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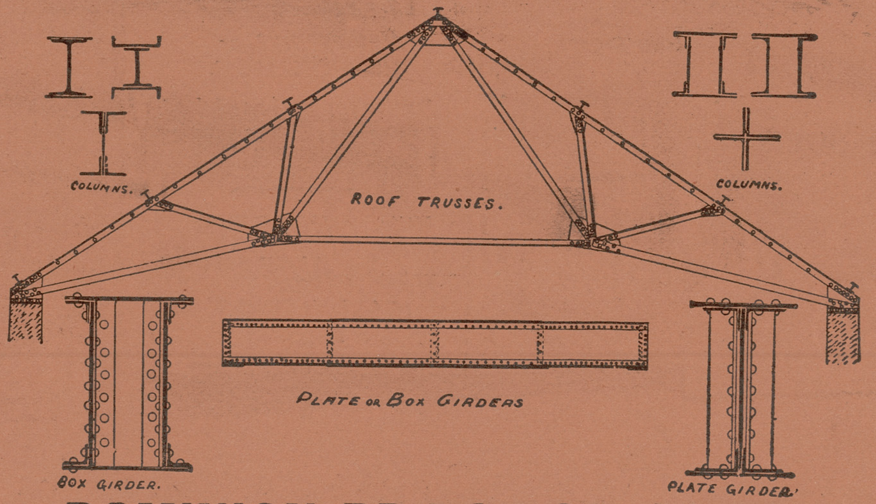

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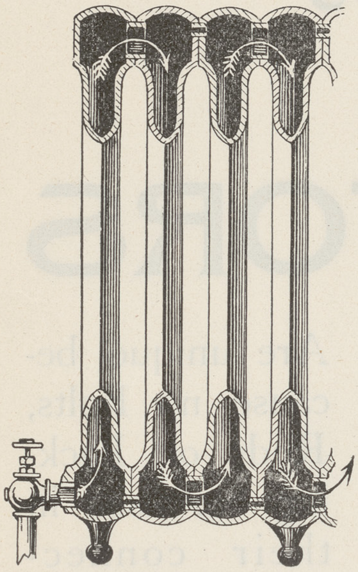

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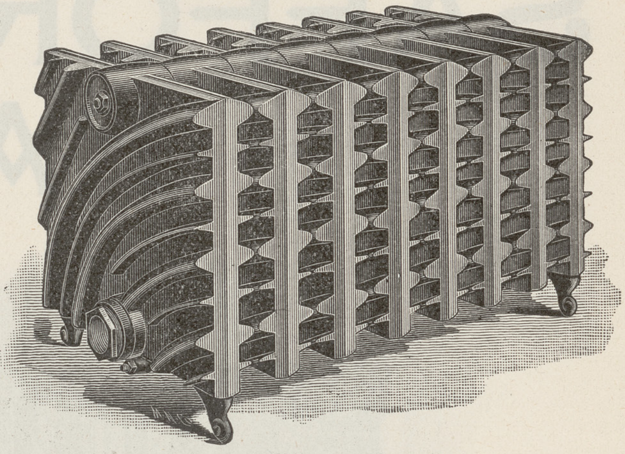

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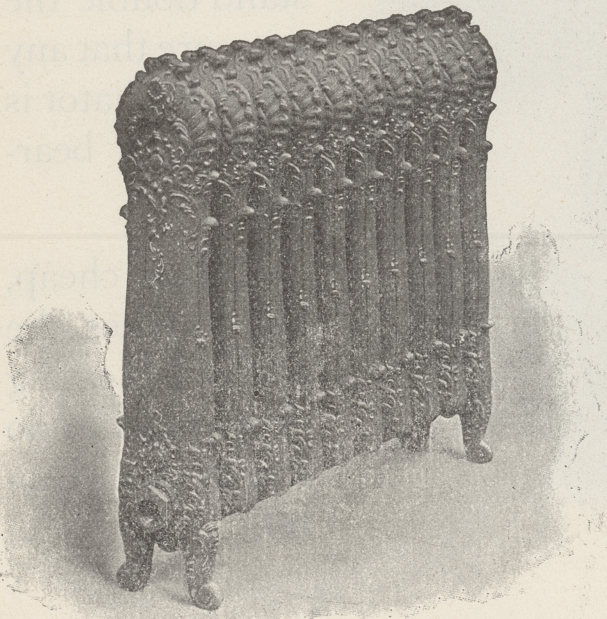

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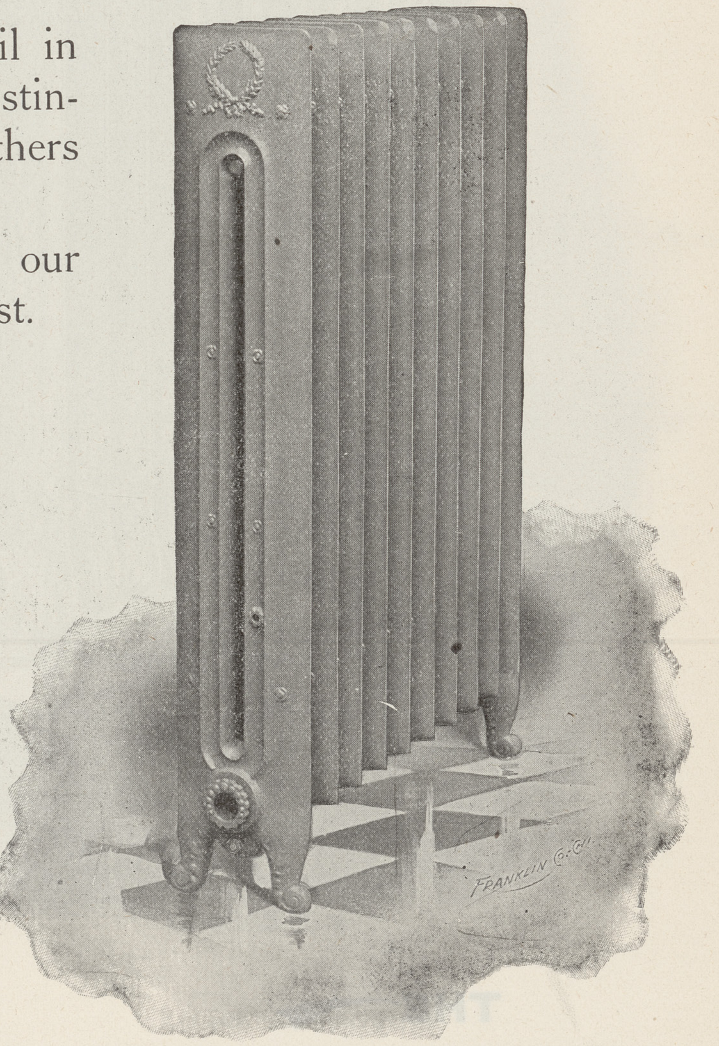

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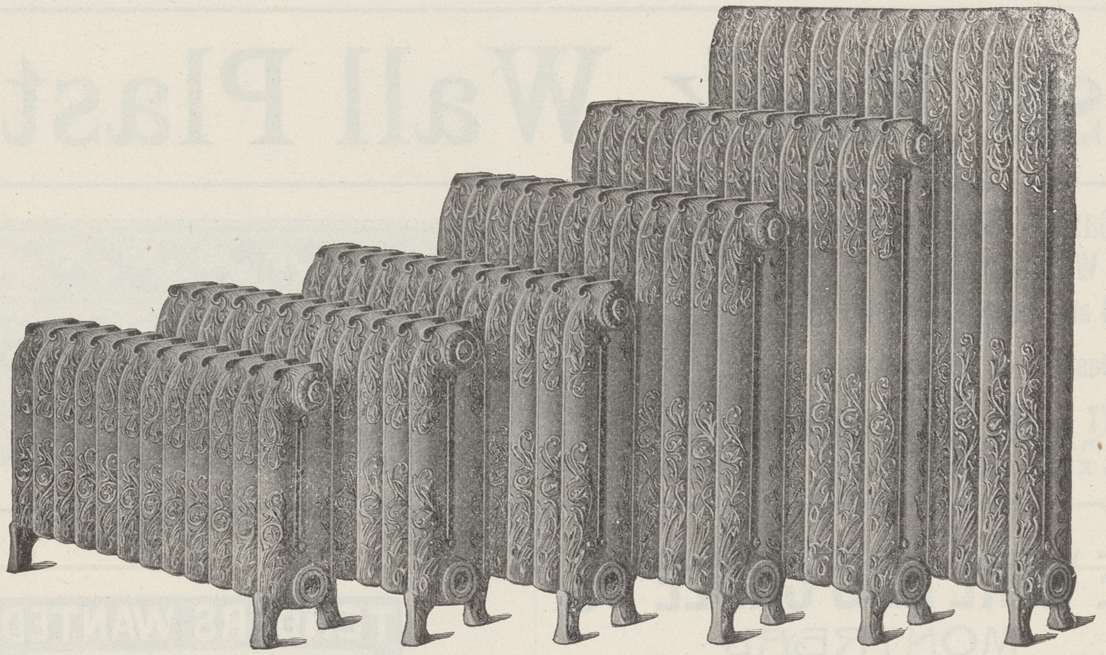

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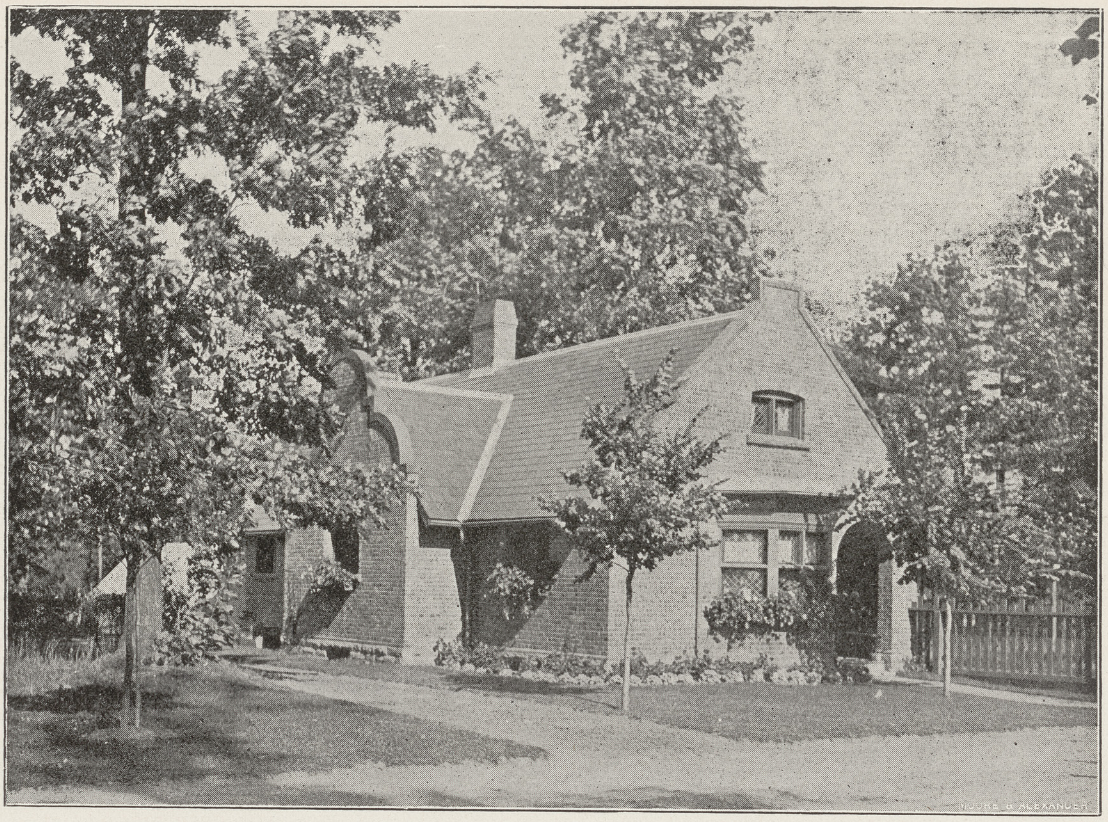

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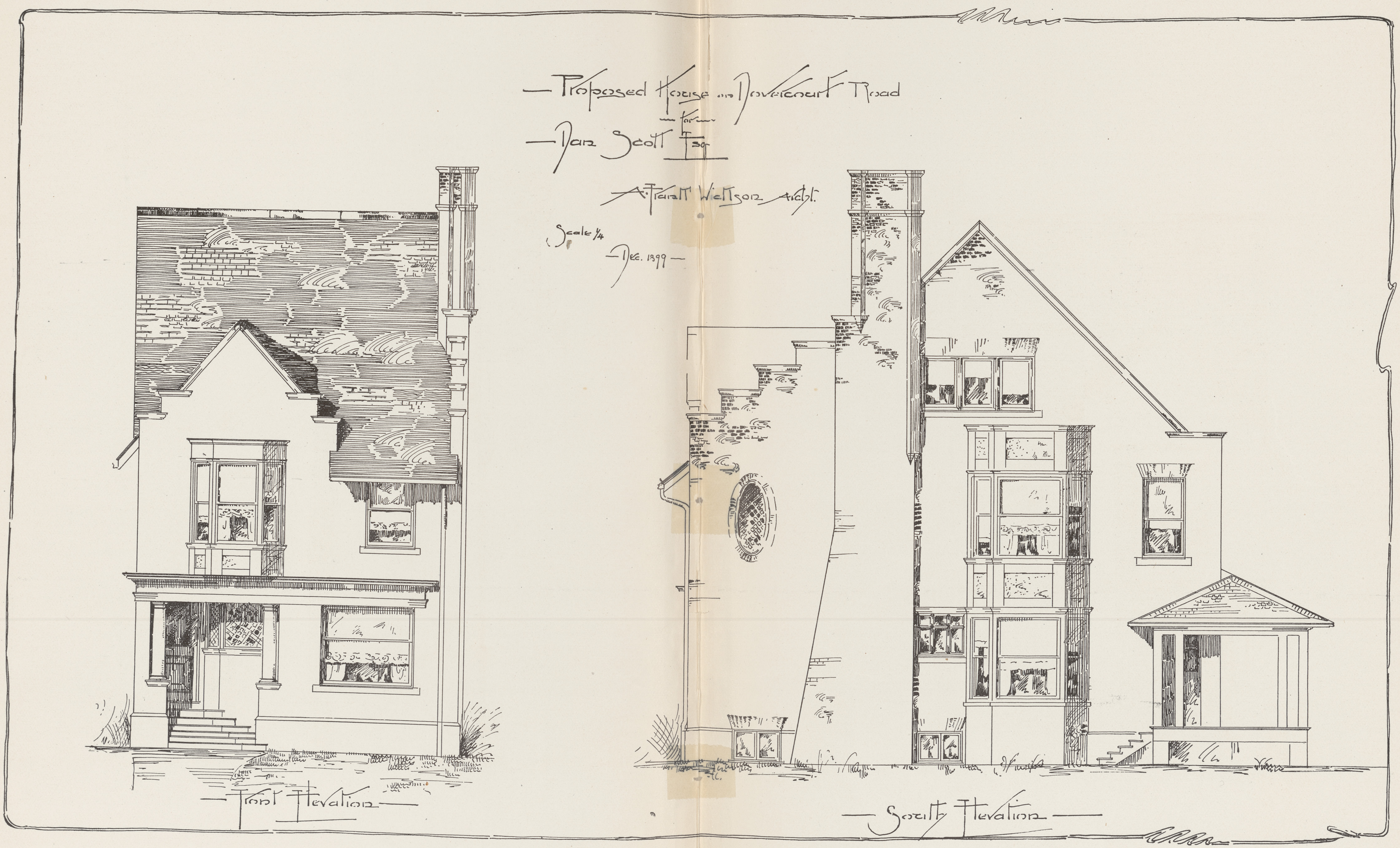

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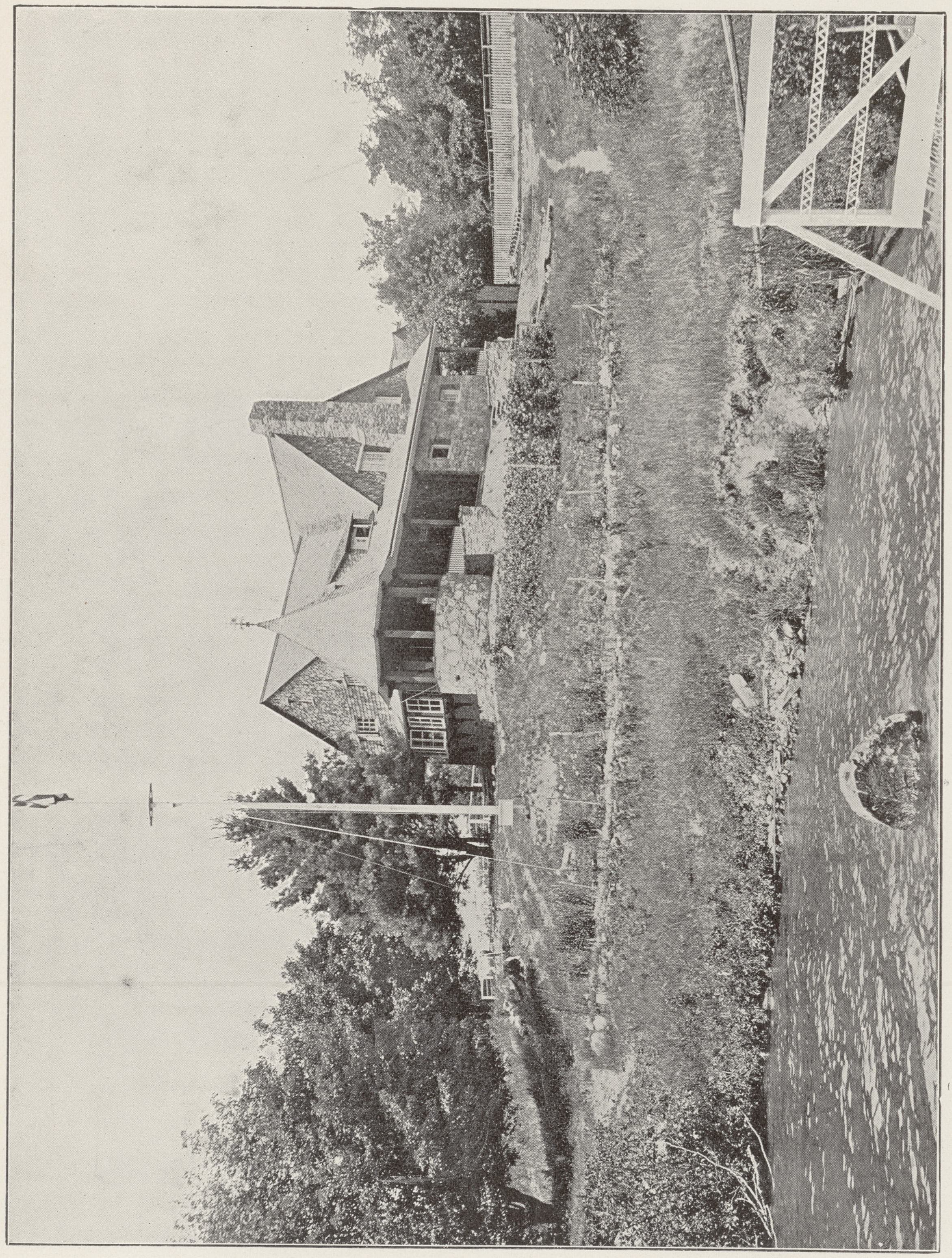

