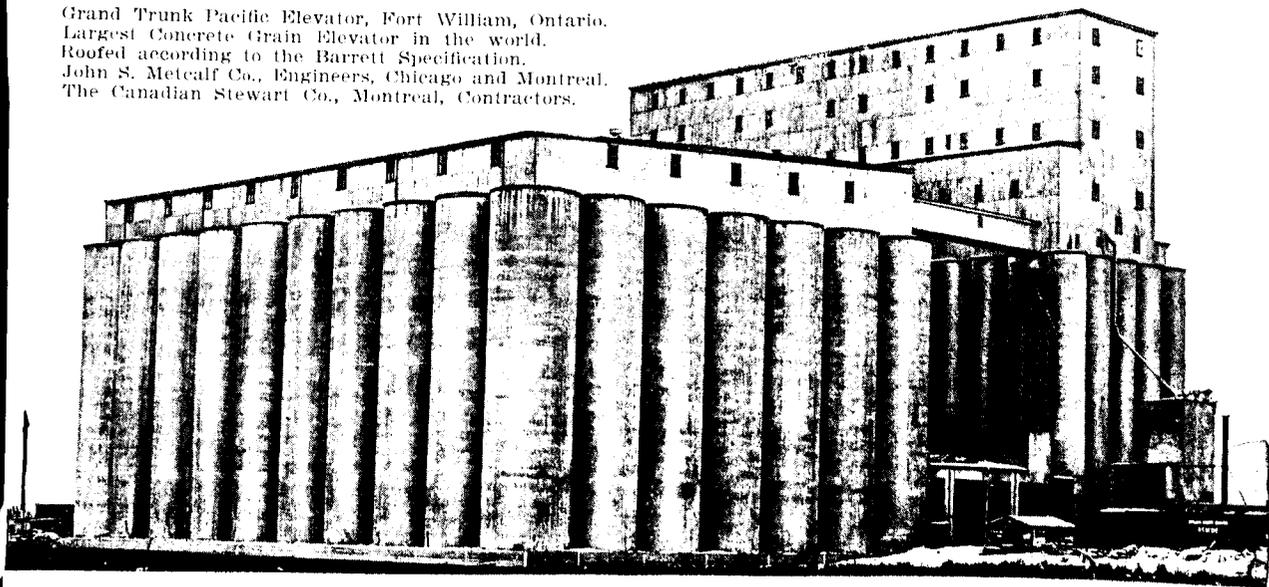
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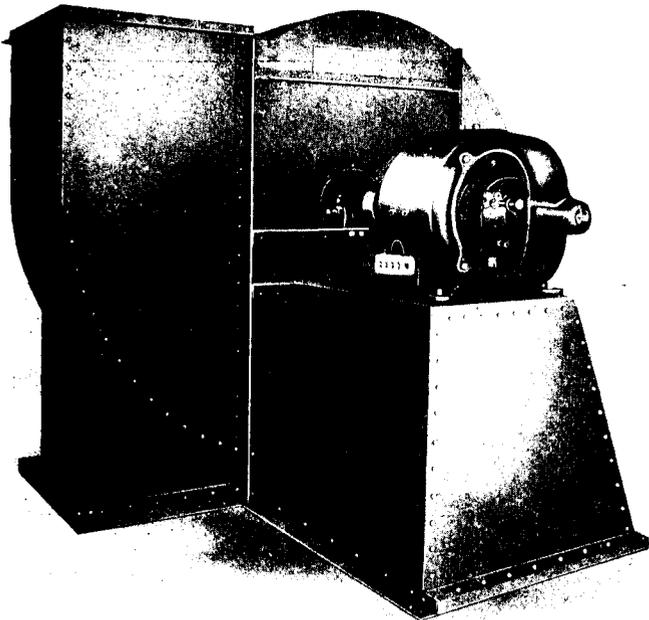
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Wettlaufer Heart Shape Mixer making Hydro Electric Poles at plant on Spadina Road.

14,000 HYDRO ELECTRIC LIGHTING POLES have been made by **WETTLAUFER** HEART SHAPE CONCRETE MIXERS

This same Mixer is averaging 250 poles a day. While this Mixer has been in constant operation for over a year! It shows no sign of mechanical wear and tear, and is in as good condition at the present time as the day it was put on the job.

