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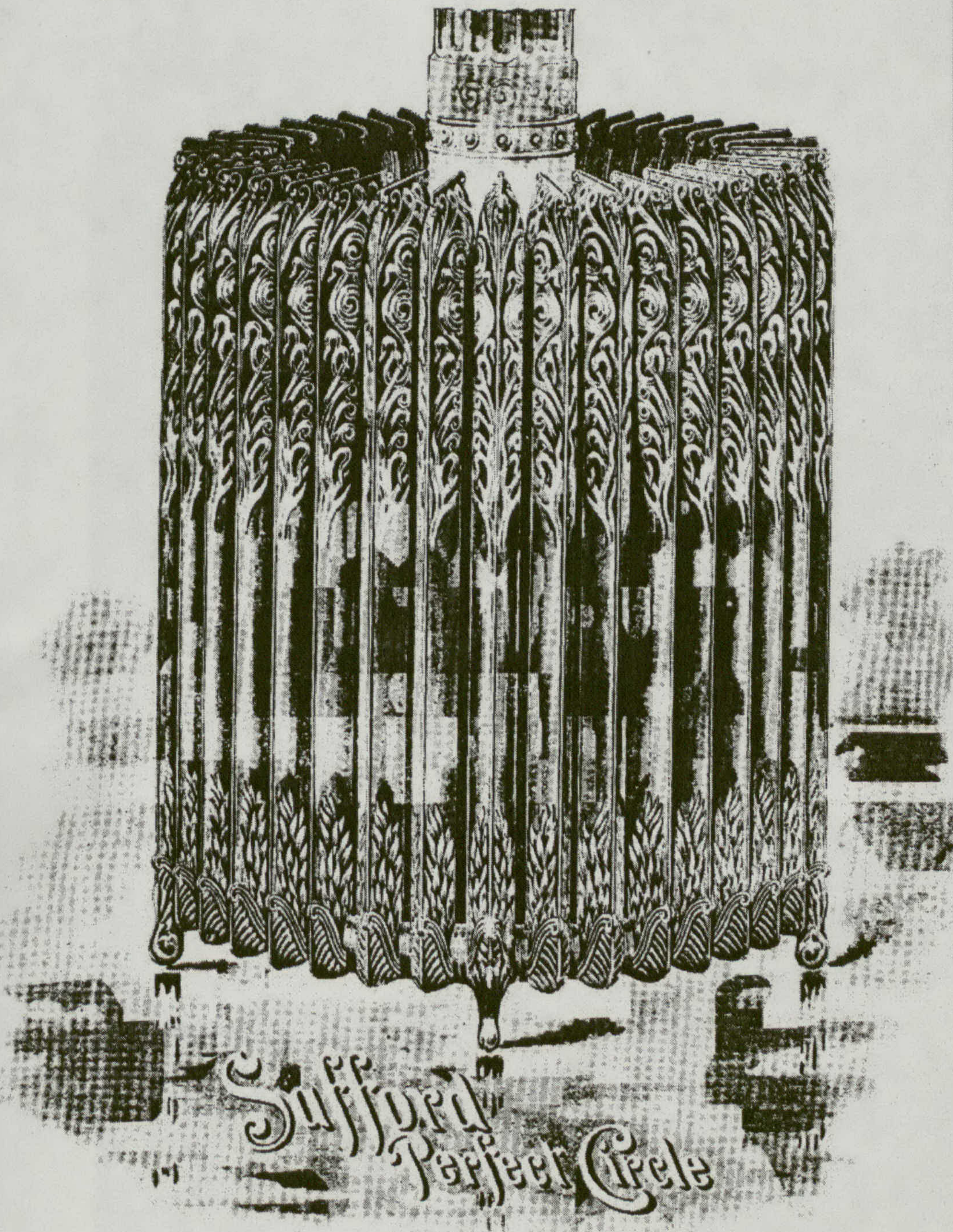

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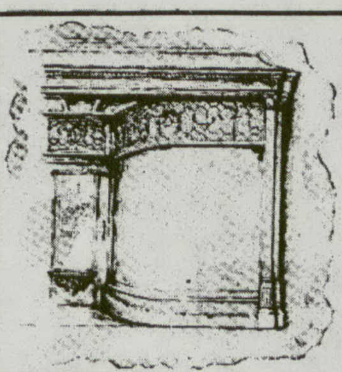

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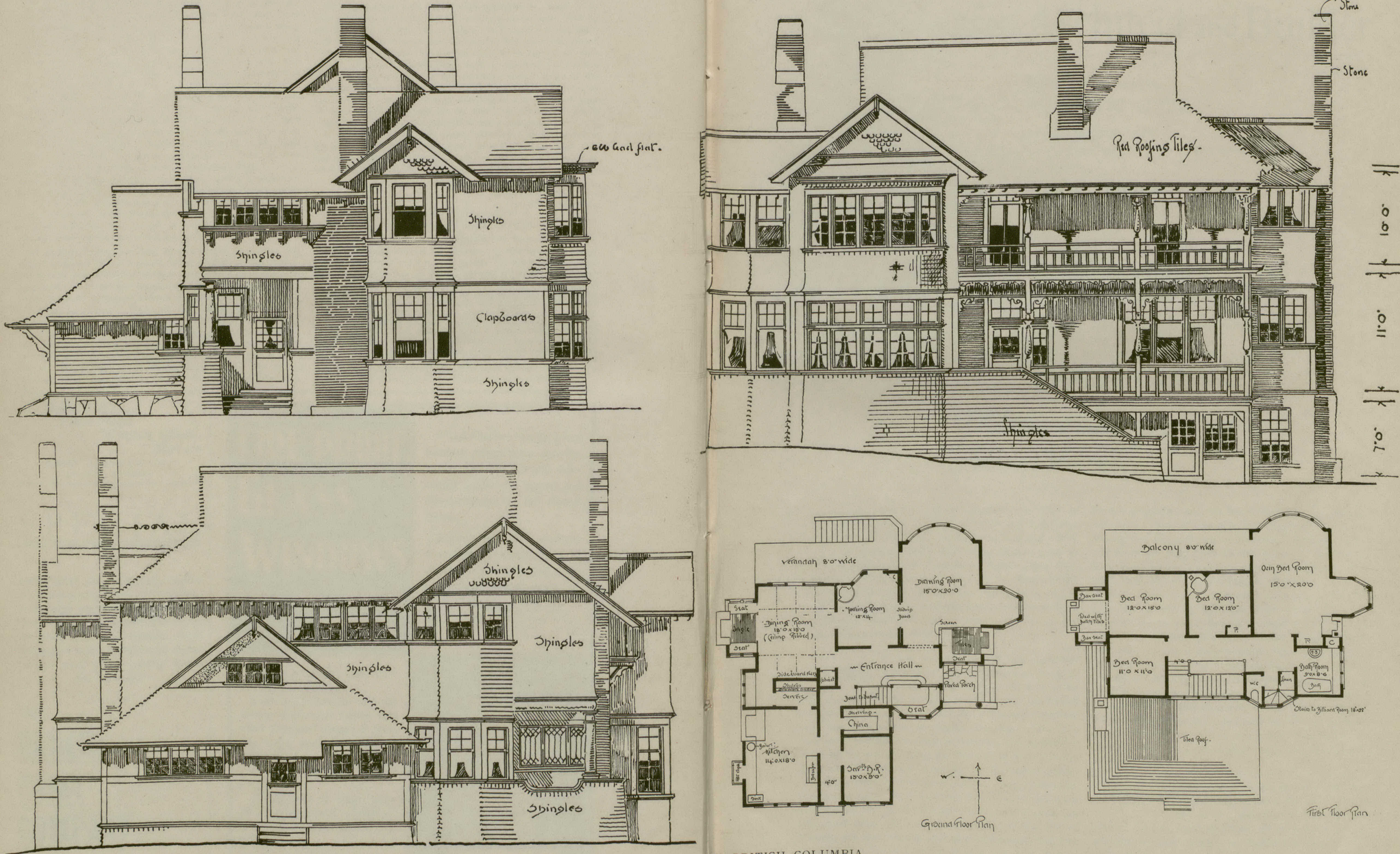

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SUPPLEMENT TO
CANADIAN ARCHITECT AND BUILDER

The Canadian Architect and Builder

VOL. XIV.—NO. 162. JUNE, 1901.

ILLUSTRATIONS ON SHEETS.

Plan and Section Proposed "Salle Des Fetes,"—W. S. Maxwell, Architect.
Design for Residence in British Columbia—R. M. Fripp, F.R.I.B.A., Architect.

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SPECIAL CONTRIBUTORS.

PROF. S. H. CAPPER, R.C.A., Department of Architecture, McGill University, Montreal.
MR. W. A. LANGTON, Architect, Toronto.
" EDMUND BURKE, " "
" S. H. TOWNSEND, " "
" FREDERICK G. TODD, Landscape Architect, Montreal.
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" J. C. B. HORWOOD, Architect, Toronto.
" A. F. DUNLOP, R.C.A., Architect, Montreal.

The Evil of Strikes. As the result of a lengthened strike of Belgian glass workers, for a greater increase of wages than the manufacturers could afford to pay, the trade of these manufacturers has gone to other countries, a once prosperous industry has been lost to Belgium, and ruin has come to those whose means were invested in it. The competition engendered by the emigration of large numbers of the strikers to the United States, is said to threaten the life of the window glass trust in that country.

The Proposed Art Gallery in Toronto. It was announced not long ago that $30,000 for this building was in sight, leaving only $20,000 to raise to make half the cost of the building ; and it was contended that, when the half was raised by voluntary contribution, the city ought to supply the rest. This is a reasonable proposition, and it suggests the possibility of the whole scheme being put through in time for the Duke of Cornwall and York to lay the corner stone. The city's subscription, once agreed upon, is but the stroke of a pen. It is only the $20,000 of voluntary subscription that need take any time, and it need not take much time. It is not hard to find in the city of Toronto one man who is able to give $20,000, nor two who can give $10,000, nor four who can give $5,000, nor even twenty who can give $1,000. There is hope for the accomplishment of such a purpose as getting the memorial to Queen Victoria advanced far enough for her grandson, and our future King, to lay the corner stone. The fashion of giving has not been in vogue among the original rich of Toronto. Perhaps it was not so much their fault as the fault of their times. Rich men had not discovered what is now being discovered, that one of the blessings of wealth is the power to give. Can there be a greater enjoyment of wealth than the power to say that there shall be an Art Museum in Toronto? Several gentlemen have already decided to say this, with an emphasis proportioned to their means ; and if the committee, who have the project in hand want to get a sub-committee who will put the matter forcibly before other gentlemen of means, we would suggest that they ask the present subscribers to form such a sub-committee. They have a right to ask others to subscribe ; and will be able to persuade others to taste what, if one may judge from recent examples, is the latest enjoyment of rich men—the pleasure of giving.

Re Beautifying Toronto. The Toronto Guild of Civic Art has been trying to move the civic authorities in the direction of an improved plan of the city, towards which all extensions and improvements may work ; so that every piece of work undertaken in the way of laying out new streets in the suburbs, or opening up new streets in the old part of the city, may tend towards the accomplishment of a definite scheme which will make Toronto a fine city.

It was well contended by the deputation from the Guild that this was a matter beyond the scope of volunteer advice such as the Association of Architects have offered in the minor matters of rearranging the fair grounds or preserving an ornamental water front in the centre of the city. The Mayor's reply that, if a plan which would cost money was necessary, the Guild of Civic Art ought to collect half the sum necessary for it, was probably the most practical politics, though, abstractly, the work is eminently a public work, and is only an expense in the first instance ; for it would undoubtedly in the end save many times its cost.

Economy was the word with the Board of Control. Let us then point out a civic improvement that would be a saving ; which at least would have been a saving if nothing had yet been done, but now involves the slight expense of some uprooting, for it is the uprooting of what has been planted that constitutes the improvement we would suggest. Somebody has conceived the idea of spotting the Queen's Park over with little conical evergreens. Whether these remain dwarfs or grow to any considerable size, the Park is in either case spoiled ; and it is difficult to understand how any official, of sufficient attainments to be in a position of authority in this department of the city, could not see how totally at variance these plantings are with the character of Queen's Park. The history of the Queen's Park is probably that of most of the parks which are adjacent to the country seat of an English landed family. It was originally set apart for pasture land, and trees have been allowed to grow up sufficient for shade without being so close as to spoil the grass. The resulting character of sweeping lines of grass, harmonizing with the spreading growth of trees which stand alone or in groups, constitutes to English people the idea of a park ; and that sort of park we had in greater perfection than many an English nobleman, until this bush planter came along and intercepted every vista under the trees by his little stiff cones of fir, so that the eye can no longer follow the long sweeps of surface which were the characteristic beauty of the park.

Doubtless the idea comes from the new American parks, in which a garden style is adopted as the only thing available until trees can be grown. To imitate this at all is only excusable under the same conditions, and one may expect from the committee of parks and gardens not only a perception that the two styles cannot be mixed, but a perception that the style of the Queen's Park is much the finer. It is only an understanding of the ground of beauty in the Queen's Park that can preserve it not only from this danger but from a danger which continually threatens, of tampering with the ravines so as to spoil the slopes which are so essential to the beauty of the park. Trees on a slope have always made a favorite theme for painters, and, whatever happens to the bottom of the ravines, it ought to be well understood that the grassy slopes must be preserved.

The New S.P.S. Building. The Guild of Civic Art is also taking a hand in the effort to have the new School of Practical Science Building made worthy of the city. It is supported by representatives from most of the important public bodies in Toronto, who have united with the Guild to form a special committee for this purpose. An interview with the Premier has been arranged, but so late in the month that it is probable the Premier's answer will be— with much regret— that it is too late to do anything. It is understood that the Provincial Architect's office is already engaged upon plans of the building. It is now or never that the case of this building must be pressed. The Premier and the Minister of Education have both spoken in such a way as to lead to the belief that they wish to have this building well designed, and are disposed to regard favourably a liberal policy in regard to the appointment of an architect. That liberal policy which will be most effectual is to be found in practice in the United States, where private architects of repute are employed for the erection of public buildings. The Minister of Public Works, who seems to think his department is being "passed over" unless the provincial architect is not only the supervisor but the designer of the new building, will find, if he enquires about the present method in the United States, that there is no occasion for such a feeling. The Federal architect and the State architects still exist and have plenty to do, but, thongh it is such a short time ago since the struggle arose with these departments—the same struggle as is taking place over the School of Practical Science Building— to have important buildings put in the hands of architects in private practice, the question is completely settled, settled on its merits. Public opinion and official opinion are at one in the matter. Indeed, so settled has the idea become that this is the only way to procure good public buildings, that the government is now quite as anxious as architects or the public not to lapse into the old way of doing things. Some misunderstandings have arisen, the American Architect says, in applying the bill under which treasury work is given out to competition of invited architects, and some of the most eminent architects in the country have declined invitations to compete for government work. In consequence of this, the Secretary of the Treasury has been conferring with the President of the American Institute of Architects, in order to remove the conditions which have led to misunderstanding. It is evident that the Secretary of the Treasury agrees with the American Architect that "the refusal of the best architects to enter into government competitions would be a public misfortune." This is after experience of the working of this method, which had when first proposed to encounter the identical opposition which, if we may judge from his words, it is encountering now in the mind of the Hon. Minister of Public Works in Ontario. It is for this reason that we recommend to him to make enquiries about the American method of proceeding, and we think he will find that he will pursue a course most to the credit of his department if he requests the public architect to utilize the study he has so far made of the subject, and the special information he will acquire on his trip with Professor Galbraith, to draw up a full statement of the requirements and conditions of a properly arranged building for the school, and to act afterwards as one of the expert arbitrators to judge the results of either a limited competition or an open competition.

We are reminded by this Ontario situation, of a motion that was made in the convention of the Ontario Association of Architects, to memorialize the Dominion Government upon this same subject of appointing private architects to design public buildings, or giving the buildings out to competition. The question was referred to the council to act upon as they should see fit. The council appear to have seen fit not to act upon it, but it is a question whether this was what the convention intended.

