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—THE—

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NOTWITHSTANDING the great advance in the price of iron, its use in building grows with rapid pace. It is estimated that the Carnegie Company has contracts on hand at present aggregating almost 1,000,000 tons of structural material, and no further contracts for delivery before three months can be accepted.

THE building permits granted in Toronto for August amounted to $95,215, as against $94,550 for the corresponding month of 1894. The total permits issued for the first seven months of the year were $1,094,065, and for the same period in 1894 they amounted to $774,895. This substantial increase is due largely to the re-building necessitated by the fires of last winter, but we believe there is a steady growth and that the city is slowly recovering from the disastrous effects of the boom.

BY the merest accident the cause of an acoustical defect, which had been attributed to faulty construction, was recently discovered in Trinity Church, Pittsburg, Penn. A magnificent organ had proved a disappointment, there being a lack of volume and a slightly muffled effect. This was ascribed to the position of the organ. It recently happened that the church was undergoing a thorough repairing and cleaning. The ingrain carpet and padding had been taken up. It was then noticed that the volume of sound from the organ was increased and that the muffled sound had entirely disappeared. The cause was thus, to the surprise of all, discovered to be in the carpet. It is probable a narrow strip of matting, or tiles, will be substituted for the carpet in the aisles. Perhaps the reason of defective acoustics in other buildings may be found to arise from a similar cause.

TWO native Canadians have just distinguished themselves and their country by their success in the competition for prizes offered for the best plans for two bridges over important waterways in the United States. Mr. Charles Macdonald, son of W. S. Macdonald, Esq., of Gananoque, of which town the former is a native, has won the prize for a design for a great railway bridge across the Hudson, between New York and Jersey City, to cost in the neighborhood of $25,000,000. The bridge will be shorter than the Victoria bridge at Montreal, and others in Europe and America, but it will surpass them in that it will have a single span of 3110 feet from one pier line to the other, which is nearly double the longest existing span in the world. It will be 125 feet wide, with six tracks, and is designed on the suspension plan, with steel towers 557 feet in height, and 12 cables supporting steel trusses, which rise 200 feet above the roadway. Mr. Andrew Onderdonk, the well-known contractor, is said to be associated with Mr. Macdonald in a company which will undertake the construction of the bridge, as soon as certain necessary preliminary arrangements are completed. Mr. Macdonald has already distinguished himself as a bridge engineer in Australia, and occupies the position of vice-president of the American Society of Civil Engineers. The other Canadian referred to is Prof. J. G. L. Waddell, a native of Port Hope, a noted bridge builder, and author of one of the best treatises

on the subject. Some years ago he was appointed Professor of Engineering in the University of Tokio, Japan, but subsequently returned to the United States, where he now practises his profession. The bridge for which he has prepared the successful plans is to cross the Missouri river.

WIRE nails have to a very large extent supplemented cut nails for building purposes. Many carpenters and builders, however, declare that wire nails for shingles are a failure. Their life is not more than six or seven years, or even less where large quantities of soft coal are burned, or near the sea. Along the Atlantic Coast copper or galvanized iron nails are taking the place of wire nails for shingles. The blame for leaky roofs may not lie so much in the shingles as in the nails.

THERE is a city by-law in force in Toronto, limiting the area in certain classes of building, without a fire wall, to 4,000 square feet. There is some difference of opinion as to the wisdom of such a law. As a precaution against fires it is well to have it, while on the other hand, it restricts the size of large shops at the expense of appearance and convenience. As a matter of fact, the law is set at defiance in many cases. We could point to buildings now being built or re-constructed in which much larger areas than the law allows, without fire walls, are found. Buildings of larger area should at least be fire proof. While the law is there it should be enforced. If it is objectionable let it be repealed, but it is not right that it should be ignored. Is it not the duty of the building inspector to see to this?

AMONG the papers which were read at the recent meeting of the Medical Health Association for Ontario, was one by Mr. H. J. Bowman, Town Engineer, of Berlin, Ont., on the "Possibility of Simple and Safe House Plumbing." Mr. Bowman's paper is in the nature of a review of the by-law attached to the Medical Health Act of 1884, which by-law is in force in all municipalities where it has not been superseded by one of their own. Having been passed so long ago, it is defective in some respects, in the light of fuller knowledge on sanitary questions and improved methods of plumbing, and Mr. Bowman points out a number of ways in which it should be altered, which will probably be done at the next session of the Ontario Legislature. The paper is a valuable one, and we shall endeavor to publish it in full in a future issue.

IMPROVEMENTS IN HOUSE DRAINAGE.

IN a paper read at a meeting of the Architectural League, Mr. Gerhard, C. E., Consulting Engineer for Sanitary Works, brought out a number of points relating to improved methods of house drainage in America. Some of these it will be of interest to note.

At the outset Mr. Gerhard refers to a noticeable improvement as to drainage plans. The practice has been to indicate the location of plumbing fixtures on the floor plans, but beyond this to give very little information. In consequence of the plumbing laws which have been enacted, it is now the custom to prepare a special drainage plan, on which the drainage and soil pipes are shown in detail, with size, and all other information necessary to enable contractors to make their estimates in an intelligent way. The workmen are assisted in that they can find by reference to the plans where the pipes are to be run, and architects and building superintendents are saved, because they do not require to spend so much time at the buildings and in answering questions. Well considered drainage plans are therefore of great assistance, especially in the case of large and important structures. The same holds true as to plumbing specifications. When too general in their character the result is that the estimates for the work run widely apart. The more detailed and accurate they are the closer will the figures be, and the more will the finished work conform to the expectations of the architect and his client. Extras will be avoided, at least the extras which the architect finds himself compelled to order on account of omissions in the original specifications. Mr. Gerhard condemns the use of the printed blank specifications of the building department, which, while convenient and labor-saving for the department, are not sufficiently detailed for anything but small buildings, or simple warehouses.

Turning to the question of material, Mr. Gerhard condemns the use of earthenware pipes, and commends the practise of using the same grade of pipe for the soil, drain and vent pipe systems of any building. In some cities the use of extra heavy pipe is compulsory, and Mr. Gerhard approves of it being so, and he further suggests that, in order to guard against sand-holes or imperfect seams, only pipes and fittings should be used which have been tested by hydrostatic pressure. He further advocates the more extensive use of screw-jointed wrought iron pipe for drainage, more especially in the case of high buildings. Architects and plumbers are coming to look with more favor on this class of material. Protection against rust at the joints is provided for by the use of coal tar or hot asphalt, or by the application of a process which renders the pipes rustless, or galvanized pipe may be used. The use of drawn lead and brass traps, instead of cast lead and lead with hand made seams, is commended.

Mr. Gerhard next refers to to the improvement as to the size of drains, commending small-sized pipes in preference to large ones, so long as they are of sufficient size to do their work. Two small drains are preferable to one large one, the reason being that the smaller sizes are better self-cleaners. An instance is given where a large building in New York, with 205 wash-basins, 24 sinks, 52 urinals, 62 water-closets, all the roof water, and other wastes, are carried off by two six-inch pipe sewers, with a fall of one-fourth inch to the foot. We presume many architects will not agree with Mr. Gerhard in this matter, but he has given the subject much study and his opinion should be worth something. The same principle he applies to soil and waste pipes, which are made smaller than formerly.

As to the method of laying drains, Mr. Gerhard condemns the practise of burying the pipes in the ground. Rather, he says, incase them in concrete, with man-holes at suitable intervals for examination or cleaning, but he favors the plan of suspending them from the ceiling or fastening them to the cellar wall.

Another point of improvement is the non-separation of bath, lavatory and sink wastes from water-closet and soil pipes. The double system is complicated and expensive, without corresponding advantage, and was the former practise in England, whence it was introduced to America. It was also the practise to have separate soil pipes from the baths and water-closets of each floor, making a complication of plumbing, with added expense. The tendency now is to simplify as much as possible, to group plumbing fixtures, and to concentrate the drainage in a single line of pipe, thus securing a well flushed line and economy in construction.

The common-sense system of open plumbing is highly commended by Mr. Gerhard. How the old plan of placing the pipes in a house under floors, behind plaster walls, and in other out-of-the-way places, where they were quite inaccessible in case of accident, ever came to be adopted seems incomprehensible.

Mr. Gerhard sees a great advance in the methods of house drainage adopted during the past ten years, and while we can recognize what has been done in the way of improvement, we must all admit that there is much room yet, before we reach a full conformity with the laws which nature has laid down for us in such matters.

PERSONAL.

Mr. W. A. Langton, architect, of Toronto, will leave for England in a few days. Mr. Langton has promised to give the ARCHITECT AND BUILDER the benefit of what comes under his notice in relation to architectural subjects.

Messrs. Arnoldi & Calderon, architects, of Ottawa, recently dissolved partnership. Mr. Arnoldi has just formed a new partnership with Mr. J. A. Ewart, under the style of Arnoldi & Ewart. Mr. A. M. Calderon is practising on his own account at new offices, 45 Elgin street.

Congratulations are in order for Mr. Sproat, of the firm of Darling, Sproat & Pearson, architects, of this city. An announcement in the marriage columns of the papers is the cause. On the 14th of August he led to the altar Miss Annie E. Harris, daughter of Mr. John Beverly Harris, of Tyndall avenue. The ARCHITECT AND BUILDER joins in best wishes.

Mr. Richard Dinnis, contractor for the carpenter work on the new court house, Toronto, met with an unfortunate accident recently which will lay him up for some time. He was driving along Front street with his little grandson and a servant, when a runaway horse dashed into his buggy and overturned it, throwing the occupants out. Mr. Dinnis suffered a dislocation of the shoulder and some severe cuts. The little boy was not seriously injured and the servant escaped unhurt. Mr. Dinnis is one of our oldest builders, having been in the business some forty years, and has numerous friends, who hope he will soon recover from the effects of the accident.

LIFTING A ROOF.

How a New Story was Added to a School-House.—Raising and Moving Buildings.

