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—THE—
CANADIAN ARCHITECT AND BUILDER,
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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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THE attention of the City Council of Toronto has recently been called to the fact that repairs are urgently required for the preservation of the residence of the late Mr. Howard, the donor of Howard Park. Mr. Howard, who was an enthusiastic antiquarian, bequeathed to the city not only many acres of beautiful park lands, but also his residence, stables, etc., with their interesting and valuable contents. To allow these to perish through neglect would show a lack of appreciation of the donor's generosity which should be sufficient to discourage the giving of like public bequests in the future.

IF we are to judge by the slim attendance at the public meeting called in Toronto recently to discuss the construction of a trunk sewer, the citizens see no pressing necessity for the project being undertaken at present. That a better method of sewage disposal than the existing one is required cannot be questioned. A still more important matter at the present time, however, is the adoption and carrying out of means for increasing the water supply and for ensuring its purity. If the city's financial position will not warrant the immediate commencement of both these undertakings, then precedence should certainly be given to the one last mentioned, upon the carrying out of which the health of the citizens so largely depends.

ON another page of this paper is printed the provisions of a by-law for the regulation of plumbing and drainage work in the city of Montreal. This law, which has been under consideration for the past two years, finally passed the Council on the 24th of June. It appears to have been carefully framed, and will no doubt be the means of vastly improving the standard of plumbing and drainage work in the future. From our knowledge of of the sanitary condition of the city, an ordinance of this kind has long been a necessity. It is gratifying to observe one Canadian city after another thus providing means for the protection of the public health. If action had been taken in this direction years ago it would have resulted in the preservation of thousands of lives.

OUR attention has been attracted by an account of the annual meeting of the Whitby Hedge Co., Ltd., to a new and apparently profitable line of business—the planting of hedges—in which the above company are the pioneers in Canada. The company show a substantial surplus on the business already done, and unfinished contracts amounting to upwards of $12,000. Judging from its location and the personnel of its managers, we presume this company's operations are confined to the rural districts. There is a growing opportunity in the cities also for work of this character. It is gratifying to note these evidences of the growth of the artistic instinct and sentiment among all classes of our people. As a result, the charm of landscape for which England is famed may possibly in future characterize Canada also.

THERE was recently published the statement that the cost of building operations in Winnipeg this season would be nearly double that of 1893, or between a million and a half and two million dollars. In view of the general commercial depression, we read this statement with surprise. Its authenticity is now being called in question, and it is alleged to have had its source in the office of an enterprising real estate firm, whose methods are not unknown in some of our eastern cities. Building operations in Winnipeg are on a moderate scale, and are not likely to exceed the record of last year. British Columbia advices state that a quiet season is being experienced. Works on the new

Legislative buildings at Victoria is said to be progressing satisfactorily. On the ground that in the erection of these buildings American materials and workmen were discriminated against, an effort is being made by the Trades Council of Tacoma, to prevent Mr. R. L. Fox, a British subject, who secured the contract for granite work on the Port Orchard dry dock, from using Nelson Island, B. C., granite in the work.

DOUBTLESS as the result of representations made from time to time by the Architectural Associations of Ontario and Quebec, it is gratifying to learn that the Government has resolved to change the method of appraising the value of architectural plans imported for use in the erection of buildings in Canada. We are informed that new instructions have lately been issued by the Government to customs officials, under which architectural plans passing through the customs will in future be charged a duty based on the cost of the building to be erected. It has likewise been stated, though with what authority we know not, that the new regulations are to be retroactive, and that under them duty will be collected on the cost of the Ontario Legislative buildings, the Toronto Board of Trade, and other buildings erected during recent years from the plans of foreign architects.

THERE is no other class of work in which contractors are obliged to exercise so much ingenuity, good judgment and care as in alterations to existing buildings, which require shoring, underpinning, etc. It is quite common to see the architecture of heavy business blocks and entire streets entirely changed in this way, and in many cases it affords a comparatively cheap means of modernizing property which would otherwise be unattractive and in little demand for business purposes. The calls for this kind of work are becoming more frequent, and it cannot be too carefully studied by all who wish to make themselves competent for any emergency that may arise in their business. We publish in another part of this number a few examples of such work, and hope to follow them with others equally or more interesting.

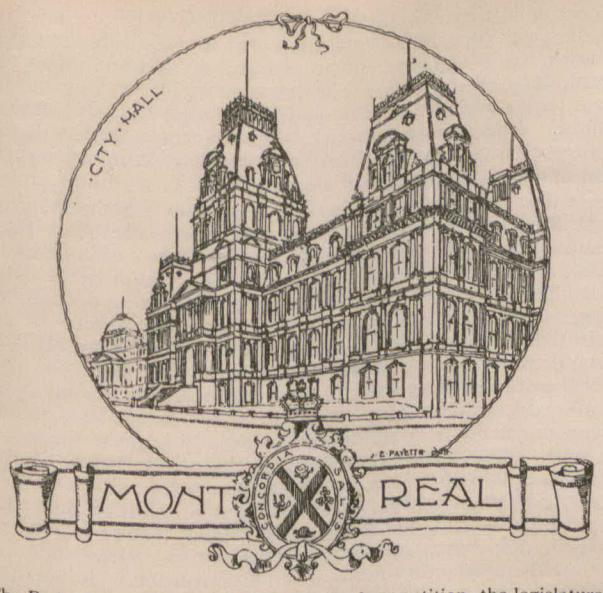
AN act passed by the Legislative Assembly of Ontario at its last session provides one of the simplest, cheapest and speediest methods that has yet been devised for the settlement of controversies by arbitration. The Board of Trade in any city of 30,000 inhabitants may elect 25 members of a Board of Arbitration to be chosen from 30 or more names selected by the Council of the Board of Trade. Membership in the Board of Trade is not a necessary qualification for the Board of Arbitration. Persons submitting a case may select one, two or three members of the Board of Arbitration to hear and decide the case. Sittings may be entirely private unless otherwise agreed, and unless the time be enlarged by ageement, all awards shall be made within twenty-one days after the submission has been signed. Arbitrators can compel attendance of witnesses on oath and have other powers similar to those in other arbitrations. There is also provision for the submission and award being made a rule of court.

ONE of the most difficult problems that architects have to consider is how to educate the public to a better understanding of what an architect's duties are, and the necessity and value of his services in connection with the erection of buildings. Many people have a hazy sort of idea that architects have something to do with very large or public work, but would never dream that they needed an architect to assist them in building a house, even of considerable cost, much less a small or cheap house such as they imagine "anybody" could successfully manage. How often has the remark been made, "Why, you wouldn't pay for an architect for a house costing so little as that, would you?" And how often persons have started out to save the architect's fee and lost twice as much by lack of his services, to say nothing of the wrangling and worry incident to such efforts. We hope to see this question a live one among members of the Architectural Associations when the season for outings is over, and would be pleased to receive suggestions as to the legitimate means which might be employed to better acquaint the public with the nature and value of the services which an architect should render to his clients.

ATTENTION is directed to the testimonial letter printed on another page of this paper, showing the value of the CANADIAN ARCHITECT AND BUILDER as a medium through which to advertise materials for the use of architects and builders. We have on file and shall publish from time to time a number of other letters from advertisers handling various lines of goods, all bearing testimony to the wide circulation of this Journal and to the fact that the most satisfactory results have followed its use. There are still some lines of business which should be represented in our advertisement pages, as indicated by the following enquiry just received from an architect in a western city: "Will you kindly forward to me by return mail, the names of some parties who would tender on wiring a building for incandescent lighting. I have not the time to advertise in the CONTRACT RECORD, therefore I have asked this favor." Architects and builders will oblige the publisher of the ARCHITECT AND BUILDER by frequently scanning the advertisement pages, and by communicating with us when requiring materials which they do not find advertised.

DURING the past month the people of the United States have been wrought up to the highest pitch of anxiety through a succession of strikes centering in and around Chicago. As usual Canada has been pursuing the even tenor of her way, but while we have been favored with freedom from the turmoil which has engaged our neighbors, we must not be unmindful of the signs of the times and the fact that the question of our continued prosperity may be affected at any time by the development of a larger sympathy with the situation in other countries. The civilized world is groping about for some means of allaying the dissensions between labor and capital. England is well in advance of America in dealing with this question. In the States present progress amounts to little more than a proof that there is a labor question which must be settled, or at least brought nearer to a settlement than it is now, and with as little delay as possible. If this is not done by peaceful agitation and combined effort on the part of all interested, there is every indication that still greater trouble will follow. The relations between labor and capital will not stand many such strains as the recent occurrences in Chicago. None have more at stake in this question than the builders, and they should have as much influence as any class of men for its intelligent treatment. Labor organizations are still too ready to resort to strikes. Peace between capital and labor can never be maintained except by mutual concessions and constant readjustment to meet new conditions. This must be brought about through earnest study and in compliance with natural laws. To this end contractors, material men and tradesmen should meet each other and cultivate at all times a feeling of mutual interest and good will. In this way they would wield a more powerful influence for holding men in check and for preventing such frequent resort to strikes with their sure accompaniments of violence and other aggravated evils. Of all the remedies proposed for removing the differences between labor and capital, arbitration stands to the front as meeting with the greatest amount of favor. It will not be found a universal remedy, as some apparently believe, but it will be very helpful as an intermediate step in some cases, and will become the established usage in others. In all business carried on under public franchises, and largely for public convenience, such as railway and telegraph operation, government should make such regulations as would prevent any set of employees going on strike or leaving their work in such numbers or manner as to interfere with the usual facilities for the performance of public service. For business involving only private interests the best results will come from the recognition of mutuality of interest between employers and employees. When employers and employees shall be willing to meet each other in a spirit of fairness and friendliness, they will be able to work together on a common basis to secure legislation tending to lessen the differences which now frequently arise, and secure their equitable adjustment without recourse to strikes. The whole subject is worthy of the serious attention of all business people. The necessity for its consideration is imperative.

The days of the "steeple" are numbered in New York. The many tall buildings recently and still being erected in the city completely dwarf the former landmarks.



The Ratepayers Association has resolved to petition the legislature to amend the city charter, so as to disqualify as voters at municipal elections every person in the employ of the city or having an interest in any contract with the city.

MASONIC HALL COMPETITION.

The new Masonic Temple which is to be erected on Dorchester street, from designs by Mr. Robert Brown, architect, of this city, will have a frontage of 51 feet and a depth of 109 feet. On each side of the entrance there will be stores, and in the rear a concert hall. The first floor will be fitted up as offices and assembly hall; the second floor as club and refreshment rooms, and the top floor for lodge rooms. In the basement will be the caretaker's quarters, billiard room and vaults. The cost of the building will be about $60,000.

Following is a copy of the report of Mr. Hutchison, the expert appointed to judge the plans submitted in the above competition :—

MONTREAL, June 25th, 1894.

Will. H. White, Esq.,
Secretary Masonic Temple Company.

DEAR SIR,—I beg to report that I have examined the several competition designs sent in for proposed Temple Building on Dorchester Street.

For this competition eleven designs were submitted under nine mottos as follows:—"Shield," seal in red wax with the motto "Touch Not the Cat but a Glove"; "Complete," (three different designs); "Beta"; "Forty-seventh problem of Euclid"; "Try"; "Inter Nos"; "Wasp"; "Ich Dien."

A preliminary examination of the several designs showed that the competition for the first and second place lay between two designs—one designated by a shield and the other by a seal in red wax.

After a careful and minute examination of these designs and a comparison of the merits of each, I came to the conclusion that the design bearing the motto of a shield should be ranked first in merit, and the design bearing a red seal with the inscription "Touch Not the Cat but a Glove," should rank second.

In arriving at this conclusion I have taken into consideration that the author of the second design adhered strictly to the conditions respecting the placing of the two largest lodge rooms in the rear of the upper story of the building, and the smaller in the front, while the author of design No. 1 took the liberty of placing one of the large lodge rooms in front: this change, however, gave him no advantage over the author of design No. 2, and the selection of his design as first is made without awarding him any superiority for this arrangement.

The selection of the design as third in merit I found a more difficult task, as three of the designs approached so nearly in merit that it was difficult to determine which was best. After a careful examination I concluded that one of the designs submitted under the motto "Complete," which I have for the purpose of distinguishing it from the two designs by the same author, marked in pencil as "No. 1," is third in merit.

I have the honor to be,
Your obedient servant,
(Sgd.) ALEX. C. HUTCHISON.

ORGANIZATION OF PLUMBERS.

A general meeting of the master plumbers of this city was held in the "Monument National" building on Thursday evening, the 12th inst., for the purpose of organizing themselves into an association to raise the standard of their profession. Messrs. J. W. Hughes, W. M. Briggs, P. J. Carroll, John Date, Jas. A. Sadler, Wm. Britton, Jos. Turcotte, John Burns, P. C. Jacotel, J. Jacotel, C. St. Denis, G. W. Henders, Albert Cardinal, H. Paddon, A. Sicotte were present, amongst many others whose names it has been impossible to procure.

On motion of Mr. Hughes, Mr. P. C. Jacotel took the chair. In brief terms the chairman addressed the meeting in French, stating the object for which it had been called; and requested Mr. Hughes to address the meeting in English.

