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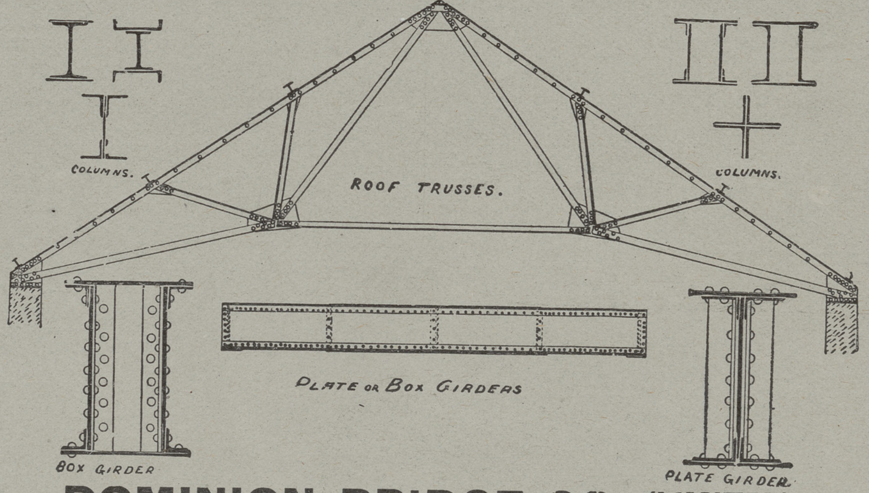

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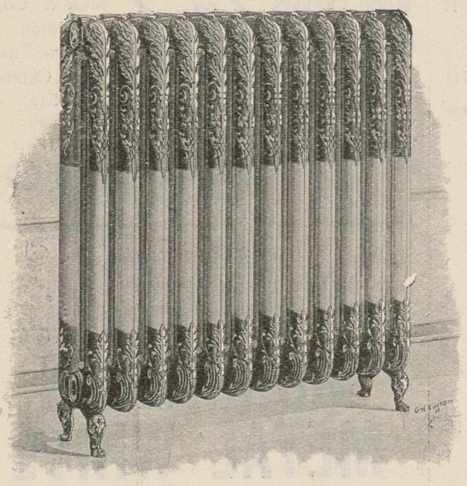

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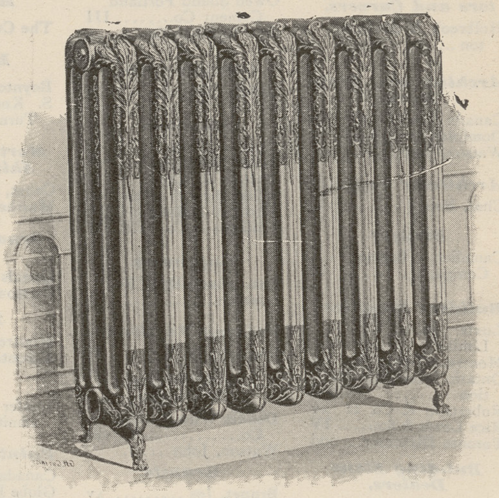

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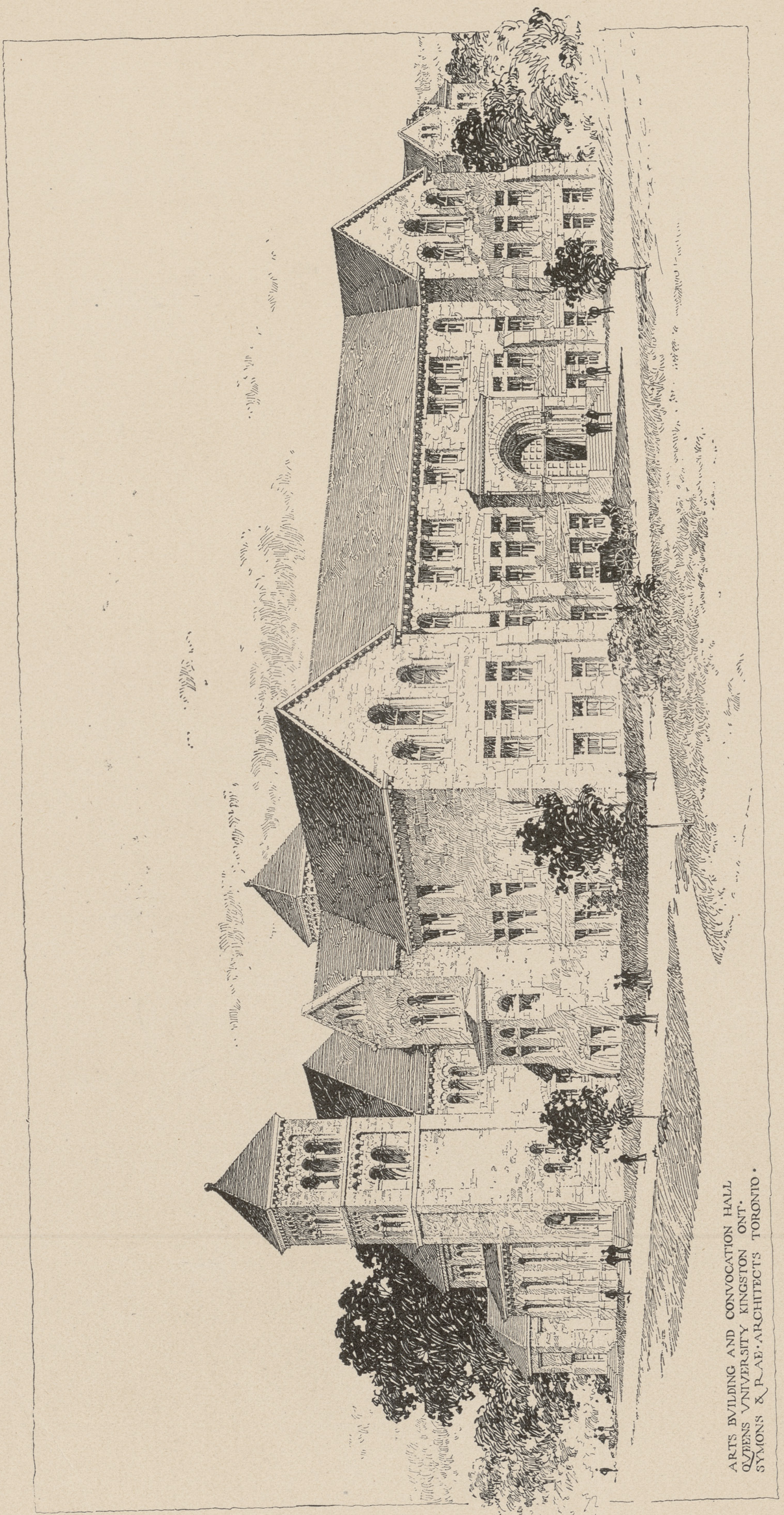

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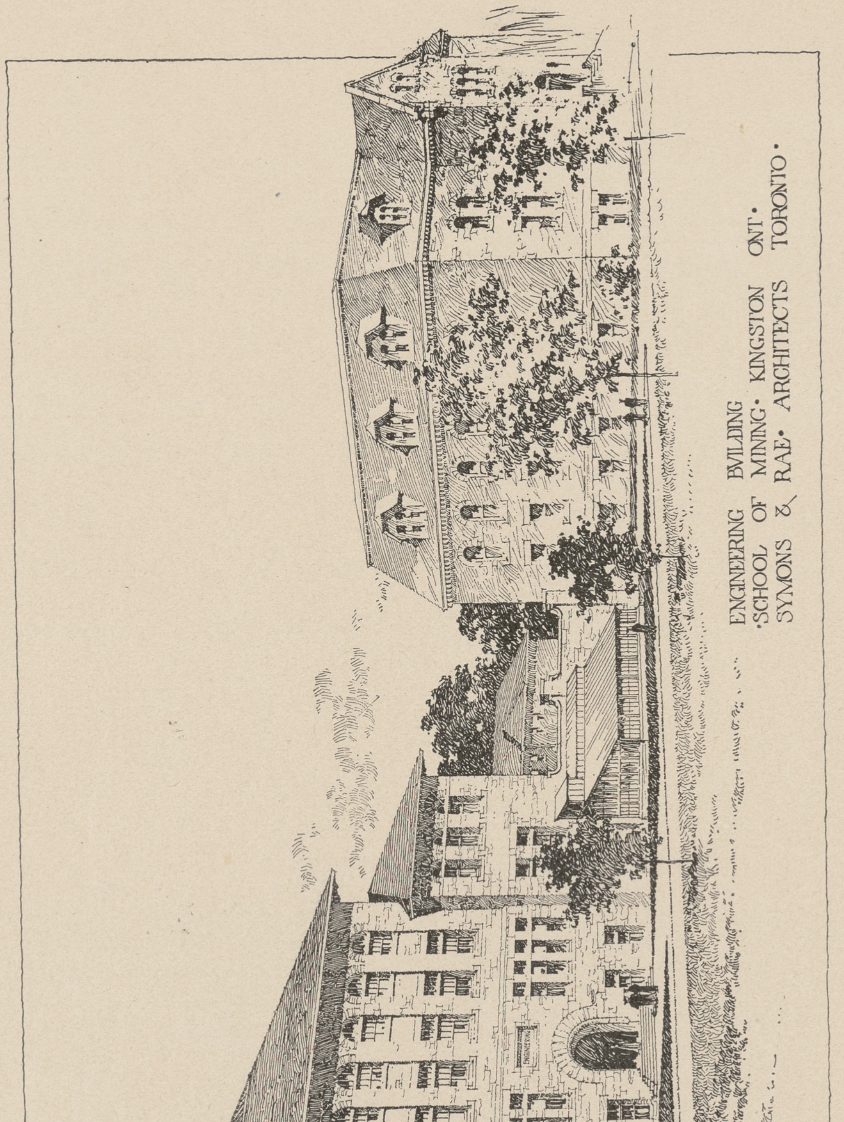

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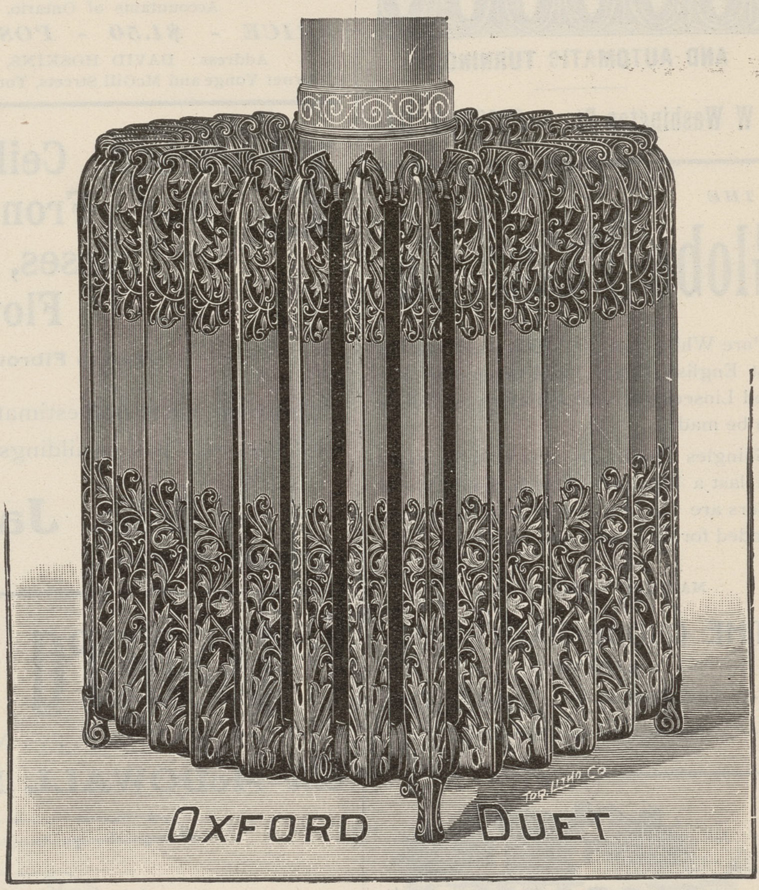

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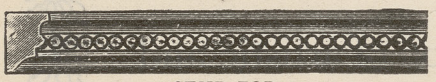

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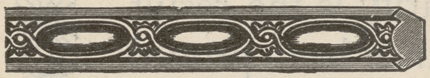

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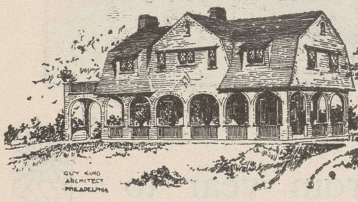

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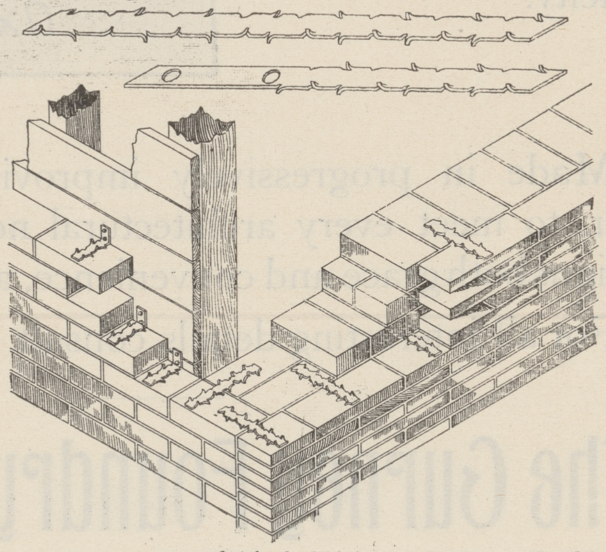

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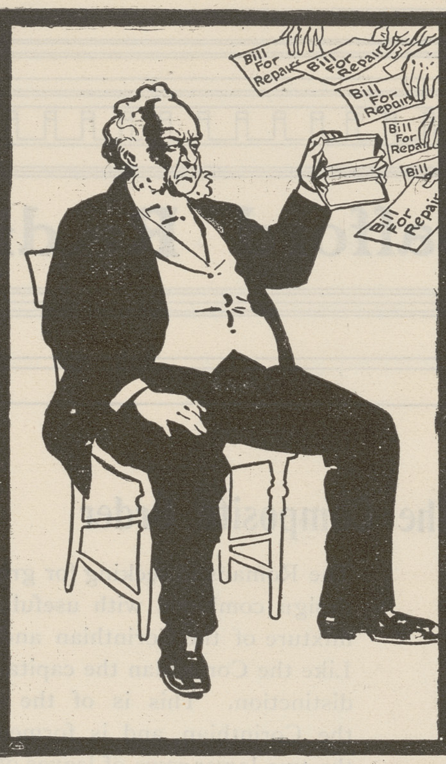

