

PAGES

MISSING

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TO ADVERTISERS.

For the benefit of Advertisers, a copy of this journal is mailed each week to persons mentioned in the CONTRACT RECORD'S reports as intending to build, with a request to consult our advertisement pages and write advertisers for material, machinery, etc.

THE Royal Institute of British Architects proposes to expend the sum of £200 on a series of systematic tests of brickwork.

THE project for the erection in Toronto of a first-class hotel, is assuming more tangible shape. The names of responsible gentlemen—one a successful hotel proprietor—are given in connection with the undertaking. Preliminary plans for the building are said to have been prepared, and should financial obstacles not block the way, there appears to be every likelihood that the erection of the building will be proceeded with during the coming year. Toronto is emphatically behind the times in point of first-class hotel accommodation, and there is little doubt that if an hotel embracing every improvement is erected at a cost of a million dollars, as proposed, it will prove to be a paying investment.

BUFF bricks and terra cotta have been used in quite a number of the larger buildings erected within the last year or two, and now under way, in Toronto and Montreal. The appearance of these materials is pleasing in many but not in all instances. The red and brown shades for brick work will probably remain in greatest demand for all classes of work. The lighter colors have some advantages in certain positions, but never give the effect of strength and solidity that the darker shades do. Among their disadvantages may be mentioned their greater susceptibility to injury by smoke and dust. They can always be used with good results for trimmings and in combination with other shades, but their suitability in large masses depends largely on the surroundings of the proposed structure.

CONTRACTORS for masonry or brickwork should give as much attention as possible to the various uses of concrete and cement work, for which there is an increasing demand. These materials will undoubtedly continue to grow in favor, and the contractors who are best prepared to handle such work intelligently will most uniformly obtain good results, and reap a corresponding benefit. The proper use of cement requires far more care than ordinary mortar, and with it a contractor has more risk of loss through bad material or inexperienced workmen. In fact, the better kinds of concrete work should only be placed in the hands of the most skilled artisans. Concrete well finished in cement is the ideal cellar floor for dwellings, and its adoption for this purpose will be greatly increased as the importance of making houses moisture-proof becomes better understood. Laid in a similar manner, it is a favorite material for first-class sidewalks, and is unequalled for making a suitable road-bed for any kind of pavement. For foundations it is indispensable, while its value for fireproofing, and its adaptability to many other purposes in building are only beginning to be understood. In no kind of work should a contractor be more particular as to the quality of his materials. Whether using native or imported cement, he should be sure that it is in good condition, and not try to do work with any less than the quantity necessary for a thoroughly good job, but rather insure perfectly satisfactory results by allowing a margin on the side of strength. In our next issue we shall publish a number of carefully selected standard formulas for mixing concrete and cements.

THERE is a suggestion for wide-awake manufacturers and dealers in building supplies in the advertisement of an architect which appears in this number, inviting information concerning such materials. The cheapest and most effective method of affording information of this character to architects is by means of a standing announcement in the pages of the ARCHITECT AND BUILDER, which will be found on file for reference in the offices of 90 per cent. of the architects of the Dominion.

SOME recent remarks of Judge Ferguson, at Ottawa, in regard to the terms of a certain contract being very hard on the contractor, have attracted considerable attention from the local contractors, some of whom say that they do not get fair treatment as contracts are at present made out. While admitting that the various stipulations are intended to act as a preventative against fraudulent contractors, they claim that there are clauses not needed even for this purpose. We have long been of the opinion that the usual form of building contract would furnish good material for the careful consideration of contractors, with a view to securing some changes. One clause only will be cited here, viz., "That in the case of several contractors being employed on the work, no trade is to be considered complete till the other several contracts are also completed." Contractors are every day signing conditions which, if rigidly enforced, would compel them to perform work as part of the contract without having had adequate opportunity of estimating its cost. Other conditions might in various ways be made burdensome to contractors. To the credit of the architects it can be said that their large powers are seldom abused, but there is a difference between them in this respect, which is properly taken into account by contractors in tendering. It is hardly fair to ask contractors to sign articles of such a nature as can only be required as a general protection from unreliable persons. Owners are encouraged to believe that with such iron-clad conditions the architect is sufficiently armed to insure a first-class job from any one regardless of price. Contractors would be justified in objecting to such clauses. The architect is supposed to stand as the independent interpreter of the obligations between proprietor and contractor, but since he is in the pay of the proprietor it is only reasonable to expect that he will be more particularly interested on the side from which he receives his commission. It follows that the contractor must look after his own welfare, and the clearer and more definite contracts can be made the more satisfactory will be his position and the less embarrassing that of the architect. We believe the architects would gladly meet the contractors for the consideration of questions of this kind. We have no hesitation in saying that the Uniform Contract used in the States and approved by the American Institute of Architects and the National Association of Builders, is better than the forms in use here, but it also is capable of being improved.