Mr. Hughes said that a by-law similar to those existing in the principal cities of the United States to regulate plumbing in Montreal had been needed for a long time. He was glad to say that such a by-law had been recently passed, though it was not up to what master plumbers would have liked it to be.

A committee was appointed to consider the plumbing by-law adopted by the City Council and to report at an early date. The election of officers for the projected association was deferred to a future meeting. This association proposes to embrace all the master plumbers in the province of Quebec, with headquarters in Montreal, and branches in the principal cities of the province.

PROVINCE OF QUEBEC ASSOCIATION OF ARCHITECTS.

At a Council meeting of the Association of Architects of the Province of Quebec held on Thursday, the 12th inst., it was resolved to call a general meeting of the members of the Association, which will be of great importance to members, as it is proposed to discuss the advisability of applying to the Legislature for the purpose of making changes in the charter of the Association.

STUDENTS' DEPARTMENT.

USEFUL HINTS.

SQUARING UP LINES.—In drawing the lines for a foundation, or stretching them overhead for a shafting, a paper of pins comes in handy, to locate positions on the lines. All that is required is to thrust one through the line every time a point is to be located, and it can be easily done, in a moment, as close to the mark as anyone can work on a drawing board. It may take a few moments to square a set of cross lines on the six, eight and ten principle, when there is to be a ten-foot pole supported by three assistants, reaching out from whatever they may be able to stand upon, as every change in a cross line disturbs all the measurements, but when once adjusted all further lines can be laid out by direct measurements, and the rest of the angles will take care of themselves.

SEASONING WOOD.—Growing wood contains in winter about 50 per cent. of water, in March and April 46 and 48 per cent. in the next three months, with but little variation up to November. Timber dried in the air holds from 20 to 25 per cent. of water; never less than 10 per cent. Wood dried by artificial means until all the moisture is expelled, is deprived of its elasticity, and becomes brittle. If the natural qualities of the wood are to be preserved, the drying must begin at a moderate heat, and be carried on very slowly. For the drying of small pieces of wood, such as are used by joiners or cabinet makers, a bath of dry sand, heated to a temperature not exceeding one hundred degrees, is recommended. The sand diffuses the heat, and absorbs moisture, but it must be cold when the wood is first buried therein.

EFFECT OF HEAT ON LEAD PIPES.—Text-books contain a great deal of useful information, no doubt, but they fail to give a vast amount of knowledge which is required in practice. Where, for example, do we find any mention of the effect of heat on lead pipes? In the case of a recent electric lighting installation, exhaust steam by some means found its way into the ventilating and soil pipes leaking to the drains. One of the first evidences of this was found in the warping of all lead pipes so used. It appears that the heat of the exhaust steam caused the lead pipes to expand and warp, but when the steam was entirely prevented from entering the drains the lead would not contract, and all such pipes had to be straightened by hand. This is a point which embryo engineers would do well to keep in mind, as each time the pipes were heated they expanded, but in no case did they show any signs of coming back to their normal condition.—Industries and Iron.

SAND IN MORTAR.

It was the opinion of Vitruvius that pit sands were preferable for mortar, but he says that they must be freshly dug, otherwise they are decomposed by the action of the atmosphere and become earthy, and in this state they make bad mortars. Alberti, Palladio, Phillibert, Delorme, Blondel and some other writers agree in these opinions, but Belidor thinks that river sand is best, and that it should be sharp. Palladio considers that white sands are worst. Belidor states that color has nothing to do with the matter. Rondelet, in consequence of these contradictory opinions, made experiments himself on the subject, with the following results:—(1) That the glassy or quartzose sands form with lime a weaker mortar than mixed sands, and that such mortar is longer drying. (2) That pit sand produces a better mortar than that made with river sand composed of grains of the same size. He did not find that the sharpest (*plus arides*) sands made the best mortar but thought that of sands of the same kind those which were deepest in colour, excepting the yellow, were to be preferred. The best sands, he states, are such as hold a middle place between those which are very plastic and very sharp. On comparing mortars made with freshly dug sand washed and dried in the sun, the sharp (*arides*) grains only being left, he found that the first acquired the greatest hardness, and that mortar made with very fine sand did not harden so well as that made with sand of a moderate-sized grain.

All these authors considered sea sand the worst, but Alberti mentions an exception. The sea sand from the neighborhood of Salerno he found to be as good as the best pit sand.

A FAILURE OF CAST IRON COLUMNS.

Major-General Hutchison's report to the Board of Trade, of London, England, gives the result of his enquiry into the accident which occurred on the 12th of December, at Portsmouth Harbor Station, when the roof covering the arrival island-platform was blown down by a high gust of wind just as a train was leaving. Several persons were injured, one very seriously. The fall of the roof must, Major General Hutchison says, in the absence of any other probable cause, be attributed to the effect of a sudden gust of wind during the prevalence of a gale. The zinc roof covering did not give way, but the wind pressure was transmitted toward the base of the cast iron columns—a double row of which supported the roof—with the result that one (or more) of these was at once broken off four feet above its base (which was bolted down to wrought iron cross girders, connecting the cast iron columns employed in the structure of the station), this being immediately followed by the similar fracture of the whole of the forty-nine remaining columns, and the fall of the roof. The columns were all broken in two places, the two points of fracture being in each column almost identical. The thickness of metal was intended to have been uniformly ½ inch, and it must have been either from a deficiency in this thickness or from a flaw in the casting that the force of the wind was able to break a column thus weakened. The evidences of the witnesses does not lead to the impression that they had felt the force of the wind very excessive when the roof fell. Theoretically these columns should have been able to sustain a far greater pressure than they were ever likely to have been exposed to.

"A Draughtsman" writes to the Ottawa Journal urging the formation of an Architectural Sketch Club, on lines similar to the Toronto club. "Draughtsman" is apparently unaware that the Toronto Sketch Club has ceased to be. It should be possible for clubs of this character to be organized and maintain a useful existence in several of the leading cities of Canada.

TORONTO BUILDERS' EXCHANGE.

We are pleased to learn that the Toronto Builders' Exchange are again holding their annual excursion to Lake Island Park, Wilson, N. Y., on Friday the 27th inst. As the Committee are making every possible arrangement for the pleasure and comfort of the party, this will, no doubt, be one of the most enjoyable trips of the season.

We understand that the steamer "Garden City" (which has been chartered by the committee) will leave Yonge street wharf at 10 a.m. on the above mentioned date, the price of tickets being 50 cents, and 20 cents for children. The members of the Exchange extend a hearty invitation to all their friends to accompany them upon the trip.

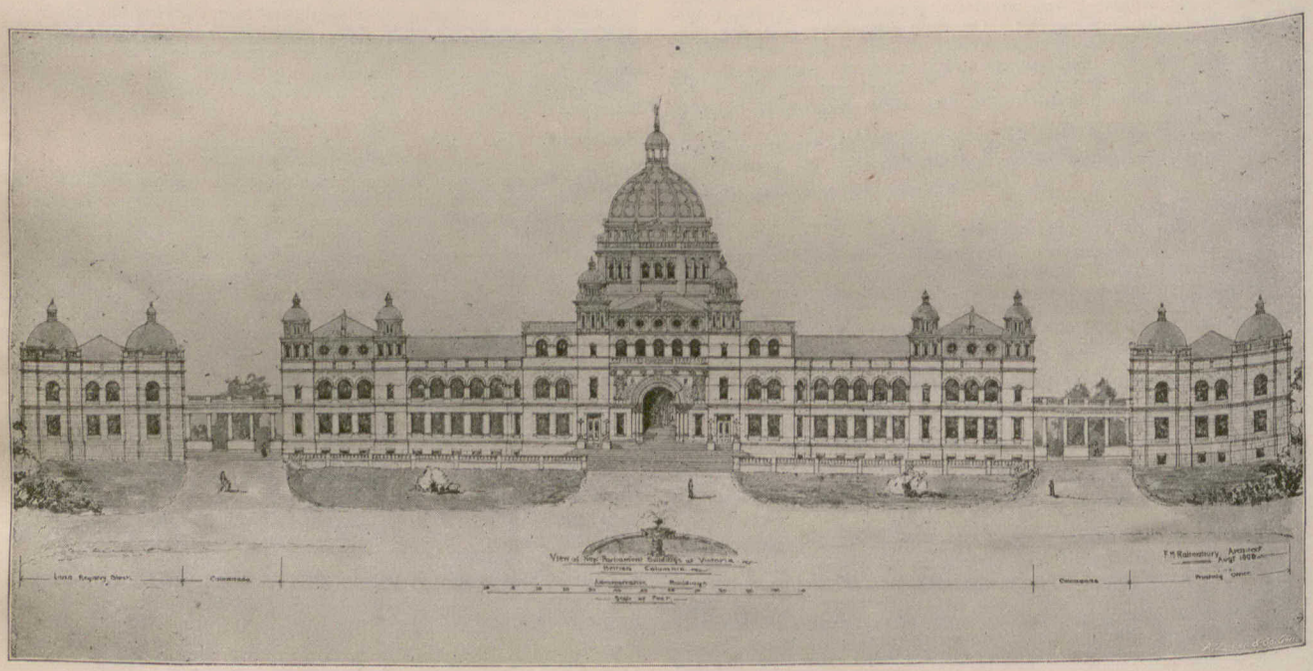
ESTIMATES AND QUANTITIES.

There is generally a considerable difference to be noticed between an estimate prepared by a builder from a set of drawings and a specification and one which is based upon bills of quantities prepared by a regular surveyor. It is often assumed that a builder can sail nearer to the wind than a surveyor; that he is not under the same necessity for allowing margins of safety, and that, in fact, as he makes any omissions at his own risk, he knows how to compensate himself for such lapses of forethought. Hence, in small works, when an estimate has been accepted on a builder's own quantities, the architect is more than usually on his guard against making allowances for extras. When there is a disagreement in such cases, the amount in dispute is often so trifling that the builder ends by yielding the point and accepting the architect's award. If the architect be a fair-minded man, he will endeavour to adjudicate impartially between the builder and the building owner, allowing the interests of neither to gain any undue ascendancy. This, however, is an extremely difficult thing to do. Setting aside the fact that an architect's own interests are mainly identical with those of his client—a fact which, it is fair to say, does not influence the conduct of most professional men—how does the question usually present itself to the mind of an architect? On one hand there is the client, a man unversed in the technicalities of building, and therefore completely at the mercy of those acquainted with all its mysteries. On the other hand, is the builder, with his own special, practical knowledge, which on some points may exceed that of the architect, and with one object before him—that of carrying on his business with the greatest amount of profit to himself. It is then assumed at once that the client alone stands in need of protection; and so it often happens that an architect becomes virtually his client's advocate, instead of maintaining a judicial attitude between him and the builder.

When a builder commences making an estimate without a previously-prepared bill of quantities, he has an amount of labour thrown upon him for which he can claim no remuneration, and which, in a competition, may prove utterly unfruitful. In taking off quantities, although he will probably adopt more simple and rough and ready methods than would be found convenient for a surveyor, his task becomes really more complex. Instead of taking off a number of dimensions, to be subsequently squared or cubed, abstracted, and brought into bill, he may be seen examining the drawings with knitted brows, going through mental calculations, and occasionally jotting down rough notes. He "lumps" many of his items, considering in his mind the quantity of materials required, the markets where they can be obtained, the cost of carriage, the amount and quality of labour involved, and the profit for which it will be worth his while to undertake the work. Such methods of procedure, so far from being haphazard, demand the exercise of more thought, and bring into play a larger amount of practical knowledge than is generally realized. The items which are "lumped" in a surveyor's bill require an equal amount of careful consideration in pricing, but these items are comparatively few.

In estimating the cost of carving and other ornamental work, the builder often runs considerable risk, unless there is a plentiful supply of large scale details to form the basis of his estimate, or unless he is thoroughly familiar with the style of work which the architect is in the habit of carrying out. In an open competition, when the lowest tender is to be accepted, there is little doubt that differences between estimates are often largely due to vague drawings or the absence of provisional sums for ornamental work in the specification. Marginal sketches in the latter are extremely useful to an estimator, and might be introduced more extensively with advantage, especially in these days of rapid work, when it often happens that there is not time to draw many details before the contract is signed. Architects are usually ready enough to furnish a builder with all the information they can command, and to afford him every facility in preparing his estimate; but time rarely permits of this being done in a thoroughly satisfactory manner to all concerned. Sometimes a builder is allowed two days in which to estimate the cost of a work. He cannot be expected, under such circumstances, to take off quantities in any true sense of the words, and thus finds himself driven to adopt expedients which only very sound knowledge can make reliable. An inexperienced man, says the Building Times, who secures a contract in a competition may well doubt if he has not engaged in an unprofitable undertaking, and may even come to envy those who have given time and thought to the preparation of estimates which have not been accepted.

When an architect is carrying out a work for which the estimate is based upon builders' quantities, he should bear in mind such circumstances as we have endeavoured to delineate. As a matter of fact, such estimates often come out much cheaper than those which are made from bills of quantities supplied by a surveyor. In some cases builders have been known to make little or no profit upon the original contract, and have even sustained losses over extras and omissions. In these days of bad trade it is indeed hard to be presented with the alternative of standing idle or of working to no advantage, and every consideration ought to be shown, in carrying out the details of a work, to those whose toils are but too seldom adequately rewarded.



