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MISSING

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—THE—

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(With a Weekly Intermediate Edition—The CANADIAN CONTRACT RECORD).

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ARCHITECTS, CIVIL AND SANITARY ENGINEERS, PLUMBERS, DECORATORS, BUILDERS, CONTRACTORS, AND MANUFACTURERS OF AND DEALERS IN BUILDING MATERIALS AND APPLIANCES.

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Tall Building.

THE completion of a ten-storey building in Toronto, and the proposal to erect a fourteen-storey structure on the site of the present St. Lawrence Hall Hotel in Montreal, would seem to be evidence that the craze for tall buildings which has marked Chicago and New York for several years past, is exerting its influence upon the architecture of our Canadian cities. It may not be out of place at this juncture to point out that in the American cities we have named popular favor is being withdrawn from these abnormal specimens of nineteenth century architecture, and legislation has been introduced for the purpose of restricting the height to which buildings may be erected in the future. Another potent influence tending to discourage this style of architecture is that the number of such structures already built so far exceeds the demand that the owners are said to have been compelled to reduce rentals by 50 per cent., while some of the high structures in Chicago which were designed for office purposes are being used as storehouses, in which capacity it will of course be impossible to obtain a fair return on the owners' investment. The unsatisfactory experience of our American neighbors in this direction, coupled with the lower land values in Canadian cities, would seem to render inadvisable the erection of structures exceeding say six or eight storeys in height.

The Safety of Elevators.

IN New York recently four persons had their legs broken by the dropping of an elevator. This elevator is said to have been of the most modern type, fitted with so-called safety catches, which in the event of the breaking of a cable or other accident, are supposed to grip the slides and hold the elevator in place. The accident referred to points to the necessity for protective devices which can be depended on to accomplish their purpose. There is also a greater degree of competency required on the part of persons in charge of elevators. Not only should the employment of lads for this purpose be forbidden, but the man who is placed in charge of an elevator should be required to become thoroughly posted regarding the method of its construction and operation. To illustrate the present condition of knowledge, the writer recently made a few inquiries from a young man in charge of an elevator in a modern office building as to whether there was anything to prevent the elevator from falling in case of accident to the guys. He was assured that there were catches for this pur-

pose. On being asked to point out the whereabouts of these protective devices, and the method of their application, the attendant was unable to do so. All he knew about the matter was that he had been told the elevator could not fall, and he had gone on operating it in the calm assurance that no accident could happen, and without making any effort to investigate for himself the actual conditions.

Duty on Artists' Materials.

THE request recently presented to the Government Tariff Commissioners by representatives of the Art Societies for the removal of the duties on artists' materials, is one with which the government should comply. The imposition of these duties for many years past, has not, so far as we know, resulted in any attempt being made to manufacture these materials in Canada. Presumably the market is too limited to warrant such an attempt. Under these circumstances the duties constitute a burden upon the art workers of the country, and tend to retard the development of art in the Dominion. It would therefore seem to be proper to remove them in part or altogether.

Care in Designing.

Too much care cannot be exercised by the architect with the details of his design. A seemingly trifling error of judgment in designing one particular feature often results in marring the general effect of the building. Instances have come under our notice in which for lack of a particular curve the outline of a verandah, otherwise satisfactory, proved defective in the eyes of the architect by whom it was designed, who felt a constant desire to pull the work to pieces and reconstruct it. Such a slip is doubly annoying to the architect if, having been dissatisfied with the effect of the detail on paper, he has allowed it to be put in concrete form, in the belief that in situ it would present an improved appearance. This rarely happens. Therefore the architect who is unfavorably impressed with the appearance on paper of any feature of his design is likely to save himself lasting disappointment by giving the problem further study, and making such changes as in his judgment will secure a satisfactory effect.

The Buffalo Breakwater.

MUCH interest was taken by both Canadian and United States stone dealers in the awarding of the contract for the new breakwater at Buffalo, for which the government made an appropriation of $2,000,000. Twelve tenders were submitted, several of which were based on furnishing Canadian stone from quarries in the township of Bertie, across the lake from the harbor and only four miles distant. Provisional clauses were inserted that the stone was to be shipped from Canada in the name of the United States, a proceeding which permitted of the importation of the stone without duty. As there appeared to be a fighting chance for the adoption of Canadian stone, steps were at once taken to head off such a movement, and the introduction of a bill in the House of Assembly at Albany providing that only citizens of the United States be employed on Government work was threatened Upon opening the tenders for the breakwater, however, the figures for the supply of both Canadian and American stone were nearly the same, and it was resolved to exclude the Canadian product.

Building Conditions.

MUCH satisfaction is being expressed by architects, builders, and all persons in any way connected with the building interests, with the extremely mild and fair weather which has prevailed to within a few days of the close of the year. In consequence of this unusual condition, a large amount of work in the way of completing buildings, and carrying out repairs and improvements, has been in progress, which otherwise must have been postponed until spring. Unless we should be unfortunate in having a late spring, the gap between the building season of 1896 and 1897 will be much shorter than usual, a circumstance which would be appreciated by all whose interests are dependent upon activity in the building industry.

The Ontario Architects' Bill.

IT is a pity that some of the people who were referred to by a correspondent in our last issue as objecting to the attachment of a legal status to the title "architect" do not express their views in print or write enquiring if they are right in their suppositions of what the proposed Architects' Bill will enact. There can be no doubt that there has been much misconception of the nature of the bill and much unnecessary anxiety, on the part of builders especially, as to how their interests will be affected if the bill passes. It is not easy to see upon what this anxiety is based; but, if stated, we are confident it will be found to be as baseless as Mr. Ireland's conception of the Association bent on keeping out new comers by examinations turns out to be, in the light of the Registrar's letter in another column saying that the Association does not wish to control the examinations. It is essential in introducing such a bill to safeguard all existing interests from sudden change, and it is not likely that, if the bill passes, anybody will be able to perceive any immediate effect. Ultimately, no doubt, the profession of architecture will, as the promoters of the bill expect, be established upon a higher plane; but why any other branch of the building trade should suffer in consequence, it is hard to see. For builders in cities, who for the most part erect architects' buildings, an improvement in the architects' art will not mean either less work or less good work; and improvement in the architects' skill will be a direct gain, for it cannot be denied that the builders' gains are sometimes seriously impaired by unscientific methods on the part of the architect and the need of making good his deficiencies. The country builder perhaps regards himself as somewhat in competition with the architect. However that may be, it is clear that the architect can never be in competition with the builder. The builder must still build everything that is built, and plan a great deal of it too. The proposed bill is not a law to make people employ architects, as some people seem to have thought, but to make architects better worth employing. It is intended to raise the quality of the architect and the character of his profession; not to insist upon every little piece of work being put into his hands. It would doubtless be an ideal state of affairs if every village store and cottage was the work of a first-rate designer, but work of this kind will always be done by builders. We do not think, however, that the design of such buildings will be unaffected by improved design on the part of architects, for the builder is quick to pick up new ideas, and the better the work of architects the better his work will be.

BY THE WAY.

A NORWEGIAN firm is reported to be engaged in the manufacture of bricks from condensed petroleum for fuel purposes. These bricks are said to give out four times as much heat as coal, and without smoke. In view of the attention which the production of petroleum is at present receiving as the result of recent discoveries in Western Ontario, this might be an opportune time to experiment with the manufacture of petroleum fuel bricks in this country.

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A CONTRACTOR from Uncle Sam's domains came to Toronto not long since for the purpose of tendering on a contract about to be let. After taking the quantities from the specifications and making his estimates thereon, he enquired in a matter-of-fact manner what commission he should allow for the architect. He seemed greatly surprised on being informed by the architect that in Canada it is not customary for architects to accept commissions from contractors. The inference might reasonably be drawn from this incident that the practice of accepting commissions from both client and contractor is one which obtains to some extent across the border.

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As an illustration of the old saying that one must look abroad for home news, I find the following paragraph in an English technical journal:—"It is said that many hundred rolls of wall paper with solid black grounds, designs for the most part in slate-colour, are yearly used in Canada by French Canadians. These people, when they go into mourning, never do things by halves, but even hang their private apartments with these gloomy papers, indicative of a death in the family." The improbability of this story was so evident that I caused enquiries to be made in Quebec regarding it, and found as I expected, that there was not the slightest truth in it. In fact, the very reverse is true—the French Canadians being partial to lively colors.

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DROPPING into the office of a well-kmown solicitor in Toronto the other day, I was informed of a peculiar incident which occurred in connection with the testing of cement. Two buildings were in course of construction, by different contractors; the same architect and clerk of works having charge of both. The contractor for one of the buildings obtained a quantity of cement which he believed was according to specification and would stand the necessary test, but it was refused by the architect and his superintendent as being of an inferior grade. It was consequently stored in a down-town warehouse. The two contractors, being on friendly terms, the one whose cement had been refused sold the same cement to the contractor of the other building, and it was accepted without a word of complaint. What rendered the transaction still more peculiar was the fact that the specifications governing the cement were exactly the same in both cases. Either the architect and his clerk were unduly severe on the first contractor, or allowed inferior materials to enter into the construction of the building in which the cement was used.

It is reported that the Danville, Que., Slate and Asbestos Co. is to be capitalized at $2,000,000. English capitalists lately visited the works in connection with the proposition.

DUTY ON BUILDING MATERIAL.

MESSRS. Joseph Wright, president, J. W. Taylor, manager, and David Carlisle, director, of the Toronto Radiator Manufacturing Company interviewed the Tariff Commissioners at Toronto and asked that the duty on radiators be allowed to remain as at present, the duty of 27½ per cent. being considered sufficient under certain conditions. They were, however, desirous of having a bonus of $4.80 per ton on exported radiators, whether made of Canadian or American iron. The competition from the United States gave considerable cause for complaint. Labor was cheaper there than here, was of an inferior class, and the vast expanse of this country made freight expensive. Mr. Taylor said that radiators sold in Toronto 30 per cent. cheaper than in the United States, and the cheap rate of freight, viz.: 14c. from Boston to St. John, compared with the 58c. rate from Toronto to St. John compelled the Canadian concern to sell 10 per cent. cheaper in St. John than the United States firms did, in order to meet the American competition. The present duty of 27½ per cent. ad valorem was, if anything, not high enough, as it gave the American concerns an opportunity to work off their surplus stock in this country.

At Hamilton representatives of sewer pipe companies asked for the imposition of a duty of $5 per ton on sewer pipe. The present duty averages 35 per cent. In the event of there being no specific duty they asked that the value for duty be placed at 70 per cent. off the American list instead of 77 per cent.

Among the reasons presented for a specific duty was that double-strength pipe was frequently admitted as ordinary standard pipe, whereas it should be 20 per cent. dearer. There were in Canada five factories, but there was no association for keeping up prices.

William Findlay, builder and roofer, asked for a lowering of the duty on slate for roofing purposes. He said the duty used to be 80 cents per square, but it was subsequently changed to 20 per cent. ad valorem, and at the last revision was fixed at 30 per cent. He asked that the duty again be reduced to 20 per cent. The source of supply was chiefly in the United States. There was one quarry in Quebec, but that concern could find a market in its own district for its output. The difficulty in obtaining supplies was often great, and builders were seriously hampered in their work. With a lower duty, slate would be cheaper and would be more generally used.

The Hamilton Blast Furnace Company asked for protection for their works. The capacity of the furnace was stated to be two hundred tons of iron per day, but the average turnout was one hundred and twenty tons. They intended next season to bring the ore from Lake Superior by water transportation. Since starting they had purchased Canadian ore, found chiefly in Hastings county, 10,000 tons, costing $35,000. They have produced 21,000 tons of pig-iron. Of this 10,000 tons have been sold and delivered, and 4,000 tons are booked, leaving a little over 6,000 tons not sold. They have paid in inward freight on ore $66,000, and $7,000 in outward freight. Their wage bill amounts to $1,150 a week, making a total paid in wages $46,000. If the present protection were withdrawn they would lose the whole of their investment. If the Hamilton furnace was well encouraged it was the intention to go into the manufacture of steel, employing at least 500 men. It was stated that about 16,000 tons of pig-iron were produced in Canada in a year from five blast furnaces.

PROPOSED AMENDMENT OF THE O. A. A. ACT.

THE Ontario Association of Architects have wisely decided to renew their efforts for the amendment of the Ontario Architects' Bill, in a manner to in future restrict the use of the word "architect" to properly qualified persons. The relation which the work of the architect bears to the health of the community and the extent to which the safety of human life and the interests of property are dependent upon his knowledge and skill, demand that the public should have means of knowing who are qualified to call themselves "architects." It should be clearly understood that no attempt is being made to compel persons who desire to erect buildings to employ a qualified architect to prepare the plans and supervise the construction. If they have sufficient confidence in the ability of some person who is not entitled to call himself an "architect," to prepare plans and carry out the work, they are at liberty to entrust to him the undertaking. In view of this freedom on the part of anybody to prepare plans for buildings so long as he does not designate himself as an "architect," and of the public to employ a properly qualified architect or not, as they may choose, we fail to see any reasonable ground of objection to the desired legislation.

A REQUIRED DISTINCTION.

EVEN great men do not hesitate on occasion to express an off-hand opinion on subjects of which they possess but a surface knowledge. Greater care should be exercised by such persons in this regard, for the position they occupy in the community by reason of their superior attainments in a particular field of learning or effort, is apt to lead the public to attach great importance to their opinion on all subjects. It does not follow because a man is a clever lawyer that, therefore, he is competent to express an opinion upon architecture, or that he is familiar with the conditions under which a large proportion of the buildings erected are designed and constructed. It was undoubtedly ignorance on this point that induced a prominent lawyer of Toronto to make an indiscriminate onslaught, before an audience he was recently addressing, upon architects for their alleged inability to put up beautiful buildings. This talented lawyer evidently was not aware of the fact that perhaps most of the buildings in the locality to which his remarks bore reference were constructed entirely without the agency of a properly qualified architect—the the speculative builder having alone been responsible for their design and execution.

There is here a strong argument in favor of the effort which the Ontario Association of architects is making to induce the legislature to restrict for the future the use of the title "architect" to persons who are properly qualified for the practice of the profession. So long as everybody who may undertake to put up a building can call himself an architect, the public is unable to distinguish who are properly qualified men, and naturally enough, under these circumstances, the men of taste and skill are brought under public condemnation on account of the lack of taste displayed by those who possess no qualifications for the work which they undertake to do.

W. B. Mundy, architect, formerly of Hamilton, Ont., is erecting the new Chicago Fair building, which is to cost one million dollars.