THE annual convention of the American Institute of Architects held in New York last month is likely to have a marked influence towards bringing about some changes in practice. Many valuable papers were read; some of these called out spirited and interesting discussion. The president's address contained brief references to the past year's experience and suggested lines of discussion for the Institute to take up. We quote only a few sentences as follows:—"There is great virtue in the formal publication of any truth."—"It is a good thing for the Institute to publicly express its views concerning vital matters of professional conduct."—"Whatever the Institute condemns the architects must conform to, and stand squarely on its decision, or lose caste in the eyes of the profession and of the public."—In the discussion on his address, the president recommended that the Institute especially express its views regarding the practice of doing work without proper remuneration, either in competition or otherwise, and that such practice be stamped as unprofessional. If this was published as the view of the Institute, it would have great weight, while the same belief expressed by the members to each other privately would have no influence whatever. The report of the Committee on Competitions was approved and the committee continued to prepare a code embracing the views expressed in the report. It is not proposed to make any change

in the rate of 5 per cent. on the cost of the work for full professional services, including supervision, 3½ per cent. for preliminary studies, general drawings, specifications and details, and 2½ per cent. for the same, less details. A radical change is proposed, however, in charges for preliminary studies, as follows:—

Minimum charge \$50.00.		
For works costing \$		50,000, 1 per cent. of proposed cost.
" " " 5,000 to \$	50,000 "	\$ 550.00
" " " 50,000 "	75,000 "	650.00
" " " 75,000 "	100,000 "	750.00
" " " 100,000 "	150,000 "	950.00
" " " 150,000 "	200,000 "	1100.00
" " " 200,000 "	250,000 "	1250.00
" " " 250,000 "	300,000 "	1350.00
" " " 300,000 "	350,000 "	1450.00
" " " 350,000 "	400,000 "	1550.00
" " " 400,000 "	450,000 "	1650.00
" " " 450,000 "	500,000 "	1750.00
" " " 500,000 "	600,000 "	1900.00
" " " 600,000 "	700,000 "	2000.00
" " " 700,000 "	800,000 "	2200.00
" " " 800,000 "	900,000 "	2350.00
" " " 900,000 "	1,000,000 "	2500.00
" " " 1,000,000 "	1,250,000 "	2850.00
" " " 1,250,000 "	1,500,000 "	3050.00
" " " 1,500,000 "	1,750,000 "	3300.00
" " " 1,750,000 "	2,000,000 "	3500.00
" " " 2,000,000 "	2,500,000 "	3950.00
" " " 2,500,000 "	3,000,000 "	4300.00
" " " 3,000,000 "	4,000,000 "	5000.00
" " " 4,000,000 "	5,000,000 "	

The rate is about 2½ times the square root of the lowest estimated cost. This rate seems excessive for inexpensive buildings, but is about right for buildings of great cost. It is expected that architects will not enter competitions unless paid for their services according to the above schedule, and it is hoped to discourage competitions for buildings of low cost. The table of charges quoted is to supersede the former rate of 1 per cent. on estimated cost for preliminary studies. Competitions are not to be entered into except for public buildings, and then only on condition that four competitors shall be paid at the schedule rates, and one employed as architect with compensation at the minimum rates fixed by the Institute. The paper on High Buildings brought out in discussion a variety of opinions regarding the durability of iron skeleton construction. In a paper read on fireproofing it is assumed that if protected from fire such buildings are practically indestructible. Mr. Post, who has had a large experience in erecting this kind of buildings believes their life will be but short. His opinion, supported by others, is, that the most serious drawback is the effect of rust on the iron. In view of this he argued in favor of cast iron for columns instead of wrought iron or steel. These ideas were strongly opposed, but the conclusion is unavoidable that every possible precaution should be taken to protect iron work from rust in whatever position it may be placed, and also as far as possible to arrange the construction so that it can be examined and painted from time to time. A paper on elevators treated exhaustively of the mechanism of the modern electric elevator, showing its advantages over other kinds. The opinion is expressed that little improvement in these appliances is to be looked for in the near future, for the reason that in every industrial development there are forms of machines which early become typical and remain so, and that machines are now in use of so high efficiency as to leave little margin for improvement.