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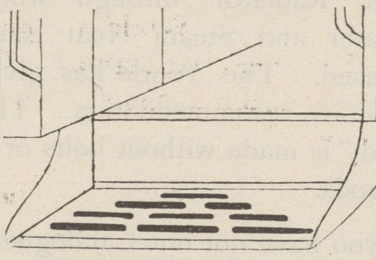

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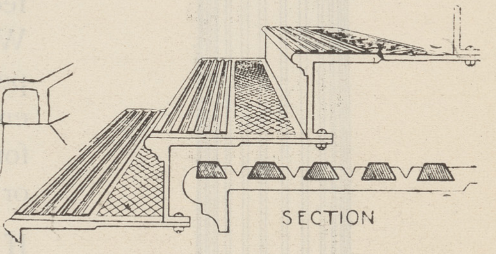

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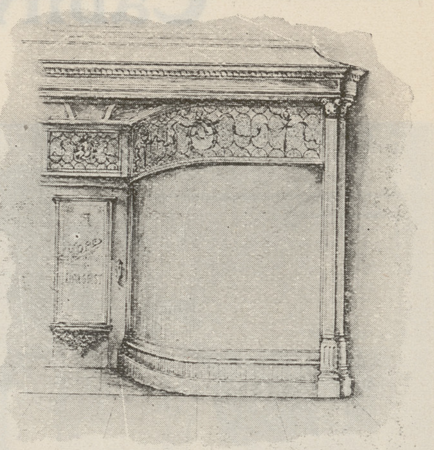

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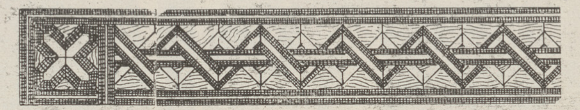

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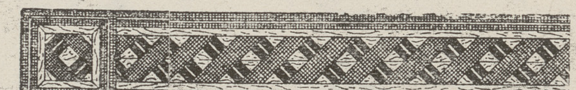

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The Canadian Architect and Builder

VOL. XV.—NO. 170. FEBRUARY, 1902.

ILLUSTRATIONS ON SHEETS.

New Buildings, Queen's University, Kingston, Ont.—Messrs. Strickland & Symons, architects.

ILLUSTRATIONS IN TEXT.

Cottages in Connection with the Sanitorium for Consumptives at Gravenhurst, Ont.
Block Plan of Buildings, Queen's University, Kingston, Ont.
Plan for Re-Arrangement of Toronto Industrial Exhibition Grounds, submitted by the Ontario Association of Architects.

ADDITIONAL ILLUSTRATIONS IN ARCHITECTS' EDITION.

Photogravure Plates—Exterior and Interior of English Cathedral, Montreal—John Wells, architect.

CONTENTS

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.
" W. H. ELLIOTT, of Messrs. Elliott & Son Co., Toronto.
" J. C. B. HORWOOD, Architect, Toronto.
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Union League Club House, Chicago

The competition for the Union League Club House is an instance of a successful competition. It was a limited competition for which three well known firms were engaged, the losers to be paid $1000 each. As the proposed cost is $800,000, and the successful architect's fee $40,000, the expense fee, promised to unsuccessful competitors, is a bagatelle to the promoters, and secured them a good competition. If any building is of sufficient importance to make a competition worth while, it is worth while to spend some money in the competition. The conditions of competition are published in the Inland Architect for January, along with the plans. There is no mention of a professional advisor for deciding the merits of the plans. Decision lay with the building committee of the Club. But considering what a city Chicago is for eminent architects and that they are probably all members of the Club, the building committee was most likely an unusual building committee. The competing architects had also an opportunity of appearing before the committee, before the final decision was made, to give a detailed explanation of their plans. This was also a good feature. The result secured is a wonderfully fine plan by Mr. Burnham which seems upon examination to justify without doubt the choice of the committee.

Winter Transplanting of Trees.

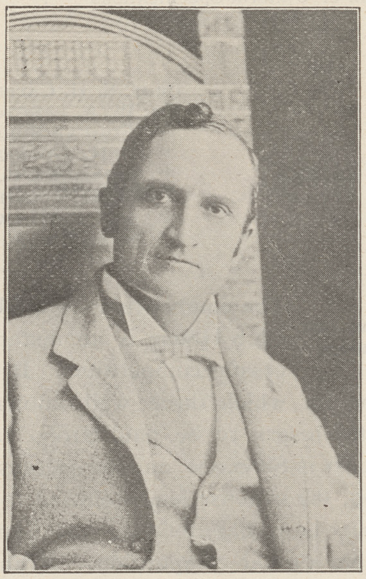
An interesting piece of work is being done at St. Louis, in preparation for the World's Fair. The Fair, which is to be placed in Forest Park, where are many large trees, will require the removal of 700 trees ; but, both to preserve the trees and to have the advantage of their shade for the Fair, they are to be transplanted so as to line the broad avenues which will remain as a feature of the park when the Fair is over. As the trees are from 12 to 18 inches in diameter, this is an undertaking of more than unusual difficulty, and it will not do to waste time in failure. It is in the method employed to insure success that the interest lies for us. The trees are to be lifted during the winter, while they are dormant and when the ground is frozen so that the earth in which the roots are set may be carried away bodily. There is a suggestion here for another way than the heart-breaking destruction that is sometimes found necessary when a fine tree stands in the wrong place on a building lot. If the transplanting project of the St. Louis Fair is successful, we who have so much more frost—whose trees must be if anything more dormant, or at any rate dormant longer, and who can be sure of removing a greater depth of frozen earth—ought to be able to move a large tree within a lot, or bring to the lot from elsewhere trees that it would take more than twenty years to grow.

The Naming of Floor Plans

A proposition was made at one of the weekly lunches of the Toronto Chapter of the Ontario Association of Architects, recently, that members of the Association should agree to adopt a uniform nomenclature when entitling the floor plans of a building. It was further proposed that the system adopted should be the American system of abandoning the use of the term "ground floor," and calling the floor immediately above the street the first floor. There was some discussion on the reasonableness and simplicity of the American system, but it was decided that usage alone should settle a question of this kind. It certainly seems as if usage that requires an edict in its favor cannot be called predominant yet. There is reasonableness in the English system too, and a certain descriptiveness which is strong in the mind of anyone who has been accustomed to its use. It is interesting to note that in Mr. Burnham's plan for the Union League Club House, Chicago, the entrance floor is called the ground floor. It is only two steps above the street and is devoted to such uses—the office, telegraph, telephone, coat rooms, lavatories, barber shop, etc.—that it seems proper to call it the ground floor and leave the term "first floor" free for the floor above, which is entirely given up to what the architect calls a "State Suite." Herein is a moral which may often be found in American affairs,—that the most American practice is not always the best American practice; that in the higher developments there is a tendency to return to an old world way of doing things. Let us, who inherit in many things the way of the old world, make quite sure, before we change, that a change is necessary.

Theatre Exits. The manager of a theatre in Montreal had to appear in court the other day, at the instance of the Inspector of Buildings, because on a single date his programme had not fulfilled the terms of the building by-law, that on every play bill shall be printed a plan of the theatre showing exits and stairways. This is an excellent regulation. It secures an exhibition of the floor plan in a place where it is sure to receive study, along with the jokes and advertisements on the programme which get such careful attention during the waits. To make the regulation fully effective there should be some provision in the by-law for a manner of representation that would invite attention, and a scale of drawing that would be understandable, so as to guard against mere compliance with the letter of the law by the insertion of a half-inch blot that would represent nothing to the inexpert, for whom it is most intended. An incidental advantage of the prominence thus given to exits would be to dispose theatre proprietors more to their consideration. If the law requires a nightly display of the exit qualities of a theatre, it is likely that some pains will be taken that this part of the plan may bear inspection. If, for instance, the plan of the Toronto Opera House were made prominent on the programme it would say in the plainest language that for the sake of space to let in the front of the theatre the lives of visitors to the theatre are nightly endangered, from the way in which the audience from the floor and the balcony are brought to a common exit. The streams from the balcony on each side enter at right angles the stream from the floor. It is true that a balustrade is interposed at the bottom of the balcony stairs to turn the flow from the balconies in the same direction as that from the floor, but it would not stand for a moment a panic rush; and its wreck, thrown down under foot, would insure catastrophe. If the balustrade could stand, the people from the floor might perhaps escape, but what would happen to the people rushing down from the balcony? At the bottom of the stairs from the balcony, which is about six feet wide, they would find a fence, about four feet from the bottom step, obliging them to turn at right angles through a door three feet four inches wide. This is a fine illustration of the feat known as coming out of the small end of the horn. If set down in plan it would look like the section of a sausage machine; and those persons who object to theatres, and hand tracts to people who come out of them, might make use of it to hand to them going in as a graphic representation of the tract entitled, Prepare to meet thy Doom.

Canadian Building Stone. It is surprising that the abundant building stone of this country is not more widely used. There is plenty of it and in great variety. A valuable paper read before the Ontario Association of Architects by Mr. Andrew Bell, and printed in the CANADIAN ARCHITECT AND BUILDER for March, 1896, ought to have had more effect than it appears to have had in introducing some Ontario stones to notice. Recently the Pan American Exposition has afforded an opportunity which has been to some extent taken advantage of by the Bureau of Mines in making the mineral exhibit of Ontario. The first consideration with the Bureau of Mines was an exhibition of ores but incidentally there was a very fine exhibition of building stone, and the descriptive catalogue of this exhibit should be in the possession of architects who are in the way of using stone. There were eight kinds of granite shown; half from the Lake



MR. W. A. LANGTON,
President, Ontario Association of Architects.

Superior neighborhood and half from that of Lake Ontario. The best specimens were exhibited by the Bureau of Mines itself, showing presumably that there is as yet no commercial development. There was a fine red from Brule Point, L. Superior, and a beautiful grey from Ignace on the C. P. R. in the Rainy River district, where the material is said to be found in immense quantities. The only private exhibitors were T. Sydney Kirby of Ottawa, who showed a sample of grey granite and W. C. Caldwell of Lanark, Ont, who had a dark red. There were twelve examples of Syenite, which looks like granite and often takes its place in ornamental work. The only commercial exhibit was perhaps the most beautiful, a polished block of dark, solid green from Gananoque quarries, sent by T. J. Stewart, Hamilton Granite Works, Hamilton. Sandstone is said in the catalogue to be of common occurrence throughout the eastern and southern parts of the Province. The Credit Valley and Medina sandstones of Messrs Carroll & Beharriell's and Carroll and Vick's quarries are well known. There was also a good red stone of a rather dark colour sent by the Chicago and Vert Island Stone Co., Port Arthur, Ont. Other exhibitors were F. N. Gibbs, Port Arthur; the Cataraqui Quarry Co. Kingston, Ont., and L. O. Armstrong, C. P. R. Offices, Montreal. F. N. Gibbs also sent some cut blocks of white stone from Thunder Bay. Limestone is said to be abundant in the southern peninsula and the eastern counties. There are quarries at Queenston, Merritton, Beamsville, Wolfe Island, Guelph, Ottawa, Belleville, Huron county and other places. Marble, if one may judge by the number of exhibits, is even more abundant. There were twenty-eight exhibits of marble but most were by the Bureau of Mines. There were all colours—white, black, grey, green and shell pink. There was one piece of statuary marble sculptured ; but in most specimens there was some marking. The specimens were said to have been all taken trom the surface or near the surface and a more uniform and better quality is promised for deeper development. When will this development take place ? The principal beds of marble in Hastings, Leeds, Renfrew and Frontenac counties are not far away from the principal building centres on Lake Ontario ; and the Thunder Bay district, which supplied the remainder for this exhibition, is easily accessible by water. It seems safe to predict a market, if wealth continues to grow as it has recently. The use of good material in building will easily become a commercial necessity, and nothing will have a more important influence in developing good architecture.

THE SEWAGE DISPOSAL OF SUBURBAN HOUSES AND PUBLIC INSTITUTIONS.

By Dr. P. H. Bryce.

It gives me pleasure in complying with your invitation to prepare a paper on some sanitary problem connected with your work, to present a paper on the title indicated, as being of extreme importance, connected as it is, directly with the problem of "Pure Air in Houses," which I discussed before you last year.

As we are well aware, there is a more or less marked difference in the air of country places and of towns and cities, indicated by a small excess of carbonic acid (Co$_2$) in the latter and the absence of ozone, or oxygen in a nascent condition, due to the excessive presence in towns and cities of organic matters on the surface, in houses, lanes, manure heaps, drains and so on, constantly undergoing decay or reduction to simple compounds by the action of various living organisms, especially bacteria, which utilize oxygen in their biological processes. Sometimes they find this oxygen in the organic compound itself, especially in the azotic or nitrogenous compounds but also in the carbon compounds of a starchy character ; in other and under ordinary circumstances, they utilize the oxygen free in the air. As will be supposed, there are different species or classes of this minute form of largely vegetable life, some of which do not thrive in free oxygen and air and some forms what live within the bodies of animals and external to them in free air as well.

To the first class Pasteur long ago gave the name an-aerobes or microbes living apart from air, and the second he called aerobes or those which require free oxygen for their development.

The two classes have properties differing more or less from one other, one especially peculiar to an-aerobes being the liquefying of organic compounds by growing into these and really dissociating their solids, as, for instance, gelatine, forming, of course, by-products during the process both of gaseous and liquid character. The constitution of these chemical compounds varies; that of the gases being principally CO_2, H_2O, H_2S, and many highly organized volatile compounds, such as those given off by the breath of man and animals, those from the many foods and fruits, which develop during their mellowing and decay, and especially the extremely unpleasant emanations given off from putrifying meat, fish and the solid wastes, which pass off to the sewers as excreta, and kitchen and house wastes of every sort. It is a fortunate fact that the products of aerobic decomposition are less disagreeable and injurious than those from an-aerobic decay, since such are those which are most constantly exposed to air from surface decomposition of outside matter everywhere. With these preliminary remarks it will be easy to see something of the nature of the problem to be dealt with in disposing, safely and conveniently, the house wastes which go by the name of sewage, or those matters which are conveyed by water into underground pipes or sewers.