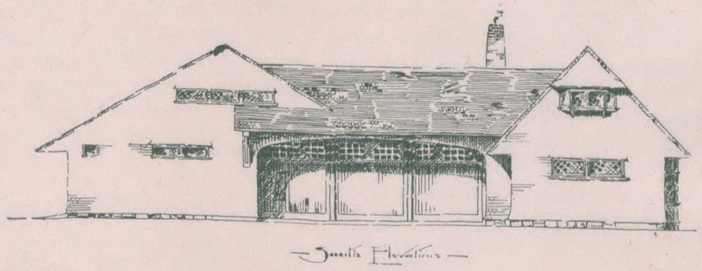
COMBINATION HEATING.

THE question of furnace and the best form of coil or heater adapted to it being decided, says Mr. J. W. Hughes in an article on this subject in the Metal Worker, the fitter has next to plan or lay out the mains and branches to suit different coils and radiators. As the buildings to be warmed differ in plan, so will the placing of pipes vary, and as long as the general principles controlling the circulation of water are not violated the apparatus will work. But there is no doubt but that certain plans on a given job will work better than others. The main object is to arrange the pipes to allow the greatest freedom of circulation. Undue friction must be avoided by not having the pipes too small, and by having too many sharp turns, and above all, the pipes must be arranged to allow of their being filled "solid"—that is, that there be no air pockets. As the water in the heater becomes hot it expands and becomes lighter, and by the law of gravitation ascends to the rising main or flow pipe, the colder water flowing in by the return. As long as the heat is applied this goes on continuously; but as the difference in the weight of the two columns of water—viz., that in the flow and return—is very little, it takes very little to stop it. A bubble of air in the pipes will stop circulation by separating the water.

The lesson to be learned is to avoid everything that will prevent the pipes and coils from being solidly filled with water, and that will prevent the water from flowing freely in the direction which it should go—that is, up from the heater when warmed, and back and down to it when heat has been imparted to the air of the apartment.

The combination system is of necessity restricted in a greater or less degree by the size and make of the hot-air furnace, and the possibility of fitting a given sized coil or heater in it. The fact must not be lost sight of that in a building warmed with a combination apparatus, air from the furnace is the principal factor, the heat from the hot water circulation combined with it being a useful adjunct or assistant for warming certain portions of the building to which the hot air cannot gain access, or to increase the heat where the hot air would only be partially sufficient. Valves on coils should be avoided. To shut off a coil on a general circulation makes a serious disturbance that is apt to cause the formation of steam, with the accompanying noise, and when the checking of the fire causes the condensation of the steam the pipes will no longer be solidly filled with water, and there will be a poor circulation or none at all.

The following proportions of heaters or coils in furnaces to the amount of heating coils or circulation in rooms are from actual jobs that worked well: 30 ft. of 1¼ in. spiral coil in dome of furnace with 1¼ in. flow and return, and 1 in. and ¾ in. branches heated 1,300 ft. of 1 in. circulation coils; 11 ft. 1¼ in. heater pipe did the same for 380 ft. of ¾ in. coils; 11 ft. 1¼ in. coils with 1¼ in. flow and return and 1 in. branches took care of 260 ft. of 1 in. circulation coils; 9 ft. 6 in. of 1½ in. heater coil with 1¼ in. flow and return mains and 1. in branches to coils, carried 240 ft. of 1 in. circulation; 13 ft. 7 in. of 1 in. coil with 1 in. flow and return branches off to 1 in. and ¾ in. supplied 550 ft. of 1 in. coils; 12 ft. 7 in. of same sizes to 325 ft. was a success again; 12 ft. of 1 in. to 320 ft. of coils worked well; 11 ft. 10 in. of 1 in. with same



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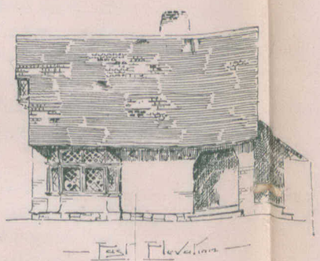

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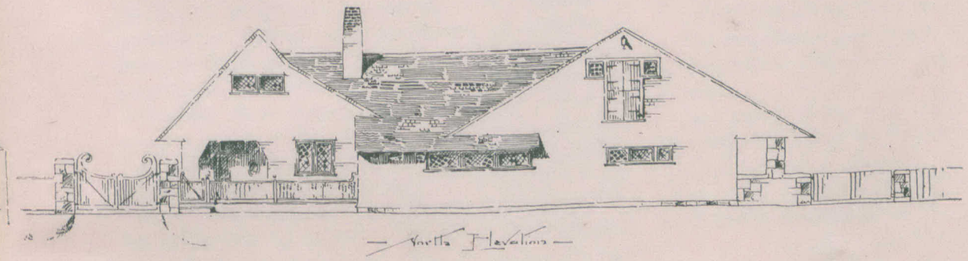

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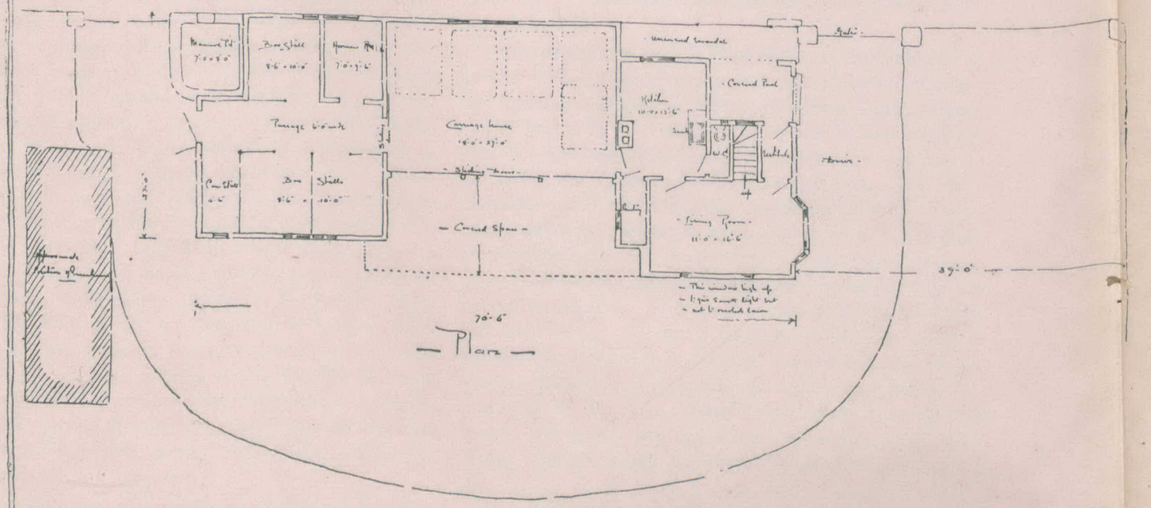


— Preliminary Sketches —
for
— Proposed Stable & Coachman's Dwelling —
— for Allan Chisholm Esq —
— Oakville, Ont. —

— ½" Scale —

Sept 1893

— Dick & Wickson Archts
— Canada Life Bldg Toronto

sizes for distribution carried 439 ft. of coils ; 14 ft. 6 in. of 1 in. to 400 ft. same sizes, and 13 ft. 2 in. of 1¼ in. with 1¼ in. flow and return 1 in. and ¾ in. distributing branches, to 490 ft. of 1 in. coils gave good results.

ARTIFICIAL MARBLE.

A COMPANY is said to have been recently formed in Toronto with the purpose of manufacturing artificial marble from gypsum, by a process invented by Mr. Geo. W. Parker.

The material is made into clocks, pedestals, table tops and other fancy articles for which marble is frequently employed. The gypsum, while in its crude soft state, is cut into the desired form, being afterwards subjected to a chemical solution and polished. Prof. Coleman, the well-known geologist of the School of Practical Science, Toronto, speaks of the new material as follows :

"I have examined with great interest the specimens of 'artificial marble' shown me, and have discussed the patented process by which they were made. Mr. Parker, of Michigan, the inventor of the process, explained his method viz : Dehydration of gypsum by heat, continued for a few hours, soaking the dehydrated gypsum with sulphate of alumina solution and then drying the mass operated upon. By this means the gypsum, which is soft and easily cut with a knife, or turned on a lathe, is transformed into a hard substance very much like marble and capable of the same uses. The raw material is very cheap and obtainable in large quantities ; the treatment is simple and the result surprisingly good. A specimen of gypsum from western Ontario was given to Mr. Parker for treatment after being initialled by myself, and a fragment broken off for future identification of the mass. After treatment in the way mentioned, I found that it filled the fragment broken off and was evidently the identical mass of gypsum from my collection at the School of Science. But its properties were quite changed ; it is even harder than marble, which it closely resembles, and is not attacked so readily by acids, which is a point in its favor. So far as I have examined into the process, I am very favorably impressed by it. A cheap and easily worked substance is changed by two or three days treatment of a simple and inexpensive nature into a substance as beautiful and apparently as durable as marble, which is very costly when of good quality."

CHIPS.

The new management of the St. John's Stone Chinaware Company, of St. John's, Que., have given notice of application to the legislature for a special act of incorporation.

The Canadian Society of Civil Engineers, at their regular meeting on the 17th inst., will discuss what action should be taken in view of the expiration on the 1st of May next, of the lease of the rooms at present occupied by the Society.

The eleventh annual meeting of the Canadian Society of Civil Engineers is announced to take place at the society's rooms, 112 Mansfield street, Montreal, on Tuesday, January 12th. The council for 1897 will be elected and other important business transacted.

A new heating and ventilating apparatus has lately been placed in the Pictou Academy building at Pictou, N. S. The building is heated by two separate systems of heating, direct and indirect. The first named consists of radiators in the halls and coils in the rooms, the coils to be used only in the coldest weather. The indirect system is supplied by fresh air from the outside, which enters in the basement and is warmed to the required temperature, being then admitted to the rooms through large registers. Mr. Frank Powers, of Lunenburg, was the contractor for the heating work, and Messrs. Elliott & Hopson, of Halifax, were the architects.

TESTS OF CONCRETE.

SOME important tests of concrete were recently made at McGill University, Montreal, by Messrs. Theo. Denis, G. G. Hare and Carl Reinhardt, the results of which will be found below. The experiments are rendered particularly interesting by the fact that the general opinion of the effect of water on cement is somewhat erroneous. Following is the report of the tests as presented at a meeting of the Canadian Society of Civil Engineers :

Of late monolithic works of great importance have been carried out, and every day concrete, as building material, is creeping to a foremost place.

Although cement testing proper has been subjected to elaborate, scientific and practical investigations, very few researches, and especially normally conducted researches, have been made on the strength and behavior of concretes and betons. This probably is due to the fact that for such experiments heavy and costly apparatus is needed. Investigations on small specimens would be useless, and conditions approaching as nearly as possible to practice have to be followed.

The following are the results obtained from a series of experiments made by students of McGill University, 1895-96.

The object of this first series of experiments is to determine the effect of different per cents of water on the strength of the concrete. The limits were 16 and 30 per cent. of water, by weight of cement and sand, which are beyond the extremes of practice on both sides.

CEMENT.

The cement used was, of course, the same brand throughout the series. It was a German Portland of good quality, slow setting, on which separate sand tests were made in connection with this series. The results are tabulated below.

SAND.

This was clean, coarse, angular, dry sand of good quality, of slightly higher grade than usual practice.

STONE.

This was broken limestone of such size that the pieces would have passed through a ring 1¼ inches diameter. They were unscreened and just as they came out of the breaker. Consequently a slight amount of dust was mixed with them. They had to be broken a little smaller than in actual practice. The blocks of concrete being only one cubic foot, it was thought that more accurate results would be obtained in this way.

MOULDS.

The moulds were made of ¾ inch plank, lined with sheet zinc. They were 5 feet long, 1 foot high and 1 foot wide, divided into four compartments, which would mould four cubes at once, of dimensions 1 x 1 x 1 feet, forming specimens large enough to investigate seriously upon. These were removed by unscrewing one side of the box and sliding them out. Care had to be taken to oil the sides of the moulds slightly before ramming the mixture in them, to avoid trouble in getting them out.

CONDITIONS OF MIXTURE AND PROPORTIONS.

The proportions adopted for this series were one of cement, two of sand, and four of stones, by weight, the proportion of water being based on the weight of sand and cement.

The cement and the sand were first thoroughly mixed dry, then the water added gradually. The stones were

then thrown on this mortar, spread out, and the whole vigorously and very thoroughly mixed. The fresh concrete was then placed into the moulds and rammed in 1½ to 2 inch layers.

RAMMING.

The rammer was a block of hard wood 2 feet long by 2 x 2 inches, with a lathe turned handle. It was not very easy with this to ram uniformly, even throughout one block, and this is one of the main sources of discrepancies in this series of experiments.

It was thought that a reduction of the breaking loads to a standard weight of the blocks would be only fair, and would slightly improve the results.

GROUPING OF TESTS.

The tests were made at one week, four weeks, and two months, and the results grouped accordingly, that is to say, the one week tests, with different per cent. of water, compare between themselves, four weeks and two months likewise. Parallels between the results, at different ages, cannot be drawn on account of some specimens having been prepared under widely different conditions. For instance, the results at two months are exceedingly low as compared with those obtained at one and four weeks. This is due to the fact that these two months specimens were the first prepared of all, and this before the cemented trough in which they were to be immersed was completed. Consequently, they were kept 8 to 10 days longer than the others in the dry air of the laboratory, which seems to have had a disastrous effect on them. But in spite of these slight drawbacks, the annexed table shows that up to 24 per cent., the percentage of water has not a very great effect on the strength. This is an important point, for below 20 per cent. the mortar obtained is rather dry and very difficult to handle.

But beyond this limit of 24 per cent. a greater proportion of water seems to weaken the concrete considerably.

This limit is very sharply defined in the adjoining table, where an additional 2 per cent of water from 24 to 26 per cent. weakens the concrete by almost one-half for the one-week tests. It is, however, interesting to notice that strength is almost completely recovered with time, the four weeks test showing the weakening limit to be between 26 and 28 per cent., and the two months between 28 and 30 per cent. So that if immediate strength be not required of the concrete structure, 28 per cent. of water will not affect the ultimate resistance it allowed to stand two months.

In the parallel sand and cement tests the weak line is not so sharply defined, but yet it is sufficiently so to show that the same statement applies. The tests in this case show a marked weakening between 14 and 16 per cent. of water for the one week, which strength is ultimately recovered, as is shown by the four weeks and two months test.

The low limit of 14 per cent., as compared with 24 for the concrete, is probably due to the fact that the stones of the concrete, on account of their porosity, absorb a part of the water.