New German Schedule of Fees

A new schedule of fees has been adopted in Germany, which affords interesting study. In the first place, it is adopted not only by the architectural societies, but by engineers, constructive, heating, gas, water, electrical and mechanical, who appear to be united in one association with the architects. Fees are determined upon principles common to all the associated professions. Specialties have special sections. The liberality of the principles upon which fees are computed is worth studying. In the matter of preliminary studies, a large view is taken of the importance of this part of the work, and more intelligent provision is made for proper payment than a hard and fast rule of 1 per cent. Where a commission embraces several structures of the same design, to be executed simultaneously, the fee is reckoned for supervision upon the whole cost, which is natural, and for other services according to the work done, which is also fair ; but preliminary studies too get consideration on the basis of total cost. When a commission consists solely of the preliminary sketches, the fee is to be increased one-half. Where preliminary sketches, agreeing with different programmes, are desired, each is considered independently. In case of several preliminary sketches being desired for the same site and programme, the full fee is estimated for the first, and compensation for the others is based on the additional work they require. In case there are no preliminary sketches, but the architect is called in at the stage of working drawings, (a strange case), the fees for working drawings and specifications are increased one-fourth. On behalf of the client, there are special provisions that all commissions or rebates will be turned over to him and that he may ask for expedition in the preparation of plans without incurring an extra charge. The client is to bear the cost of all contingent work, that is to say, of all surveys, measurements, examinations of foundations, etc. He is to pay the salaries of inspectors and superintendents, the expense of establishing and running a special office, the cost of advertising and closing contracts, and that of measurements for the final estimates. The cost of engineering advice to an architect, or of architectural advice to an engineer, is also borne by the client. Work by time is $5 for the first hour, and $1 for each hour additional. For journeys $6 a day is added to the usual fees ; but this charge can be made only once, i.e., if two or more clients are served by one journey, the $6 charge is divided according to the facts of the service.

With such handsome allowances for services beyond ordinary necessities, one would expect to find the ordinary charge kept rather slim, but it is not so. The method of computing the fee is by percentages upon a sliding scale of cost and under four heads of elaboration in the character of the work ; so that the fee increases as the proportion of finish in the work increases and decreases with the increase of total cost. The headings of degree in elaboration are not set forth in terms of the character of the work, but in terms of the percentage of finish. There are four such groups, and a fifth of furniture and fittings. The table will best be explained by reproducing it in extenso :

Architectural Fees, in Percentages of Cost of Construction.

Total Cost in Dollars.	Minimum Charge for Groups I-V I	II	III	IV	Extra for more finish.	Charge for Group V.
	Percentage Finish is to Total Cost 20%	30%	40%	50%		
250	6.00	9.00	12.00	15.00	0.135	21.00
500	5.60	8.40	11.20	14.00	0.125	19.60
750	5.30	8.00	10.60	13.30	0.120	18.60
1,000	5.10	7.70	10.20	12.80	0.115	17.90
1,250	4.90	7.40	9.80	12.30	0.110	17.20
1,500	4.80	7.20	8.60	12.00	0.108	16.80
1,750	4.70	7.00	9.40	11.70	0.106	16.40
2,000	4.60	6.90	9.20	11.50	0.104	16.10
2,250	4.55	6.85	9.10	11.40	0.103	15.95
2,500	4.50	6.80	9.00	11.30	0.102	15.80
3,750	4.30	6.50	8.60	10.80	0.097	15.10
5,000	4.10	6.20	8.20	10.30	0.093	14.50
6,250	4.00	6.00	8.00	10.00	0.090	14.00
7,500	3.90	5.85	7.80	9.70	0.088	13.60
8,750	3.80	5.70	7.60	9.50	0.086	13.30
10,000	3.70	5.55	7.40	9.30	0.084	13.00
12,500	3.50	5.40	7.20	8.00	0.081	12.60
15,000	3.60	5.25	7.00	8.70	0.079	12.20
17,500	3.40	5.10	6.80	8.50	0.077	11.90
20,000	3.35	5.05	6.70	8.40	0.076	11.75
22,500	3.30	5.00	6.60	8.30	0.075	11.60
25,000	3.25	4.95	6.50	8.20	0.074	11.45
37,500	3.10	4.70	6.20	7.80	0.070	10.90
50,000	3.00	4.50	6.00	7.50	0.067	10.50
62,500	2.90	4.30	5.80	7.20	0.065	10.10
75,000	2.80	4.20	5.60	7.00	9.063	9.80
87,500	2.75	4.10	5.50	6.90	0.062	9.65
100,000	2.70	4.00	5.40	6.80	0.061	9.50
125,000	2.65	3.90	5.30	6.60	0.059	9.25
150,000	2.60	3.80	5.20	6.40	0.058	9.00
175,000	2.55	3.75	5.10	6.30	0.057	8.85
200,000	2.50	3.70	5.00	6.20	0.056	8.70
225,000	2.45	3.65	4.90	6.10	0.055	8.55
250,000	2.40	3.60	4.80	6.00	0.054	8.40
312,500	2.30	3.45	4.60	5.80	0.052	8.10
375,000	2.20	3.30	4.45	5.60	0.050	7.80
500,000	2.10	3.20	4.30	5.40	0.049	7.50
625,000	2.05	3.10	4.15	5.20	0.047	7.25
750,000	2.00	3.00	4.00	5.00	0.045	7.00
1,000,000	1.95	2.95	3.90	4.90	9.044	6.85
1,250,000	1.90	2.90	3.80	4.80	0.043	6.70
1,500,000	1.85	2.85	3.70	4.70	0.042	6.55
1,750,000	1.80	2.80	3.65	4.60	0.041	6.40
2,500,000	1.75	2.70	3.55	4.50	0.040	6.30

Note : In using this table, the total cost will be rounded off to the next higher tabulated amount provided the fees are increased by so doing.

INJURIOUS EFFECTS OF GAS ON ASPHALT.

The fact has been established that the gas escaping from underground mains injuriously affects asphalt pavements on streets where such leakage of gas occurs. The first noticeable effect is checking of the surface of the asphalt. This is followed by general disintegration. Instances are recorded in which asphalt paving contractors have declined to fulfill their agreements to keep roadways so affected in repair, on the ground that their destruction was not due to defects in workmanship or to ordinary wear and tear of traffic.

MASTER PLUMBERS' CONVENTION.

The annual convention of the National Master Plumbers' Association of Canada will be held in the Temple Building, Toronto, on the 26th, 27th and 28th inst. The Executive will meet at 9.30 a.m. and the convention at 2 p. m. on the 26th. A large attendance is looked for, including representatives from the various Provincial Associations. Reports of the work done during the year will be presented and discussed. The local plumbers and plumbing supply firms have appointed a joint committee to arrange for the entertainment of the visitors. On the 27th inst. they will be given a carriage drive around the city, and in the evening will be held the annual Association banquet. After the election of officers and completion of the business on the 28th inst., it is proposed to make an excursion by electric cars to some place of interest outside the city, and there enjoy a musical program and luncheon. Strong inducements are being offered the Association to hold the annual convention next year in Halifax, Nova Scotia.

DECORATION METHODS AND MATERIALS.

By W. H. Elliott.

In attempting a short description of the methods and materials employed in interior house decoration at the present time, I shall endeavor to be as concise in my statements as possible—describing the material, its advantages and disadvantages, where it may or may not be used satisfactorily: and so of the methods employed.

As in other things decoration has its fashions—styles come and go in public favor, and in five years the decorations of a house may be quite out of date. This would be unfortunate if it were necessary. Many styles are never out of date and they are usually the most desirable, temporary styles having their destruction inherent in themselves. It is quite possible to carry out a scheme of decoration which if entirely appropriate to its position will always give lively satisfaction both in color and design.

I might also refer to some notions at times prevalent about the use of color which do duty for the time as decorations. Not long since I heard a lecture in which the theory that each color symbolized an abstract idea was gravely set forth—as that red was love—yellow, aspiration, etc. The folly of attempting to embody such ideas in schemes of decoration would be apparent to any one giving only slight attention to the subject. Of equal value was a scheme for the decoration of a church in which the color of the lower wall represented the bark of trees, higher up the leaves, then a golden sunset, and above all the pale green and blue of the evening sky. Very fanciful no doubt and possibly resulting in good hands in a harmonious arrangement of colour, but on what ground are we to transfer bodily the outer landscape to the walls of a church?

The possible scheme of colour is not objected to, but the gravity with which these and similar fads are presented as principles of decoration. The principles of decoration are worked on other lines. The amount of light usually governs the strength or depth of colour; the presence or absence of sunlight has its due weight, the purposes of the room, the tastes of its customary occupants and a hundred other considerations which are not fanciful, but very practical, influence the decorator in his work.

To follow some of these theories would be to tie ourselves to a certain arrangement for certain conditions in every case. For example a very cheerful room may be carried out with blue as its motive color (no matter what its signification may be) and a very dismal room may result from a badly balanced scheme in yellow. And here let me say that in most cases one color should strongly predominate when a successful effect is desired. Too positive colors in nearly equal proportions are fatal to repose of any room. The exception to this is of course when the color is thoroughly broken up as in the Moorish or Romanesque styles. Another rule which is very safe is that all three primary colors should be represented in every scheme of decoration, otherwise a tame effect is certain. The red or yellow may be very much subdued in a blue room, and so of the other combinations, but their presence if ever so quietly introduced, is unconsciously felt as a satisfying impression.

Looked at from the standpoint of durability many of the materials employed are far from satisfactory, but happily or unhappily, durability is not often considered in present day decoration. The universal surface material, plaster, is anything but durable. Various attempts have been made to produce substitutes, but thus far without conspicuous success. For small surfaces what has been named plaster board is something of an improvement. It is usually a thickness of plaster-of-paris or asbestos in which coarse canvass or scrim has been incorporated. When this material is cast in ornamental forms such as cornices, friezes, centres, &c., it is called staff. Lightness and strength are obtained by this method and some comparatively large sections have been cast in this way.

For finer ornament various compositions are used which admit of plastic moulding to a limited extent. Ornament of this nature has become necessary on account of the extensive use of the French styles of the Empire, Rococco, etc. As a practical substitute for plaster the sheet metal designs so largely placed on the market at present are very satisfactory where the decorative effect is of little importance. They can hardly be classed as decorative material.

Where any work of importance is contemplated it is advisable to first cover the plaster surface with a strong cotton or burlap, so that cracks may not eventually injure the appearance of the work. Burlaps of various degress of coarseness are now used extensively for covering wall surfaces and are invaluable for the purpose—the texture giving an excellent surface for color or decoration. The color is obtained either by painting the burlap after it is fixed or by using the ready dyed materials which may be obtained in all desirable colors. Burlaps, cottons and other similar materials are applied to the wall with ordinary flour paste, the wall being pasted instead of the material. Joints should be overlapped about an inch to allow for shrinkage, left several hours, then cut through both thicknesses with a sharp knife, the strips removed and the two edges brought neatly together. Dyed material does not require overlapping as it is already shrunk. For painting, a rather open weave is preferable, the color not filling it so as to hide the texture.

Decoration in glaze colors, outline relief work, and other methods are employed with excellent effect on the painted burlap. Silks and woven tapestries are also used to a limited extent for covering the walls of the more important rooms of the house. The cost of these both in material and application is of course much greater than that of other coverings, and it is questionable if the results gained justify the additional cost. These materials are usually tacked to thin strips of wood which have been nailed on all angles of the wall, the joints being concealed by silk cord gimp or rounded strips of wood which have been covered with the wall material. A lining of ordinary cotton or Canton flannel is usually applied first to the wall to protect the more expensive material from dampness and to give a softer surface. Hand-woven tapestries are only possible to the very few, so that practically we are confined to the products of the machine loom. All of these are closely reproduced in the many beautiful wallpapers now to be had. I have always maintained that such imitation is perfectly justifiable, as the material or groundwork is only a medium for transferring the design to the wall and of no importance in itself beyond its suitability for the special work in which it is employed. Ordinary silk will not retain its appearance on the wall as long as its reproduction in wallpaper, its texture making it a receptacle for dust, smoke, etc., which in a short time completely ruins its surface. No doubt this is more especially true of our houses in Canada, shut up closely as they are during a long winter with the accompanying accumulation of dust.

This brings us to the consideration of wall paper as a medium for decoration—a material more generally used than any other and undoubtedly more broadly adapted to the various requirements of house decoration. As I have already said, wall paper has been designed to reproduce other materials in a cheaper and more practical form. Silk, leather, tapestry, cretonnes, etc., are now to be had in wall paper in their choicest designs. The first cost of die cutting, etc., being distributed over a large output the richest and most elaborate examples of each fabric may be copied. How one is deceived by these reproductions when on the wall, but one may have the very best of design and weave the world affords, while if attempting to use the actual fabrics only a very moderate and perhaps undesirable selection is possible. There is of course a very large range and very superior range of designs which are not copies of anything but simply wall paper.

Wall papers are broadly divided into hand-made and machine-made—pressed flat, gilt and color. The manufacture of hand made papers follows somewhat the earliest type of printing press, but while the old printing press has long been discarded, the hand or block printing machine still retains a large place in wall paper manufacture. The advantages are a more solid layer of color and as a consequence a more forcible effect on the wall. Large designs also may be printed with blocks when the expense would be too great to construct a machine for the purpose. But of late years, with perfected machinery and skilful printing many designs are produced which test the ability of an expert to detect as not hand made. The best designs come from England—that is designs which are purely wall paper, not imitations of any other fabric. Such men as Burne Jones, William Morris, Lewis F. Day, Walter Crane and others have given their best efforts to the designing of wall paper and the result is what might be called a school of wall paper design which is drawn upon by the designers of other countries. These men by no means treat the wall as in all cases merely a background for other things, but rather as an important feature in the furnishing of the room. Of course where important pictures are to be hung many of their designs would be quite inappropriate, but unfortunately the number of important pictures bears a ridiculously small portion to the number of rooms to be decorated. French designs excel in reproduction of silks, leathers, etc. and many of their papers are exquisite examples of the art of wall paper making. By far the largest proportion of designs are studies of natural flowers slightly conventionalised. Always popular and easier of treatment than ornament. they peculiarly appear in the season's lines although the really good floral designs of one season could be counted on the fingers of one hand.

Within the last year or two the reign of the frieze has perceptibly drawn to its close. At one time considered a sine qua non in every room—in fact almost as essential as the furniture—it is now relegated to the cheap parlor combinations as they are called, where ceiling frieze and wall are beautifully matched, saving brains and much anxious thought to the dealer and the buyer. Wall papers are now usually carried to the ceiling or cornice and finished at the top with a picture moulding. Ceilings if good are painted or tinted, if cracked are papered with something simple in design and of almost one color. Sometimes the ceiling color or paper is brought down a short distance on the wall to meet the wall paper at the picture moulding. Sometimes the upper third of the wall is covered with a different design from the lower two thirds, the picture moulding again acting as divider. A very pretty treatment for bedrooms is to carry a narrow border around each wall of the room forming them into large panels. These borders frequently have corner pieces to match. Papers with the texture of burlaps, denims, &c., make a very good lower wall and are an excellent background for pictures. Ingrains or cartridge paper are now very little used. Pressed or raised papers except in leather effects are not much in use, good coloring being preferred to their somewhat showy effect. The stripe designs which come to us at present in such abundance will not continue to occupy so large a place in dealers' collections, yet they have an important use in giving an appearance of height to rooms whose ceilings are undesirably low, besides being an agreeable change from the ordinary run of designs. The old cretonnes and chintzes furnish a range of beautiful patterns for bedrooms, morning rooms, etc.

The proper treatment for all of these patterns is to simply cover the wall with them as would be done with the actual material.

Coming to the woodwork of the room we find a variety of new tones for natural wood. Rich browns, deep mossy greens, Flemish oak finish, may be applied to ordinaty pine or white wood with highly satisfactory results. The strong reds and greens of the wall at once call for special treatment of the woodwork and these deep tones are the result. In direct contrast are the white and ivory tones which set off equally well the reds, greens and blues of the wall. The old fashioned drawing room in white and crimson or green is very much in evidence at present, while in the bedchambers white woodwork prevails, almost to the exclusion of everything else. Graining, while not tabooed on aesthetic grounds as formerly does not seem to find a place with other prevailing features. Oak among hardwoods is in great favor but more frequently finished in Flemish bog oak coloring, than in the natural wood.

One of the most desirable importations of old world ideas is the more general use of hardwood floors. Very few realize the danger to health which lurks in the harmless looking carpet which in many cases remains securely tacked to the floor for several years. An analysis of the dust accumulated in that time has revealed possibilities of disease which in many cases must have neutralized in the actual thing.

A permanent floor may be laid in any house on top of the existing floor without alteration to doors or other woodwork of the room and at the cost of ordinary carpet. Parquetry designs add decorative character to this part of the room. Not the least important advantage gained by the use of hardwood floors is the introduction of the very artistic and everlasting Eastern hand made rugs which now adorn so many of our homes. When the life of these things is considered, the money expended upon them is probably the best investment possible in house furnishing.

THE CHARACTER OF SAND GRAINS.

It has been pointed out by Sorby and others, that by the aid of the microscope much may be learned concerning the history and character of sand grains. He has classified them into five groups, which, however, graduate into each other. These are :—

1. Normal, angular, fresh-formed sand, such as has been derived almost directly from the breaking up of granitic or schistose rocks.

2. Well-worn sand in rounded grains, the original angles being completely lost, and the surfaces looking like fine ground glass.

3. Sand mechanically broken into sharp angular chips, showing a glassy fracture.

4. Sand having the grains chemically corroded, so as to produce a peculiar texture of the surface, differing from that of worn grains or crystals.