Wettlaufer Heart Shape Mixers are noted for their durability, perfect operation, and thorough and quick manner which they turn out the batch.

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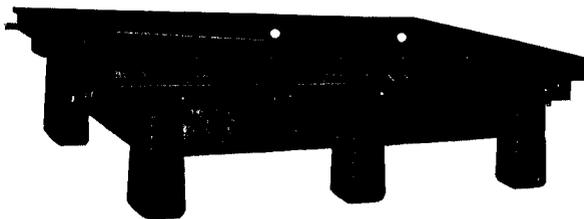
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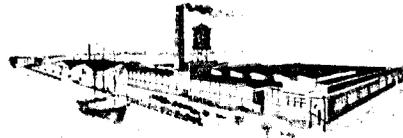
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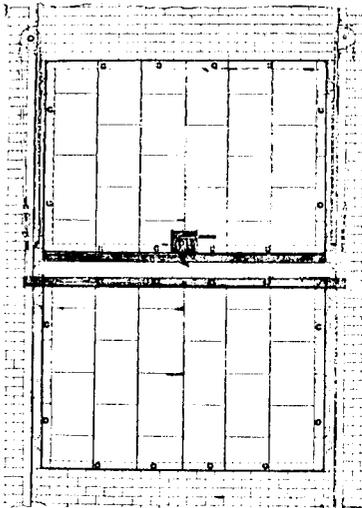
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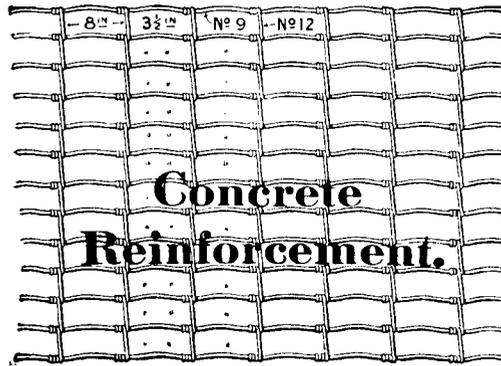
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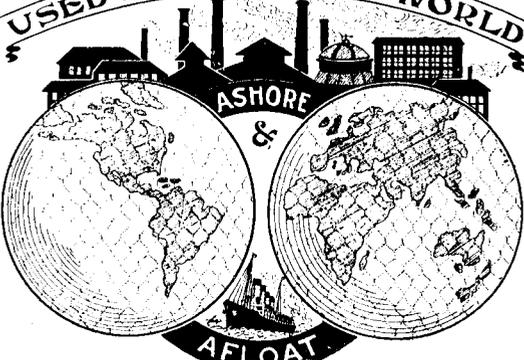
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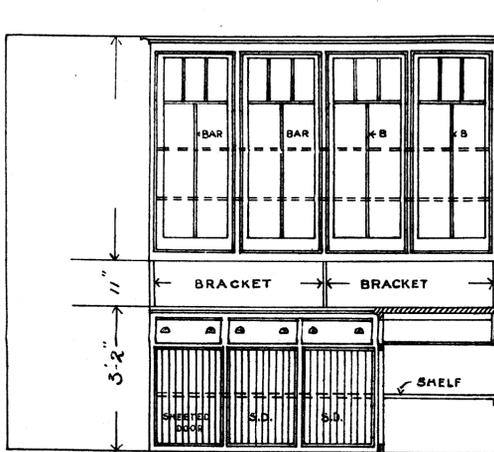
- Metal Shingles. Galt Art Metal Co. The Pedlar People.
- Metal Store Fronts. E. F. Dartnell, Dennis Wire & Iron Co. Hobbs Mfg. Co.
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- Wire Rope and Fittings. B. Greening Wire Co. Limited. Mussels, Ltd. Otis-Fensom Elevator Co.