NEW LEGISLATIVE BUILDINGS, VICTORIA, B. C.
F. M. Rattenbury, Architect.

LEGAL.

Mr. McLea Walbank, architect, of Montreal, designed a chimney for the Royal Electric Co., of that city. The chimney was built by Mr. Wand, contractor, and is alleged to have proved defective. The company brought action for $1,281 damages against the contractor, who in turn took action in warranty against Mr. Walbank, alleging that the chimney had been constructed in accordance with the plans and therefore that responsibility for defects should be with the architect. Mr. Walbank demurred to the action in warranty, contending that no such action lay in a case of this kind. Mr. Justice Davidson dismissed the demurrer. The Civil Code provides that if a building perish within 10 years, from a defect in its construction, the architect and the builder are jointly and severally responsible.

CHRIST CHURCH CATHEDRAL.

VERY few churches in Montreal are comparable from a constructional, as well as from an artistic point of view, to Christ Cathedral, of which I have attempted herein to give a short description. The great cost of stone found in this district, owing to its hardness and the difficulty experienced in carving it, tends no doubt to generalize the employ of lumber and galvanized iron, which has been so extensively used lately where stone should have been used for decoration and construction. This cathedral is an exception to the majority of our churches, having been built by the wealthiest congregation of the city; and nothing was spared to make it artistic and handsome. It is the only structure of its kind here, where stone has been so lavishly used for exterior as well as for interior effect. It is built on the north-west corner of Phillips Square, on the block bounded by Union avenue, University street and St. Catherine street, on a site that was donated by George III, King of England, for the erection of the cathedral which was destroyed by fire in 1856. Work was commenced on the existing church immediately after the fire, and was completed in 1859, when the edifice was opened for service. The plans were prepared by a prominent London architect, who unfortunately was not permitted to see this gothic chef-d'oeuvre carried out, but died before the foundations were out of the ground, at the beginning of the year 1857; when a successor had to be appointed to carry out his plans.

But two blunders were committed, one owing to the entire ignorance by the architect or his representative of the nature of the ground on which the church was to be erected, and the other to the severe climate of this country in winter. The first was due to the inefficiency of the spire foundation, which having sunk considerably before it got half way up, had to be taken down and rebuilt. The other blunder is practically irreparable, experience having shown that part of the stone employed in the construction cannot resist our severe winter frosts, and every year a goodly amount of money has to be laid aside for the replacing of the damaged stones. All the stone used in exterior trimmings and also in the interior, where there is a considerable amount of stone, was specially imported for the purpose from Caen, France. This stone resembles very much in appearance the Ohio standstone, and was very extensively used for inside work in England at the time the church was built; it is an exceptionally suitable material for executing fine sculpture and mouldings—when not exposed to weather. Mr. Taylor, architect, was appointed some years ago to pay regular visits to the structure and attend to all restoration that the course of time might have rendered necessary; nothing is allowed to be touched or altered without professional advice, as it is considered that an inexperienced hand can destroy in an hour what it has taken years for an artist to produce.

A few years ago two stones fell from the spire through the roof, and the beautiful stone cross over the chancel gable also fell to ground, broken into atoms. The architect was sent for, and all the fragments were gathered and put together, and a reproduction of it made of the same material to replace the broken one. Several other ornaments and moldings also perished, but all were treated in the same manner. The only part that has not yet been affected by the frost is the window tracery—which are of stone—and great care is taken to preserve them intact. The chancel and aisle windows and the rose window in front have very remarkable tracery, and should they be injured it would be found extremely difficult to repair windows of such sizes. A curious thing to note is that nearly all the window tracery are of different design, such being the case with the row of circular windows over the main nave and on each side of it. The spire is built entirely of stone, and contains a beautiful clock and chimes. It is reputed to be the highest stone spire in Canada, measuring about 225 feet from the ground by — feet square at its base above the roof.

On Union avenue, close to the church, stands a handsome little monument, about 28 feet high, built of Ohio sandstone, in commemoration of Bishop Fulford, first bishop of Montreal. The front porch of the church is also very handsome, and fine details are to be found, such as crochets, gorgoils and elegant moldings.

Now let us glance at the interior, which is as interesting as the exterior. As we enter there is no flashy decoration, and anyone expecting to see fret or ginger bread work will be disappointed; but everything is so appropriate, neat, simple and artistic, that on closer inspection we are forced to admire the whole. The beautiful stained glass that adorns the chancel and aisles is mostly of Clayton & Bell's make, and of a Brussels firm. On the left hand side of the chancel is the organ, which is hardly apparent, and which is reputed not the most powerful, but the most perfect musical instrument of its kind in America, and is a reproduction of the old organ that was burned with the old cathedral in 1856. It was built by Hill & Son, of London, Eng., who had preserved the plan of the original organ.

The Ledilia (marked 1 on the plan) and baptismal font (5) being all stone, deserve more than a passing glance, and exhibit admirable carving. At (4) stands on a pedestal a bust of Bishop Fulford; in (2) is the Bishop's chair, and in (3) is his throne. The two rows of arcade dividing the aisles and nave, and door and window jambs, are all of solid stone, and the capitals of the columns each contain a specimen leaf of the different kinds of Canadian trees carved in the stone. The altar cloth, made by the Sisters of St. Margarets, of this city, the memorial window in the left transept and the fine brass chandeliers, are of recent date, and were executed from drawings by Mr. Andrew T. Taylor, F.R.I.B.A.

An interesting part of this church that should also receive some attention from the visitor, is the Chapter House over the vestry, where beautiful stone carved statues supporting the roof trusses can be seen. In a word this is a church thoroughly English in character, that is very seldom seen on this side of the Atlantic; and I would advise my professional brethren, when they have an opportunity, not to forget to pay a visit to what I consider one of the finest specimens of gothic architecture of the Decorated Period on this continent.

I desire to here thank publicly the Rev. J. G. Norton, M. A., D. D., rector of the Cathedral, and Mr. Andrew T. Taylor, F.R.I.B.A., architect in charge of the restoration of the church, for the valuable information which helped me in preparing the above.

P.

ESTIMATING.

MANY good workmen and thorough superintendents make poor attempts at estimating, and often their efforts in this direction prove their ruin. On the other hand, the writer has known poor or indifferent workmen who seemed to have a natural gift for arriving at the cost of proposed works; not by any proper or systematic course, but by a sort of intuition which stood them instead of actual trained knowledge. Men, however, of this sort, whose conclusions are jumped at, are not reliable in their figures, when the works estimated are above the average magnitude; and on more than one occasion I have known these haphazard contractors to have been sorely bitten when reaching out beyond their limits.

Estimating, like everything else resulting from human effort, can only be a certain success when directed by a thorough knowledge of the subject and painstaking labor. There is no royal road to estimating, and the man who attempts to jump at the cost of a proposed building, aud takes the contract at his own figures in the face of intelligent competition, either does not get proper returns for his labor, or jerrys the work,—either dilemma proving ruinous in the end. The best contractors are men who have been trained to the service, and whose knowledge of every detail in building, the cost of every variety of supply and material, whose acquaintance with the producing capacity of workmen, is complete. Such men are found among the regularly employed "Clerks of the Works," so-called in the British Isles, and in some portions of Europe and America. These men are supposed to know, and generally do, all particulars concerning buildings of every style and grade, and estimates made by them always deserve respect.

In this country the architect is perhaps the best authority on the cost of a proposed building, though I must confess that some estimates made by professional men in this country often prove wide of the mark, their figures generally being too low. There is one department of estimating, however, wherein the architect's figures are generally correct, and that is in the quantities. These, when given by the architect, may be relied upon, and having these, the wide-awake contractor ought to be able to get at the cost of a building pretty close. I have often thought it a mistake that quantities are not attached to specifications in some way, and that intending contractors be taxed a small amount for the privilege of making use of the figures. Let it be understood, however, that I do not advocate the doing of this extra work by the architect, gratuitously. To take out the quantities of a building of any magnitude, entails a great deal of labor and time, and it would be but just that these should be paid for by the parties who receive the benefits, who, of course, are the contractors. The cost to each aspirant need not be much, while the benefits are manifold, inasmuch as the figures may be relied upon; there is much time and tiresome labor saved, and no item will be forgotten or overlooked. The architect might also give the cubic contents of the building, with the actual cost per foot of similar buildings—not that I approve of the "cubing method" for estimating, for I believe it to be very faulty; but it might be given as a sort of guide by which the estimator could see if he had made any serious mistakes.

In a future paper I will endeavor to show a method of estimating, suitable to the requirements of country builders.

A. Z. Z.

Collingwood, July 7th, 1894.

TRADE NOTES.

Mr. Alex. Bremner, of Montreal, dealer in contractors supplies, has issued an attractive wall hanger, giving, by means of illustrations and printed matter, information relating to his various lines of goods.

Referring to the opening of the Zion Evangelical church at Berlin, Ont., the daily news of that town on June 18th said: "The gas reflectors and fixtures were supplied by I. P. Frink of 551 Pearl street, New York. The lighting of the church is on a style most complete, and was put in under the supervision of Mr. E. C. Breithaupt. The lighting is so perfectly arranged that though the church will be as light as day, there are no lights near the pulpit, to dazzle the eyes of the congregation, the reflectors spreading a brilliant light over everything."

Dr. Grady, of Eastport, Me., in company of an expert, has recently made an inspection of the black granite deposits at Bocabec, N. B., with the view it is believed of investing therein.

ILLUSTRATIONS.

COMPETITIVE DESIGN FOR PROTESTANT ORPHAN ASYLUM, MONTREAL.—DAVID A. BROWN, ARCHITECT.

The design which we illustrate received third place in the competition. The reproduction is from a drawing by Mr. O. Tolhurst, of Montreal.

RESIDENCE OF MR. W. T. MCMULLEN, WOODSTOCK, ONT.—A. WHITE, ARCHITECT.

The face stone work is of Credit Valley brown stone, the cut stone of Ohio buff free stone, and the brickwork of first quality Beamsville red pressed bricks. The roof is covered with Rockland slates. All outside woodwork will be painted a cream color. The hall, staircase and principal rooms will be finished in quartered oak ; the bedrooms in clear pine, natural state. The parlor, dining room and two bedrooms to have open fireplaces, with tiled hearth and facings.

ORILLIA TOWN HALL AND MARKET BUILDING.—GORDON & HELLIWELL, ARCHITECTS, TORONTO.

The building is constructed of brick with stone trimmings and basement, and a slate roof. The general dimensions are 60 × 106, the tower and staircases projecting beyond this.

The front portion of building on ground floor is utilized for town offices, including a council chamber 40 × 32, town clerk's room and a committee room. The rest of ground floor is devoted to the market, and contains eight butchers' stalls or shops and a general market room for vegetables, &c.

The basement under market is devoted to cellar accommodation for stalls and a public lavatory.

The cellar under council chamber is used for boiler and fuel room.

In the two circular towers at front are two wide staircases leading to public hall on first floor and to the gallery of same. In the square tower is a private stair to the stage and dressing rooms of public hall.

The auditorium of hall on 1st floor is 56 × 64 feet, and the stage platform recess in rear is 32 × 25 feet. On each side of stage are dressing and property rooms. Around three sides of hall is a gallery to seat about 270 persons. The main floor of auditorium will seat about 600 persons.

The internal finish in town office portion is hardwood and in the rest of building pine. The walls of market are brick and the ceiling wood. The ceiling of auditorium is an elliptical arch in plaster.

NEW LEGISLATIVE BUILDINGS, VICTORIA, B. C.—F. M. RATTENBURY, ARCHITECT.

SKETCHES FROM CHRIST CHURCH CATHEDRAL, MONTREAL.

PRACTICAL CARVING.

A FEW remarks on practical carving may not be amiss at the present time, writes John Keily, of Toronto. Some would-be critics say : Why not use your eye? And a carver who is seen to use a compass or plumb-bob is said to be a mechanical carver.

Now the eye cannot always be depended upon. It seems to be a prevailing fault in drawing a circular curve to make it a flat curve, and a flat curve nearer to a straight line. In the oft repeated egg and tongue moulding, which takes a good carver to make, and which is attempted by every tyro or stone cutter, the chamfer of the egg is invariably on the left side, leaving it full on the right. Its section is not a half circle but the section of a thumb moulding. I observed the same defect on a number of organ pipes carved behind a figure of music.

I once had to finish an oval shield after a boss carver, who used his eye when roughing it out. Taking a centre line and stepping the compass to the right and then to the left, I found the latter was narrower than the right side : the outline on the left side flat, the right bulbous. A fulness on the right side of spiral bands is also a common occurrence.

In carving a head or mask in stone there is a tendency to splay it off to the left and undercut it on the right. A proper carver when carving the capital of a column uses a plumb-bob on the bell of the cap to get the column line, carrying it well up to give the column vigor ; whereas a novice will leave the bell projecting beyond the column line, and the foliage falling out from the astragal to the abacus.

Dalon, the great French sculptor, when modelling a figure from life, takes a number of fixed points in a mechanical way to determine the proportions of his subject, and then gets in his artistic work. Flaxman says "that Greek sculpture did not rise to excellence until anatomy, geometry and numbers had enabled the artist to determine his drawings, proportion, and motion ; then and not before, a just expression might be infused in the truth and the harmony of parts, and the artist endow his statue with life, action and sentiment."