It is the experience of every local health officer, and a source of constant difficulty to the Provincial Board, that in those towns where a sewerage system does not exist and in many houses in the suburbs of towns, even where such systems are, in rural districts and in the large temporary summer resorts, hotels and cottages, the problem of what to do with excretal matters, both animal and vegetable, has been everywhere, if not difficult, yet the most constant one which the local boards have to deal with in the matter of nuisances, and which in many cases proves the most constant danger to the household immediately interested, and where streams or lakes are polluted, not unfrequently has become the occasion of some sudden and serious outbreak of typhoid fever or diarrhoeal disease. The fact that 253 examinations of water were made during the past year at the Provincial Laboratory, most of them due to outbreaks of typhoid, shows that the causal relationship between polluted water and typhoid and diarrhoea is well recognized, and general observation, as well as laboratory work is quite agreed as to the direct connection between such pollution and some accumulation of decomposits of animal or vegetable matter. Privy vaults, deep pits, or cess pools, constant contamination of the area around the house pump with kitchen washings and slops of every kind, hotel stables and barnyards, soakage from slaughter houses, the wastes from cheese factories and creameries and the heaps of refuse from canning factories, and indeed every kind of manufactory in which organic products are used, may become direct means of pollution to wells and sources of public water, and many are moreover the cause of serious injury to health from their creating effluvium nuisances.

*Paper read at the annual meeting of the Ontario Association of Architects, Toronto, January, 1902

Now, perhaps, gentlemen, as it may be only occasionally that as architects you are called upon to deal with more than one of these sources of ill-health, viz., this one of the disposal of house sewage, including excreta, kitchen and chamber wastes, in places where there are no public sewers, it is most essential that some general principles should be laid down and acted upon with a view to the safe, economical and aesthetic method of disposing of such organic wastes.

Probably every one here accepts the theory that in the economy of nature nothing can be lost, or that matter is indestructible, and perhaps all will, in a general way, agree that whatever is yielded by the soil, as, for instance, the potash, phosphates, ammonia and so on, which are contained in the grains and other fruits of the earth, should be given back to Mother Earth for her goodness to us. So in spite of man's foolish waste and ignorance, they ultimately are returned to her, but at an enormous cost of time and energy. Carried to the sea, sewage will form deposits ultimately forming new land, or in solution will become the food of microscopic vegetable forms of many species of the deeper ocean planton and of the larger plants of the ocean littoral, which in turn becomes the food of the microscopic infusoria and finally the food of fishes, molluscs and other sea animals, and so is brought back finally as food to man. Were we intelligent and careful we would see to it that not a single pound of organic waste matter is allowed to decompose out of its place, in other words, to so act as to return to the earth every ounce of C, H, O, and N, which taken from the humus or upper layer of soil is year by year being used up by cultivation and must be returned there, if fertility of the soil is to be maintained.

As however, it is found in practice in most parts of this country that there is a lack of appreciation of the manureal value of such materials, and that the adoption of what is known as the dry-earth system in houses and institutions has not proved free from objections, owing to neglect to supervise it carefully, owing to its cumbersomeness, and as moreover it does not do away with either the need for water pipes and a supply of water being laid on in the better houses, or of the need for disposing of the kitchen and chamber wastes, in any case it is evident that the growing appreciation of modern conveniences in houses is demanding some systematic method for dealing with all house wastes, whether for kitchen or closet by the water-carriage system.

I propose, therefore, to indicate how in practice such a system may be established, at once efficient and economical. In the annual report of the Provincial Board of Health for 1898 a chapter is devoted to "The Biological Principles Involved in the Purification of Sewage," which to those interested will be found to contain a very full discussion of the scientific principles of this whole matter. There will be found a table giving the average analysis of town sewage. While probably less concentrated than the sewage of a single house, since it would contain water from factories, from sub-soil drainage and so on, yet it will very well serve as an illustration of the contents of sewage. It is as follows :

1. Solid matters in suspension—
    - (a) Organic..............20 grains per gallon.
    - (b) Mineral...............10 " "
    - Total...............30 " "

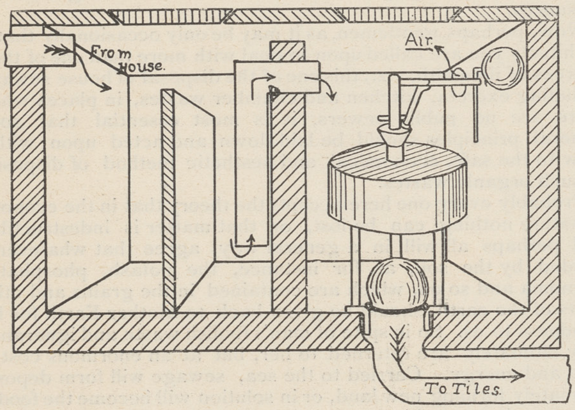
(2) Solid matter in solution—
    - (a) Organic..............20 grains per gallon.
    - (b) Mineral...............50 " "
    - Total...............70 " "

Or expressed in parts to 1,000,000 such a sewage would yield :

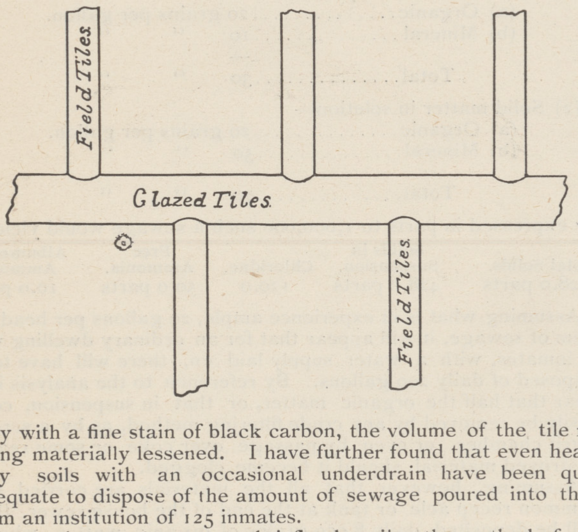
Total Solids.	Solids in Suspension.	Chloridne.	Free Ammonia.	Albumenoid Ammonia.
1428.0 parts	428.0 parts	120.0	50.0 parts	10.0 parts

Assuming what is in experience ample, 20 gallons per head per diem of sewage, it will appear that for an ordinary dwelling with 10 inmates, with a water supply laid on, there will have to be disposed of daily 200 gallons. By reference to the analysis it is clear that half the organic matter, or that in suspension, could easily be removed by any crude filtering method, as by a screen, a grit chamber, or even by passage over coke or some readily destroyed material, should it become clogged.

Assuming, however, that all the materials are carried to a common receptacle or tank at the end of the house sewer, there will be deposited daily 8,000 grains of organic matter, whether suspended or in solutions, and 12,000 grains of mineral matter or altogether some 3 lb., of which two-fifths is organic, or is, capable of undergoing decomposition, most of which will gradually be carried away when dissolved in the 200 gallons of water daily passing into the receptacle, the balance of carbon gradually being deposited in the tank. Of the mineral matter 50 parts are in solution as potash, lime and other salts, which will likewise be carried away in the water. It thus appears that some 100 grains of insoluble mineral matter will deposit in the tank daily with small amounts of carbon, or in 365 days for such a household not more than 10 lbs. of mineral matters will have accumulated. That such is true may readily be proved by anyone caring to make the experiment, as I have done, that such a tank at the end of a year has not had a total deposit of solid matter, greater than can be held by a half-bushel measure. If the balance then, after decomposition, is capable of being carried along with the 200 gallons of water daily, it is clear that nearly all of it is capable, like any other soluble material, of soaking away into the soil with the water, if the conditions are favorable.



I have had drawn up for your inspection the diagram of a tank, which is intended to deal with such materials in a way to give the organic matter an opportunity to decompose, the water carrying the soluble materials, being gradually removed from the decomposing tank, which we may call the septic tank—the word septic meaning putrid or decomposing—to a second tank, whence it may be discharged by a simple apparatus, at such intervals as may be found practical to produce the best results. The question then arises : In what manner can we dispose of this organic matter in solution, conveniently and in such a way as will not create a surface nuisance, or a pollution of ground water ? Let us assume that by a series of sub-surface tiles, laid in a proper manner, we can distribute the 200 gallons over an equal number of feet of surface. It is plain that each square foot would receive 1 gallon of water daily. As soils vary in their capacity for water, from a coarse sand which will hold in its interstices not more than 25 per cent. of its volume of water, to a tenacious clay which holds 75 per cent. of its own volume of water, it is apparent that if one gallon of water were poured on the surface of a cubic foot of dry soil, there would not be any water leaking away from the bottom of even a coarse sand, since a cubic foot of water equals 6.25 gallons ; so that it requires 1½ gallons to be poured on such foot of dry sand before it begins to drain away from the bottom. A dry clay would hold three times as much before it began to leak. In practice it will be seen that two four-inch tiles, laid side by side, would distribute such water fairly well over the surface of a cubic foot of earth ; and also that the water contained in them soaking out of the open joints and pores of the tiles would rapidly dispose of the small amount of water received by each tile daily. In practice it is found that in any ordinary porous sandy soil or sandy loam, tiles filled twice daily will rapidly dispose of the charge of soluble sewage poured into them ; and, lifting up tiles after several years' use, I have found them lined



only with a fine stain of black carbon, the volume of the tile not being materially lessened. I have further found that even heavy clay soils with an occasional underdrain have been quite adequate to dispose of the amount of sewage poured into them from an institution of 125 inmates.

It may be proper now to briefly describe the method of construction of such a system of tanks and sub-surface tiles. As in any system of house sewage, it is convenient to arrange all the fixtures so as to discharge into one soil pipe. These being brought out beneath the ground-floor through the foundation, or, if the house be on a hill-side, tt may occasionally be possible to bring them out under the cellar floor so that the wash-tubs there may be discharged into them, if this unsanitary plan for the laundry be adopted, the soil-pipe will be led to the top of a tank made of brick and cement in a manner similar to that shown in the diagram. If most convenient, this tank may be built directly against the house to save iron pipe and to prevent its appearance on the lawn, since, as will be seen in a moment, it is necessary that the discharge pipe of the tank on level ground be not more than a foot beneath the surface. The capacity of this tank n the case we are discussing will be such as to hold in each compartment 100 gallons, to be discharged twice daily. It will be seen therefore, that a compartment 2 x 3 x 3 feet will nicely hold 100 gallons, or a tank of interior measurement 4 feet long by 3 wide and and 3 deep is adequate for two compartments each holding 100 gallons.

The arrangement of the interior of the tank is shown in the diagram. As in all sewage tanks, the plan is adopted of having several divisions, the sewage becoming less dense as it passes from one to the other, thereby aiding to make that discharged from the valve chamber as thoroughly liquid as possible.

It will be seen that from compartment No. 1 to No. 2 the fluids are drawn off by an overflow pipe from about midway beneath the surface since at the bottom will be found sediment, while the whole surface is covered with the decomposing matter, which appears to the eye a solid mass, but is really tbe organic material kept floating by the contained gases of decomposition. The liquids, which pass over of course contain a large amount of organic matter in solution, being composed especially of ammonia (NH^3) and carbonic acid (CO_2) combined as ammonium carbonate with the sulphur compounds as ammonium sulphide. These are held in the second compartment until 100 gallons have accumulated, at which moment the flush valve operates automatically and discharges in a minute or two the contents of the tank into the sub-surface tiles. It is apparent that the size of the tanks may be made such as to deal with 1,000 gallons quite as readily as with a 100.

The sewage thus discharged must, it is evident, be carried to tiles so laid that each tile will get its own share of sewage and no more. It is apparent that with a rapid discharge, the tiles laid on an exact level will each receive this amount, if together they hold exactly 100 gallons, provided the air which is in them be displaced. It is found in practice that in a loose soil the air from tiles laid near the surface readily gives place to the water, if discharged under the head in the tank. Where the soil is level, as of a lawn or garden, it is apparent that the matter is a simple one. If on a slope it is equally apparent that some careful detail work will be necessary in order that the tiles may, at the same time, be kept at the same depth beneath the surface and also receive each its own share of sewage. To complete the description of the tank it is apparent that as some gases, in excess of what are in solution, may be given off into the space over the sewage, it will be necessary to prevent them from accumulating and forcing themselves through the cover of the tank. This is obtained by making the cover of rough boards, and if thought proper, they may again be covered with earth and sod. The gases, if any pass outward, will be absorbed by the soil. In addition to this however, it is necessary to provide for the ventilation of the tank. This is done by a large goose-neck leading from the distal end of the tank, which admits cold fresh air and thus will displace the warm gases of decomposition which are carried up through the soil-pipe to be discharged above the roof as in ordinary house-plumbing in cities where the separate sewerage system is in operation. It may be asked, what ultimately becomes of the organic matter carried away in solution. In reply I would say that through the action of the microbes of the soil the ammonia salts are rapidly nitrified—that is, are changed into nitrates or nitric acid, which at once combines with the lime and potash salts of the soil and thus has become a neutral salt in a condition to act as plant food for the grass or vegetables growing above it.

The following table by W. D. Scott Moncreiff, from the Ashstead experiments, 1895, illustrates the change :—

Effluent from cultivation tank.

Chlorine	Free. NH^3	N.	Oxygen consumed	Nitric Nitrogen	Total Oxidized N	Total N of all kinds
9.0	12.5	10.3	9.843	0.12	0.12	12.46
From final filter tray after complete nitrification.						
7.5	0.25	0.2	0.58	9.0	9.0	0.6

As the tank arrangement from which these experiments are taken, was essentially a tank of this kind, except that, instead of the microbes of the earth to do the work Moncreiff had arranged a series of artificial filters or pieces of coke over wnich the sewage from the septic tank flowed, by which means the liquids for analysis could be obtained, there is nothing different in principle to the system we are discussing.

Little more need be said, I think,, to make it clear that in these results of the study of biological processes, which convert organic matter back to its original constituents, we have not only a practical lesson of how to apply science to our every day needs and convenience, but we may also see how economical is Nature and how wholly wise in her operations if she does not have man attempting in his ignorance to violate some of her primary laws. To me it daily seems more true, the more that I try to comprehend the meaning of the processes of Nature in this fine old world of ours.

"That nothing walks with aimless feet,
That not one life shall be destroyed,
Or cast as rubbish to the void
When God hath made the pile complete."

INTERCOMMUNICATION.

[Communications sent to this department must be addres ed to the editor with the naue and address of the sender atta hed not r ecessarily for pub ication. The editor does not hold himself responsible for the expressions or opinions of correspondents, but will, nevertheless, endeavor to secure c rrect replies to queries sent in. We do not guarantee answers to all queries,neither do we undertake to answer questions to issue following their appearance.]