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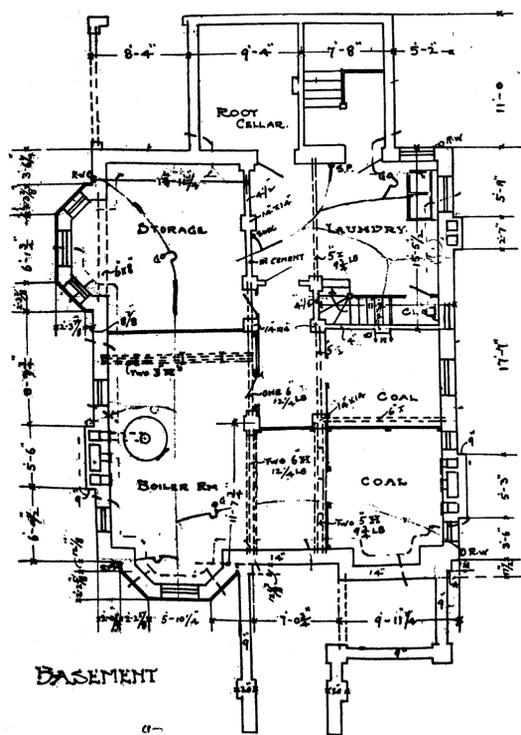