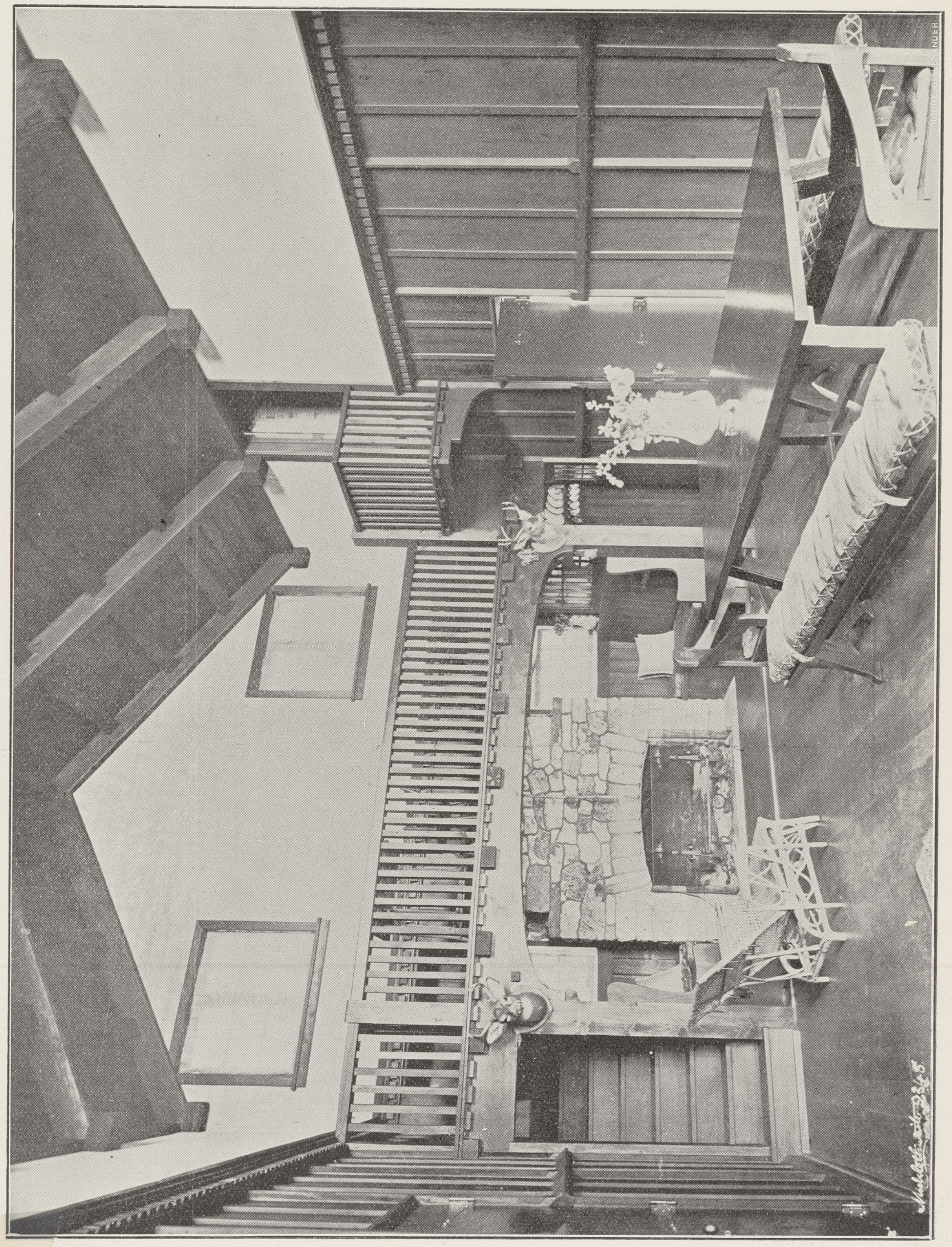

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Contributions of value to the persons in whose interest this journal is published are cordially invited. Subscribers are also requested to forward newspaper clippings or written items of interest from their respective localities.

Subscribers who may change their address should give prompt notice of same. In doing so, give both old and new address. Notify the publishers of any irregularity in delivery.

A Result of the Ottawa Fire.

NOTWITHSTANDING the adoption by the City Council of Ottawa of new building regulations calculated to prevent destruction by fire, the insurance authorities are reported to have decided to increase rates in that city by 25 to 50 per cent. This action should be sufficient to compel the extensive use of fire-resisting materials and the erection of a greatly improved class of buildings.

The A.I.A.

IT has been decided to hold the annual convention of the American Institute of Architects at Washington, in December, during the session of Congress, in the hope that the meeting may exert an influence in furtherance of several public improvements of a national character, which are expected to come up for consideration at that time. These include the remodelling of the White House, the proper grouping of the Federal buildings, plans for the improvement of the city, etc.

Quality in Portland Cement.

THE manufacture of Portland cement is attended with many difficulties, hence the product of different manufactories is likely to vary widely in quality, and purchasers require to be cautious in buying. The process of manufacture in Canada, by the older established factories at least, has to a large extent been perfected, and the products of these factories is of a uniformly high character. There are a number of new factories projected, which, though able to profit by the experience of their predecessors, must to a certain extent contend with the difficulties incident to the experimental stage of manufacture. The owners of these factories, in order to secure for their products a place in the market, should be prepared to furnish buyers with detailed re-results of carefully conducted scientific tests showing the quality of their material.

The Latest Phase of Unionism.

THE local labor union, of Vancouver, B. C., are reported to have absolutely prohibited their members from joining or remaining in the militia. In doing this, says the American Architect, the unions have taken a step which brings them perilously near to giving notice that they enrol themselves in the ranks of anarchists, pure and simple, enemies of society as established, and as such to be pursued and punished to the bitterest extremity upon the performance of the first overt act against the laws of order. The militia is one of the recognized arms of government, and any citizen who evades duty in its ranks, is unworthy of the protection which under other circumstances, the law would afford him, and for all we can see, is subjeet to attainder for treason the first time he resists the law. Any body of men who give public notice that they feel themselves obliged to obey the rules that contravene the laws established, by and under the constitution, by the people, place themselves voluntarily in the position of public enemies, and must abide the consequences.

Strength of Brickwork.

THE failures of brickwork which occasionally occur in Canada, are probably in some measure due to the application by architects of the standards of strength published in Trautwine's and and other American hand books. The tests of Canadian bricks which have been made at the School of Practical Science, Toronto, show that the native material should not be loaded much above five tons to the square foot. The following quotation from Trautwine shows that his standard is nearly double that amount. He says: With our present imperfect knowledge on the subject, it cannot be considered safe to expose first-class pressed brickwork in cement, to more than 12 or 15 tons per square foot; or good hand moulders to more than two-thirds as much." Local tests have also shown quite a difference in strength as between bricks manufactured at Hamilton and at Toronto. So that it becomes necessary that the architect should ascertain for himself, as nearly as possible, the strength of the actual material which he proposes to employ, Some years ago a series of valuable tests of Canadian building stones was conducted under the direction of the Ontario Association of Architects at the School of Practical Science, Toronto. At a later date some tests were also made by the school authorities, of brick piers. It is desirable that the latter tests should be supplemented, so that Canadian architects, engineers and builders, might have all the data required to guide them in the use of the native material.

Technical Education.

A REPRESENTATIVE of the Bureau of Labor of the United States is said to be in Canada for the purpose of making enquiry into the subject of technical education. The results are likely to be disappointing and of little value. The haziest ideas seem to prevail here with regard to the subject. Nobody has apparently any well founded knowledge of the lines on which a technical school should be conducted, or of the character of the instruction which such an institution should impart. This statement applies also to the Board of Management of the Toronto Technical school. The large falling off in attendance of late is an evidence that the institution is not being conducted on proper lines, and that it is not fulfilling the purpose for which it was established. Under present circumstances the large expenditure for maintenance seems to be an unprofitable one. Nor does it seem wise to expend nearly one hundred thousand dollars in a building before the lines on which the school should be conducted and could be made successful have been determined. It would be as wise to attempt to construct a building from the roof downwards. A few more years of such management as the school is now subjected to will result in irretrievable ruin. The cause of the trouble seems to lie in the fact that the Toronto Trades and Labor Council has been given a controlling influence on the Board of Management. Why should this be the case? The Council have no more interest in the success of the institution than the representatives of other interests. Nor on the whole are its members as well qualified by education and travel to judge of the requirements. It is time to call a halt, reconstruct the Board of Management, and decide what are the functions of a technical school, what kind of instruction is demanded by its prospective students and the best means by which it may be given.

Province of Quebec Association of Architects.

THE annual convention of the P.Q.A.A., the proceedings of which are printed in this number, was characterized by a small attendance and an apparent lack of interest on the part of a majority of the members. This was perhaps, in a measure, due to the meagreness of the programme. There were no papers, and apparently no subjects set down for discussion. The Association dinner which was formerly an adjunct of each convention, was omitted also. Under these circumstances, it was perhaps too much to expect a large turnout of the members. Meetings of this kind, to be successful, must have a carefully planned programme, calculated to interest and profit the members. As our Montreal correspondent suggests, there should be papers on subjects of interest to the profession, the discussion of which should, to a certain extent, be pre-arranged. Printed copies of the papers should also be sent out to members in advance of the meeting, and they should be invited to come prepared to take part in the discussions. Our correspondent suggests other causes for lack of interest on the part of the members in the affairs of the Association, regarding which we have no knowledge. The report of the Council shows that the new Association rooms which were fitted up at considerable cost, are not made use use of by the members, therefore the proposed large expenditure on an architectural library to be placed in these rooms, would seem likely, under existing circumstances, to be an unprofitable investment. The new Council would do well to try to discover the cause of the apparent apathy on the part of a majority of the members, and if possible provide a ramedy. We are heartily in accord with the views expressed by Professor Capper, the retiring president, regarding the necessity for better theoretical and aesthetic training of the students. In the proper education of the students lies the hope of a higher standard of architecture and architectural practice in Canada in the future, as well as the existence and usefulness of the Association. The Ontario Association of Architects having come to realize this fact, are about to formulate and put in operation an educational system for the benefit of students. Every young man who desires to enter as a student the office of a member of the Association in the future will be required to bind himself to take the required course of study and pass the prescribed examinations. Might not the Associations of Ontario and Quebec with advantage work together in this matter?

A SUMMER HOUSE ON THE LAKES.

The summer house on an island or point in one of the back lakes is an institution so well established that it has ceased to be satisfactory in the crude simplicity that distinguished the first experiments. People do not now play at temporary barbarism as they used to. There is as good boiled linen to be seen at the evening meal in a well-kept house on the lakes as there is in town. People have discovered that all the joys of an out-of-doors life are possible without dispensing with the niceties of ordinary refinement, and yet the houses in which the summer is passed are such as in many ways to contradict this tendency and to interfere a great deal with the comfort of a household composed of ladies and gentlemen who, however great friends they may be, do not want to be in constant sound of one another night and day, and hardly able to avoid keeping track of one another's private movements.

With tight joists, wide apart ; ⅞" flooring and partitions of matched boards, a bedroom ceases to be a private apartment. It is merely a cubicle with enough protection to fend off sight, but with none against sound ; and to take precautions against being heard merely adds the indignity of stealth.

The question of expense, of course, is concerned in that of the simplicity of the building ; but, in the first place, the time has come to spend a little more money—it need not be much more—upon these houses ; and, secondly, there is a great deal to be done by mere attention to plan, without involving greater expense.

The life is so much an out-of-doors life that the location of the house must be part of the plan, not only for the ordinary conditions of relation to the sun and to the view, but because certain functions that are usually performed inside the house will now be performed outside of it. The bathrooms are out of doors. They cost nothing in themselves, and there is no question of expense connected with their being made comfortable. But there is plenty of room for planning with the condition that the bathing places and the house shall be considered as one piece, and arranged so that the approach to the gentlemen's bathing place may be from the gentlemen's rooms, and that to the ladies' bathing place from the ladies' rooms, so that there may be no danger of rencontre between pyjamas and dressing gowns on the way to the morning bath. Pyjamas are a perfectly respectable attire. Traders in the South Sea Islands transact their business thus habited, and if some member of the more dressy professions would start the same fashion for July and August "in this Canada of ours" he would deserve well of his countrymen. Dressing gowns also, when caught in at the waist and adorned with a Watteau pleat, are nothing more than tea gowns more highly flowered and surmounted by hair differently piled up from the method that obtains later in the day. The final cause of the large horse-cloth check that makes pyjamas splendid, and also of of the greater though more imperfectly apprehended elegance of dressing gowns is no doubt the chance of their being seen ; but such chances ought to be limited to fires, fits, burglaries, and other nocturnal catastrophes. In their essence they are symbols of retirement, and to rashly expose them to the light of day and the sight of eyes is to withdraw the veil that makes the sanctuary. Modesty may be unassailed, but reverence is tampered with ; and it is time that the principles of house planning were applied to the summer house and its surroundings so that outside the house as well as within it there should be a men's quarter and a women's quarter, in approaching which either sex may have no need to dodge the other.

Within the house as well as without this would be the system of greatest convenience, and overcome most effectually the disadvantages proceeding from the necessary flimsiness of construction in a cheap house. Men's quarters over the boat house is a satisfactory arrangement, but it tends to make the boat house taboo to the women except at certain times. Separate wings for the bed rooms, each giving towards its own quarter, is the obvious solution of a house which is spacious without being substantial. All elaboration may be concentrated in a central living hall with a fireplace. In proportion as a building is compact, it must be more substantial in order to be more comfortable. A double floor with felting between would do much to do away with the noisiness and want of privacy in a small house ; and something should also be done to the partitions. This is the burlap period of architecture and and burlap could be of great service in killing the resonance of wood.

In placing a summer house the paramount consideration will be the view, but the question of aspect has its usual importance, and as usual there are considerations of both cold and heat ; for the inevitable cold wave that comes at intervals in the summer, and is so welcome in town, affects the idle dwellers in a summer house as it does the idle fly. They come out after breakfast to crouch in the sun and thaw their numbed faculties ; and it is essential that they should have a sunny front as well as plenty of shade. Indeed the sunniest aspects should have the largest exposure of the house, because it is from that quarter that the breezes of the hot days come, the only breezes that we cannot do without. There is not much danger of darkening the hall too much by wide verandahs, for its wall surface should be mostly doors and windows, and in any case, where people are so much out in the sun and air, a house is chiefly welcome as a cool dive, free from glare. What house life there is in the day time goes on chiefly on the verandah, and it must be not only wide but many sided so as to give not only shade at all times but shelter from all breezes. This puts the kitchen side and the bedroom approaches obviously to the north. There is no sun there, and the breeze from that side is rare, and not welcome when it comes. The three remaining sides are all pleasing aspects at some time of the day or in some kind of weather, and in choosing a site they should have recognition as the best aspects for the front part of the house.

The greater part of the problem of planning a summer resort is site, and if the architect, when there is an architect, could only get in at the point of choosing site, he might achieve perfection. A good site for a house is apt to have a somewhat unpromising appearance from the water. A good deal of rock and a few trees, though not much to look at, make an excellent place to look from. A house that looks from it will have free outlook and will get all the air that is going, while its presence makes the spot to be no longer unadorned. A fine old bluff well above the water is tempting, and of course has advantages when one gets there ; but the labour of getting there many times a day kills the advantage. A house must not be too far from the water, with which the occupants want to be in constant touch ; and after all, though a high view is always fine, the most charming view over water is the low view over the surface.

There must be trees at the rear to screen the back premises and to shade the ice house, and a tree or so in front gives composition to the view. The fringe of bushes that is so apt to grow along the edge of the water, makes a natural screen for the bathing places. It is impossible not to regret the growing tendency to fit summer houses with bath rooms. A kitchen sink is both a necessary convenience and is no drawback, for it is easily drained over the surface at a sufficient distance from the house. If necessary it may by a simple contrivance discharge over a different surface for every day in the week, so as to secure complete purification of each day's discharge. Bath rooms are, however, a paltry luxury compared to the perfection of a morning's bath in the lake from a sunny spot. Those who must have a warm bath in the morning, can use a moveable tub, and have the contents discharged, with the other household wastes, over the drainage area in the woods. As for water closets, they are an abomination. A body of property owners, such as the Muskoka Lakes Association, ought not, and perhaps does not, allow them; and detached island holders in larger areas, if they have any real appreciation of the true charm of this way of life, which is its absolute purity, will abhor them as defiling both the water and the house in which, if they do not exist, it is possible for a few months in the year to live in the certainty that the air of one's room is pure. The ordinary country privy is safe, and need not be very far from the house to be no annoyance. As to the question of privacy, if one is approached by way of the boat house, or men's quarters, and the other is approached by way of the kitchen, or women's quarters, and if both are in the woods, there is nothing left to be desired. Remoteness from the house is of course no drawback in a house for summer occupation only, and rain is as a matter of fact not a feature worth considering in connection with outside privies. It is essential that there should be a quiet place for boats. Some favoured places have a channel or cove near the house, which is quiet in every wind, but a south side is quiet enough at all times for a boat house landing.

All these arrangements presuppose an island or point of some size. The picturesque establishments that one sometimes sees, perched upon a little island, must have many practical inconveniences, and none more than the inability of people to get away from one another. The condition of constant association in idleness is trying, and requires occasional relief to keep it from becoming wearisome or worse.

BY THE WAY.

JUDGING by a recent conversation with a well-known firm of decorators the lot of the painter contractor is not an enviable one. The firm to which the gentleman belongs had not for several years submitted a tender for painting, but recently, at the solicitation of a friend who was building, consented to do so. Their figure proved to be more than one hundred dollars higher than that of the next highest tenderer, who is a reputable contractor. Below these two were a number of tenders of less responsible firms, grading down to very low figures. An insight into the means by which prices have been reduced to such a low level was recently given by the representative of a painters' supply house, who was offering for sale a very cheap paint mixture. Enquiry elicited from him the fact that the chief ingredient was water, which the salesman gravely asserted was being used by many painters as a substitute for white lead, and was said to answer the purpose very well.

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I WOULD like to hear from somebody who can get better value for his money than an architect of my acquaintance who recently designed and supervised the erection of a small country house. The house included a living room 18 x 20 feet, a parlor and three bedrooms each 12 x 12 feet, a cellar full size of house, having stone walls. The roof and outer walls of the house are shingled, exposed boarding being left unplaned. Window frames, doors and door frames were purchased from the mill and painted. The entire cost, inclusive of architect's fees was $650. The entire work was done by a local builder.