Some experiments were recently made by the Buildings Inspection Department, Vienna, on the protection of iron from fire by incasing it with brick. A wrought iron column, 12 feet long, and built up of channels connected by lattice bars, was used. This was set up in a small chamber constructed of brick, and the column was loaded by levers. This done it was surrounded by a 4½ in. brick wall laid in fireclay mortar. Between the wall were fixed samples of fusible metals, which should serve as a gauge of the temperature attained. Various samples of stone concrete and other materials were also placed in the chamber within the column. This chamber was then filled with firewood, which was lighted, and the doors were walled up. An examination of the room after the fire had burned itself out showed that the walls of brick laid in Portland cement retained their strength whilst most of the natural stones left in the chamber had been destroyed. The ceiling had been lined partly with plaster of Paris and partly with terra-cotta tiles. Both were damaged. The inclosure round the iron pillars was still standing firm, though corners of the brick-work were chipped 1 in. or so, and the fireclay mortar was largely washed out of the joints. On removing the casing, however, the pillar inside was found to be uninjured, even the paint being unscorched, and the fusible plugs only showed a temperature of 149 degs. Fahr.

THE BYSTANDER.

THE social element in human nature goes a long way to smooth down the rough places everyone meets in his path-way in life; and when this feature of character is found wanting in man, either individually or collectively, the circumstance is likely to produce comment. The Bystander heard the charge made a short time since that the architects of this city were an exclusive and unsociable body of men. "There could be no doubt, but that they were a fine class of men," said a member of the profession, "and when assembled in their annual gathering, they are hail fellows well met, and an enjoyable, as well as a profitable, time can always be spent in their company. When, however, they get outside of the walls of their association meetings, they are as unsociable as members of some of our religious bodies, when disassociated from the organized body, or on the ordinary six days of the week." The complaint of this friend was that each one seemed to be so taken up with his own personal affairs, no opportunity was given to cultivate that spirit of cordiality that ought to exist, he believed, among any class of people engaged in the same calling. The Bystander has always held that not alone is it an agreeable thing for men in the same business to get together occasionally, but that it is a very profitable matter. Our ideas are broadened as we rub shoulders with one another. The suggestion was made, as one means at the present time of bringing the brethren together and helping to break down this barrier of exclusiveness, that the drawings that had been sent for exhibition at the Quebec Association by the Toronto architects, should be placed on exhibition at some central point in the city, where each could learn what the other had done on this occasion, and thus meet, exchange views and become better acquainted. On this matter of personal sociability, the Bystander thinks of a remark made by Henry Ward Beecher, that people sometimes charge others with being unsociable, when they themselves are the real source of the trouble. He said, "I have known persons to cross to the opposite side of the street, when seeing an acquaintance coming along, having the notion that he would not care to speak to him, where the real fact is the individual in question only wanted the opportunity to cultivate a better acquaintance."

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An old saw that finds many illustrations in everyday life is that which tells that extremes meet. Human nature seems born to run to excess, for no sooner is the folly or the excess of yesterday learned, than to day the disposition is to go to the opposite extreme. Only a few years ago, and a year is a short period in the history of a country, times were flush almost the world over, and little importance was placed on the out-go by any class of people. Reaction came, as it had come before, and as it will come again, and multitudes struck hard bottom. To-day there is seen, as a result of this change, the extreme of the profligate age, and "cheap," and "squeeze" is the policy of the day. Everybody sees this kind of thing in the ordinary commercial transactions of life. The Bystander has been impressed with the fact that this prevailing spirit of hard times has few, if any, limitations. How it crops out in the matter of building contracts. No value would seem to be placed by many on their own individual time or labor, or that of their employees. Chatting the other day with a city architect, he said: "Let me show you what encouragement there is to embark in contracting and building in these times. Here are the drawings for a house that I figured down to \$5,000, without heating, which added would represent several hundred dollars extra. Now in my judgment this figure could not possibly stand any paring, and even allow a living wage to the contractor and the opportunity to pay his men the current wage of the day. What is the situation? I have just now let that contract to a man in this city who agrees to construct the house according to plans and complete it with heating, all for \$4,800." How is he going to manage it? was a natural question to ask. "It is just like this in his case," said the informant. "This man is a mechanic himself; within his family are bricklayers and stone masons. They will keep the work largely within their own hands. None of them can make so much as a journeyman's wages, but work is slack and they are glad to get anything to do and accept any price." From one point of view this seems a common sense method to adopt. Better half a loaf than none. It is a method,