From "Contractor."—There seems to be some difference of opinion regarding the number of bricks required to build a wall. Some builders when figuring for brick-wall claim that for a wall four inches thick, 7½ bricks should be allowed for each superficial foot of wall, and for a 9 inch wall, 15 bricks to the foot, and for a 13 inch wall 22½ bricks to the foot, and for an 18 inch wall 30 bricks to the foot. This rule is given in Kidder's book, which has been adopted as a text book by the Ontario Association of Architects. Other authorities give a less number per foot, while others again, such as Trantwine and one or two other authorities even give more than these. As a matter of fact, many builders in Ontario allow much less than any of these when estimating on brick-work. Kidder says

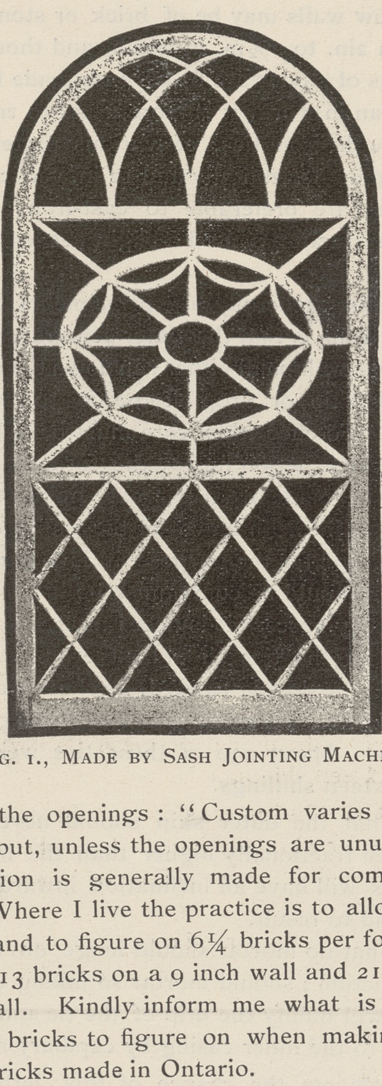


FIG. 1., MADE BY SASH JOINTING MACHINE.

regarding the openings: "Custom varies in different localities, but, unless the openings are unusually large no deduction is generally made for common brick-work." Where I live the practice is to allow half the opening, and to figure on 6¼ bricks per foot on a 4¼ inch wall, 13 bricks on a 9 inch wall and 21 bricks on a 14 inch wall. Kindly inform me what is the proper number of bricks to figure on when making an estimate for bricks made in Ontario.

ANS.—The answer to this and many other questions are given in the "Canadian Contractor's Handbook and Estimator," but, answering our correspondent we may say, that the sizes of bricks vary. In the east they are much less than in Ontario, and in the Western States, in some places, they are nearly an inch larger, half an inch thicker and half an inch wider than in central Ontario .This accounts largely for the different figures given by authorities. About the proper figures to be used in Ontario are: For a half-brick wall, 7 bricks to the foot of surface; for a full brick wall, or a 9 inch wall, 14 bricks, and for a 14 inch wall, 21 bricks, and for an 18 inch wall, 28 bricks should be accounted for in every superficial foot of surface wall. But when these figures are employed, all openings should be deducted, as ample material will be provided to cover waste in breakages, cutting and fitting.

From "Factory Owner."—I am informed there is a

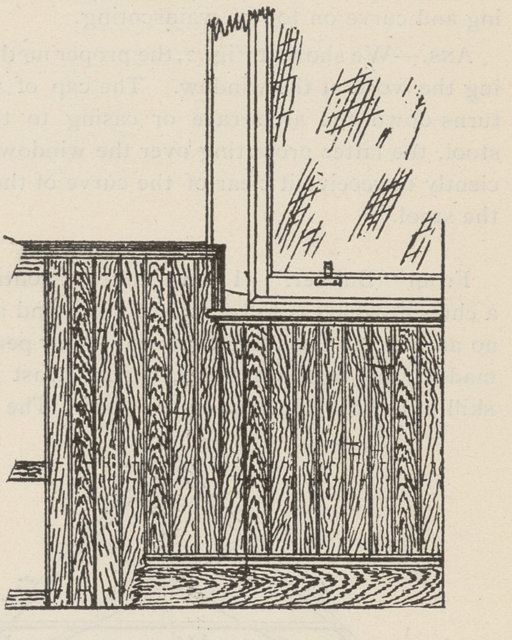


FIG. 2., FINISHING AROUND WAINSCOTING.

machine in the market for making and jointing sashes and sash-bars for circular, elliptical and diagonal work? If such a machine is in existence, please inform me through your valuable journal, or otherwise, where it may be seen or obtained.

ANS.—Such a machine was exhibited at the Pan-American Exposition last year by L. G. Heald & Co., of Barre, Mass., along with some of the work it would do. We publish one of the sashes on exhibition, which was taken from a photo distributed by the manufac-

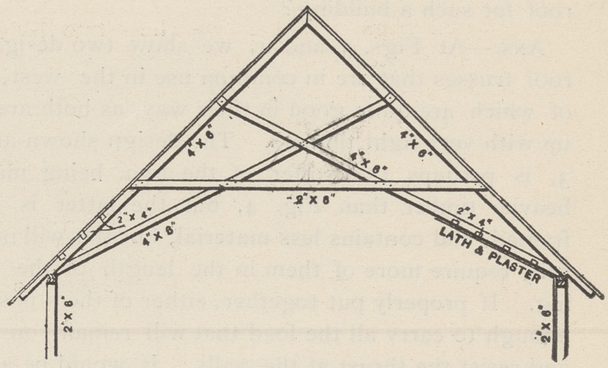


FIG. 3., CHURCH ROOF, FIRST DESIGN.

turers, which shows to some extent what can be done with the machine.

From "Puzzled."—I am in want of a white cement to "point up" the joints of white enamelled bricks. The cement must resist the action of uric acid and water, as it is wanted in a urinal, and it must also resist the action of frost?

ANS.—Fill up the joint with the same kind of cement that was used for beddingthe bricks, let dry hard, and have all surplus cement removed, then paint the joints three or four coats with some one of the well-known enamel paints to the tint required. This will make a good job, if properly done.

From " Young Un."—How should " staved " wainscot be finished around a window when the sill or stool of the latter drops below top of wainscoting? In the case alluded to, the sills are 6 inches below the noseing and curve on top of wainscoting.

ANS.—We show at Fig. 2, the proper method of finishing the work at the window. The cap of wainscot returns down the architrave or casing to the window-stool, the latter projecting over the window-stool sufficiently to receive it clear of the curve of the winding of the stool.

From " Builder."—I have taken a contract to build a church, which is to be 30 feet wide, and as there are no architect's plans to follow, only a few pencil sketches made by one of the trustees, I must trust to my own skill in the construction of the roof. The ceiling will

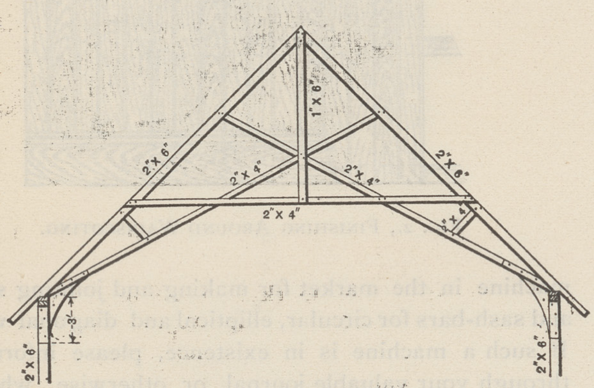


FIG. 4., CHURCH, ROOF SECOND DESIGN.

be carried about 6 fett above the plates, and as it will have a sissors truss, the timbers forming the truss will form a part of the ceiling, a collar beam forming the flat ceiling. The whole building is to be built of scantling, lathed and plastered inside and rough-casted on the outside. Could you offer a design or two for a suitable roof for such a building?

ANS.—At Figs. 3 and 4, we show two designs for roof trusses that are in common use in the west, both of which are quite good in their way, as both are built up with very light timbers. The design shown at Fig. 3, is perhaps the stiffer of the two, being made of heavier timber than Fig. 4, but the latter is easier framed, and contains less material, but this will neccesarily require more of them in the length of the building. If properly put together, either of them is strong enough to carry all the load that will remain on them, and resist the thrust at the walls. It would be a good plan, however, to nail on the roofing boards diagonally, as this would help to strengthen the whole truss work materially.

The Dominion Radiator Co. of Toronto, is sending out an exceedingly handsome calendar.

The Hamilton Master Plumbers Association held their first annual banquet at the Waldorf hotel, Hamilton, on the evening of January 27th, the president, Mr. A. Rogers, presiding. A handsome ring, suitably engraved, was presented by Mr. W. J. Welsh, the retiring president, to Mr. W. D. Smith, in appreciation of his valuable services to the Association. The occasion was a most enjoyable one, and was participated in by a number of Toronto plumbers and representatives of supply firms.

HOLLOW WALLS WITH IRON TIES.*

Hollow or " cavity " walls should be employed for external work in all situations where damp is likely to be caused by driving rain, the aspect most particularly to be protected in this way being the south-west. Much may be done in mitigation of dampness caused by driving rain by training creepers and ivy on the walls, or by planting quick-growing shrubs and trees to afford shelter. In this connection perhaps the most useful tree to plant is the Austrian pine, as its rapid growth and compact habit soon cause it form a good barrier to the wind. Thuga lobii is also a good guard and may be planted when rather of large size, but it is apt to be injured by frost and is not in any case very long-lived.

Cavity walls are particularly needed in the south of England, where the use of porous clamp-burnt bricks is so general. The writer has seen water from driving rain streaming down the inside of o 4½in. wall built of these bricks when the wind-pressure prevented it running down the outside.

Hollow walls may be of brick or stone with a cavity of from 2in. to 2½in. in width, and though the special wall-ties of stoneware or purpose-made bricks are good and clean in work, it is more usual to employ cast-iron or wrought-iron ties, of various patterns, spaced at about 36in. horizontally and 12 in. vertically—wrought-iron ties are preferable to cast-iron as they are less liable to fracture should a slight settlement occur in the wall.

Speaking generally, the principle of construction of hollow walls is that the water penetrating the outer casing of the wall shall either run down the inner face of the exterior skin or drop off the ties to the bottom of the cavity. To effect this, care must be taken that neither by the construction nor by the form of the tie shall a bridge be made from the external to the internal half of the wall. Both halves of the wall should be founded equally, and for the purpose it is desirable that their footings should be common to both.

To carry success it is necessary :—

1. That the ties should either have a V drip in the centre or be double twisted, as shown in Fig. 1, which latter is the author's favourite form of wrought-iron wall-tie. About 230 of these ties weigh 1 cwt. and cost sixteen shillings.

2. That the outer skin should never be allowed to get even fractionally higher than the interior skin, or the ties will have an inclination inwards and disaster is bound to result.

3. That no mortar should lodge on the ties during construction ; should mortar so falling remain upon the ties it will nullify the drip of the tie and will draw damp across to the inner casing by capillary attraction.

To obviate the chance of this, laths or hay-bands should be employed and drawn up as the work proceeds, and if it should happen that mortar has accidentally lodged on any uncovered tie, a long lath should be inserted to poke it off before the building gets too far advanced. Otherwise it may probably become necessary to cut the wall (from the inside of the building, for the sake of appearance) at that place ; whenever a roundish dark spot appears on the plaster of such a wall it is conclusive evidence either that a tie at that spot is not clean or that it has not been built fairly in

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* By G. S. Mitchell, F.S.I., in the Builders' Journal.

the centre of the cavity and so loses the effect of its twisted form.

A very simple method of forming a hollow wall is that shown in Fig. 2, though such flimsy construction is not to be recommended for first-class work. It consists of two thicknesses of 4½in. brickwork with a cavity of 2in. in width, so that the total thickness is 11in. Such a wall is of less strength than one of solid 9in. work would be and the security it gives against damp is only obtained at the cost of its stability.

A much sounder building is obtained by the use of a 9in. interior casing with a 4½in. outer one, the timbers necessary for roofs and floors resting on the thicker and more stable portion of the wall. When, however, flint or stone is used the thicker skin will in all probability form the exterior portion.

Fig. 2 shows the method of construction which should be adopted for carrying the lower floor joists

cheaper but much less efficacious method of dealing with these openings is to form a little cement gutter on the door or window head to fall rapidly each way. Care should be taken to secure that these gutters deliver clear of the frame.

I have occasionally found that rain will penetrate at the sides of a solid window frame even when apparently properly "stopped," and to prevent this I now tack a slight slip of wood about ½in. by ½in. section in a vertical position down the side of the frame and in the centre of the cavity. The haunch at the bottom of the frame must be partially cut away and the slip should go down a trifle below the lower side of the sill; any rain then driving round the frame will be checked at the stop formed by the wood slip and will run down and will drop clear from its lower extremity. This trouble caused by wet travelling round the window frame does not appear to take place where boxed frames are em-

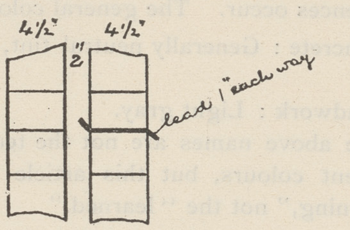


FIG. 4

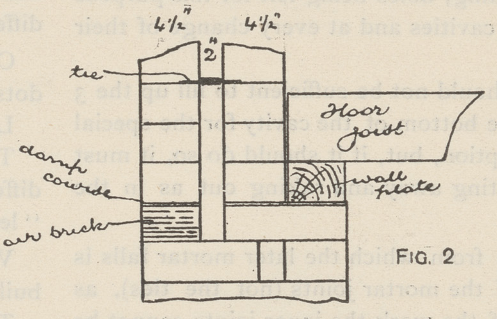


FIG. 2

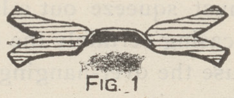


FIG. 1

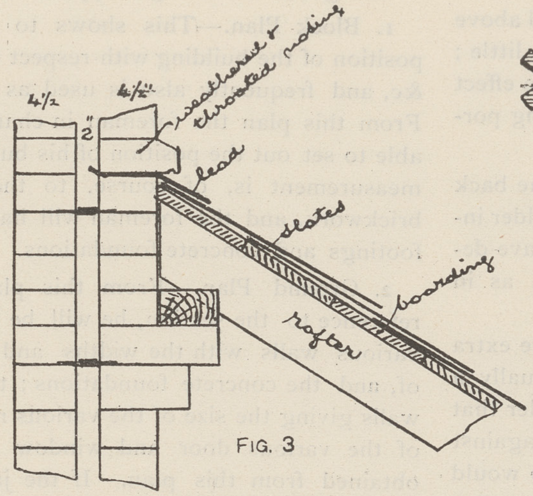


FIG. 3

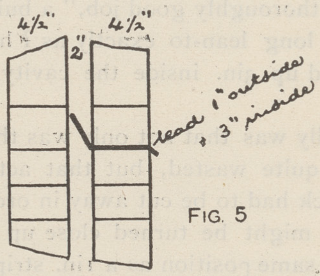


FIG. 5

HOLLOW WALLS: DETAILS OF CONSTRUCTION.

where two 4¼in. thicknesses are employed. The damp-course should be divided as shown in order that any mortar droppings may fall into the cavity below the damp-courses, as it will be at once realized that, were the damp-course placed upon the solid work 3in. lower, a bridge for the water would be formed, even if no droppings were present.