The town of Iberville, Que., has granted a bonus of $600 per year for ten years to Mr. H. Black, for the establishment of a factory for the manufacture of porcelain sinks and baths. Mr. Dakin will be the manager of the new concern.

SHORING.

BELOW we show cuts of two examples of shoring which are in use on prominent streets in Toronto. In both these cases side walls are removed down to the footings about 14 feet below the sidewalk. In Figs. 1 and 2 the principal timbers A are built up of 3 pieces each to a thickness of 7½″ × 12″, and in Fig. 2 the piece marked B is built up of 3 thicknesses of 4″ × 12″. This timber is footed at the bottom of the new basement excavation 15 feet below the sidewalk. In Fig. 2 the shop front is entirely removed on the ground floor, and the corner shored up is supported by the post C, and also by another heavier upright which is omitted from the sketch to make the shoring clearer. The tie pieces are of 2″ stuff spiked on both sides of the timbering. The differences in these two examples are mainly in the spread of the lower end of shorings, which is 15 feet in Fig. 1 and 6 feet in Fig. 2, and the way the braces are cut around the cornice in Fig 2. In both figures the height of shoring is about 30 feet above the sidewalk.

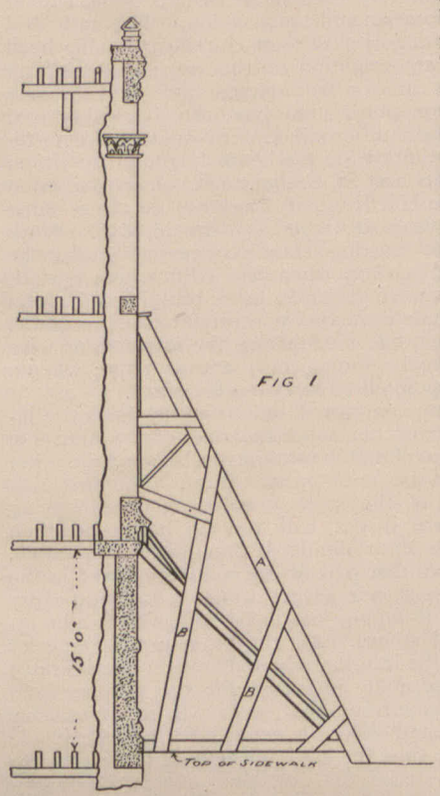


FIG 1

In this connection we reprint from the Building News the following interesting description and illustration of the methods employed in moving back a brick wall :—

In connection with the widening of Minster street, Reading, it has been necessary to throw a portion of the site occupied by Messrs. Watson Brothers' glass and china warehouse into the street. As Mr. Watson was very anxious that there should be no loss of time, and desired that any new front to his shop which might be erected should be similar to the existing one, the Borough engineer (Mr. Arthur E. Collins, Assoc. M.I.C.E.), designed and carried out an arrangement by which the existing front has been pushed back to the desired position. Notwithstanding that a good many persons, who well illustrate the saying that "A little knowledge is a dangerous thing," thought the intended operation a very dangerous one, as an actual matter of fact no more risk was incurred than during the progress of any ordinary constructional operations. Every necessary precaution was taken to avoid accident, and these precautions proved effectual. The actual operations were as follows : —The plate glass shop-front and the window sashes were removed ; the floors and roofs were shored up and cut back to the extent of the intended setting-back of the front wall ; five strong trestles were constructed beneath and across the girder supporting the front wall, and sliding pieces were placed on these trestles. The sliding surfaces having been well lubricated with soft soap and tallow, the weight of the wall was transferred to the sliding pieces by driving oak wedges between those pieces and the girder supporting the wall. The front wall was then cut away from the surrounding walls and from its supporting brickwork and columns. Screw-jacks were then applied to the slides, and the wall was pushed back into its new position. To prevent the wall from falling forward

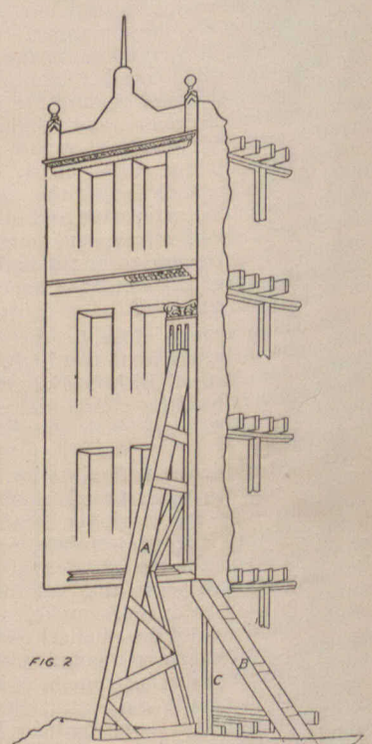
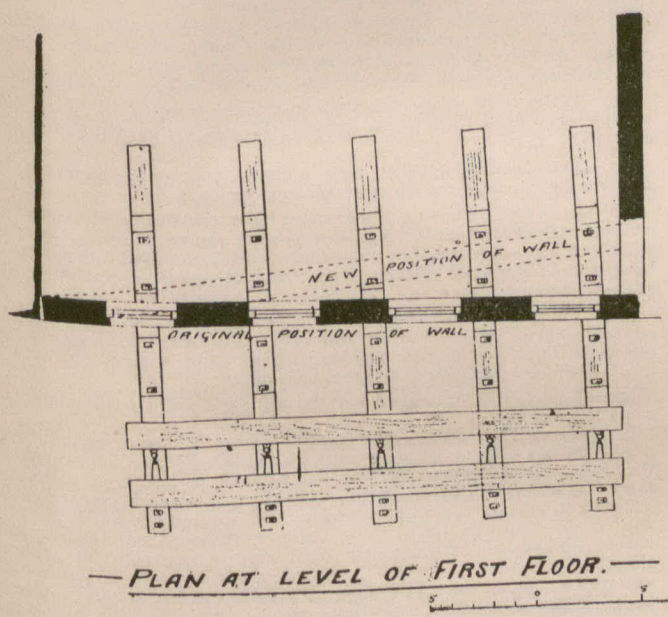


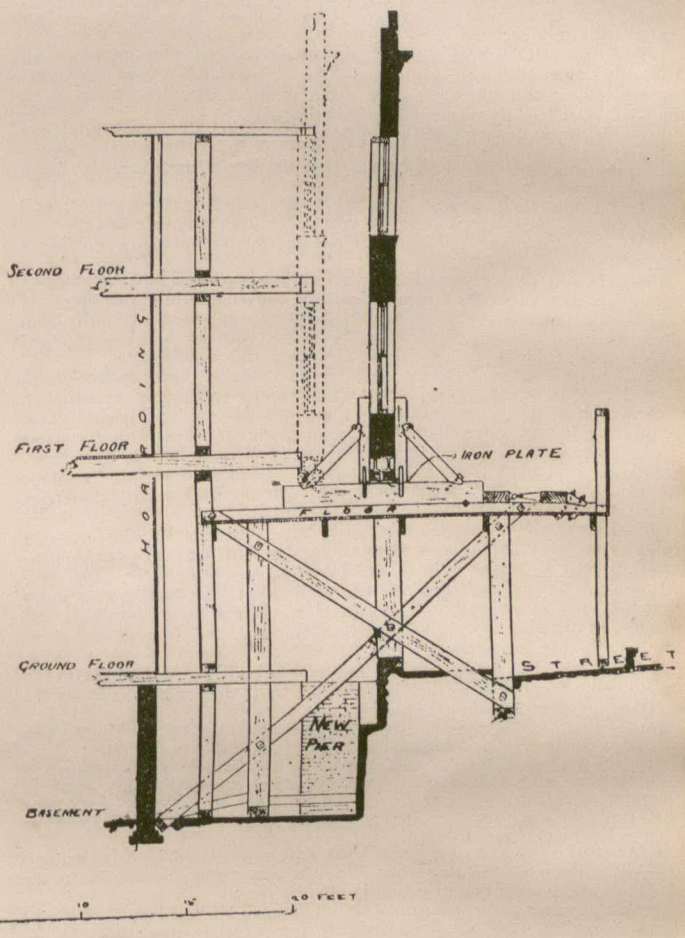
FIG 2

into the street, should it show a tendency to do so, four sets of Tangye's differential chain blocks were attached to the wall and to suitable points in the building, these chains being kept just taut. To prevent any falling inwards of the walls, struts, consisting of stout scaffold poles, were butted on suitable parts of the building. These struts were constantly shortened as the wall moved back, so that whilst never touching the wall, at no time was there a greater distance than 1 in. between the moving wall and the end of the strut. The actual moving was performed in about two hours and a half, under the immediate direction of the borough engineer. Mr. George Lewis, of Castle street, the contractor, assisted by his foreman, Mr. William Church, executed the necessary work most ably, and business was carried on as usual throughout its progress. Messrs. Watson's premises in Minster street are three stories high, and have a basement. The wall moved was 30 feet long, 23ft. high above the first floor, and 18in. thick, including plastering, &c. The front is stuccoed. The east end of the front was moved back 3ft. 6in.; but the west end was not moved, as it was already fair with the adjoining building. The weight of the wall is about 38 tons.

COLOUR IN BUILDING.

At a recent meeting of the Edinburgh Architectural Association, Mr. A. N. Paterson, M.A., read a paper entitled, "Colour as a Means of Architectural Expression." By way of introduction it was shown that the materials which the architect employs having each their colour value, his art is essentially chromatic, and that in consequence the study of colour is of the first importance; that, nevertheless, it has been much neglected by architects, and that to this among other causes is due much of the monotony of present-day architecture. Architectural expression is regarded to be as much a matter of color as of form, the term expression being used to indicate the individuality which differentiates one building from another, as well as the quality and character of the design in any one building. Three main lines of colour-study are laid down as being of most advantage to the architect. I. An examination of some of the principal laws of the science of chromatics, with the facts thereby to be discovered regarding the effect of colours according to their position and juxtaposition; a knowledge of these facts by itself will never produce fine results artistically, but they may be used by the artist as safe guides for the direction of the studies. The difference between light and pigments in relation to color is noted, and the laws regarding complementaries, contrast and small interval are explained and commented upon. The propositions regarding the use of color laid down by the late Owen Jones in his "Grammar of Ornament" are examined with relation to past examples of architecture and analogy from nature. II. Attention is turned, secondly, to the color qualities of our materials and the range of materials we have at our disposal, and it is found that there is no color which has not its exponent in almost every material the architect makes use of. The various materials are passed in review, with reference to their effect from a color point of view; stones, marble, of which it is thought more extended use might be made over small surfaces in external work; cement used as granolithic, rough cast and (as a form of small decoration) sgraffito; the various woods, singly and in combination, with a remark as to the greater use of inlays; bricks, tiles and terra-cotta; the metals, mosaic and other forms of internal and external decoration. With regard to these last, the more extended collaboration of artist craftsmen is pleaded for as the only means of producing the finest results. III. In the third place, attention is directed to the use of color in the architecture of the past. It is found that color has always played an important part, and a rapid survey is made of pre-classic days, of Greek and Roman, Romanesque and Byzantine, Mauresque, Gothic and Renaissance architecture, with a more careful examination of some Italian temples illustrated—St. Mark's at Venice, with the Ca d'Oro and other palaces there, the churches of Sienna and Florence and the houses of Bologna and Perugia. The use of colored materials and pigments in England and Scotland in past times is inquired into and illustrated. In conclusion, the tendency towards a more widespread use of color in the present day is noted and welcomed, and particular reference is made to buildings in Edinburgh and Glasgow giving evidence of this. The counter influence of fog and smoke is discounted, as much of an architect's work lies in the country beyond their reach, while it is further contended that even if a colour effect in towns is limited to a few years' duration it is none the less worth being carried out, for that beauty is none the less beautiful because it is transient.





MOVING BACK A BRICK WALL.

THE NEW UNION DEPOT, TORONTO.

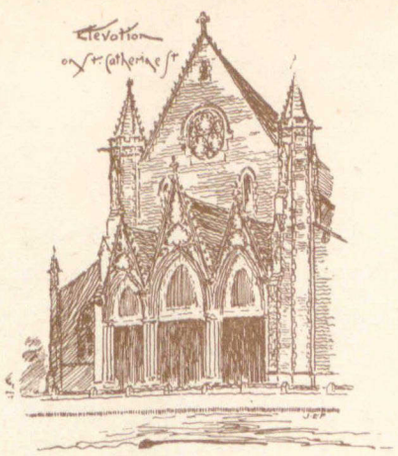
The erection of the new union depot at Toronto is proceeding satisfactorily. The entrance to the passenger waiting rooms on Front street is spanned by an immense arch, the dimensions of which are: span, 44 feet; rise, 28 feet; thickness, 4 feet; depth of voussoirs, 6 feet. There is also an inner arch, of the following dimensions: span, 54 feet; rise, 32 feet; width, 12 feet. The outer arch is believed to be the largest, forming part of the construction of a building, to be seen in America. The existence of two towers, one on each side, has rendered it possible to make this arch such an important feature of the building. It is built of Credit Valley brown sandstone, the inner arch being constructed of imported Scotch sandstone, which is also to be employed to a considerable extent for the interior walls of the waiting room. The progress of the work has been considerably delayed by the difficulty experienced in getting the necessary supply of this stone at the time required. The contractor for the masonry of the building, Mr. Benjamin Gibson, of Oshawa, Ont., is deserving of praise for the excellent character of his work. It is one of the finest specimens of masonry construction to be seen in Canada.