SOME time ago the Board of Public School Trustees in Toronto found it necessary to provide more school accommodation in Parkdale. They had a good school-house, known as the Queen Victoria, which they wished to enlarge, but how best to do it was the question. It was 115ft. × 57ft. in size, two storeys high, with a brick addition 57 × 57 in rear. After consulting an architect it was decided to lift the roof, and build another storey, and the services of I. Wardell & Son, who make a specialty of such work, were called into requisition. They agreed for $800 to raise the roof, and replace it on the building after the new storey, 14 feet in height, had been added. The accompanying illustration, with a brief description, will show how it was done.

The roof of the addition was sawed off in line with the brick wall of the main building. The floors were shored from the basement up with stout timbers. Timbers were set in and needle beams put under the plates. A strong scaffold was built on the upper floor, on which the jack screws were to be worked. As the stone and brick pediments were to be lifted with the roof, needle beams, 12 × 14, were placed under them. Fifty-five jacks were employed to lift the main roof and 24 the addition. The jacks were the ordinary bottle jack, except those at the four corners, which were of the pattern known as anchor jacks. The roof was raised 6 feet, 13 men being employed to work the jacks. The joists for the new floor were then put in, and the jacks placed on them. The roof was raised 8 feet more and the brick wall for the new storey built up, when the roof was eased down till it rested upon the wall again.

PROCESS OF RAISING THE ROOF, QUEEN VICTORIA SCHOOL, PARKDALE.

As the roof, when resting on the jacks, would be liable to sag in the centre, provision had to be made for such a contingency. Two principles run from end to end of the building. They are about 115 feet long, and are 12×14 in size, built up of 2×14 joist. They were fastened together with a tie timber at each end to keep them in place, and 16 jacks, on a scaffold in the hallway in the centre, raised them simultaneously with the jacks around the outside.

The upper part of the tower with its roof was raised at the same time. It was supported on frame work, which rested on timbers suspended by chains from the plate. Two guy ropes served to steady it. To guard against the roof being dislodged by the wind while the work was in progress, purchase screws were attached and made fast to the joists of the first floor. The purchase screws were let out as the roof went up.

So well were operations carried out that the plaster of the ceiling was not cracked. It was considered advisable subsequently to remove it and substitute a metal ceiling.

The whole job was completed within 21 days from the commencement of operations. Not an accident or hitch of any kind occurred.

Wardell & Son, who carried out this job so successfully, make a specialty of raising and moving buildings, and have performed some clever feats in this line. Their most risky undertaking was at Kemp's Stamping Works near the Don. The factory stands on a side hill, and they underpinned it and held it up while the old foundations were removed and two new storeys built under. Work in the factory went on as usual all the time. The building is of brick, about 200 × 40 feet, and contains some very heavy machinery. So hazardous did the undertaking appear that some men declined to work on it, but it was successfully carried out without accident.

Last winter the same firm moved the hotel at Hanlan's Point 400 feet from where it formerly stood, and raised it with 100 jacks, so that a new storey could be built under it.

When the new water-front was made along the Esplanade they moved 13 buildings out to the new line, including the club house of the Argonauts. The latter was lifted on scows and floated to its new position. It was a difficult and risky operation, but was successfully accomplished, during the early morning, when the wash of passing steamers would not interfere with the work. They frequently remove brick and stone buildings from where they stood and turn them around so as to face in a different direction.

The firm consists of Mr. I. Wardell, an old wrecker, and his son. The senior member has been engaged in the business for some 40 years, the junior for 14 or 15 years, during the last 7 or 8 years of which he has been a partner.

LIME COMBINE.

THE Manitoba Grey Lime Burners' Association has been organized. The association comprises the lime-burners of Stonewall, Stony Mountain, St. Andrew's Parish, Gonor, East Selkirk and Tyndall. There is a local society at each point. Each member is bound not to sell lime unless he receives an order from the local secretary, who first receives it from the head secretary in Winnipeg, who divides the sales proportionately among the different localities. The price of lime has been raised to 18c. a bushel. All the burners in the Tyndall district, except one, have joined the association, and Mr. James Pruden is now burning a kiln to fill the first order sent him.

AN electric storm and cyclone visited Kingston on the 11th inst., wrecking the cotton mill badly and destroying much of the machinery. The water pipes were twisted and broken and the mill flooded. It will cost about $80,000, and take a month to repair the damage. The erecting shop of the K. & P. railroad was also wrecked.

THE ADVISABILITY OF THE REGISTRATION OF ARCHITECTS.

WITHIN a short time I have heard read two suggestive papers upon the architecture of the past in America—one being merely a resume of the records of the Boston Society of Architects from its formation in 1867; the other an account of the methods of the layman in New England and probably elsewhere of obtaining architectural service in the early forties and fifties. The records of the society showed a small body of earnest men dealing with comparatively small things, that is to say, with things small as compared with the buildings of to-day; there was a freshness, a *naivete*, about these records that caused a smile upon the faces of the men who had made them thirty years ago in their youth, and who were sitting about the table as they were read. There was no sign of recognition from the public in them, no expressed hope that the society formed should be recognized as representing the acknowledged leadership of the profession in Massachusetts, only a desire for mutual support, interest and criticism, and incidentally for architectural welfare. The other paper told of the constant custom of clients who went to England, bought copies of one-eighth-scale drawings of actual houses which had been built by English architects, and had, on their return, houses built from these plans by local builders.

All this is not so very long ago; in fact I can remember eighteen or twenty years ago that a building that cost $100,000 was considered quite exceptional in Boston at least, and until the great fire in Boston by far the largest amount of work done by the architects of that city was in suburban houses of small cost and in alterations of already existent buildings. The builder was a recognized individual as he still is; the architect was an occasional luxury. Under such circumstances it was not to be expected that he should be anything else. But with the growth of our cities, the concentration and increase of wealth, came requirements which the builder could not meet; and it was found that the architect was no longer a luxury, but a very earnest necessity.

Naturally as the demand for the services of the profession increased, coincidentally there appeared pretenders in its ranks; that is to say, there were plenty of men who neither had the adequate ability or sufficient application to thoroughly train themselves, who presumed to practice a profession which certainly required considerable study and attainments. Inasmuch as what services they had been able to give were quickly and cheaply prepared for, they were willing to perform them at a meagre price, but what under the circumstances was more than ample compensation.

Architecture having a distinctly commercial side was to be done by the lowest bidders. Of this class of practitioners little need be said, except that they are a curse to any profession, but in addition to these there have been and still are a number of very worthy men who insist in making their livelihood by practising a business under the name of art. This is legal enough,—no one can prevent it, no matter how much they may wish to do so,—and it occurs oftener from ignorance than from intention, but it nevertheless exists, and under what appear to be compensating conditions. As it happens, the man who makes an art into merely an artless business, either from the concentration of his thought upon one object, or by the very nature of his personality, is very apt to give the impression of being a so-called business man, and as such he appeals to business men and to their likes and dislikes, to their prejudices; and architecture so called thrives under the conjunction of the "practical architect" and the "practical" man. It should not be understood that the business side of architecture can be neglected, but that it should occupy, both in the architect's and the client's mind, its relatively just position, that is, that it is the necessary method of action that makes architecture itself actual and not imaginary.

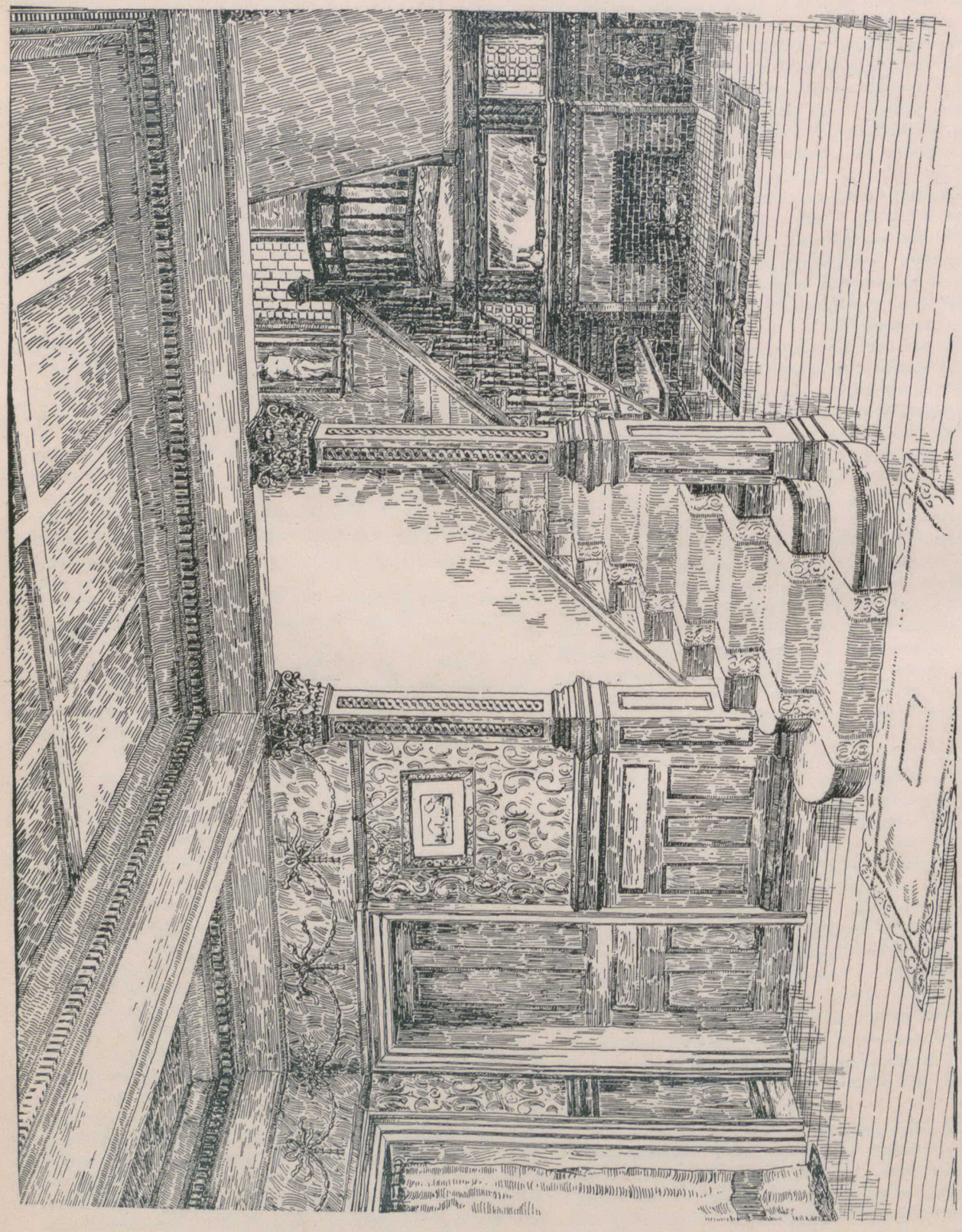
The architect, unlike the sculptor and the painter, is in some factors of his profession necessary to the public; he is needed to carry out work which otherwise could not become existent; but on another side he is dependent upon the public for an opportunity to express himself. He occupies, therefore, the position of an executive who is limited in his action by the will of the sovereign people. In governments such a condition has proved satisfactory in proportion as both ruler and people are intelligent. In architecture it may be assumed, the result would be the same. The object to be attained then is to insure that the architect shall be intelligent, to hope that the public may be.