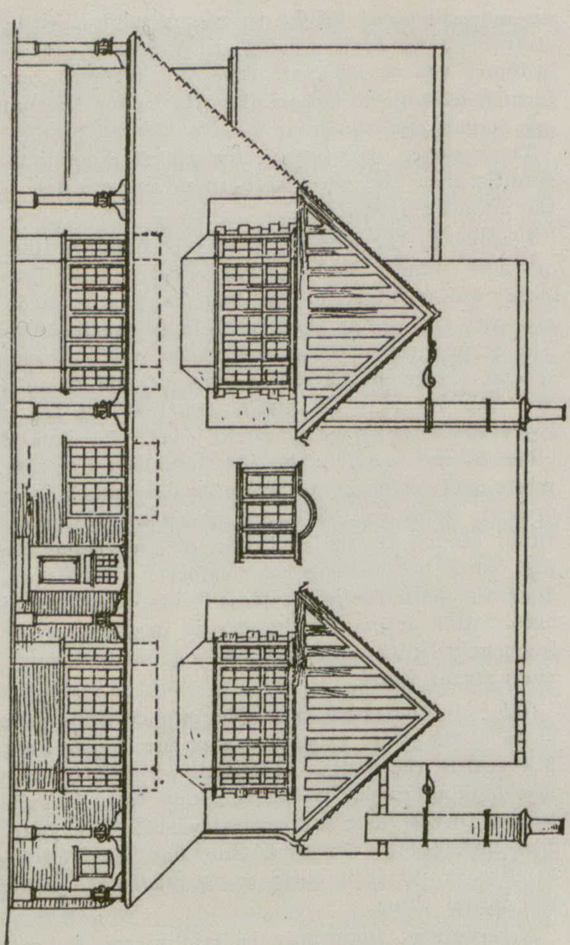
5. Sand in which the grains have a perfectly crystalline outline, in some cases undoubtedly due to the deposition of quartz upon rounded or angular nuclei of ordinary non-crystalline sand.

In the manufacture of bricks fired at a low temperature, No. 3 above described is no doubt the best, as it possesses certain binding qualities; but the usual type of sand met with in ordinary brickyards is either No. 1 or No. 2.

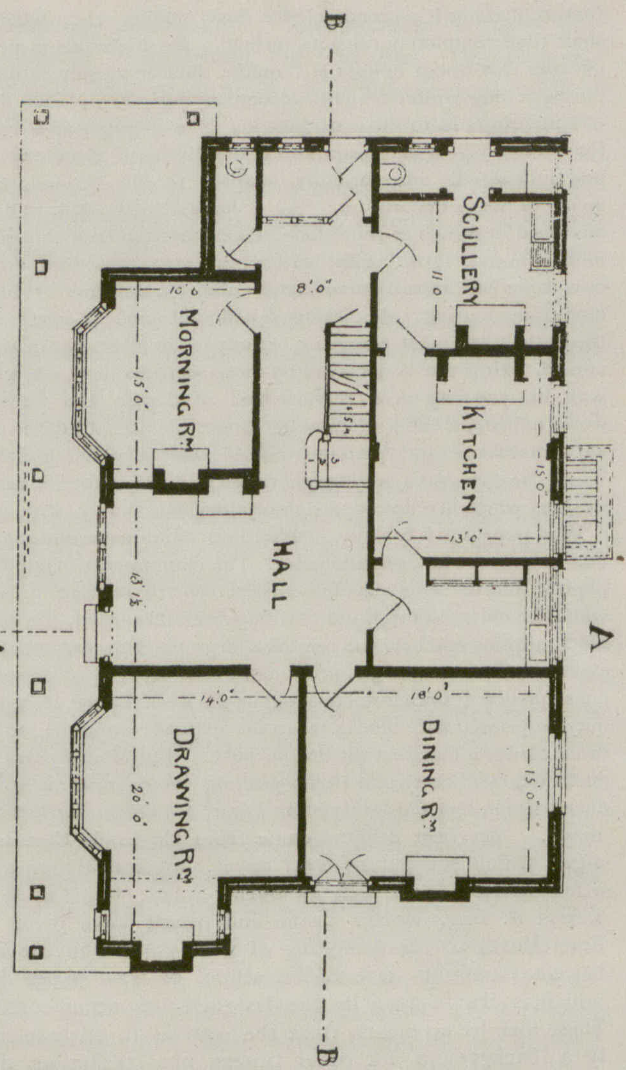
NOTES.

The value of building permits issued to date by the Inspector of Buildings of Winnipeg is $630,575, as compared with $383,633 for the same period last year.

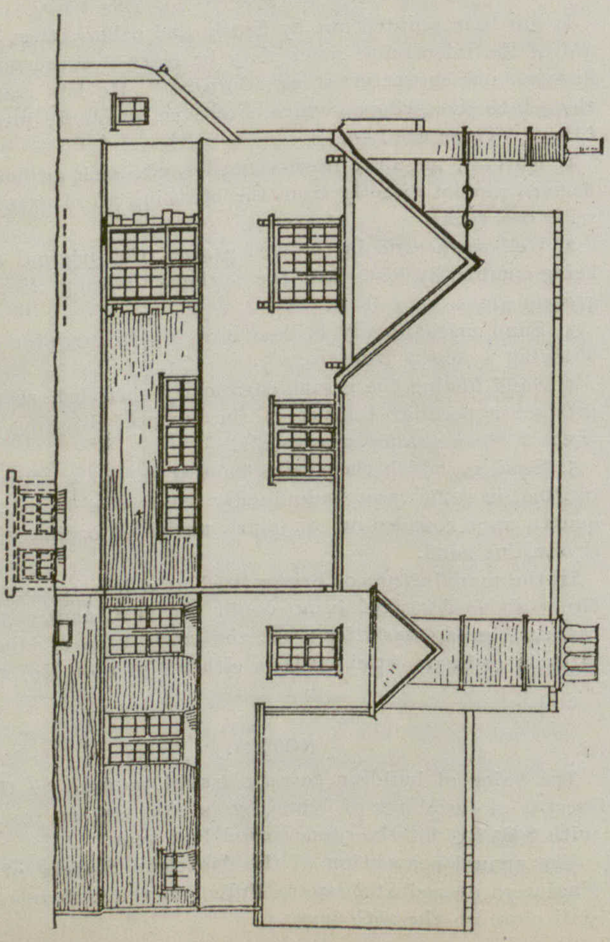
The annual convention of the American Society of Civil Engineers opened at Niagara Falls, on the 25th inst., and will close on the 28th inst.



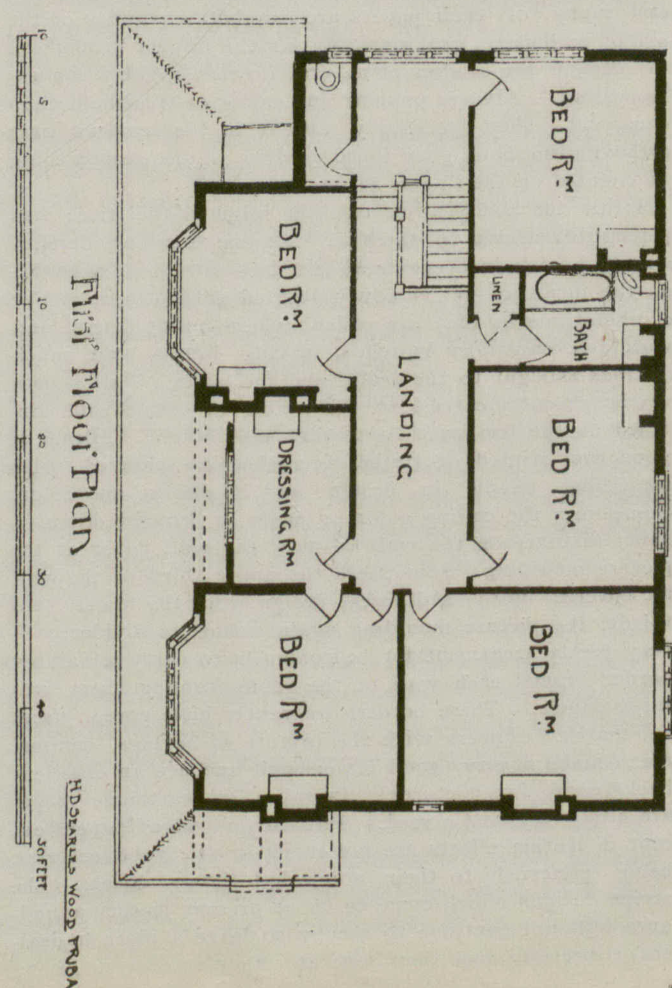
SOUTH ELEVATION



Ground Floor Plan



NORTH ELEVATION



First Floor Plan

SMALL SUBURBAN HOUSES.

(Illustrations accompanying paper by Mr. Searles-Wood before the London Architectural Association.)

MONTREAL CORRESPONDENCE.

INSURANCE RATES.

The result of the refusal of the property owners to sanction the expenditure for improved fire equipment seems likely to be a further increase in insurance rates. At a recent meeting the Canadian Fire Underwriters' Association adopted the following resolution:—"Resolved, that the association records, with regret, the non-acceptance by the property owners of the recent proposed by-law for the improvement of the fire brigade and appliances and the consequent inability of the city to remedy, even in a modified form, any of the defects detailed in Inspector Howe's recent report on the city's fire brigade and appliances. The attention of the company is drawn to the matter with a view to considering whether the rates now obtained are adequate to the hazard." The Association appointed a committee to consider what action should be taken.

QUEBEC CONCILIATION AND ARBITRATION ACT.

An Act respecting Councils of Conciliation and arbitration for settling Industrial Disputes, passed the Quebec Legislature on March 28th. Its provisions are quite similar to those of the Ontario law of 1897. It provides for a Council of Conciliation consisting of representatives of the parties to the dispute; and a Council of Arbitration a body of a more permanent character, which may, upon application of one of the parties, hear cases which have been before a Council of Conciliation without being settled, or, upon application of both parties, hear cases which have not first gone to the Council of Conciliation. The award of the Council of Arbitration is not binding, excepting with the assent of the parties. The failure of the parties to accept the award does not, however, prevent a further reference to a Council of Conciliation.—The Act applies to all employers employing not less than ten men in the same business.

P. Q. A. A.

At the special meeting of the P.Q.A.A. held on the evening of the 8th ult. there was quite a large attendance, among those present being noticed Mr. Tangnay from Quebec, Messrs. Venne, Archibald, Brown, M Perrault, A. T. Taylor, Doran, E. Maxwell, W. S Maxwell, Raza. Resther, Saxe., Lacroix, Monette and others. There was considerable discussion on the new tariff of charges and several strong objections were made by some of the members, but the following resolution was finally adopted: "That a vote of thanks be tendered to Mr. Maurice Perrault for the trouble he took to obtain the tariff for the P.Q.A.A. but we trust it will be amended as soon as possible."

The clause which met with opposition was

On all classes of buildings, costing from $50,0000 to $150,000 four per cent.

On all classes of buildings, costing more than $150,000 three per cent

The tariff formerly did not vary on account of the amount spent—only on the class of buildings. We presume the law is intended to read "for the first $50,000 at 5 per cent. for the next $100,000. at 4 per cent. and above that figure at 3 per cent." otherwise there will be the absurdity and injustice of an architect's commission on a building costing say $48,000 bringing a higher remuneration than one costing say $51,000.

NOTES.

As Mr. Owens is now one of the city's assessors, he has been obliged to give up his business as painter and decorater, and has therefore sold out the good will to his foreman, Mr. Houte.

A fire recently broke out in the offices of the Mount Royal Cemetery Company. A new building is already being built larger and more convenient from plans by Messrs Hutchison & Wood.

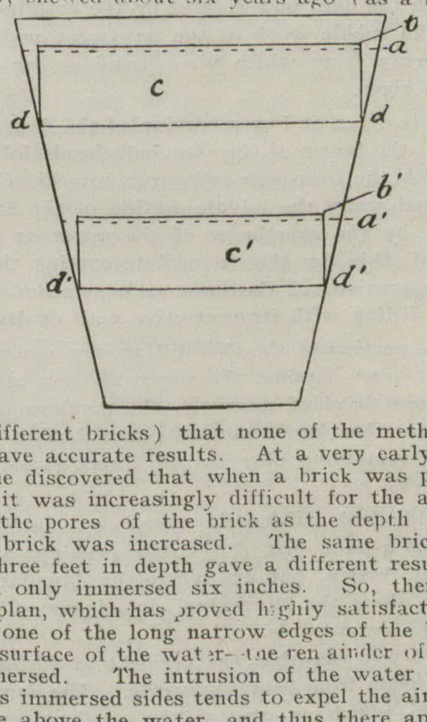
The building materials of the old St. Anne's and St. Gabriel Markets were sold on the 13th ult., so that these old city relics are a thing of the past. They have for many years been carried on only at a loss to the city so that we imagine there will not be many tears shed at their departure.

As Royalty is intending to pay Montreal a visit shortly it is trusted that some attempt will be made to put the streets in better repair abd also that owners of property will do their share in, putting a new coat of paint on the front of buildings in good order. It is wonderful what a well kept grass plot in front of a house adds to the general appearance so that it is well for architects to bear it in mind.

BRICK IMMERSION TESTS.

One of the greatest difficulties that experimenters on the different physical properties of bricks have had to contend with says a writer in the British Clayworker, is that connected with absorption. The older experimenters used to place the brick under an air pump, and having (as they thought) exhausted all the air from it, they proceeded to immerse it in distilled water. All of which is a careful and cautious proceeding, no doubt, but which had subsequently to give way to the exigencies of practice. Then engineers came along, with rough-and-ready ways and no time to spare, and they simply shot the brick into a tub of water, weighing it before it went in and after it came out—the difference, they held, indicating the porosity of the brick. On second thoughts, both they and the few architects who then took an interest in the subject, began to form the belief that the element, time, ought to be taken into account; but they came to the erroneous conclusion that the longer a brick stayed in the water the more water it absorbed. At about the same period the chemist announced that bricks contained, as a rule, a considerable amount of matter which was soluble in water, so that the absorption tests ought to be considered pari passu with loss of solvent material, when weight only was to be employed as a criterion of absorption. In other words, there was waste, they said, as well as absorption.

The present writer, who in his time has tested the absorptive capacities of different kinds of bricks throughout the country, shewed about six years ago (as a result on



over 400 different bricks) that none of the methods then in vogue gave accurate results. At a very early stage in his work he discovered that when a brick was placed under water it was increasingly difficult for the air to escape from the pores of the brick as the depth of water above the brick was increased. The same brick placed in water three feet in depth gave a different result to the same when only immersed six inches. So, therefore, he devised a plan, which has proved highly satisfactory, that of leaving one of the long narrow edges of the brick just above the surface of the water—the remainder of the brick being immersed. The intrusion of the water into the brick on its immersed sides tends to expel the air from the free surface above the water, and thus there appeared a possibility of arriving at a standard method of testing. And the writer is of opinion that this is the most accurate method of testing absorption.

His further tests, however, have shewn him that there was something lacking, in that the bottom of the brick always rested on a flat surface, and thus precluded the water from having free access to that portion of it.

As a consequence, he has devised a method which, so far as he is aware, is new, though it seems so simple that it is possible another experimenter may have thought of the same thing. This method is illustrated in the accompanying diagram. The vessel containing the water is bucket-shaped—wide at the top and narrow at the bottom. It is designed to take both large and small bricks. Let a represent the water level, c the brick, and b the surface of the brick just projecting above the water. It will be obvious that the only parts of the brick which touch the sides of the containing vessel will be situated at a, so that the water has free play to enter the bottom and sides of the partially immersed brick.

When a smaller brick is being dealt with it is necessary to lower the water level, so that the relative positions are a, b, c, d, as shewn in the diagram.

It is necessary in these experiments to put in more water to compensate for evaporation during long-time tests and any waste (as from a rubber) should be carefully noted. Where necessary a chemical examination of the water at the end of a test may be made, to discover if the brick has suffered from dissolution by chemical means. In practice, however, the latter will not often be found necessary, as the difference in actual absorption by the improvements brought about by this new method is sufficiently well marked to tell its own tale.

ACCIDENTS TO RESERVOIR DAMS.

By C. Baillarge, Mem. Am. Soc. C. E.

The late washout at the reservoir dam at Middlefield, Mass., and that at Chicoutimi, Que., can only avail as lessons in "The Instructiveness of failure" when the way in which they occurred can be made known to the profession.