The table shows that the great density is obtained with 16 and 18 per cent. The weights of the cubes beyond this decrease up to 24 and 26 per cent., where they are again nearly equal in density to the 16 and 18 per cent. of water. Therefore this 24 and 26 per cent. seems to be the point where the best practical results are obtained, because 16 and 18 per cent. make up too dry a concrete to allow of easy handling.

Another point incidentally comes up. Attention has been drawn to the poor results obtained by the same tests and reason of long exposure to dry air given. This shows up a very important point, namely, the necessity of covering up carefully all concrete and cement works exposed for any length of time to dry air and sun. The bad effect of these agents is plainly demonstrated, and it is doubtful whether much strength would ultimately have been recovered.

It is also interesting to notice the results obtained by the concretes made of 1 part of cement, 2 of sand and 5 of stones, and 1 cement, 2 sand and 6 of stones. The specimens of these compositions gave results equal to concretes 1, 2, 4, showing that for strength they are as good as the ones containing a less proportion of stones, while being much more economical.

These experiments are as yet very incomplete. But it is hoped that the researches in this subject will be continued and that valuable information for the engineer in practice derived from them.

CONCRETE TESTS—COMPRESSION.

Proportions by weight: 1 part cement, 2 sand, 4 stone.

Per cent. of water by weight of cement and sand	Crushing strength per square inch. 1 week. comp. tests.	4 weeks.	2 mos.	Average weight of sp. per c. f.
16	792	677	382	141.5
18	653	679	507	143.0
20	746	626	507	139.5
22	620	615	670	139.5
24	679	542	559	141.5
*26	362	545	500	141.2
28	326	340	823	138.0
30	245	331	361	135.5

Proportion by weight: 1 cement, 2 sand, 5 stone.

20 — 703

1 cement, 2 sand, 6 stone.

20 — 728

CEMENT AND SAND TESTS.

Proportions: 1 cement, 2 sand.

10	825	800	1822
12	800	1311	1666
14	750	1000	1100
*16	475	1389	1777
18	395	1110	1266
20	400	913	1633
22	330	844	1233
24	388		1230
26			1000

* Line of weakness due to excess of water.

THEO. DENIS.
CARL REINHARDT.
G. G. HARE.

McGill University, April, 1896.

New machinery has been put in position at the cement works of the Rathbun Company at Napanee Mills, and the output of the mills will be greatly increased.

A series of lectures on bridge designing has recently been delivered before the Applied Science Graduates' Society of McGill University, by Mr. J. A. L. Waddell, M. Am. Soc. C. E., a graduate of the civil engineering school of McGill, now of Kansas City, Mo.

The following are the newly appointed examiners of the Province of Quebec Association of Architects for the term commencing January, 1897: Messrs. Chas. Baillargé, F. X. Berlinguet, J. F. Peachy, of Quebec; Stewart Henbest Capper, Professor of Architecture at McGill University; A. T. Taylor, F. R. I. B. A., and Jos. Venne, of Montreal.

At a recent meeting of the governors of McGill University, Mr. R. J. Dureey, B. Lc., A. M. G. C. E., London, was appointed assistant-professor of mechanical engineering in the faculty of applied science, in the place of Mr. J. G. Guest, who resigned a short time ago to accept the position of professor of mechanical engineering in the School of Engineering at Worchester, Mass.

CONVENTION OF THE ONTARIO ASSOCIATION OF ARCHITECTS.

THE annual convention, which will this year be held on Jan. 12th and 13th, will devote itself more than hitherto to artistic criticism in the form of free discussion of representations of executed work thrown on the wall by means of a stereopticon. Besides the usual display of members' work by this means, it is proposed to discuss the best examples of old work in Toronto; and there is talk of substituting for the paper that has always hitherto been given by some member of the staff of the School of Practical Science, a similar display of examples of some one style, selected from the admirable photos taken in England by Mr. Jos. Keele for the School collection of architectural photographs, and accompanying the exhibition by comment and discussion. There will also be two papers, one from Professor Capper of McGill University, of which the title has not been received, and one from Mr. D. B. Dick, on the "Possibility of a New Style." The programme seems to have a practical tendency all through, and will probably bring out further the more sociable manner of carrying on discussions that was noticeable at the last convention.

THE DUTY ON ARCHITECTS' MATERIALS.

A DEPUTATION representing the Ontario Association of Architects, interviewed the Tariff Commissioners on the occasion of their last visit to Toronto, with the object of endeavoring to secure a reduction in the duties on materials used by architects.

The following letter, expressive of the views of the Association, and accompanying memorandum, were placed in the hands of the Commissioners by Mr. Langton, the Registrar :—

"The accompanying statement of the duty imposed upon materials used by architects states also to what extent these materials are manufactured in Canada, and shows that, although there are two of the articles made in Canada, it is only imported articles of that kind that are used by architects. So that it is true to say that upon all the drawing materials used by architects there is a duty of from 25% to 35%, and that none of these articles are manufactured in Canada.

"The duty, therefore, is of no use except as a contribution to revenue; and while regarded as a contribution to revenue, the result must be small, because the architectural profession comprises but a small body of men, to each architect the addition to his office expenses caused by these duties is of considerable importance.

"Nor is this a case where the tax levied on one body of men can be transmitted to others in the way of charges. An architect's fee is fixed by custom as a commission on the cost of the building erected; his own expenses do not enter into the calculation, and though they are greater under this tariff than before, there is no customary method of adjusting his charges to this increase."

STATEMENT CONCERNING ARCHITECTS' MATERIALS.

Tracing linen.....	Duty 27½%	—Not made in Canada.
Prepared tracing paper	" 35 %	—" " " "
Black print paper....	" 35 %	—The composition a chemical secret known only to two persons in the U. S., and made by them.
Blue print paper....	" 35 %	—A little of this made in Canada, but the duty does not protect its manufacture, because the drawing paper which forms its base must be imported from the U. S. under duty. In the U. S. both the paper and process are native, and the manufacturers are able to keep the Canadian market.
White drawing paper..	" 25 %	—Not made in Canada.
White tracing paper...	" 25 %	—" " " "
Manilla paper.....	" 25 %	—A little made in Canada, but not of a quality suitable for our use. What we use is imported.
Inks, Colors, Instruments	" 25 %	—Not made in Canada.

A writer in an exchange warns painters not to mix chrome yellow with Prussian blue to produce a bright green. Either substitute ultramarine for the Prussian blue, or yellow ochre or raw sienna for the chrome yellow.

POINTS ON VENTILATION.

SINCE a man inhales on an average 16 ft. to 18 ft. of air in an hour, and the air he exhales contains 180 times as much carbonic acid as fresh air, it will require 120 times as much fresh air to dilute it sufficiently in order to render it suitable for respiration. Each individual will require, therefore, about 2,000 cubic feet of fresh air per hour.

In practice it is generally found that a larger quantity is desirable, and this is usually stated at 3,000 cubic feet. Since the air of a room, it may be said, is not changed more than three or four times an hour, it is desirable that, if each individual is to be provided with 3,000 cubic feet of fresh air per hour, he should have an air-space of from 750 to 1,000 cubic feet.

It has been found that where a current of air enters a room at a greater rate than 2 ft. per second, a draught is caused. The art of ventilation, therefore, may be described as the art of supplying a public building or dwelling with air at this rate, and in quantities sufficient to prevent the possibility of the carbonic acid from increasing beyond the limits of purity.

BRICKS MADE FROM SAND.

AN organization has been incorporated in San Francisco, California, which proposes to expend $50,000 in the purchase of a site and the erection of buildings for the manufacture of bricks from sand. The stone brick which it is proposed to make will be manufactured from powdered stone or the elements contained in stone, such as sand, clay, etc. These substances are mixed with a prepared "flux," which acts as a bond, holding together the particles of sand or other material used as a filler, the whole being thoroughly annealed by heating.

Among the advantages claimed for the brick is the saving of time, only ten hours being needed for their manufacture, instead of eight to thirty days; a much less consumption of fuel; scarcely any loss from burning; a crushing strength from 10,000 to 40,000 lbs. to the square inch instead of from 400 to 4,000 lbs., and a reduction of cost to three-fifths of that of the old style bricks.

TESTING QUICKSAND.

SUPPOSE we take a certain quantity of quicksand, dry it artificially, and then try to make it into quicksand again. Put it into a box and pour water on it carefully. Instantly the water is soaked up, and if we measure the volume—or better, the weight—of the sand, we shall see that it takes up a quantity of water that measures 30 per cent. of its own volume, or 20 per cent. by weight. The rest stays above the layer of sand. If we now pierce a little hole in the bottom of the box, we shall see pure water run out; the sand forms a kind of immovable filter. Also by turning the box upside down to see the sand keep its form like a stopper. It follows from this experiment that we cannot obtain quicksand in this way. We must reverse the condition of the experiment. Let us put the water into a vessel and sift in the dry sand in a thin stream, while shaking the vessel lightly. Then we shall get the thick but easily flowing compound known as quicksand. That the mixture may keep its mobility, two conditions are necessary: (1) The quantity of water must not be less than 21 per cent. by weight. (2) The whole must be continually though lightly shaken. If we increase the proportion or interrupt the agitation for an instant, the mass settles down, retaining about 20 per cent. of water, while the surplus, if it exists, rises to the top.—La Nature.

CORRESPONDENCE.

[Letters are invited for this department on subjects relating to the building interests. To secure insertion, communications must be accompanied by the name and address of the author, but not necessarily for publication. The publisher will not assume responsibility for the opinions of correspondents.]

THE CONDUCT OF EXAMINATIONS.

TORONTO, Dec. 10, 1896.

To the Editor of the CANADIAN ARCHITECT AND BUILDER.

DEAR SIR,—Your correspondent, Mr. Ireland, in the November number of the CANADIAN ARCHITECT AND BUILDER expresses a wish that intending architects should be examined by "an independent and recognized public body." The Board of Examiners of the Ontario Association of Architects is in reality such a body; but being composed chiefly of architects it is possible to assert that is not independent, and perhaps Mr. Ireland means to do so.

The conduct of the examinations was given to the Association by the legislature along with limited public powers. When it was proposed to increase these powers the legislators who expressed themselves as favourable to doing so did not think it necessary to alter the present manner of conducting the examinations, although the Council suggested that the government should take the examining out of their hands. If it should be proposed to put the examinations in the hands of the government, the Association will be not only content but glad.

Yours truly,

W. A. LANGTON, Registrar.

THE ONTARIO ARCHITECTS' ACT.

To the Editor of the CANADIAN ARCHITECT AND BUILDER.

SIR,—In your November number Mr. S. J. Ireland's letter was to me a great surprise—a double surprise—in that Mr. Ireland should not have been more familiar with the workings and aims of the Ontario Association of Architects, and that he should also be so unfamiliar with the qualifications for architectural practice.

As regards the O. A. A., Mr. Ireland wishes we had "an independent and recognized public examining body"; is he not aware of the fact that such a body has existed for several years—a body as independent as that of the legal, medical or clerical professions, and a body of recognized ability, composed as it is of the best men in the profession in Ontario; and even now for membership the O. A. A. makes it compulsory to pass certain examinations, and hard ones they are, comprising infinitely more than Mr. Ireland enumerates as necessary. This examining body and these examinations will continue after the amended Bill is passed, and all embryo architects will have to prove themselves for admission just as they have now—justice, of course, demanding that practising architects be admitted without examination.

Personally, I thank Mr. Ireland for bringing out these points against us. He states them as public opinions; I know they are public opinions, for I have repeatedly heard the same lines of argument, and I sincerely wish that the public understood our Bill, understood our workings, understood our history; if they did, there would not only be no dissenting voice, but they would favor us. We are not working for self, but for our art, and by forcing our would-be exponents to be properly qualified, we are doing a great good for Ontario architecture—a good that will be felt for all time.

In regard to our education, I must take issue with Mr. Ireland on every point, because the system of education in use by the O. A. A., and proposed to be continued under any additions to our Bill, is the best possible under present circumstances—requiring five years' study in an office with three examinations, or graduation at the School of Science with three years in an office and one examination. To this the only advisable addition would be that five year office students should, during the fifth year, attend the School of Science to receive a polishing off in theory.

Mr. Ireland's contention in regard to a boy and divinity is proper for divinity, but if he would analyze architectural and divinity qualifications he would find that the boy, were he never at a church service, never heard a public speech from his birth till his graduation as a preacher, would be of no use in a pulpit; the school simply teaches him the laws and history; his own observation of church services alone will fit and experience him to stand in the pulpit. So also in architecture, which is largely a profession of observation and experience, the boy learns theory at school or studies it up for himself, and can only gain practising knowledge by several years' actual office work.

Mr. Ireland says his school will teach a boy in two years as much as we will learn in five in an office; well—perhaps. Our offices must be funny places, for gloomy indeed is his picture of our fledglings wearing out five long weary years of their tender young lives in office drudgery, and especially foreboding is the information that after all this slavery they might have acquired as much or more knowledge in two years at an art school. I can assure Mr. Ireland that his ideas, as stated, in regard to office training, are entirely erroneous; if a youth enters a three-year office term a Science School graduate, he starts with a certain quantity of knowledge that the other lacks, who, not a graduate, takes the five-year term, which extra two years are added that he may pick up as fully as possible what the Science School one knew upon entering, and the office history of the boy runs through the whole gamut, from ignorance to proficiency, from tracing and copying during the first few months to preliminary sketches, perspective rendering, original drawings, details, designing, writing specifications and superintendence, besides becoming thoroughly familiar with all classes of materials. Five years of this in a good office will turn out a tolerably fair architect if the boy be any good. Now to this we add the O. A. A. requirements of three examinations, thus forcing the boy to systematic study and giving him a thorough test, proving that he can build strongly and well and that he is master of his materials. What more can the public demand, and are they not aware that we have been doing this very thing for several years?

We do not require to alter our Bill—all that we require is that the public throw off the shakles of deliberate blindness, study our aims, and they will grant our requests.

As one who has passed the O. A. A. examinations, I cannot urge too strongly upon all the boys to study, and study hard and pass the examinations, whether or not they intend ever to practice in Ontario; and to those who intend entering the profession, if their purse strings will admit it, I strongly advise graduation at the School of Science before taking the three-year term which is then allowed, and don't enter the lists unless from pure love of architecture, and in return the O. A. A. welcomes you.

STRATFORD, Dec. 4, 1896. DAVID GUNN BAXTER.

STAINED GLASS.