The external half of the wall should have air-brakes at top and bottom in order that ventilation may take place in the cavities. The draught in walls so constructed is often such that no candle can burn.

DOOR AND WINDOW OPENINGS.

That no wet may penetrate at the heads of doors and windows strips of lead should be inserted right through the outer wall above the lintel or arch; this lead should be turned one inch upwards inside the cavity and one inch downwards outside the building, as shown in Fig. 4. The length of the lead strip should be about 2in. greater than that of the opening it covers, so that any drips at the ends may fall clear of the frame. A

ployed but only when they are solid and have therefore no projections on their backs.

LEAN-TO ROOFS.

The same method of laying lead over applies where a lean-to roof comes on to a hollow wall, and a good method of construction for such a lean-to is given in Fig. 3, where it will be seen the plate to which the rafters are secured is carried by corbels from the outer skin of the hollow wall, a strip of 5lb. lead being laid through this wall and being turned up 1in. inside the cavity and dressed down at least 3in. over the slates outside (the width of lead strip in the case of a 4½in. wall being thus 8½in.); to cover all a projecting weathered and throated string-course of splay bricks laid in cement ensures a water-tight joint.

Wherever a lower range of buildings abuts against the hollow wall of the main block somewhat similar precautions must be taken to prevent the exterior skin of the main wall forming a damp inner wall to the lower building.

NECESSARY PRECAUTIONS FOR HOLLOW WALLS.

The builder of any hollow wall should bear in mind that mortar falls—

a, during the bricklaying.

b, afterwards during the building of the premises.

c, as long as there is any mortar left in the sides of the cavity.

The first-named (a) is wet mortar and is dealt with by precautions during the progress of the work as already described.

I have always found it profitable to commence this work by promising the foreman bricklayer a bonus of, say, £1 or £2 if upon completion no trouble is caused by mortar on the ties.

The second (b) is dry mortar and is chiefly dislodged during the laying of the floor boards. This is raked out from the bottom of the cavity just before the completion of the building, holes being left for this purpose at the ends of the cavities and at every change of their direction.

The third (c) should not be sufficient to fill up the 3 in. space left at the bottom of the cavity for the special purpose of its reception, but, if it should do so, it must be removed by cutting away and raking out as in the second case (b).

The chief place from which the later mortar falls is the interior face of the mortar joints (not the ties), as from the nature of the work the inner joints cannot be properly struck, and when the weight of the wall above comes upon the mortar it must squeeze out a little; and in the case of the outer casing certainly the effect of wet and frost will be to cause the over-hanging portion to fall to the bottom of the cavity.

In this connection I heard of a case a short time back where, "to make a thoroughly good job," a builder inserted lead over a long lean-to exactly as I have described it, but turned up 3in. inside the cavity, as in Fig. 5.

The result naturally was that not only was the extra 2in. width of lead quite wasted, but that actually a whole course of brick had to be cut away in order that its superabundance might be turned close up against the outer wall in the same position as a 1in. strip would have occupied! He had of course laid the lead so that it just missed the inner casing, and the falling mortar could not in this case fall to the bottom, and consequently quickly formed a bridge across where the lead obstruction did not allow it room to pass.

The author's specification clauses for hollow walls may be of service; they are as follows:—

"Pick bricks used externally for colour and quality.

"The external walls to be built hollow (as shown) with a cavity 2½in. wide, with two 4½in. thicknesses to be tied together with approved double-twist wrought-iron wall-ties dipped in boiling tar.

"Great care to be taken that the ties are not laid with an inclination inwards, and to keep them free from mortar—a lath to be laid on the ties for this purpose and drawn up as the work proceeds—and holes to be left at the foot of the walls to extract any droppings after floor boards have been laid. Provide and lay efficient damp-course of felt—well tarred—in all walls 3in. above ground line at the least. In the case of hollow walls it is to be laid one course above the solid work so as to allow a slight drop of mortar without injury."

WORKING DRAWINGS AND THEIR USES.

To understand plans the first really requisite knowledge is to find the scale to which the plan is drawn.

It will be quite correct to state that the principal and most common scales used are 2 ft. to 1 in., or ½ in. equals 1 ft.; 4 ft. to 1 in., or ¼ in. equals 1 ft. Of course it is obvious to anyone that the above scales can also be rendered one twenty-fourth, one forty-eighth, and one ninety-sixth full size; but the first expressions are the most common. Knowing what the scale is, there should not be any difficulty on the part of readers to measure up the thickness of walls, height of storeys, &c.

The next thing to know is the standard colors by which each material is represented. The mechanic or general foreman should consult his specification, and not trust entirely to the colorings of his drawings, as differences occur. The general colors are:—

Concrete: Generally neutral tint, or blue with black dots.

Leadwork: Light gray.

The above names are not the technical ones for the different colours, but this article is written for the "learning," not the "learned."

We next come to the different plans, &c., of the building.

The general drawings supplied on a contract are:—

1. Block Plan.—This shows to a small scale the position of the building with respect to other buildings, &c, and frequently also is used as a drainage plan. From this plan the foreman in charge of the works is able to set out the position of his building. Now, this measurement is, of course, to the finished line of brickwork, and the foreman will have to allow for his footings and concrete foundations.

2. Ground Plan.—From this plan, together with reference to the section, he will be able to set out his various walls with the widths and thicknesses thereof, and the concrete foundations; the position of the walls giving the size of the various rooms. The widths of the various door and window openings are also obtained from this plan. If the jambs of the doors have not reveals, they are lined, and have not, as a rule, solid frames.

3. Plans of Upper Floors.—These plans give similar information to the last mentioned.

4. Sections.—These are very important, and this is where the stumbling block occurs to many mechanics. A section is an imaginary line taken vertically through any portion of a building, and strictly speaking, only requires that portion of the building to be shown which the section line cuts; but to make things more explicit, a "sectional elevation" is nearly always given. This latter differs from the former, inasmuch as the latter gives the elevation of everything seen beyond the "line of section." To make this clearer we may give a simple illustration: Take a square box and cut it vertically into two parts. Now, to illustrate a section of same the simple outline with the thickness of the material need only be shown, but, supposing a sectional elevation is required, then, if any openings were in the side of the box, these openings would have to be shown in their proper positions. You will now see how valuable a sectional elevation is. It not only gives you

the measurements of anything on the line of section, but also the measurements of anything seen beyond, such as doors, &c.

5. Elevations.—The various elevations are shown to give an idea of the completed view of the building, and, together with the sections, give the heights of the various windows, &c., the widths corresponding to those given on the plans. They also give the kind of windows and doors used, and position of rainwater pipes, &c.

TILES FOR SLATES IN CHINA.

At the risk of imitating Artemus Ward, I must commence my account of Chinese slates by stating that there are none, writes a special correspondent of the Slate Trades Gazette. Slates are not used, as far as I can gather, because there are none to use. The fairy presiding over the distribution of geological favors seems to have passed China by. Hence, the Chinese, in giving their reasons for not using slates, may imitate the French priest who said he had twenty reasons for not ringing his church bell when the king passed through his village. His first reason was: "We have no bell."

The Chinese have no slates; had slates existed in the country, no doubt the Celestials would have found out the use of them, as they have of every other natural product of their astonishingly rich country. Failing slates, they early took to roofing their houses with tiles. They are used universally, except in the poorer class of houses, which are thatched with straw or reeds; or, in the case of the huts of the huge beggar population, with anything that comes handy. I have seen a roof made of an enamelled iron advertisement of Nestle's Milk, some straw, old tarpaulin, a side of a Gossage's soap box, the lid of a kerosene oil tin, and some sods. A patent for that roof is about to be applied for!

Apart, however, from artistic roofs like this, Chinese houses are roofed with ordinary tiles, of which, though no expert, I cannot speak well. They seem to have all the vices capable of being possessed by tiles. They are invariably black and of coarse, gritty clay. This shows itself in the surface texture, which is rough and sometimes even covered with sharp points, so that the finger might easily be slightly torn as it passed over. Their capacity for absorbing moisture is enormous. The only parallel I can find for it is that of an inveterate toper of liquid. I should say that a Chinese tile easily holds its own weight of water. Those of good quality cost five dollars (20s.) a thousand. Those of poorer quality cost three dollars a thousand. The surface of a cheap tile would make a capital file it is so rough.

In laying them the Chinese have not learnt the art of pegging them. Each tile is held in its place by the weight of the one above it. It can easily be seen that to enable the tiles to keep their places at all they must overlap one another very considerably. They do so, in fact, to such an extent that each tile overlaps quite three quarters of the one below it. The result of the extreme porosity of tiles, and their want of pegging is disastrous to the roof in two directions. First it adds enormously to the weight of the roof, and in the case of a large building it is normally great, and when rain falls heavily, as it can do in China, the weight is something terrible, often leading to the complete collapse of the building. When Shanghai was first founded, Chinese tiles had to be employed for foreign houses; but the advent of galvanized roofing—cheap, clean, fast, secure—is becoming universal for such houses. This may be grevious news for the master slaters of Great Britain, but truth must out. I am writing this shielded from a heavy rain by a galvanized roof. Another consequence of the loose character of Chinese slates is that Chinese roofs are in a chronic state of disrepair. They never look tidy, as cats, in their nightly gambols, displace the tiles. The roof is a favorite place for the Chinaman, in hot weather, for fresh air; he climbs the roof to gain a vantage point to wittness fires, and every step across the roof displaces a tile or two. If a typhoon does get under a tile it plays havoc with the roof, and from one cause or another these Chinese roofs always look untidy. The country ought to be a paradise for that bete noir of the slater, viz., the "jobbing bricklayer." But a roof must show daylight through it before the average Chinaman will have it mended. He is like the Irishman with whom a traveller remonstrated one day on the state of his roof. "Why don't you mend it?" "I can't," said Pat, "it's wet." "Why, then, don't you do it in dry weather?" "Sure," said Pat, "what's the good when it's dry." Only, the Chinese have the pull over Pat as to the weather. In this climate, with its months of splendid dry weather, roofing is not of the importance that it is in Britain.

I have not seen any tiles shaped like the English red pan-tiles. They are all simply concave, and are laid one on the other with the concave side uppermost. They are laid in lines, with a gutter between each line, as the illustration will show. The bottom tile of each row is slightly raised by a closed end, upon which appear designs, beautifully chased, of flowers, or gods and goddesses, and these give pretty finish to the roof. As to the laying of tiles, a Chinese contractor tells me that a workman will lay about half a faung a day, a faung being about 10 feet square. This means that he lays 200 tiles a day. Wages are low. A man earns 30 or 40 cents a day (6d. or 8d.), according to circumstances.

In the method of Chinese tiling, the tiles are set up edgeways all along the ridge. This, of course, adds enormously to the weight.

In conclusion, I may add that while my description of ordinary Chinese roofs is, I think, correct, I must in justice say that when all the lines of tiles are in order, they look well, while the roofs of the temples are frequently very beautiful. On quite ordinary temples and guild houses the ridge of the roof has the most attention lavished on it. The ridge of the Guild House of the Shansi bankers in Shanghai is made of exquisitely colored porcelain. The symbol of the sun is in the centre, with a sacred dragon at each side. Such roofs, with their yellow, red and blue tiles, with their quaint dragons and monsters, and their graceful, upturned gables, are as fine as any in the world; while one of the great temples in Pekin, with its roof of delicious sky-blue tiles, is one of the sights of the world—that is, if the allied troops, during their civilizing (?) campaign in that city, have not totally destroyed it, and robbed the world of one of the choicest productions of human art

SUBJECTS FOR WALL DECORATION.

One of the first requisites in designing a subject for decorating a wall is to make it fit the space as if the shape had been made for the design, and this is clearly dependent upon the skill of the painter ; at the same time, to the painter who knows the resources of his own art, every new shape will suggest a new modification of the composition of even a hackneyed or commonplace subject. For as the fine arts consist in the application of forms and colors so as to make a given appeal to the mind, the arrangement of lines and masses in a composition may be varied to suit the requisition of decorative art, but the idea must still be conveyed in its full integrity. It is in this sense we must understand Fuseli's observation, "He that conceives a subject twice has not conceived it at all." Every subject has some peculiarity which distinguishes it from every other of its class ; some point at which that peculiarity is most fully developed and which should be rigidly adhered to by the artist. The "dressing up" of this point of the subject, to which Fuseli limits the admissibility of second thought, is, in fact, the application of what should in strictness be called the art of the full development of the idea, with all the advantages the situation will admit of.

METHOD OF PREVENTING STRIKES.

Mr. Wm. H. Sayward, secretary of the National Association of Builders of the United States is said to be meeting with much encouragement in New York city in his endeavor to secure the adoption by employers and employees in the building trades of a method of adjusting wages.

The plan briefly outlined is the establishment of a court of settlement and appeal which shall have as its permanent members three persons entirely outside the constituency of the building trades, and to be selected as follows : One by the workmen of all the trades acting collectively through committees appointed for the purpose, and these two to select a third, also outside the constituency. These three persons are to be preferably men of legal training and judicial character and of such high standing in the community as to lend dignity to the tribunal ; they to practically furnish the balance of the court and preserve the community's interest in the conduct of the court's fuuction. These three permanent members of the court form the nucleus. The full court is to be composed by the selection of three workmen and three employers who joined with the three permanent members will make a court of nine. These workmen and employers are to be selected from each trade and to act consecutively in sitting in the interest of that trade in making annual agreements. The three permanent members thus sitting with six representatives of each trade in succession will be able to preserve the decisions from conflict and complication one with another and will from their character lend dignity and significance to the decisions of the court, while at the same time bringing the whole detetmination of affairs for the building trades upon an infinitely higher plane than they have previously been.

All decisions of the court will be open to the public, and will be conclusive and binding upon all parties. During each year the court will be available for reference in case either employers or workmen in any branch fail to live up to the agreement as announced, the whole to be determined by the court, and no strike or lockout of any name or nature be permitted under any circumstances.