True, it has been shown that in the Middlefield case, where the dam was but 20 feet high, and the level of the spill-way 15 feet, the gates over the spill-way could not be opened due to their faulty construction and that the water rose till it poured over the dam and caused its destruction; but how the erosion could have caused the wreck is not explained, in view of the fact that between the outer walls of the dam which was 30 feet in breadth and abundantly heavy and strong to resist any pushing or forcing of the dam forward as at Boazey in France, Austin in the United States and ealsewhere, there were two intermediate bulk heads or walls of 2-inch matched sheet piling on boarding.

No gradual erosion from the top downwards could therefore have occurred on account of these intervening water tight partitions. The only way then of explaining the washout through and through the dam, is this: the overflowing water, first wore away the outer, lower or down stream of the three vertical sections of earth work into which the dam was divided by the bulk heads, taking with it the rubble work of the revetment wall, the component stones from which were found as far as 500 feet down the river.

When this outer or lower portion of the dam had crumbled away, the lower of the two bulk heads followed suit, after which the over-pour of water immediately attacked and scoured away the middle section of the earth work, followed by the overthrow of the upper or inner bulk head, and this by the immediate cutting through and down, by erosion, of the inner or up-stream suction of the earth filling with its protective wall of dry rubble.

Where a portion of the clay filling was resistent enough to hold its own against the scour, up to a certain height from bottom level of reservoir, the portions of the bulk heads above that level, were of course broken off at level of top of remaining clay by the direct pressure of the water behind them.

The Middlefield mishap is therefore a case not of the bursting of a dam, not of a bodily pushing away of the dam as at Austin, but one where the dam failed, as do the levees along the Mississippi, by erosion of the water from above downwards.

We shall now see that the accident at Chicoutimi is a case of erosion from below upwards. The dam across the Chicoutimi, which is one of the out-flows or discharges from Lake Kinogami and its smaller companion as expressed by the diminutive "Schish" Kenogamischish, is about a mile from the city or town of Chicoutimi, the Metropolis of the Saguenay District.

The dam is built at right angles across the stream, a powerful one empting into the Saguenay river. It is a wooden structure of crib work with a base up stream of about 3 to 1, planked over with a water tight flooring and relying for its stability on being kept down and in situ by the very weight of water above it, some 20 feet higher than on the down side, and though, the higher the water within the reservoir the greater the thrust outward or downward, the greater also the weight upon the dam and its adherence to the bottom on which it rests and is probably bolted to.

Above the dam proper is a superstructure some 10 feet or more in height answering as a bridge or roadway between the opposite sides of the river and to the upper or up stream side of this superstructure are adapted a series of some 20 gates or more, but which as at Middlefield, must have been inoperative due to their great size under a head of some 10 feet of water against them; for the water on the occasion of the accident about to be related rose to 10 feet above its normal freshet level and evidenely pressed hard against the dam superstructure which is entirely too narrow, it being but 12 feet wide instead of 20 which it should have been; and to proof, it is now bulged down stream, wriggled and out of plumb as well as out of line.

Now while this dam of some hundreds of feet in extent across the river was solidly abutted against the river's high and rocky bank at one or its eastward end; the western end of it rested on or a few feet into the face of a bank of quite a different nature on the opposite side; where not only does the rock rise to or crop out at level of bed of river; but the material above it and for a height of some 50 to 60 feet is nothing but the most irresisting soft clayey sand and vegetable mold.

Had the precaution, an expensive one of course, been resorted to, as was done at Grand Mére on the St. Maurice, in an absolutely similar case, of rip-rapping the face of the cliff from the dam to some distance up stream or of a wooden revetment against wash and scour of river, the accident likely might not have happened. It would certainly not have occurred had this cliff revetment been made water tight to a certain height, even though it should have cost an extra $20,000 or more to do so along a stretch of 200 to 300 feet.

What happened is this: the water having on the occasion risen to 30 feet, a pressure of 13 pounds to the square inch or close upon 2,000 lbs. to the foot, a great tendency to filtration through the bottom of the bank (where the strain was irresistible by material of the light and loose structure alluded to) was brought about, and a leakage through and around the western end of the dam was seen to occur. Under such pressure and through such friable material it may easily be imagined how quickly the scour did its work, increasing in a few hours the water way through the bottom of the bank to the dimensions of a sewer and then enlarging sidewards and from below upwards, to the vastness of a tunnel, when of course the roof or over-lying earth caved in—the out rushing water in the mean time wearing away the side hill from below and causing the cliff to go piece by piece almost vertically in slices from 4 to 6 feet thick at a time, till the gap up stream from the dam reached to a distance of some 200 feet, while in the direction of the length or axis of the dam prolonged, the hill was cut into by not less than 300 feet and the scour down stream or below the dam wore away the bank of the river to a distance of more than 700 feet.

The quantity of material carried away—the cliff as already stated being some 60 feet high—is not less than 300,000 cubic yards discoloring the water of the Saguenay for miles below the town and rendering it for the time being unfit to drink.

The dam will of course now have to be extended by some 300 feet or more to the opposite bank or to the present site thereof, while a temporary dam will have to be built to confine the water to passing over the present dam till the extension is put in; but the whole structure should be widened out down stream by say 20 feet, to support a bridge and gate superstructure of some 25 to 30 feet in breadth and capable of holding its own against any subsequent rise of like magnitude in the river; and this should be done at any cost and in the the company's own interests; for as the area of the reservoir or breadth of water upheld will hereafter be of so much greater an extent westward, a second accident of the kind might sweep down upon the city and destroy thousands of dollars worth of property, with probably or at any rate possibly loss of life for which the company might be held responsible—and a stitch in time saves nine.

I would also say here in relation to the new concrete dam at the Chaudiere—it was quite a question this spring whether it would not give under the immense ice pressure against its almost vertical inner or upper face, and my surmises of last fall when writing on the subject have now become a certainty, and to the effect that inward of this concrete rampart should be made an inclined apron of crib-work of two or three feet of base to one of height boarded over with deals or plank laid parallel to the flow of water, and such that any future tendency of an ice jam against the dam will be done away with by the certainty that the swell of the ice forward or down stream will shove it up the incline and topple it over the dam in a way to do no damage to the permanent structure.

PLUMBERS' WORK IN DWELLINGS.

This was the subject of a most interesting lecture delivered at Carpenter's Hall, London, Eng., recently, by Mr. A. Buchanan. It formed one of an organized series of Sanitary Building Construction.

Mr. Buchanan defined plumber's work as the preparing for and fixing of sanitary fittings and connecting them with drains. Such work, he pointed out, must be very carefully done, in order that the gases arising from sewers, which are so deleterious to health, may not be allowed to enter the house. Of course, if proper and adequate ventilation could be given to the sewers, that is to say if there could be a shaft at every ten or twelve feet, no accumulation of gas could take place, and the sanitary arrangements would not need to be so carefully designed and carried out. But it is found impracticable to ventilate sewers at such short intervals.

The lecturer then gave some particulars of lead, the metal chiefly used by the plumber, illustrating with lantern slides the methods of its preparation. Lead is principally found mixed with sulphur. The ore yields about 75 per cent. of metallic lead, and is reduced by roasting and refining in a reverberatory furnace. The chief characteristics of lead are these: It is a bluish grey color, malleable, ductile, tough, flexible, of little tenacity, gives a dull sound when struck with a hammer, melts at 618.8 degrees Fahr., contracts on cooling, oxidises rapidly, alloys with other metals, and has a specific gravity of 11.-36.

For plumbers' work lead is cast or rolled into sheets of varying thickness, and is known as 3 lb., 4 lb., 5 lb., up to 14 lb. lead, according to the number of pounds per foot super. Cast sheet lead is harder than rolled lead and is slightly crystalline in structure. It is subject to air balls, is of uneven thickness, has a tougher surface and should not be used of lighter weight than 6 lbs. per foot super. Milled lead is not crystalline; it is softer, more homogenous, more ductile, and can be had in larger sheets than the cast lead. This is the lead which is now almost universally used for plumbers' work.

Lead pipes are now generally made by hydraulic pressure, and can be obtained from 3-16th in. to 6 in. in diameter and of almost any substance. The apparatus is called a squirting machine. The lead is run into the machine and when in a semifluid state pressure is applied, causing the metal to issue through the dies, a rod or mandrill forming the hollow pipe. Large pipes are sometimes turned up from sheet lead, the seam being either burnt or soldered. In the first process the edges of the lead are fused together by a fierce flame; in the second they are joined by solder. A soldered pipe is not so reliable as the drawn or burnt description, and eventually although not perhaps for a hundred years, the joint is likely to become oxidised and give away.

Plumbers' solder consists of two parts of lead to one of tin; it melts at 440 degrees Fahr. Soldering is carried out as follows: The surfaces and edges of the pieces to be joined are scraped with a shave-hook, and as solder will only adhere to the clean metal, the bright surface is immediately covered with tallow or some such material which acts as a flux and prevents the surfaces becoming oxidised before the solder is applied. The wiped joint is usually soiled, that is, covered with a mixture of lamp-black and size, before the shaving is done. This enables the plumber to prepare the surface to exactly the size required to be covered with solder. The metal is then poured or splashed on, and is manipulated by the plumber with a small pad of fustian called a solder cloth. This has the effect of raising the temperature of the lead to such a point that the tin in the solder combines with the surface of the lead to be joined. The solder is then shaped and the joint finished.

Sometimes a heated copper bolt or bit is used to melt the solder; in such cases solder with a lower melting point is used. As the solder flows these copper-bit joints must be horizontal, or nearly so. Wiped joints can be made in almost any position.

Blow-pipe joints are similar in shape and appearance to copper-bit joints. But the heat it obtained from a jet of flame forced by a column of air on to the joint. A blow-pipe joint is considered to be much stronger than a copper-bit joint, as a greater heat is used in the process. joints are produced by burning the joints in a very fierce flame, which melts the joints together at the seam. This is a process which is not often followed on the building; it is more suitable for shop work.

Lead pipes with soldered seams should not be encased in plastered walls. The action of lime on lead converts it into cerusite, and soldered joint seems to be affected more quickly than the lead, particularly in the presence of moist air.

Soil pipes may be made of either lead or cast iron. To conform to the L.C.C. by-laws they must, if of iron, have socket joints, though probably flanged joints would be equally effective. The metal should be at least 1-4 inch thick, and have large sockets to admit of at least 1-4 inch packing of lead. The iron pipe should be treated by galvanizing, or some similar process, to prevent too rapid oxidation. Lead soil pipes are usually in 10 ft. lengths, and they are usually joined by the wiped joint. The vertical soil pipe is fixed to the walls by means of tacks soldered on to the back of the pipe at intervals of 3 ft., or 3 ft. 6 in. These tacks should be of heavy lead, the metal about the holes being much thicker than the rest.

To bend a lead pipe the throat or inner part of the bend is heated, the outer part being kept cool. The pipe is then bent, causing the inner part to collapse; it is then dressed out, thus thickening the lead at that point. The part is then again warmed and burnt, and the bossing is continued, the operation being repeated until the required shape has been obtained. In the ordinary course the throat becomes much thicker than other parts of the pipe, but a good plumber will dress the lead until he has worked this excess evenly over the surrounding parts. To see that the pipe is of the same diameter throughout, balls or bobbins of wood are forced through by the aid of a mandril, but great care must be exercised, to avoid breaking the pipe. Bends are sometimes made by hydraulic pressure, and sometimes by shaping two pieces and soldering the seams.

Branch soil pipes should enter the main pipe with an easy curve in the direction of the current, the joints being wiped. Soil pipes should be carried up above the roof or 3 ft. above any window, and should be covered with a cowl to prevent downblow.

Soil pipes are connected to iron drains by means of a copper or brass thimble or sleeve, which is slipped over the pipe and wiped on at the top. The connection is made water-tight by spun yarn and blue lead being run in and caulked. In connecting soil pipes with earthenware drains it is not usual to pass the lead pipe through the thimble, which is simply wiped on to the lead pipe, the joint between the thimble and the drain pipe being made with cement. Sometimes a little silver sand is mixed with the cement to prevent it expanding.

Lead pipes do not require painting. Probably if this were taken into account lead would be found more economical than iron, which needs repainting every year or so.

According to the L.C.C. by-laws all soil pipes must be fixed outside the building. In many ways this is a wise rule, though it has its disadvantages. During a severe winter, it is not an usual thing for soil pipes to burst, owing to leaky taps allowing water to trickle through and freeze before reaching the bottom. The risk of faulty joints is the most important reason for placing the soil pipes outside, but when one considers that in lead pipes the joints are soldered and are practically as strong as the pipe itself, the chance of leakage is remote.

To prevent the ingress of sewer gas and bad smells to the house a water-trap is necessary under each fitting. A good trap should have a water seal of not less than 2 in. It should be self cleansing, that is to say, the inner surface should be scoured each time it is flushed. The contents of the trap should be forced out, and clean water left after each time of flushing. The mouth of the trap should be larger ehan the trap itself, so that the flush may enter with sufficient force to remove any deposit. All lead pipes should be fixed inside the house and immediately under the fitting.

After showing on the screen several kinds of traps and explaining their characteristics, the lecturer discussed the three chief causes of the failure of traps. These are evaporation, momentum, and syphonage. If a trap is unused for a long time through the house being unoccupied the water is evaporated; this can be overcome by pouring in a little glycerine, which will cover the surface of the water, and will not itself readily evaporate. The second defect is due to the flush entering the trap with too great a force and so carrying away some of the water necessary to give the seal. This can be overcome by a little care in arranging the flushing apparatus. The third kind of failure, syphonage, is occasioned by the air on the drain side of the trap being drawn out by a charge passing down the main soil pipe. This is remedied by introducing ventilation or anti-syphonage pipes.

The lecturer then showed on a screen a number of types of water-closet, explaining briefly the characteristics of each. In conclusion he mentioned the following books as likely to be useful to students of plumbing.—Hellyer's "The Plumber and Sanitary Houses," "Principles and Practice of Plumbing," and "Lectures on the Science and Art of Sanitary Plumbing; J. Wright Clarke's "Plumbing Practice," and "Lectures to Plumbers;" P. J. Davies' "Practical Plumbing;" Middleton's "House Drainage."

BUILDERS' EXCHANGES AND THEIR BENEFITS.

For many years the impression has prevailed that the principal or general contractor for a building should be a carpenter. Now, in many places, and in fact wherever stone, bricks, or structural steel predominates or enters largely into the making of the structure, any one of these trades may, and frequently does, assume the general contract. Competition being stimulated, a closer economy in construction must be observed. This has created a growing demand for craftsmen and overseers of the highest degree of intelligence and education along constructive lines so that every detail might be thoroughly understood and wisely guarded.

And as this same "higher education" is needed to estimate accurately, it is obvious that the principal contractor, of whatever trade, cannot afford to ignore or dispense with any valuable helps to a successful competition.

The Builders' Exchange comes in here if an "Exchange" it be,—a veritable school of instruction in which men in daily contact with the best and most progressive representatives of their fellow-contractors and tradesmen, inevitably involve a condition eminently above the man who prefers to follow his own selfish lines and notions, fearful lest some one might profit by a suggestion made by him in an unguarded moment. Confidence between men of integrity—and it is presumed only such shall be admitted to an Exchange—cannot fail to strengthen each one in his indiv dual occupation, and collectively the Exchange is sure to be such a factor in public affairs, as will command recognition and respect when concerted action is needed to secure wise legislation upon matters relative to any department of architectural improvement and structural development.

As touching confidence as essential between builders, I am pleased to quote Judge Wing, of Cleveland, who, in a speech at a banquet of builders in his city recently, said —"I think this may be taken as certain: that no man was ever injured in his business by praising the business of another; and that no man was ever left wholly uninjured who decried the business of another."

One of the many benefits to the builder was expressed by Mr. Conlon, Vice-President of the Lowell, (Mass.) Exchange, at their annual gathering a few weeks ago. He said—"The architects are coming to regard membership in the Exchange more and more as a standard of merit and trustworthiness."

It is my firm belief that this standard is an object not merely aimed at, but realized by the many Exchanges throughout our country, their method being to thoroughly investigate every applicant for membership, in order that his honesty, business integrity and ability to perform his contracts, may be assured before he is admitted to membership.

The benefits to the builder from a well equipped and properly conducted Exchange are manifold and cannot be enumerated here, neither can they be estimated in dollars and cents, for, as a man's capabilities in any honorable calling of a public character are enlarged, more apparent become his possibilities as a representative citizen in all public spirited and progressive movements, thereby broadening the opportunities for advancing the interests of his particular calling.

As has been said by a writer upon this subject,—"A Builders' Exchange is a business organization and not a social club."

Here business men meet for business, during a stated business hour, and a rendezvous of this kind affords opportunity for business intercourse between allied branches, whereby is accomplished in an hour or less what frequently requires days to accomplish on the outside.

The business of the builder, whether he be operating largely or not, is located in many places at the same time, and if by means of the Exchange rendezvous he can see his sub-contractors, dealers, architect, and owner, too, and they in turn having need to see the builder, the benefit is apparent. Correspondence and telephones will accomplish much when no better facilities are available, but experience has taught that nothing is so expeditious, so definite and so satisfactory in every way as a face to face interview with the people you need or who need you, especially when amid congenial surroundings where the very atmosphere savors of the business in which you are engaged.