however, that may someday serve as a boomerang. Many workmen who are not situated as the parties who took this contract and able to work together, are tied down to the regulations of their trades unions, and they must walk the streets day in and day out. The Bystander is informed that with certain trades the carrying on of work during the depression of the past few years has been absolutely blocked because of the determined attitude assumed by workmen in the matter of wages. And yet the winter approaches and those who would not deviate 25c a day from the standard wage, when capital has been earning its smallest interest, would accept a half wage for a day or two at the city's expense to toss snowballs in the air. Of such it may well be said, with Milton: "They feel by turns the bitter change of fierce experience."

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A pleasant hour was spent by the Bystander a short time since in the studio of Mr. J. W. L. Forster, the well-known and talented portrait-painter of this city, whose portraits of Mayor Kennedy and other prominent citizens have from time to time elicited many encomiums. Excelling in his own special line of art he is also able to take a long view of artistic affairs. He sees a close relationship between the work of an artist, using the term in its usually accepted sense, and that of the architect. Both, in fact, are artists, and Mr. Forster expressed the view that each might learn something from the other by an occasional interchange of opinions. The conversation getting down to something specific, a discussion followed touching the matter of interior decorations. The view was expressed by this artist that the artistic effect of a room might be largely enhanced, if the plan were adopted of darkening the lower part of the windows and allowing the natural light from the heavens above to pour into the room, rather than the imperfect light there comes through a window as now constructed. And suiting the action to the word he illustrated what he meant by darkening his own window at the lower part, closing out the light in that manner, but allowing it to come in from above. "Now," said he, "observe the softening effect on everything in the room, the carpets, the furniture, and even the clothes that one may wear." How would it answer to arrange for a social gathering some evening of the artists and architects of the city?

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Everyone has not the courage to speak out in meeting, but were it not for some brave mortal doing this occasionally, things could come easily to a standstill in some of our best regulated organizations. A letter in the October CANADIAN ARCHITECT AND BUILDER proding the Executive of the Ontario Association of Architects is a case in point. The Bystander has learned that some of the profession do not take kindly to the criticism. This, however, is not the unanimous view. It is held by not a few leading architects that the Ontario Association of Architects could show an increased measure of activity, and then not over-exert itself. It is to be remembered that the annual meeting is near by, and yet very little has been done to secure a successful and profitable gathering. Aside from this, members of the profession say to the Bystander, why should we exist only for the sake of getting together once a year? Other associations map out programme enough to keep themselves fairly in the front the year through. Furthermore, whilst a large number of the members of the Association are residents of Toronto, yet a number are outside of the city, and they would like to know occasionally what the Executive is thinking about. The letter of "City Member" is believed to have more truth than poetry in it. At the same time, a member of the Executive has said: "Let this writer reveal himself and we will give him the opportunity to show his activity." Others are wont to quote Byron, and say:

Seek roses in December; ice in June;
Hope constancy in wind, or corn in chaff;
Believe a woman, or an epitaph,
Or any other thing that's false, before
You trust in critics.