The burden of the proof of intelligence and ability lies with the architect. His chief credential is not pre-eminence as a business man, or even as a constructor, but as an artist. He will be judged by the next generation by that credential, and by no other. He owes to his client that he shall honestly and conscienciously fulfil his desires as far as possible as to expenditure; and that his building shall be abiding he owes both to his client and himself; but both these facts will be ignored in some fifty years. The judgment of the future passed upon an architect will always be upon his work as an artist and upon nothing else, and his influence will be proportionate to his skill as an artist alone. But in the meantime that chief credential is ignored, and the public choose their architects indiscriminately, and in many cases ask no credentials whatever. As a result "fools have rushed in," and architecture, though in better favor since the World's Fair, is glanced at askance and not recognized by many people as a profession equal to that of law and of medicine.

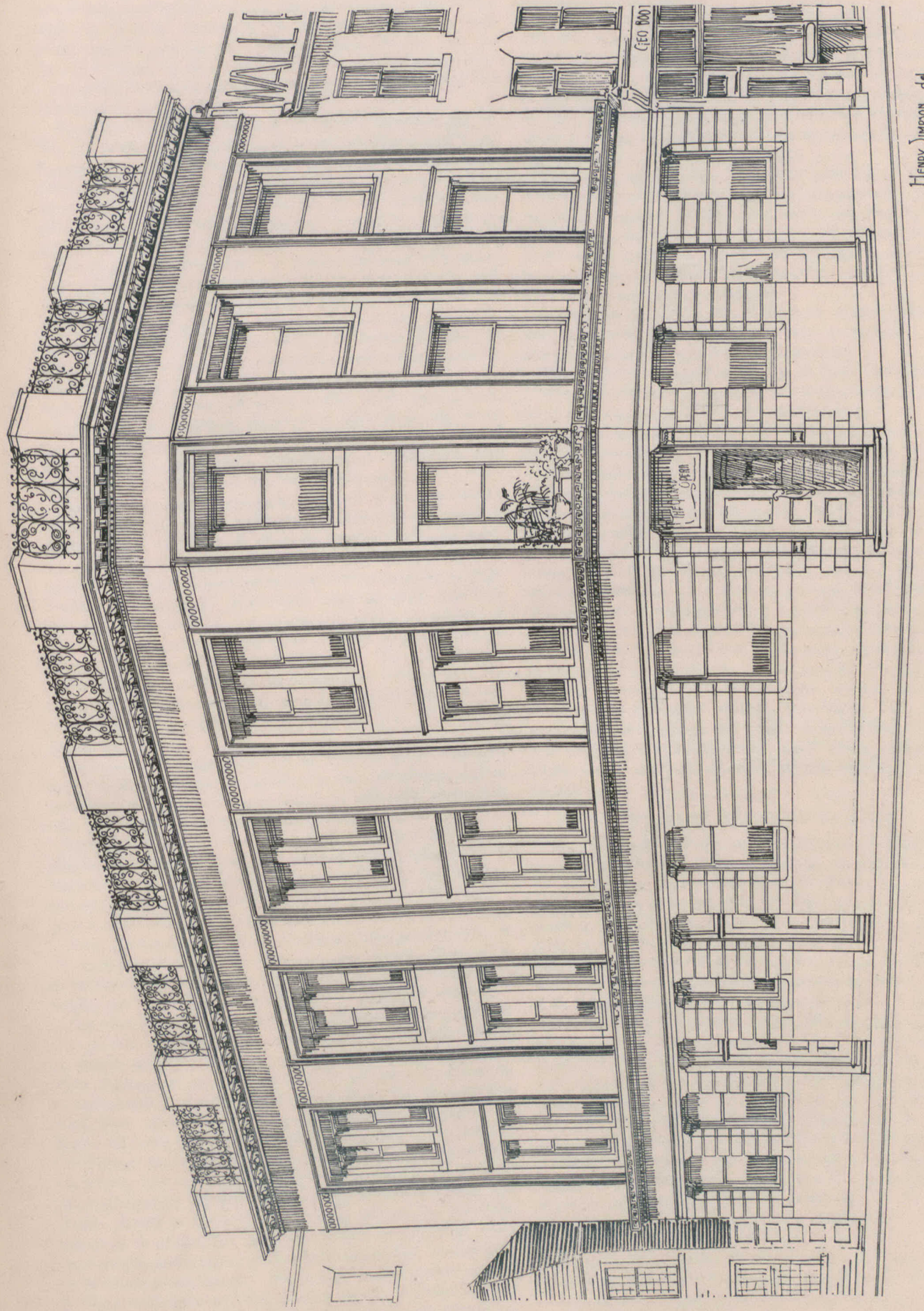
With whom lies the fault? Certainly not with the public or clients, for they assume, with true business understanding, that to be called an architect implies a knowledge of architecture, just as to be known as a cobbler implies a knowledge of shoes. We cannot blame them for lack of discrimination in their choice. How should they discriminate between men who are devotees of an art which requires long study for its attainment? Is it then a question of protecting ourselves against the pretenders in our ranks? This would seem to be an acknowledgment of weakness, of a callow state of affairs, which would defeat its own object. Surely the skilful man in any profession can take care of himself and afford to ignore inefficiency in others. If the public choose to be satisfied with worse than mediocrity, so much the worse for the public; why should we "fash" ourselves about it? But upon analysis the offence is greater than it first appears. Architecture is the most conspicuous of the arts, it is man's constant environment; and as he is very susceptible to the influence of surroundings, architecture has much to do with his education. If the public insist on employing men calling themselves architects, but who put up buildings bad in plan, construction, and appearance, then the trained architects, as citizens, should insist upon it that such work is detrimental to the public taste, that it mocks architecture itself, and that it should not be permitted.

The surest way of eradicating an evil is to deprive it of opportunity of action. If it were possible to diminish the numbers of the inefficients amongst architects, there would be a very perceptible change in our buildings and cities. Apparently the only way in which to do this is to restrict the right to practise architecture to those who have gained such a right by certain attainment. The making of plans and being paid for them cannot be restricted, but certainly the architects themselves have the right to say who shall be considered their peers. Give a dog a bad name, etc., can be paraphrased by give a man a good name and crown him. If it is once an established fact that all architects are obliged to show certain ability before they can practice architecture, the public will be thankful for that amount of certainty. The public are very prone to accept any profession at its own valuation, provided it maintains its own standard of excellence as announced. What should that standard be, and how should it be maintained?

The professions of law and medicine have long since determined their own action. A lawyer must be a member of the bar of his country, and the physician must have received his degree from a medical school; the fact of being a member of the bar or an M.D. guaranteeing the public a degree of training in each. Both imply lectures attended and examinations passed. A very small proportion of the public fail to assure themselves of the standing of their doctor or lawyer before they employ him. The restriction has elevated the profession in the eyes of the public. Would not the same result follow in architecture? In one country, Austro-Hungary, architects are only allowed to practice after having passed certain examinations; elsewhere the same universal chance for charlatans occurs. It will be urged that the charlatan will always exist, which may be very true, but he will be forced to be a clever charlatan, and that is a great gain. It will be said that the American Institute



STAIRCASE HALL IN A.E.KEMP'S HOUSE
WELLESLEY CRESCENT
E.BURKE, ARCHITECT



NEW GRAND OPERA HOTEL, TORONTO

HENRY SIMPSON, ARCHITECT.

of Architects already give sufficient credentials to whoever desires them; but the American Institute, though more in evidence than formerly, is not known or recognized by the public to a corresponding extent as is the title of M.D., and leaves many able men out of its ranks, and occasionally excites antagonism. It is one thing to base one's pretentions upon known attainments, and another to base them upon membership with a body which must necessarily be fallible, and which is only lately donning the purple. Besides which, holding up the American Institute as a shibboleth does not lop off the dead wood of the profession, and the insistence upon attainment before practice does.

There is still another objection which will be made, that is, that the registration of architects is an autocratic and high-handed proceeding. This is based upon exactly the same error which considers that the best government is one where universal suffrage is allowed. A democracy of any kind averages things down before it begins to elevate. But while a democracy may be the best government, there is no need of a democracy in the profession of architecture. A profession, by its very name, implies the assumption of knowledge. My contention is that this assumption should be made a fact and that the only method of making it a fact is, by only allowing by law such men to be called architects as have shown reasons for being so called; in fact, to the legal registration of architects, and the institution of penalties for illegal use of the name. This will accomplish two ends: first, it will protect the public against charlatans; second, it will elevate the character of architects throughout the country. To my mind this is much more important than whether perspectives should be sent in competitions, or whether one style or another of architecture is the best to be found.