Any new features or ideas looking to a change, modification or extension of the rules for any trade during the interim between times of annual agreements are not to be permitted because of abandonment of work, but are to be referred to the court for consideration and digestion during the balance of the year, and are to come up for actual consideration at the time of the next yearly agreement.

From the statements above presented it will be seen that this is a radical, yet at the same time, comprehensive plan, and simple in its principle. It is based entirely upon the idea that it is possible to settle the affairs of mutual concern to employers and workmen, in the building trades at all events, upon lines that are just, fair and businesslike.

"AS MAY BE REQUIRED."

A great deal of carelessness is shown in the preparation of specifications. That the aid of the courts is not more frequently invoked to interpret disputed points is often due to the fact that it is cheaper in the end to pocket a certain loss than to incur legal expenses that may run into the thousands of dollars. A very important case, which bears a lesson to all contractors, was brought up by Messrs. Stewards & Company, stone merchants and quarry owners of Portland, England, against the British Admiralty. The case really turned on the meaning of the words "may be required." In announcing the decision "The Acrhitect and Contract Reporter," of London, says :

When the tender was accepted by the Director of Admiralty Works, he used the words "about 2,000,000 tons, or such quantity as may be required, of cap and roach stone." The question was, did the phrase "may be required" relate to a less quantity than 2,000,000 tons, or a larger quantity? It was contended on the part of the government that the Admiralty need only take the quantity they required and not the amount that was necessary for the construction of the breakwater, or any definite portion of the works. There is no doubt the official documents were loosely drawn. But in the consideration given to the case in the House of Lords by the Lord Chancellor and Lords Davey, Robertson, Shand and Brampton, it was treated as if it were a transaction between ordinary individuals. Mr. Justice Day had decided in favor of the contractors, and his judgment was approved in the court of Appeal : but in the House of Lords it was held that when the director spoke of "such quantity as may be required" it was to be understood that the Admiralty could at any time cease to draw stone from the heaps belonging to Messrs. Stewards & Co. In other words, the plaintiffs were bound to have a supply of 2,000,000 tons available, and within that amount the contractors could take as much or as little as they pleased. Although the argument could not be brought before their lordships it is well known that the price charged for stone depends generally on the quantities to be taken. The Admiralty, by proposing to take 2,000,000 tons were able, as it were, to obtain a wholesale price, whereas if their intentions were known, a much higher retail price should have been quoted. The case should serve as a warning, for it shows the necessity of precision in the phraseology of contracts relating to materials.

SILICATE BRICK.

A company has been organized at Sydney, C. B., to manufacture silica brick. The following gentlemen among others are interested :—A. C. Bertram of North Sydney and H. F. McDougall, of Grand Narrows. Silica brick is the invention of a Swede and has but recently been placed on the markets of the world. The brick is said to be of very fine quality and of great durability. The process for making these bricks, as now carried on by over fifty firms in Germany, is very simple. Sand and lime are the materials used. They are moulded into bricks under a pressure of 150 tons, and placed on steel cars and driven into large retorts containing ten thousand bricks, which are then closed and live steam is introduced giving a pressure of one hundred and twenty pounds to the square inch. After remaining in this receptable for ten hours the bricks become solid as stone, and are then turned out to cool when they are fit for building purposes. A number of Montreal capitalists have secured the patent rights for this country, and factories will be erected at Montreal, Sydney, and perhaps other points.

THE QUESTION OF UNIFORM SPECIFICATIONS.

No more important question has ever been brought before the National Association of Master House Painters and Decorators, says the Painters' Magazine, than that of devising a set of uniform specifications by means of which every different branch of painters' work may be accurately described, and which shall be satisfactory alike to painters and architects. For it is only by the preparation of specifications that will be mutually satisfactory that any real good can be accomplished. It would be the height of folly to suppose that any architect would be willing to adopt a form of specification that depended in the slightest degree upon the honesty of the painter to whom the contract was awarded in order to obtain the quality of work intended. While undoubtedly it is true that many specifications are written that are so loosely worded that this very result obtains, it must be conceded that this is usually the case because the architect is ignorant of the correct way to specify the grade of work he desires, and not because he has any intention of writing a document that can be readily misconstrued.

That is seen if the painters who criticise will but take the trouble to examine the descriptions of the work required of other mechanics in the same specifications that are so often faulty in their description of the painting work. The sizes of moldings are accurately given, the quality of the lumber is indicated with exactness, the number of nails to be used to each joist or stud is particularly mentioned, the weight of the lead pipe for each particular fixture is fixed, and every lock, knob or hinge is called for by its catalogue number, so that there is no chance for the dishonest mechanic to escape from doing the work he has agreed to, provided the superintendent is faithful to his duty. But when it comes to painting, the architect is too often attempting to describe work without knowing what is the proper method for obtaining desired results. This is not strange, for in many cases two or more painters asked to suggest the proper form of specifications for a particular piece of work would disagree radically as to the correct method to pursue. Ir will therefore be seen that the committee to whom this important work of formulating a set of uniform specifications has been intrusted have no easy task before them for they must approach the subject not from the point of view of the painter, but they must endeavor to put themselves in the place of the architect who is trying to obtain the best result for his client and who is desirous of framing a specification for painting that shall be strictly drawn, so that there can be no possible dispute as to its intent and meaning and that will afford no loophole for the dishonest painter to crawl out of, and under which such a man when looked after by a faithful, honest and competent superintendent, can be compelled to produce work of the exact quality intended by the specifications. There can be no hope that any set of uniform specifications that shall be formulated along any other lines than these would be considered by the American Institute of Architects, and unless it is approved by that body, it would be useless to hope for its general adoption by the profession.

COST OF STEEPLES.

A church economist of a practical and somewhat eccentric turn of mind has estimated that in the United States nearly forty-five million dollars has been invested in non-productive, nonessential and purely ornamental church building, chiefly in the form of steeples. The total value of church property in the United States is set down at $316,187,000. The greater part of this enormous sum is represented in splendid and costly edifices devoted exclusively to religious purposes and open for only a few hours each week. For the remainder of the time these buildings stand idle and empty, monuments of religious faith and sentiment, cold, stately and magnificent—all this, but nothing more. From a practical and business point of view they represent capital that is tied up and non-productive. This state of things is prejudicial to the cause of religious progress ; it is repugnant to common sense and enlightened reason ; it argues wastefulness and extravagance, and it ought not to be.

THE ELASTIC LIMIT.

The "factor of safety" has been aptly termed the "factor of ignorance." If we wish to purchase a rope, says the Mining Reporter, which is to lift a weight 2,000 pounds, a rope will be obtained that will lift 12,000 pounds (dead lift), and hence we have a "factor of safety" of six. The fact of the matter is, however, that we do not really have a factor of even three in many cases. A dead load of 2,000 pounds may readily rise to a "live" load of five or even 6,000 pounds. A more scientific method is rapidly taking the place of the factor of safety method. The elastic limit is the limit to which materials of construction are loaded. It is well known that if a piece of iron or steel is loaded to such a degree that the piece will not resume its original dimensions, on the removal of the load, that the material is robbed of its most important quality, and that it is utterly unreliable. It has been loaded beyond its elastic limit. Therefore, engineers are paying more attention to the elastic limit than false factors of safety.

LEGAL.

Judgment for $2,500 damages was recently awarded by Mr. Justice McMahon in the Toronto Courts against the city of Toronto on account of the death of one, Levi Gaby, of Richmond Hill, who was drowned by falling into a post hole at the new St. Lawrenne market on November 19th last. The city is in turn given judgment against James Crang, the contractor, on the ground that the post hole was not properly guarded.

BROTHERSON V. CURRY.—Judgment in the Divisional Court at Toronto, (E.B.B.) on motion by plaintiff to set as de non-suit entered by Lount, J., in an action for negligence tried at Peterborough, and for a new trial. Action by Andrew Brotherson, a laborer of the township of Otonabee, against James A. Corry, and E. G. Laverdure, contractors for the construction of a section of the Trent Valley Canal, to recover damages for injuries received by plaintiff while engaged in working for defendants in such construction. A derrick used in the work fell upon plaintiff, owing to the alleged negligence of defendants in not sufficiently supporting the derrick, and by reason of a defect therein. Held, Britton J., dissenting, that the non-suit was right and should not be disturbed, because no negligence on the part of defendants was shown. It is not a case in which the doctrine of resio saloquitur should be applied, because evidence of proper and careful construction was given by defendants: Scott v. London Dock Co.. 3 H. & C. 596, Moffat v. Batemen, L. R. 3 C. P. 115, Black v. Ontario Wheel Co., 19 O. R. 578. Motion dismissed with costs. The case is one, therefore, in which the jury are asked to say that the derrick was negligently constructed, when no witness on either side has said so, and where the only opinion expressed by any witness is that it was properly and not negligently constructed. The case is within the doctrine laid down in Walsh v. Whitely, 21 Q. B. D. at p. 378.

BOOTH V. BOOTH.—Judgment by Justice's Meredith and Britton in the Divisional Court at Toronto, on appeal by the landowner in a summary proceeding to enforce a mechanics' lien, from the judgment of the Master at Belleville in favor of the plaintiff, who is the husband of the defendant J. A. Booth. The work and materials, for which the lien is claimed upon his land, are alleged to have been performed and furnished in making repairs to a house, situate on these lands, which had been damaged by fire. The plaintiff agreed with his wife and her mother, who owned the adjoining building, both buildings being under the same roof, to repair both for $886.75. Held, that a lien may attach on the land of each owner where the buildings are repaired under their joint contract, as in this case, for one entire price, provided a separate account has been kept. R.S.O. ch. 153, sec. 4, creates the lien, and by sec. 7 it attaches upon the estate of the owner as defined by sec 2 (3). The Master has properly found that the plaintiff has brought himself within these provisions. The work, etc., was done at the request of the wife, and plaintiff is entitled to a lien on her estate, limited to the amount justly due. The price may be apportioned. This has been done in the United States. Butler v. Rivers, 4 R. J. 38; Ballou v. Black, 17 Neb. 389. The Master found that the lien was registered within the time, and the action brought within the time limited of secs. 22 and 23, and as there is evidence to support his conclusion, it should not be disturbed. There was also evidence to establish the work done, and the materials furnished for the part of the building which belonged to the wife. The Master's finding should not be disturbed even though he had found the other way on the evidence. It cannot be said he was wrong, and unless it can, his findings should not be set aside. Appeal dismissed.

LUDLAM V. WILSON.—Judgment by Court of Appeal at Toronto on appeal by plaintiffs from judgment of Facolnbridge, C. J., dismissing action brought for price of material and work done under a contract made by defendant with one Craddock for the erection of a house on West Wellington street, in Chatham. Craddock failed to perform and plaintiffs agreed to do so. The money was to be paid upon the certificate ot the Superintendent named in the contract, but plaintiffs allege that he is so under the influence and direction of the defendant, so inexperienced and so prejudiced, that he refuses to give any certificate. The trial Judge held that a case had not been made out which would justify him in declaring that plaintiffs were relieved from the necessity of procuring a certificate. Held, that the plaintiffs did not contract, as Craddock did, to furnish and do additional carpenter work, and that term of Craddock's contract is not imported into plaintiff's contract, which must be read according to its subject matter, ie., as a contract to furnish specified material and to do the carpentering work mentioned in the amended tender, and, therefore, the stipulation that all the "conditions" of Craddock's contract are to apply to the plaintiff's contract cannot import into the latter an agreement to "furnish and do" any extra additional carpentry work required by the defendant. For any material, therefore, or work done beyond that tendered and expressly contracted for, the plaintiff is entitled to recover without a certificate. His contract must be read with reference to what he has assumed to do, and so must the provision as to payment, and though he was to obtain the Superintendent's final certificate of completion, that means the completion of his own contract, not of some one else's. The evidence justifies the inference that the defendant discharged the plaintiffs from doing anything further under their contract; that is the meaning to be taken from the certificate and the evidence of the defendant and his Superintendent as to the reasons for giving the certificate of the 14th February. The contract was thereby terminated, and the necessity for any further certificate waived. Appeal allowed with costs. Reference to Master at Chatham of all matters in difference. Defendant to pay costs to and including hearing. Further directions and subsequent costs reserved.

WILSON V. BOTSFORD-JENKS CO.—Judgment by the Divisional Court at Toronto (E. B. B.) on motion by plaintiff to set aside non-suit entered by Ferguson, J., at the trial at Owen Sound of an action at common law by servant against master to recover damages for injuries received by the former in the course of his employment, owing to the alleged negligence of the master, and for a new trial, on the ground that there was evidence of negligence to go to the jury. The injury was received in September, 1900. The work was the building of an elevator at Meaford, and the plaintiff was engaged in excavating. The alleged negligence was the dangerous and unsafe condition of a scaffolding upon which the foreman ordered the plaintiff to go, and it said that the condition existed to the knowledge of one Jenks, the Secretary of the defendants, an incorporated, foreign company, and that Jenks personally interfered with the work. The trial Judge held that there was no evidence to submit to the jury. The plaintiff contended that the whole case should have been left to the jury, the company being bound by the knowledge of Jenks. Falconbridge, C. J., delivered the judgment of the court:—It is not shown that Jenks in any way assumed to give orders to the men, or directions as to the practical work which was going on. There was some evidence that he was standing, with his hands in his pockets, looking into the excavation on the morning of the accident, and that on former occasions he had been seen to call Danger (the superintendent) to one side and say something to him which no one overheard. There was no evidence that the persons employed by defendants were not proper and competent persons, or that the materials used were faulty or inadequate; Matthews v. Hamilton Powder Co., 14 A. R. 261; Wigmore v. Jay, 2 Ex. 354; Lovegrove v. London, Etc., R. W. Co., 16 C. B. N. S., 669. There was no evidence that defendants had any better means of knowing of the danger than plaintiff. As to all the matters in respect of which plaintiff can seek here to charge defendants, the onus is on him; cases above cited and Allen v. New Gas Co., 1 Ex. D. 251. The Secretary had no authority to make admissions on behalf of the company as to the defective condition of the scaffolding and defendant's knowledge of it; Bruff v. Great Northern R. W. Co., 1 F. & F. 344; Great Western R. W. Co. v. Willis, 18 C. B. N. S. 748; Barrett v. South London Tramways Co., 18 Q. B. D. 815; Johnson v. Lindsay, 53 J. P. 599; Newlands v. National Employers' Accident Association, 53 L. T. N. S. 242. Motion dismissed with costs.

With the object of hastening on the completion of the Wolverhampton Exhibition buildings now being erected, Mr. Thomas Graham, J. P., chairman of the executive committee, hit upon the happy idea of presenting a challenge casket, to become the property of the builder who first completes his contract. The casket has been designed and executed at the Wolverhampton School of Art, the accepted design being that of Mr. J. E. Wootton. The casket is of silver, and is valued at one hundred guineas. It has enamelled panels containing figures emblematic of the builders craft, relieved with precious stones, and surmounted by two figures representing "success." It is 14 in. long and 7 in. high.