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There recently visited this city the correspondent of an American lumber journal, and in a published letter, he made this statement: "I found at Toronto, and the same is presumably more or less true of other border cities on the Canadian side, that considerable yellow pine timber and joist was being used in the construction of public and other large buildings. Some of these are

after plans drawn by American architects, who appreciating the superiority of yellow pine as bearing joist specify that kind of stuff." Those who have interested themselves in lumber matters are aware that an effort has been made to create a market in the eastern states for the yellow pine of the south, and bring it into competition with white pine, a large part of which now goes to these states from Canada. To only a small extent, however, has this wood been successful as a rival to white pine, except for some common uses, where price was a consideration. Knowing these conditions it seems clear to the Bystander that yellow pine, when used in Canada, has not found any large place here on its merits, but simply, as this American journal has suggested, because American architects have designed plans for the buildings where such pine is used, and have not lost an opportunity to promote the interests of a wood grown in their own country. The injustice to Canada of giving the work of designing public buildings to foreign architects does not, therefore, come home only to the Canadian architect, but as it seems here to other interests in the country as well. It would be taking a narrow view of conditions to say that the interests of any concern, or of the public, should be sacrificed by refusing to place in outside hands work that could not be done at home. But with the high standing of the profession in Canada, and their work is before everyone to testify to the fact, is it not disloyalty to our country and people to seek talent abroad for the designing of any of our buildings, public or private?

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Looking around the other day among the new buildings in the business part of Toronto the Bystander met Mr. Henry Langley, of Langley & Langley, in the store of John Catto & Co., which is being constructed under his direction. Mr. Langley was engaged just then in inspecting a case of terra cotta brick. Architects and builders have evinced more than average interest in the terra cotta used in the construction of the Catto building. It is made by the Rathbun Co. Taking a cursory glance at the front of the building one might notice that it bears an embossed appearance. The bricks are combed, Mr. Langley says, and afterwards cut to proper size, giving a very tasty effect. The Bystander had heard some complaint of the quality of this terra cotta. "The trouble has been," said Mr. Langley, "things were rushed too much at the outset, and the plant of the Rathbun Co. overtaxed. As a result some of the terra cotta was not burned sufficiently." A feature of the bricks which attracts attention is the small oblong shape. So far no large quantity has been used in building construction in Toronto. In Buffalo and other American cities this brick is used largely, the first lot, it is said, being imported from Scotland. Its introduction here may be taken, perhaps, as a movement to get away from the staid routine that is often a serious fault in the construction of buildings, both for public and private purposes, in all our cities.

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The work of brick-making in Canada has grown apace since the early inhabitants of Babylonia found on the plain in the land of Shinar clay for their construction, and "said one to another, Go to, let us make brick and burn them thoroughly, and they had brick for stone and slime had they for mortar." The reference in another paragraph to the class of brick that has been used in the construction of the new store of John Catto & Co., is an illustration of Canadian progress in brick-making. Said Secretary Phillips, of the Builders' Exchange, a few days since: "Really commendable and substantial progress in brick-making has been made in Canada within the past few years. One does not need to go far back in memory to talk of bricks at \$40 a thousand. To-day we are getting a good pressed brick for \$16. Brick-making has become a very thorough study with some of our manufacturers. I do not know just what amount of money, for example, Taylor Bros. have expended in experiments in order to reach the high degree of perfection that is shown in their pressed bricks, but the sum has been considerable. And what has occurred with them has had a parallel, in a measure, with the Rathbun Co. and other manufacturers. Despite a duty of 25% Canadian brick-makers have been able to send into the United States large quantities of their bricks." Methought these were complimentary words for Canadian brick-makers. They furnish proof that thoroughness and a determination to reach as nearly to perfection as possible are elements certain to achieve

success. Brick making is an industry full of large possibilities. The Bystander has been asked as to the resisting power of fire bricks. An authority on the question says that fire bricks will resist a crushing force of from 600 up to 3,000 pounds per square inch.

AN INTERESTING ARBITRATION.

An important arbitration has recently been concluded between the corporation of the City of Moncton, N. B., and the Moncton Gas, Light and Water Co., to determine the amount which the city should pay the company, in consideration of the transfer of the company's property to the corporation.

In 1878, the company were given a charter by the provincial government to construct works and supply water and light to the city, on such terms as could be agreed upon between the company and city, for a period of ten years. The necessary works were constructed, Mr. E. H. Keating, the present City Engineer of Toronto, and the late Mr. Gilbert Murdoch, of St. John, acting as consulting engineers on the work. The works were extended from time to time afterwards, an electric lighting plant being added in 1888. Terms were agreed upon between the city and the company, and after the expiration of ten years, the period of the contract, a renewal contract for a further period of five years was arranged. This renewal contract expired in the early part of 1893. Dissatisfaction was expressed by the city with the character of the service performed by the company under the contract, in consequence of which the city announced its intention to own and operate its own water and light plant, and made an offer of \$180,000 for the company's property. This offer being declined, the city made application to the legislature for a special act to authorize them to construct the necessary works for the supply of water and light. This application the legislature refused, but as a compromise, authorized the expropriation of the existing works at a price to be fixed by arbitration.