Our worst enemies are always to be found in our own ranks; the purpose should be to make them as harmless as possible. In the present condition of affairs the architect is called upon more and more frequently in matters of importance, but he has up to this time acted, been asked to act solely upon the basis of his personal reputation. How much more powerful would be such action if it could be the unanimous action of a body of men, that is, in matters of laying out of public improvements, of conceptions of large public undertakings! But the architect will always be crippled in the undertaking of reforms until the standing of his profession is fixed and acknowledged. By the requirements for registration a standard will at least be attempted.

Necessarily that standard will at first be low. The first thing which has to be recognized is, that all persons calling themselves architects at present must be allowed to retain that title. A law of this kind cannot be made retroactive.

Second, the laws will be State laws, as are those of physicians; and, as was recently forced upon the notice of the physicians of Massachusetts, all the quacks will emigrate to the State having the weakest law. That was what occasioned the recent registration of physicians in Massachusetts.

Next, graduates of architectural schools must be admitted, as no discrimination can be made between schools, although it would be well to supplement school training with office experience. So far proposed action may be indicated definitely.

But what is to be done with the large body of draughtsmen who do not go to the schools, and with the considerable number of people who attempt architecture with neither school nor office training of any account? It is not wise to accept the recommendation of architects in whose offices the draughtsmen have been. Manifest personal qualifications are necessary. To determine these, examinations will be required. At once the two different tendencies of architectural students are to be acknowledged—the one towards art, the other towards construction and mathematics. Examinations should be made in both, and honors should be given in both. If no honors are received, especially in design, the applicant should be debarred. And just here comes the question of assumption of titles conferred as an invitation of attainment. The result of examinations in construction, mathematics, strength of materials, etc., can readilly be determined; that of the examinations in artistic ability requires much more consideration.

It has already been said that an architect is primarily an artist, and will be ultimately judged as an artist, therefore he should be tested as an artist. It may be urged that his faculties may develop late. This is not usual with so-called artistic temperament, but in such a case he can try again. The examination for testing the capacity of design of an applicant cannot necessarily be more severe than school problems. It need not be as exacting in the matter of rendering, but it should test capabilities of handling plans, masses, and details, and it should also test creative skill.

By whom should such examinations be made? By a board of architects, not local, but from all over the country, appointed by the art commission of the city or State, if it possesses one, otherwise by the officers of the nearest Chapter of the Institute of American Architects. The art commission is suggested first, as it is a body representing the public more than do the Chapter of the Institute, and is constituted usually of men in recognized high positions.

Finally, in regard to the ethics of the profession. The Institute has not yet an established a code of ethics, except that it does not tolerate thieves. When it produces a code, after its adoption it should be voted upon by the architects of the country, and as much of it as is approved by their vote should be made mandatory and a law, and those violating this law should be debarred from the exercise of their profession.

If there are any strong objections to be made to the suggestions here made, I have yet to hear them. If carried out they will go far to produce the following results:—

They will clear the profession of much undesirable material.

They will remove all vagueness in the minds of the public as to its purpose and the ability of its members.

They will tend to eliminate bad architecture and stimulate good architecture.

Once this has been done, the members of the architectural profession will be consulted in regard to the designing of all important buildings, as the physicians are in regard to public health. Confidence in the ability of its members once given, and the architects of America, who will then be worthy of the name as a body, as well as individually, can do more to make this country famous for its art than can any other body of men. We are establishing scholarships, schools, and prizes of architecture; let us make evident the purpose for which these are established by giving the men so honored worthy competitors in their practice. Only to-day, in talking this over with a lawyer, I remarked: "You lawyers went through this long ago. What do you find is the result?" His answer was this: "It never keeps out anyone who ought to be in; the only trouble with the legal restriction is, that it still lets a number in who ought to be out."—C. Howard Walker in the Architectural Review.

PRESERVING WOOD BY LIME.

SOMEONE who has been experimenting on the preservation of wood by the use of lime, gives the result as follows:—"I have for many years been in the habit of preparing home-grown timber of the inferior sort of fir, Scotch spruce and silver, by steeping it in a tank, or a hole dug in clay or peat, which was fairly water-tight, in a saturated solution of lime. Its effect on the sap-wood is to so harden it and fill up its pores that it perfectly resists the attack of the little wood-boring beetle, and makes it, in fact, equally as durable as the made wood. I had a mill which was lofted with Scotch fir prepared in this way in 1850, and it is in perfect preservation. The timber is packed as closely as it will lie in the tank, water is let in, and unslaked lime is thrown on the top and well stirred about. There is no danger that the solution will not find its way to everything in the tank. I leave the wood in the solution for two or three months, by which time an inch board will be fully permeated by it. Joists and beams would, of course, take a longer time for saturation; but in practice we find that the protection afforded by two or three months' steeping is sufficient, if the scantlings are cut to the sizes at which they are to be used."

As the summer season is well nigh over, the meetings of the Toronto Master Plumbers' Association will be shortly resumed.

The death is announced of Mr. David Mitchell, only son of Rev. David Mitchell, formerly a Presbyterian minister in Toronto, lately of Jersey City. The young man was only 22 years of age, and was employed in an architect's office in New York. His death was the result of an accident.

ILLUSTRATIONS.

NEW GRAND OPERA HOTEL, TORONTO.—HENRY SIMPSON, ARCHITECT.

STAIRCASE HALL IN A. E. KEMP'S HOUSE, WELLESLEY CRESCENT, TORONTO.—E. BURKE, ARCHITECT.

PROPOSED ADDITION TO THE LAKESIDE HOME, TORONTO.—CURRY, BAKER & CO., ARCHITECTS.

The building which we illustrate is designed to occupy a site separate from the Home proper, and is intended for the use of the nurses.

CONVENT OF THE SISTERS OF ST. CROIX, MONTREAL.—J. B. RESTHER & SON, ARCHITECTS.

THE building now in course of erection for the Reverend Sisters of the Congregation of "Ste Croix et des Sept Douleurs," is situated on the north side of Mount Royal Avenue, extending from Rivard street to Berri, a frontage of 150 feet. In plan, it is that generally adopted in buildings for educational purposes, with corridors on each storey, running the entire length of building, and large commodious staircases and elevators.

The corridors lead to large rooms used as class rooms, parlors, studios, etc. These are all well lighted and ventilated. The heating apparatus is the hot water system; the boilers being centrally situated renders the distribution easy and effective. All the most improved plumbing and other appliances have been devised to insure comfort to the inmates.

The main building is 150 ft. in length, 62 ft. wide and four storeys high, with an eastern wing 27 ft. wide, 42 ft. long, two storeys high; a western wing 33 ft. wide, 52 ft. long, three storeys high. All substantially built of Montreal lime stone; the front and sides are of rock faced ashlar, with cut stone bands, chiselled sills, lintels, quoins, trimmings and moulded course.

The beams and columns supporting the interior structure are of steel throughout; the interior partitions and furring to outer walls are of terra cotta lumber. The first floor is devoted to the infants' course refectories, kitchen, laundry, &c., while the second floor is restricted to the administration, the third floor is mainly composed of class rooms, the chapel in the western wing being 75 ft. long, 28 ft. wide, 17 ft. high in the clear; the fourth floor to be occupied as a general dormitory. The building to have improved fire escapes and to accommodate two hundred pupils, chiefly boarders.

ANNUAL CONVENTION OF THE PROVINCE OF QUEBEC ASSOCIATION OF ARCHITECTS.

THE annual convention of the Province of Quebec Association of Architects is announced to take place on the 2nd of October, the place of meeting being the city of Quebec. At the time of going to press the program is as yet incomplete, and we are therefore unable to give full particulars, but it is anticipated that papers will be presented by several members of the Association. Some amendments to the charter, proposed by the Quebec members, will be considered, but it is said that should the said amendments be adopted, the position of the Association will not be altered. The members should endeavor to make the convention a success.

SUDDEN DEATH OF A WELL-KNOWN ARCHITECT.

MR. G. F. STALKER, a well-known architect of Ottawa, died suddenly the other day. He left his house in the evening apparently in his usual health, and soon after was found lying insensible on the steps of Rideau Club. A cab was called, but when he reached home he was dead. An inquest was held and the cause of death declared to be apoplexy.

Deceased was a native of Scotland, and was 54 years of age. He came to Canada in 1883, and except for one year, spent in the public works department, he has been in business for himself in Ottawa ever since. He leaves a wife and nine children, the eldest 20 years of age. Mr. Stalker was well known as an architect. He drew the plans for the cottage hospitals on Porter's Island, and his plans for the new central railway station at Ottawa had just been accepted.

PUBLICATIONS.

Fiction and travel are the strong points of the September Cosmopolitan, and it may be said that no more beautifully illustrated number of the Cosmopolitan has ever been given to the public.

STUDENTS' DEPARTMENT.

CONCRETE FLOORS FOR STABLES.

A SUBSCRIBER inquires how to lay a concrete floor for a stable.

The floor should consist of three layers, first, about three inches of broken stone and brick, in pieces that will pass through a three inch ring, second, 2½ inches of gravel, sand and cement, mixed in proportions of 4 of gravel and sand and one of cement, topped off with a ½ inch floated coat of clean sharp sand and cement, mixed in proportions of two of sand to one of cement (best Portland cement to be used). The floor is to be so laid to have proper fall to drain off all water, and provision is to be made for this. The usual method is to give it a slope to the rear, where there is a gutter to carry off the liquid matter. The surface of the top coat should be scored.

As concrete makes a hard and unyielding floor for a horse to stand on, planks may be laid down over it, which can be easily removed for cleansing and airing. Instead of the plank, sawdust may be employed. It makes good bedding, is soft under the horses' feet, and is cheap. What is soiled can be removed every day and replaced by fresh.