An exchange should be all of this, but as the universal law of sowing and reaping applies here, the builder, in order to reap benefits must sow aright—keeping faith with his Exchange by punctuality and regularity in his attendance, and by a generous, trustful and loyal spirit towards his fellow members.—John M. Hering, Secretary Builders' Exchange of Baltimore.

SEATING IN ENGLISH CHURCHES.

It seems the nave was formerly paved and entirely open, but gradually, dating from the sixteenth century, low benches were introduced, and later in that century we find in a few churches single pews or seats set up, but these appear, during that and the following century, to have been made movable. Weever says, "Many monuments are covered with seats or pews, made high and easy for parishioners to sit or sleep in, a fashion of no long continuance and worthy of reformation." But the fashion unfortunately increased, and in time even these high pews, as well as the solid open benches of earlier date, were gradually raised higher and higher by additional framing; and the proper direction of the pews, which even at first was preserved and made to face the altar, became disregarded, and by cutting away the middle framing, two pews, and more often benches, were thrown into one and cross seats were added. Thus came into existence the high square pews, with their many easy and comfortable nooks and corners, formed, as it would seem, for no other purpose than to encourage sleep.

STONE FOR MOSAIC.

The Greeks at first preferred marble to any other material for mosaic, but in course of time as they introduced new methods and ideas they came to use glass in one form or another, and under certain circumstances bone, ivory and mother-of-pearl. The main reason why marble was abandoned is not far to seek, for it is evident that chemical mixtures of glass and colors together with the advent of gold and silver leaf under the glass, produced, a wonderful splendour and artistic effect previously unknown. The effort to reduce mosaic art to a representation of paintings made it necessary to improve the material, and, therefore, colored enamel of various shapes and sizes were introduced, and of different shades, with most delicate tints and half-tints. The end of the 17 century, therefore, witnessed the restoration to favor—to a great measure—of mosaic, and it was very widely used for the reproduction of the paintings of the great masters.

Four hundred incandescent lamps are required for the proper illumination of the new clock in the tower of the Municipal buildings at Toronto.

INTERCOMMUNICATION.

[Communications sent to this department must be addressed to the editor with th name and address of the sender attached not necessarily for publication. The editor does not hold himself responsible for the expressions or opinions of correspondents, but w ll, nevertheless, endeavor to secure correct replies to queries sent in. We do not guarantee answers to all queries, neither do we undertake to answer questions in the issue following their appearance.]

F. H.: In answer to Jas. D., I submit herewith a method of describing the veneer he asks for. Let Fig. 1 be the plan of a door or window opening in a straight partition, the head or soffit A B C, D E F, being circular, and splaying equally with the jambs A D, and C E. To find the shape of the soffit or veneer, divide A B C into any number of parts; continue A D and C E to H; or H as a centre, draw A G and D J indefinitely; from A to G set off the parts divided around A B C; connect G H;

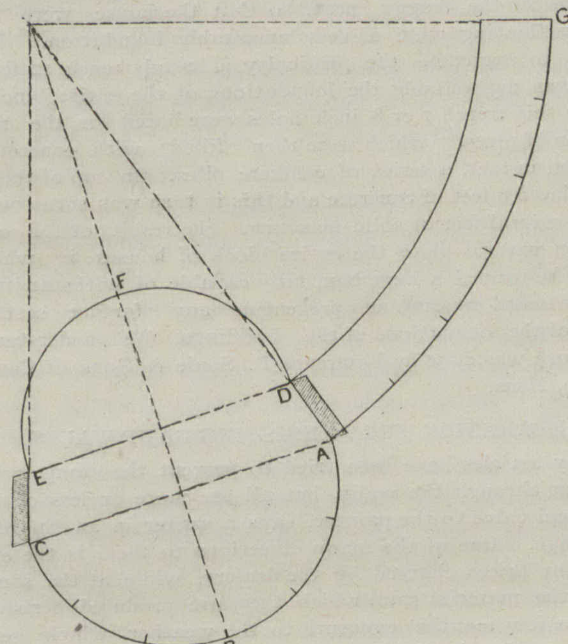


FIG. 1.—SPLAYED SOFFIT·

then A G, D J will be the shape of the edges of the soffit. This is probably the simplest way known of getting the proper curvature for work of this kind. If the wall into which this door or window head is to go was circular, or a round tower wall, instead of flat, a number of new conditions would have to be met of a very complicated character, which this diagram and method, would not meet.

W. T.: Replying to P. McF., who, in your last issue asks if there is a correct method of laying off degrees with the steel square? I may say there are several methods one of which I enclose as shown at Fig. 2, and which I think is among the best. It will be seen by the diagram the relationship of certain divisions of the circle to different figures on the square is indicated. The divisions shew the degrees from 5 to 90 with the exact figures on the tongue necessary to produce the same. This diagram is also useful in roof work, as for example: if a pitch of 25 degrees is required, use 12 inches on the blade and 5 5-8 on the tongue. By reversing the conditions, 65 degrees will be established. Indeed, this scheme may be used for the solution of many problems in the construction of angles. With regard to laying out "braces" for that is what P. Mc F. means I suppose, I may quote from the "Steel Square and its Uses." If we examine the illustration, Fig. 3, we find a brace having a run on the girt of three feet, and a run on a post of four feet, which of course, is an unequal run. The positions of the square for laying the run off, are shown by the dotted lines. To get the length of brace and level of cut for this "run," we take nine inches on the tongue, and twelve inches on the blade, and the distance between the two figures—9 and 12—will give the length of "one foot run" as measured on the brace, and the line marked on the edge of the tongue, will give the top cut of the brace, while the line along the edge of the blade will give the cut or bevel of the brace fitting against the post. The operation is to be repeated four times as shown at Fig. 4. If we want a brace with a two foot run and a four foot run, it must be evident that, as two is the half of four, so on the square take 12 inches on the tongue and 6 inches on the blade; apply four times and we have the ,ength and the bevel of a brace for this run. For an

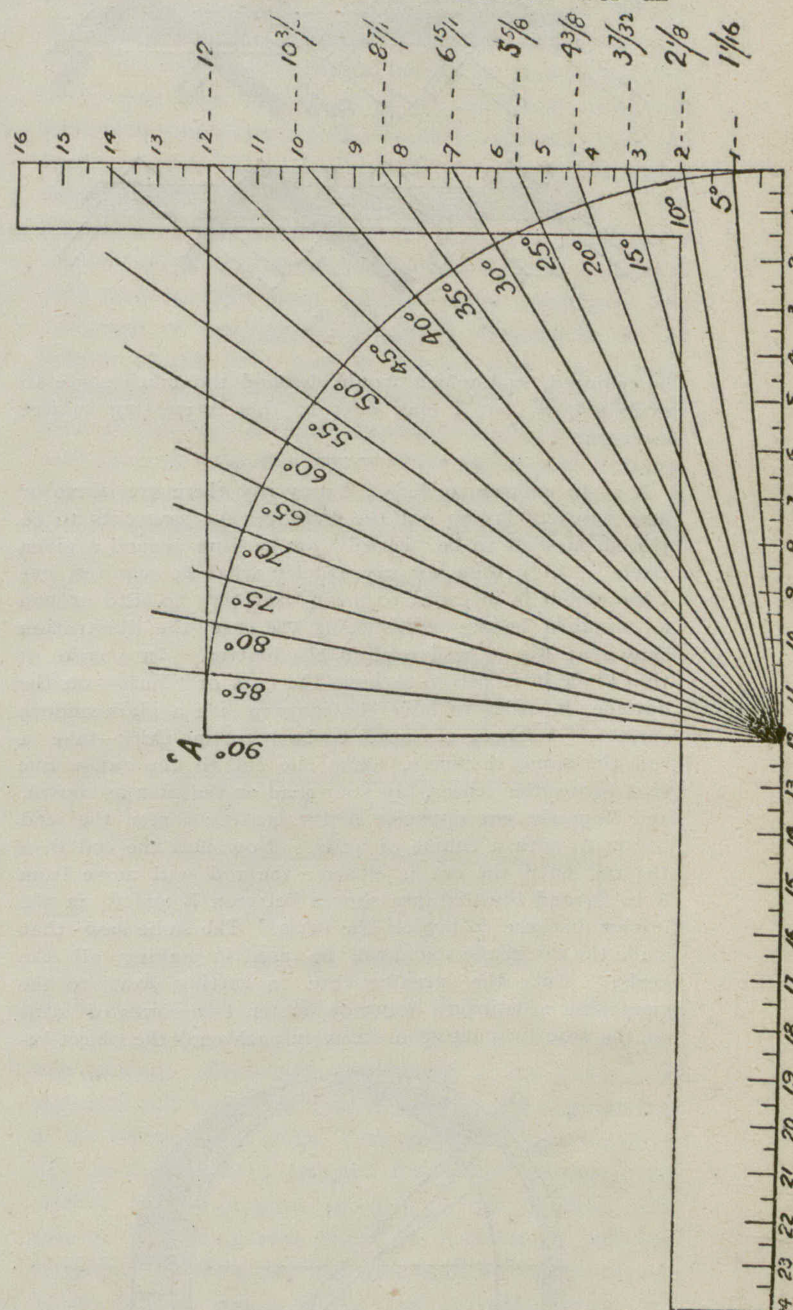


FIG. 2.—LAYING OFF DEGREES BY STEEL SQUARE

"even" or square run, we take 12 inches on the blade, and the same on the tongue, and apply as many times as there are feet in the run,—so, for a four ft. run as shown at Fig. 5, we apply the square four times as shown at Fig. 6. This explanation, will I think, satisfy P. Mc F., so

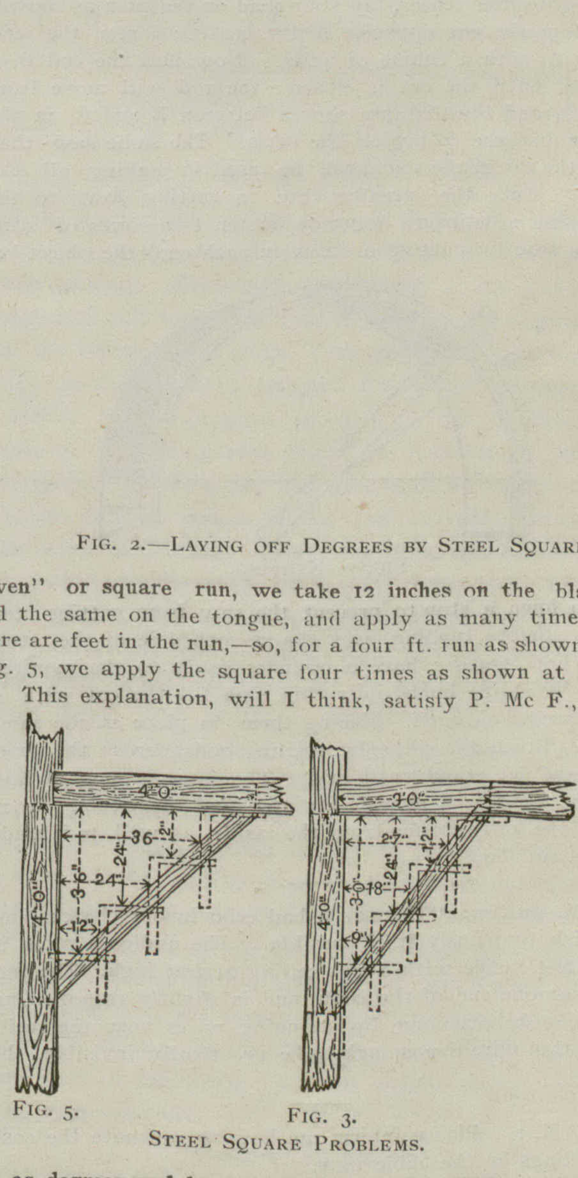
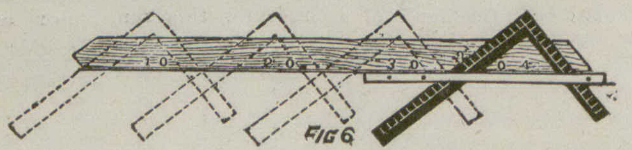


FIG. 5. FIG. 3.
STEEL SQUARE PROBLEMS.

far as degrees and braces are concerned. With regard to cutting hip and valley rafters, they can all be cut on the ground by using the square and saw properly. For bevels and lengths of rafters, take 17 inches on the blade, and the pitch of the tongue, and you have the plumb cut on the tongue, and the flat, or plate cut, on the blade for all regular or square roofs. Irregular roof or roofs having acute or obtuse angles, some different treatment will



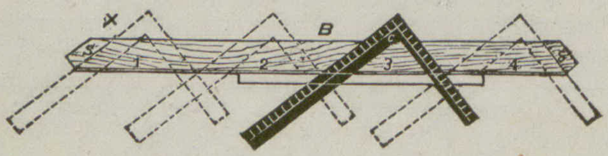


FIG. 4.
LAYING OUT BRACES.

be required, and which would demand too much space to explain how, but I may refer to this interesting subject later on.

X :—In answer to J. N., I may say there are three or four ways of laying out the distances for saw cuts to be placed on stuff to be "kerfed" for bending around a given circle. J. N. does not say exactly what he requires, but I presume it is intended to mean "kerfing" to bend around a window head. This being the case, the illustration shown at Fig. 7 will explain the matter. In a case of this kind, it is better to have the cuts or "kerfs" on the outside, in order to have the concave side a plain smooth surface. Suppose the stuff to be 1 1-4 in. thick—take a rod the same thickness, make one cut to the gauge line that forms the veneer, lay your road on the plan as shown, and keep the cut opposite A the centre ; fasten the end below A with a couple of nails. Now pull the end B of the rod until the cut is closed ; the rod will move from B to O, and the distance shown between B and O, in the proper distance to lay off the kerfs. The same saw that made the cut in the rod must be used in making all the kerfs. Take the greatest care in cutting down to the guage line ; to insure accuracy fasten two pieces of stuff on the saw by putting a screw in each end, the object being to form a stop to prevent the saw from cutting too deep. Before bending, wet the smooth side of the stuff with hot water ; have a cylinder ready to the required circle, bend the board over this, and fill the cut with a thin strip of stuff, glueing them in place at the same time. Brace the piece by trailing rods across the bottom, and let stand until dry. The same system of laying out kerfs will answer for any kind of circular work where the kerfs are made on the inside, as well as if made on the outside.

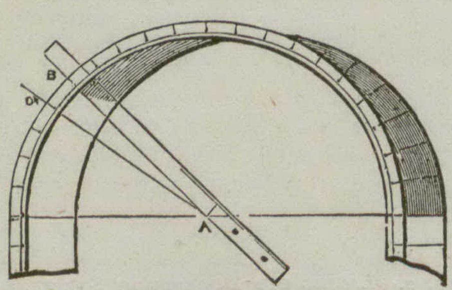


FIG. 7—KERFING.

V. W. writes : "There is a bad echo in our church, and we wish to remedy it if possible. The audience room is 38x50 feet inside with a flat ceiling 21 feet high. The pulpit is at one end of the room and is slightly raised. Can this echo be overcome by stringing wires near the ceiling ? Can wire fine enough to be practically invisible, be used ?

Jas. N. : Please inform me how to estimate the cost of buildings by the cubic foot.

P. R. S. : I would very much like to know if the Red-Wood of the Pacific coast is a good wood for inside finishing ?

R. S. T. : I cannot get the bronzing on some radiators I have finished, to keep from peeling off. What is the best liquid to mix the bronze with ?

W. P. : Given the rise of span of a segment arch which is the easiest way to find out the skew-backs—the diameter of the whole circle of which the segment is to part, also the exact measurement from skew-back to skew-back ?

CONTRACTING METHODS.

Our readers will be interested in learning the method adopted by a Boston contractor to place a stable foundation beneath a number of houses that had been built upon what was years ago a swamp with a stratum of quicksand below the boggy peat, so that the houses were in reality floating upon a very unsuitable foundation. In order to overcome the difficulty a broad trench 12 feet deep was dug outside the foundations of the entire block, and in this trench 7 or 8 inch holes were bored for the reception of pipes, which were then filled with concrete, making, in fact, a series of concrete piles. On top of these was placed 6 feet of concrete and this in turn was surmounted by several feet of solid masonry. The result of the operation was to place the entire block of houses in what might be termed a huge box, fully capable of withstanding any outward pressure and preventing any further settlement of the foundations of the buildings. We understand the work was done by Lawrence P. Soule & Sons of Cambridge, Mass.

PREPARATION FOR RESISTING DAMP WALLS.