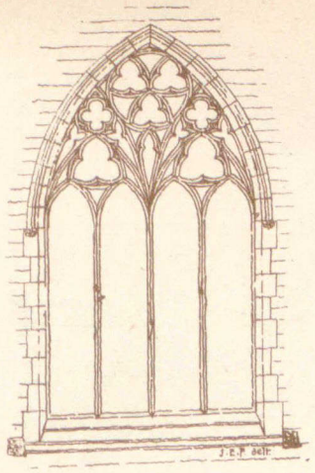
Black granite polishing works are being erected at Bocabec, N. B.

Mr. Wade, the well-known English sculptor, has been commissioned to erect the statue of Sir John Macdonald in Kingston.

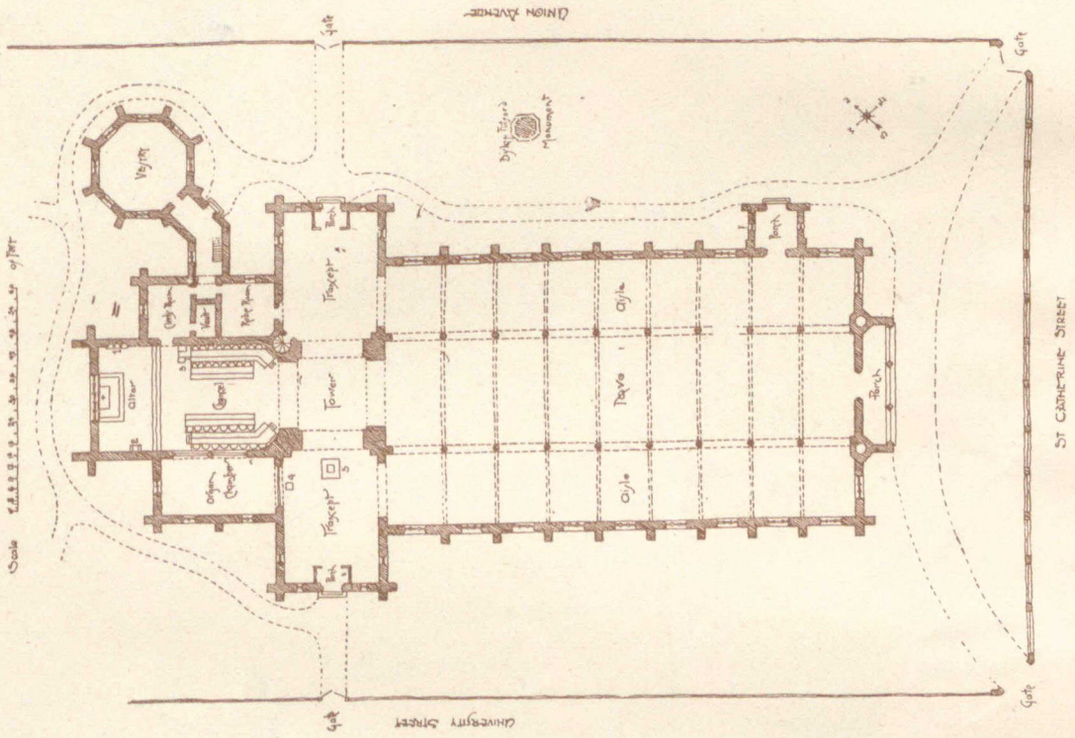
A company is being incorporated at Pictou, N.S., under the name of the Cairo Polish Co., to manufacture bricks, tiles, pipes, paints, etc. Capital $10,000.

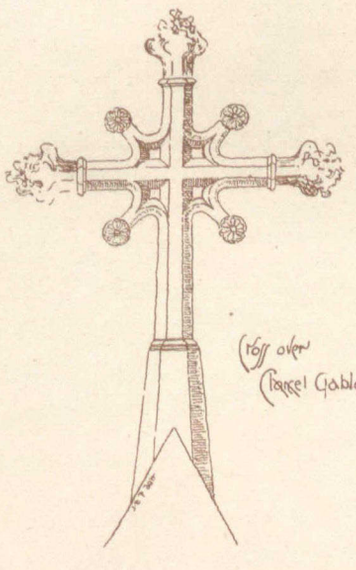
The Sydenham Glass Company, of Wallaceburg, Ont., are applying for incorporation, with a capital stock of $50,000, and will erect a factory at Wallaceburg to manufacture glassware. Mr. A. G. Laird, is acting secretary.



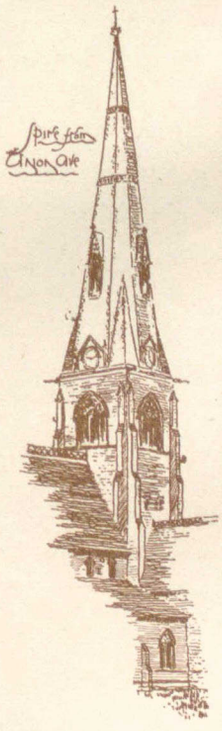


Window in North East Transept



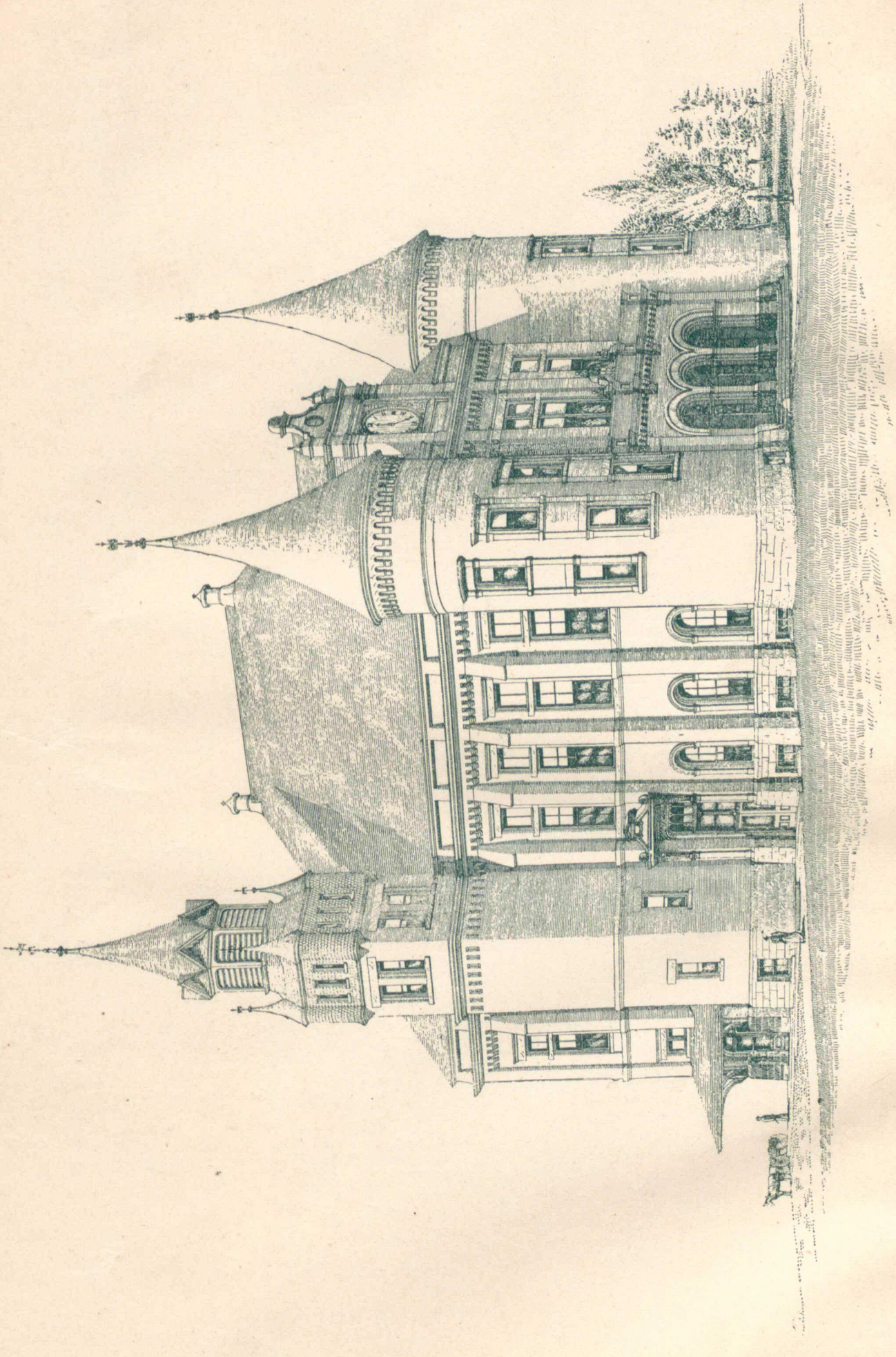


Cross over Chancel Gable



SKETCHES FROM CHRIST CHURCH CATHEDRAL, MONTREAL.

(ACCOMPANYING ARTICLE ON PAGE 89, THIS NUMBER).

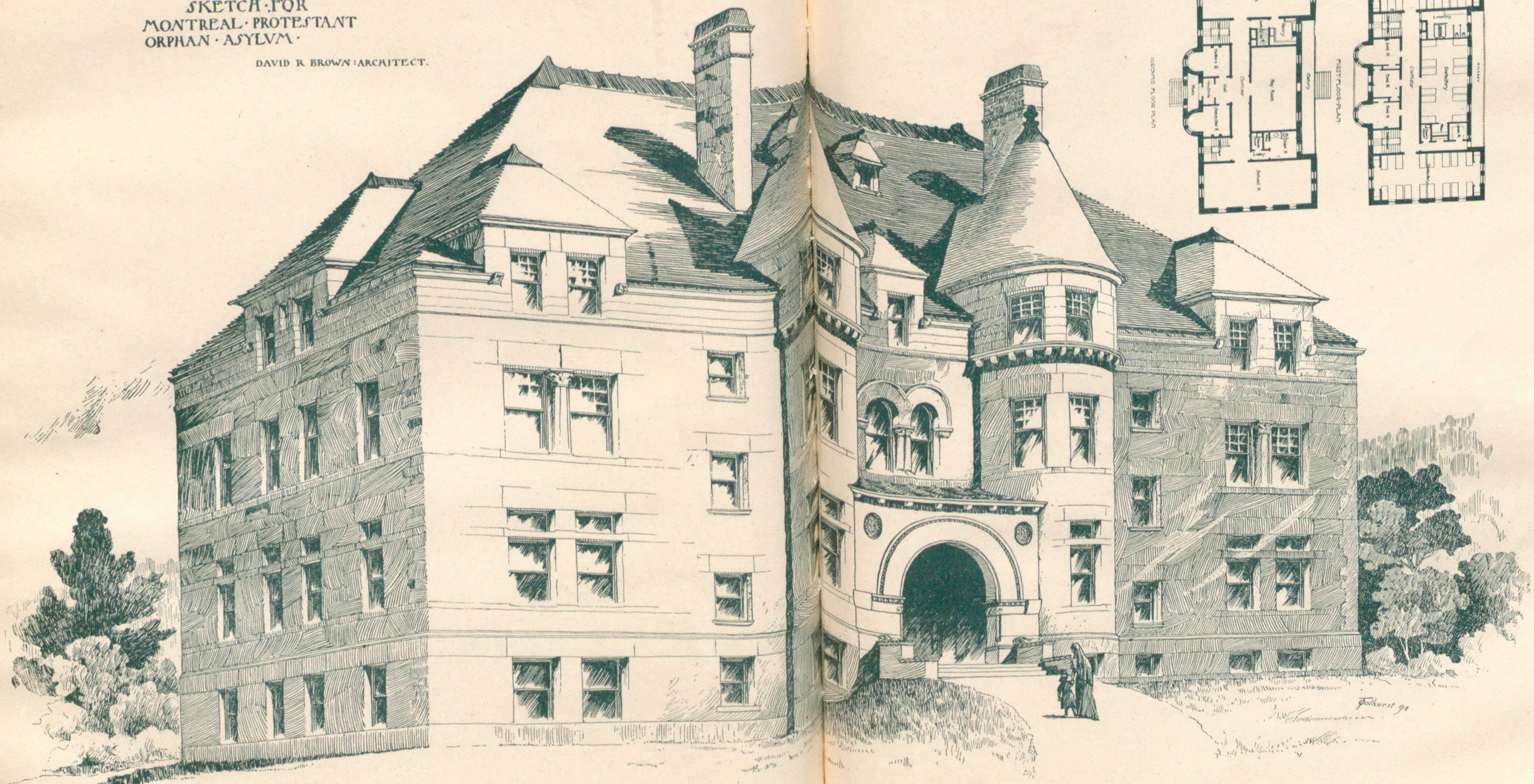


TOWN HALL AND MARKET ORILLIA ONT.