Vitrified brick is considered by some as making a better stable floor than concrete.

USEFUL HINTS.

A new kind of veneering material is reported from Germany. This is composed principally of infusorial earth mixed with various binding and coloring ingredients, and spread in layers over a wooden core; on the mass becoming dry, it is cut into sheets or blocks, which resemble in effect that of figured wood.

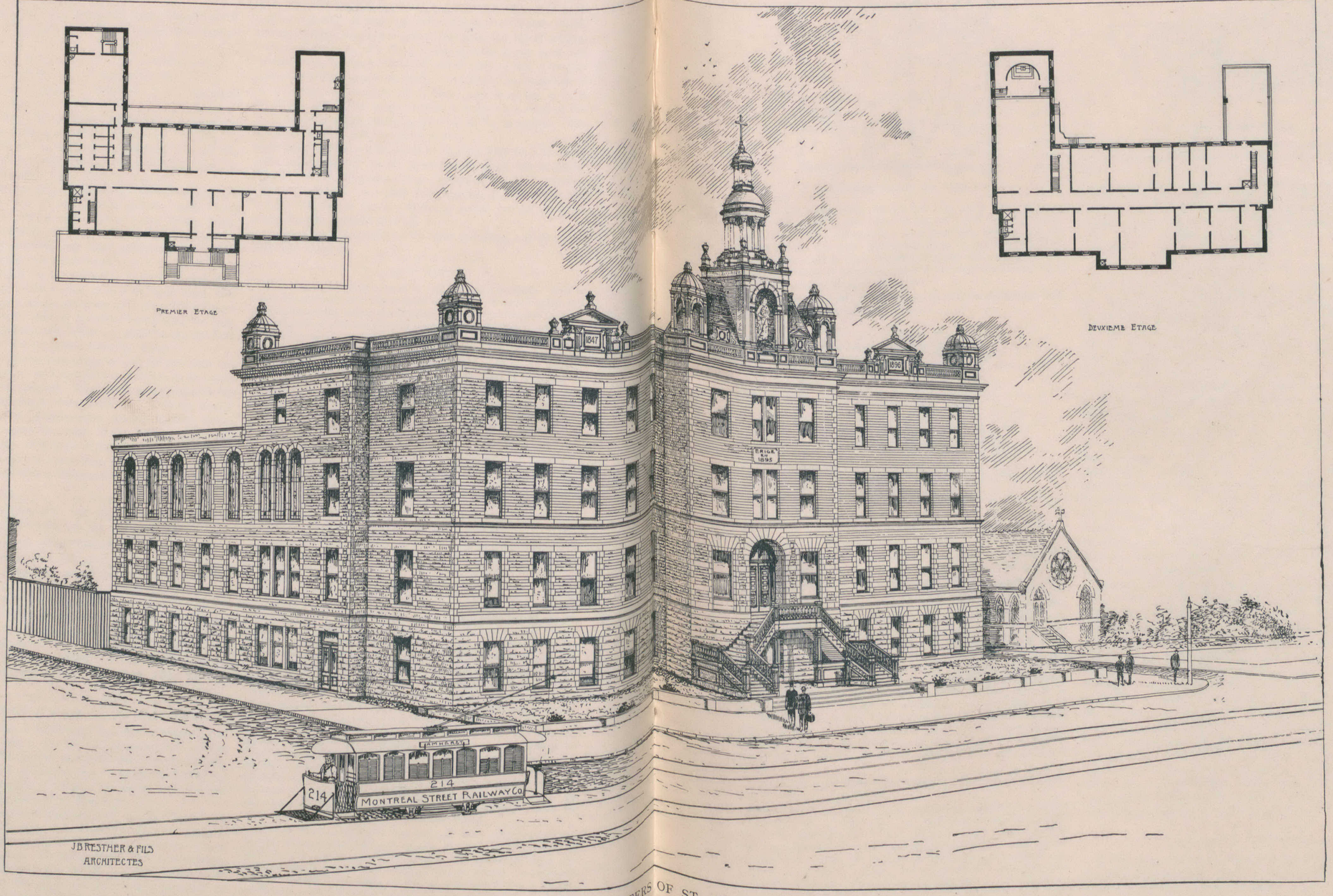
The American Druggist recommends the following formula for waxing hardwood floors: Yellow wax, 25 ounces; yellow ceresin, 25 ounces; burned sienna, 5 ounces; boiled linseed oil, 1 ounce; spirits of turpentine, 1 gill, or about 30 ounces. Mix the wax and ceresin at a gentle heat, then add the sienna, previously well trituated with the boiled linseed oil, and mix well. When the mixture begins to cool add the turpentine, or so much of it as is required to make a mass of the consistency of an ointment.

The free circulation of water in steam or hot water heating boilers is one of more importance, says the Master Steam Fitter, than is generally considered, because where the circulation is obstructed a certain amount of power is required to overcome friction to produce the circulation necessary for the free development of steam. Restricted or otherwise obstructed circulation always calls for more fuel to produce a given heating effect. This is practically shown when comparing the action of two boilers of the same pattern but of different size, especially those used for heating purposes.

A safe, constructed of cement with steel wire netting embedded in it, was recently tested at the Reichsbank, the official bank of the German Government, in order to decide whether it is practicable to build safety vaults of this material, which will be proof against fire. The test, which was most severe, consisted in placing the safe upon a pile of logs soaked with kerosene, which were then set on fire, the safe being exposed for half an hour to a heat of 1,800 degrees F. Two hours later the safe was opened, and the contents, consisting of silk, paper, blank drafts and a maximum thermometer, were found to be entirely uninjured. The maximum thermometer showed that the temperature inside the safe at no time exceeded 85 degrees

Buildings divided into offices, consultation rooms, dormitories, or "light housekeeping" apartments for the use of many occupants, require, says a contemporary, not only thoroughly deadened floors, but extra care in perfecting the partition walls. Two-coat, or better, three-coat work in plastering should be specified, continued down close to the floors, to prevent the passage of air or sound. The first coat is usually neither very even nor smooth, partaking of the inequalities of the lathing, and purposely left rough as a foundation for the next or brown coat. Care should be observed in putting on this second coat, to make the walls straight and true by filling up and leveling out malformations visible in the first coat. The third, or last coat, the white finish, is too thin to hide any defects of this kind. On the contrary, it is understood that the finer the finish of the last coat, the more sensibly will the inequalities of the surface appear.

RUST OF STEEL AND IRON.—Iron and steel with a perfectly bright surface do not rust in absolutely pure water or air; carbonic acid, or similar agent, must be present. Moisture, carbonic acid and oxygen being present, oxidation is not produced so long as vapor of water is not condensed upon the surface of the metal. In rusting, carbonate of Iron is formed, which is dissolved in the water charged with carbonic acid and transformed into bicarbonate. In the presence of air this is decomposed and gives magnetic oxide, then a hydrated oxide of iron. Polished iron and steel resist oxidation for a long time, but once started the rust forms rapidly and soon spreads over the entire surface. This is because the oxide of iron formed is electro-positive relatively to the iron, and is very hygroscopic, facilitating the absorption of moisture from the air. Steel and cast iron rust more easily than the purer metal; the more pure the iron is, the more it is subject to oxidation.



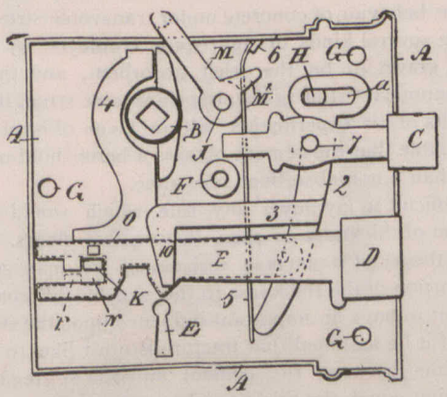
CONVENT OF THE SISTERS OF ST. CROIX, MONTREAL.

J. B. RESTHER & SON, ARCHITECTS.

RECENT CANADIAN PATENTS.

The following patents have been granted at Ottawa to Canadian inventors :—

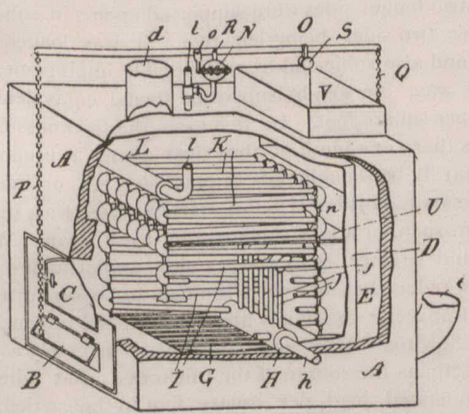
No. 49,420, for a combined Latch and Lock, to Alexander Watson, Kinmount, Ontario, Canada, 8th July, 1895 ; 6 years.



COMBINED LATCH AND LOCK.

Claim.—The combination, with the lock case, safety catch M, sliding latch C, locking bolt D, and tappet B through which the knob spindle passes, of the lever 2, having arms 3. 4, and a spring 5, engaging said lever near the free end, said lever pivoted slidingly to the lock case through an elongated eye a, and the arm 4 engaging the tappet and having frictional contact with the tail of the locking bolt, and the latch loosely connected to said lever, as and for the purpose set forth.

No. 49,547, for a Hot Water Boiler, to John D. McEachren, Galt, Ontario, Canada, 23rd July, 1895 ; 6 years.

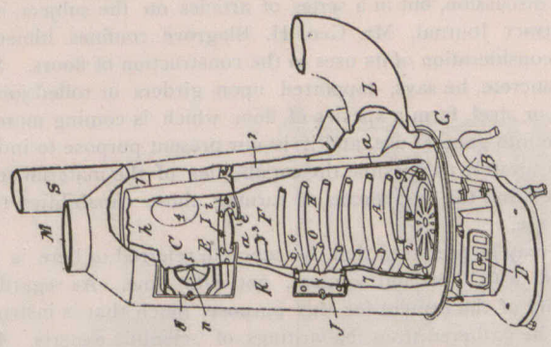


HOT WATER BOILER.