Many articles have been tried to prevent the damp from striking through the walls, but all are more or less of no practical value to the painter, says a writer in an English exchange. One of the many objections to them is the exorbitant prices charged by the dealers, while at the same time the material from which they are produced perishes after a few months' exposure to the weather, which generally results in the damp resister and overcoats falling off in large masses.

An effective preparation may be prepared as follows : Procure 14 pounds common rosin and melt over a fire, or melter, stir in two parts each boiled linseed oil and hard oak varnish, and then allow it to cool down somewhat and take well away from the fire and add slowly 3-4 gallon coal tar naphtha, constantly stirraing until all the ingredients are thoroughly mixed.

This preparation should be kept in air tight vessels, otherwise the naphtha, being volatile, passes off, leaving a thick, unworkable mass.

The above preparation is transparent, but may be prepared in any shade or color by adding any good boiled pigment, thinned down with naphtha and thoroughly mixed into the preparation.

The best method of applying the preparation is to rub the first coat well into the work by means of a heavy varnish brush. This should be allowed to thoroughly dry, which usually takes about three hours, it may then be given another coat, which dries hard with an excellent gloss. The work may then be proceeded with in the usual way. This recipe produces about 2 1-2 gallons, and will cover about 120 square yards, one coat.

The McLellan Paint Company, of Toronto, has been incorporated to manufacture and deal in paints, varnishes and painters' supplies generally, and to take over the business heretofore carried on by the McLellan French Paint Company.

In the city of St. John, N.B., there is a by-law existing at present requiring that plumbing work shall be done by competent men. It is now proposed to go a step in advance and make it compulsory for plumbers to take out licenses.

The capital of the Peninsula Portland Cement Co., with general offices at Toronto and works at Durham, Ont., is $1,000,000. Gilbert McKechnie, of Durham, and T. W. Stanhope and Barlow Cumberland, of Toronto, are directors of the company. In the vicinity of the works there is a superior quality of marl and suitable water powers which have been secured.

STRESSES IN FOOTINGS.

The huge buildings of the present age for stores, warehouses, mills, and mammoth emporiums, as well as abutments and piers for bridges, viaducts, vaults, large arches, and retaining walls, have greatly increased the intensity of the stresses in footings. It is, therefore, highly desirable, says the London Contract Journal, that simple principles of estimating these and the corresponding extent of the requisite resistances for certain unit loads in the usual structural materials should be plainly presented. None of the usual text-books discuss the statical details and the complex conditions that are, in many cases, involved. The pupil or apprentice, even if armed with advanced course technical certificates and added honors, will need home aid, which the following may, in a restricted sense, supply. It consists mainly of a few informal data by way of a rough model for dealing in a measure with the principles of the subject.

STRESSES IN FOOTINGS.

The footings being the bottom projecting courses, in the foundations of masonry walling, piers, etc., their proper stresses are vital to the stability and safety of the superstructure. In usual building details the footings are made to project equally on both sides of walls, and round piers, columns, isolated furnace chimneys, etc. This procedure is frequently done because it is a practical custom, followed by the metropolitan building by-laws as regards dwellings and warehouses. The amount of the projections should, however, be equal round the final resultant of the centre of gravity of walls and the axis of pressure of the resultant of all load points of floor girders, roof trusses, or other loads bearing upon the walls. If the distribution of footings is not thus equalized round the axis of load pressure there is a tendency to unbalanced subsidence, causing distortion, cracks, and other evidences of failure. These evidences only occur at the points where the stresses are most intense and unbalanced, and that are in no way modified by the elasticity of the masonry. In fenestrated walls, the piers and masonry transomes over openings are the most vulnerable for locating evidences of conflicting stresses and distortions. In the case of high furnace chimneys of large internal diameter at the bottom, they are always best treated as a single mass in the lower beds of the foundation masonry or concrete; but just below the level where the boiler flues enter it the footings should project inside as well as outside. This is needed, because the axis of the centre of gravity of the section of the battered wall falls inside of the geometrical centre of the base. It is by means of the projecting footings that the stresses of the wall base are sufficiently diffused to bring them within the sustaining power of the foundation soil. The unit base load of the footings should have a factor of safety of two or three against the soil consistency to provide for future accidental decrease of its sustaining power by flooding drainage or overloading of any part of the superstructure. When the footings are designed satisfactorily in this respect, undue or unequal subsidence is provided for to preserve the equilibrium of the superstructure and prevent any displacements of parts.

DESIGNING FOOTINGS.

The designing of footings should be no rule-of-thumb matter, in order to adequately meet the various active stresses to which their position and functions give rise. The footings, besides having sufficient projection to balance the respective intensities of stress on either side, must likewise have sufficient depth to resist the transverse stresses as a pair of cantilevers placed back to back. It becomes necessary to view the functions of the footings, not only as cantilevers merely in respect of their projections from the planes of the back and front wall faces, but likewise as back-to-back cantilevers from the axial centre of the entire breadth of footing base. This double method of treating the stresses is typified by the persistent vertical splitting of the wall base itself for a considerable height above the footing level in tests that were made in India—near Calcutta—some years ago. The designing of footings systematically commences at the bottom of the level base in contact with the ground. Sometimes this bottom bed is of concrete, which is often made of common quicklime mortar that seldom gets hardened in moist ground, and may never attain much tenacity. The first practical problem in the order of procedure is to ascertain the safe sustaining power of the soil at the depth

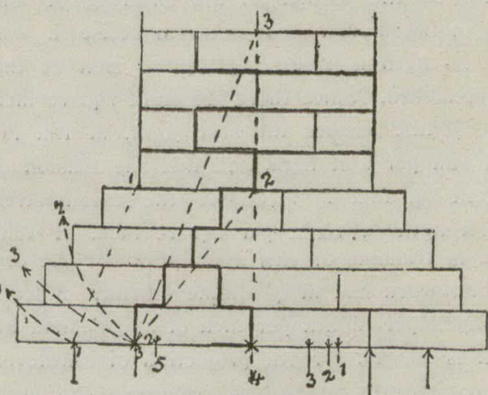


FIG. 1.—RENDING FOOTING STRESSES.

of the level of the footing base, as well as the nature and thickness of the successive beds in the soil section of the surface geology. The depth and extent of the auger borings and unit load tests must depend on the requirements of the building and of the local geological circumstances. The methods usually adopted for these purposes are omitted as not properly included in our heading. The area of the footing base should be increased by sufficient spreading out from the resultant load axis until the inherent bearing power of the soil covered thereby will be amply sufficient to support the completed building with its total possible loads when fully equipped or occupied. The graphic method of the "funicular polygon" of forces is convenient for finding the precise position of the final static resultant of all the direct and abutting loads and pressures sustained by the foundations of buildings at the footing base level. The geometrical centre of the footing base will thus be made to coincide exactly with the final resultant axis of all the loads and weights. This systematic course, when carried out in practice, will be found to differ from the equal projections of half the thickness of the wall base on each side of it, as prescribed by the London Building Act, 1894. The upward reaction of the soil against the footing base is a uniform pressure over the area, and the centre of reaction is at half the cantilever projection from the resultant axis of the gross load and weight of the structure and superstructure.

STRENGTH OF FOOTINGS.

In considering the strength of footings, first, as back-to-back cantilevers (2, 4, 2, Fig. 1) of half the wall-base projection laid in common lime mortar the rate of incidence of the increasing load first presents itself. At the ordinary rate of building operations it may be roughly assumed that one-tenth of the total unit load is added per month. This would be 2cwt. per square foot per ton of total footing load per month in ordinary soils. In the large back-to-back cantilever the weakest point is the bottom course of the axial tooth joint of the footing brickwork, say at 4, Fig. 1. The resistance is that of the weaker of the shearing or adhesion of the mortar to the bricks in the toothing bed joints. The vertical side joints of the stretchers add nothing to the tenacity of the tooth joint. Taking four courses high of brickwork per foot, and the effective interlap of the toothing bed joints as 2in. average, there would thus be eight square inches per foot high per each 9in. of projection of the cantilever, according to the Metropolitan Building Act, 1894. As the soil reaction produces the transverse stress on the footing base, which tends to separate the back-to-back tooth joint of the cantilevers near the footing axis (4, 2. 3, Fig. 1), there would first be the weaker of the shearing or adhesive strengths of the mortar bed joints to resist it. Assume that this strength is 2½lb per square inch at the end of the first month. Since there are eight square inches of tooth bed joints, besides the base joint, in 1in. long of length of wall per foot high, and that the tension on the lowest joint (4, Fig. 1) is double the mean stress, an average strength of 1¼lb. per square inch. or 10lb, per foot high. is available on this assumption for the ordinary class of brickwork laid in quicklime mortar. Since 1-10th ton, or 224lb., per month per inch of longitudinal breadth of section is 18.66lb. for 1ft. projection of cantilever unit stress, it constitutes an upward reaction. But according to the London Building Act, 1894, the projection for 1ft. high of footings is 9 in. (= ¾ths), and a uniform load acts at the statical centre of pressure (⅜ths of 1ft. high) for each 9 in. of footing breadth. Then 8-3rds of 10lb = 26.66lb. is the tooth-joint resistance corresponding to 1ft. high of such cantilevers with 9in. of projection, and 26.66lb ÷ 1 = 13.13 lb for 18in. projection. There is thus about (½ 26.66 − 18.66 =) 4lb of deficient resistance of mortar strength in 1in. breadth of this cantilever, at the end of the first month per 1-10 ton of the ultimate unit-ton load on the footing base. For succeeding months, in most cases the strength of the mortar would perhaps increase quicker, up to the limit of its ultimate strength, than the load additions occurred. But as the axial back joint of the large cantilever may really act with at least double the vertical leverage due to the footings alone, having the cross-section of the base of the wall, with half-brick toothing, or double that of the footing courses, if the bricks be laid in English bond, to draw upon. For such extra vertical leverage at least three times the above estimated results may be justifiably relied upon in practice in compressible soils. If three times the 1ft. resistance for double the vertical leverage is thus assumed, there would be nine bed-joint interlaps, including that of the base. Four of the footing joints are of two square inches each, and four more of them of more than four square inches each, besides the base bed joint, which, if allowed at the rate of the latter, makes about 28 square inches of bed joints. Then the corresponding effective cantilever action of the uniform load is 8-3rds of this

cantilever action of the uniform load is 8-3rds of this = 75 square inches, which at 1¼lb = 94lb for a cantilever ings per inch breadth of the cantilever. The double area of wall-base toothing makes it very probable that the footings would be completely rent before the wall-base resistance would come into operation. But this is only an interim load; the ultimate conditions of load and resistance must be accounted for, which may reveal less satisfactory results. An ultimate load for ordinary soils at usual house-building levels, say down to 6ft. below the surface, is about two tons (4,480 lb.) per square foot, or 1-12th of it (373.33lb.) stress per inch of cantilever on the wall line. On the other hand, the ultimate tensile resistance of common quicklime mortar (two sand), made in the ordinary way, in Vicat's latest investigations, is given at 10lb. per square inch, at one year old. If half of this, 5lb. per square inch, be taken as the ultimate safe mean shearing strength of the joint under the impressed load| then for 12 in., including the footing base joint × 5 = 60lb., and 8-3rds of 60 = 100lb as the effective resistance of the cantilever back-to-back joint per 9in. of the footings for 1in. of length on the wall line. Half this result is less than half the two-ton unit load by 26-66lb × 1 = 53.2lb.

SMALL CANTILEVERS (1, 1, 1, FIGS 1 and 2).

If, now, the tooth joint of the side wall cantilevers of the footings be considered only, the portion projecting from the vertical planes of the wall faces will here be similarly examined. These cantilevers are limited to the projection for their leverage height—i.e., 9 in. projection for each foot in height. If every allowance is made for full 2 1-4 ins. interlaps of toothing (which, however, can only be so when the full-length 9 in. bricks are used) 1-4 lb. more strength of resistance is thus produced. If 13 in., including the footing base joint, be the cantilever toothing area, then 13x1 1-4 equal 16 lb. per foot of

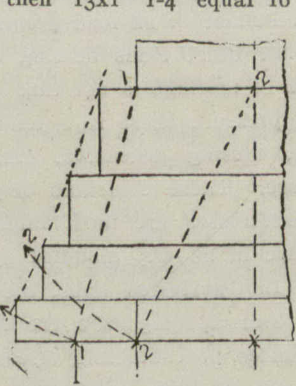


FIG. 2.—UPWARD INCREASED STRENGTH FOR EQUAL INSETS.

(Note.—For one brick on one side only, to show the principle more distinctly.)

height for the 9 in. projection outside the face of the wall base. For a uniform soil pressure the corresponding cantileverage projection is 8-3rds of the height of 1 ft., therefore 16 lb.x8-3rds equals 43 lb. This gives a large surplus at the end of the first month for 1-10 ton load, which was assumed to be an ordinary rate of increase. if a double bottom footing course were laid it would afford an additional tooth joint and increase the resistance by 2.5 lb.x8-3rds equals 7 lb. per inch of longitudinal section of the wall. It appears, then, that one cause of the ultimate cracks and displacements that disfigure many London and provincial houses, especially the old ones, cannot be thus explained, for the earlier increments of loading when fenestration statics do not operate prejudicially The ultimate deficiency of strength of ordinary quicklime mortars, which cannot produce a safe mean shearing and adhesive resistance of 10 lb. per square inch, must be the cause of some of the disfiguring cracks observed. It has been shown that the London Building Act footings do not afford sufficient resistance for stresses produced by one ton per square foot of ultimate load on the footing base in compressible soils. Considering that four or five times more quicklime mortar is used than Portland cement in the footings of many large structures, a stronger design of footings should be adopted. There should also be more certain knowledge of tested adhesive and shearing resistances of the usual mortars employed.

RENDING STRESSES AND LINES OF RUPTURE.

Fig. 1 is a diagram indicating by the thickened zigzag lines the static rending stresses produced by the normal upward reaction of the soil. It has also a tangential tendency in the direction of the arcs, 1, 3, 2, to withdraw the toothing about the vertical lines of the cantilevers. The arcs start from the lower ends of the radial leverage lines with which the static pressures normally act. The cantilevers are hinged at their upper ends, 1, 2, 3 (Fig. 1,) and swing in the direction of the arcs, 1, 3, 2, on one side of the axis, 4, 2, 3. The longer the radius and the less the horizontal leverage the flatter is the tangential stress, as in Fig. 2. It is observable that there is more tendency in the small cantilevers to break the bricks across towards the top courses of the footings. The tangential stress is most active in the bottom course. The outside end of header bricks in one course breaks joint with those in the next courses. In looking over some of the tests made by Mr. John Grant in connection with the Metropolitan main drainage works 1858-71, it is found that white chalk mortar (three sand) gave 4 3-4 lb. per square inch adhesion to stock brick at 28 days old. If 2 1-4 lb. be taken as an effective mean resistance stress on the tooth joint, then 2 1-4x8 square inches in 1 ft. high of tooth joints gives 18 lb. of resistance for 1 ft. projection. But the London Building Act footing only requires three-fourths of this—i.e., 8-3rds—or 48 lb., which for a uniform toil resistance allows a margin of 29.35 lb. per inch of longitudinal wall section to meet accidental weaknesses or drawbacks from damp soil and other usual causes of possible occurrence.

TRANSVERSE STRESS INCREASES UPWARDS.

Fig. 2 is an exaggerated diagram of the required increased height of the footing courses upwards, so as to be the more readily observable. The projections are equal in every course at both sides. Each narrower footing course has proportionally smaller area to support the same gross load than the course below it. Hence each upper course having the greater unit load requires the greater transverse strength imparted to it by increase of height. If each brick area in a course has 1-4 ton of load, then each half-brick area that each higher course is lessened has 1-8th ton more of load than the course below it. This added load is divided over the lessened area or number of bricks. Since the transverse strength of the cantilever increases as the square of its depth, double the load only requires the addition of the square root of its depth. If, then, the transverse strength of one-brick course is sufficient thickness for the bottom course of, say, four bricks, then the next higher course must be increased by one-eighth of its transverse strength—i.e., one-eighth of the square root of the depth of the bottom course. If there were eight courses of equal offsets, then the increased height of the upper course would be the square root of the effective thickness of the course. Many kinds of bricks vary in thickness from 2 1-2 in. to 2 3-4 in., the bed joint of mortar being about 1-2 inch thick. For a 2 3-4 in. thick brick, the added thickness required in the top course will be 1.7 in., or nearly 1 3-4 in. This assumes the footing bricks to be sound and reliable.

TRANSVERSE STRENGTH OF BRICKS.