FROM A DRAWING BY N. T. LYON, OF THE CENTRAL PORTION OF A STAINED GLASS WINDOW PRESENTED BY ARCHBISHOP WALSH TO THE NEW CHAPEL OF THE SISTERS OF ST. JOSEPH, TORONTO, OF WHICH MR. JOSEPH CONNOLLY IS THE ARCHITECT.

ILLUSTRATIONS.

PRELIMINARY SKETCHES FOR PROPOSED STABLE AND COACHMAN'S DWELLING AT OAKVILLE, ONT.—MESSRS. DICK & WICKSON, ARCHITECTS.

REPRODUCTION FROM A DRAWING BY N. T. LYON, OF CENTRAL PORTION OF A STAINED GLASS WINDOW, PRESENTED BY ARCHBISHOP WALSH TO THE CHAPEL OF THE SISTERS OF ST. JOSEPH, TORONTO, OF WHICH MR. JOS. CONNOLLY IS THE ARCHITECT.

RESIDENCE FOR MR. W. R. MILLER, STANLEY STREET, MONTREAL.—R. FINDLAY, ARCHITECT.

This residence, recently completed, is a good illustration of what can be done in making an old building meet modern requirements, and by the skill of the architect such changes are often successfully carried out.

The old building, once a private stable and coach house, and belonging to one of Montreal's leading citizens, was purchased by Mr. Miller, who decided to convert it into a residence, and entrusted the work to Robt. Findlay, architect. The result has been most satisfactory, and the building is now considered one of the best residences in the city. Although so great a change has been wrought, the old foundations, a portion of the old walls, and the entrance doorway, still remain, and form part of the new building. The interior is handsomely designed and finished in the old colonial style. A handsome stable and out-buildings have also been erected within the grounds. The site is an excellent one on the mountain slope and overlooking the city.

FRENCH METHODS OF CONSTRUCTION.

In the construction of large buildings in France iron has been used to a much less extent than in America. Heretofore its use in its ordinary form has been confined to floors, partitions and roofs, where, as a rule, it is covered by a coating of cement, wood or stone, except in the case of buildings destined for brasseries or drinking halls, where the iron was left visible, and emphasized by means of painting or mosaic work. In the city of Paris, however, iron is fast finding favor for employment in combination with other materials, such as cement or concrete, and in a special form known as the cement arme system. By this method iron and steel is employed in the form of thick wire, trellis, or light bars, imbedded in cement or concrete. Three different systems of this construction have been used in various buildings of more or less importance, and are said to possess advantages when employed for floors, partitions and roofs, both as regards economy, conveniences for internal arrangements, and decorative purposes.

In a building constructed for the Society of Civil Engineers, iron and other modern materials were liberally used. The facade in this building is 100 feet long, and is built of solid stonework, the thickness of the masonry at the lower storeys being 24 inches and at the upper stories 18 inches. The body of the building is constructed of a framework of iron, the chief supports consisting of four framed iron uprights, 16 in. by 16 in., rising from the basement to the roof. The uprights are held together at the floor by iron girders, supporting the iron joists of the upper floors and the light partitions which divide up each storey.

Nearly all the stone is dressed after being put in place, which affords greater facilities for studying the general ensemble of the facade and the proper scale to be given to the mouldings and decoration. The stone is soft when first taken from the quarries, but becomes hard and durable after dressing and exposure to the air. The courtyard wall of the building is formed of light brick or metallic fillings between the iron uprights and the party walls.

The ground floor is built after the Coignet system, composed of light iron bars and cement ; the first floor and its supporting pillars and arches are constructed after the Hennebique system of cement arme ; the upper floors are formed of iron joists filled in with light supports and plaster or with terra cotta fillings between joists.

The ground floor of the conference hall, 50 x 20 ft., paved with mosaic work, will be a movable one, to be raised or lowered by an ingenious system of hydraulics, and capable of being placed in an inclined position for conference meetings or raised to a horizontal position for ball-room purposes.

The roof is lined internally with agglomerated cork bricks, and the walls of the area will be lined with opaline, a vitreous material of a bluish-white color, which will afford cleanliness and afford additional light.

ELECTRIC STONE CUTTING.

An ingenious application of electricity has recently been made in the large new Hotel Cecil, in London, Eng. After the marble staircase was put up it was found that the balusters had been placed so far apart that it was quite possible for a child to slip between them. In order to make the stairs perfectly safe it was resolved to place a brass baluster between every two marble ones. In order to do this as quickly as possible, with a minimum of noise and dirt, the use of an electric motor with flexible shaft and twisted drill was suggested. A small one-horse iron-clad motor, controlled by the operator, was used, and the holes were drilled at the rate of thirty or forty a day. They were neat and clean, with very little fracture at the edges. This method of rapid drilling is said to be likely to take a prominent place in marble working.

RECENT CANADIAN PATENTS.

The following patents, of interest to architects and builders, have recently been granted for Canada :

Hot Water Boiler—Geo. C. Morrison, Hamilton, Ont. The claim is for a vertical boiler, constructed of one seamless tubular piece having threaded or screwed ends, and faced in combination with the heads, having inner true face, to engage with end of said boiler when screwed in position, with water inlet and circulating tube or pipe, and a water heating reservoir connected by means of pipes.

Clay Mould for Sanitary Ware—F. B. Dakin, of Iberville, and C. C. Corneille, of Montreal, Que. It consists of a clay body, comprising Pennsylvania Feldspathic clay as a base, a silicious clay, English ball clay and English Cornwall stone.

Brick Kiln—John K. Caldwell, Minneapolis, Minn.

Rock Crushing and Grinding Apparatus—Kinkead Mill Company, San Francisco, Cal.

Hot Water Heater—John Barsley, Montreal, Que.

Hydrant—E. S. Manney, Montreal, Que.

Hot Water Furnace—Joseph T. Robbins, Newton, Iowa.

Metallic Lathing—Alex. R. Fordyce, Newark, U. S.

Metal Lath—D. B. Hilton, Brooklyn, N. J.

Brick-Making Machine—Frank Gutteridge, Seaforth, Ont.

Art or Process of Making Stone for Buildings—R. A Pyne, J. M. Huchins, Z. Hemphill and H. M. East, of Toronto.

Machine for the Production of Slabs of Plaster, Cement or Composition—R. W. Hitchins, Finsbury, London, Eng.

THE INFLUENCE OF STEEL CONSTRUCTION AND PLATE GLASS UPON STYLE.*

THE author of an article recently published in Lippincott's Magazine summarizes the laws of architectural design in the sentence, "form follows function," and endeavors to condense into three words what others have vainly tried to enunciate in numerous treatises and in bulky volumes on the Philosophy of Art. If it was necessary to state in a three-worded aphorism the entire law of architectural design and composition, nothing could have better suited the purpose than the words quoted above from the pen of that clear thinker and brilliant writer, Louis H. Sullivan.

Every architectural work has a "function," a purpose which has called it into being, and its success is measured by the degree of approximation to fulfilment of "function" which characterizes its "form."

From this one might infer that it is only necessary to divide into a few classes the functions to be served by architectural structures, and to determine the form best adapted to each, and thus develop an infallibly correct system of architectural design from which none may deviate without incurring the reproach of ignorance and lack of culture.

We should then have an architecture somewhat more scientific and vastly more practical, but as trite and as devoid of the interest imparted by the creative impulse as is the architecture founded upon the principle, form follows historic precedent, which stamps as barbaric every structure for which the architect has failed to provide an academically and historically correct mask and costume, and which treats as heresy an attempt to do, not as the Romans did in the year 1, but to do as one thinks the Romans might have done in the year 1896.

Returning to Mr. Sullivan's aphorism, we find that he bases it upon studies and conversations of nature which, carried a little farther, show that although the common function of all organic creation is maintenance and propagation of the various species, yet an ever varying environment has produced an infinite number of species and innumerable differences in individuals of each species.

Therefore, if "form follows function," it does not follow in a straight line, nor in accordance with a simple mathematical formula, but along the lines of curves whose elements are always changing and never alike.

If the lines of development and growth of vegetable and animal organisms are infinitely differentiated, the processes of untrammelled human thought and human emotions are even more subtile in the differences and shading of their manifestations, while the natural variations in conditions of human environment are as great as those which influence the developments of form in the lower organisms; and human work is further modified by necessary artificial conditions and circumstances.

Therefore, before accepting Mr. Sullivan's statement of the underlying law upon which all good architectural design and all true architectural style is founded, it may be well to amend it, and say: "function and environment determine form," using the words environment and form in their broadest sense.

The functions served by the work of the architect have expanded but little, and have varied still less within the limits of the historic records of architecture; nor has there been much change until the last quarter of this century in those conditions of environment which comprise the structural and decorative materials at the disposal of the architect.

The great epochs in the development of architectural style are respectively characterized by the introduction of the pointed arch and its characteristic vaultings. It is our good fortune to have inherited all that was accomplished by the many generations who lived and thought and worked in these epochs. We are still more blessed in being allowed the privilege of participating in the creation and in witnessing the birth of another epoch in architectural design, the form of style of which will be founded upon the discovery of the steel pillar, the steel beam, the clear sheet of plate glass, electric light and mechanical ventilation—all devoted to the service of functions or wants created by the greater intensity of modern life and by improved means of communication between places and men.

Probably there were those in Greece who deplored the departure from correct and historic Assyrian and Egyptian architecture which had to be made in order to originate and establish the most exquisitely finished and most fully and logically developed architectural style the world has known. And when the sturdy but gross-minded Roman used and modified Greek prototypes in accordance with his coarser and more aggressive mentality, and when, finally, he introduced the arch and the vault, and substituted for the refined and elegant treatment of the severe and regular forms inseparable from beam and lintel construction, a bold and comparatively unrefined treatment of the more irregular and picturesque forms made possible by the discovery of the arch, the new departure was certainly as displeasing and distressing to the purists and scholars of that day as were in latter days the works of those alleged barbarians whose efforts to utilize to the utmost the means and knowledge at their command, created the styles known as "Byzantine" and "Romanesque," and finally that culmination of protest against dry-as-dust tradition, the styles which scholars and men of culture derisively named after the barbarian Goths.

So, also, in our day, many of those who have been taught to understand and love and honor forms and traditions transmitted from past ages shrink from contact with the new materials and processes, and, noting the inevitable modifications of time-honored theory and practice, lift their voices in protest against legitimizing forms which are the offspring of newly-arisen functions and of newly-discovered conditions of environment.

And yet each historic style was called into being in obedience to new developments of function or environment, and each was in its day an iconoclastic innovation upon well established and firmly founded practice.

Therefore we are justified in assuming that the new conditions will exert a marked influence on architectural style in our day and in the future.

It is the duty of those, who by familiarity with the historical styles are best fitted for this task, to ascertain the creative principles and laws which underlie the architectural style of by-gone periods of greatest artistic achievement, and to apply these principles to the utilization of the means placed at the disposal of the architect of our day for satisfying the requirements of the day.

The American architect, who travels in Europe and studies the architecture of the many ages which have preceded the last century, is impressed and charmed by the freedom and naivete with which consciousness of the fact that each age is the heir of all preceding ages is proclaimed in the composition and in detail of so many structures. Nothing can be more interesting than the observation of the existence of a living vigorous style, joyous in the consciousness of life, free to assimilate the old and to create the new. Nor is it unprofitable to follow a style from the exuberance of its youthful vigor to old age and decadence, to ossification and crystallization into an inert and lifeless set of fixed and unalterable rules, into a fetich to be worshipped by future generations; in other words, into an academic historic style.

But after one has taken it all in, there is one impression stronger than all others. It is the consciousness of the zeal and earnestness of the all-pervading endeavor to so utilize all the means at command, that the form and expression of each structure might conform to its function, whether that were the worship of God or the glorification of guild or municipality; whether intended to serve the lavish display of the wealth and dignity of the great noble, or to house the humble burgher, each kind of structure has its individuality, and of these, again, each gives expression to the character and personality of its occupant.

Our generation has in many ways shown itself worthy of its heirship of so many ages, and has given expression to its appreciation of its good fortune by transmitting to the future an inheritance still more valuable than that which has fallen to its lot.

What can the architect do, that he also may prove himself worthy of opportunities so much greater than those enjoyed by his predecessors?

Human nature has limitations which circumscribe and define the attainable in literature and art. There will be none greater than Homer, than Moses, than David, than Shakespeare, than Phidias, than Leonardo da Vinci, than Raphael, than Michael Angelo; no author, no sculptor, no painter, no architect can as an artist expect to excel many who have gone before. But the architect is not only an artist, but also an engineer, a man of science and a man of affairs. In these latter capacities, the architect of to-day has at his command instrumentalities and opportunities unknown to his predecessors. Were he an artist only, the giant strides which science, and by its aid industry, communication and traffic have made in the past fifty years would leave him by the wayside, content as are his fellow-artists of the brush and chisel to admire the onward rush, to be with it, but not of it, to be dazed by its splendor and to thrive and wax fat under the patronage of those

*Paper by Mr. Dankmar Adler, presented before the American Institute of Architects.

who initiate and control the movement of modern material progress.

But architecture is not permitted to remain placidly contemplative of the march of events. The architect is not allowed to wait until, seized by an irresistible impulse from within, he gives the world the fruit of his studies and musings. He is of the world as well as in it. The world of to-day has greater need of his aid than had any previous period, and he is pressed into its service and must work for it and with it, no matter whether or not urged by the spirit within him. The world must have buildings; it will have them adapted to its wants and functions; it will insist upon the utilization of the best of the materials and processes which scientific and industrial progress place at its disposal. The architect must, therefore, fit himself for the duties thrust upon him. The world calls upon him to do the work of to-day with the tools of to-day, not as a tyro, not as one who must first learn how, but as an architect, a master worker, as one of whom the world believes that familiarity which he has acquired with the processes by which the work of other periods has been accomplished makes him better fitted for the work of to-day, and that he will press into its service all the experience of many ages and epochs.

Michael Angelo was painter, sculptor, architect, diplomat, but above all, and in all, an artist. An important factor in his greatness as an architect was his familiarity with the technique of the auxiliary and subsidiary arts, sciences and crafts, the command of which devolves upon the architect. The great Buonarotti did not disdain to learn the metal-founder's, the quarry-worker's and other crafts in order to be the better able to carry out the plans which his great mind had conceived. Were he among us now, he would be in the front rank of the experts and specialists in all the modern arts and sciences which have arisen to perplex and worry the artist-architect wedded to the traditions, processes and materials of the past. And being Master of specialties and details, he would, as General, master them all into martial array for overcoming the difficulties incident to the expanded and diversified demands which our time makes upon the architect.