THE IMPROVEMENT OF THE GROUNDS OF THE TORONTO INDUSTRIAL EXHIBITION.

When it was proposed last year to erect three new buildings on these grounds, one of them being of much greater area than any of those now in existence, it was felt by the members of the Toronto Chapter of the Ontario Association of Architects that the time was opportune for a re-arrangement and improvement of the avenues and grounds as far as circumstances permitted.

The development of a satisfactory scheme, and its adoption before the location and commencement of the new buildings, was considered to be a matter of paramount importance, as, ocne placed in a wrong position, changes or improvements would be permanently blocked or delayed for many years.

The Chapter spent many evenings in working out suggestions for these improvements, several members submitting sketches.

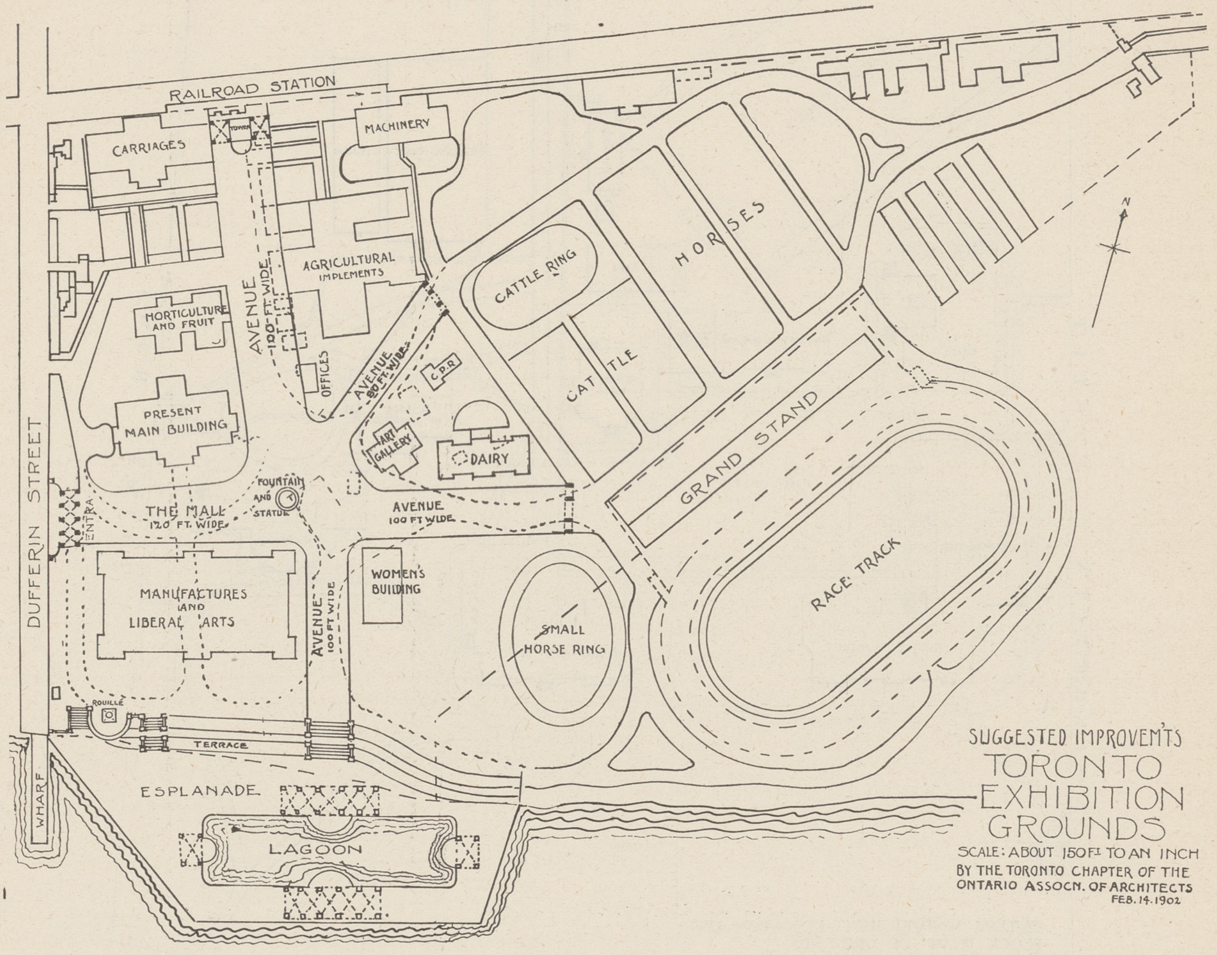
The good points of the various schemes were assimilated into the plan which was most favorably received, and although it was not felt that this plan was at all perfect, especially as the Chapter was in ignorance of some of the requirements, it was submitted to the Exhibition Board which passed it on to the Parks & Gardens Committee of the City Council.

instance as nearly as possible on the old walks and roads, which are indicated by dotted lines.

The making of the new avenues and the widening of the old may be spread over a series of years if necessary, and no large buildings, except those referred to, need be removed till they are worn out or obsolete.

The scheme, in brief, is as follows:—

The main avenue or mall 120 ft. wide to be located south of the present main building with appropriate entrance gateways on Dufferin street. The mall to open into a circle 300 ft. in diameter from which will branch avenues leading north, south and east 100 ft. wide, and north-east 80 ft. in width. The triangle between these avenues would be occupied by the art Gallery and the Dairy Building, while the Manufacturers and Liberal Arts Building would be located on the south side of the extension of the mall leading to the grand stand, and just west of the small horse ring, and not immediately south of the present main building as shown in the cut. This will permit the main avenue running north and south to be extended in a direct line to the lake. All these avenues to have their axis radiating from the centre of the circle, which would be their focal point, after the manner of the avenues in Washington, which are admitted to be among the finest and best planned on this continent.



Since the revival, with the new year, of the project of erecting the new buildings, a committee of the Chapter, in consultation with members of the Exhibition Board and the Park Commissioner, have evolved a modification of the former plan, eliminating the impracticable features and providing satisfactory sites for the proposed new structures.

It is not claimed for this plan that it is a complete or entirely satisfactory solution of the problem, as such is practically impossible under existing conditions, but it is claimed that it will be an immense step in advance of the present lay out of the grounds, and some approach toward the type of grounds so well illustrated in the planning of the Pan American at Buffalo.

The commendable features of the grounds at Buffalo were the broad Plazas, direct Avenues, well defined axis, interesting focal points, and well placed buildings.

Our scheme embodies these features as far as circumstances will premit.

The new buildings can be located in the positions shown with but little change, this year, in the roadways or approaches, while only one large building, (the Annex, or Women's Building) and three or four unimportant buildings will require removal.

It will be observed that the new avenues are located in every

It will be observed that the plan illustrating the above article does not correspond with the text. The location of the Manufacturers and Liberal Arts Building was changed after the engraving was prepared, and too late to alter it, as a result of a conference between the Park Commissioners, the architects of the building and the members of the Toronto Chapter, at this week's lunch.

The vistas at the ends of the avenues could be closed by appropriate architectural features such as a tower, arcade or pergola, while the circle could be accentuated by a generously proportioned fountain, embellished with groups of sculpture.

As the work of development went on year by year an esplanade could be formed at the mere expense of cribbing, the filling being done by the street commissioners department.

In this esplanade a lagoon or lagoons could be formed with appropriate architectural features on the margins.

If possession of the garrison commons should be acquired, the esplanade could be extended a long distance eastward, making a magnificent foreground or front to the grounds.

The banks along the shore, which are now but a disgraceful dumping ground for rubbish, could be terraced, with suitable balustrading and steps, making an unsurpassed vantage point for viewing aquatic displays in the lagoons beneath, or the lake beyond.

These suggestions are confessedly somewhat crude, and require working up into a systematic and well thought-out scheme.

This being done it should be quite practicable to do something each year, however little, towards the final completion of the scheme. The vital point is to secure and adopt a well devised plan now and adhere to it till the work is finished, be it ten or twenty years hence.

EDMUND BURKE,
Chairman of Chapter.

QUEEN'S UNIVERSITY, KINGSTON, ONT.

It was decided in laying out the grounds in connection with the new buildings to divide the present Campus into two parts, about equal in area, and the group of buildings now being erected will complete the lower quadrangle; leaving the North, or upper portion of the grounds, which in the meantime will be used as a football campus, for future buildings.

There are two entrances to the University grounds at present, and that from Union street may be termed the public entrance, but as the City has gradually grown westward, it was deemed advisable to plan a new entrance from University Avenue. This will ultimately be the main entrance, and leave the present entrance from Union Street, at the rear of the quadrangles, for supply purposes.

In thus laying out the grounds in two quadrangles, it was possible for the building committee to arrange the new buildings so as to complete one of them, leaving the upper quadrangle unhampered in any way for future generations.

It is the intention to lay out the roadways and walks as shown on the block plan and the question of tree planting, shrubberies and general arboricultural effects will be carefully considered in the laying out of the grounds.

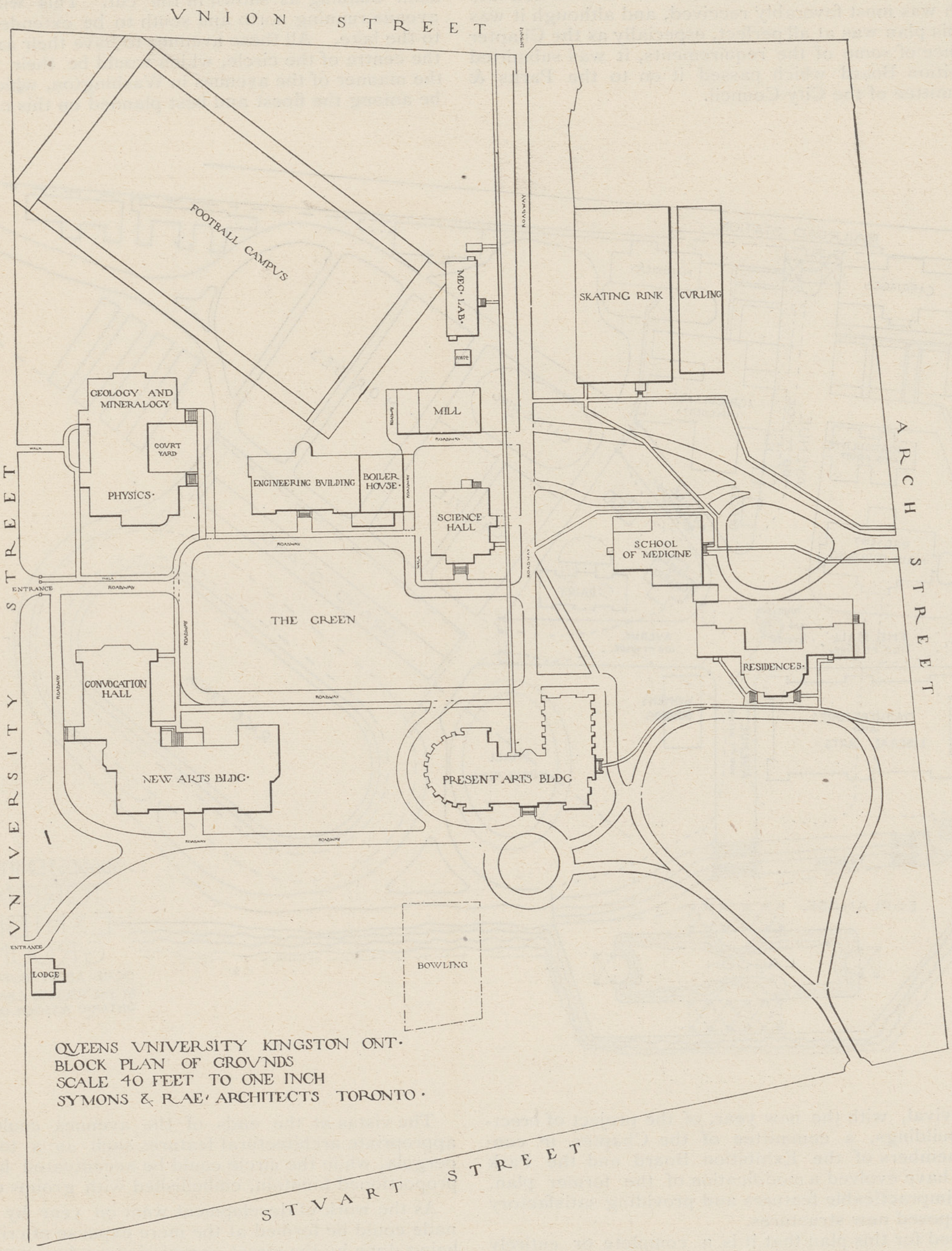
The new buildings being brought into such close relationship with the present Arts Building and Science Hall, it was considered best to adapt the style of the new buildings to them, and consequently a Romanesque treatment was chosen.

The new Arts Building situated at the southwest corner of the quadrangle has been erected through the liberality of the citizens of Kingston, who voted the sum of $50,000 towards it. Associated with this building will be the new Grant Memorial Hall, which will probably be commenced early this Spring.

To the north of the quadrangle are situated the Geology, Mineralogy and Physics Building, and Engineering Building, which are being erected by the School of Mining (in affiliation with the Queen's University,) and for which the Provincial Government have provided funds.

All the buildings are being built of stone quarried near Kingston, the general exterior wall surface being left rock face random rubble with picked dressings. As the local stone used is of a very hard brittle nature, its use for mouldings was limited; but notwithstanding, the entire work, including cornices, steps, and other exterior finish, has been executed in stone, thus doing away with any poorer effects obtained by metal or inferior materials.

The buildings are of slow burning construction, the outer walls being built entirely of stone, and the interior walls of brick; the corridors and entrances being lined with pressed brick. The Arts Building, and Physics and Geology Building are finished throughout in the same manner, the general finish being in pine with the exception of the staircases which are to be of oak, and the flooring which is hardwood throughout. The ceilings of the corridors and staircases are heavily ribbed and finished in pine, and the class



rooms throughout are finished with fibre plastering.

The laboratories and class rooms are of sizes varying from that necessary to accommodate 60 students to 180, the larger class rooms having high ceilings and the walls finished in brick.

Each separate department has the necessary laboratories and workrooms in connection therewith, and also its own library and student's rooms and lavatory and cloak room accommodation for students of both sexes.