It is surprising that with so much brickwork used in footings, where their transverse strength is vital to the stability of structures, there should be so few tests published. We are principally indebted to the United States of America for the data there exists. Prof. Baker, of the Illinois University, supplies tests of bricks of high-class manufacturers. Thus, machine-made of stiff clay, best 50 per cent. in the kiln, gave coefficients: 42 lb. minimum to 82 lb. maximum per square inch; dry clay ("pressed"). 8 lb. to 27 lb.; face bricks in wall 17 years, 14 lb. to 23 lb. averages. The engineer of the Lehigh Valley Railway's data is quoted for Eastern States bricks: "medium hard," 28 lb. to 36 lb. per square inch "soft" (underburned), 15 lb. to 25 lb. per square inch. There are other higher results for "very hard" and "hard" bricks, good-shaped and sound, but that class are not often put into ordinary foundations. The hard ones here are generally shapeless, which exposes them to abnormal stresses. The above, however, will compare with common stocks that are so much used here. Take, for an example, the minimum breaking coefficient for "medium hard," sufficient for railway works, and a factor of safety of four to five, giving a safe coefficient of 6 lb. per inch of centre load for a rectangular beam supported at both ends, then for the cantilever uniformly loaded 3 lb. is the coefficient. The effective leverage of a quarter brick with 1-2 inch mortar joint is 3 in. equals .25 of 1 ft. span. The safe load on it equals 3 lb.x2.5^2 divided by .25 equals 3x6.25 equals 18.75 divided by .25 equals 75 lb. on a quarter-brick offset for 1 in. length of footing along the wall line. Since 1-12th ton per square foot is 47 lb. for 1 in. of a quarter-brick footing course, then 75 lb. is 1.6 tons per square foot of safe resistance of a sound medium hard brick.

METHOD OF RAISING A SEVEN STORY BUILDING.

An interesting piece of work, which has recently been successfully executed, says Carpentry and Building, was the raising of the seven-story Cambridge Hotel building at Thirty-ninth streets and Ellis Avenue, Chicago, and this without so much as cracking the plaster of a wall. The building, constructed in 1892, had originally only a 5-foot basement, which was not sufficient to allow the boilers in the steam heating and electric lighting plants to come up to the grade level necessary under city ordinances. The building had to be raised 3 feet. This has been done by using over 1,500 jack screws, combined with a steel substructure. The work was completed in 21 days instead of 30 the limit placed in the contract. The contractors were the L. P. Friestedt Company, 145 La Salle street, Chicago.

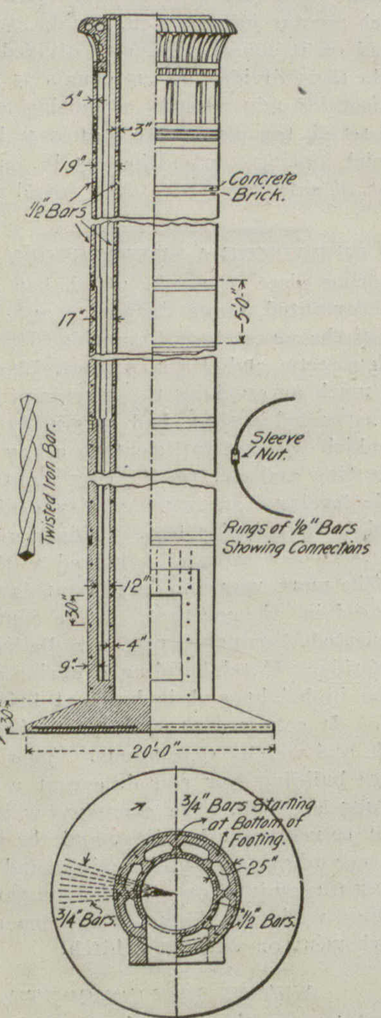
The Cambridge Hotel building contains 450 rooms, is seven stories in height and is built of brick on a steel frame work. It covers a ground space of 50x138 feet, is 150 feet high, and weighs 15,000 tons. This is claimed to be the highest building ever raised, except a church whose steeple was 145 feet high. The company were under a $75,000 bond not to injure the building, and the work was accomplished according to specifications and in nine days less time than the limit allowed. The company had 80 men on the building, with four foremen and one superintendent and the work went on without a hitch.

WET OR DRY CONCRETE.

In a recent issue of the Journal of the Western Society of Engineers, Mr. J. Hirtz describes some experiments made for a railway company to acertain whether any advantage was gained by using concrete mixed rather dry. Authorities on concrete have differed very much on this point, some as the result of laboratory experiments having recommended that the water added should be kept down to the lowest possible amount, while others prefer an excess of water. Actual practice has also differed, for inquiries showed that, out of thirty-five prominent railroads, ten preferred a dry mixture, five a moderately dry one, sixteen a moderately wet mixture, and four a wet mixture. In the experiments referred to the concrete consisted in each case of 1 part of Portland cement, 2 parts of sand, and 5 parts of stone. This was mixed by a Ransome mixer, and moulded into two 3 ft. cubes. In the one case the water added was 82 per cent. of the volume of the dry concrete, and, as a consequence, the mixture was so wet that it was difficult to handle. In the other case the water added was 44 per cent. of the volume of the dry mixture, and heavy tamping was necessary to consolidate the concrete. This tamping was done on each 6-inches layer. After thirty days it appeared that the wet concrete weighed 9.7 per cent. more than its fellow; it had, further, a much better surface, and on being broken proved of much higher quality, the interior being a solid and compact mass, with the surface of fracture passing through the limestone and granite pebbles of the aggregate. The broken surface of the dry concrete block, on the other hand, showed numerous voids and pores, and a much larger percentage of pieces of stone and pebble "pulled out" in place of breaking. It is obvious from this that plenty of water should be added to the mixture, in order to produce the best concrete.

A CONCRETE CHIMNEY.

A concrete chimney just completed for the Singer Manufacturing Company at Elizabethport, N.J., is thus described by Ralph C. Davidson in the Scientific American: This chimney is of the Ransom cold-twisted-iron construction and is the second of its kind in this country; the first, a chimney 150 feet high, with walls less than 12 inches thick, was built about three years ago at Bayonne, N. J., for the Pacific Coast Borax Company. This chimney has given perfect satisfaction and has withstood a



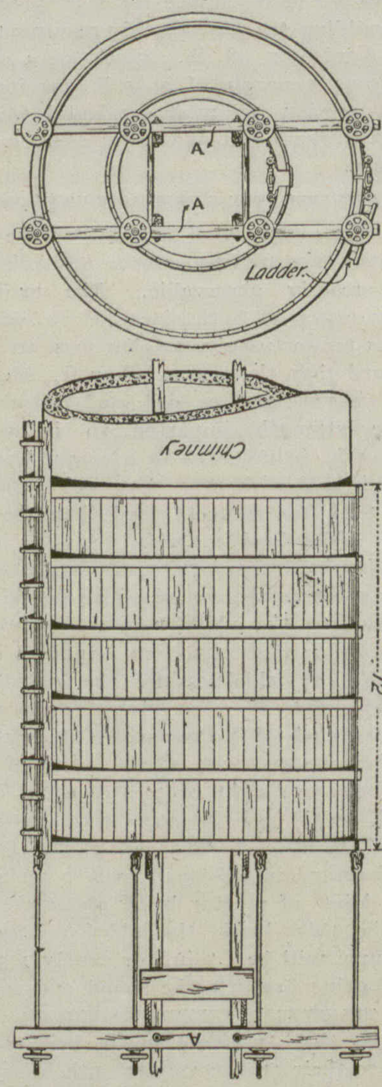
DETAILS OF CONCRETE CHIMNEY AT ELIZABETHPORT, N. J.

number of severe wind storms. All the buildings of this company are of concrete throughout. The Singer chimney is a straight chimney 125 feet high, with a 9-foot flue. It weighs 250 tons, the load on the base being 9 1-2 tons to the square foot; 20 pounds per foot was allowed for wind pressure in designing the chimney. What is known by concrete men as "wet" concrete was used. By a wet mixture is meant one which quakes slightly when rammed; by dry mixture is meant one which requires repeated ramming to bring water to the surface. The concrete was mixed according to the following proportions: 1 part American Portland Cement, 3 parts sand, 5 parts broken Hudson river limestone. (Stone broken to pass through a 3-4 inch ring unscreened.) All of the concrete used was machine mixed, this process being much quicker and cheaper than mixing by hand. The method used in constructing this style of chimney is ingenious and novel, and is covered by patents. In laying the foundation for this chimney no piles were used; the ground was simply leveled off and the concrete laid as shown in Fig. 1. Cold-twisted-iron bars were imbedded in the foundation, radiating from the centre as shown. Twisted rectangular bars are used for the reason that the spiral ribs formed upon the iron make a continuous lock between the bars and the concrete. It was also shown by test that the tensile strength of twisted bars was considerably more than bars that were not twisted. The following table shows the increase of strength of iron bars by reason of twisting. When the foundation is thoroughly set, a mold is put in place and the actual building of the chimney commences. This mold is constructed as shown in Fig. 2. It is filled with concrete, through which iron bars are distributed as shown in Fig. 1. This concrete is then thoroughly tamped and allowed to set. It will be noticed that the chim-

Material.	No. of twists per foot.	Per cent. of gain	No. of twists per foot	Per cent. of gain
¾ inch square commercial iron....	⅜	0.03	¾	0.05
" " " "	1½	0.17	2¼	0.18
" " " "	3¾	0.20	6	0.24
¾ " " Norway " ...	...	....	6	0.53

ney has an inner and outer shell; the space between these shells is obtained by means of wooden core blocks. Scaffolding is erected inside of the mold; on this scaffolding the hoisting beams, A, shown in Fig. 2, are supported.

After the first filling of concrete in the mold is thoroughly set, the turn-buckles on the mold are let out, leaving the mold free to be raised by means of the threaded stays and hand wheels. Eight men are required to raise the mold, one man at each wheel. The mold is raised 5 feet at a time, this leaving the mold a lap of 7 feet on the portion of the chimney already set. The mold is now tightened up by means of the turnbuckles, and is again filled with concrete and iron rings. Perpendicular iron rods are also placed through the chimney, as shown in Fig. 1. These are joined at every filling, making a series of continuous bars from the base to the top of the chimney. The operation is continued each succeeding day, the scaffolding being extended upward, and the mold raised, filled and the concrete allowed to set; thus 5 feet of the chimney is com-



PLAN AND ELEVATION OF THE MOLD.

pleted each day. When the mold is raised high enough to clear the cleaning-out door, the concrete is delivered to the men on the scaffolding by means of a bucket-hoist inside of the mold. In molding the cap, a plaster mold is used.

The outside finish of these chimneys may be left plain, or tooled to represent stone; sometimes, to add to a chimney's appearance, two rows of concrete brick are laid in place after each day's work, this making a series of brick rings 5 feet apart throughout the height of the chimney. When lightning rods are desired, the perpendicular rods already referred to are extended up through the cap.

AN EFFORT TO SECURE UNIFORMITY IN SIZE OF BRICKS.

A conference was recently held in London between representatives of the Royal Institute of British Architects, the Institution of Civil Engineers, and the Institute of Clayworkers to consider the question of standardizing the size of bricks. There was placed before the conference the following standard suggested by a joint committee of the R.I.B.A. and the Institution of Civil Engineers :

1. The length of the brick should be double the width plus the thickness of one vertical joint.

2. Brickwork should measure four courses of bricks and four joints to a foot.

Joints should be 1-4 in. thick and an extra 1-16in., making 5-16in. for the bed joints to cover irregularities in the bricks ; this gives a standard length of 9 1-4in. centre to centre of joints.

The bricks to be measured in the following manner :—

Eight stretchers laid square end and splay end in contact frog upwards, in a straight line to measure 72 in.

Eight headers laid side by side, frog upwards, in a straight line to measure 35in.

Eight bricks laid, the first brick frog downwards, and then alternately frog to frog and back to back, to measure 21 1-2 in.

This is to apply to all classes of walling bricks, both machine and hand-made, and facing bricks."

Representatives of a number of brick manufacturing firms gade expression to their views, and referred to the difficulty of producing bricks to a standard size—especially as regards length—owing to shrinkage in the kiln. One manufacturer pointed out that to burn the darkest red color it was necessary, or usual, to burn these bricks stood on end, and consequently the weight of the bricks above, and the heat of the fire below, made these oftentimes shrink nearly half an inch in length.

On the other hand the Chairman of the Kent and Essex Brickmakers' Association said the brickmakers were quite capable of making any size or any shaped brick that engineers or architects might require, if architects or engineers would pay the price for it ; but the fact was that the engineer required the very best brick he could get, and he wanted to give the very lowest price for it. Another speaker put this fact in a different way by saying that if a rule were made that bricks were to be a certain length, with no allowance for uncertain contraction, they would have to be sorted, and hence become more expensive.

The conference resulted in the appointment of a committee representing all parties concerned, to consider the desirability of making the size of bricks uniform throughout Great Britain.

In this connection the following table of normal brick dimensions in various countries is of interest :—

	Length ins.		Width ins.		Thickness ins.
United States	8	x	$3\frac{7}{8}$	x	$2\frac{1}{2}$
Germany (normal)	$9\frac{7}{8}$	x	$4\frac{3}{4}$	x	$2\frac{9}{16}$
" (north-west)	$8\frac{1}{2}$	x	$4\frac{1}{8}$	x	$2\frac{1}{4}$
" (Bavaria)	$11\frac{1}{2}$	x	$5\frac{1}{2}$	x	$2\frac{3}{8}$
Austria	$11\frac{1}{2}$	x	$5\frac{1}{2}$	x	$2\frac{9}{16}$
Italy	9	x	$4\frac{5}{16}$	x	2 to $2\frac{3}{4}$
France	$8\frac{5}{8}$	x	$4\frac{1}{4}$	x	$2\frac{3}{8}$
Belgium (Brussels)	8	x	$3\frac{3}{4}$	x	$2\frac{3}{8}$
" (Liege)	9	x	$4\frac{3}{8}$	x	$2\frac{1}{2}$
" (Boom)	$7\frac{1}{8}$	x	$3\frac{3}{8}$	x	2
Switzerland	$9\frac{7}{8}$	x	$4\frac{3}{4}$	x	$2\frac{3}{8}$
Russia	$10\frac{3}{8}$	x	$4\frac{7}{8}$	x	$2\frac{11}{16}$
Holland..	$8\frac{1}{2}$	x	$4\frac{1}{8}$	x	$2\frac{1}{8}$

—THE—

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THE WINDSOR PLASTER CO.

The works of this company, situated at Windsor, Nova Scotia, are from two to five stories in height and cover a floor area of 43,000 square feet. In 1893 the company commenced the manufacture of calcined land plaster, and the year following began the production of English Selenite Cement for plastering walls and ceilings. This material has been favorably received and largely used by architects and builders throughout the Dominion.

THE RELATION OF WALL PAPER TO DISEASE.

Some of the Master Painters' Associations of the United States are calling the attention of city councils and local Boards of Health, to the necessity for a regulation forbidding the hanging of wall paper without previously removing the old paper from the wall. Many cases of infectious and other diseases are said to be traceable to the practice of covering up old wall paper with new. There is a regulation in New York which prevents the re-papering without first cleaning the walls, but it applies only to tenement houses. It is no doubt particularly applicable to houses of this character, anh if so, would seem to be also necessary in the interests of the public health, for buildings of all kinds where paper is employed as a wall covering. Not only should the old paper be removed from the walls in every instance before new paper is hung, but walls should always be washed with carbolic acid or other disinfectant.

MANUFACTURES AND MATERIALS

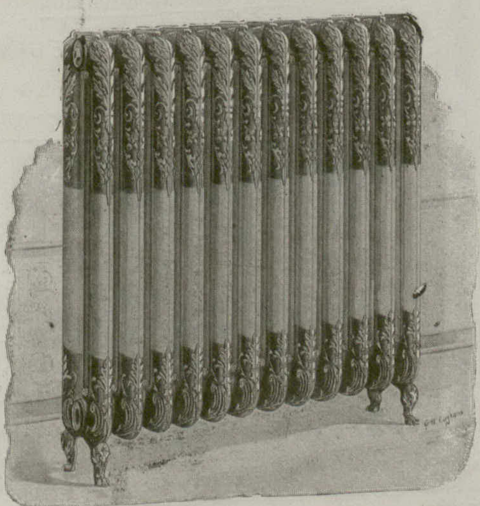
WOOD FIBRE PLASTER.