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A GENTLEMAN who recently returned from Sault Ste. Marie has told me something about the wonderful progress which that town is making, and which is in a large measure due to the ability and enterprise of Mr. Clergue, manager of the great pulp mills. This gentleman who, by the way, is a bachelor, lives in a house of the block house type, and on the site where a blockhouse once stood. The first story of the building is constructed of local red sandstone, and the upper stories of logs or square timbers. Another peculiarity of this residence is that the heating, lighting and cooking are all done by electricity. The proprietor being also the owner of the electrical plant from which the streets and industries of the town are lighted, and of the immense water power by which the electricity is generated, is in a position to adopt this method of heating, the expense of which would be prohibitive in the case of persons less fortunately circumstanced. Speaking of power I am reminded that Mr. Clergue is now developing by means of canals on the Canadian side 80,000 horse power, and on the American side 100,000 horse power.

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BRET Harte tells the following anecdote, illustrative of the "Child-like and Bland" characteristics of the average Chinaman: "In a certain portion of New Zealand, so runs the story in question, the population is composed mainly of Scotsmen and Celestials. All the members of the Municipal Council, however, belong to the former race, and, as a natural consequence, are in the habit of giving their own country-men the preference wherever opportunity arises. Such a one occurred the other day, when tenders were locally invited to take up a contract for road-making. The work being of a highly remunerative nature a large number of applications for it were received from the Caledonian community. At the meeting of the Municipal Committee appointed to decide the matter it was officially announced, amid loud applause, that the accepted tender was that of one Sandy McPherson, who was thereupon instructed to come forward and sign the necessary documents. To the consternation of the worthy chairman, the individual presenting himself before the committee for that purpose was seen to be a pig-tailed and almond-eyed inhabitant of the flowery land.

PERSONAL.

Mr. Frederick G. Todd, who was formerly with Olmsted Brothers, the noted Landscape Architects of Boston, opened an office in Montreal last January, and the remarkable success which has since attended his profession shows that the Canadian people are not behind those of other countries in their appreciation of that which is beautiful. Mr. Todd is a strong advocate of the natural and picturesque style in treating a place except where the house demands a more formal treatment in the shape of architectural gardens or terraces. As the arrangement of the grounds is studied with regard to its effect on the architectural features of the house as well as to obtain a good effect from the house, Mr. Todd is receiving the steady support of many of the best architects in Montreal.

HEATING AND VENTILATION WITH REGARD TO GREENHOUSES.*

By Robt. W. King, Mechanical Engineer, M. Can. Soc. C.E.

The writer's attention was specially called to this subject in 1886, and 1887 with a view to the application of steam in place of hot water heating in greenhouses. The first experiments were made in the greenhouses of Dr. Roe, of Georgetown, Ont. In 1888, the writer became acquainted with the late Mr. H. Dale, of Brampton, who had in contemplation the building of some houses for cut flowers. A more exhaustive study of the subject was then made, including the designing of boilers for that special purpose. In writing a paper on this subject, it is natural to recall those earlier days, because it was then that the points now to be brought to your notice, were mainly first considered.

In commencing to build a greenhouse plant, and especially with a view to future extensions, the plans for heating the whole or completed plant are one of the first and most important things to be considered. It will invariably be found advisable to modify in many ways the houses or their location in order to obtain the best efficiency and economy, both in the installing and use of the heating plant, rather than to endeavor to adapt that plant to houses that have already been erected, with little or no thought to efficient and economic heating. Since the variations, due to differences in location, are many, it will be impossible in a brief discussion to cover the whole ground, but it will be the writer's aim to convey in a condensed form, the conclusions to which his experience has led him.

In considering the methods of heating to be employed reference will be made only to hot water and steam heating. The former still has many advocates, especially in the shorter or smaller houses, and indeed, it is not so very long since it held the entire field. But, with the majority of large growers it has had to give way to steam.

The efficiency of any plant does not depend so much on whether steam or hot water is employed, or on the class of boiler used, or on various other items often pressed upon one's notice as essential to success, as upon the details, and thoroughness of its individual design and manipulation. There are growers who after changing from hot water to steam, have changed back again to hot water, and then published their experience as a caution to others against steam. Moreover, boilers that have worked successfully in one place have failed to do so in another.

Where steam has failed to give good results and economy in heating, it has been due to fault in the plans or method of installing it. In the earlier days, the methods of installing hot water were well understood while steam was not. This was the case when the writer engaged to make a special study of steam heating as applied to greenhouse work.

In any undertaking it is necessary to consider what are the requirements to be specially provided for. In greenhouse heating it is mainly economy in fuel, and attendance.

Fuel constitutes the main expense account, though attendance is also an important item, especially in small houses. These should have boilers designed to safely carry steam all night. Boilers so designed have proven themselves safer and more advantageous than others depending for regulation on a night watchman. Night watchmen fall asleep sometimes or do not wake up when they should, and so allow the houses to chill or become frozen. In a young business the watching of the fires at night generally falls on the proprietor, and the broken rest so necessitated interferes seriously not only with health but with the proper conduct of business, which requires, for its best performance the stimulus of a sound night's rest.

Coal in some form is the principal fuel employed by greenhouse men, and will therfoer be mainly so dealt with in this paper. In the first place it should be intelligently purchased. It is not enough to know by chemical analysis or the statement of an agent that from a certain grade or sample can be obtained the greatest number of heat units in proportion to the price to be paid for it, and as compared with some other coal. It is essential to know that the particular fuel purchased is best adapted to the particular plant it is to be burned under. We burn fuel under boilers for the purpose of conveying as fully as may be possible the heat made by its combustion to the water in the boilers. Therefore the most direct way of testing a sample lot of coal is to so burn a measured quantity and then measure the heat conveyed thereby to the water in the boilers.

Also it is essential to know that the efficiency of the plant generally, and its manipulation is such that a proper or economical duty is obtained from the fuel burned under the boilers.

For these reasons every greenhouse should be provided with means for making evaporation tests or a direct measurement of the heat values obtained per pound of coal consumed. After having expertly determined the best obtainable efficiency of the plant itself in regard to the cost of the heat units absorbed from the fuel, then the grade of fuel and method of firing should be employed that will best maintain that efficiency.

The importance of evaporation tests cannot be too strongly accentuated. Nor is it a very difficult or expensive matter to arrange for taking such tests as far as it is necessary for gardeners' purposes, though to attempt to describe them within the limits of this paper would be too wide an extension of my subject. To make a test reliable for comparison with other plants, there are engineering questions and calculations in bringing all to one common basis of measurement that a gardener not also an engineer would not usually undertake. It would be more practical to consult an engineer, and have him arrange and supervise the first tests taken and leave such instructions as will enable subsequent comparative tests to be made at any other time desired without his supervision. This has been successfully accomplished in the Dale greenhouses at Brampton. Some of the tests thus taken will be referred to in the course of this paper.

Test for efficiency of a heating plant need not be confined to steam heating. In a paper read before the "Engineers' Club," of Toronto, last spring the writer describes a method of testing the efficiency of a hot water boiler in such a way that the results in economy on fuel may be compared not only with other hot water boilers, but also with steam boilers. This paper in question was published in the "Canadian Architect and Builder," and in the "Canadian Engineer" of recent issues.

In designing a heating plant to obtain a high grade of economy in the cost of fuel, the prudent man will find that he must not look with too miserly an eye on the first cost necessary to install such a plant. In order to obtain the abundance of heat necessary for your best success, more has to be expended than in installing a plant that will develop only a small amount of heat at a high cost per unit. This may be illustrated as follows:

Steam boilers with heat passing from front to back have been experimentally constructed in sections, so that the evaporation from each section could be independently measured. It was found that the largest part of the work was done at the first or front sections, while the boiler being made long enough, practically no work was done by the last or back section. Suppose such a boiler divided into two equal sections of such a length that the first half does 75 per cent. of the work in absorbing heat from the fuel burned, and the last half 25 per cent. Now it is evident that you can purchase boilers designed (as amount of surface exposed to fire is to fuel consumed) on the first section plan for about half the cost of boilers built on the plan of the whole or combined sections; but the latter will, though costing you more, give you a saving over the former plan of 25 per cent. in fuel, which may mean over 100 per cent. per annum on the extra cost of the plant as a business investment. By following the first plan you invest your money in the most unprofitable part of the plant and omit the most profitable as regards the cost of fuel, thus seriously affecting the net profits of the business. It will be seen, therefore, that the gardener without any check on what his plant is accomplishing may be working under a serious handicap in ignorance of his possible profits going up the chimney in smoke.

It will be found that the same principles apply to hot water boilers, though steam boilers have a serious impediment as compared with the former in the higher temperature of the ordinary steam boiler surfaces which thus detract from their efficiency or heat absorbing power. This fact was early noted by the writer as a point wherein hot water had the advantage both in economy of fuel and in boiler construction over steam, since in a hot water system the lower temperature of the circulating water as compared with steam made the boiler surfaces better adapted for the absorption of heat. Though makers of hot water boilers discount this objection—and sometimes to an absurd extent—by giving that much less heating surface to their boilers, it still remains a point in favor of hot water heating.

To meet this in steam heating the writer designed and patented plans for using the return water in a gravity system as a cooling agent to apply to the waste gases between the hotter boiler surfaces and the chimney flue, and he considers this princi-

*Paper read before the Canadian Horticultural Association at Montreal, August, 1900.

ple in some shape or other as essential to the best economy in steam heating. This may be proven as follows :

Given, for illustration, that the B.T.U. (British Thermal Units) in one pound of coal are 15,000 and that 1,000 B.T.U. are required to evaporate one pound of water ; given also an ordinary steam boiler with an evaporative efficiency of 10 lbs. of water to one of coal consumed : In burning each pound of coal to evaporate 10 lbs. of water we have utilized 10,000 B.T.U. of this 15,000 burned and allowed the remaining 5,000 to go to waste at the flue. In the return water heating plan when carried to its full extent the piping is arranged so that the water of condensation may after having parted with its heat in the houses, return to the boilers at 60°. This can be and has been done with the return pipes lying in the lower and colder parts of the houses. Now in using our otherwise waste gases to raise this water from 60° (F.) to 212° (boiling point) or over, before re-entering the boilers, we are unable to capture from such gases about 150 B.T.U. per pound of water so raised. (15,186 B.T.U. being according to Peabody's tables the amount of heat required to raise 1 lb. of water from 60° to 212° F.) Practically equal to 1,500 B.T.U. for each 10 lbs. of water evaporated or pound of coal consumed. So that in the burning of a pound of coal by this system we have captured 11,500 B.T.U. in place of 10,000 by the other, giving a proportionate saving in fuel consumed, that is to say, 10 tons with return heater as against 11½ tons without. This calculation refers to steam at atmospheric pressure or zero on the steam guage; any pressure carried above this admits of the returns being brought to higher temperature and a correspondingly larger amount of heat units to be saved by this plan.

In installing economizers at Brampton it was found that not only is the feed or return water raised to steam temperature before entering the boilers, but also an additional amount of steam was made, requiring special piping to carry it away representing a saving to be credited to return heaters over and above that already shown.

Having thus shown means for overcoming in a steam heating plant this fundamental disadvantage, we will now consider a point in greenhouse heating where steam has the advantage over hot water. Such advantage consists in the ease by which the steam heat may be regulated and controlled.

In hot water heating the radiating pipes and boilers are necessarily full of water, the pipes usually being of large size and necessarily of larger size than those employed in steam heating. In order to bring the piping to a working temperature by a stated time (a point that has to be determined in advance), earlier fires are required for the evening or night than in a steam apparatus which has only the smaller and empty pipes to bring to such temperature. This, with other causes not necessary here to enlarge upon, causes a comparative waste of fuel in the hot water system. This can be met to a certain extent, but to a certain extent only by making the water pipes as small as possible consistent with necessary freedom of circulation, remembering, however, that if you are depending on a large reservoir of hot water for maintaining an even temperature you are detracting from the reliability of your system in this respect.

With steam heating you can depend for this reliability on the steam pressure which will automatically regulate the fire, so that the necessity for any objectionable reservoir for heat no longer exists, outside of the necessity of placing sufficient fuel in the furnaces to run the plant for the length of time desired. Therefore in order to obtain the full advantage of steam heating in this respect, as small a reservoir of heat as possible should be employed. By encumbering a steam plant with boilers containing an unnecessary amount of water and steam space part of the advantage possible in steam heating will not be obtained even though the boilers when working may show the highest evaporative efficiency.

This principle in economy further applies to the fires themselves. In explaining this point it will be necessary to refer to the different methods employed in firing which will vary accordind to varying conditions and requirements. For a small plant and to obtain the best results of an all night fire, hard coal, being the slowest burning fuel and the cleanest, is recommended. The writer has not experimented with soft coal for this purpose. In order to obtain the effect desired in all night fires the area of grate surface should be carefully proportioned to the work to be done. Therefore in planning a heating apparatus some standard of measurement for the work to be done is first required. This has often been a difficult matter to obtain, but may be calculated approximately on the quantity of piping or radiating surface to be employed to obtain a temperature of 60° (F.) The temperature has to be considered because the same proportion of piping will do more work and consume more steam in a colder house ; while the reverse is of course the case in a warmer one. For instance to raise the temperature an extra 20° about double the quantity of radiating pipe will be required, while it will be found approximately correct to assume that 50% only of additional steam will thereby be consumed, thus discounting the work done by the whole 25%. Like reasoning calls for a corresponding advance in duty for radiating pipes in a temperature of 20° below the standard average assumed of 60° (F.) The amount of radiating surface in the heating pipes then being brought to the common basis of what it would be were the piping all of one inch internal diameter, for all night fires a grate surface of one half a square foot is required to every 100 feet of pipe or with night fireman a one fourth square foot will supply the same amount of radiation. This basis of calculation assumes that the boilers used are of a certaln standard in evaporation efficiency.

It will be noticed that no reference to the size or power of the boilers is here made though generally the first question asked is, "Will some certain sized boiler heat my place?" It has already been shown how half a proper sized boiler may heat a place if the proprietor is able to stand a 25% waste of fuel. With this kind of boiler a proportionate amount of grate surface will, of course, need to be added to burn that waste fuel, but the real basis of power is in the measurement of the grate surface, and rate of fuel combustion, the proportions of the boilers affecting mainly the economy and efficiency in absorbing and conveying the heat of combustion to the houses to be heated.

This part of my subject will not be complete without reference to the burning of slack or low-priced coal such as screenings, with automatic stokers, and smoke consuming devices. And trust it may be charitably conceded that it is for the sake of brevity, rather than personal conceit, that I confine my remarks rather to the narrow bounds of my own experience than to attempt to embrace the whole field.

It being proposed to burn under a greenhouse plant soft coal screenings, to the grower's requirements originally referred to must be added the absence of smoke, or the heavier portions thereof, that by falling on the glass would shut out the sunshine, which is more valuable to the grower in winter than the fuel he consumes. The engineering requirements to prevent this smoke as also the waste of gases that produce it and can be burned, are the mixing of such gases with sufficient air, and then bringing the whole to such a high elevation of temperature in the combustion chamber that the gases, more particularly the less volatile, may become ignited and consumed therein. This necessitates a higher rate of combustion than in hard coal burning, and was accomplished after several experiments by reducing the grate area, and proportionately increasing the rate of combustion per square foot of grate per hour. These values may be broadly placed as follows : For all night fires with hard coal 2½ lbs. per square foot of grate per hour ; with night fireman 5 lbs.; soft coal screenings with automatic stokers 10 to 12 lbs. or over. Other proportioning of the heating plant must be adjusted to correspond on the lines already indicated. In order to illustrate as plainly as possible, exactly what has so far been acomplished, and for the purpose of furnishing a comparative guide to florists in the use by them of the system of measurement by evaporation tests already referred to, the following tests with hard coal, and soft coal screenings, taken by the writer from plants, while in ordinary operation, are submitted :—

BRAMPTON.

	Test, "A" December 31, 1896.	Test "B" June 3, 1897.
Heating surface in boiler, square feet,	450	450
Grate surface..........................	14½	9.4
Percentege of ashes....................	12⅓%	20%
Duration of test in hours............	19	6
Steam pressure in pounds...........	2	1
Temp're feed water 3015 lbs. at 60° F		
" " " 8835 " at 50° F		60 F
Total coal used from pile...........	1302	475
Coal consumed combustible.........	1142	378
Coal used per hour....................	68	79
Coal used per square fort grate per hour......................	4.7	8.4
Total water evaporated.............	11850	3367
water evaporated per hour..........	624	561
Water evaporated per lb., coal used	9.1	7.08
" " " " consumed	10.3	8.09
" " " " from and at 212° F....................	12.12	10.31

Test A. Best hard coal hand fired. Stack 40 feet high.

Test B. Soft coal screenings—not dried—"King" automatic stokers under same boiler and stack.

On the authority of these tests, showing more waste in the screenings lb. for lb. than in hard coal, a correspondingly additional amount of screenings were purchased for the experimental stoker fires, which remaining unused at the end of the first season it was judged that the extra ease in regulating the stoker fires which has already been referred to, produced an economy that balanced the loss of efficiency in soft coal screenings, and automatic stokers as compared with best hard coal, hand fired.

In order better to prevent smoke in burning the soft coal screenings higher stacks (60 feet) have been built, and other changes experimentally made. In fact I am unable to report at the present time that these experiments are fully complete, so final results cannot be given.

Though advising and afterwards designing and installing automatic stokers at Brampton, the writer was aware that there were other methods in use for burning the cheaper grades of fuel, but we must always have in view the economy of the plant and the saving of labor. As regards the former, the stokers were found capable of giving with such fuel an evaporative efficiency that would pay a high rate of interest on their cost of installment; that they burned the fuel cleaner; and that they gave greater ease in regulating the fires. This latter is specially noticeable in the stoker action, fires being brought from a banked condition to almost maximum efficiency in five minutes, and let down in a proportionately short space of time. With proportionate reduced area of grate surface and depth of fuel, there is probably not 25% in weight of the quantity of fuel under combustion, that there would be in hand firing. When the fires are lighted, the gases from the screenings burn in a fierce flame near the entrance of the furnace, and cease burning immediately the automatic feed is stopped, thus reducing to the minimum the heat in reservoir already referred to as effecting economical results.

The regulation of the fires can be automatically controlled by the steam pressure. Ease of attendance is further provided for in the Brampton plant, by the automatic conveyance of the coal to the stokers, as their requirements call for, from bins in the room overhead, holding a day or more supply, so that no coal appears in the boiler room or has to be shovelled into the stokers. The filling of the overhead bins is accomplished by machinery, which removes the coal from any part of the storage shed desired, and deposits it, evenly spread, in the bins referred to. The same machinery is arranged to receive coal dumped into a hopper from the wagons entering the yard, and deposit it at any part of the storage shed referred to, which is made large enough to hold a season's supply, thus enabling the grower to purchase and obtain delivery of his fuel to the best advantage in regard to price and time. The same machinery also receives the ashes from the boiler room, and elevates, carries and deposits the same in a wagon or sleigh ready for further removal. Thus great economy in labor and ease, and convenience in manipulation, have been accomplished from the time the coal enters the premises, until the removal of the ashes produced by its combustion. Ventilating shafts are also provided every 12 feet distance throughout the storage shed to prevent spontaneous combustion of the coal.