The ground floor of the Physics and Geology Building will be fitted up for a Museum, the walls being finished in brick and the floors in concrete. It is the intention to fit the class rooms and laboratories with the most approved appliances and apparatus.

The Grant Memorial Hall will have a seating capacity for about one thousand persons. The plan consists of a large nave or auditorium, adjacent to which on the east and west sides will be narrow aisles, the walls of the latter being designed to receive the general trophies of College life. The aisles will be carried up to receive the galleries, which will run around two sides and the south end of the entire Hall.

Over the arcade between the aisles and the auditorium will be arranged clerestory windows, which will ultimately be filled with memorial glass. On the north end of the building will be a dais capable of seating two hundred persons, and it is also arranged so as to be able to be used for the various stage entertainments consequent in College life.

The alcove at the north-west corner of the hall will be arranged for a grand organ. Adjacent to the dais will be suites of reception and robing rooms. The interior of the Hall will be finished in half timbered and stucco effects ready to receive the decorations.

The Engineering Building equipment is worthy of note. The building itself will contain lecture rooms and laboratories necessary for the work of civil and mechanical engineering and surveying. A draughting room occupying the entire upper storey of the building will accommodate about 125 students, adjacent to which will be the necessary rooms for photography and blue print development.

In the ground floor of the building are situated the laboratories in connection with the mechanical engineering work, and in connection with this floor will be the plant for the lighting and heating of the buildings on the Campus.

The boiler room will ultimately contain boilers of 600 h. p. in units of from 100 to 200 h. p. each, both fire tube and water tube type, and some of which will be equipped with mechanical stokers and economizers. The entire plant will be operated by mechanical draught, thus permitting the boiler plant to be placed in a central location on the Campus, without the accompanying disfigurement of a huge smoke stack.

The engine room will contain engine and generator power for the light and laboratory work in the various buildings, and is also arranged so that the plant can be used in connection with the students' work. Ultimately all the present buildings will be lighted and heated from this central station.

In the new buildings will be installed the fan system of heating and ventilation, which will be supplemented by direct radiation. The steam is conducted from the main station through mains insulated with the most modern underground pipe insulation, the return water being taken back to the boiler house from all the buildings, except the Arts Building, where it is run through an economizing coil and into drains. The fans, which will be run by steam, will propel the heated air into all the class rooms and laboratories and corridors, which will in its turn be exhausted through brick ducts into the roof chamber, from which exit will be obtained. The lavatory ventilation and also ventilation from Physics laboratory has been kept entirely separate from the general ventilation system, and is exhausted by means of electrical fans. The fan system as installed will permit a change of air, even in the larger class rooms, once every twenty minutes, if necessary.

The entire buildings on the Campus are being erected from the designs and under the supervision of Symons & Rae, architects, Toronto, at a total cost, including equipment, of about a quarter of a million dollars.

COTTAGES IN CONNECTION WITH THE SANITORIUM FOR CONSUMPTIVES
AT GRAVENHURST, ONT.

CATHEDRAL ARCHITECTURE IN ENGLAND.

(Digest of a Lecture by Rev. Prof. Cody, M. A.)

A cathedral is not synonymous with a church of the first architectural importance. It is the seat of a Bishop's cathedra or chair, and, in consequence, the ecclesiastical centre of a diocese. But naturally, architectural splendor was made to express ecclesiastical rank; hence the size and beauty of cathedrals. The method in which Christianity was introduced into England in Anglo-Saxon times has had an influence upon cathedral architecture. There emerges here a contrast with France. In France Christianity was first preached in the towns which were centres of secular authority in the subdivisions of the Roman province. The cathedral was erected in the civic centre, in a town already important. In England dioceses were laid out on tribal lines, and within the territory of the tribe there might be no great municipal centre. The Bishop's chair had sometimes to be placed in a missionary station completely in the wilds, and some cathedrals stand still where they stood at first in tiny country towns. The most characteristic English cathedrals do not rise from among the closely-pressing houses of the laity, but stand apart, surrounded by lawns and foliage. This fact is a reminder that in most cases originally the cathedral was first in importance; the city, second.

As a cathedral chapter was collegiate, i.e. consisting of secular priests, bound by the ordinary vows of priests, and having their individual houses, or monastic, ie. consisting of monks living according to "rule," so would there be architectural differences in the buildings surrounding the cathedral. Within the precincts there was not simply the magnificent church, but a chapter house, dormitory, cloister, refectory, library, school, infirmary, bishop's palace, canons' dwellings, etc. Every kind of mediaeval architecture may be found here, from the ornately ecclesiastical to the humblest domestic and utilitarian. In no other country is there so diversified a series of cathedrals. There is nothing on the continent like Salisbury with its lovely lawns and bishop's palace, like Canterbury with its ruined monastic buildings, like Wells with its revelation of the collegiate life of the middle ages.

The English cathedrals were practically paid for by the bishop or monks of the chapter. The direction, enterprise and glory was their's. A secular guild of architects and builders would probably have been better than a monastic, and perhaps the limitations of English Gothic are due to its being the art of churchmen.

The development of style is easily traced in England. There is practically no pre-Norman left above ground in any cathedral. At the time of the Norman conquest every Christian land practiced some form of Romanesque. This was based upon Roman building, and had brought into integral union the round arch and the column. The arch sprang from the capital itself, the entablature carried on columns being thrown aside. This union of arch and column marked the birth of a new art in the widest sense of the word. The Saxon Romanesque was rudely wrought. Norman Romanesque, or Norman as it is more briefly called, being more highly organized and skilfully wrought, easily displaced it. Round-headed doorways and windows and heavy pillars are the chief distinguishing features. The ground plan of a great Norman church was cruciform. There were the long nave with lower aisles to the right and left, the transepts forming the arms of the cross and a choir forming the upper extremity toward the east. An interior section of such a church (Peterborough, for instance), shows as the first stage the pier arches supported by massive pillars separating the naive from the aisles, as the second stage the triforium or blind story arcade opening into a low story above the aisles, and as a third stage the clerestory or row of windows opening clear upon the outside above the roof of the aisle. Only the aisles of the early Norman cathedrals were vaulted with stone. A flat, painted, wooden ceiling covered the centre, and held its ground in England even when Normandy adopted stone. This love for wooden ceilings seems to have been a characteristic of English builders. The great length and comparative narrowness of Norman churches were specially conspicuous in England. This immense extension of a building of inconsiderable height would have produced a monotonous aspect had it not been for the semi-circular or apsoidal east end, the square tower at the crossing and two smaller towers flanking the west facade. In Norwich alone are the apse and centre tower preserved. There was little decoration in the Norman—only simple zig-zags, rolls or fillet mouldings. The general character of Norman architecture is strength, even to massiveness, plainness to boldness. This Titanic work, immense, awful, austere, fitting expression of the aims and ideals of the Norman race at the zenith of its power.

At the beginning of the thirteenth century, the supersession of the rounded by the pointed arch marks the beginning of the Gothic style and new structural principles. The English treated this pointed arch in a fashion of their own. The lancet-pointed or Early English style prevailed for the greater part of a century. Pointed windows, tall and slender, were grouped together without being actually united into a single complex opening. The massive pillar became lighter and was girt about with slender shafts in more or less intimate union with it—the clustered pier. Capitals instead of being square became circular, with chiselled deep-cut mouldings. Vaults were pointed. The ground plan was altered—the eastern arm of the cross grew longer owing to the growth of saint and relic worship (shrines were usually placed east of the high altar.) The aspidal east end (still retained on the Continent) became square (an English peculiarity) with groups of lofty windows. At the extreme east end of the already lengthened choir the lady chapel was built (for the growing cult of the Virgin Mary) and sometimes an eastern set of transepts was added to emphasize the distinction between choir and sanctuary. Salisbury is an admirable example of this style.

In less than a century came the full-blown Decorated, marked by elaborate tracery in the windows, enriched doorways and beautifully-arranged mouldings. The tracery passed through the stages of simple plate, geometrical flowing. In France the tracery developed into flamboyant, so-called because of its unfettered exuberance by which the lines seem to be twisted and woven into flame-like, stone defying forms. The central date of this style is 1300, a period not marked by much church building on a large scale. It was a time of splendid and expensive wars, of legislative and social innovations, of the half revolt against Rome. Architecture was military or domestic, and the prolific time of church alteration came later. The angel choir of Lincoln, and the greater part of Litchfield and Exeter are examples of geometrical Decorated, while the west window of York is flowing Decorated. Late English Gothic stiffened into the Perpendicular style—an English peculiarity—the prose of architecture as compared with Flamboyant, its poetry. The millions of the windows abandoned their curves and ran straight from top to bottom. They were cut across by strong horizontal transoms, and this panel-like form was frequently extended as a decoration over the wall space. The low four-centred curve was frequent in the arch. This style afforded an enormous window space to be filled with stained glass. The choir and lady chapel of Gloucester are good specimens.

The genesis of the window may be described as follows: First there was the round arched head, then the pointed head, then two pointed windows close together with a projecting moulding in the shape of an arch drawn round them enclosing both and a plain piece of wall above their heads. Then began the piercing of this space. At first the window seemed to be a group of bright spots on a shadowed wall ; at last it became a tracery of dark lines upon a wide bright field, like a pattern done in black on a lighter background. The latest style represented in the cathedrals is the Renaissance or revived classical, of which St. Paul's, London, is the splendid example.

English Gothic exhibits a love of lowness and a neglect of the effects of vertical extension. As extreme elevation demands daring processes of construction, perhaps the relative lowness of English cathedrals is an expression of the national caution and self-restraint. The spirit of Gothic architecture was audacious, imaginative, aspiring ; to be deficient in these qualities was in measure to fail to exhibit the highest qualities of the art. The imaginative power of England, it has been remarked, expressed itself best in poetry, that of France in art.

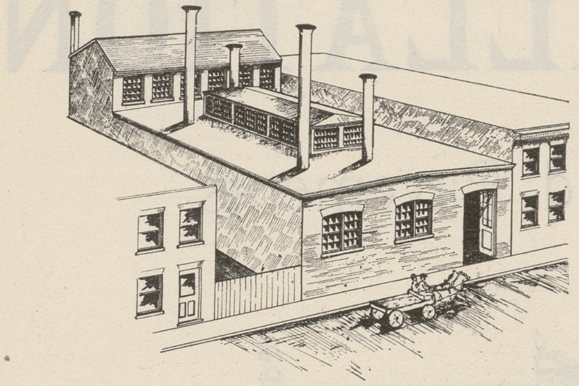
Viewing an English and a French cathedral from within, one notes the vast height of the French with its resultant mystery, sublimity, impressive soul-subduing character ; the huge length of the English, length that can be seen and understood. The French structure is broader, shorter, taller, more compact than the English. The typical French cathedral strikes one as more of a unity, the typical English as a complex body with numerous and dense parts. The external aspect of each is different. The French cathedral has a compact, broad, tall body with ranks of flying buttresses ; the English a long, low, narrow, self-sustaining body, which however permits extraordinary dignity in the towers. In France as the Gothic body grew tall, the western towers grew with it and the central tower shrank into a mere spirelet ; in England the central tower grew but the western towers either remained on a smaller scale or finally disappeared. The narrowness of the English building led to great breadth of transept which assured the eye of the stability of this central tower.

Each type of building suits its surroundings. The French stands in the heart of the city. It was built by and for the people. Its west front facing the great city square is the place of common entrance, and is made correspondingly ornate and conspicuous. The English is often set apart from the busy city streets, and compassed with green sward. The chief architectural accentuatisn falls at the crossing of nave and transcept and still reminps one that the cathedral was bnilt primarily for the clergy and only secondarily for the laity.

The attention of architects and contractors is called to the announcement of the Zanzibar Paint Co., Ltd. Toronto, Ont. sole manufacturers of Zanzibar Anti-Rust Paints. This is made in any color desired, and is now being used largely by railroads for bridges, train sheds and other structural iron work requiring protection from rust.

NEW GLASS BENDING OVEN.

On visiting the works of the Toronto Plate Glass Importing Company, Toronto, a representative of this Journal, learned that they have recently added to their new factory at Nos. 209 to 213 Victoria St., a thoroughly up-to-date glass bending oven. This branch of their business is now in complete operation. This is said to be the only plant of its kind in Canada for the bending of glass on the most approved principles. The



Bending Factory of The Toronto Plate Glass Importing Company, Toronto.

photo in the Company's advertisement in this issue illustrates the oven used for bending all sizes of glass. It is built of brick and has a capacity of 1,000 feet of glass per 24 hours. The glass is first cut to required sizes, then placed on a truck on which are large steel moulds. It is then fed into the oven which is hot enough to bend the glass to the required shape, after which it passes through a process of annealing to prevent it from being too brittle. This process reduces the temperature until the glass becomes gradually cooled to a flesh heat. The process is very complete and produces such a finish on ordinary glass that, but for thickness, it can hardly be distinguished from plate glass. Previous to this oven being installed, a large proportion of the bent glass used by this firm had to be imported. In consequence, orders could not be delivered promptly. This delay operated against the use of bent glass. The Toronto Plate Glass Importing Company now claim that they can deliver orders, if necessary, one day after received. This promptness of delivery and reduction in cost should largely increase the use of bent glass for all purposes, and will no doubt prove to be a great convenience to architects, and those using bent glass.

A CORRECTION.

Our attention has been called to several errors in the letter of our Montreal correspondent printed in our January issue. In this letter Messrs. McKim, Mead & White are given the entire credit of being the designers and architects for the new Bank of Montreal. This statement, we learn, is entirely erroneous and misleading, as Mr. A. T. Taylor, F.R.I.B.A. is joint architect with McKim, Mead & White, and the building has been jointly designed, and is being carried out in every particular under the joint care of the above named architects. We sincerely regret this mis-statement, and others of less importance, appearing in our correspondent's letter, and take the earliest opportunity of directing attention to them, in order to repair, as far as possible, any mis-conception which may have arisen in consequence of their publication.

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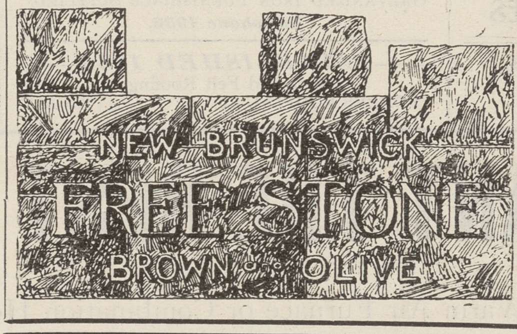

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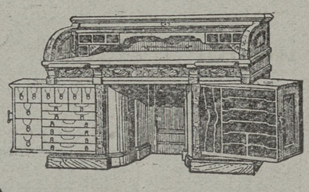

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