Mr. Robt. Surtees, City Engineer of Ottawa, was chosen as arbitrator on behalf of the city, Mr. Walter Shanly, C. E., of Montreal, for the company; Mr. F. T. Holt, C. E., of St. Stephen, N. B., being appointed by the Lieutenant-Governor-in-Council, as third arbitrator. The legal counsel for the city were: B. M. Britton, Kingston, Ont., Hon. H. R. Emerson, Commissioner of Public Works, H. A. Powell, M.P.P. and Mr. B. Chandler, of New Brunswick. The company were represented by Hon. A. G. Blair, Attorney-General of the province, A. A. Stockton, M.P.P., C. W. Weldon, Q.C., R. A. Borden.

The engineering expert for the city was Mr. Willis Chipman, of Toronto, who was assisted by Mr. John McCready, City Engineer, and Mr. J. J. Taylor, of Moncton. For the company—M. M. Tidd, C. E., of Boston, Mass., their permanent engineer, John Edington, and Mr. Croasdale, of Moncton.

The arbitration opened the latter part of August. The taking of evidence occupied three weeks. The case hinged largely upon the interpretation of a single word. The Act under which the arbitration was held, declared that "The arbitrators shall proceed to determine the compensation to be paid." The important word was "compensation." The company claimed that the compensation should be based on the net earning power of the plant, capitalized at 4 per cent., with an allowance for prospective profits for the next ten years. The average net earnings of the company for the last six years were shown to have been \$24,000 per year, and calculated on this basis, the valuation placed upon the property by the company was \$800,000. The company's construction account showed amount expended to have been \$281,000. The total cash paid for stock was shown to have been \$116,000; stock paid out of earnings was \$100,000; making total stock issue \$216,000, to which must be added \$60,000 bonds.

The city contended that they should not pay more for the works than would be required to construct new works, less depreciation. Mr. Chipman estimated the cost of new works at \$137,500 for water works and \$74,000 for lighting—a total of \$211,500. This estimate did not include some lands of the company, on certain streams not in use, which would bring the total up to \$225,000. The depreciation was estimated at \$17,500, which deducted, left the total estimate \$208,000.

The award of the arbitrators, which is signed by Messrs. Surtees and Holt only, gives the company \$265,000 for the water works, and \$78,000 for the lighting system—a total of \$343,000.

The water committee of the City Council, in their report on the case, bestow credit on the legal counsel, and on Mr. Chipman, the engineering expert, for the ability with which they handled the city's case.

ELECTRIC PERCUSSION AND ROTARY DRILLS.

THE accompanying illustration shows in operation at the Windsor Gypsum Quarries, Windsor, Nova Scotia, portable electric percussion and rotary drills which have lately been introduced and are being manufactured by the Canadian General Electric Co.

The percussion drill in general external appearance conforms very closely to the regular type of steam and air drill; in fact the tripod and shelf are of the standard steam drill form. Electrically, it is arranged in the form of a solid piston reciprocating in a magnetic field and controlled thereby. The piston is provided with a standard air drill rotating rifle-bar and the usual form of springs to protect the front head of the drill from blows. The drill has a piston diameter of $3\frac{3}{4}$ " , a length of stroke from $6\frac{1}{2}$ " to $8\frac{1}{2}$ " , length of feed 24" , number of blows per minute, 360 to 380.

The first of these drills was installed on the Canadian "Soo" Canal last winter, when the contractors, Messrs. Hugh Ryan & Co., were greatly pleased with its performance. On these works the performance was equal to that of a 3" steam drill, and the facility with which the drill could be moved, owing to the complete flexibility of the connections, was especially remarked. As far as economy goes, it far surpassed any other drills on the works. The cost of operating, including power for operating the generator and labor of the attendant at the power house, was somewhat under the average operating expenses of the steam drills. Bearing in mind that the attendance at the power house is the same whether one drill or fifty are in operation, and that the increase of power is by no means in proportion to the number of drills, it will be readily seen that a very great saving will be effected over steam drills where the number in operation is the same.