Having thus far considered as of first importance, the economical production of heat, the grower must see to it that it is economically employed. Pipes passing through spaces not requiring their heat, must be wrapped by heat non-conducting material in some efficient manner. The radiating pipes must be so arranged in the houses, and provided with shut-off valves, that any pipe, or number of pipes, can be put in or out of action to maintain exactly the heat desired, which should be regulated within a margin of a few degrees. Any over-heating causes waste at the ventilators, that if automatic, will immediately open. If the ventilators are not automatic, the stock may be seriously injured and the heat worse than wasted. The houses must be well built as regards being air tight, and the presence of outside walls which require extra heating, should be as much as possible avoided. The practice now coming largely into use, of putting as much space as possible under one roof, is favorable to the best economy in the use of heat, division may be made in this space by introducing light or glass partitions where required, which do not increase the area of the outside walls.

Some reference should be made to the laying of radiating pipes. Since it will be impossible to embrace all the systems employed, we will consider mainly the requirements for laying steam radiation on the gravity and return heating plans recommended above.

As a precaution against fire, the main steam pipes should not be hung overhead in a shed above the boilers, since a fire in the shed might cause them to fall and so disable the heating plant. In such a position they are, moreover, unsightly and in the way. They should rather be placed under the floor level of the houses in a trench made to receive them, and they should be supported in such a way that though the shed might burn down, the pipes would remain intact, and the whole heating plant in working order.

For a site having a slight fall only, as advised by Mr. Dale, the requirements of this system would be best served by selecting the highest point for the boilers, and then sinking the boiler cellar deep enough to give ample drainage from the lowest heating pipe to high water line of boiler, equal to at least one half inch in every ten feet of heating pipes going and returning, with an extra foot or two to spare.

The main steam pipe from above the boilers, commencing large enough to allow for possible extensions, should be carried across the housen, reducing its diameter proportionately as the different houses are supplied, and may be carried after leaving the boiler in a trench made to receive it at its upper level. This pipe should fall from the highest point above the boilers, and be relieved of condensation at its far end by a return pipe running under it at the bottom part of trench, and direct to the water space of boiler, avoiding the return heater. From this main steam pipe are taken the feeds to the headers of the coils of heating pipes in the houses, on the basis of say a 2 inch pipe to supply 1000 feet of 1¼ inch pipe, as given by Mr. Dale. A single 1¼ inch pipe may run 400 feet, enabling houses to be built to this length when using this size for radiating pipes, or to a length of 200 feet when using radiating pipes of one inch internal diameter. Or houses may be double this length by having the main across the centre, instead of the ends of houses, the pipes and houses falling away from both sides. A greenhouse is now being built at Brampton in this way, 830 feet long, using 1¼ inch steam heating pipes. With a large main the feeds to coils may be tapped direct into the pipe at any points desired.

It is preferable in the return heating plan, to run the radiating pipes to fall all the way from the highest point where start is made, so as to carry the condensation with the steam and discharge it at the far ends of the houses. Some ingenuity may here be employed to abstract the heat in the water of condensation before returning it to the reheaters.

In short houses, the returns for each house may be gathered in one or two pipes and returned inside their houses to enter a special main return pipe in the cross-trench before mentioned, and then pass to the return heater, but in long houses it would necessitate possibly a deep trench being made to receive it in each house. To meet this objection the following method, as one of others that may be devised, is submitted. In carrying steam 400 feet in an 1¼ inch pipe, it will be found a certain pressure is required at its entrance end to force steam of no pressure to its further end. The exact amount the writer has not determined, but as the temperature of steam falls with its pressure, it follows that there must be some falling off of heat at the further end of a long house so heated. Now this may be counteracted by leading the return pipe of each coil, in a single loop, back part way up the house, returning again and joining with a main return pipe running across the houses at their lower ends. This main return pipe will then, by one trench only, length ways of houses, conduct all cold returns to the reheater. By following some such plan as this, the extra cost or trouble involved will be well repaid where the return heating system is in use, by the saving in fuel thereby, as illustrated in a previous part of this paper.

VENTILATION.

In regard to ventilation the requirements for greenhouse work should be understood better by the grower than by the engineer. It is the latter's duty only to incorporate into his machine if automatic, such action under varying conditions as the grower may dictate. If his machine is not automatic he has simply to construct such a mechanism as will the most easily, with due regard to the expense of installing it, open and close the shutters at the will and by the effort of an operator.

When undertaking to construct an automatic ventilating apparatus for greenhouse work it was given to the writer that the requirements of the grower were a more even regulation of the ventilating shutters at all times, than could be obtained by human attendance, the machines required to be capable of adjustment to maintain any desired temperature within a variation of not more than about 4° of heat and to give also a graded movement while acting in the limit referred to. For instance, should the temperature rise say 1° causing the machine to operate, the shutters must open steadily that proportion only, namely one-fourth of their full opening, and stay at that point till further change in temperature called for further movement. Any erratic action of shutters such as being put up too high, to be lowered again too low when fall in temperature occurs, that must then naturally take place, causes drafts, and alternate overheating and chilling of plants.

The machine must pull down as well as hold up the shutters. In carrying out the latter point in Brampton it was found advisable to introduce a spring in each connecting rod to the shutters, so that should a piece of ice or other obstacle be in the way of any individual shutter closing, the others could close, and in the case of ice or snow being in the way the continued pressure of the closing shutter would eventually succeed in thawing it out when this shutter would automatically and individually close.

In principle the mechanism consists of a double action hydraulic ram operated from the water pressure (required in green-houses for watering) to actuate the shutters controlled by a delicately constructed double acting and graduating valve which is itself operated by a powerful thermostat moving its operating finger to and fro as heat changes occur.

There are times in the season when heat may be out of houses when it is desirable that shutters should not entirely close at night, since in such case dampness and mildew might result. Under such conditions a stop is arranged to prevent an entire closing of shutters to any desired limit.

The introduction of automatic ventilation in the Brampton plant was simply a natural following of a leading mind, and whose absence to day is mourned as that of a brother indeed who has departed and gone before to that rest to which we all are hastening, whose aim was in accord with advanced and even advancing minds engaged in solving such economic problems as further the best interest of the human race. For him the best was not too good, while every detail of his business was carried out with that thoroughness of which the success that followed his efforts speaks. For him it was enough that ventilating shutters could be better and more economically operated by an automaton than by human attendance, resulting in his having installed to date some fifty-two automatic machines in the Brampton plant referred to herein.

The advantages of automatic ventilation are there obvious. Muscles of iron grow not weary of their task. They sleep not, and never forget. Like a clock keeping track from day to day of the fleeting hours of time, so automatic regulation is always prepared for operation. It may apparently sleep through the winter months, but it starts into action with the first peep of spring. It bows its head to passing clouds and closes out the chilly winds, effectually relieving the grower of one more care, and asks no pay for its services other than the small amount of water under pressure required for its operation.

ILLUSTRATIONS.

(1) GATE LODGE, UPPER CANADA COLLEGE, DEER PARK. (2) WORKINGMEN'S COTTAGES, BELLWOODS AVENUE, TORONTO.—SYMONS & RAE, ARCHITECTS.

PROPOSED RESIDENCE ON DOVERCOURT ROAD, TORONTO.—A. FRANK WICKSON, ARCHITECT.

SUMMER RESIDENCE IN LAKE JOSEPH, MUSKOKA.

The foundation in field stone is carried up in places to form the walls. The walls are of timber framing, filled in with brick or shingles. The shingles throughout are dipped in Cabot's creosote stain, weathered shingle color. The interior of the living room is in pine toned down to a dark color. The upper wall is rough trowelled grey mortar.

HAMILTON ART SCHOOL.

A hand-book of information relating to the Hamilton Art School has been published by the authorities of that institution. The introductory chapter states that the object of the school is to provide facilities for the study of fine and technical art, to enable the students of Hamilton and its immediate vicinity to obtain instruction at least equal to that obtainable in any high class art school, and to charge for the same the lowest possible rate of fees; thereby saving the expenditure of a large amount of money and possibly foreign residence as well; also to provide technical instruction during the evening at an almost nominal fee for those whose trades prevent attendance at day classes. The premises were specially designed for art school work. The rooms are well heated and ventilated, lighted by electricity, and fully equipped with casts, models, copies and appliances for teaching every branch of drawing, painting (oil and water color), modelling, designing, carving, architecture, building and machine construction and the mathematics required for the same. Mr. S. John Ireland has been re-appointed principal of the school for a term of years.

Branch Office of the CANADIAN ARCHITECT AND BUILDER, Imperial Building.

MONTREAL, Sept. 10th, 1900.

The annual convention of the Quebec Association of Architects was held in their rooms on Sept. 3rd and 4th, and although the attendance was small the meeting was one of considerable interest. A full report will be found in another page. Professor Capper in his presidential address dwelt upon the advantages to be gained by architects in having a university education, though only as part of the general system and not in any way to do away with the practical side of the work which can only be acquired properly in an architect's office and on the actual buildings in progress.

This is an important question and one that should be carefully studied in view of the younger generation about to enter the profession; especially is this the case in the province of Quebec where the profession is now a close one.

In the university education the student has the advantages of masters who have studied more especially the theoretical and artistic side of the profession and are no doubt in most cases more adapted to teaching, with all the necessary materials for so doing at their hands, than is a busy practising architect who can as a rule give only a few minutes each day to his pupils, and who have therefore of necessity to rely for their training in more or less a haphazard manner—the amount of their education relying considerably on their own anxiety to study or lack of same, and the good nature and willingness to teach on the part of the draughtsmen. For these reasons it is probably preferable for a student to receive an academic training for the first two years of his course and for the following two years to work in a practising architect's office. He will by this means enter an architect's office with sufficient knowledge of the rudiments of his profession to be able to grasp the meaning of the work that is going on around him and therefore to be able to take full advantage of the practical side of his profession. This manner of educating an architect is similar to that in vogne in the medical profession. First the theoretical academic course and then the practical hospital training. Surely if architects only looked more often at the higher phases of their work there would be less poorly designed detail, fewer badly proportioned columns and ill conceived carving to be seen on our streets. If architects would only remember that their work consists not only in making a pretty sketch, but also in carrying out the details in such manner that every moulding and column shall be proportioned so as to be pleasing to the trained artistic eye, there would be less work that violated all the true canons of art. Erecting buildings with faulty detail similar to that which one expects from a "jerry builder" should be despised by members of the profession, and the training of the younger men should be made with a view to obviate the possibility of such work and to train them so that inharmonious schemes of colour and ill-proportioned mouldings and other details is as objectionable to their trained artistic eye as a false note is to the ear of a musician. This, no doubt, should be unnecessary to state, but unfortunately our streets show us that the artistic sense of many of our architects is far from what it should be, and it is this very stigma on our calling that the better education of the younger members of the profession is expected to eradicate. No doubt the tendency is towards improvement, but there is still a vast deal to be learned by many of our architects as well as the general public before these intolerable "designs" which afflict us on every hand (as Prof. Capper expresses it), are eradicated.

It is the architects who have the work of teaching the public on their hands and it is their duty to erect good and refined structures, so that when the public pass by they will soon become, (even if not at first), gradually filled with the quiet beauty of the work so that they will learn to appreciate the superior design over the poorer but oftentimes more ostentatious building.

In reference to the attendance at the meetings it would not be unfair to state that it was far from satisfactory. At the meeting on Monday morning when the election of officers for the ensuing year was held, and which usually calls forth the largest attendance, only 22 members were present out of a membership of 123. This can hardly be called a creditable showing and it would doubtless be well for the Association to look well into the cause of this lack of interest.

There are several reasons which at first sight might be suggested, all of which no doubt may be partly the cause: 1. The unwillingness on the part of most members to lay aside the calls of private practice with its resulting profits for the good of the profession as a calling. 2. The tendency to re-elect the Council or the majority of the members of it, as has so often been the case in past years. An improvement might be suggested so that no member of Council can serve more than two years unless a space of three years have elapsed. By this means the changing of the council would be compulsory and would therefore no doubt tend to more interest in the elections. 3. The lack of any attractions to draw numbers together. In the past year according to the annual report, no general meeting was held but only Council meetings, so that for the past year at least the only privilege members had was that of being able to use the reading room. This, no doubt, to a good many of the members seems hardly commensurate with what they should receive in return for their annual fee. Surely something that would be attractive to a large proportion of the members could be held during the year. Lectures have been tried, we believe, and not found successful, but were not the lectures even among a certain clique? It might be suggested that lectures be given by outside persons who have made a special study of their branch—on Electricity by an Electrical Engineer; on Skeleton Construction by a Civil Engineer; Cements by one who had made a special study of Cements; Decoration by an artist, and so on—allowing members to bring friends who are interested and having a short discussion started by two members who would be asked beforehand to lead the discussion so that it would not be likely to drag. These papers with the following discussions could be printed in the form of transactions of the society, which ought to be a series of valuable papers on subjects of interest to all members. The subjects are almost endless, but great care should be taken and every effort made to procure the man who is best qualified to speak on the particular subject in question. One more suggestion that might be made would be that an annual meeting should be held in which members would be invited to ask their friends to some lecture that would be of special public interest—such as the decoration of the home, designing of furniture, etc., showing the difference between good and bad designing. At this lecture an exhibition of architectural pictures could be held and designs of decoration, furniture, etc., by outsiders who have and are endeavoring to raise the standard of such work. Invite the honorary members and their families, the members and their friends, and make this meeting a popular success, and the members will be only too glad to come. Endeavour to make at all risks the first meeting a success and the others will become a simple matter.

The exhibition of architectural drawings held in the rooms of the Association during its annual meeting was hardly a representative one. This it was hoped was on account of the architects being too busy, but it is seen that two of the busiest architects in town are the best represented, so that the cause must be looked for elsewhere. Messrs. Hutchison & Wood had a very good water colour drawing of the new C. P. R. Telegraph Building now being erected at the corner of St. Francois Xavier and Hospital Streets. Also a large one of the McIntyre block on Victoria Square, and a pencil sketch of additions to the Ottawa Hospital. Messrs. Taylor & Gordon were represented by a water colour sketch of a branch bank for the Molson's Bank, also their bank at Vancouver, the branch bank of Montreal, on Notre Dame Street, Montreal, the Nurse's Home connected to the General Hospital, Montreal, and several photographs of some of the buildings at McGill College. Several of these drawings however had been exhibited before.

Some of the student's work at the architectural classes were exhibited on the tables. Among the designs were noticed one for a theatre and one for a public library. The work was of a high order and it is hoped that more may be heard of these students in the future at the rooms of the Association.

Over the president's chair was hung a very effective water colour sketch of a house at Cote de Nieges, for H. L. Rutherford, Esq., by Mr. C. B. Patterson, while Messrs. McDuff & Lemieux had a drawing of a more prosaic, but no doubt not less useful building in the form of a shirt factory for Tooke Bros. at St. Henry.

Mr. Doran, our representative for mayoralty honors at the last elections, showed a pen and ink drawing of the Catholic High School.

CANADIAN BUILDING MATERIALS AT PARIS.

The Canadian exhibits of materials used in the building trades at the Paris Exhibition, according to accounts to hand, are on the whole, representative and a credit to Canada. That Canada has won the grand prize for its forestry exhibit should be a source of pride to all those interested in the progress of this country, and it is hoped that this exhibit may be used in the future in a more permanent manner by being placed, or at least a portion of it, in the Imperial Institute. The exhibit includes 48 54-foot deals o the principal Canadian woods, ⅓ of each deal being polished, ⅓ waxed, and ⅓ simply planed. This is a sensible, business-like method of showing the different varieties, and one likely to be of interest to those using or likely to use Canadian woods. In other building materials Canada is well represented, the province of Quebec in particular having the following exhibits:

Granite from Stanstead, Mt. Johnson, St. Philippe and Riviere de Pierre.

Serpentine from Calumet Island and various points in the eastern townships.

Slate from the New Rockland Slate Co. Works.

Marble from Dudswell and Philipsburg.

Sandstone from Dudswell (Flagstones) and Beauharnois.

Limestone from Montreal, Lacheviotiere, Mt. Ottawa, Pointe Claire and Caugnawaga.

Brick from Laprairie and fireproofing from the Montreal Terra Cotta Co.

The above, although not a complete exhibit by any means, is a fairly representative one, and the other provinces appear to be about equally represented.

Considering the wealth of her natural resources, Canada should look for a wider field than her own, or, in other words, the export trade should be carefully inquired into and made use of if her resources are to be utilized on the most advantageous terms. The home market is small and does by itself hardly warrant the expenditure of large amounts of capital in working quarries and mines with the most modern machinery, and it is only with these modern appliances that this country can compete with the outside world. It is therefore a question of great importance whether one large concern with capital centralized cannot work to better ends than can several small firms each fighting against the other in, generally speaking, a purely local market. Take for instance the granite industry—this is one in which to make a success on a large scale it is necessary to have the latest machinery, derricks, etc., and every thing in the way of locality, railway facilities, good and abundant stone, etc., in its favor. To procure all this needs capital, and to get returns on large amounts needs a large field, and in Canada this means in many products an export trade. It would be wise, therefore, for Canadians to study well the possibilities of creating an export trade. The government have done a good deal to forward the possibilities of manufacturers, etc., being able to make enquiries of the trade possibilities in other countries by appointing commercial agents in different parts for this very purpose, who are always willing to give information to those interested in the local requirements of the districts they represent. A list of these agents is appended:—

J. G. Colmer, 17 Victoria street, London, S.W., England.
Harrison Watson, Canadian Section, Imperial Institute, London.
G. H. Mitchell, 15 Water street, Liverpool, England.
H. M. Murray, 52 St. Enoch Square, Glasgow, Scotland.
W. L. Griffith, 10 The Walk, Cardiff, South Wales.
Thomas Moffat, 24 Wale street, Cape Town, South Africa.
J. S. Larke, Sydney, N.S.W., agent for Australasia.
G. Eustace Burke, Kingston, Jamaica.
Robert Bryson, St. John, Antigua.
S. L. Horsford, St. Kitts, agent for St. Kitts, Nevis and Virgin Islands.
Edgar Tripp, Port of Spain, Trinidad.
C. E. Sontum, Christiania, Norway, agent for Sweden, Denmark and Norway.
D. E. Cosli, 75 Marche, St. Jacques, Antwerp, Belgium.

Mr. Chaussee, the new city building inspector for Montreal, has already increased in a marked degree the efficiency of his department, and expects to be able to increase the revenue sufficiently o make the department self-sustaining.

PROVINCE OF QUEBEC ASSOCIATION OF ARCHITECTS.

THE annual convention of the Association was held on September 3rd and 4th in the Association's rooms, 112 Mansfield street, Montreal. The President, Prof. S. H. Capper, presided. Among the members present were the following: Messrs. Charles Baillarge, A. M. Sigouin, G. E. Tanguay, J. P. Ouellet, P. A. Lefort, C. Dufort, J. O. Turgeon, A. T. Taylor, A. Raza, L. Lemieux, G. A. Monette, J H. Lebon, E. Maxwell, Alcide Chausse, A. H. Lapierre, J. S. Archibald, Raool Lacroix, Jos. Venne, J. R. Gardiner, W. E. Doran and M. A. Hutchison.

PRESIDENT'S ADDRESS.

Professor Capper, the retiring President, in the course of his address, dealt with the subject of the University education of architects for their professional career. Professor Capper said: The training that a student can obtain at a University is necessarily of a special kind; it leans to the theoretical side; it can never supersede the practical training acquired in an office and on the actual work, as it rises in material construction. But it is not a question of one training at the expense of the other; both are needful; in every profession it is the same, and in our own profession, with its noble traditions extending back almost to the dawn of our civilization, the scientific and aesthetic side of our training cannot be neglected without crippling, and often stultifying, our work.