Few, perhaps none of us, can be equal to Buonarotti, but all can emulate him in his zeal and capacity for hard work. We, too, can become impatient and contemptuous of the performance of auxiliaries and specialists, and dismissing them, can ourselves acquire a knowledge of the technique of their arts and sciences and crafts, and in the furnace heat of zeal and enthusiasm for the attainment of a great end, combine all that we honor in the lore and traditions of our profession with the discoveries and achievements of the science of to-day, pour all into the mould of contemporary requirements and bring forth our contribution to the architecture of the New World, the new age of steel, electricity and scientific progress.

For several years it has been the fashion among the professors of our art to decry the new materials and processes of construction, and condemn their most noteworthy applications to the service of requirements born of modern conditions. The contributions which modern science has made to our power to command and utilize the materials and forces of nature, and the increased and expanded opportunities for the creation of useful and beautiful works which modern society has given us, have been looked upon askance. And it is greatly to be regretted that some of those whose works had proved them well qualified to determine under the new environment the forms best adapted to the old, as well as the new functions, have been most persistent in their condemnatory utterances against the new problems which they themselves were so successfully solving.

What I have written is intended to be a protest against the dogma that art in architecture ended with the Renaissance, a denial of the assumption that the uses of materials and processes, and wants and functions unknown to the masters who flourished in that glorious period, or their predecessors in other eras of great artistic vigor in architecture, is incompatible with the performance of truly artistic work.

I wish to maintain that the steel pillar and beam, and other contemporary contributions to the materials and processes of building construction, that the modern business building, and many other so called monstrosities, are as legitimate contributions to architectural art as were in their day, when first introduced, the stone pier and lintel, the brick wall or pier, the arch, the vault, the roofed temple, the vaulted basilica, the spired and buttressed cathedral. All that is wanting is the will and the ability to make proper use of these newly discovered agencies.

The new materials and processes, the new requirements, should not, however, in their introduction into architecture and in their assimilation by our art, be treated as things apart and by themselves, but they should be treated as related to and part of all that has gone before in the long history of human and artistic progress.

The author of to-day has at his disposal and does not disdain to use an enlarged vocabulary; the musician has a greater range of instruments, a richer and fuller orchestration; and the great composer deems it a privilege to be able to evolve combinations of tone that were unattainable to his predecessors. And even if the painter of to-day uses the same pigments, and depicts the same phases of animate and inanimate nature, and the sculptor uses the same marble, and both painter and sculptor play upon the same gamut of human emotions, as did their prototypes for many generations, that is no reason why the architect should look askance upon new instrumentalities and new opportunities for developing and enlarging the scope of his art.

Let us, then, welcome the prosaic output of furnace and mill, and even the unpromising and garish sheet of plate-glass. If they are always used where they are wanted and as they are wanted and never where they are not wanted, nor as they are not wanted, we shall have taken the first step towards the transmutation of these utterances of scientific prose into the language of poetry and art. In the nature of things, the block of rough stone, the lump of clay, the log of timber, are all apparently as uncompromisingly unpoetic and inartistic as the much dreaded and impreciated modern intruders into the programme of architectural composition, which form the title of this paper. What they have of poetic suggestion and significance they owe to the genius of man, and what man has done, man can do. Let us not stand back and admit that we are unable to learn from our predecessors how difficulties are overcome, how victory is wrested from apparent defeat.

Yet another work. I have quoted the dictum "form follows function," and have modified it into the words "function and environment determine form."

Steel pillars and steel beams occupy so little space that in order to enclose structures of which they are the essential supporting parts, they must be furnished with a filling, if a space enclosing structure is to be erected, and steel posts and beams to be adequately protected against possible attacks of fire must receive bulky fire protective coverings. In these fillings and coverings we obtain media for artistic treatment which may be handled solely with reference to the desire to adapt "form" to "function."

From this I deduce that the influence of the new materials and processes will tend to a more free and less trammelled treatment of architectural design, and that the striving for the creation of ideally perfect form will be less hampered by limitations incident to the use of refractory materials of construction.

PERSONAL.

The death is announced of Mr. J. C. Clements, contractor, of Vancouver, B. C.

C. A. & E. W. Barber, architects and mechanical engineers, have opened an office at Rat Portage, Ont.

The firm of J. W. & E. C. Hopkins, architects, Montreal, has been dissolved, Mr. J. W. Hopkins continuing.

At the recent convention at Chicago of the American Society of Municipal Improvement, Mr. E. H. Keating, city engineer of Toronto, was elected a member of the Water Works and Water Supply Committee.

Mr. H. D. Ellis, formerly of the city engineer's staff, Toronto, has lately returned from Manitoba, where he has been engaged in the construction of 100 miles of railway from Gladstone through the Dauphin district to Lake Winnipegoosis.

Mr. E. C. Hopkins, formerly of the firm of J. W. & E. C. Hopkins, architects, Montreal, has recently formed a new partnership with Mr. E. Sainbault, certified architect, of Paris. The new firm will be known as Hopkins & Sainbault, with offices at 1,586½ Notre Dame street, Montreal.

Messrs. Heney and Borthwick, of Ottawa, have taken suit in the Exchequer Court for $15,000 for work done in connection with the construction of a drain at the Lachine Canal.

Action has been taken by Messrs. Blanshard & Norton, brick and stone contractors, against the trustees of the First Methodist Church, London, for a balance of about $7,000. The trustees claim to be holding back part of their contract price on account of the mechanics' liens placed by a sub-contractor.

STUDENTS' DEPARTMENT.

LEAD, COPPER AND ZINC FOR ROOFING.*

In attempting to compare the relative claims of each of the three metals—lead, zinc and copper—as materials for roof covering, one has first to consider what are the chief requirements for a material used for this purpose.

These may be stated in the following order: First of all, durability; then lightness; then workableness; next, capacity to resist fire; and lastly insonorousness.

Although the question of durability must be decided chiefly by experience and observation of special instances, yet something may be predicted as at least highly probable from a consideration of the texture of the metal and its liability to corrosion from acids, etc. Into this inquiry, of course, the element of weight largely enters, and I therefore take the opportunity of naming specific gravity and atomic weights of each of the three metals:

	Specific Gravity.		Atomic Weights.
Lead	11·4	Lead	207
Copper	8·8	Copper	63·5
Zinc	6·9	Zinc	65

or, taking the weight of a superficial foot 1-16 in. thick we find it—

Lead	about 3¾ lbs.
Copper	" 2¾ "
Zinc	" 2¼ "

Thus, if weight were the only consideration in this inquiry as to durability, lead would be nearly twice as durable as zinc and at least a third more durable than copper. But there is another element which must be equally considered—namely, the hardness or, rather, firmness of the material, and perhaps this property can best be indicated by the relative amount of conductivity, which in lead may be represented by 230; nearly twice as high in zinc, say 430; while in copper it is more than twice as high as zinc and more than four times as high as lead, viz., 1,000.

And the conclusion which we might derive from these figures is corroborated by those which represent the fusibility of the different metals, viz., lead, 630 deg. Fahr.; zinc, 800 deg. Fahr.; and copper, nearly four times that of lead and nearly three times that of zinc, viz., 2,143 deg. Fahr.

It thus appears that though lead is so very much heavier than the other two metals, its want of firmness is still more conspicuous, and, on the whole, roughly it might be guessed that lead and copper would, surrounding conditions being equal, be of about equal durability, particularly as neither of these metals is easily acted upon by acids.

As to zinc, although it occupies a middle place between lead and copper, both in the matter of weight and also of firmness, it is yet quite out of the competition as to durability from the fact that acids act upon it with great facility.

The softness of lead has its advantages, since it is easy to use it of great thickness, while at the same time the low price makes it possible to do this without a prohibitive outlay; so that lead may be laid of a thickness weighing perhaps 6 lbs. or 7 lbs. to the foot as easily as copper weighing only 16 oz. or 18 oz. to the foot. And at these relative weights it would be fair to assume that the metals would be about equally durable. Experience endorses these assumptions, and it is found to be practically the case that zinc, laid of the best thickness which it is worth while to use, say about 1½ lbs. to the superficial foot, will keep a roof sound from twenty to thirty years, while copper of 16 oz. to the foot, or lead of 7 lbs. form either of them a practically permanent covering lasting 100 years or upwards; that is to say, if properly laid and in favorable situations.

But the question of durability cannot be disposed of without a consideration of the property of expansion. When a zinc flat lets in water, and has to be taken up for renewal, it is often seen that the metal is not perished, but is split into cracks. The heat of the sun has so increased the size of the metal that, having been fastened by nails, or soldered together in large sheets, it has risen in buckles. When a shower of rain or a cold night has followed, the metal has contracted, and so caused the cracks. If the expansion of zinc is set down at 30, lead will show 28, and copper only 19.

In laying either of the metals care has to be taken to allow for expansion, and if the proper methods are adopted much can be done to prevent the injurious effects of it.

There is one thing to consider—viz., the capacity to bear traffic without injury. Flat roofs are very likely to be walked over, and to have things placed upon them, round or under which dirt or moisture can collect. On account of its extreme softness, lead, unless very thick, is easily damaged by traffic; and zinc, although harder, is brittle, and is also easily corroded by foreign matter; and both, as already mentioned, are exceedingly liable to buckles and cracks. Copper, on the other hand, is so tough that it is practically uninjured by traffic and little liable to corrosion. It should, however, be laid with wood rolls and welted caps, and not according to the old method of stand-up welts.

So far for flat roofs. For pitched roofs and towers or spires the great weight of lead is much against its use. In such positions lead has a way of crawling down, as it is called, and this is a very destructive process and greatly shortens its usefulness. As an instance of this I may mention that some years ago we had an order to cover the spire of St. Peter's Church, Cornhill, with copper. It was then covered with lead, which we ascertained had been laid in the year 1804.

When the lead was stripped off it was found to be very thick—some of it at least from 10 lb. to 12 lb. to the foot, and was not perished, but was very badly torn and cracked through the expansion and contraction and the creeping down in some places, and the giving way of the wood supports in others. In fact, its own weight had destroyed it.

The copper which we put on in place of it would weigh perhaps not more than one-eighth or one-tenth of the lead, and would rather tend to support the woodwork than require to be supported by it. The key which forms a sort of finial on the top of the spire was in good repair and did not require renewal—it was of copper. It is said, but I am not sure upon what evidence, that the lead on the roof of Bristol Cathedral crawled down as much as 18 in. in two years.

The extreme softness of lead makes it unfit for ornamental work. It is always necessary, when lead is being used, that the wood should first be formed into the shapes, and the lead dressed closely over these; on account of their stiffness zinc and copper do not require the mouldings and ornaments to be formed in the wood, but are sufficiently supported by a rough wood core. Zinc, however, suffers in the process of stamping and hammering, as it is seriously injured by application of heat.

Copper, on the other hand, may be heated to a red, or even a white glow, and then immersed in cold water without being in any way injured, but by this annealing, as it is called, is rendered soft and pliable, and regains its stiffness under the hammer or stamp.

On these accounts copper has come to be very much used for ornamental roofs and for spires, fleches, finials, figures, etc., for which it is also specially adapted on account of the little weight per foot which is necessary to use.

Lead has been so very largely used for roofs for many hundreds of years that it is unnecessary to quote instances as to its lasting power when properly laid on flat roofs, but as the durability of copper is not so well known, I may mention one or two examples.

The tower of the parish church of Hampstead was covered with copper in the year 1784, and the copper is still in good condition, being of a beautiful green color. Some years ago, however, in a severe gale, two or three of the sheets were blown off, and had to be replaced by new sheets, which, of course, have still the dark look. Mr. Clowser, a builder, of Hampstead, told us that his old father knew that the tower was covered with copper over 100 years ago, and the church records give the date above mentioned.

*One of a series of papers on "Roof Coverings," read before the London Architectural Association by Mr. G. Ewart.

RESIDENCE OF W. R. MILLER, STANLEY STREET, MONTREAL.

R. FINDLAY, ARCHITECT.

A few years ago we had to replace a copper flat on the roof of Somerset house. The copper itself was not perished, as may be seen by the sample which we kept. The reason it had to be replaced was that it had been laid in the old style with stand-up welts, and these had been trodden down and broken. There is good reason to believe that this copper was laid when Somerset house was built.

We have also obtained a sample of the copper on the church of St. Botolph's, which is very thin, weighing only about 14 oz. to the foot. The metal is still not perished, although probably laid when the church was built. Through the sinking of the timber it is out of repair, and this is one of many instances in which the copper covering outlasts the material of the building. A remarkable instance occurred some little time ago, which showed, at the same time, the great durability of copper and the importance of having it properly laid.

We were instructed to take the old copper off a church in Wiltshire, and were told by the architect that it had been laid 250 years ago. The flat sheets were not perished, but the standing welts were worn through. We cut the worn edges off the sheets, and relaid the same material with wood rolls, after repairing the wood work, which had rotted where the upright welts had admitted water.

Next to this paramount question of durability comes that of weight, or, we should rather say, of lightness. Here, of course, lead cannot stand comparison with either zinc or copper. Lead is so soft, and has so little coherence, that in order to make a good job, it is found necessary to lay it very thick—nearly ⅛ in. But at the same time, lead is exceedingly heavy, so that a square foot of this thickness weighs upwards of 7 lbs.; it thus happens that when allowance has been made for the necessary rolls and laps, the lead necessary to cover a square of 100 ft. weighs rather more than the slates which would be necessary to cover the same area, and at least half as much as plain tiles.

Zinc, on account of its superior firmness, is laid in the best manner at about one-fourth of this thickness and less than one-fourth of the weight, say 1½ lbs. to the foot; but then, as already mentioned, zinc cannot be relied upon to stand more than about one-fourth of the time that lead will.

With copper, however, the case is different. Here we have at least equal durability to that of thick lead, with a thickness still less than that of zinc, and a weight of only 16 oz. to the foot.

On new structures, substantially built, the question of a few tons, more or less, upon the roof, is not, I suppose of very serious consequence. Yet, even in such structures, it may be often worth while to be able safely to use lighter timbers; but for an old roof, where the supports are not too strong, a few tons, one way or the other, may make a very great difference. I may quote as an instance the flat roof of the Portman Rooms. We found this covered with lead and leaking all over. In many places the woodwork had sunk, and to cover it with lead would have been exceedingly dangerous. But a perfectly safe and a perfectly sound job was made with copper.

It is unnecessary to add that as a covering to spires, fleches, domes and suchlike erections, the comparative lightness of copper makes it exceedingly appropriate.

Coming now to the next desideratum in a roof-covering, which, for want of a better word, I have been obliged to name "Workableness," I must explain that I mean by this the possibility of being turned up with moderately sharp angles and twisted over into welts. As already mentioned, all the three metals under consideration expand and contract with changes of temperature—though copper very much less than either zinc or lead—and therefore all require some arrangement which will leave them free to expand or contract without blistering.