Claim.—1st. A hot water or steam boiler having an inner and outer casing, the said inner casing being of metal or other suitable material as ventilation may be required and the outer casing of brick work, a space between the said casings, an air inlet and an air outlet communicating with said space, a series of tubes forming the boiler, the said tubes forming the sides, end and top of the fire box, substantially as set forth. 2nd. In a brick set boiler, the combination with the brick work A, of the metal or other suitable material, lining D surrounding the boiler and furnace, substantially as set forth. 3rd. In a hot water or steam boiler, the combination with the fire box of the tubes or coils I, forming the sides of the said fire box, substantially as set forth. 4th. In a tubular boiler, the combination with the tubes forming said boiler of the counter bored fittings M, substantially as set forth. 5th. In a tubular boiler, the combination with the tubes forming the said boiler of the counters bored fitting M, having a hollow depending supporting lug n, whereby the said tubes are splayed and supported, substantially as set forth. 6th. The fitting M, being counter bored, and also threaded for the reception of tubes or pipes, as and for the purpose set forth.

No. 49,519, for a Hot Water Boiler, to John D. McEachren, Galt, Ontario, Canada, 18th July, 1895 ; 6 years.

Claim.—1st. In a portable hot water boiler, the combination with a boiler consisting of a fire pot, fire chamber and combustion chamber of a conical shape, a hot water coil contained in the said fire pot and fire chamber, of an outer casting jacket forming a ventilating space around the said fire pot, fire chamber and combustion chamber and an air inlet and air outlet connected with the space so formed, substantially as set forth. 2nd. In a portable hot water boiler, the combination, with the hot water coil H, of the supports g, in which the said coil rests substantially as set forth. 3rd. In a portable hot water boiler enclosed in an inner and outer casing, having a heating coil spirally arranged and fire pot enclosed in the said inner casing, the combination with the said inner and outer casing having openings situated above the said fire pot, and connected together, of the door J, and sliding-door O, substantially as set forth. 4th. In a portable hot water boiler, the combination with the fire pot, grate and fire chamber, having a spirally arranged conical shaped coil located therein, of the combustion chamber located above the said fire chamber, a diaphragm having a central opening and deflecting plate, separating the said fire chamber from the said combustion chamber. 5th. In a portable hot water boiler, the combination with the fire chamber and combustion chamber, of a diaphragm having a



HOT WATER BOILER.

central aperture and a series of perforations around the said aperture, and a movable deflecting plate over the said central aperture, substantially as set forth.

Patents have also been issued to R. H. Stilwell, of Detroit, Mich., for a form of matched board ; to W. M. S. Garrison, of Elizabeth, N.J., for a portable elevator ; to C. G. Davies, of Denton Harbour, Mich., for a brick machine ; to Sam. Hughes, of Lindsay, Ont., for a window sash and sash frame, and to C. J. Cooze, Charterton, Wellington, New Zealand, for a window sash.

THE OLD CRYSTAL PALACE.—A REMINISCENCE.

MR. Edwards, Secretary of the Department of Public Works for Ontario, has been hunting up the history of the crystal palace, which stood so many years on the old exhibition ground, immediately south of the lunatic asylum in Toronto, and which was afterwards taken down and removed to the present exhibition park, where it still does duty as the upper part of the Main Building at the Industrial. It is quite interesting.

The corner stone was laid on the 15th of July, 1858, by Hon. E. M. Vankoughnet, Minister of Agriculture, the officers of the Agricultural and Arts Association being as follows :—

D. B. Stevenson, president ; Wm. Ferguson and John Wade, vice-presidents ; Richard L. Denison, treasurer ; Prof. Ed. Buckland and Wm. Edwards, joint secretaries ; Prof. Henry Croft, chemist, and James Fleming, seedsman. These gentlemen and the following formed the Toronto Local Committee: W. H. Boulton, Mayor ; F. W. Jarvis, sheriff ; W. B. Jarvis, Rev. Dr. McCaul, Dr. Daniel Wilson, Ald. Reid, Ald. Brunel, Ald. Boomer, Ald. Ritchie, Ald. Carr, J. E. Pell, Samuel Walton, J. D. Humphries, Joseph Hartman, M.P.P., warden ; Geo. T. Denison, Alexander Shaw, Prof. Buckland and all the members of the Board of Agriculture.

The only surviving members are :—Wm. Edwards, ex-Ald. Reid, ex-Ald. Ritchie, John E. Pell and Samuel Walton.

The architects were Fleming & Schreiber, now Dr. Sandford Fleming and Collingwood Schreiber, Deputy Minister and Chief Engineer of the Department of Railways and Canals at Ottawa. The amount paid the contractors, Smith & Burke, for the completed building was $20,804.92. The building was principally iron and glass, and was 256 feet in length, 144 feet in breadth and 56 feet in height. It contained 2,000 square feet of glass in the roof and 5,000 feet in the walls, its gross weight being twelve tons. There were only three kinds of castings in the building—the ground columns and the girders, each 16 feet long, and a shorter column from the gallery floors to carry the roof. The iron frame was then in 16 feet squares and was held in form by iron screw bolts and clamps, and the entire building—columns, girders and circular roof ribs—were unbolted and taken apart with the breakage of only three pieces of the castings.

AN ARCH COLLAPSES.

A FEW days ago the big brick arch forming the portal of the Toronto, Hamilton and Buffalo tunnel under Hunter street, Hamilton, fell with a crash, fortunately without injuring anyone. The chamber, or support, of the eastern half of the arch had been removed. The sides were not strong enough to stand the strain, and bulged out, and the unsupported part of the arch fell. The accident was also partly due to the sand in the cement not being strong enough. About 40,000 bricks had been used in the arch, all of which will have to be removed. The loss will fall upon Mr. Onderdonk, the contractor for the tunnel.

CONCRETE FLOORS.

THE subject of concrete opens a wide field for investigation and discussion, but in a series of articles on the subject, in the Contract Journal, Mr. Geo. H. Blagrove confines himself to the consideration of its uses in the construction of floors. Slabs of concrete, he says, supported upon girders or rolled joists of iron or steel, form a species of floor which is coming more and more into general use, and it is our present purpose to indicate as accurately as possible the capabilities of the material so employed and the best means of turning those capabilities to advantage.

It may be premised that the concrete referred to here is composed with Portland cement, not with lime. As regards the quality of the cement for this purpose, much that is instructive may be gathered from the writings of scientific experts. Practical men usually adhere to a few plain rules which occasionally receive modification when some newly-discovered fact meets with general acceptance. Thus, for instance, the specification for a recent contract required that the cement used in making concrete should be of such a degree of fineness that a sieve of 2,500 meshes per square inch should not reject more than 12 per cent. of the powder when gently shaken. Scientific tests have shown that great additional strength is obtainable with higher degrees of fineness, but anything beyond the ordinary degree seems rarely to be insisted on in practice. We shall assume that the cement with which we deal is of the quality stated, that it weighs at least 112 lbs. per striked bushel, or nearly 90 lbs. per cubic foot, and that a briquette of neat cement will have an ultimate tensile resistance of 400 lbs. per square inch after six days' immersion in water. To prevent any possibility of its being used hot, and so being liable to crack after setting, it may be required to be kept for a month or six weeks after being mixed, and may be spread out upon a floor and turned over daily during the last two or three weeks. The question of chemical analysis is rarely approached in ordinary practice. It is generally admitted, however, by experts, that the cement should contain about 60 per cent. of lime, about 24 per cent. of silica, and about 11 per cent. of alumina, the remaining 5 per cent. being made up of magnesia and alkalies.

Supposing the ingredients to be thoroughly mixed, we should obtain a concrete upon which some reliance could be placed for its resistance to transverse stress. But this thorough mixing embraces the requirement often insisted upon that every particle of sand and coarse aggregate shall be completely coated with cement. If there should be an absense of cohesion in any part of the mass, all calculations of strength may be at fault.

The question of the nature and proper proportions of the ingredients for making Portland cement concrete is indeed a wide one. As bearing upon the construction of floors, valuable information is afforded by the results of Mr. Darnton Hutton's experiments described in course of the discussion of Mr. John Grant's paper on "Portland Cement" at the Institution of Civil Engineers.* Mr. Hutton experimented with bars of concrete 4 ft. long and 1 ft. square, supported upon a 3 ft. span and broken by means of a load hung from the centre. The general proportions of cement to other materials was 1 to 9, though sometimes higher. With 1 cement, 5 shingle, and 4 sand, the central breaking weight was 2,656 lbs. With 1 cement, 5 shingle, and 3 sand, or a proportion of 1 to 8, the breaking weight was increased to 3,023 lbs., an increase of about 14 per cent. But on reverting to the proportion of 1 to 9, with 9 parts of shingle only to 1 of cement, the breaking weight was increased to 9,590 lbs. The inevitable conclusion is that for transverse resistance sand is a source of weakness, and should be omitted. But everything would appear to depend upon the careful mixing of the ingredients. Without sand, and with an unequal admixture of cement and water, the cement might have a tendency to honeycomb in the interstices between the particles of aggregate, and this would be less likely to occur if sand were used. As a general rule, therefore, with ordinary workmanship, it would seem safer not to dispense with sand. As might have been expected, experiments generally show that the greater the proportion of cement the greater is the transverse strength, and of course the tensile strength of the cement is an important factor. It is remarkable, however, that in some of the experiments of Mr. Alexander Fairlie Bruce, to which further reference will be made,† a higher degree of strength in the cement was accompanied by a lower transverse resistance in the concrete when the proportions of sand and coarse aggregate were unaltered. This is only one of many instances that could be cited of the capricious behavior of concrete under transverse stress.

Among several kinds of aggregate employed by Mr. Bruce, he found gravel to be the least absorbent, and therefore the most economical. But as regards transverse strength, the general results of his experiments tell in favor of hard sandstone. It is probable that the cement obtains a better hold upon an absorbent than a non-absorbent substance.