Why is it that we see around us in this comparatively young country so many poverty-stricken designs? Why should we have to bewail artistic feebleness; work that is weak, faulty and bad; worse still, much that is pretentious and meretricious; at times, positively frantic abortions in architecture?

One cause, at least, is to be found in the lack of definite training in design, during the years when a student is getting his first insight into the work of his chosen profession.

I do not refer to the sins of the speculative builder, whose intolerable "designs" afflict one on every hand. But take a glance at church architecture.

Quite recently I travelled through parts of England and Northern France, making my way back to Canada. And, as I stood on the steamer's deck coming up our magnificent St. Lawrence, I could not but contrast the appearance of our Canadian country churches with the old work on the other side.

Age, it is true, and historical association will invest many a commonplace building with a certain charm. That will not, however, suffice to explain the difference in total impression produced, and I am bound to say I do not feel that the work in church architecture on this side, in spite of the very large sums that must have been spent, can bear comparison artistically with the quiet, unaffected, utterly unpretentious dignity and charm of similar but older work in France and England.

Yet we ought in these modern times to be able to do as well, nay, better than our fathers did. In a new and young country, there ought surely at least to be found a freshness and vigor of design sufficient to give character and value to architectural work; for it is character that makes our work impressive.

I am far from wishing to overlook much satisfactory and able architecture. But why is it that too much of our work in Canada to-day is incontestably less effective than it ought to be? I am persuaded that it is due, in many instances, to inadequate training on the aesthetic side.

There are some, I know, who oppose such training as theoretical and academic, and, therefore, worse than useless; there are others who say such training stifles genius; there are even others, I am afraid, who are in blissful ignorance that training on this side is needful to a modern architect at all.

I therefore earnestly ask this association to consider carefully on behalf of the younger men, the question of the best training, at the outset of their career, for their work in life.

I am myself most strongly convinced of the vital need of just this so-called theoretical, academic and unpractical training. I have spoken of our profession as many-sided: I know of no profession that is more so; and this, the side of artistic expression, that is, the side that must perforce appeal to one and all who see our work and experience the impression produced by it, is in some ways much the most enduring, the most characteristic side of our art. And I have sought consistently to emphasize and promote and develop such training in the fullest measure, convinced that therein lies the true function of a University training—not to attempt to supersede in the slightest the absolutely essential training in the office, on the scaffolding, in actual practical work, but to supplement that all-important training by the equally important education on the scientific and aesthetic side, which cannot be acquired in offices or workshop; which can only be acquired by academic study, but without which an architect is but half fitted for his calling.

The Council submitted the following report, referring to the work performed by that body on behalf of the Association during the year:

TENTH ANNUAL REPORT OF COUNCIL.

GENTLEMEN,—Ten years ago, when a few fellow-members of this city, moved by a concourse of opinions and wishes, often expressed in private, undertook to unite the volitions and direct not only the studies but also the future aims of the profession, in its own interest of course, but principally to give more security to the public, the idea was accepted by some with mistrust and by others with an open spirit of hostility.

A body of serious and influential members of the community accused the architects of illegitimate ambitions and secret aspirations towards the formation of a new Order of Labor Knights in order to increase the already exorbitant fees which the powerful Association collects from that poor and honest class called speculators and jobbers.

As adversaries of the idea were to be found among the very founders of the Association, it is not to be wondered at if the building public, always impressible and nervous when their interests are at stake, should have felt diffident.

We must acknowledge that among the promoters of this project, who worked so earnestly for its success, who did all the preliminary labor, so difficult and sometimes so unpleasant in organizations of this kind, there are some, we might say all who admit that there is more, much more, to be done, before the idea will be found acceptable to everybody.

Nevertheless, such as it stands at the present time the Quebec Association of Architects has received many adhesions to its project; has met with great encouragement in its field of action on the part of the most eminent societies. The R. I. B. A., the Central Society of Architects of France, the Royal Institute of Antwerp have all honored us with their correspondence and invited us to correspond on all subjects of actuality.

La Construction Moderne (an architectural review from Paris), in an article signed by the eminent architect and writer, Charles Lucas, has even thought proper to give part of our Constitution as a model for the regional societies of France. We have been specially congratulated for having agreed on a fundamental basis and for having obtained from our Government a Charter which enables us to accomplish more in the near future.

As to the interior details of the administration the Council of the Association has endeavored, and succeeded to a certain extent, in organizing the Library Department. As already stated at the last annual meeting we have made an arrangement which enables us, under certain conditions, to have access to McGill University's Architectural Library, Westmount's Municipal Library and the Library of the Association of Arts.

The Library of our own Association contains 181 volumes, the value of which you will be able to judge by consulting the catalogue which will soon be distributed.

The rooms of the Association have been regularly opened to the members, except during the vacation months of July and August. It is to be regretted that a very limited number of members availed themselves of the opportunity. The Council going out of charge begs to suggest that students following an office be supplied with a special card giving them free entrance to the library.

The inauguration of the rooms of the Association took place on the 30th October, 1899. On this occasion Prof. S. H. Capper gave a very interesting lecture, illustrated with stereosopic views, before a large number of architects and invited guests.

The Association had been invited to make a Canadian exposition of Retrospective Architecture at Paris, but unfortunately the time was too short to organize a decent exposition. The idea of a local exposition had also been suggested but did not succeed, the members being too busy with the works of the season to have any time left to organize it properly. This idea, however, has been held over until the present meeting with more or less success as you will be able to judge for yourselves.

Thanks, we will not say to the just demands of the Council of the Association, but rather to the good sense of the public, the idea that the Inspector of Buildings should be an architect has been accepted and you are all aware of the changes for the better which the present incumbent has made since he came into office.

The proposed Building Regulations which had been prepared some years ago by the Council of the Association has at last, after many trials, come before the City Council of Montreal. Without wishing to prejudge the case we believe that all the aldermen who have any experience in construction are in its favor, while those who delay its adoption are not so much against the principle of New Regulations (they admit that a New Regulation is needed) as against certain details which can easily be arranged if the City Council takes into serious consideration such an important study.

As to the intricate question of members in arrears and of unqualified parties who practice illegally, measures have been resorted to of which we will not now speak because they are of a private character, but the Association may rest assured that the day is not far off when this question will be regulated in a satisfactory manner.

The examinations held during the year have been specially interesting both by the number and quality of the candidates. The examination papers remain in the archives of the Association, where they will form a very interesting record.

At the suggestion of the R. I. B. A., and through the medium of one of its members, Mr. A. T. Taylor, former president of our Association, a Board of Examiners of the eminent Institute has been organized in Canada. Our president, Prof. S. H. Capper, Mr. A. Raza, former president, and Mr. A. T. Taylor, acting also as secretary, have been appointed examiners for the Province of Quebec. Two other members, completing the Board, are chosen among the members of the Ontario Association.

In the absence of the rich traditions of honor and integrity which prevail among the European Architects, the Association felt keenly the want of a code on professional ethics, and at the last annual meeting a commission was appointed which is now ready to make its report. It is to be hoped that all unite will to give force of law to a measure of such importance which will complete and give more force and stability to the tariff of fees which has been distributed in the course of the present year.

All the members of the Association should endeavor to observe strictly this tariff in order to give it force of law by custom.

It has already been proposed by the Builders' Exchange to form joint commissions, whose purpose would be to study, in order to render them more comprehensible and more useful, certain customs, certain relations, in order to facilitate the regulation of questions arising between organizations interested in the construction industry, and also to define the different responsibilities.

Two members of this Association have resigned: Mr. E. C. Larose, who is now practising in Ontario, and Mr. J. A. Dechamps, who has decided to transfer his activity to another field of labor.

The Asssociation has at present 123 members, of whom two registered since the last annual meeting, after passing the necessary examinations.

There was no general meeting during the year, but there were 3 special meetings and 11 regular monthly meetings of the Council.

S. H. CAPPER, President.
G. A. MONETTE, Secretary.

REPORT OF QUEBEC SECTION.

G. A. MONETTE, ESQ., Architect,
Sec. "P. Q. A. A.," Montreal.

SIR,—The undersigned, officers of the Quebec Section, P. Q. A. A., hereby have the honor to submit to the Council of the Association the following report for the year 1899-1900.

On the 27th of December last, the Quebec architects met at the City Hall, for the purpose of electing their officers for the ensuing year, M. G. E. Tanguay presiding. M. G. E. Tanguay has been re-elected President, and M. Jos. P. Ouellet, Secretary. The latter has also been appointed Treasurer of the Quebec Section.

M. Thomas Raymond, who had withdrawn from the Association, has come back to it, and is again a member of the Quebec Section.

Nothing of special importance have been done this year by our Section.

The Quebec architects, together with their Montreal confreres, have discussed, compiled and submitted to the Council their opinions regarding a certain Code of Professional Ethics, the adoption of which is not done yet, on account of the importance of the questions discussed, and the difference of opinions on many points.

During this year again a new effort has been made towards the approval of our Schedule of Charges (somewhat modified) by the Lieutenant Governor in Council, so as to make it law. All the Quebec members were unanimous in approving that Schedule, as modified, and a copy of same has now been distributed to all the members of the Association, who have bound themselves by their signature, to observe it in all points.

Besides these questions of general interest for the Association, the Quebec Architects have several times met to discuss others, rather local, but by no means less important for them; the consideration of which is still progressing.

The above respectfully submitted.

JOS. P. OUELLET, Sec. Q. S.
EMILE TANGUAY, President Q. S.

Quebec, July 17th, 1900.

The treasurer presented his report which was found to be satisfactory and adopted.

The following officers were elected for the ensuing year: President, G. Emile Tanguay, Quebec; first vice-president, Jos. Venne, Montreal; second vice-president, W. E. Doran, Montreal; secretary, G. A. Monette, Montreal; treasurer, J. S. Archibald, Montreal; councillors, Prof. S. H. Capper, A. T. Taylor, Alcide Chausse, E. Maxwell, A. H. Lapierre, Montreal, and J. P. Ouellet, Quebec; auditors, C. Dufort and J. H. Lebon.

The new President having taken the chair it was decided to hold the next annual meeting of the Association at Quebec, on a date to be fixed by the Council.

A recommendation was made to the Council to consider certain changes in the by-laws and report to a special meeting of the Association.

The second day of the convention was devoted to a visit to the electrical power generating and transmission works of the Lachine Rapids Hydraulic & Land Co.

SHALL THE MAIN DRAIN TRAP BE ABOLISHED.

To the Editor of the CANADIAN ARCHITECT AND BUILDER:

The proposed abolition of the main drain trap is not, in the opinion of the writer, in the public interest. The object of such a change is to better ventilate the public sewers, making the plumbing and drainage systems of our houses serve as ventilators. There can be no doubt of the effect of such a change on the public sewers—they would be ventilated to perfection. Another advantage would be the abolition of the fresh air inlet pipe, which, without a trap, would not be necessary, and for which it is sometimes difficult to find a suitable position.

There is one point upon which I am unable to come to a decision, not having any data on the subject; it is this:—will the better ventilation of the public sewers so purify them as to render harmless the air which passes through them? If it will, then there can remain no valid objection to the change. But assuming that sewers are foul and dirty and that consequently the air passing through them is also foul, the change could not be made.

The chief danger of such a system is that it depends for its efficiency to exclude sewer gas from our houses, on the perfect construction, and maintenance in perfect condition, of the drains and plumbing, for these will then have become conduits to carry off the foul air from the sewers, and any defect, such as a broken closet, a broken drain, clean-our screws carelessly replaced or forgotten entirely, and soil pipes frozen over where they terminate above the roof in very cold spells, will cause the building through which they pass to become, as it were, a part of the sewer ventilation conduit to the detriment of the occupants thereof.

Vacant houses may also serve as sewer gas conductors to adjoining houses (in a row or block of houses). The traps become unsealed by evaporation, or are emptied to prevent freezing, thus permitting the free escape of sewer gas into the house, from which it may be forced into the houses occupied on either side by the difference in atmospheric pressure, caused by the heating of the occupied houses—this being facilitated by the freezing, or partially freezing over of the soil pipe terminus above the roof.

A case occurred a few winters ago which well supports this theory. A builder had, late in the year, completed a fine pair of semi-detached houses, in which the main drain trap had been omitted (which is permitted under the city by-law under certain conditions), and because of such omission was unable to sell or rent them during that winter. The traps of the various fixtures were empty to prevent their being frozen and burst, and every time he invited a prospective buyer or tenant to inspect the houses, they detected sewer gas and were so alarmed that the inspection seldom proceeded further.

If the private drains must serve as sewer ventilators, it should be done as described in the Public Health Act, namely, by a pipe continued up the front wall of every building without any connection to it from the inside of building. Where it is desired to avoid the disfigurement of building fronts, this pipe might be allowed to run up the inside of front wall, the main trap being placed between this vent pipe and the house, or just inside the wall of building.

BENJAMIN KIRK,
Plumbing Inspector.

THE BUILDER

[THIS DEPARTMENT IS DESIGNED TO FURNISH INFORMATION SUITED TO THE REQUIREMENTS OF THE BUILDING TRADES. READERS ARE INVITED TO ASSIST IN MAKING IT AS HELPFUL AS POSSIBLE BY CONTRIBUTING OF THEIR EXPERIENCE, AND BY ASKING FOR PARTICULAR INFORMATION WHICH THEY MAY AT ANY TIME REQUIRE.]

Preparing Kalsomine.

THE writer has often been asked to give a formula for preparing reliable kalsomine in plain white and in colors or tints. Experience has shown the following compound to be durable and strong in covering qualities: Soak one pound of white glue overnight in about a quart of clean soft water; then dissolve in boiling water, and add twenty pounds of Paris-white, diluting with water until the mixture is of the consistency of rich milk. This, laid on with a soft brush, gives a fine marble finish to a wall, and will not peel off if the wall is clean and free from any greasy matters before the kalsomine is applied. To give this wash the following tints or colors, add, for lilac, two parts of Prussian blue, and one part of vermilion. Mix thoroughly in a separate vessel, and incorporate with the white kalsomine until the desired tint is obtained. For buff, mix two parts spruce or Indian yellow and one part of burnt sienna. Proceed as before until the right tint is obtained. For a rose-color, take three parts of vermillion and one of red lead; add to the kalsomine in very small quantities until the desired shade is produced. For gray, use raw umber, with a very small amount of lamp-black added, mixing carefully and thoroughly, as greys are difficult to produce. For a fine straw color, mix chrome yellow with a touch of Spanish brown; a pleasing tint will be the result. To make a lavender tint, take a small quantity of Russian blue, mix until a light tint is produced, then add sufficient quantity of vermilion to give it the proper lavender color. The pigments used in these combinations will not fade or change color, and a wall or ceiling finished in any of these tints will have a very pleasing effect.

Finishing Redwood.

ALONG the Pacific coast, and, indeed, in many of the inland towns and cities, redwood and Douglas fir are made much use of in house finishing, and it is well to know how these woods may be finished in order to give them a good appearance when left in their natural state. Both woods may be made to compare favorably with some of the more aristocratic hardwoods when properly handled. For finishing redwood, first make a mixture of one quart of spirits of turpentine, one pound of corn starch, a quarter of a pound of burnt sienna, one tablespoonfull of raw linseed oil, to which add a tablespoonfull of brown Japan. Mix thoroughly, apply with a brush, let the work stand for about fifteen minutes; then rub off with excelsior, fine shavings, or a clean soft rag. After this, the work should stand at least twenty-four hours, that it may sink into the wood and become hard, a process which also hardens the fibres of the wood. After the whole is perfectly dry and hard apply two coats of white shellac, then rub down with fine glass paper until the whole is perfectly smooth; then put on a couple of good coats of herb polishing varnish; when hard and dry rub down with clean water and finely pulverized pumice-stone; let stand a day or two, then clean down with chamois, and rub with a little olive oil and rotten stone until perfectly dry, and if the work has been well done the whole will have a piano finish, and the grain of the wood will show up handsomely. The same mode of finishing may be followed on Douglas fir, only, when the natural wood color is desired, all coloring matter must be kept out of the mixture. If, however, it is desired to stain the fir a cherry color, the following mixture may be used in conjunction with the filler or the formula given above. Mix together, by stirring, one quart of spirits of turpentine, one pint varnish, one pound of burnt sienna; mix with equal quantity of the first receipt, and apply and treat in like manner as described for finishing redwood.

Something on Foundations.

THE foundation of a building should be of such a nature that it will bear the weight laid upon it without compression or flinching. If the soil be of a soft nature, it will of necessity yield or compress beneath the weight placed upon it. If any part of a building be loftier and more weighty than the other portions of it, as in the case of a church tower or steeple, the soil beneath the extra weight will be more compressed than the other parts of the site; hence all that portion of the building will sink somewhat into the ground, and in thus sinking, the heavy part of the building will break away from the adjoining work which will not settle in the same manner. Under such conditions, extra precautions must be taken to prepare the foundations under the tower in such a manner that the settlement, if there be any, shall be equal along the whole line of footings. In proportion as the ground is of a soft and yielding nature, the footings of the building should spread; for if a square yard of ground will bear a ton weight with a certain degree of compression, two separate square yards will bear two tons' weight with the same degree of compression, or they will bear one ton weight with only half the degree of compression, and perhaps less. For ordinary foundations, where the buildings are to be of brick or stone, the footings may be from two to three feet wide and from six to eight inches thick, and laid on solid ground that has been well tamped; but in larger or heavier buildings the footings should be placed on a bed of concrete; the thickness and breadth of concrete must be determined by local features, such as the nature of the soil, weight of the building, and the depth to which frost penetrates. Rock generally provides a good foundation, particularly when the stratum is more or less level. The surface should be levelled, and all broken or decomposed fragments cleared away; any large hollows should be filled up with good concrete. If the rock is sloping, it may be stepped in order to get level bearings for foundation walls. Gravel forms a good foundation, being easily levelled, and not affected by the frost. Sand is a good foundation if dry, and if not liable to escape laterally, or to be washed away by water. Sand or gravel, when overlying clay on a slope, require to have a large drain therein next that side of the building which adjoins the highest grounds, so that the flow of water to the building will be intercepted. Clay, when hard and dry, is usually satisfactory; if on a slope, it is likely to prove treacherous. Hard ground overlying soft ground may frequently be built on, if the pressure is well distributed, and the surface sunk into as little as possible; but when soft ground overlying hard ground is met with, the foundation should be carried down to the hard ground, if not more than twelve or fifteen feet deep. If the soft ground is below that depth, say from twenty to thirty-five feet down, and the building is a heavy one, then piles should be driven into the soft earth, in sufficient numbers to resist the pressure. Made ground is never to be trusted, even though many years have elapsed since its formation. Proper drainage and protection from water is of very great advantage in connection with the strength and durability of any foundation or structure, and this is particularly so in soft soils. On the other hand, water is the main support of a building, and to drain it away is then a grave error. Uniformity of foundation and resistance to compression is of the utmost importance for the purpose of securing the requisite stability, and great care should therefore be bestowed upon the examination of the trenches cut for the foundation walls. All soft places should be excavated and, when possible, filled up with concrete, or else gravel should be dumped in and well tamped down before the footings are laid on. If there should be a soft pocket in the foundation grounds, and the other parts are good and sound, a brick arch may be thrown over it, or, if dry, a steel or concrete lintel may bridge the span, making sure the ends of the lintel rest on ample footings. Always allow the trench one foot wider than the footings, so as to give the mason a good opportunity to get his footings in properly. The ground that is filled in to level up to top of footings should he well tamped, and if weeping tiles are laid along the side of the footings, the earth should be packed around them firmly, having a care that tiles are not broken by the tamping.