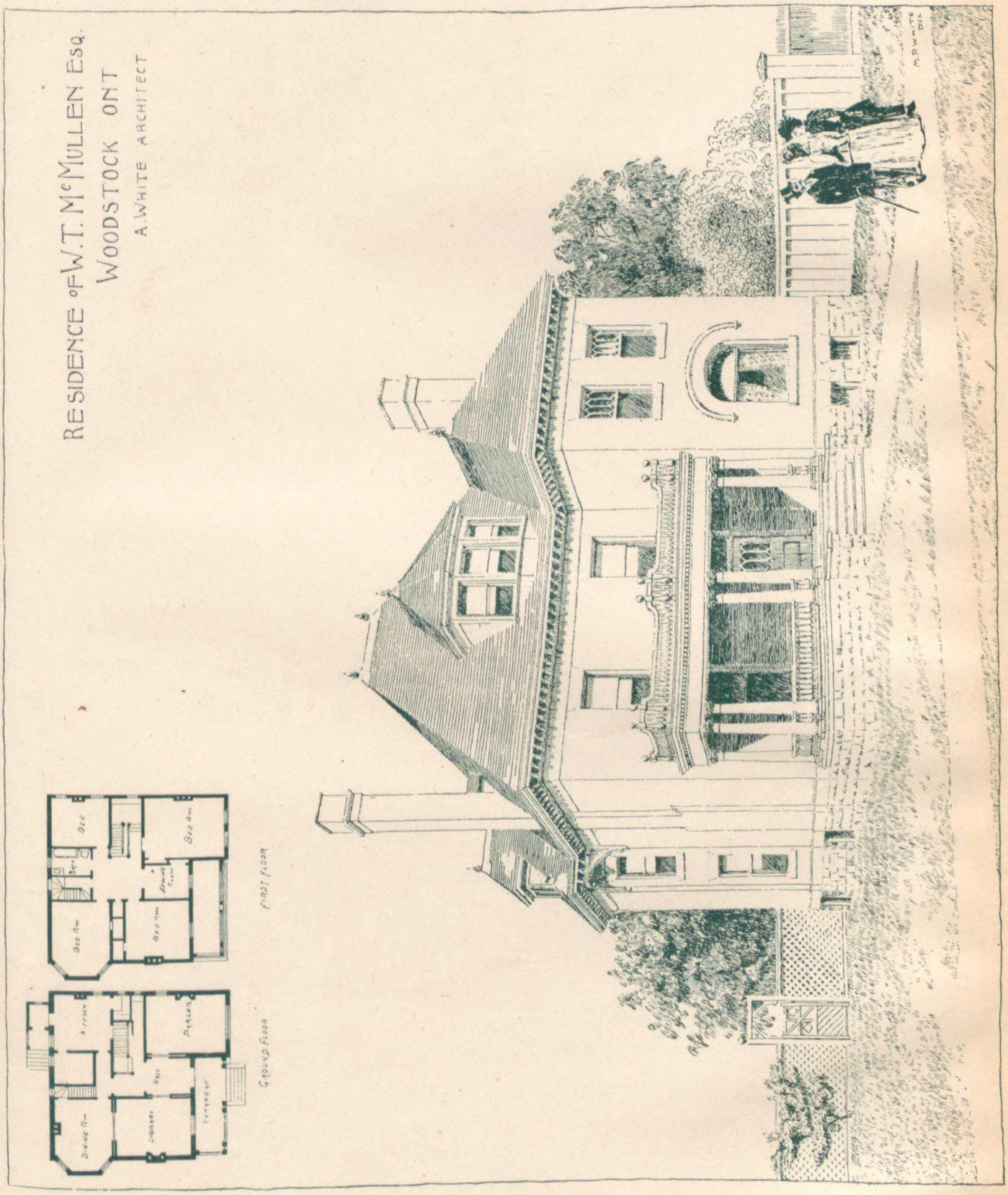
GORDON & HELLIWELL ARCHITECTS TORONTO

SKETCH · FOR
MONTREAL · PROTESTANT
ORPHAN · ASYLUM ·

DAVID R BROWN : ARCHITECT.



RESIDENCE OF W.T. McMULLEN ESQ.
WOODSTOCK ONT
A. WHITE ARCHITECT



NEW PLUMBING BY-LAW OF THE CITY OF MONTREAL.

FOLLOWING are the provisions of the by-law for the regulation of plumbing, drainage and ventilation adopted by the Council of the City of Montreal on June 24th, ult.:—

Sec. 1. Every master plumber, or drain builder or drain layer shall be required to register his name and place of business at the office of the board of health, and to give notice at the said office in case of the removal of his place of business.

Sec. 2. An official list of such plumbers and drain builders or drain layers recognized by the Board of Health, shall be published once a year during the month of May.

Sec. 3. It shall be unlawful for any person to carry on the trade of plumbing or drain making in the city of Montreal, unless enregistered as above.

Sec. 4. All plumbing and house drainage and ventilation in the city shall be made and constructed in accordance with the following rules, which shall be binding on all parties concerned :

(1)—No drain or plumbing work or drain ventilating shall hereafter be made in any new building unless plans, drawings and a description of the same shall have been previously submitted by the proprieter, or his representative, in the health office, at least eight days before the commencement of the work, and unless such plans and drawings shall have been approved of and authorized by the sanitary engineer ; and in case of repairs or alterations affected by sanitary regulations, notice shall be given to the health department at once ;

(2)—No part of the work shall be covered or concealed in any way until after it has been examined and approved of by the sanitary engineer or his representative ; and notice shall be given to the health department when the work is sufficiently advanced for such inspection ;

(3)—The water department shall refuse to turn on the water unless the demand for the same is accompanied by a certificate of the sanitary engineer, to the effect that the works have been inspected, and found to be in accordance with the said rules ;

(4)—The material used shall be of good quality and free from defects, and the work shall be executed in a thorough and workmanlike manner ;

(5)—The arrangement of the soil, waste and ventilation pipes shall be as perpendicular as possible ;

(6)—The soil, drain, waste and drain ventilation pipes shall be at all times exposed to view ready for inspection and for convenience in repairing ;

(7)—When necessarily placed within partitions or recesses of walls, soil, drain, waste or ventilation pipes shall be covered with woodwork, so fastened with hinges or round headed screws, as to be readily uncovered ;

(9)—Every house or building shall be separately and independently connected with the street sewer, in front of such house or building, or with such other sewer as shall be designated by the board of health ; but in all cases of dwelling houses, there shall be a special communication with the street sewer for each fifty feet frontage of said houses if there be only four dwellings in the said space ; and in case there shall be more than four dwellings in the said space of fifty feet, the special communication with the street sewer shall be as directed by the board of health ;

(9)—Every interior house drain shall be of iron, and in the form of a cylinder, with a fall of at least ¼ inch to the foot, and no joint shall be made directly under the wall of the house or any other wall ; moreover, where water-closets discharge into it, it shall be at least four and not more than 6 inches in diameter, and be laid in a straight line if possible. All changes in direction shall be laid with curved pipes, and at least one clean out pipe shall be provided ;

(10)—Every such drain put in and covered without due notice to the health department shall be uncovered within 24 hours for inspection by the sanitary engineer or his representative ;

(11)—No brick, sheet metal, earthenware or chimney flue shall be used as a sewer ventilator, or to ventilate any trap, drain, soil or waste pipe ;

(12)—Soil pipes shall be of cast or wrought iron of the weight specified in subsection 20, and shall extend at least two feet above the highest part of the roof, or coping, light, shaft louvres, window or other opening ; they shall be of the same size throughout, and in no case shall they be less than four inches in diameter ;

(13)—Soil, waste and vent pipes in an extension, shall be carried above the roof of the main building when they are closer than twenty feet to the windows of the main building of adjoining houses ;

(14)—All water closet traps must be amply back air ventilated with a pipe from 2" to 4" or other approved device to prevent syphoning ;

(15)—Joints of sewers and soil pipes shall be gas and water tight ;

(16)—When stacks of pipe are required for sinks only, they shall be carried full size through the roof and be not less than 2" for 4 sinks or 3" for over that number ;

(17)—When lead pipes are used to connect fixtures with vertical soil or waste pipes, or to connect traps with vertical vent pipes, they shall not be lighter than six lbs. sheet lead to the square foot ;

(18)—There shall be no traps in connection with vertical soil or waste pipes unless a permit so to do shall be obtained from the board of health ;

(19)—All pipes shall be sound and free from holes or cracks ;

(20)—The following weight per lineal foot or yard shall be accepted as standard :

IRON PIPES.

For plumbing work.

2 inch, 4 pounds per lineal foot.
3 " 6½ " " "
4 " 9 " " "
5 " 12½ " " "
6 " 17 " " "

For drain work.

4 inch, 13½ pounds per lineal foot.
5 " 17 " " "
6 " 20 " " "

LEAD PIPES.

1¼ inch, 1½ pounds per lineal foot.
1½ " 2 " " "
2 " 2½ " " "
2½ " 4½ " " "
3 " 5½ " " "
4 " 7 " " "

For waste sink pipes.

2 inch, 10 pounds per lineal yard.
3 " 15 " " "

Lead waste pipes, bends or cesspools shall be equal to not less than 6 lbs. per square foot of sheet lead ;

(31)—The fittings used in connection with said pipes shall correspond with them in weight and quality ;

(22)—The plumbing work shall be tested by the sanitary engineer or representative, or an officer authorized by him, in presence of the plumber, (when the latter is required to be present) with the peppermint, smoke, or air ;

(23)—When defective pipes are discovered, they shall be removed and replaced by sound pipes ; defective joints shall be made tight and every part of the work in which defects are found shall be made to conform to the present rules ;

(24)—Joints in iron drain, soil and waste pipes, shall be so filled with oakum and lead and hand caulked so as to make them gas tight, and they shall not be painted, varnished, tarred or puttied over until after inspection, unless the sanitary engineer does not signify his approval or disapproval of the work within 36 hours after the health department shall have been notified that the work is ready for inspection ; the said joints may also be screw joints ; should the work prove to be satisfactorily executed in the judgment of the sanitary engineer, he shall grant a certificate to that effect to the person concerned ;

(25)—All connections of lead with iron pipes shall be made with a brass or copper sleeve or ferrule of the same size as lead pipes, put in the hub of the branch of the iron pipe and caulked with lead ; and the lead pipe shall be attached to the ferrule by a wiped or overcast joint ;

(26)—All connections of lead pipes, shall, where practicable, be by wiped joints ;

(27)—No tile shall be connected with the waste pipe unless the same be provided with a flange to admit of a proper connection being made ;

(28)—Every water-closet, urinal, sink, basin, wash tray, bath, and every tub shall be separately and effectively trapped. This rule shall apply to a set of tubs, but only one trap shall be required for the set ;

(29)—The connections between iron and tile pipes shall be made with the best Portland or Roman cement or by other means approved by the board of health ;

(30)—Traps shall be placed as near the fixtures as practicable, and in no case shall they be distant more than two feet from the fixtures ;

(31)—There shall be only one trap under the water-closet and that immediately beneath the same ;

(32)—All waste pipe fixtures other than water-closets shall be provided at the inlet of such fixtures with strong metallic strainers to exclude from such waste pipes all substances likely to obstruct them ;

(33)—In no case shall the waste pipe from a bath, tub or other fixture be connected with a water-closet trap ;

(34)—Overflow pipes from fixtures shall in every case be connected with the inlet side of the trap, and above the water ;

(35)—Drip or overflow pipes from the safety pan under water-closets and other fixtures, or refrigerators, or from tanks, other than those of water-closets, shall be made to run into some place in open sight ; and in no case shall any such pipe be connected directly with the drain, waste or soil pipe ;

(36)—Water-closet apartments shall open to the outer air, by means of a window, shaft or air duct, going through the roof, or by vent shaft to the chimney ;

(37)—Every water-closet shall have a cistern supply, and in no case be supplied directly from the city reservoir supply pipes ;

(38)—In houses containing one or more than one family, there shall be one water-closet for each family, and a separate cistern for each closet ; in other buildings, however, a group of closets may be supplied from one tank, but not water-closets on different floors ; and at least one water-closet to every 15 inmates ;

(39)—The overflow pipes from water-closet cisterns shall discharge into an open sink, or the basin of the water-closet, or where its discharge will attract attention and indicate whether waste of water is occurring, but not into the soil or waste pipe or into the drain direct ;

(40)—Valves must be so fitted and and adjusted as to prevent wasting of water ;

(41)—No privy vault or cesspool for sewage shall be permitted in any part of the city where water-closets can be connected with a public sewer in the street ; when no sewer exists in the street a permit for a temporary privy may be granted by the board of health ; and in such case it shall be water tight, of a capacity of 45 cubic feet ; the sides and bottom shall be constructed of cemented brick twelve inches in thickness and well cemented inside with hydraulic cement ; such vault may be constructed of cast iron, the shape or form of which shall be either circular or oblong without angles, and with a concave bottom ; it shall be provided with a ventilation pipe at least 4 inches in diameter, extending from the pit through the roof sufficiently high as to prevent inconvenience to occupants of neighboring houses ; the seats shall have a tight fitting cover ; it shall have an aperture opening exteriorly to allow of cleaning by pneumatic process, such aperture to be 2 feet by 1½ feet in size ; or else the flooring shall be air tight and shall have a tightly fitting trap door communicating with the pit ; the top of the vault shall be one foot above the level of the ground ; nothing shall be put into the pit, excepting human excreta ; privies shall be located at a distance of 20 feet (or more according as the board of health may deem necessary) from any house or street ; they shall be emptied when the contents reach to within eighteen inches of the top of the vault, by persons appointed by the board ; no offensive smell or gases may be allowed to escape therefrom. But, in no case shall a privy be allowed within the walls of a dwelling house or in any property situated on a street having a sewer ;

(42)—No steam exhaust, blow off pipe shall connect with a sewer directly or any house drain, soil pipe or waste pipe ; such pipe must first discharge into a tank or condenser ;

(43)—Cellars shall not be connected with the house drain unless absolutely necessary, and by special permission of the board of health, and according to plans approved of by the board ;

(44)—A sub soil drain shall be provided when absolutely necessary, and shall be constructed and trapped to the satisfaction of the board of health ;

(45)—No trap shall be permitted between the house drain and the public sewer, unless by permission of the board of health ; conditionally however that such trap shall have a hand hole for cleaning purposes and a fresh air inlet pipe, the whole as may be decided upon by the board of health ;

(46)—Drains in yards shall, in all cases, be trapped below frost, that is to say : four feet at least under ground ;

(47)—In the case of privy vaults now drained into a common sewer, they shall be isolated by means of suitable traps placed below frost and according to instructions from the board of health ;

(48)—In the case of a new house being built or one already existing being repaired, wherever there is a public sewer in the street, a water-closet shall be put in, to the exclusion of privy pits ;

(49)—The inspection of drains within the line of street shall be under the exclusive control of the board of health ;

(50)—Gas pipes will be tested in the presence of the sanitary engineer or his representative ;

(51)—Gas companies are obliged to place a stop cock to every main pipe;

Sec. 5. The word "board" wherever it occurs in this by-law, means the board of health of the city of Montreal ; and the word "sanitary engineer"

means the sanitary engineer appointed by the council to carry out the provisions of this by law, or his representative.