It is difficult to lay down any rule which would govern the proportion of thickness to span in concrete floors. But apart from the theory of transverse resistance, we may suggest that the proportion of the thickness to the size of the coarse aggregate ought to have an important influence upon the strength, especially if it be assumed that fracture is most like to take place in the joints between the cement and the aggregate. Other things being equal, the thicker slabs ought to show a higher degree of transverse resistance, as being relatively more homogeneous than thin slabs in which the pieces of aggregate are few in depth and have but little chance of breaking joint.

Among some of the earliest recorded experiments upon the transverse strength of concrete floors is one mentioned by Mr. Potter in his work on "Concrete: Its Use in Building." A slab of concrete, made with two bushels of Portland cement and nine bushels of crushed slag, was tested one month after manufacture. The slab measured 6 ft. by 4 ft. 9 in. and 5 inches thick, and its two longer sides were supported upon 2 in. solid bearings, the other two sides being left free. It was loaded with 550 bricks, and also subjected to considerable impingement, but did not give way, the weight supported being equivalent to about 140 lb. per square foot. In this case the thickness of the slab was less than one-tenth of the clear span, a proportion that would hardly be thought safe in practice. An ordinary proportion for small spans is 11-sixths, as in the case of a 4 in. thickness for a 2 ft. span, or a 6 in. thickness for a 3 ft. span. With larger spans and greater thicknesses, the proportionate thickness might be reduced according to the load to be supported. If the laws of transverse resistance are to be applied to concrete slabs, it will follow that the strength will vary inversely as the span and directly as the square of the thickness. But when there is a certain stated load per square foot to be carried, the total amount of load will vary as the span, and the strength must be made to vary in the same proportion. Hence the square of the thickness should vary as the square of the span, or, in other words there should be a constant ratio between thicknesses and span for any stated load per foot.

* See Proc., Inst. C.E., vol. lxii.
† See Proc., Inst. C.E., vol. cxiii., or Contract Journal, August 23, 1893.

THE NEW LEGISLATIVE BUILDINGS, VICTORIA, B. C.

VICTORIA, B.C., Aug, 24th, 1895.

Editor CANADIAN ARCHITECT AND BUILDER.

SIR,—Your reference in this month's CANADIAN ARCHITECT AND BUILDER in respect to the foreign oak used in the above building, rather exaggerates the case. As a matter of fact the whole of the numerous offices and rooms of the new Parliament Buildings are panelled and finished in British Columbia lumber —cedar, maple, alder, spruce and fir—except only two small rooms, which are partially panelled in oak; and also, when the rooms are finished in cedar, some of the doors which will be subjected to rough usage are of oak—the oak harmonizing with the cedar better than any wood I know of, the cedar itself being too soft for hard wear and tear. You will thus see that the amount of foreign wood used is comparatively trifling.

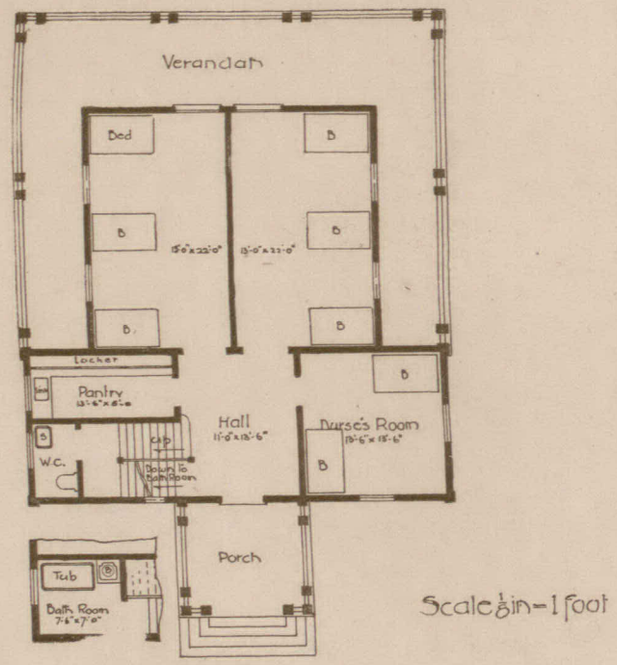
It has been the earnest desire of everyone connected with our new Parliament Buildings, to utilize as far as possible local and and native materials, and we have done so to an extent rarely equalled, I should think, in any building of similar importance.

Yours faithfully,

F. M. RATTENBURY, Architect.

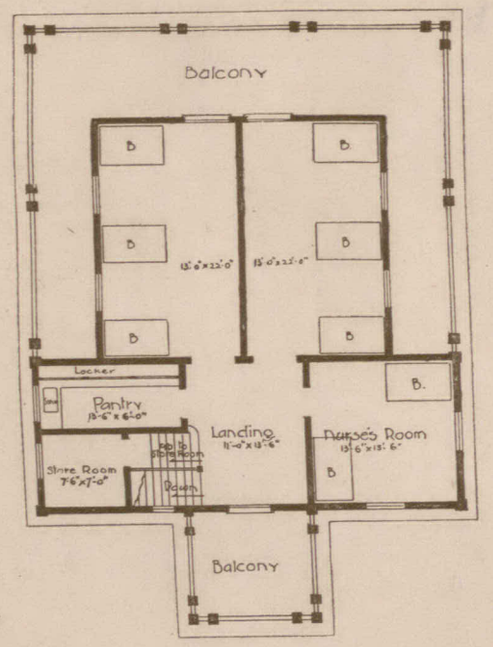
THE Don Valley Pressed Brick Works have just turned out their first kiln of paving bricks, which are considered by experts to be equal, if not superior, to any made on the continent.

. PROPOSED NEW WING
. LAKESIDE HOME FOR
LITTLE CHILDREN .
. TORONTO .

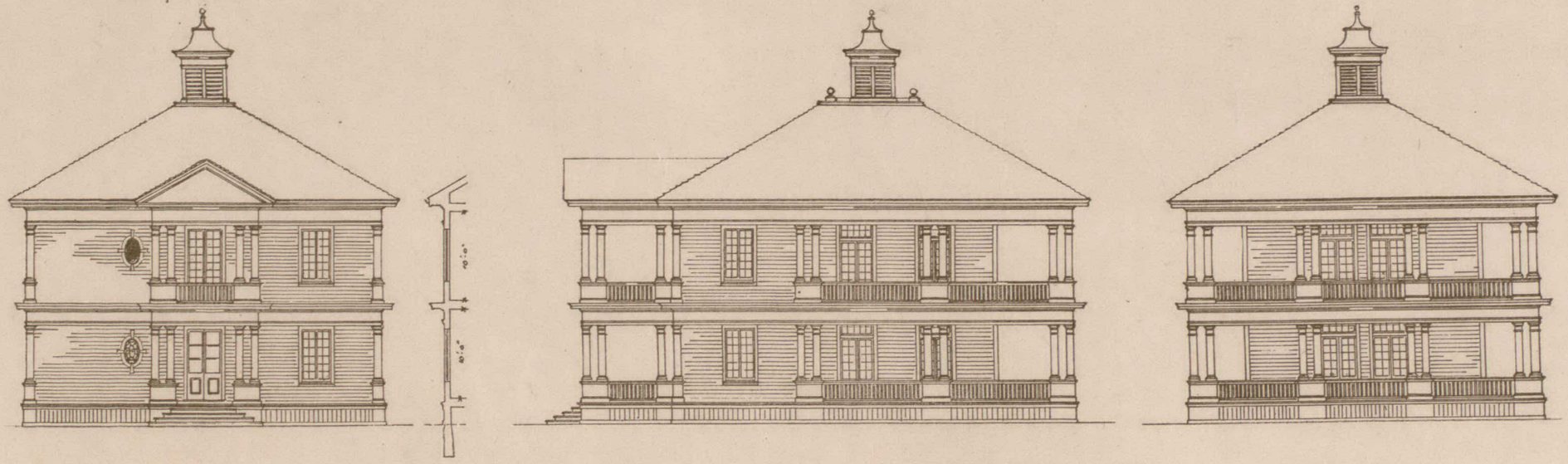


Plan of Ground Floor

Scale $\frac{1}{8}$in=1 foot



Plan of First Floor



PROPOSED ADDITION TO THE LAKESIDE HOME, TORONTO.

CURRY, BAKER & CO., ARCHITECTS.

MANUFACTURES AND MATERIALS

QUALITIES OF BUILDING-STONE.*

By Maurice Thompson.

The qualities necessary to the best possible building-stone are, workability, durability and beauty. It must also be cheap.

Workability includes in its meaning, accessibility, a ready yielding to quarrying operations, the absence of refractory qualities under the hammer and chisel, and a texture and grain that will hold decorative finish.

Stone that cannot be quarried readily has the disadvantage of great cost to begin with. If the "raw material" is expensive, the finished product must be costly. On the other hand, if nature has so deposited her stores that the stone is easily taken from the quarry, still, if the material is refractory in the final cutting and finishing; no matter what may be its other qualities, it cannot be a very cheap material for the builder, as it will demand an over amount of expense and delay in preparation. Still less will it be desirable if it obstinately refuses to hold finish or decoration. Stone that comes from the quarry soft, and yet somewhat tough, but hardening after a time, has the finest quality of workability. This renders it easy to quarry, very responsive to the tools of the cutter, and capable of taking easily, and holding permanently, the finish and decorative designs of the architect's specifications. It must be kept in mind, however, in axamining stone, that it comes from the quarry wet, and for that reason easily workable, it may again take up water after drying, which would be most objectionable ; but if, in the process of drying in the first place, it passes through a chemical change which will render it ever afterwards impervious to water, the quality is just what could be wished for in this regard. Usually an examination of the outcropping surfaces of the stone in place will give a safe knowledge of its value as regards workability. Next, after the character of the stone, regard must be had touching the condition of its deposit. Too much overlying matter, whether stone or earth, will usually make the quarry work very heavy and expensive. This overlying matter, technically called "stripping," is, as a rule, quite worthless, and must be entirely removed before the stone can be worked with steam channelers or other quarrying appliances, hence the necessity of a careful examination to determine its nature and extent in each case before opening a quarry.