For the Bricklayer

BRICKS should be well drenched with water before using, to prevent them absorbing the moisture from the mortar, and to wash the particles of dust and dirt off them. In the summer the bricks should be soaked with water before using, and in winter it is a good plan to have each brick dipped in a pail of warm water. This will tend to keep the mortar from freezing and prevent the water in the mortar from being absorbed. The whole of the walling should be carried up simultaneously when possible. If it is necessary to carry up one part of the wall before the other, the end of the first portion should be "racked back," that is, left in steps, each course projecting more than the one above it, but the sum total of the heights of one part above the other should not exceed three feet, or it may be difficult to make the joints "line up." When the ends of timbers such as joists, tie-beams, bressummers or other similar pieces are built in brick walls, they should rest in recesses formed by galvanized iron shoes, so that a circulation of air may have due play round the timbers. Wooden strips for nailing the strapping or furring to are preferable to scantling; they should be cut to the thickness of a certain joint, and should not be less than three and a half inches wide, and the bark edge should be well flushed in with mortar. In laying brick copings, the hardest and least porous bricks should be used, and laid on edge, set and pointed in cement. In corbelling, the projections of the courses should never be more than one quarter of a brick, so that each back joint may be kept well within the last course. A less projection is advisable when great strength is required, but in no case where much weight is to be carried is it advisable that the projection of each brick should be more than one-third on the course below. It is a mistake to suppose that semi-circular arches have no thrust. When any arches occur near the end of a wall provision must be made for the thrust. The flatter the arch the greater the thrust. New work should butt against old, either with a visible joint, or let into a chase cut for the purpose, if necessary, to bind them together. If required to be bonded at every alternate course, the new work should be built in a quick setting cement, and each part allowed to harden before being weighted. It is bad construction to use bond timbers for nailing on the strapping, and when it can be avoided it is better to use thin strips between the joints in the brickwork, or to employ wooden plugs; the latter is the better method, but is too costly for general purposes. Struck, or bevelled joints, are the best for general work, and they last longer without being impaired; they are formed by pressing back the upper portion of the joint while the mortar is moist, thus forming a sloping surface, which throws off the rain. The lower side is cut off to a straight edge. Joints struck the other way up are common, but should not be allowed, as they leave a resting place for water. Joints should not exceed three-eighths of an inch in thickness in good work, but in common work, where the bricks are rough and unequal, a thicker joint is permissible; in rough work, the mortar should be quite stiff. Flat or flush joints are formed by pressing the mortar flat, so that the surface of the joint is flush with the face of the wall. In tuck pointing the joints are raked out, and "stopped," that is, filled up flush with mortar, which is colored and rubbed with a soft brick of the same color. A narrow groove is then cut in the centre, and the mortar is allowed to set; then pure white lime putty is filled into the groove, with a slight projection beyond the face of the wall, and a width of about one-eighth of an inch. The thickness of brickwork should be measured one brick for every twenty feet in height. The bond generally in use in the Dominion for ordinary brickwork, is one course of headers to every five courses of stretchers; this makes a pretty solid wall. Drains should be kept as far away as possible from walls that are likely to settle. Four-inch drains are generally large enough to branch into a main drain, for ordinary houses. Hotels, factories, schools and other places where a number of people congregate, require larger branch drains, but the least possible size necessary should be used, as being more self-cleansing than larger pipes. Tile-piping is preferred to iron by many even for fixing inside a house, although it is impossible to find a drain of this material of any great length, that has been used for years, that is not defective in some particular. Iron pipes can be made perfectly watertight, and they have sufficient rersisting power to prevent their disruption under ordinary strains.

PRISMATIC LIGHTING FOR THE ILLUMINATION OF DARK INTERIORS.*

By Dr. Wm. H. Greene.

The practical application of the refractive property of the lens or prism to change the direction of light rays passing through it, for the purpose of artificial illumination, originated with the French physicist, Fresnel, who first suggested its use in lighthouses, for the protection of maritime coasts, about the year 1815; and the Fresnel lens in various modifications is to-day solely used for this purpose.

The Fresnel lens is designed for projecting a powerful beam of parallel light upon objects to be illuminated at a distance. The principle of this device is seen in Fig. 1, which shows a central plano-convex lens surrounded

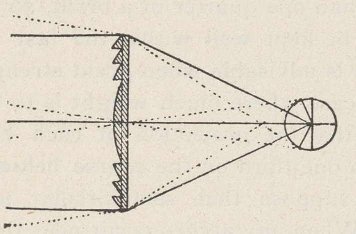


Fig. 1.

by a series of rings or segments of lenses or prisms, to which successively diminishing curvatures or angles are given in order to give them a common focus.

Within the past four or five years the application of this principle has been made, and with decided success, to the illumination of dark interior spaces where the amount of light naturally entering therein is insufficient for satisfactory illumination, and artificial lighting must occasionally or constantly be resorted to.

The requirements of public buildings and modern office buildings in this respect, have been most urgent, and the various devices known generally by the name of "prismatic lights" have been extensively used for the purpose and have proved so useful that in one or another form they have come to be regarded by architects and builders, not to speak of a great number of householders, as indispensable.

It is the purpose of this communication to give a brief review of the art of prismatic lighting, which, at the present time is passing through the active stages of the course of evolution, to which all the arts are subject, in determining the survival of the fittest.

Omitting, for the present, consideration of the vault light for basements and cellars, where but one form of prism, namely, an approximately right-angled prism depending on total reflection for its utility, is admissable, there are two general methods in vogue of installing prismatic lights to meet the requirements of service.

In one of these the sheet of prismatic glass is placed in a window frame in the vertical position, thus taking the place of a window light. In the other the sheet of prismatic glass is installed in a more or less inclined position, projecting outwards from the window opening. This form of construction is known in the trade as a "canopy."

The question as to which of these two forms of installation will give the best results is determined by the extent of the sky opening upon which dependence must be placed for light.

Where this is of considerable area, as for example where the windows face a wide street, the prismatic glass set into the window-frames in the vertical position will give satisfactory results.

Where the windows receive their light from a restricted area, as for example in court-yards, or the side-yards of dwelling houses, and, generally, in the many situations where high walls rising in close proximity cut off the free access of light from above, the projecting, canopy form of prismatic glass is preferable.

Speaking in a general way, the change from the vertical to the canopy form of installation will be indicated when the incident angle of the light falling on the window opening averages 60 degrees from the horizontal plane.

The popularity achieved by the use of light projecting devices of this general nature. has called into existence a great number of patented inventions, some claiming special forms of prism construction (in combination, in certain cases, with a prismatic or lenticular formation on the reverse side of the glass), and of a far greater number of designs, patents and methods of glazing, and other matters of minor detail.

For the purpose of this communication, these minor devices may be left out of consideration, and the several generic forms of prism construction only will be given attention.

These may be divided into two general classes:

(1) Those in which the glass forming the light-projecting device consists of sheets having on one surface a series of prisms or segments of lenses of any desired angle, the back of the sheet being a plane surface, and

(2) Those in which the glass forming the light-projecting device consists of sheets having on both surfaces a series of prisms or lenses.

The prism glass most generally known and used is that of the first-named class.

The action of a section of prism glass of this construction is shown in Fig. 2, in elevation and plan. It

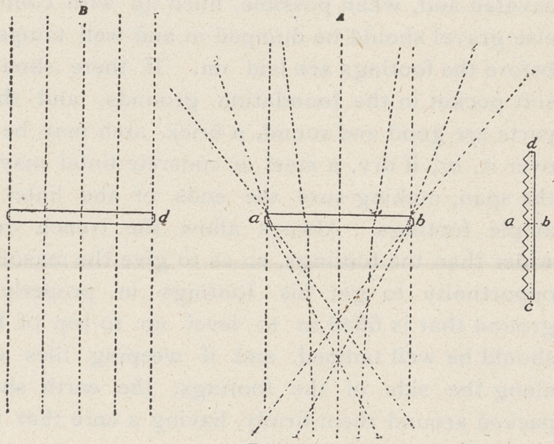


Fig. 2.

is obvious that the general refracting effect of the prismatic surface in this and in the other forms of prism glass will be substantially the same, whether the refractive surfaces of the structure be straight (i.e. prismatic), or more or less curved (i. e. lenticular), irrespective of the angles of the prism sections or of the curvature of the lens segments. It is important, however, that these angles (or curves) be carefully considered, since upon the correct appreciation of this element the light-projecting efficiency of the structure largely depends. Improper angles (or curvatures) may greatly diminish the efficiency of the device, by the dispersion and loss of light, caused by total reflections in the interior of the glass.

* Paper read before the Franklin Institute, and printed in the Journal of the Society.

There is general misapprehension regarding the proper action of light-projecting glass, which needs a word of reference. It is assumed by many that the prismatic glass should be so constructed that all the exterior light transmitted from the interior boundary of the prismatic window, or canopy, should be directed in lines substantially parallel to the boundary walls, floor and ceiling of the apartment, and that the more nearly this condition is realized the closer will be the approach to the theoretically-perfect mode of operation. Some of the manufacturers of prismatic glass endeavor to realize this condition by varying the angles of the prisms uniformly from the center to the edges of the sheets, on the principle of the Fresnel lens.

A little consideration of what is intended to be realized by prism lighting of interiors will suffice to show that this view is an erroneous one and liable to result, in practice, in a much inferior interior illumination than can be otherwise obtained.

This criticism will be understood by stating the general proposition, that the objects of prismatic lighting are, first, to direct as much extraneous light into the interior as possible ; and, second, to direct it in such manner as to derive the largest possible benefit therefrom.

In considering the relative merits of parallel and divergent light transmission by prismatic glass, it should be said that practically as much extraneous light can be directed into the interior space to be illuminated by the one as by the other arrangement of prisms or lenses. But when we come to consider the second portion of the proposition, it can easily be shown that the system of transmitting the light in parallel lines cannot possibly be as effective as the method ot divergent transmission, and more especially, divergent transmission in both vertical and horizontal planes, and for the following reason :

It is well known that the best effects in interior illumination are realized when uniform diffusion throughout the apartment is obtained. This effect can be secured most effectively only when all shadows are obliterated by calling into requisition the action of the entering light reflected from all parts of the side walls, floor and ceiling of the apartment.

By the method of directing the transmitted light in parallel lines, the ill effects of shadows cast by opaque objects in the path of the entering light will be realized in an extreme degree, as there will be no ameliorating influence to counteract and neutralize the shadows by reflection from the bounding walls and floor of the apartment ; and an inspection of the condition of an apartment thus treated will disclose this objection at once.

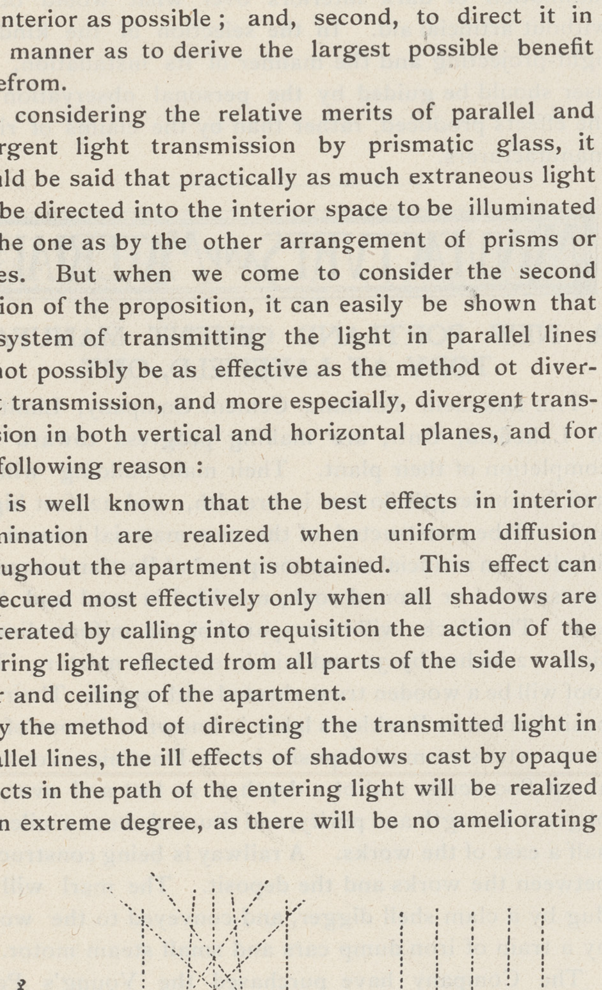


FIG. 3.

By the method of divergent transmission, while quite as much or more extraneous light is thrown into the apartment as by the other method, its distribution is decidedly more advantageous, from the fact that the repeated reflections from the bounding surfaces of the apartment cause the practical obliteration of all shadows and a practically uniform diffusion of the light to all parts of the interior.

Returning now to the descriptive portion of the subject, the modus operandi of the simplest form of a light-projecting prismatic window is shown in the plan views in Fig. 2, A and B, in which the light from an exterior source falling upon the plane, outward surface of the glass is refracted at the boundary of the interior prismatic surfaces and projected into the room to be illuminated.

Fig. 2, A, which is a plan view of this construction taken on the line a b, exhibits the effect of the light distribution in the vertical plane from the effect of refraction from the terminal portions of the prism, where the influence of the more oblique rays is not counteracted by a modification of the angles of prism from the center line to the upper and lower edges of the glass. Fig. 2, B, is a plan on line c d, showing that the light rays are not distributed divergently in the horizontal plane, but are all directed in parallel planes.

Figs. 3 and 4 represent the action of prismatic glass of the second class, i.e., in which both surfaces are prismatic or lenticular.

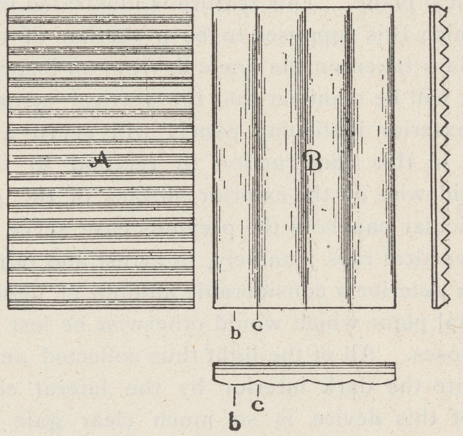


FIG. 4.

Fig. 3 shows a form of light projecting glass that has lately come into use, and for which certain advantages are claimed over the construction previously described. The sheets in this form of prism glass have one surface furnished with prisms—commonly placed towards the room to be lighted—and the other surface formed of a series of lenses of small curvature, distributed in panel form, parallel to the direction of the prisms. This construction, as well as that shown in Fig. 2, manifestly exaggerates in the vertical plane the divergent distribution of the transmitted light, and consequently operates, so far as it goes, in the correct manner, utilizing the reflecting action of ceiling and floor in diffusing the light.

The construction shown in Fig. 3 possesses one obvious advantage over the several modifications of class 1, namely, that the lenticular form of exterior surface arrests and directs into the dark interior to be lighted a certain amount of the exterior light, which, with the plane exterior surface of class 1 would be lost by total reflection from the exterior plane surface. Practically all of this additional light thus projected into the dark interior would be gained if the angle of the prism and the curvature of the lens panels were correctly adapted to the length of the apartment to be lighted.

The latest modification of class 2 remains yet to be considered.

In this, the interior prismatic surface of the glass is the same as that just described, but the exterior lenticular panels are arranged not parallel, but transversely, to the direction of the prisms. The details of this form of construction are shown in Fig. 4, A and B, while the modus operandi is best observed in Fig. 5, A and B.

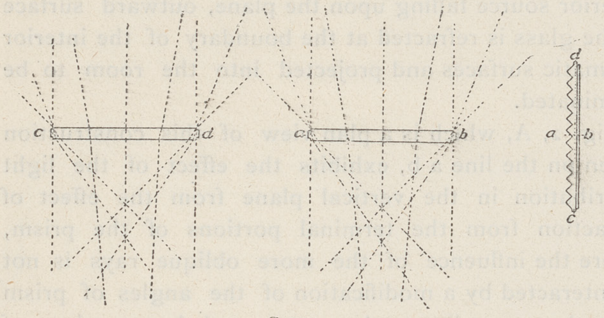


FIG. 5.

The radical difference in the operation of this form of ight projecting glass and that of both forms previously described, resides in the fact that the light distribution in this form is exaggerated in the lateral as well as in the vertical plane. This feature is illustrated in Fig. 5, B, in which B is supposed to be a section of the prismatic glass taken on the line c d, from an inspection of which it will be manifest that the vertical arrangement of the exterior lenticular panels will serve a similar purpose in this construction in relation to the light falling sidewise on the exterior surface of the glass as the lenticular panels in the previous case serve in relation to vertical rays; namely, to arrest and refract into the dark exterior a considerable amount of light in the horizontal plane which would otherwise be lost for useful purposes. All of the light thus collected and introduced into the dark interior by the lateral collecting action of this device is so much clear gain over the devices previously described.

Further consideration will show, also, that if the interior surface of the glass be provided with prisms of uniform angle, determined in each case by the length of the apartment to be illuminated, this form of construction will secure the same advantage in respect of the vertical diffusion of the entering light as will be obtained from the lenticular prismatic construction previously described.

On theoretical grounds, therefore, the last-described modification of light-projecting glass, belonging to class 2, should give the best results if intelligently installed. Comparative practical tests also bear out this conclusion.

An additional and important advantage possessed by prism glass of the last-named construction (namely, a prism plate constructed with prisms on one side and prisms or lens panels arranged transversely on the reverse side) remains to be noticed.

Since all illumination by means of prism glass is thrown from a comparatively low point, namely, through windows, while all other illumination is directed from a point above, the shadows produced by the prisms on objects in a room constitute a disadvantage common to most systems of lighting by means of prisms, as has been noticed in what has preceded. The light-projecting glass last described, however, by reason of its diffusing quality, both in horizontal and vertical planes, largely overcomes this objection. Where two such prism windows are used for the same apartment, the light thrown from one window completely overlaps that thrown from the other, thereby practically obliterating the shadows produced by prism lights of other constructions.

This construction also has the advantage of enabling manufacturers to produce more readily the larger sizes of prisms, from the fact that one surface has projections at right angles to projections on the reverse side, giving a bridge effect, thus adding to the strength of the plate. For this reason, likewise, it is not essential to have the thickness of the body of the glass as great as with other forms; and inasmuch as there is a larger loss of light through absorption in passing through a thick than a thin medium, the loss of light from this cause may be much reduced.

Finally, it may be said that all the various forms of light-projecting prismatic glass accomplish, measurably, their intended purpose ef considerably increasing the illumination of dark interiors over what would occur without artificial aid. In the selection of the kind of light-projecting and the manner of its installation, the user should be guided by the personal observation of the effects produced, rather than by the claims of rival manufacturers.