And then, of course, the sheets have to be somehow joined together, and the joint is to be made, if possible, without solder. For it is found that the places where soldered seams have been made perish long before the rest of the metal is worn out.

Although lead is so soft, yet on account of its great thickness it cannot be easily welted, and requires large rolls. On the other hand, its weight and softness incline it to lie close even without joints—only then, of course, it is easily displaced. Zinc, being the most expansive of the three metals, and being also more brittle than lead, requires great care in laying, and the provision of very free play for each sheet, both at the ends and sides. On this account, many drips are needed. This is sometimes very objectionable on account of the increase in height.

Copper, on the other hand, expands so little that if wood rolls are used at the sides of moderately wide sheets, the ends may be safely welted together in considerable lengths, and so few drips are necessary.

At the same time, copper is so easily worked that welts are readily made, and may be used not only to connect the sheets in lengths but also to fasten them to the roll-caps at the sides, thus making a very firm and light covering. As a fireproof material, copper is immensely the best of the three metals.

As already stated, lead melts at 630 deg. F., and, therefore, in a fire is soon poured down in a terrible stream, more dangerous than even falling timbers or bricks. Zinc melts at 800 deg. F., and blazes brightly if thrown into an ordinary coal fire.

Copper requires a temperature of 2,143 deg. F. to fuse it, and retains its shape even at a white heat.

As an example, I may mention the instance of a tower in which the woodwork was entirely consumed, while the copper covering was left standing as a hollow cone, the flames and smoke having escaped by a hole in the top. Another instance illustrating this fireproof quality is that of Mr. Stedall's Mantle Warehouse, in Portsmouth. Here the copper roof was found intact after the fire, although the building beneath it was gutted; the copper sheets had, in fact, prevented the exit of the flames and stopped the spread of the fire.

The last property I named as required in a roof-covering was Insonorousness. Here lead has the immense advantage of its exceeding softness, and the same quality of softness makes it a non-conductor of heat.

For a long time lead was almost the only metal used for covering roofs, sheet zinc being practically unknown, and the high price of copper almost prohibiting its use for buildings where economy had at all to be considered.

The introduction of sheet-zinc about sixty years ago, and a great reduction in the price of copper during the last twenty years, have altered this state of affairs.

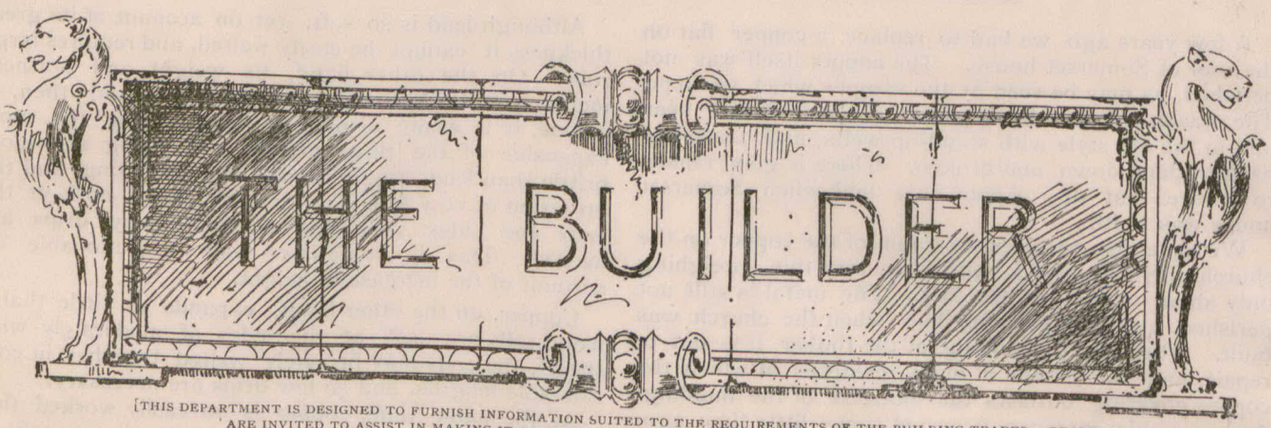
The change would have been greater still but for the fall which has at the same time taken place in the price of lead, partly on account of the improvements in the methods of separating the silver from it.

At the present market rates sheet zinc is, weight for weight, nearly twice the price of lead, and sheet copper, weight for weight, nearly three times the price of zinc, or about five times the price of lead. It is evident, therefore, that for temporary work sheet zinc is by far the cheapest metal covering, being properly used at one-fourth the thickness, while it is not quite twice the price of lead, and at the same time it has the advantage of lightness.

On the other hand, compared with copper, although it is not much more than one-third of the price, it requires to be laid at least half again as thick.

For a covering to permanent buildings zinc, for reasons already stated, is inadmissible; while copper and lead are perhaps about equally durable, so far as the metal itself is concerned.

Lead has the advantage over copper of making much less noise in driving rain or a hailstorm, but copper has perhaps still greater advantages over lead, being only about one-sixth the weight, being almost absolutely fireproof, requiring very little support in ornamental work, having only a little more than half the expansiveness under heat, and consequently requiring fewer drips. To which may be added its capacity for being easily welted, and finally the beautiful color which it takes on from a damp atmosphere after a few years of exposure."



[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.]

Hanging Doors.

In fitting a door the workman should take pains to have it clear the panel about one-eighth of an inch on one side only. It is best always to "fit" from the hanging stile side; that is, have the hanging stile fit close to the jamb, and let the space all show on the lock stile; and when it is hinged, the space should be divided, allowing 1/16″ clear on hinge side and the same on the lock side. One sixteenth space is a liberal allowance and should never be exceeded, and is only permissible when the doors are to be painted. Hardwood doors that are finished in natural wood should not show nearly this much space, but the lock stile should be bevelled slightly to allow of its inner edge to leave the jamb without striking. A door should not bind on its hinges; when closed it should remain so, even if the lock-bolt does not enter the keeper, nor should it drag on the floor or sill, or bind in the frame at any point. A door properly hung is a "joy forever," but one that is eternally striking some point in the jamb, or striking at the top or bottom every time it is opened, is a source of irritation and a corruption of good morals. In adjusting the hinges for ordinary panel doors, the proper distance to place the butts is eight inches from the top to the top of the hinge, and ten inches from the floor to the bottom of the lower hinge. If there is a third butt required, as is sometimes the case, it should be placed a little nearer the bottom hinge than the top one, as most of the labor and stress falls to the lower hinge always, and if the third butt is carried down below the centre of the door, it relives the bottom hinge materially. The lock should always be placed with its top edge on a line with the lock rail, that is, of course, if the door is one having a lock rail. Sometimes, however, as in multi-paneled outside rails there are no lock rails, in which case the workman must so adjust his lock that the spindle for the knobs will be just two feet eight inches from the bottom of the door, this distance being the correct height to place the knobs or pulls. In case there is a lock rail in the door, and the stiles of the door are narrower than ordinary, a rim lock should be used, for if a mortise lock be employed it will necessitate cutting away the tenon of the lock rail to insert the lock, a process that would destroy the strength of the door at an important point. If the stile is the full width, 472 inches, a narrow mortise lock may be used without doing much injury to the door, providing the door is well made and properly glued together. The spindle on which the knobs are fastened, should pass through the door and lock, exactly at right angles in every direction. Workmen are often very careless on this point, and their carelessness leads to trouble and annoyance as the roses cannot receive either the spindle or the knobs properly, and binding against the wood follows, and both knob and spindle after a time work loose or the lock breaks at the eye with the constant strain. As much care should be exercised in trimming a door as in hanging it, in order to make a good lasting and satisfactory job.

Repairing Roofs.

Just about this time of the year many house owners will be made aware that they cannot any longer defer stopping the leaks in their roofs. In a shingle or slate roof, little difficulty will be experienced in stopping the leak, but with a flat roof, whether covered with composition, tin or sheet iron, the trick of curing the defect becomes a serious matter, particularly if the roof is wet, as it is likely to be during the fall and spring months. It is well known that it is very difficult to solder tin or sheet iron when it is covered with moisture, and should there be any holes in the tin or iron while there is water or snow on the roof, and it becomes a necessity to stop the holes to prevent the leakage, do not attempt to solder the holes, but adopt the following method: Procure a piece of iron about three sixteenths of an inch thick of suitable length and width to cover the hole. Have a sufficient number of holes drilled in it to take No. 10 one inch screws. Countersink holes to take in head of screws. Take a piece of felt cloth; a piece of an old hat will do if you have nothing better; make it the size of the iron; soak the cloth in thick oxide of iron paint or white lead; place the cloth over the hole, then lay over this the iron and screw tight down to the roof. If water is running down the roof it may be held back by building a dam above the leak with putty, which will divert the stream until such time as the leak is repaired. A little varnish mixed with the paint will tend to make the cloth stick better at first. When these cloth patches become dry they answer better than solder, and will outlast the roof. If the flashings break away from a chimney or from a brick wall, they can be fastened by taking wire nails and putting washers on them to make the heads large and driving them through the tin into the mortar joint; then the tin can be plastered with a cement made by mixing dry sand with iron paint to the consistency of mortar; sand and paint makes an exceedingly good medicine when properly applied, for curing leaky roofs. If a leak occurs between wood and brick, or on a gravel or composition roof, a proper application of this cement will give instant relief. For repairing about chimneys this cement is unequalled. When a gravel roof is wet, it is evident it would be difficult to repair it with paint cement or

hot tar. Yet, if the roof leaks it is at this time the repairs are required. In such cases take the best Portland cement, mix with about one quarter of sand, and see that it is well mixed while in a dry state. Put in the mixture just enough water to allow of its working with a trowel—don't make as fluid as mortar—apply to the leak and "trowel" it well. As the cement will harden under water, the fact of the gravel and felt being wet will not affect its efficiency in the least.

QUESTIONS AND ANSWERS.

A CORRESPONDENT, living in Montreal, asks for information regarding "the weight of different kinds of roofing, floors, stud-partitions finished, outside walls, of wood, brick, and stone, etc.?" In answer to these enquiries, the only thing we can do is to give the weight per foot, per yard, or per square; and having these, it will be an easy matter to ascertain the weight of any given roof, floor, partition or wall.

Commencing with roofs, we find the authorities giving the following figures:—

(1) Slate Roofs: The average weight of one foot of slate laid on a roof, is 7½ pounds (Kidder). If pine, hemlock, or spruce is used for roofing boards, one square will weigh, if green, 300 pounds; if half seasoned, 270 pounds; if dry, 250 pounds (Hodgson.) In a piece of roof ten feet square, making 100 feet, there should be five rafters not less than 2″ × 6″ × 10′, each of these containing 10 feet of lumber, making a total of 50 feet, the weight of which, if dry, will be 125 pounds. This will then make the weight of one square of a slated roof, as follows:—

Slate	750 lbs.
Dry roofing boards	250 "
Dry rafters, 2″ × 6″	125 "
Total weight	*1125 lbs.
If we place building paper under the slates, we add for each square	15 lbs.
and to this may be added nails	4 "
which brings the total up to	1144 lbs.

Sometimes a layer of mortar is placed under the slates, the mortar being spread about ⅜ of an inch thick. The average weight of mortar so laid is a little over two pounds to the foot. This would add, say, 225 lbs. to the load, less 15 lbs. for paper which will not be required if mortar is used. The actual weight will then stand at

	*1125 lbs.
Nails	4 "
Mortar	225 "
Making a total of	1354 lbs.

In making calculations for the size of timbers to be employed to sustain a roof of any kind, wind pressure must not be overlooked as an important factor. A roof calculated to sustain any given load, and no provision made for wind-pressure, would come to grief with the first wind storm that struck it. The usual figures allowed to meet this contingency are 40 lbs. to the square foot, but, as a matter of fact, hurricanes, cyclones and tornados sometimes have a velocity of 100 lbs. to the square foot; but, roofs being sloping, rarely get more than a pressure of 40 lbs., which would add to the weight of the roof, under wind stress, 4000 lbs., making an actual total the bearing timber of the roof must resist, of 1354 + 4000 = 5354 lbs. per square. This, however, is not all, as provision must be made for rain and for snow. A slate roof should be made strong enough to resist a pressure of 10,000 lbs. to the square, or 100 lbs. to the square foot.

(2) Shingle Roof:—One square of shingles laid 5 inches to the weather, pine or cedar, will weigh, if dry, 125 lbs (Vogdes). According to Trautwine, it requires two pounds of 4-penny nails to lay a square of shingles; but we don't think this estimate is correct. In practice we have found that it takes a little more than 3 lbs. of nails to properly lay a square of shingles. Taking these figures as our guide, we find that the weight of a shingle roof, including roof boards, five rafters "2 × 6", and mortar laid under the shingles, to be per square:—

Shingles	125 lbs.
Dry roofing boards	250 "
Nails for roofing boards and shingles	7 "
Mortar	225 "
Total	732 lbs.

To this must be added wind pressure, also weight of snow and rain. Many architects build their roofs sufficiently strong to resist a pressure of 90 pounds to the square foot, a resistance that will prove equal to any stress that may arise.

(3) Galvanized Iron Roofs:—According to Kidder, the weight of a square foot of No. 16 guage galvanized sheet iron laid on roof, is 4½ pounds: that would equal 425 lbs. to the square, including solder, nails and battens. About 25 lbs. may be added to or taken from this figure per square, per guage, according as the iron used is heavier or lighter. The other factors are the same as for a slate or shingle roof.

(4) Tar or Composition Roofs vary in weight according to the quantity and quality of materials used; they average, however, about 200 lbs. to the square, being somewhat heavier than shingles and lighter than slates. The wood and timber work to be the same as for other flat roofs.

(5) Tin Roofs are about one-third as heavy as galvanized iron roof covering as given in the foregoing, but the formulas for timber and lumber are the same.

(6) If a roof is covered with corrugated sheet iron, the weight will be about ⅓ more than it would be if covered with flat iron of the same guage.

(7) Roofing Tiles of the ordinary kind weigh 16¼ pounds to the foot, so that a square of tiling would weigh 1625 pounds. Other factors in the roof would be the same as already exhibited in slate and other roofs.

With these figures before him, from which many formulas have purposely been avoided, the intelligent workman will have no difficulty in determining the weight of any given roof formed of the materials specified in the foregoing.