Detail of
Pantry

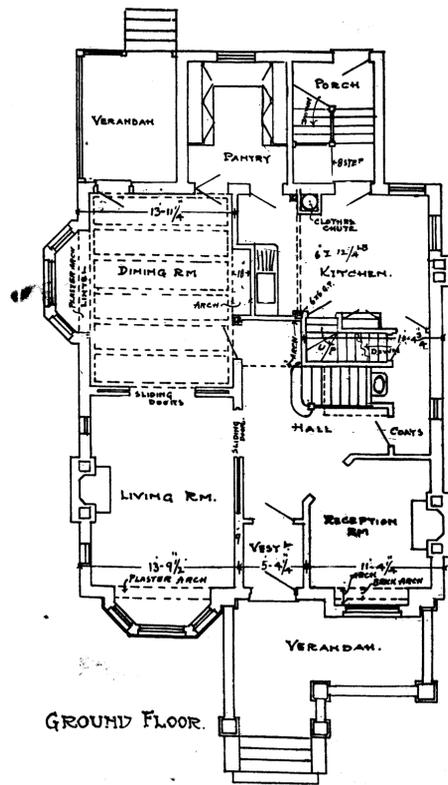


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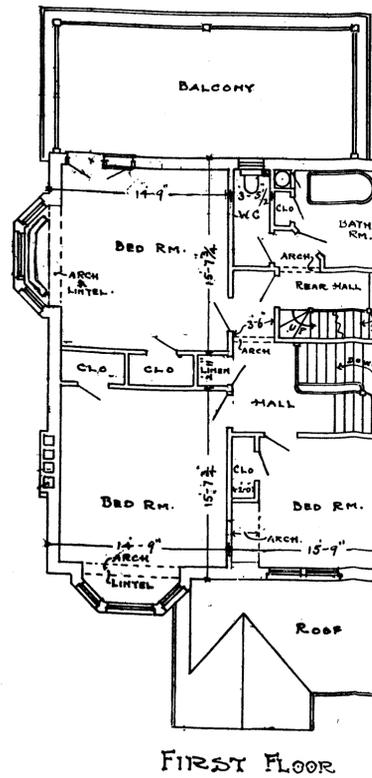
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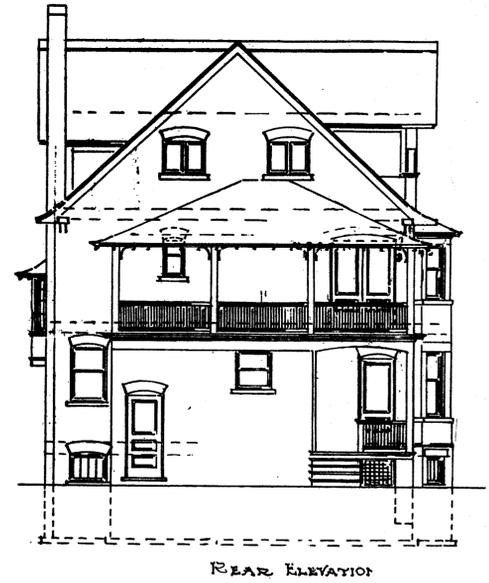
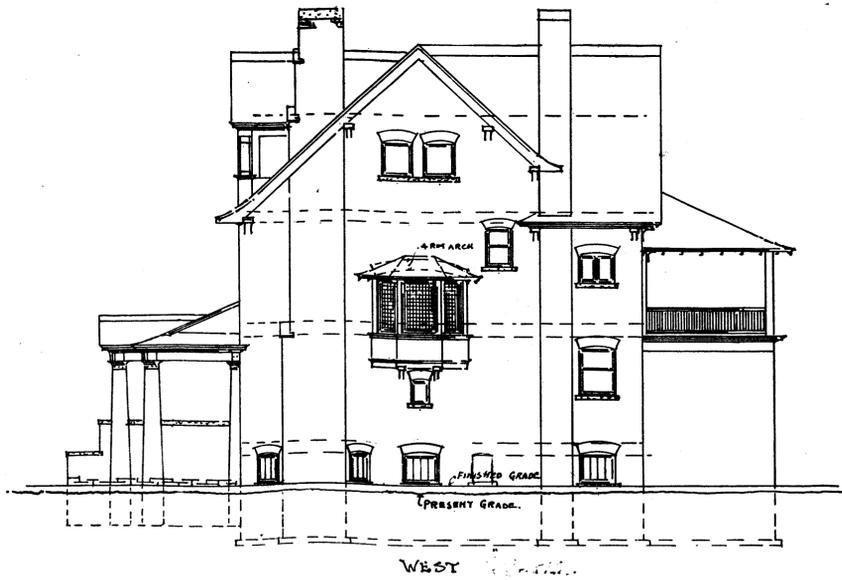
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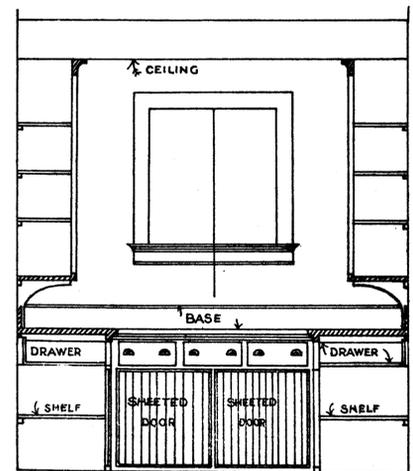
GROUND FLOOR



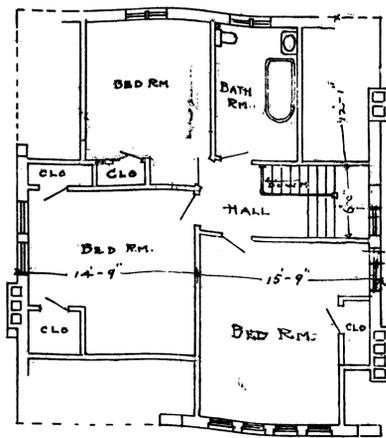
FIRST FLOOR



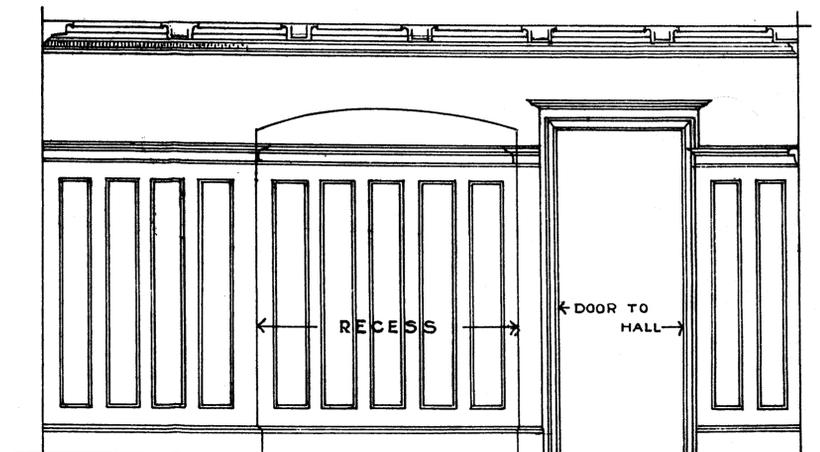
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 September, 1911. Vol. 4, No. 10.
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SOUTH END



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