MANUFACTURES AND MATERIALS

A NEW PORTLAND CEMENT MANUFACTORY AT LAKEFIELD, ONT.

THE Lakefield Portland Cement Company, Limited, of Lakefield, Ont., are making progress toward the completion of their plant. Their main building will be 326 feet in length 80 feet in breadth, and 22 feet high, and will be constructed of the new material known as litholite, an artificial stone composed of Portland cement, coarse sand or ground rock, moulded in sand and hollow. The blocks will be prepared of the uniform dimensions 12 inches by 30 and laid in cement mortar. The roof will be a wooden truss sheeted with metal. Their deposit known as Buckley's lake, is known to be one of the most extensive marl deposits in the Dominion, contains about 800 acres, and of a depth of 20 feet and over, is of great strength and purity, and situated about a mile and half a east of the works. A railway is being constructed between the works and the deposit. The marl will be dug by a clam shell digger, and conveyed to the works by a train of iron dump cars and small steam motor.

The Company have purchased the Young's Point mills and water power, and have removed the mills, and are removing also two piers of the dam for the purpose of increasing the inflow to their wheels. There will be four concrete flumes erected each of 22 feet in breadth, abutting against the face of the dam, and with wheel pits 13 feet in depth, so as to afford the fullest relief to the large body of water to be used in the power. The flow from several lakes converges at this point affording a steady and abundant supply.

The William Hamilton Manufacturing Co., of Peterboro' have secured the contracts for the wheels and iron work, and are supplying four of their 68 inch Samson turbine wheels which will all be connected to one shaft, which in turn is direct connected to a 400 k.w. electric generator. The electric power, pole line, telephone line, motors, etc., are being by the built Canadian General Electric Company. The electric plant will combine all the latest improvements known to electric science. Ten electric motors ranging from 10 horse power to 75 horse power will drive the plant.

Machinery will be installed at the present time to turn out 300 barrels per day, but the power will be sufficient to propel, and the building large enough to contain and accommodate a plant capable of turning out additional 300 barrels per day.

Messrs. R. P. Butchart, general manager of the Owen Sound Portland Cement Co., and W. H. E. Bravender, manager of the Empire Cement Works, located at Warners, New York State, and who are joint vice-presidents of the company, are engineering the plant, which will be of the latest construction. The cement turned out by both of these companies, holds first place in the trade, the Owen Sound Company having secured a silver medal for their product at the Paris Exposition, which will be a sufficient guarantee of the excellence of the product of the Lakefield Portland Cement Company.

The village of Lakefield have aided the enterprise by a bonus of $10,000 together with a grant of thirteen acres of land, lying along side the Grand Trunk Railway tracks in the village of Lakefield, also by exemption from taxation, for the period of 10 years.

The authorized capital of the company is $500,000. All of this is expected to be paid up and embarked in the enterprise.

The advantageous position of the company's works upon the Trent Canal and Grand Trunk Railway, its magnificent marl deposits, its splendid water power, as well as the long experience and thorough knowledge of the business by its manager, gives every reason to hope that this company will have a long and prosperous career.

The village of Lakefield have done a wise thing in securing this industry, which will speedily convert the village into a town, and no doubt be instrumental in bringing to the knowledge of the outer world, the many special advantages which it posseses as a location for other manufacturing enterprises. Mr. J. M. Kilbourn, barrister, of Owen Sound, who is president of the company, is summering at Lakefield and directing all the movements for the construction of the plant.

There will be no connection whatever between this Company and the Owen Sound Portland Cement Co., further than in the fact that Mr. Butchart and Mr. Kilbourn and their families hold the controlling interest in both. The management at Lakefield will be largely in the hands of Mr. Alexander Butchart, brother of R. P. Butchart, and Mr. Aubrey Kilbourn, son of Mr. J. M. Kilbourn, who will have charge respectively, of the manufacturing and financial branches of the work.

LITHOLITE.

Litholite, the invention of Mr. Kitchen of Chicago, who have secured patents in twenty different countries, seems destined largely to revolutionize the building trade, as well as to beget a large additional demand for Portland cement. Mr. Kitchen has been engaged for many years in the construction of ordinary concrete work, and has invented and brought into use many useful improvements in the manner of forming artificial stone. His latest surpasses in interest and utility anything hitherto done in the way of artificial stone making. The material used is the best quality of Portland cement, and a mixture of ground rock or coarse sand, which may be of any color desired according to the color of the sand or stone used, and can be shaded as desired, by the use of artificial pigments. A mould is prepared of the size desired to be reproduced. The pattern to be imitated is made of galvanized iron, which is attached to a board and backed up to produce solidity with cement or plaster of Paris, which protected by the iron, forms a strong and durable shaper. The bottom of the mould is covered with a couple of inches of fine clean and damp moulding sand. Upon this is impressed by simply pounding the design to be formed, which may imitate any description of cut stone work, flowers, faces, animals, or what-not.

The mortar of the consistency of thick cream is then poured upon the sand mould, and of thickness required to be produced, usually from one to three inches according to weight and size of the artificial stone to be made. Board sides and ends are then inserted into the flasks, the centre of which is then pounded with damp sand tightly pounded in. The sides and end boards are then withdrawn, and the material is poured into the space which they occupy, thus forming sides and ends to the block. If it be desired to form a back to the block, adhering to the sides and ends the material is simply poured over the moulding sand of the thickness required, and holes are cut in the back to permit the sand to run out when the block is complete. At the end of 24 hours this block is a beautifully finished, hard, light, hollow stone, which has cost not more than one-tenth of the money which would be required to produce an ordinary stone block of equal dimensions and similar design. The method of construction is so simple that any intelligent person can operate it. A company has been formed of which Messrs. R. P. Butchart, manager of the Owen Sound Portland Cement Co., W. H. E. Bravender, of New York, Mr. J. R. Forster, architect, of Owen Sound, Ex-alderman John Lucas of Toronto, Mr. J. E. Murphy of Hepworth, Ontario, are members, which has secured the patent rights of this process for the Dominion of Canada. It is proposed to erect factories at central points for the manufacture of this material, and the construction of works therewith.

The Dominion Radiator Co. recently gave a most enjoyable picnic at St. Catharines to their employees.

The Dominion Architectural Metal Works Co., Montreal, has applied for incorporation with a capital stock of $8,000.

The Dennis Wire and Iron Co. of London Ont., have issued a neat catalogue and price list of the many kinds of wrought iron goods which they manufacture.

Mr. R. O. Munro, formerly of the Canada Paint Co., Montreal, has recently been appointed general manager of the British America Paint Co., Victoria, B. C.

The Shawinigan Falls Brick Mfg., Co., Shawinigan Falls, Que,, has applied for incorporation with a capital stock of $25,000, to manufacture bricks, drain-pipes, cement, etc.

What is claimed to be the largent marl deposit in the Dominion of Canada for the manufacture of Portland cement has been discovered by Thos. M. Rowan in the vicinity of Orangeville. It comprises, 400 acres, the depth of marl, being from 6 to 30 feet. There are also 200 acres of clay, of an average depth of 6 to 10 feet. This material has been manufactured into cement and found to be an exceptionally high grade. The property is within two and a half miles of a shipping point.

VISIT OF THE CLEVELAND BUILDERS' EXCHANGE.

WHILE the Industrial Exhibition was in progess the members of the Cleveland Builders' Exchange accompanied by members of their families paid a visit to Toronto. They were met on arrival by the officers of the Toronto Exchange, shown the sights of interest n the city, including the Exhibition, and entertained at a banquet at McConkey's. Mr. H. Martin, President of the Toronto Exchange, presided and fulfilled the duties of toastmaster. The visitors were also entertained by the Board of Directors of the Exhibition, and all in all, spent a very enjoyable time.

The Architectural Annual, a book of 200 pages, in cloth binding, printed on heavy paper, is published under the auspices of the Architectural League of America, and edited by Albert Kelsey, former president of the Philadelphia T Square Club. The book is dedicated to the Young Man of Ambition, whether architect or draughtsman. It aims to be a resume of architectural history for the year. It comprises original articles on many subjects relating to architecture and municipal art, sketches of prominent architects and sculptors, with illustrations of their work, extracts from papers and addresses presented before various societies, etc. The book is sold by subscription only, at $3.50 per copy, and may be obtained from the publishers, 931 Chestnut street, Philadelphia.

METHODS OF ESTIMATING THE COST OF BUILDINGS.

There are five methods of ascertaining the value of buildings before erection, writes Mr. John T. Rea, F.S.I., in the Architectural Record. Four of these deal with approximate estimates, and are chiefly used by architects ; the remaining one is the more exact method of precise quantities, and is the business of the quantity surveyor. These methods are :—

I. Estimating by the Cost per Cubic Foot of Similar Buildings.—This is the best known and most usually adopted method, because of its general convenience. The dimensions are best taken by measuring the length and breadth from out to out of walls, and the height from half foundations to half way up the roof. The cubic contents thus obtained are multiplied by the price per foot cube of some similar building. Sometimes the height is measured from the bottom of footings (i.e., top of concrete) to half way up the roof. Cheaper attached structures, such as annexes, stables, sheds, &c., should be kept separate and priced at a lower rate; while more ornamental portions, like towers and porches, should be valued higher than the main block. Small buildings cost more in proportion than large ones of the same type.

This cubing system is open to some objections. The lumping together of voids and solids at one rate is certainly unscientific, for the same class of building may be divided into many rooms with numerous internal solids in the shape of walls, &c., between ; while another may have comparatively few chambers, creating much empty space. In fact, the proportion of voids to the solid structure is not a fixed quantity, so that the price per cubic foot can never be exactly regulated. This requires large experience and a nicety in pricing which the estimator cannot always possess. The description and quality of materials and workmanship, too, are seldom the same ; neither are the conditions of contract ; and these variations are frequently overlooked when a certain rate per cube foot is assumed. Owing to these imperfections the following methods are better :—

II. Taking out Rough Quantities and Pricing the Items.—This method is described in Leaning's "Quantity Surveying," and in "A Price-Book for Approximate Estimates," by T. E. Coleman, F.S.I., surveyor, Royal Engineer Establishment. The work should be concentrated into as few items as possible in order to save labor, and a schedule of prices or old bills of quantities would be necessary to price these out. Though less expeditious, this is a more reliable system than pricing at per cubic foot.

III. Estimating per Square.—This method has been recommended by Professor Kerr in his "English Gentleman's House," and by Mr. Webber in his "Choice of a Dwelling," published in 1872. It has, however, been reserved for Mr. Alcock, F.S.I., surveyor, R. E. Establishment, to develop and fully describe this system in an article contributed to the "Occasional Papers of the Association of Surveyors of H.M. Service, July, 1894." The mode is to take the constructional shell only, pricing it at so much per 100 square feet. Walls, for instance, are taken according to their thickness and manner of finishing, including all digging, concrete, plastering, papering, &c.; floors including joists, struttings, ceilings, &c.; roofs including slating, lead work, rafters, boarding, &c.; and so on—all being reckoned at per square complete. Such a system of superficial measurement appears to be more satisfactory than the cubing, as it takes into account the materials and labor in a more exact and definite form. Of course a special list of prices must be compiled for each of these main superficies, and care and discrimination are certainly required.

IV. Pricing per Unit of Accommodation.—This is a somewhat rough and ready means of estimating the cost of such buildings as hospitals, schools, churches, stables, which may be respectively priced at per patient, per scholar, per sitting, and per horse. It is better, however, to check an approximate estimate by working out two or more styles, thereby ensuring closer results.

V. Estimating by Accurate Quantities.—For full information on this head the reader is referred to such well-known books as Leaning's "Quantity Surveying" and Fletcher's "Quantities." This method is only adopted when it is intended to actually carry out the work, and usually when tenders are sent in by several builders in competition. It is very laborious, and necessitates great skill and a thorough knowledge of building construction, so that the subject is invariably left to quantity surveyors as experts. The system is divided into the three parts of "taking off," "abstracting," and "billing," the last only being forwarded to the contractors for the purpose of inserting their prices, when the completed bills are sent to the architect for his and his client's decision. The whole procedure is, of course, familiar to every reader of this paper.

CANADIAN BUILDING STONES AT PARIS.

The London Builder contains the following reference to the exhibit of Canadian building stones at the Paris Exhibition : "Canada exhibits many varieties of building and ornamental stones. Amongst them we noticed a granite from Spoon Island, Queen's County, New Brunswick, which is similar in appearance to our Newry granite, having a bluegrey background, in which small irregular-shaped crystals of orthoclase felspar abound. Another granite, like ourc Sotch grey Dalbeattie stone, comes from Jarvis Inlet, Nelson Island, British Columbia. A third is like red Peterhead granite, minus smoky quartz. A fourth, of Laurentian age, from Gonansque, resembles the well known deep red, medium grained granite from Sweden. There are several kinds of light green and gray sandstones from different parts of the Dominion, and a deep red sandstone, recalling the stone from Corsehill Dumfries. A good assortment of marbles also forms part of this collection which has been made under Government auspices. The cities of Montreal, Quebec, and Ottawa are chiefly constructed of limestones from the Trenton formation. The grey fine-grained granites of Quebec are raised in the eastern part of the Province ; but many others equally good yet remain to be exploited from the Laurention formation. The same horizon furnishes excellent crystolline limestones, pure, or mixed with serpentine, forming beautiful white and greenish marbles. In the eastern part of Quebec, at New Rockland for example, there are large slate quarries, and the material compares very favorably with the best Welsh slate. Most of these stones are represented in the Canada building."

A tinge of blue in white striping color on black increases the strength.

SANITATION OF THE INTERIOR OF DWELLING HOUSES.

The sanitation of the interior of dwelling houses where the house drains and service pipes are directly connected with the sewer, as commonly practised in France, was the subject of a report presented by M. M. Lacau, architect (vice-president of the Sanitary Engineers and Architects of France), and L. Masson (Engineer ot the Sanitation Works of the Seine), and also another report, from the English point of view, presented by Mr. Roechling, sanitary engineer (Leicester), at the recent International Congress of Hygiene at Paris. The main feature of the French report was the rejection of the disconnecting trap from the system of domestic drainage in favor of direct connection of the whole system with the public sewer, and the use of the house pipes as ventilators for the sewers. It was stated that the disconnecting device was introduced into English methods in consequence of defects in the sewers in England, which permitted of the formation of foul accumulations which emitted sewer gas that would be dangerous if admitted into a house. The effectiveness of the disconnecting trap for the purpose of keeping out of the house dangerous gases was denied by the French report, the denial being based upon the results of experiments made some years ago by the Sanitary Institute. According to this report the experiments of the Sanitary Institute proved that from 20 to 60 per cent. of fœcal matters were left in the traps after flushing, only from 40 to 80 per cent. of the solid matters contained in w.c. waste finding its way into the public sewer. M. M. Lacau and Masson therefore recommended the suppression of disconnecting traps and demand that in all cases the house drains and pipes should be directly connected with the sewers, the only precaution necessary being to carry above the roof a pipe with which the whole system of pipes should be connected so as to form a ventilation conduit for both the sewer and the house drains. The chief of the eight conclusions set out in the report is the 7th, which ran thus: The conduits (canalisation) of a house comprise the waste pipes, rain pipes, and house drain which connects them to the sewer. This drain, laid with the utmost fall available, is directly connected with the public sewer without the intervention of a syphon (trap). The rain pipes connected with the system are prolonged above the roof to ensure the ventilation of the whole system.

The eighth conclusion specially concerns the plumber. It runs thus: 8. The plumbing work both for the waste water drawn off from the closets, the supply of potable or other water, and for the interior of the house ought to be the object of especial care. The plumbing arrangements ought to be such that the service of water pipes, (joints, branches, etc.), as well as the hydraulic apparatus (tanks, flushing apparatus, basins, syphons, traps, etc.), the rain pipes and waste pipes, shall be completely protected from frost.

In the long discussion that followed (after the report of Mr. Roechling had also been read) strong objection was taken by Mr. Roechling, Mr. A. Smith and Mons. Symons (engineer), delegate from Holland, to the statements made with regard to the disconnecting system as generally practised in England. Mr. Roechling denied that the sewers in England (except in certain of the older parts of London where they were not so good as might be wished) were defective. The modern sewers (the majority) were as good as they could be made, and were as well if not better managed than in other countries. Unjustifiable deductions had been drawn from the accounts published of the experiments made by the Sanitary Institute. It had been stated in the paper that 50 per cent. of the solid matters remained in the intercepting trap, but it had not been stated that the position of the w. c. with which they had been made was equivalent to that of a w. c. placed in the cellar. If in England we lived in houses of five or six stories, containing from 60 to 100 persons each, with an allowance of 60 gallons of water per day, the flush would be so great that nothing at all would be left in the trap. It would be more just to cite the experiments of the Sanitary Institute as an argument in favor of the use of disconnecting traps rather than against it.

The report of Mr. Roechling, a resume of which was subsequently read by the author in French, presented the following conclusions, which, after a brief consideration were passed over without any resolution being taken on them:

1. The end and object of the systematic drainage of a house is to endow it with a good system of water supply and discharge for waste water.

2. The object will be the most certainly attained where the following essential rules are strictly observed: (a) To exclude from the interior of our houses all sewer gas, to avoid pollution of the soil by fœcal matter or waste water, to prevent the generation of deleterious gases in the soil and in the air below and around our houses; (b) to discharge as rapidly and completely as possible into the public sewer all fœcal matter and waste water produced.

3. The application of these two essential rules necessitates (a) an intercepting trap; (b) a disconnecting trap for the exclusion of gas; (c) a trap for the interception of solid matters other than those from the water closet; (d) a proper system of ventilation; (e) a flushing tank for each water-closet; (f) pipes that are air-tight and water-tight; (g) the employment of proper materials for the pipes; (h) proper dimensions and thicknesses for all pipes; (i) sufficient fall to ensure automatic cleansing; (j) junctions with very obtuse angles; (k) proper construction of water closets, baths and other sanitary appliances; (l) facility of access to all pipes for inspection and testing; (m) sufficient flush for all closets and baths; (n) periodical visitation and cleansing when necessary.

The Sun Portland Cement Co., Owen Sound, Ont., has been incorporated with a capital stock of $500,000, to manufacture Portland cement, whiting, lime, etc. The provisional directors include J. G. Hay, G. A. Ross, of Owen Sound, and John Fleet, of Toronto.

PERPENDICULAR BRICKSCALE,

APPLICABLE TO ALL FACE WORK IN CANADA.

FOR ARCHITECTS, BUILDERS AND STONE CUTTERS.

Pile 4 bricks dry (an average of the make used) and measure the height, then decide the amount of mortar for joints. The sum of the quantities will be the gauge, and indicate which column to use.