In the Windsor Gypsum Quarries, Windsor, N. S., where one of these drills is in operation, every satisfaction is being given by it. The best day's work of one drill on record is ten to fifteen holes in 9 hours and 20 minutes. This was in glow lime stone.

The rotary drill is designed especially for use in coal mining, but has also been used with great success in the Gypsum Quarries of the Windsor Gypsum Co., where the clayey nature of the material tends to clog the drill and imposes the severest test on the capability of the machine. The drill is similar to the well-known Howell's drill with an electric motor geared to it in such a way as to form a light and efficient tool. The control of the motor is effected by a small plug switch. No rheostat being used, power may be taken from the same wire supplying current for lighting, pumping or haulage.

Feed screws of different pitch are furnished for varying the speed of boring and a friction clutch protects the motor should any particularly hard obstacles be struck suddenly.

The columns are made in different lengths and each is adjustable for about two feet variation. The construction of the drill and its method of mounting enable the operator to drill close to the roof, floors or walls as well as in any direction.

The drill weighs with post complete only about 160 lbs., the drill itself weighing 100 lbs. In bituminous coal this drill shows a speed of drilling of 7 to 10 feet per minute.

COLLAPSE OF BUILDINGS.

THE records of failures in the Middle Ages rather indulge in religious than in practical explanations of the causes, and so, says the Builders' Reporter, we do not gain much practical knowledge from these examples, such as the fall of the towers of Winchester Cathedral in the twelfth century; of Gloucester Cathedral, in 1160; of Worcester Cathedral, in 1175; of Evesham, in 1215; of Dunstable Priory, in 1221; the smaller towers of Worcester Cathedral, in 1222; the tower of Lincoln, in 1244; of Ely Cathedral, in 1322; of Norwich Cathedral, in 1361; and the west front of Hereford Cathedral, in 1786; the central tower of Hereford would have fallen had not its impending ruin been observed and remedied. The old tower of Thurston Church, Suffolk, fell in 1860. Then we have the Chichester tower in 1861. The above small list of towers awakens the thought that special care is needed for all structures that are

carried upon piers instead of upon continuous walls. But the description that has been given of the cause of failure in the Chichester tower would have been very applicable to many of the other cases. The lesson derived from the Chichester fall seems to be that rubble masonry should never be used in piers carrying towers or other heavy work; it is a masonry suitable where bulk and weight are main objects, but it is inadmissible where unyielding vigour of pier is to be attained; it also suggests that in any such case a soft kind of stone is scarcely safe even if it be of a sound nature; and the stone forming the facing at Chi-



ELECTRIC PERCUSSION AND ROTARY DRILLS,
IN OPERATION AT THE WINDSOR GYPSUM CO. S QUARRIES, WINDSOR, N. S.

chester, though in some respects a good stone, was not suitable where a crushing force was the chief force in action. It was found near Binstead, in the Isle of Wight, and it is the only tertiary building stone in England; but if we want a thoroughly good freestone we must get it out of the secondary beds. The stone in the piers of the French Panthéon was of a rather weak quality, but that with which the inner and intermediate domes were formed was tertiary, from the quarries of Conflans, about eighteen miles from Paris, and for which latter purpose it is particularly suitable.

PERSONAL.

Mr. E. L. Horwood, architect, Ottawa, through our advertisement columns, invites manufacturers to send him copies of their catalogues.

Mr. E. B. Merrill, who was for many years instructor in electricity at the Toronto Technical School, has been elected principal of that flourishing institution.

Mr. William Robinson, who for 21 years occupied the position of City Engineer of London, Ont., died in that city on the 10th of October. Mr. Robinson at one time practiced as an architect and land surveyor in Toronto.

In considering simply the proper and best use of color for house interiors it is not necessary to include the question of ornament or elaboration either of walls or ceiling. These may follow, but tint must go before, and if thoroughly studied and well chosen, can very well dispense with ornament.



(Correspondence of the CANADIAN ARCHITECT AND BUILDER.)

THE MASTER PLUMBERS' ASSOCIATION.