The weight of inside partition walls that are formed by 2 × 4 scantlings, lathed and plastered on both sides, plastering done in three-coat work, is reckoned to be, when the plastering is "green" or wet, about 200 lbs. per yard of surface. This, of course, means both sides, or two yards, plaster measurement. When dry, it will weigh about ⅓ less, or 133 pounds. If the studding is 2 × 6, add six pounds to these figures, and if the partition is boarded on one side, but lathed and plastered on both sides, add 18 lbs. more to the yard, and if boarded on both sides and lathed and plastered on both boarding, add another 18 lbs., making a total weight of one yard of a 2″ × 4″ partition, lathed and plastered in three-coat work on both sides, as follows:

Lathed and plastered only	133 lbs.
Boarded on one side, add	18 "
Boarded on the other side also	18 "
Total weight per yard	169 lbs.

The weight of any partition may be obtained, approx-

imately, by first finding the number of yards in the partition—one side only—and multiplying by the figures given. Example :—A partition 20 × 9 feet—what is its weight? We find the partition contains exactly 20 yards, superficial, taking one side of it only, as per rule; then 133 × 20 = 2660 lbs. Here we have 133 pounds the weight of one yard of a partition composed of 2″ × 4″ studding, lathed and plastered on both sides in three-coat work. 20 represents the number of yards, so we have 20 times 133, which gives a total of 2660 lbs.

If the work is only two-coat work, we deduct 27 lbs. from 133, making a constant of 106 lbs. Openings are to be allowed for in these calculations, and the presumption is that all the materials used are dry, and that the mortar is set and hardened. The weight of plastering on one side of a partition, or on the inside of main walls may be put down at 55 lbs. This does not include lath or studding.

A square yard of a wall formed of 2″ × 4″ scantling, 1″ boards, a layer of building paper, half-inch clapboards, lapped, and lathed and plastered inside, will weigh about 99 lbs. From this, the weight of any balloon structure may be obtained, taking care to add the weight of the sills, which, if of pine, spruce or hemlock, will weigh about 27 lbs. to the cubic foot.

The weight of ordinary floors with 2″ × 10″ joists, 1 inch flooring, and plastered ceiling under, will average per square of 100 feet, about 1000 pounds, if all the material is dry.

Brick walls are generally estimated by the number of bricks they contain, or by the 1000. Ordinary bricks, according to Trantwine, weigh about two tons per thousand, and a thousand of pressed bricks weigh two-and-a-quarter tons, therefore it is only necessary to know how many thousand bricks there are in a wall to be able to tell how much that wall weighs.

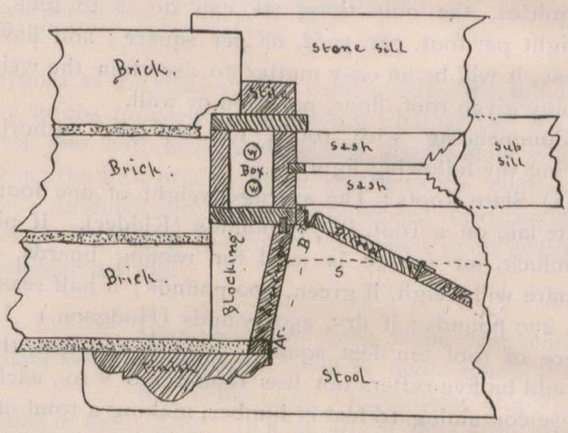
Of course, the weight of bricks will vary some little, owing to the difference in the clays of which they are made; but the little variation will not affect the figures given to any serious extent. To lay 1000 bricks requires 22½ cubic feet of mortar, and one cubic foot of mortar weighs 110 pounds, so that we find that one thousand bricks built up with good mortar weighs altogether 6475 pounds, or nearly three-and-a-quarter tons of twenty hundreds each. To this weight must be added the inside "rendering," furring, lathing and plastering.

The weight of stone-work differs with each kind of stone used. Sandstones weigh about 132 lbs. to the cubic foot, while limestones weigh 175, and some kinds of granite over 200 lbs. In laying random coursed rough quarried limestones, with good lime mortar and spalls, a solid cubic foot in the wall will weigh 190 lbs., so that a cord of stone measured in the wall at 100 cubic feet, will weigh nineteen thousand lbs. A cord of sandstone in the wall will weigh about 1000 lbs. less, while a cord of boulders or "hard-heads," whole or broken, will weigh over 21,000 pounds.

These replies cover, to the fullest extent, all the questions asked by our Montreal correspondent.

"W. S. K.," Belleville, Ont., writes: "In reply to "A Carpenter in Distress," in one of your recent issues, I send herewith a rough sketch of an economic way of preparing a window in a brick wall for inside blinds. By examining the sketch, the enquirer can see how the work is finished. The distance from A to B should be a little more than one-quarter of the width of the opening; this will permit the blinds to fit back snug without projecting into the room. The lining may be pannelled if the extra expense is no object, but when strict economy is the order of the day a plain finish may be adopted, or the lining may be formed of matched and beaded stuff.

If it is desired to run the splayed jamb lining down to the floor, this may be accomplished by putting in a stool that will project into the room no further than where the dotted lines show at S. This will make a recess in the wall under the window, which should be filled up to the stool with pannel work. If the splayed jamb lining is pannelled, a rail should be framed in at



the point where the stool S is situated, as it is not likely that the stiles would be wide enough to receive the projection of the stool.

The sketch, and this description, will, I think, relieve your enquirer from his difficulty. Of course there are many other methods of getting over this difficulty, but I know of none that answers the purpose at so small an outlay, but if any of your readers know of a better method costing no more, I, along with your enquirer, I am sure, will be glad to hear of it.

MONTREAL MASTER PLUMBERS.

The Master Plumbers' Association, of Montreal, met on Thursday, the 3rd inst., in their rooms "Salle St. Joseph," corner of Sanguinet and St. Catherine streets. The Association has accomplished much valuable work, considering its recent formation. The membership roll contains the names of ninety members. Much attention has been devoted to sanitary matters, and good results are likely to be achieved in this direction.

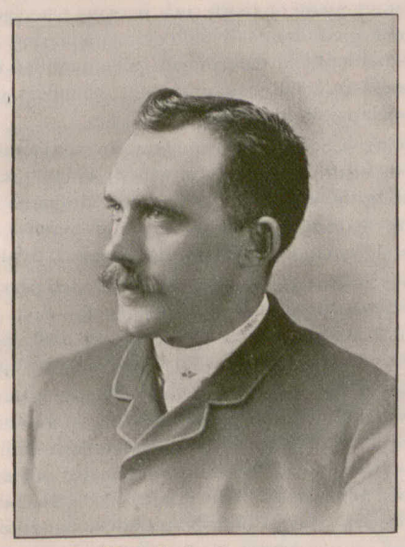
The election of officers was proceeded with after the usual preliminaries, and resulted as follows: Honorary President, John Date; President, P. J. Carroll; 1st Vice-President, Alp. Champagne; 2nd Vice-President, D. Sexton; 3rd Vice-President, Thos. Moll; Secretary, J. W. Harris; French Corresponding Secretary, C. E. Thibault; English Corresponding Secretary, G. C. Denman; Financial Secretary, J. A. Sadler; Treasurer, Jos. Gibeau. The following were chosen as chairmen of the various committees: Sanitary, H. Paddon; Arbitration, Joseph Lamarche; Auditing, E. C. Mount; Legislative, P. C. Ogilvie; Apprentice, D. Gordon.

MR. P. J. CARROLL.

Mr. P. J. Carroll, the new president, whose portrait we present, is one of the most successful and popular men in the trade in Montreal. He has risen from the

ranks to a position of prominence in his chosen line, and at present enjoys the confidence of his confreres and the public alike.

Mr. Carroll was born in Ireland 37 years ago, and at the age of 4 years was brought to Montreal by his parents, where he has since continuously resided. He was educated at old St. Laurence school, and at an early age entered into his apprenticeship under the direction of his elder brother, who had already obtained a foremost position in the trade, being at this time foreman in the shop of John Burns & Co. Mr. Carroll remained at the plumbing and steam-fitting trade with Messrs. Burns & Co. for 11 years, when he and his brother decided to embark in the business on their own account. Twelve years ago they founded the firm of Carroll Bros., but at present Mr. P. J. Carroll is the only member of the firm, his brother having died two years after the formation of the partnership. The business has prospered, and at present is one of the leading shops in the trade.



MR. P. J. CARROLL.

Mr. Carroll is a modest, unassuming gentleman, and combines with these qualities much executive ability, sound judgment and a wonderful tenacity of purpose, and under his direction we predict a most successful year for the Master Plumbers' Association of Montreal. He is to be congratulated on being unanimously called by his confreres to fill the most honorable position in their gift, and in electing him to this office they have done honor to themselves and have recognized and rewarded merit.

MEETING OF SANITARY COMMITTEE.

A MEETING of the Sanitary Committee of the Dominion Association of Master Plumbers was held at the rooms of the local association of master plumbers in London on the 3rd and 4th of December last.

The members of the Sanitary Committee are Messrs. W. H. Heard, London; M. Birch, Kingston; Walter Mashinter, Toronto; Adam Hall, Peterboro'; Adam Clark, Hamilton.

The question of uniformity of sanitary by-laws throughout the Dominion was thoroughly discussed. The advisability and necessity of a Dominion law governing sanitary construction was carefully considered, and the conclusion arrived at by the committee was that, in the interest of the public, as well as the trade, there should be a law embracing the entire Dominion, and the committee will so recommend. It was thought by some that perhaps it would be best to recommend that action be taken in Ontario as a preliminary step to getting a Dominion act. It was the opinion of the committee that the enforcement of the law should rest with the board of health, and that each local board of health should have at least one plumber as a member.

The inspection by-law was also carefully considered, and an effort made to remedy some of the defects in existing by-laws.

The committee were also strongly in favor of the appointment, in each town and city of sufficient size, of a board of plumbing examiners, whose duty it will be to advise the council or board of health on all matters appertaining to sanitary apparatus and construction, and to suggest such changes as may be necessary from time to time to keep by-laws up to date. Inspectors should be under the control of this board of plumbing examiners, who would also decide and adjust disputes arising from the operation of the by-law. The constitution of this board was also considered. This matter will come up at a subsequent meeting of the committee.

Considerable time was taken up in discussing a model specification, to eliminate as far as possible objectionable features to existing by-laws, said specification to be subject to such changes as the most modern practice and experience dictates, full consideration being given to the proposed by-law in London "To Secure the Better Sanitary Condition of Buildings."

A committee was appointed to confer with the local board of health, and it is hoped that their labors will materially aid the authorities in arriving at a satisfactory enactment.

A LONDON PLUMBING ESTABLISHMENT.

A DESCRIPTION of the plumbing establishment of Messrs. Smith Bros., London, Ont., appears in a local paper, from which we take the following: The business was established ten years ago by William and John Smith, but since the death of the latter two years ago Mr. Wm. Smith has conducted the business under the former name. He is the only plumber in the Dominion holding medals for mechanical ability, which medals are on exhibition at his shop—one being of bronze and two each of silver and gold.

The growth of the business has been such that the present premises, though large, have become too small, and at the beginning of the new year a move will be made to 265 Dundas street, where there will be three floors, 32x75 ft., instead of two floors, 16x75 ft., as at present. The show room in the rear, where plumbing apparatus will be exhibited in working order, will be the finest west of Toronto, and an undoubted credit to the city.

Mr. Smith is the inventor of an apparatus for testing plumbing work, to prove whether the sanitary part of the plumbing in buildings is perfect or not. To show the standing he enjoys among those of his own craft it may be mentioned that he is the vice-president for Ontario of the Plumbers' Association of the Dominion.

In modest houses, where repapering cannot be done often, all papers should be of the quiet sort, with indistinct figures and good, clean, clear tones of colour. Any decided design, such as stripes, or formal, conventional figures, is apt to pall upon the eye before the paper can be renewed.

PROPOSED LEGISLATION AFFECTING PLUMBING AND DRAINAGE.

We are permitted to print below a copy of a proposed act which has been drafted by Mr. W. J. Burroughes, of Toronto, the object of which is to secure the registration of master plumbers and the supervision of plumbing and drainage in the cities of Ontario. The bill will in all probability be presented at the next session of the Ontario Legislature, when it is hoped to secure its adoption. Mr. Burroughes has not yet submitted the bill to the city authorities or to the Ontario officers of the Master Plumbers' Association, and it is not unlikely that some slight amendments will be made thereto before presentation.

A perusal of the different sections leads one to the conviction that the desired legislation will be favorably received, inasmuch as the objects sought are largely for the protection of the general public, who suffer as the result of defective plumbing and drainage. Under the present conditions any person is permitted to undertake plumbing work without producing proof of qualification, and consequently much inferior plumbing is allowed to be placed in buildings, which, besides endangering the lives of the inhabitants, sooner or later requires to be renewed at a large expense to the owner.

The proposed bill is entitled "An Act to Secure the Registration of Plumbers and the Supervision of Plumbing and Drainage in the Cities in the Province of Ontario," and reads as follows :

1. Within ninety days after the passage of this act it shall be the duty of the mayor of each of the cities of this province to appoint a board for the examination of plumbers for such city, where such board shall act, to be known as the "examining and supervising board of plumbers and plumbing." Such board shall consist of five persons, of whom two shall be employing or master plumbers of not less than ten years' experience in the business of plumbing, and one shall be a journeyman plumber of like experience, and the other members of said board shall be the chief inspector of plumbing and drainage of the board of health of such city, and the chief engineer having charge of sewers of said city ; but in the event of there being no such officers in such city, then any two other officers having charge or supervision of the plumbing, drainage or sewerage, whom the mayor shall designate or appoint, or two members of the board of health of such city having like duties or acting in like capacities. The term of office of the master and journeymen plumbers first appointed under the provisions of this act shall be as follows :

One shall be appointed for one year, one for two years, and one for three years, their terms of office to expire respectively one two and three years from and after the thirty-first day of December of the year in which such appointments shall be made, and the mayor, in making the first appointments, shall for each one so appointed specify the duration of the term of office to which he makes said appointments respectively, and annually thereafter upon the expiration of the term of office of any such member of the board, his successor shall be appointed by the mayor for the term of three years or until a successor shall be appointed, and the mayor shall have power to fill any vacancy caused in such board of examiners by the death, removal, inability to act, resignation or removal from the city of any member thereof, and such appointment shall be for the unexpired term.

Such chief inspector of plumbing and drainage, and such chief engineer in charge of sewers or the officers holding equivalent positions or acting in like capacities designated or appointed by the mayor as herein provided, shall be deemed to be also ex-officio members of such examining board, and when they shall cease to hold the offices by reason or on account of which they were so designated or appointed, their successors shall act on the examining board in their stead.