Sec. 6. Any person contravening any of the provisions of this by-law shall be liable to a fine, and in default of immediate payment of the said fine, and costs, to an imprisonment—the amount of said fine, and the term of said imprisonment to be determined by the recorder's court, *at its discretion;* but the said fine shall not exceed forty dollars, and the term of imprisonment shall not exceed two calender months; the said imprisonment, however, to cease at any time before the expiration of the period fixed upon by the recorder's court, on payment of said fine and costs; and where the infraction is continuous, such infraction during each day, shall constitute a separate offence.

THE DIFFERENCE IN AMOUNT OF RADIATION REQUIRED IN BUILDINGS OF GOOD AND POOR CONSTRUCTION.*

To illustrate the subject before us I will recite my experience in several buildings. In the fall of 1879 I placed a low pressure steam heating apparatus in a building designed for a home for old ladies. Many of the rooms were small, and in order to warm them without question a radiator was placed in each room. Knowing that a high temperature would be agreeable, the calculation was made that one foot of radiation would warm 40 cubic feet of air. This we considered very liberal when the fact that we used the Gold sheet iron radiator is taken into account. We were, however, doomed to a very serious disappointment, as the temperature in the rooms on the windward side of the house frequently fell to 50 degrees, and sometimes even below, during severe cold and windy weather. After reconsidering all the conditions we determined to add a large percentage of radiation, which was done, and the building has been thoroughly warm ever since. The amount of radiation added in many of the exposed rooms was from 50 to 100 per cent. over that originally supplied. To my mind the rooms in this building are very uncomfortable, for the excessive amount of radiation required to maintain the temperature produces a very disagreeable condition of affairs, together with the excessive loss of heat through the thin walls and many air leaks. It was soon found that although the ratio of radiation was very excessive under the existing conditions the condensation was very rapid, and more boiler power was required to maintain the steam pressure. Consequently an additional boiler was supplied, at the expense of the heating contractor, which gave plenty of generating power, but all this was accomplished at a heavy proportional loss to the contractor. To my mind as I review the entire matter I find that the original calculation for the boiler and radiating surface were correct providing the building in question had been ordinarily well constructed. But from subsequent surveys I conclude that the architect and building contractor produced about as poor a specimen as it was possible to do and have it stand up as a public building. The result is that the amount of fuel needed to warm the building is enormous.

I have in my mind another building which belongs to one of our popular colleges. The building was constructed in 1872. The location was on the brow of the hill where the front was exposed to the force of the northwest winds. It was the intention of the heating contractor to make this building very warm, and all calculations were made with this object in view. After the apparatus was complete and the weather became cold it was found that many of the small rooms in the west front did not warm to the required temperature, and an investigation was made to determine the cause if possible. We referred to our calculations as to boiler, piping, radiating surface, etc., and found that the apparatus was constructed according to our calculations; nevertheless we were confronted with a number of cold rooms. We finally determined that the only way to satisfy ourselves was to live in the building and keep a record of the temperature, both in the rooms and outside. While this was in progress I visited the building one very windy day and in entering some of the west rooms I was surprised to find that the hall door would be pulled away from me and shut with a report like a gun.

I supposed at first that the windows were open, but examination showed that they were closed as tight as possible considering their construction. but the air was constantly driven through the brick walls of the building, in fact, the volume of air forced into the room was so great that the hall door was opened with difficulty. The radiators in these rooms were liberally increased and the warming of the building has been very satisfactory to its occupants. The heating contractor in this case did not meet with a decided loss, as a very liberal allowance for the exposure of the building had been made in the original calculations.

Another striking case comes prominently before me. About eight years since I placed the heating in one of our State normal schools. The building was in a very exposed location and the radiating surfaces were very carefully apportioned in order to fully meet all conditions. One large class room, containing about 100,000 cubic feet, was provided with one square foot of radiation to 40 cubic feet of space. This was thought to be excessive at the time but we wished to do the work right the first time and not have any alterations or additions to follow the work, so the full amount of radiation was supplied. When the weather became severe this room was very cold and radiating surface was added at various times until the ratio was brought up to 1 to 18 and the desired temperature secured. The larger part of the radiation was direct, in fact, all radiation which was added was direct. I found that while standing in the room during a severe northwest wind, you could feel the wind on your face as it came through the wall of the building. In the illustrations cited the buildings were very carelessly constructed, the architects in charge giving very little attention to the minor details which have the most important bearing in the comfortable use of the building.

I will now call your attention to the reverse of the conditions named above. Last year I contracted to place a small hot water apparatus in an old residence which was being altered slightly and converted into a small apartment house. The building was not badly exposed, so the calculations where based on a moderate amount of radiating surface. The apparatus was complete in the fall and the tenants moved in. The fire had not been started but a few days when there was a general complaint of too much heat, especially in the bedrooms. I find that the latter contain about 1,500 cubic feet and a radiator of 32 square feet was used to supply the heat. Our advice was to shut the valve in the radiator and run the water at a lower temperature, and when very cold weather came they would be very happy with nicely warmed rooms. Our suggestions were partly followed, but the complaints of over heating were almost constant and after passing partly through the winter both owner and tenants demanded that the radiators be removed from all the bedrooms at least. This was done and there remained in these rooms a riser of 1¼ pipe, which contains about four and a half square feet of radiation surface. In a room of 1,500 cubic feet, or a ratio of 1 to 333. The bedrooms being outside rooms, I have never had the opportunity to examine this house but there is no doubt as to its good construction. I might further say that I am advised that the temperature of the water is kept down to 140 to 160 degrees in the coldest weather.

* Paper read by Mr. E. P. Bates before the Sixth Annual Convention of the Master Steam and Hot Water Fitters' Association of the United States, June 19, 1894.

A few years since I built a small stable. Its dimensions are 24 by 36 feet on the ground. The ground room is used as a carriage room, horse stalls, harness room, etc. In practice the floor is commonly used as one room; above is a hay loft, with a room for the driver over the harness room. To my mind it is desirable to keep the stable moderately warm through the winter and to accomplish this with a moderate outlay in apparatus and fuel. Over the horse stall is a ventilating pipe running through the roof, this pipe is 12 inches in diameter and is always open summer and winter. Usually the air is going through it at a high velocity. There is no special provision to bring air into the stable, but the doors and windows are ordinarily well fitted, and there are large leaks about the entrance to the carriage room which has a sliding door about 9 feet square and opens to the north. In using the stable no difficulty was found to warm it to 60 degrees in the most severe weather, and an ordinary globe stove was used with a grate 8 inches in diameter. The amount of fuel used per season is between three and four tons. The stove pipe passes through the driver's room and heat given out by the pipe maintains a comfortable temperature in that room. I believe this stable is more comfortable in summer and winter than the average stable, although many of them may be much more expensive in construction. The stable is built of wood. The frame is balloon style, the upright stands are 2 by 4 inches, set about 16 inches between centers. On the outside of these studs I placed a course of rosin-sized building paper and one thickness of coved siding. In order to prevent the buckling of the paper at the laps, and to prevent a rapid change or circulation of air between the studs, I placed a 2 by 4 inch girth lengthwise (between the upright studs) on the sill: then, once in three feet, cut in a 2 by 4 inch as an additional girth. The paper being a yard wide abutted on this extra girth which held the edges tight and prevented the circulation of air from cellar to hay loft, and *vice versa*. On the inside of the carrage rooms on the ground floor, as well as other rooms on the ground floor, a course of building paper was used and ceiled over with ½-inch narrow Canada pine for a finish. Under the roof of the hay loft was laid a course of building paper also on the ceiling of carriage room before the ½-inch wood ceiling was laid. At the top of carriage room where the studs and joist join, I stopped off with boards to prevent the circulation of air. The idea of using the cross girths once in three feet and building paper on the inside of the walls was very amusing to the old carpenters employed on the work, but it is very satisfactory in a cold day and equally so in hot weather, the building being much more comfortable than many dwellings which are built at a much greater cost per cubic foot. It will be noticed that the stable here described is of very inexpensive construction and would be very cold in winter and hot in summer except for the succession of dead air spaces in the walls, cove siding being one of the poorest materials for keeping the wind from penetrating a building. Believing that I was correct in theory I determined to carry out my ideas more carefully in the construction of a house two years since. This house to which I will refer stands alone fully exposed on all sides on high ground, in Syracuse, where the temperature frequently falls below zero, and occasionally 15 to 20 degrees below zero.

It is constructed of wood and is comparatively inexpensive. The frame is what is known as baloon with slight modifications. On the outside of the frame are placed hemlock boards planed on one side, and over the hemlock is placed a course of heavy building paper, care being taken to leave no bare spaces, or uncovered knot holes; also that the paper fitted properly around all corners, windows and door frames. A 2 by 4 was nailed to the sill to prevent the air from cellar going to the attic or *vice versa*. Once in three feet a cross girth 2 by 4 inches was cut in between the upright studs to make a dead air space in the walls. This was also done in the partitions. At the ceiling of each story, a board to fill the space between the joists were inserted: said boards were covered with building paper. Over the partitions in the center of the house a stop off was inserted in a similar manner to prevent the air from passing from side to side of the house and cooling the ceilings of the various rooms. The roof boards were covered with paper before the shingles were laid. Every point was carefully looked after to prevent air leaks, the object being to get dead air spaces in all the walls as far as possible to do this. The next point was to install a good warming apparatus, and after having the old saw about the shoemakers' wives and blacksmiths' horses handed to me several times, I determined to erect a heating apparatus which would surely warm the house every day. I therefore placed in the house a No. 6 Bate's self feeding boiler containing 103 square feet of fire surface. This boiler is brick set. Allow me to speak of a peculiarity of this boiler, quite different from many which are advertised. It does not save any coal. They will burn all you fire into them, but if the firing is done with any reason the boiler will give you an equivalent in heat for every pound of fuel it consumes. The house in question being three stories it was decided to make a combination apparatus, i. e., hot water and steam, using hot water stacks for the five principal rooms, and steam radiators for bath, back hall and the small bedrooms The hot water was circulated from the water line, the boiler set in the usual way for carrying steam, with automatic water feeder, automatic draft door, etc. I placed in the house, which contains about 16,000 cubic feet of air space, 457 square feet of radiation, equal to one square foot to 33 cubic feet of space to be warmed Of the above 350 square feet was in the indirect hot water stacks and 127 square feet distributed in seven small radiators. For ventilation I built one chimney stack which connects conveniently to most of the rooms. In this chimney stack I placed eight tile flues made of vitrified pipe without hubs and all eight inches in diameter except the flue for the fire place in dining room which is 10 inches in diameter. These fires are used as follows: one for steam boiler, one for laundry stove, one to ventilate laundry (being three in basement), one for fire place, one for range, and one for hood over range to take off heat and vapor from cooking (being three on ground floor). On the second floor there is one flue from the large bedroom at the base of which is set a Franklin stove, and the other and eighth flue in the back hall. The bedroom being several feet from the chimney has a separate flue o ftin and galvanized iron extending through the roof independently, with a globe ventilator on top. Every test made shows each flue carrying out large amount of air, and those flues to which fires are connected are very satisfactory; in fact, they never fail to draw, and the course or velocity of the wind seems to make no difference, so it is evident that a rapid change of air is going on constantly.