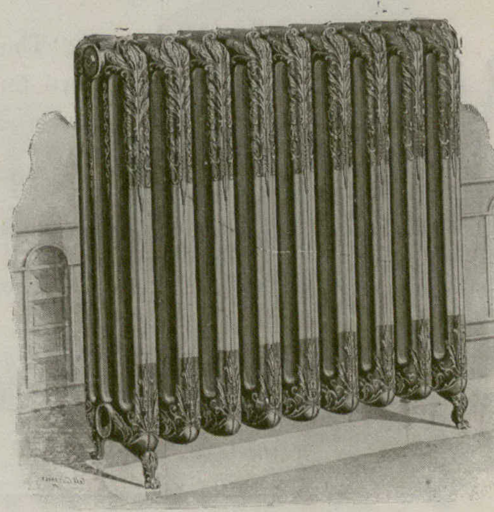
Mr. W. A. Bradshaw has recently established a factory at No. 109 Front street east, Toronto, for the manufacture of wood fibre plaster, a patent compound, one of the most important ingredients of which is wood fibre, which gives flexibility, toughness, lightness, and strength. The advantages claimed for this new plastering material are: that it it quick-setting, proof against disintegration by frost or heat, is a non-conductor, withstands effect of vibration and can be decorated in any manner. For further particulars the reader is referred to the announcement of the manufacturer in the advertisement pages of this number. Twenty tons of this material are being used to plaster the large summer hotel now in course of construction on Lake Rosseau, Muskoka.

The Sackville Freestone Company, Limited, was recently incorporated at Sackville, N.B., with a capital stock of $24,000. The members of the company are Fred. P. Thompson, Fredericton; Andrew M. Bell, Halifax; John W. Lowe, Auelsford; Charles Pickard, Sackville, and P. J. Mooney, St. John.

Protecting iron has been simplified by a Frenchman. The process consists in treating the casting with dilute hydrochloric acid, which dissolves a little of the metal and leaves a veneering of graphite on the iron. The article is then washed in a receiver with hot or cold water, so as to remove the chloride of lime that has been formed.

The Canada Foundry Company have purchased the business of the Dominion Ornamental Iron Company, Toronto, and will conduct it as a Department of their extensive new works now in course of construction at the corner of Davenport road and Mackenzie avenue. It is understood that Mr. Joseph Lea, late manager of the Dominion Ornamental Iron Company, will be in charge of this branch of the Canada Foundry Company's business.





AMERICAN SUBSTITUTE FOR SANDPAPER.

Steel wool, introduced five or six years ago, is a machine-produced material that is used as a substitute for sandpaper. It is composed of sharp-edged threads of steel, which curl up together like wool, or somewhat as the wood fibres of the familiar material known as excelsior curl up together, though the steel wool is very much finer, the finest of it being not much coarser than the coarsest of natural wools. The steel wool is put up in packages containing 1 lb. each. These are something like rolls of cotton batting, but smaller; 1lb. of steel wool, loosely packed, making, rolled in paper and open at the ends, a package perhaps 15in. long and 2in. or 3in. in diameter.

Made in various degrees of coarseness, steel wool is put to a variety of uses, the finer wools for polishing wood and metal and the coarser for rubbing down paint and varnish. It is often used on special parts of work. While, for example, on the flat surface of a door a man would use sandpaper with a block back for it, for the mouldings he would use steel wool, which fits into the crevices and conforms into irregular shapes. Such work can be done with steel wool far more readily and quickly than with sandpaper and it is used with this advantage on irregular and small surfaces and on carved work.

Besides the steel wool there is coarser material of the same kind called steel shavings, which is put to various uses; as in taking off old paint or varnish, and in polishing wood before painting, and it is used on bowling alleys and on floors for smoothing and cleaning them. Sandpaper clogs in use; steel wool breaks down. The wool is commonly used with gloves to keep the ends from sticking into the fingers.—Woodworker.

LEGAL.

Mr. Thos. Mowbray, of Toronto, one of the unsuccessful competitors in the competition instituted by the Dominion Government for designs for statues of Queen Victoria and the late Hon. Alexander Mackenzie, has entered an action for damages against the Minister of Public Works on the ground that the model which he sent to Ottawa, was seriously damaged as the result of being carelessly and improperly packed by the Government officials.

Brennan vs. Harding & Leathorne.—In this action tried before a jury at London, Ont., on April 12th last, B. was employed by a firm of contractors, and while working in a ditch, at a distance of about ten feet below the surface, was injured by a cave-in. He claimed that the accident was caused by lack of proper "shoring," and that he was injured for life, and sued the contractors for $5,000 damages. The contractors asserted that every precaution had been taken, and that the accident was occasioned by what could not have been foreseen. During cross examination B. admitted that the contractors had treated him well—that they had paid $140 for doctor's bills and hospital charges, and had insisted upon his returning to the hospital after he had left it. B. also admitted that he had gone out of the hospital when the doctor had advised him not to do so, and that he had taken a few drinks, which the doctor told him had delayed his recovery. The jury gave a verdict in favor of the contractors, and the action was dismissed.

Harris vs. Martin.—In this case argued recently before Chief Justice Falconbridge, in the Divisional Court at Toronto, judgment was given on appeal by plaintiff from judgment of County Court of Perth dismissing action for injunction to compel removal by defendant of a gable on his house, overhanging plaintiff's land, and to restrain defendant from permitting water, ice and snow to flow off the roof thereof upon plaintiff's land. The plaintiff and defendant were purchasers of adjoining properties from a common grantor, the plaintiff having purchased in 1891, and the defendant in 1893. The judge below found that the plaintiff's purchase covered all the land up to the wall of the house occupied by the defendant, including the land under the overhanging gable, and that the law, as laid down in Wheeldon vs. Burrows, 12 Ch. D. 31, preventing any implication arising in favor of a reservation by plaintiff's grantor of any easement in derogation of the grant, was subject to exception in the case of easements of necessity, and that the easements of maintaining the gable and allowing the water, ice and snow to be deposited from the roof upon plaintiff's land, were easements of necessity within this exception. Held, that under the circumstances such as here existed, the rights of the grantee are to be found in the terms of his conveyance, subject to an exception in cases of necessity, of so urgent a nature that it would not be possible to conceive the intention of the parties to the contract to be complete without admitting the implication. Assuming, as the judge of the County Court found, and as the plaintiff does not now dispute, that Cornelia Armstrong conveyed to him all that part of lot 17 lying to the east of the brick wall, and there is no necessity compelling the court to imply an intention on her part to reserve to herself the right, inconsistent as it is with the terms of the grant, to maintain a roof overhanging the land conveyed, or a right to cast water and snow upon it. The overhanging roof is not an essential or vital part even of the small building of which it forms part, and it may be removed and other means adopted of disposing of the rain and snowfall without any great difficulty—certainly without so much difficulty as the court would have in assuming a grant from the plaintiff of the rights claimed by the defendant. Judgment below varied by dismissing the claim of the plaintiff as to the portion of lot 17 lying to the west of the line of the east face of the brick wall of the defendant's house, produced in both directions, and by restraining the defendant from trespassing upon the land of the plaintiff being all that portion of lot 17, lying to the east of the said line by maintaining any structure overhanging it, or by shedding snow or water upon it, or otherwise. Plaintiff to have against the defendant the costs of the action, excepting in so far as the costs of the issue with regard to the two and a half feet are concerned, which costs are to be taxed to the defendant; the plaintiff also to have the costs of the appeal.

THE NEW TORONTO HOTEL.

Most of the contracts for this important building have been awarded and the excavation work has been completed, about 14,000 yards of earth having been taken out. The contractors, Messrs. Illsley & Horn, have undertaken to complete the building by the first of June next year. All the material is to be complete before it reaches the site, and ready to be put together, the site simply being an assembling ground.

THE CANADIAN PAVILION AT GLASGOW.

The Canadian Pavilion at the Glasgow Exhibition, a small illustration of which appears in the text of this number, measures 180 feet in length by 60 feet in breadth with a floor space of 11,000 square feet. Its appearance is said to be very effective. Messrs. Walker & Ramsay, of Glasgow, were the architects.

NOTES.

Compoboard is made of wooden slats 4 feet long and 1 inch wide, joined in an endless webb, so that the 4 feet length of the slat forms the width of the complete board. Therefore in a long board, say 4 feet x 9 feet, the end-grain of the wood s on the longer edge; in small pieces the end-grain edge is readily detected by the fact that it shows the joining of the slats inch by inch. The faint lines at the top show how the slats run from end-grain edge to end-grain edge. Always join the board on the end-grain edge. Let the joint be as tight as possible. It will never alter by shrinking or swelling, and when suitably stopped can be painted, papered, or distempered. The board is made in no less than six qualities, and they range from 7-32 of an inch to 3/8 of an inch.

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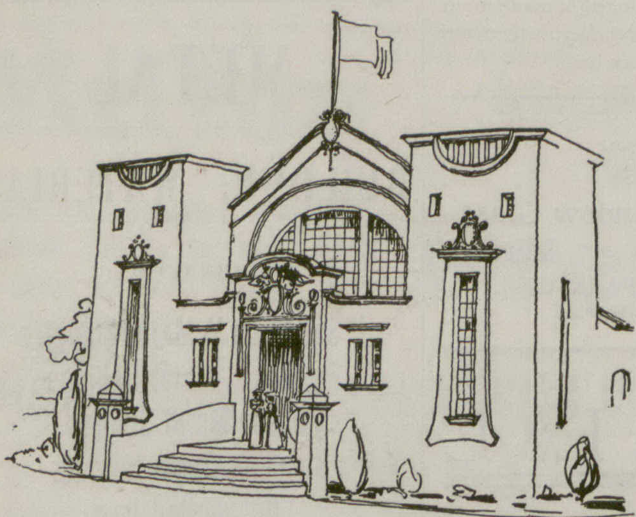
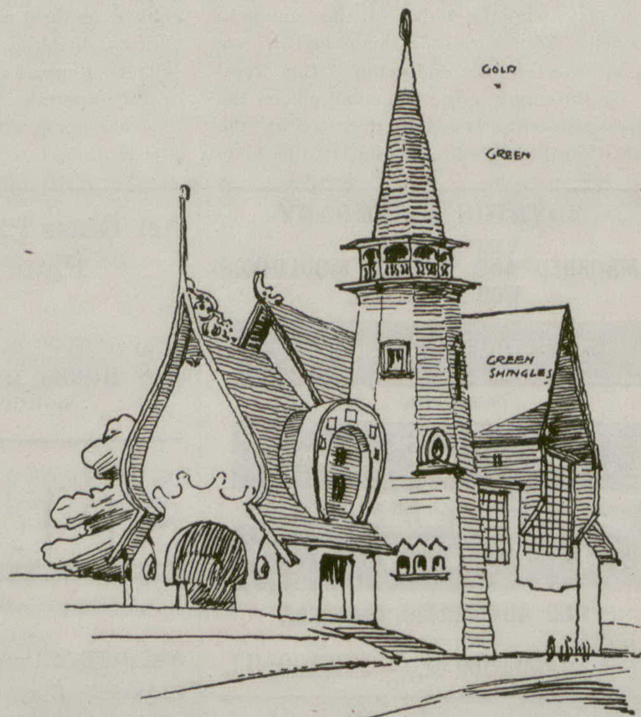
BUILDING CONDITIONS.

There is much activity in building throughout Canada this season. In Winnipeg, the value of new buildings according to the permits issued, nearly doubles last year's record. In Toronto all the architects appear to be busily engaged. Domestic work is calling for a large share of



CANADIAN PAVILION AT THE GLASGOW EXHIBITION.

attention. Some important and interesting buildings of this class are in progress, while less costly dwellings are springing up on every hand. The majority are being built amount of speculative building of the better class. It is as homes by the owners. There is also a considerable gratifying to note that the designs for most of this work were prepared by local architects, and in consequence good taste prevails to a much larger extent than in the past, when the builder undertook to be his own architect. The high cost of lumber has undoubtedly retarded build-

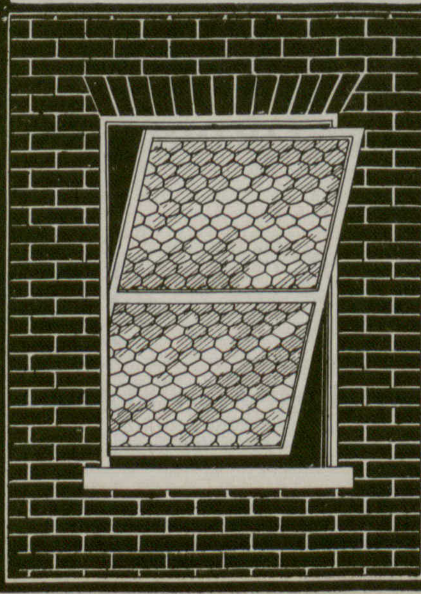


RUSSIAN PAVILION AT THE GLASGOW EXHIBITION.

ing enterprise, and the strikes of workmen in Ottawa and elsewhere are hindering operations and blocking new undertakings.

RELATIVE VALUE OF FIRE RESISTING MATERIALS.

Some valuable data concerning the fire resisting properties of various materials and methods of construction have been made available by a series of tests conducted in connection with the recent Building Trades Exhibition in London. These tests related to floors, partitions, doors, both of wood and iron, and protective coverings to open spaces. As regards flooring, it was found that by filling up with plaster to the extent of 1 in. the soffit of an ordinary floor having deal joists, a floor was rendered fire-resisting for 45 min. When slag wool was similarly used it stood the test of one hour's duration. A floor made of simple baulks of timber laid side by side, the thickness of the baulks being 9 in., stood an 80 min. test, with a gradual temperature up to 2,000 degrees Fahr. The result was that the under surface of the wood beams was charred to the average depth of about 2in., but beyond this no damage was done. A floor protected by 5in. of concrete was destroyed in 54 min. A simple iron and concrete floor was next tested. After an hour and a half the bulk of the concrete collapsed owing to the deflection of the steel plates. A floor constructed of iron and concrete, in which all the ironwork was embedded, stood a very severe test. The fire did not pass through it, and wood strips imbedded in the upper surface of the concrete were uninjured. With regard to partitions, one formed of terra cotta, wired lathing, covered with plaster of paris, stood a very severe test. It was found that doors of oak and teak stood the most severe test, and with regard to windows it was found that blinds of asbestos cloth were a great protection from the spread of fire.



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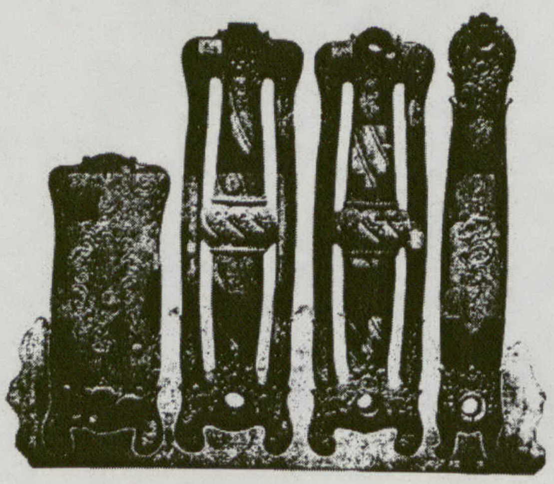

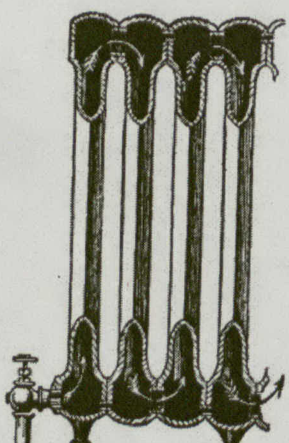

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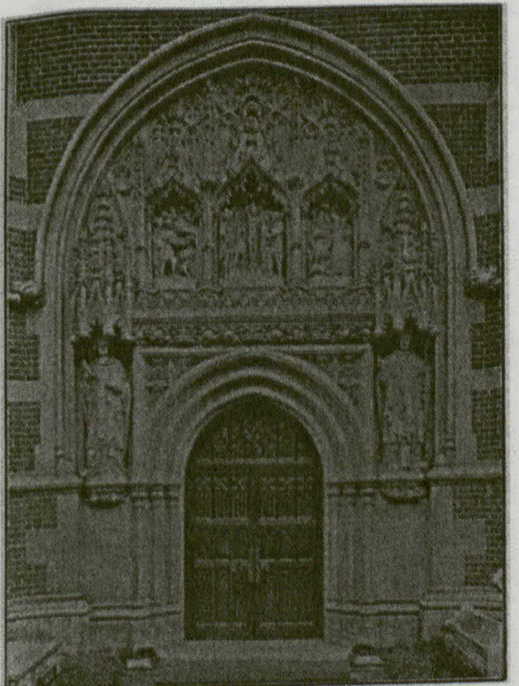

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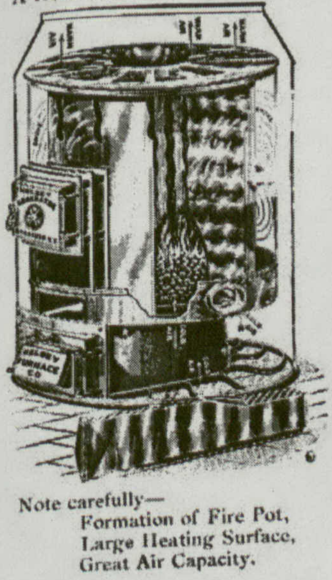

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