2. It shall be the duty of such ex-officio members of the board of examiners to discharge their duties as members of this board without compensation therefor. The master and journeymen plumbers serving as members of such board shall severally be paid at the rate of five dollars per day for each day's services when actually engaged in the performance of the duties pertaining to the office, but such compensation shall not exceed the sum of five dollars per month in cities of one hundred thousand inhabitants or less, nor the sum of ten dollars per month in cities having a population of over one hundred thousand and less than three hundred thousand.

3. All the members of such board shall be citizens and actual residents of the city in which they are appointed.

4. The several boards of examiners constituted under this act shall have power and it shall be their duty :

(1.) Meetings.—To meet at stated intervals in their respective cities ; they shall also meet whenever the board of health of such city, or the mayor thereof, shall in writing request them so to do.

(2.) Examinations.—To have jurisdiction over and to examine all persons desiring or intending to engage in the trade, business or calling of plumbing as employing plumbers in the city in which such board shall be appointed, with the power of examining all persons applying for certificates of competency as such employing or master plumbers, or as inspectors of plumbing, to determine their fitness and qualifications for conducting the business of master plumbers or to act as inspectors of plumbing, and to issue certificates of competency to all such persons who shall have submitted to and passed a satisfactory examination before such board, and shall be by it determined to be qualified for conducting the business as employing or master plumbers or competent to act as inspectors of plumbing.

(3.) Plumbing Code.—To formulate, in conjunction with the local board of health of the city in which it shall act, a code of rules regulating the work of plumbing and drainage in such city, including the materials, workmanship and manner of executing such work, and from time to time to add to, amend or alter the same.

(4.) Fees.—To charge and collect from each person applying for examination the sum of five dollars for each examination made by said board, and such moneys to be paid monthly to the treasurer of such city in which said board shall be appointed.

5. Any person desiring or intending to conduct the trade, business or calling of a plumber or of plumbing, in any of the cities of this province as employing or master plumber, shall be required to submit to an examination before such board of examiners as to his experience and qualifications in such trade, business or calling; and after the first day of March, eighteen hundred and ninety-seven, it shall not be lawful in any city of this province for any person to conduct such trade, business or calling, unless he shall have first obtained a certificate of competency from such board of the city in which he conducts, or proposes to conduct, such business.

6. On or before the first day of March, eighteen hundred and ninety-seven, every employing or master plumber carrying on his trade, business or calling in any of the cities of this province shall register his name and address at the office of the board of health of the city in which he shall conduct such business, under such rules and regulations as the respective boards of health of each of the cities of this province shall respectively prescribe, and thereupon he shall be entitled to receive a certificate of such registration, provided, however, that such employing or master plumber shall, at the time of applying for registration, hold a certificate of competency from an examining board ; but such registration may be cancelled by such board of health for a violation of the rules and regulations for the plumbing and drainage of such city duly adopted and in force therein, after a hearing had before said board of health, and upon a prior notice of not less than ten days, stating the grounds of complaint and served upon the person charged with the violation of the aforesaid rules and regulations ; but such revocation shall not be operative unless concurred in by a majority of the local board of examiners.

And after the first day of March, eighteen hundred and ninety-seven, it shall not be lawful for any person to engage in, or carry on the trade, business or calling of an employing or master plumber in any of the cities of this province unless his name and address shall have been registered as above provided.

7. Within sixty days after the organization of such examination board in any of the cities of this province, the local board of health, or the commissioner or commissioners of the board of health or the health department thereof, as the case may be, shall detail, designate, or appoint for the purposes of this act and the enforcement of the provisions thereof and the work of inspecting the plumbing and drainage of buildings, in said city, an inspector or inspectors of plumbing, subject, however, to the provisions or limitations of existing laws regulating the appointment of inspec-

tors by such commissioner or commissioners or board or department of health of such city.

But all inspectors of plumbing so detailed, designated or appointed, and all inspectors of plumbing hereafter appointed, shall be practical plumbers not engaged directly or indirectly in the business of plumbing during the period of their appointment; and they shall be citizens and actual residents of the city in which they are appointed, and before entering upon the discharge of their duties as such inspectors each shall be required to obtain a certificate of competency from said examining board. They shall be entitled to receive compensation not exceeding five dollars per day for each day of actual service, to be fixed by the board, commissioner or department making such appointment.

8. The duties of the inspector or inspectors of plumbing appointed under the provisions of this act, in addition to the duties prescribed by law, and those which may be enjoined or required by the commissioner of health, the board of health or the health department of the city in which they shall be appointed, shall be, to inspect the construction and alteration of all plumbing work performed in such city subsequent to the passage of this act, and to report in writing the results of such inspection to the said commissioner of health, or the board of health department of their respective cities; they shall also report in like manner any person engaged in or carrying on the business of employing plumber without having the certificates hereinbefore mentioned.

9. All certificates of registration issued under the provisions of this act, and all licenses authorizing connection with street sewers or water mains, shall expire on the thirty-first day of December of the year in which they shall be issued, and may be renewed within thirty days preceding such expiration, such renewals to be for one year from the first day of January in each year.

10. Whenever any inspector or other person reports a violation of any of said rules and regulations for plumbing and drainage, or a deviation from any officially approved plans or specifications for plumbing and drainage filed with any board or department, the local board of health shall first serve a notice of violation thereof upon the master plumber doing the work, if a registered plumber. Such notice may be served personally or by mail, and if by mail it may be addressed to such master plumber at the address registered by him with the local health board; but the failure of a master plumber to register will relieve any board of health from the requirement of giving notice of violation. Unless the violation is removed within three days after the date of serving or mailing such notice, exclusive of the day of mailing or serving, the board of health may proceed according to law.

11. From and after the first day of March, eighteen hundred and ninety-seven, the plumbing and drainage of all buildings, both public and private, in each of the cities of this province, shall be executed in accordance with the rules and regulations adopted by the local board of examiners in conjunction with the board of health for plumbing and drainage; and all repairs and alterations in the plumbing and drainage of all buildings heretofore constructed shall also be executed in accordance with such rules and regulations, where the board of health shall have control, but this section shall not be construed to repeal any existing provisions of law requiring plans for the plumbing and drainage of new buildings to be filed with any local board of health and to be previously approved in writing by said board of health, and to be in accordance therewith, except that in case of any conflict between such plans and the rules and regulations of the board of examiners, the latter shall govern.

12. Each of such boards of examiners shall have power to procure suitable quarters for the transaction of business, to provide the necessary books and stationary, and to employ a clerk to keep such books and record the transactions of such board. The board of control and apportionment of the city of Toronto and the common council of all other cities, shall annually insert in their tax levy a sufficient sum to meet the expenditures incurred under the provisions of this act; and all expenses incurred by the several boards of examiners in the execution and performance of the duties imposed by this act shall be a charge on the respective cities, and shall be audited, levied, collected and paid in the same manner as other city charges are audited, levied, collected and paid.

13. Any person violating any of the provisions of this act, or any rules or regulations of the board of health, or of the board of examiners in any city regulating the plumbing and drainage of buildings of such city, shall be deemed guilty of a misdemeanor, and upon conviction, if a master plumber, shall, in addition, forfeit any certificate of competency or registration which he may hold under the provisions thereof.

14. After the passage of this act the commissioner of public works of any city, or the officer or officers acting in a like capacity in any of the cities of this province, and having charge of the sewers and water mains, shall not issue a license to anyone to connect with the sewers or with the water mains of such cities unless such person has obtained and shall produce a certificate of competency from the examining board of such city hereby created.

15. All acts or parts inconsistent with or repugnant to the provisions of this act are hereby repealed.

16. This act shall take effect immediately.

NATIONAL ASSOCIATION OF MASTER PLUMBERS.

THE following is a copy of the resolutions adopted by the Dominion Association of Master Plumbers to confine the sale of plumbing supplies to those legitimately engaged in the trade:

Whereas, The manufacturers and wholesale dealers in plumbing material are selling to consumers, to our injury and detriment, placing us toward our customers in the light of extortionists, causing endles trouble; and

Whereas, The system of protecting us from this wrong which draws in its wake other wrongs, is ineffective, it is absolutely necessary to perfect such a system by united action which will remove these evils from which we have suffered for years; therefore be it

Resolved, That the members of this association confine the purchase of plumbing material to manufacturers and wholesale dealers who sell goods to master plumbers only, as defined in these resolutions;

Resolved, That this association shall keep a record of all journeymen and plumbers, who place in buildings plumbing material bought by consumers of manufacturers or dealers;

Resolved, That a committee be appointed by this association in every province and county for the purpose of reporting to the proper officers at its head in the province, any violations of these resolutions;

Resolved, That these measures are just and necessary to our welfare, and a rigid enforcement is demanded;

Resolved, That this convention endorse the above, and are authorized to adopt a uniform system of protection for the trade over their entire jurisdiction;

Resolved, That it is not the intention of said resolutions to prevent the interchange of patented or any other plumbing material between manufacturers and wholesale dealers in such goods, or for the export trade, and that the interpretation of the above resolutions be left in the hands of the executive committee with power.

INTERPRETATION OF THE TERM "MASTER PLUMBER."

Resolved, That it is the sense of this convention that in the future the interpretation of the term "master plumber," as set forth in the above resolutions, to entitle him to purchase plumbing material, be construed to mean a master plumber who has an established or place of business and represents the industry of plumbing, and who has qualified under the dominion, provincial or local enactments regulating plumbing and plumbers, where such exist; or, where no license is required, an individual or firm with an established place of business and representing the industry of plumbing;

Resolved, That any manufacturer or dealer in plumbing material furnishing net prices, or any discount from list prices to others than master plumbers, either by themselves, employees, or agents, shall be considered as dissapproving the above resolutions;

Resolved, That the supply houses doing a plumbing supply business, and contracting for plumbing work, shall be considered unjust competitors.

The following are exempt from the above resolutions:

The dominion and provincial governments, mines, and street railway companies.

Provincial and city institutions.

Railroad, gas, water and electric light companies only for such goods as are necessary for their respective lines of business.

The above resolutions apply to the whole Dominion of Canada.

A NEW FLOORING MATERIAL.

THE name of papyrolith is given to a novelty in flooring material which has lately been invented by Otto Kraner of Chemnitz, the article being a special preparation of paper pulp, which is in the form of a dry powder; when mixed with water it may be spread like mortar over stone, cement or wood, where it dries quickly and may be smoothly planed, besides which it may be tinted almost any color, in this way adapting it for parquetry with variegated borders, or for panels and mosaics. Among the various advantages claimed by the inventor for the use of this product are freedom from crevices, deadening of noises and poor conduction of heat, also considerable elasticity, safety from fire and remarkable durability. It may be employed too, for wainscoting and other architectural purposes, as well as for flooring.

USEFUL HINTS.

"Double-boiled" oil is that which has reached a temperature great enough to scorch a feather when held in it, and reaching about 300 degrees C.

Yellow and orange chromes have a tendency to rapidly blacken, as in the case with white lead, when exposed to sulphur gases, or when mixed with pigments containing sulphur and arsenic sulphide.

A correspondent asks a European exchange: "How are old stones best treated which are covered with soot? They are to be painted with a light color." The answer was: "If the soot is from wood smoke, it is best removed by the use of caustic lye soda or calcined ashes (1 pound to 8 pints of rain-water); otherwise, by means of soap lye."

The only safe way to obtain a perfectly harmonious contrast in colours is to apply them, when mixed, to the actual position they are to occupy when the scheme of decoration is completed. A series of colours that may look well indeed when used in a dimly lighted room will often appear very objectionable when exposed to a brilliant light.

A very simple remedy to remove rain spots, or such caused by water soaking through ceilings, has been employed with good results. Take unslaked white lime, dilute with alcohol, and paint the spots with it. When the spots are dry—which ensues quickly, as the alcohol evaporates and the lime forms a sort of insulating layer—one can proceed painting with size color, and the spots will not show through again.

The property which gives linseed oil its special value as a paint oil is that when exposed to the air it gradually becomes hard, and dries up, in doing which it takes from the atmosphere a large proportion of oxygen, forming a new compound of a resinous character, the properties of which have never been fully investigated. In this power of combining with oxygen, linseed is distinguished very markedly from other oils, which have little or no power of combining with oxygen.

A very pretty effect has been obtained in the hall of a Brooklyn residence by hanging the walls with an Empire pattern lincrusta, the ground work of which has been painted a dull blue green, while the wreaths and flambeaux that are repeated at regular intervals upon it have been picked out with a pale Nile green. The ceiling has been tinted a greenish white, and upon it a simple fresco border has been painted, repeating the Empire flambeaux in the corners. The old-fashioned wood work, classic in its design, and the white enamelled balusters with the polished mahogany handrail, harmonize very nicely with the decoration of the walls.

RECIPES FOR WATER-PROOF GLUE.—Water-proof glues, often used for pasting, but more frequently as a medium for colors, may be prepared in the following ways, according to the requirements of the case or the desire of the user: The glue is put in water till it is soft, and subsequently melted in linseed oil at moderate heat. This glue is neither affected by water nor by vapors. Dissolve a small quantity of sandarac and mastic in a little alcohol, and add a little turpentine. The solution is boiled in a kettle over the fire, and an equal quantity of a strong hot solution of glue and isinglass is added. Then filter through a cloth while hot. Water-proof glue may also be produced by the simple addition of bichromate of potash to the liquid glue solution, and subsequent exposure to the air. Another way is by mixing glue as usual, and then adding linseed oil in the proportion of 1 part oil to 8 parts glue. If it is desired that the mixture remain liquid, ½ ounce of nitric acid should be added to every pound of glue. This will also prevent the glue from souring.

The Council of Arts and Manufactures of Montreal, has appointed Mr. G. A. Monette, architect, Professor of Architecture of these classes.

The offices of the Prismatic Glass Co., of Toronto, have been removed to 65 Yonge St., where commodious show-rooms have also been fitted up.

Edward New has established an industry for the manufacture of fire-brick and fire-clay at Hamilton, Ont. The fire-brick has been tried in the west end pottery kilns, and is said to have proved a success. Mr. New has had the products patented.

A deputation of hardware merchants recently made request of the Tariff Commissioners that the classification of hardware for customs purposes be simplified. Builders' hardware, upholsterers' hardware and saddlery hardware are all under different duties, ranging from 20 per cent. to 35 per cent., and very much mixed. Workmen's tools are 35 per cent., builders' hardware 2½ per cent., tapes 25 per cent., picks 35 per cent., sledges and crowbars 30 per cent., adzes and axes 35 per cent. An ad valorem instead of a specific duty on building paper was suggested.

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