Number of Perpendicular Courses.	Pressed Brick. 1st Column. Feet.	Inches.	Fractions.	2nd Column. Feet.	Inches.	Fractions.	3rd Column. Feet.	Inches.	Fractions.	Common Brick. 4th Column. Feet.	Inches.	Fractions.	5th Column. Feet.	Inches.	Fractions.	6th Column. Feet.	Inches.	Number of Perpendicular Courses.
1		2	5-8		2	11-16		2	3-4		2	7-8		2	15-16		3	**1**
2		5	1-4		5	3-8		5	1-2		5	3-4		5	7-8		6	**2**
3		7	7-8		8	1-16		8	1-4		8	5-8		8	13-16		9	**3**
4		10	1-2		10	3-4		11			11	1-2		11	3-4	1	0	**4**
5	1	1	1-8	1	1	7-16	1	1	3-4	1	2	3-8	1	2	11-16	1	3	**5**
6	1	3	3-4	1	4	1-8	1	4	1-2	1	5	1-4	1	5	5-8	1	6	**6**
7	1	6	3-8	1	6	13-16	1	7	1-4	1	8	1-8	1	8	9-16	1	9	**7**
8	1	9		1	9	1-2	1	10		1	11		1	11	1-2	2		**8**
9	1	11	5-8	2	0	3-16	2	0	3-4	2	1	7-8	2	2	7-16	2	3	**9**
10	2	2	1-4	2	2	7-8	2	3	1-2	2	4	3-4	2	5	3-8	2	6	**10**
11	2	4	7-8	2	5	9-16	2	6	1-4	2	7	5-8	2	8	5-16	2	9	**11**
12	2	7	1-2	2	8	1-4	2	9		2	10	1-2	2	11	1-4	3		**12**
13	2	10	1-8	2	10	15-16	2	11	3-4	3	1	3-8	3	2	3-16	3	3	**13**
14	3	0	3-4	3	1	5-8	3	2	1-2	3	4	1-4	3	5	1-8	3	6	**14**
15	3	3	3-8	3	4	5-8	3	5	1-4	3	7	1-8	3	8	1-16	3	9	**15**
16	3	6		3	7		3	8		3	10		3	11		4		**16**
17	3	8	5-8	3	9	11-16	3	10	3-4	4	0	7-8	4	1	15-16	4	3	**17**
18	3	11	1-4	4	0	3-8	4	1	1-2	4	3	3-4	4	4	7-8	4	6	**18**
19	4	1	7-8	4	3	1-16	4	4	1-4	4	6	5-8	4	7	13-16	4	9	**19**
20	4	4	1-2	4	5	3-4	4	7		4	9	1-2	4	10	3-4	5	0	**20**
21	4	7	1-8	4	8	7-16	4	9	3-4	5	0	3-8	5	1	11-16	5	3	**21**
22	4	9	3-4	4	11	1-8	5	0	1-2	5	3	1-4	5	4	5-8	5	6	**22**
23	5	0	3-8	5	1	13-16	5	3	1-4	5	6	1-8	5	7	9-16	5	9	**23**
24	5	3		5	4	1-2	5	6		5	9		5	10	1-2	6		**24**
25	5	5	5-8	5	7	3-16	5	8	3-4	5	11	7-8	6	1	7-16	6	3	**25**
26	5	8	1-4	5	9	7-8	5	11	1-2	6	2	3-4	6	4	3-8	6	6	**26**
27	5	10	7-8	6	0	9-16	6	2	1-4	6	5	5-8	6	7	5-16	6	9	**27**
28	6	1	1-2	6	3	1-4	6	5		6	8	1-2	6	10	1-4	7		**28**
29	6	4	1-8	6	5	15-16	6	7	3-4	6	11	3-8	7	1	3-16	7	3	**29**
30	6	6	3-4	6	8	5-8	6	10	1-2	7	2	1-4	7	4	1-8	7	6	**30**
31	6	9	3-8	6	11	5-16	7	1	1-4	7	5	1-8	7	7	1-16	7	9	**31**
	Pressed Brick.									Common Brick.								

EXPLANATION—The dark face type on the sides of columns indicate the number of perpendicular brick courses; the six columns between, the calculated results to suit the different gauges.

It is a quick determination of courses, feet, inches or fractions without any tedious figuring.

The sizes vary to suit the requirements of any given problem.

USUAL SIZES OF BRICK.

Red or Brown Pressed Brick—8⅜″ × 4⅛″ × 2⅜″.
Trojan or Buff Pressed Brick—8½″ × 4⅛″ × 2½″.
Common Brick............8⅞″ × 4⅛″ × 2 9/16″.

HORIZONTAL BRICKSCALE

OF THE FACE-WORK

Giving in length the number of bricks laid in a wall or in piers.

For the use of Architects, Builders and Stonecutters.

	Pressed Brick. Red or Brown. 8⅜ × 4⅛ × 2⅜ 3/16″ Mortar Joint. Feet.	Inches	Fractions.	Red or Brown. 8⅜ × 4⅛ × 2⅜ ¼″ Mortar Joint. Feet.	Inches.	Fractions.	Trojan or Buff. 8½ × 4⅛ × 2½ 3/16″ Mortar Joint. Feet.	Inches.	Fractions.	Trojan or Buff. 8½ × 4⅛ × 2½ ¼″ Mortar Joint. Feet.	Inches.	Fractions.	Common Brick. Common Brick. 8⅞ × 4⅛ × 29/16. ⅜″ Mortar Joint. Feet.	Inches.	Fractions.
1 Brick + 1 Joint.		8	9-16		8	5-8		8	11-16		8	3-4		9	1-4
1½ Bricks + 1 Joint.	1	0	11-16	1	0	3-4	1	0	13-16	1	0	7-8	1	1	3-8
2 Bricks + 1 Joint.	1	4	15-16	1	5		1	5	3-16	1	5	1-4	1	6	1-8
2½ Bricks + 2 Joints.	1	9	1-16	1	9	3-8	1	9	1-2	1	9	5-8	1	10	5-8
3 Bricks + 2 Joints.	2	1	1-2	2	1	5-8	2	1	7-8	2	2		2	3	3-8
3½ Bricks + 3 Joints.	2	5	13-16	2	6		2	6	3-16	2	6	3-8	2	7	7-8
4 Bricks + 3 Joints.	2	10	1-16	2	10	1-4	2	10	9-16	2	10	3-4	3	0	5-8
4 Bricks + 4 Joints.	3	2	3-8	3	2	5-8	3	2	7-8	3	3	1-8	3	5	1-8
5 Bricks + 4 Joints.	3	6	5-8	3	6	7-8	3	7	1-4	3	7	1-2	3	9	7-8
5½ Bricks + 5 Joints.	3	10	15-16	3	11	1-4	3	11	9-16	3	11	7-8	4	2	3-8
6 Bricks + 5 Joints.	4	3	3-16	4	3	1-2	4	3	15-16	4	4	1-4	4	7	1-8
6½ Bricks + 6 Joints.	4	7	1-2	4	7	7-8	4	8	1-4	4	8	5-8	4	11	5-8
7 Bricks + 6 Joints.	4	11	3-4	5	0	1-8	5	0	5-8	5	1		5	4	3-8
7 Bricks + 7 Joints.	5	4	1-16	5	4	1-2	5	4	15-16	5	5	3-8	5	8	7-8
8 Bricks + 7 Joints.	5	8	5-16	5	8	3-4	5	9	5-16	5	9	3-4	6	1	5-8
8½ Bricks + 8 Joints.	6	0	5-8	6	1	1-8	6	1	5-8	6	2	1-8	6	6	1-8
9 Bricks + 8 Joints.	6	4	7-8	6	5	3-8	6	6		6	6	1-2	6	10	7-8
9½ Bricks + 9 Joints.	6	9	3-16	6	9	3-4	6	10	5-16	6	10	7-8	7	3	3-8
10 Bricks + 9 Joints.	7	1	7-16	7	2		7	2	11-16	7	3	1-4	7	8	1-8
	Pressed Brick.												Common Brick		

EXPLANATION—To ascertain the measurement of a horizontal length of a brick wall or pier on the bed (including mortar joints), select a column according to the quality of work desired.

It is a quick determination of bricks, feet, inches and fractions, without any tedious figuring.

LEGAL.

SHEPHERD v. CAMPBELL.—Watson, Q.C., for plaintiff, appealed from order of a divisional court, allowing an appeal from judgment of Robertson, J., in action for damages and dismissing it with costs. The plaintiff agreed to purchase from defendant two buildings in course of erection on McLaren street, in the city of Ottawa, and plaintiff alleges that defendant agreed to complete the buildings according to certain plans and specifications, but failed to do so in respect of the heating and capacity of furnaces furnished. The No. 26 Monarch furnace supplied has a capacity of 10,000 cubic feet, and the cubic area of the building is 27,000 cubic feet. The trial judge held that upon the proper construction of the specifications, the terms of which are, "provide and fit up in the basement one No. 26 size of the Monarch coal furnaces or equal of sufficient size to give a uniform temperature of 70 degrees Fahrenheit, when 20 below zero outside, and to maintain that temperature at all times," the words as to the uniform temperature and the maintenance of it were applicable to the Monarch furnace as well as to the substitute which the contractor had liberty to supply. It was contended that the foregoing words amounted to a representation and warranty of the capacity of a No. 26 Monarch furnace, and if not they amounted to a warranty of the capacity of the equal of a No. 26 Monarch, and if so of the Monarch itself. Appeal dismissed with costs by the Court of Appeal, Toronto.

For two-thirds of their height the walls of a dining room in a flat on the upper west side are hung with a Delft blue buckram, which contrasts well with the oak finish that has been filled with a deep yellow paste filler and then finished with a dull luster. The remainder of the wall, above a four inch plate rail, is hung with a dull, mustard yellow damask in a two-toned stripe. Blue and white Delft plates arranged in a row upon the shelf-molding give character to the frieze. The ceiling is paneled in oak, with narrow bead moldings round the panels, picked out with blue and gold. In the bracketed cornice electric lamps are arranged between the carved modillions and illuminate the room without the disagreeable glare of a chandelier. The floor is covered with a dull blue Daghestan rug, with a red and yellow border. The furniture, heavy in character, and of the florid German type, is of Flemish oak, the chairs being upholstered in dull blue and gold stamped leather.

USEFUL HINTS.

When an ornament falls on a ground which is in direct harmony with it, it must be outlined with a lighter tint of its own color; thus, when a red ornament falls on a green ground, the ornament must be outlined with a lighter red.

To remove spots caused by water in ceilings or walls, take unslaked white lime, dilute with alcohol, and paint the spots over with this mixture. When dry, which ensues very quickly, as the alcohol evaporates, the lime forms an isolating layer; the ceilings or walls may be sized and painted in any way, and the spots will not show agatn.

The colors fit to color a room with one flat tint, says William Morrice, the celebrated English decorator, are not many. These are my thoughts about them—first, a solid red, describable as a deep pink, but toned both with yellow and blue; second, very rarely, a light orange pink; also, very rarely to be used, a pale golden tint, that is, yellowish brown; fourth, tints of green from pure and pale to deepish and gray, always remembering that the purer and paler and deeper, the grayer; fifth, tints of pure pale blue, from a greenish one, the color of a starling's egg, to a grayish ultramarine, hard to use because so full of color, carefully avoiding the point at which the red overcomes the blue.

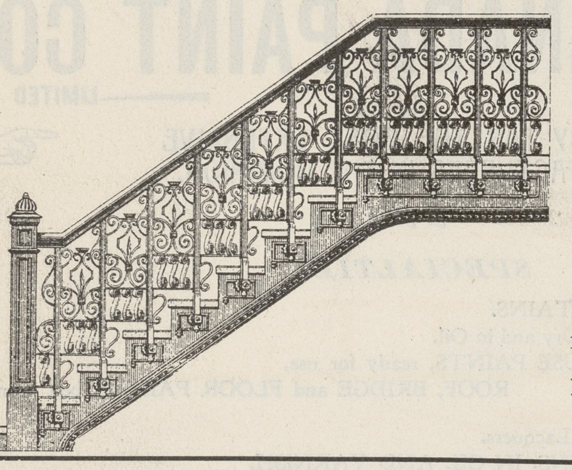
Fireproof construction, and the materials required for it, are nowadays largely engaging the attention of New York architects. The result is that many new private residences will be of the fire-resisting type. In a recently built house of this class, concrete arches between steel beams. with cinder concrete filling on top, compose the floors. In the bath rooms, the concrete filling is covered with a waterproof course of burlap and hot asphalt, flushed six inches high on all the walls and protected with a two-inch layer of concrete, in which the floor tiles are laid. The water pipes are bricked in and covered with roofing slates, and over these has been lapped burlap swabbed with hot asphalt, covered with an upper layer of concrete. In this way the pipes are permanently inclosed, and a kind of trough is made, pitched to one end, so as to carry off leakage or waste water.

PLUMBING MATTERS.

The Toronto Master Plumbers' Association have been at work for some time on the preparation of a new plumbing by-law, which will shortly be handed over to the city council for consideration and adoption.

The committee appointed at the recent convention of the National Master Plumbers' Association of Canada, to confer with the manufactures with a view to the adjustment of certain matters in dispute, are said to be endeavoring to induce the manufacturers to form an Association with which the Plumbers' Association could deal. The desire is that the manufacturers should sell only to members of the Plumbers' Association, and that the latter should buy only from the members of the ManufacturersA' ssociation. A code of price is also desired.

In answer to the enquiry of a correspondent, the Painters' Magazine gives the following method of gilding a galvanized iron cross for a church steeple: First wash the surface thoroughly with soda water to remove grease, etc., from the galvanized iron and rinse well with clear water. Rub the surface dry with a clean cloth. Now give a priming of paint, made from equal parts by measure of dry red lead and mineral brown, mixed and thinned with equal parts pure raw linseed oil and pure turps; do not add driers. Allow this to become hard, then give two coats of white lead, held flat, and when these are dry and hard, rub down smooth. On this surface apply fat oil gold size, which allow to become dry enough that it does not smut when the finger is pulled over it. As to the value of your job you will have to take the cost of your paint and time for preparing the ground work, the cost of two packs of gold leaf and at least one day's work of gilding, probably more, as the basis for your estimate. It depends very much on your experience and dexterity in laying gold leaf as to how much of the leaf you will waste and how long it will take you to lay it. Most likely you will require a pack for each gilding.



JOHN WATSON

Architectural Iron Works

MANUFACTURER OF

ELEVATOR ENCLOSURES AND CARS

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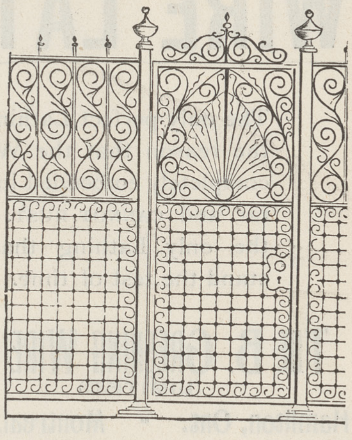

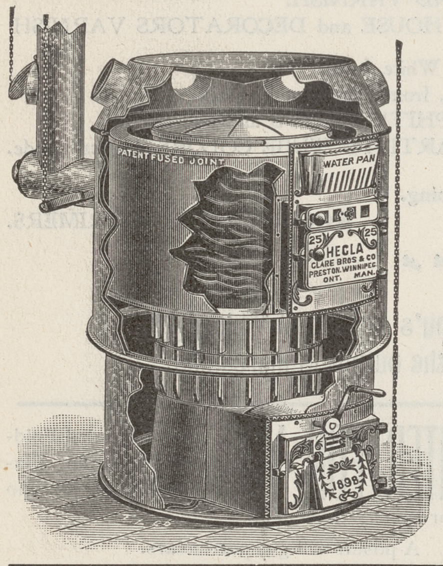

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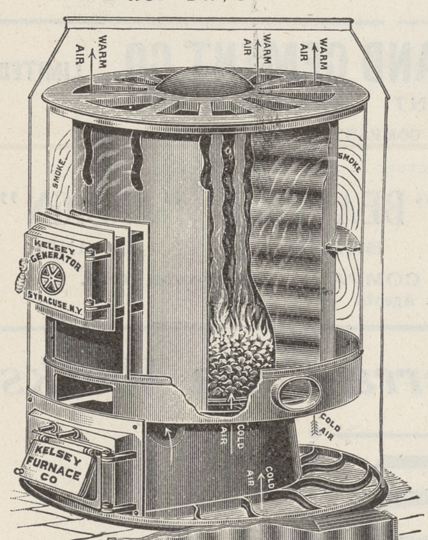

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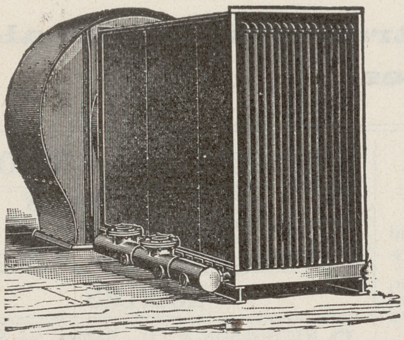

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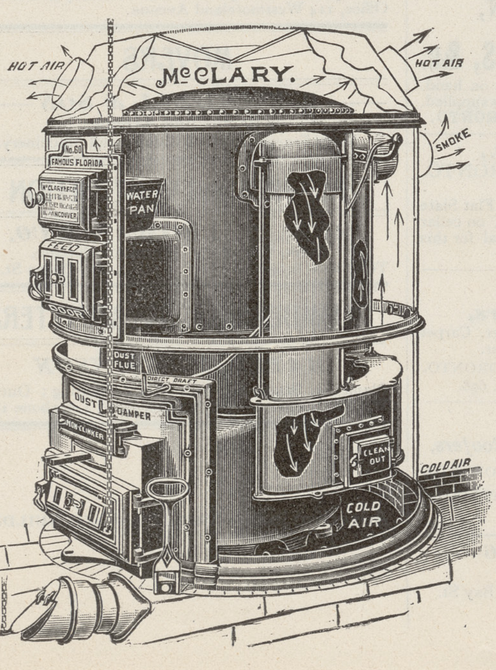

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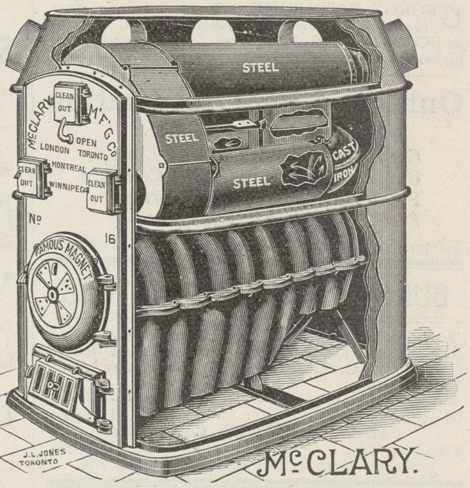

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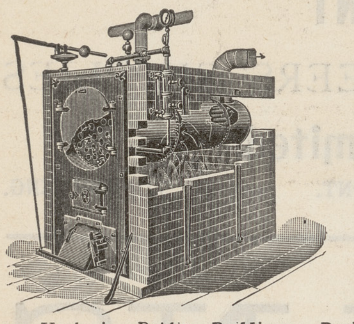

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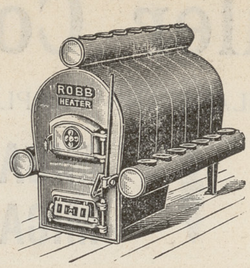

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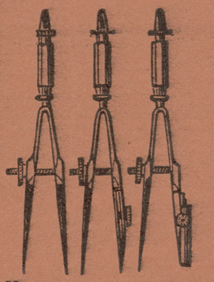

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