Durability, as applied to building-stone, includes every quality tending to make the material lasting and unchangeable ufter it is laid in a structure. These qualities are many, and often seemingly conflicting in their nature. Hardness, elasticity, tensile strength, power to resist the greatest crushing force, imperviousness to water, and invulnerability to the attacks of air and its corrosive and disintegrative burdens, are some of the qualities, but not all. Evenness and homogeneity of composition, unity of substance, so to speak, and the power to resist extremes of heat and cold, are quite as necessary. It will be seen at once that chemical analysis must be relied on to insure the best knowledge of some of these requirements. Some otherwise good and durable limestones will become corroded and discolored, and have their integrity destroyed by the effect of sulphurous smoke from the burning of impure coals ; others will be injuriously affected by the action of rain-water, and still others by the oxidizing power of the air. Some sandstones bear too much iron in their composition ; others lack sufficient cohesion of the particles, while others again are clayey, or unequal in grain or texture. Every test of practical science should be given to stone before it is used in any building intended to be a permanent structure. As a rule, if the outcropping ledges are found to be infiltrated with water, which makes the outer surface constantly damp, the stone will not be good, for this would indicate that it would take up too much moisture in the wall. Still, it is often the case that an apparently over-hydrous stone will dry out permanently after it is quarried and cut. Many of the sandstones, notably the better qualities of conglomerate, are of this character, and so soft when first taken out that they may be cut to any rough shape with a common axe or hatchet, but hardentng after a few days' exposure so that water will not affect them.

The elasticity of stone may be tested by sawing it into long, slender strips, say two inches square and three feet long, when, if it be quite perceptibly flexible, its elasticity is good. If such a bar be suspended so as to hang free by a string, and is struck a light blow with a hammer, its evenness and solidity of fibre will be attested by a clear, sweet metallic note, not unlike that of a fine bell, or that of a well tempered steel bar. As a rule, the best stone will break with a direct line of fracture; but it may be conchoidal, or otherwise indirect, and still be unobjectionable. Parallel lines of cleavage, or of stratification, are always favorable indications where other features are promising.

Resistance to crushing weight may be pretty safely inferred from solidity of texture and evenness of grain ; but it is always necessary, before a final acceptance, to submit the material to the severest tests of an apparatus designed for that purpose. This will be described in the proper place.

In examining sandstone, with a view to building purposes, the outcropping, if there be any, should be carefully scanned with a view to discovering what effect long exposure to the atmosphere and the rigors of winter may have had upon it. If the stone has "weathered" badly, this will be shown by one or another sign of disintegration or demolition, and a talus of fragments and sand will be found formed at or near the base of the outcropping cliff. Often the substance of the rock will give unmistakable evidence of inequalities of structural composition, such as horizontal cavities caused by the weathering out of seams or streaks, that, on account of bearing too much iron, have oxidized and crumbled away. Such stone, if used in a building, would prove worthless, and, therefore dangerous. It is often the case, as I have observed during a long experience, in civil engineering, that public bridges erected by counties are rendered unsafe by having their piers and abutments constructed of this kind of stone, and that, too, in places where most excellent material lay near at hand, and which a little knowledge of the nature of the stone would have pointed out to the superintendent. Too frequently it happens that appearances of the most untrustworthy kind are relied upon where an ignorant person is set to do work which ought to be in charge of a skilled and well-informed engineer.

In judging of the probable durability of limestone, before subjecting it to any test of science, the same observations should be made as in the case of sandstone, with a view to ascertaining its weathering qualities. Any unequal discoloration of the face of the exposed ledge should be scrutinized carefully. Usually these are caused by the presence of iron in the composition of the rock. But limestones are much more injuriously affected by hidden faults of composition than are sandstones, and for this reason they demand a much more careful examination before any extensive quarries are opened. It is often the case that iron in limestone will do no more than discolor the outer surface on exposure to the action of air and rain-water ; but even this is a serious defect when the stone is to be used in any structure wherein beauty is a chief object. For the rough masonry of ordinary bridges, and for the hidden foundations of buildings, a cheap and durable stone is what is most wanted, and in these discolorations is not a fatal fault.

Beauty, when the term is applied to any building material, includes all the good qualities already enumerated, with the added value of a pleasing color, or combination of colors, and a general effectiveness of appearance when the structure in which it is used has been completed. The variegated granites undoubtedly are the most beautiful of all building materials. Next to granite, the red and brown sandstones are most pleasing to the eye, but the white, gray and blue limestones are very effective, and they have the advantage over granite in that they work much more easily in ornamentation, while they take figures in relief with far more clearness of action than do the sandstones as a rule. Architects have long since discovered the pleasing effects to be produced by using different kinds of stones in the same building, placing each where its particular qualities will best serve the general motive of the design.

As a rule, all else being equal, the stone which holds its native color best will be most beautiful in a building ; and of the stones which change color, that will be most desirable which changes least and evenly. Some of the gray sandstones, however, change color unevenly, and give a striking and ofttimes picturesque cloudiness to the surface, which adds to its effectiveness of color in a wall. The nearly white limestones that take on by exposure a dark cream-brown hue, if they do not contain too much magnesia, hold that tint very well, and are quite beautiful. As a rule, the presence of many large animal remains in a stone is objectionable on account of the tendency of such a composition to crumble ; but where the fossiliferous rock is durable, it will usually be found very beautiful when cut, the organic remains bossing it over with variegation, that greatly heighten its appearance. Stone which contains large fossils is not, however, the best for receiving raised ornamentations, such as figures in relief, no matter how durable and beautiful it may be, for the animal form will interfere with nicety of cutting and polish, as well as with the regularity of the figures. Fossils will usually be found harder than the matrix in which they are set ; but this is not always the case, for quite often the form is that of a hollow cast or impress, filled in with material which crumbles easily. As a rule, fossils, though very hard, are but loosely set in sandstone, and often they are very large and rough forms of plants, extremely silicious and refractory. Blocks containing these are to be avoided as probably worthless for building purposes, however valuable and interesting they may be from a scientific point of view.

Many very beautiful stones that are not durable when exposed to the weather, are very valuable for the inside finishing of buildings, where they will last for ages, holding the finest tints of their coloring without perceptible change.

From what has been said above, it will be seen that every owner of

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stone beds, should, before going to the expense of opening quarries, have his rock beds examined by an expert, whose report should show all the defects as well as all the good qualities of the material. Usually this can be done without any great outlay of labor or money, for the experienced geologist or engineer can quickly discover from the stone and its surroundings the nature of the deposit, and very simple chemical and mechanical tests will settle the question of strength and durability. There are beds of magnificent building-stone lying undeveloped in many places, simply for the reason that the owners are not aware of the treasure that they possess. In other places quarries are being industriously worked and the stone used in the erection of costly buildings, where, in fact, the material is wholly unfit for use on account of its lack of durability. I have examined many extensive structures whose stone was fast crumbling away. True, a few years will not show much decay, but in the long future the result will certainly be disastrous. The constant action of the atmosphere, the expansion and contraction consequent upon extremes of heat and cold, and the disintegrating effect of rain-water, slowly but surely tell upon the integrity of the exposed parts.

The invitation extended to visitors to the Toronto Industrial Exhibition by the Gurney Foundry Co., to visit their extensive show rooms on King street west, and inspect their Oxford boilers and radiators, and other heating appliances, drew a large number of visitors to their establishment during the Fair.

A new kind of insulating and non-conducting material for covering heating apparatus, etc., consisting of flakes of mica, enclosed between covers of wire netting and canvass, forming mats of any size or shape, has recently been placed on the market by the Mica Boiler Covering Co., of No. 2 Bay street, Toronto.

The high price of hard wall plasters heretofore has prevented the adoption of them generally in Canada. The Alabastine Company, of Paris, Ont., announce in another column their "Paristone Wall Plaster," which they claim to be superior to anything now on the market, and at a price within reach of all. Architects who are interested in bringing the cost of buildings within the amount of their estimates might do well to investigate this new plaster. Situated as they are near to the central Canadian cities, and having their own mills and mines, it would seem that this firm might be able to produce the goods at a low price. The agency for this city has been established with the Toronto Salt Works, 128 Adelaide street east.

TESTING STRUCTURAL MATERIALS.

THE following are the subjects which appear on the program of an international conference, at Zurich, Switzerland, to be held on September 9, 10 and 11, to consider the adoption of standard uniform methods of testing structural materials. The conclusions of the conference will be watched with interest by architects and builders all over the world.

1. Future promotion of uniform methods of testing materials and important technical products.
2. Establishment of uniform methods of testing rust-preventing processes.
3. Relation of chemical composition of natural stones and their resistance to climatic changes; influence of smoke and sulphuric acid upon stones.
4. Method of determining quality and climatic resistance of roofing slates.
5. Methods of securing normal consistency and uniform density of cement test briquettes.
6. Investigation of methods of determining the constancy of volume of hydraulic cements.
7. Quick methods of determining quality of cement.
8. Adhesive strength of hydraulic mortars.
9. Technical value and physical tests of puzzolanas.
10. Investigation of anomalous phenomena of cements, especially of time of setting.
11. Investigation of influence of fecal matter on hydraulic mortars.
12. Processes of testing ordinary wrought iron, uniform methods.
13. Comparative tests, most simple measurements and expressions for flexibility of metals.
14. Influence of corrosion, wire tests for corrosion,
15. Tests of microscopic structure of metals, uniformity of methods.
16. Investigation of effect of very low temperatures on wrought iron.
17. Experiments on solder and soldering.
18. Compression tests of iron.
19. Cast iron tests.
20. Tests of iron and steel railroad material, axles, tires, &c.

PAGES

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