As to results. When the thermometer registered 5 degrees below zero during the past winter we used one stack of pin radiators in the reception hall. Said stack contains eight sections. The register over the other stacks was kept closed, a radiator of 16 square feet in back hall of second floor was filled with steam, and a radiator of 18 feet on third floor was partly filled, equal to ten square feet, or in all 108 square feet in active operation in severe weather. There is no doubt we receive some benefit from the stacks where the registers were closed as there is a small percentage of leakage through the registers, and some heat given off by the tin flues running to the upper rooms. If only 108 feet were used the ratio would be 1 to 135. After having several cold days and demonstrating the fact that the amount of radiation was greatly in excess of the amount which could possibly be used, radiators were removed from the house, to the amount of 86 feet of direct radiation and 60 feet of indirect, the latter being the stack placed to warm the drawing room and was not used, as the room was thoroughly

warmed by the hall stack. It was found also that during the coldest days and evenings it was comfortable to sit in any part of the house, even the rooms where the registers were closed, also that the difference in temperature between the outside and partition walls was slight. One fact worth mentioning is that the bath room was in constant use, and that it was designed to heat it by means of a brass coil nickel plated containing twenty feet of one inch pipe, but the valve was not opened during the winter the room being comfortable at all times to take a bath. During this season it is my intention to extend the tin flues to three bedrooms from which the direct radiators have been removed, as the stacks are abundantly large to supply them with heat. I might say in explanation that I should not have carried heat enough to carry steam, but for the fact that one of the upper rooms was used as a sewing room and steam was required to reach that room. In my opinion I shall not need to carry the water above 180 degrees the coming winter to perfectly warm the entire house. Under the conditions here described the boiler ran with the minimum of care, the draft door remaining consequently closed days at a time, the grate was shaken once in twenty-four hours in the most severe weather, and only once in 72 hours in very mild weather. With a temperature of 32 degrees outside, water at a temperature of 110 degrees to 120 degrees at the boiler was sufficient.

The question may now be asked what has all this matter of construction to do with our craft? We do not build houses or other buildings; we must take them as we find them, good, bad, and indifferent, and place in them a heater that will fill our guarantee, be it more or less. This is a fact from one standpoint. There is, however, another view to take of the subject; every trade is responsible for existing conditions to a certain extent; by agitating a subject we bring about reforms, and if fifteen to forty dollars judiciously expended in the construction of a small residence will save the full amount in the value of fuel in one or two seasons and add largely to the comfort of the occupants all the time, our efforts are well expended in diffusing the knowledge of the fact, and intelligent inquiry will be well rewarded in its research. Further, we all make our great successes in well constructed buildings and our failures and sometimes losses in those of poor construction. With this in view I hold that it is largely to the interest of the steam fitter and heating engineer to promote in every way possible the desire which the owner and architect may have for a well constructed building. "Continual dropping wears the stone."

PERSONAL.

Mr. Surtees, City Engineer, of Ottawa, is at present on a visit to New Brunswick.

Mr. Fred. Batty, manager of the stone quarries at Wallace, N. B., died suddenly of heart disease a few days ago.

Mr. Edward Copping, City Building inspector for Toronto, received severe injuries a few days ago, by being thrown from his buggy.

Mr. Eustace G. Bird, who has been pursuing the study of architecture in England and on the continent for several years past, has returned to Toronto.

Messrs. Strickland & Symons, architects, have recently removed their offices from Toronto street to Aberdeen Chambers, corner of Adelaide and Victoria streets, Toronto.

Mr. D. Norman MacVicar, late of Messrs. Taylor & Gordon's office, Montreal, has associated himself with Mr. David R. Brown, architect, under the name of Brown & MacVicar.

Mr. Richard Dinnis, senior member of the firm of R. Dinnis & Son, contractors, has recently returned home from a visit to Great Britain. He describes business conditions in England as discouraging in the extreme.

PUBLICATIONS.

The July Cosmopolitan marks the close of the first year since the revolutionary announcement was made that the price of that magazine, already low had been cut to one-half of three dollars a year. Even severe critics admit that with each succeeding number there has been a betterment in the quality of articles and illustrations, and the size has remained unchanged.

Mr. Charles Baillairgé, of Quebec, at the last meeting of the Royal Society at Ottawa made an interesting contribution to the at present popular subject of Technical Education, in a paper entitled "Technical Education of The Peoplein Untechnical Language." Mr. Baillairgé holds that the education of the masses should not go beyond the three R's and object lessons in scientific subjects. "Let us beware," he says, "of too much education; there is a danger of over doing the thing, and thus causing our should be agriculturists to become dissatisfied with their parents mode of livelihood, flocking towards populated centers, there to because second and third class professionals of every hue, with little or nothing to do; with mischief and discontent and anarchical tendencies following in the wake." To our way of thinking the need of the times is in the direction of a change in character and methods of instruction rather than in restricting education.

RECENT CANADIAN PATENTS.

Mr. George A. Watson, of Toronto, has secured a patent, No. 45,906 on a sectional hot water heating boiler.

Messrs. William Pinkerton and Joseph Barrett, of Toronto, have been granted a patent on a building composition consisting of about equal parts of limestone and stone or shale containing oxide of iron and silica melted and moulded into a homogeneous mass.

TO MAKE TRACING PAPER.—Home-made tracing paper is much less expensive than that purchased at shops. Common tissue paper can be had at something less than ½d. per sheet of the ordinary size, when purchased in quantities. To prepare it, mix a proportion of one of boiled linseed oil to five of turpentine in a cup. Put a single sheet of paper at a time on an inverted tea-tray, large enough to allow at least the half of the sheet to lie flat. The mixture should then be put on with a small sponge, one coating only, and that not too thickly; each sheet after such process should be hung over a string stretched across the room, and when all the clear oily marks entirely disappear, it will be ready for use. —Carpenter and Builder.

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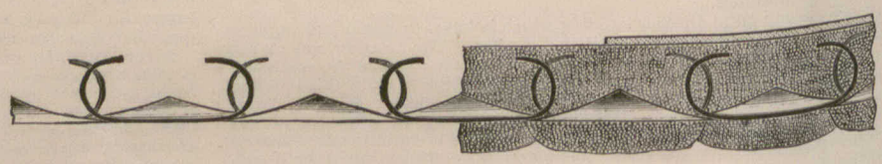

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Dominion Ornamental Iron Co

MEASURING MASONRY.

There are two widely different methods of measuring and estimating the value of masonry, to which we will find it necessary to attend. By the first of these methods the value of the rough material in cubic feet is added to each successive kind of labour exercised upon it in superficial feet, in order to ascertain the final value of each piece of stone employed. In ashlaring the price of plain work is allowed to face, bed and joints of each stone, with horizontal bed and one vertical face only for bond-stones, unless they are through stones, when two vertical faces may be allowed. If labour is not charged on any face of a stone, half sawing is to be allowed for each lower face. Columns are measured by taking first two plain sides of the cube, added to the girth of the column as circular planes, and two plain faces to each horizontal joint. The material in solid steps is measured by taking the extreme length, including the tailing in the wall, by the width and whole height. Winders in the same, the width being the mean between the extreme end widths. Labour on steps, if solid, includes plain, sunk, or moulded work on the face of the tread, riser, and ends only if laid on brickwork. To this half the bed is to be added if the step is laid on stone. For cornices, strings and blocking courses set on brickwork add the moulded, sunk or planes in faces and top to the plain work in joints, and allow no beds; but if set on stone, half a plain bed to be allowed besides, also half-plain to the back if worked. For landings plain work is to be allowed on top, edges, and joints. If the underside be worked, to be charged half-plain superficial. Curbs are taken as plain, sunk, or moulded to the three faces, but no bed. For hoisting stone above 10ft. from the ground level an additional 2d. per cubic foot for 10ft. in extra height is to be understood, unless otherwise specified. The second method of estimating masonry recognizes only the exact nett cubic quantity of stone used, and affixes a definite and total price to this, varying it only to meet cases, where vast differences of labour are palpably required, and allowing no extra or additional charges whatever under any circumstances. Thus we may have rubble or ashlar, as the case may be, in walls, including all plinths, grooves, arch stones, reveals to openings, string courses, copings, returns, etc., at so much per cubic foot nett, deducting all openings, and backings, if of brickwork, as they may appear in the drawings or in the specifications; in fact, tantamount to a lump sum for the whole piece of work. While it must be admitted that this wholesale method of measuring facilitates the progress wonderfully, it is equally undeniable that it is as uncertain in results as careless in process; and, indeed, the exact and just measurer, even if driven to adopt this method ostensibly, will take the trouble to work out an average block or two of each kind of work upon the other and more correct system, and reduce the cost thus found to a set of prices per cubic foot in the required estimate.

CREDIT VALLEY BROWN STONE

From Carroll & Vick's No. 6 Quarry, Credit Forks, Ont.

SANDSTONE, fine grained, reddish brown. Contains quartz, and a little felspar and mica. The stone is in beds of four feet and under, and can be handled in pieces up to five tons. Quarry 300 yards from Railway.

Specimen.	Section under Pressure	Height.	Crushing Load.	Crushing Stress per sq. in.	Average Crushing Stress per Square Inch
	Ins.	Ins.	Pds.	Pds.	Pds.
A	.....	.....	.....	.....	
B	$2\frac{7}{8} \times 3$	$2\frac{7}{8}$	131,000	15,188	
C	$2\frac{15}{16} \times 3$	$2\frac{7}{8}$	130,000	14,751	
D	3×3	$2\frac{7}{8}$	133,000	14,777	14,905

14,905 pounds is the average crushing strength per square inch of our Credit Valley Brown Stone.

The highest standard of test attained by any pure Sandstone in America.

IN confirmation of the facts above stated, we have pleasure in directing your attention to the accompanying table, showing the result of the test of our stone, in connection with the series of tests of building stones conducted in 1892 at the School of Practical Science, Toronto, under the direction of a committee of the Ontario Association of Architects.

By referring to the results of the tests above mentioned, it will be seen that the average crushing stress of the majority of Canadian and American sandstones is far below that of ours, the difference in our favor ranging from 75 to 50 per cent.

The Credit Valley Brown Stone, owing to its modest tone, harmonizes beautifully with red or cream colored brick.

It has been reported that there is difficulty in obtaining Credit Valley Brown Stone. To correct this mistaken notion, we wish to state to architects and the public that we have a large quantity of stone ready to ship on the shortest notice, which can be followed up with an unlimited supply. Last year we made extensive additions to our plant and opened up new quarries and mines, and will supply promptly all orders given to us or our agents.

CARROLL, VICK & CO.

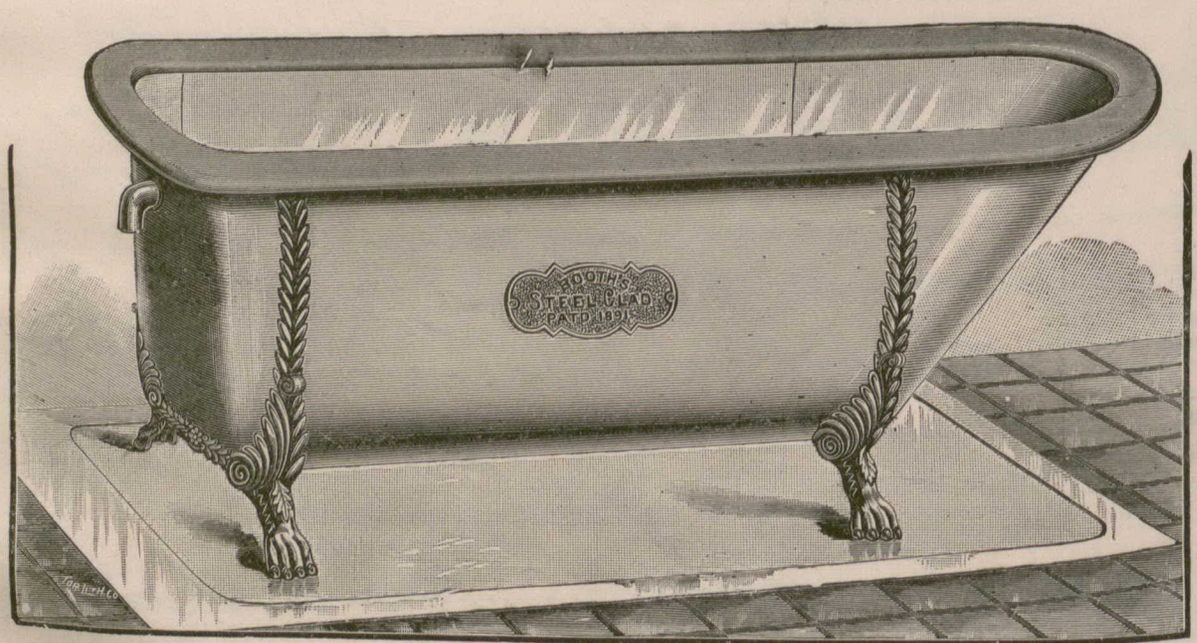
Quarries: Credit Forks, Ont. Office: 84 Adelaide St. West, TORONTO.

Montreal Agents: T. A. MORRISON & CO., 118 St. Peter Street.

THE . . .

"STEEL-CLAD" BATH

Booth's



Patent

. . . MANUFACTURED BY . . .

Toronto Steel-Clad Bath and Metal Co., Ltd.

123 Queen Street East, Toronto.

MONTREAL ST. JOHN, N. B. QUEBEC VICTORIA, B. C.

ADDRESS ALL COMMUNICATIONS DIRECT TO THE COMPANY.

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