The recently formed Montreal Master Plumbers' Association will apply to the legislature for an act of incorporation. As the result of correspondence which has been going on for some time between the Association and some of the leading plumbers of Quebec, it is probable that a plumbers' association will be organized at an early date in that city. The Council of the Arts and Manufactures Association has invited the Association here to assume superintendence of the plumbing class in connection with that institution. The meetings of the Association, which thus far have been held regularly twice a month, are well attended. Careful consideration has been given to the city plumbing by-law. The endeavor will be made to bring about a conference at an early date of representatives of the Association and of the City Council, to discuss needed amendments to the ordinance.

PROVINCE OF QUEBEC ASSOCIATION OF ARCHITECTS.

At a recent meeting of the Council of the Province of Quebec Association of Architects it was decided to hold monthly meetings and dinners of the members of the Association on the second Tuesday of each month during the winter, in the rooms of the Association, New York Life Building. It was also decided to hold a general special meeting of the members of the Association on Thursday, December the 6th, at 4 o'clock p.m., to discuss the amendments to the by-laws which will be proposed according to the notices of motion given at the last annual meeting, as follows:—Mr. A. C. Hutchison will move to make the following change in section XI of the by-laws: to strike out the following words in the 3rd, 4th and 5th lines of the section—"to collect all funds and hand them to the Treasurer, taking his receipt for the same;" and in line 8 of the same section to omit the words—"receipt for them to the Secretary," and to add to section XI the words—"The Treasurer shall also furnish to the Secretary at the close of each year a list of the members whose subscriptions have been paid.

Mr. W. E. Doran will move to amend section V of the by-laws by changing the words in sub-section III thereof, after "separately," to read as follows—"The retiring President shall be ex-officio the premier member of the Council, the other five members to be balloted for on one paper."

Mr. Victor Roy will move that "The Lieutenant Governor of the Province, the Prime Minister, and the Minister of Public Works of the Province, the Mayors of Montreal and Quebec, the Honorable Sir Donald Smith and G. A. Drummond be elected as honorary members of our Association."

Mr. A. T. Taylor will move "That the Council shall appoint a Board of Examiners composed of six members, instead of four, as in the past."

Members of the Association who may desire to introduce any sub-amendments in connection with these amendments, are requested to communicate them in writing to the Secretary on or before the 17th inst.

Mr. A. F. Dunlop, who was elected a member of the Council of the Province of Quebec Association of Architects at the recent annual meeting, has since resigned the position.

THE BUILDING BY LAWS.

There are probably on this continent very few cities of the size of Montreal where the aesthetic in architecture is so much ignored. Some of our city fathers even are not more enlightened on the subject than their electors are. An example of the extent of their knowledge in that line was the passing of a by-law a few years ago, when the street railway craze began, to the effect that all buildings erected in future on the new street line should be faced with stone and be not less than three clear stories in height. As the result buildings strictly in accordance with this by-law, but of cheap construction and mostly of poor design, sprung up on these promising thoroughfares, of which Notre Dame street is a recent example. Brick and terra cotta of any kind were absolutely prohibited for the facing of front walls. These materials in the eyes of some of our aldermen are merely baked mud unfit for decorative purposes, but such highly ornamental and substantial material as galvanized iron was allowed to be used in profusion for decoration and the construction of cornices and towers. Recently the Merchants'

Bank of Halifax, which is erecting a very creditable and ornamental building at the corner of Seigneurs and Notre Dame streets, asked permission of the City Council to use buff pressed brick on the Notre Dame street fronts. After considerable opposition on the part of some of the aldermen the by-law was amended, and anyone may now use pressed brick for facing front walls. When that by-law was passed, instead of prohibiting the use of brick, which they thought was too common a material to be used on those streets, the aldermen might better have directed their attention to forbidding the employment of galvanized iron for cornices, etc., as a substitute for terra cotta and stone, and to the regulation of the height of each story, so as to ensure uniform height in the buildings, thereby preventing such erections as that on the corner of Notre Dame and McGill streets, one of the best business locations in the city, where the building conforms in every way to the by-laws, with a stone front, and three stories in height, but where the height of each story is not more than seven feet six inches. Would it not be wise for the civic authorities when a building permit is applied for not only to enquire about the constructive merit of the structure but also as to its artistic merit, with the object of putting a stop to the erection of buildings from so-called "builders' designs," and the showy and ill-constructed buildings put up wholesale by speculators, which at present do so much to disfigure our streets?

COUNCIL OF ARTS AND MANUFACTURES OF THE PROVINCE OF QUEBEC.

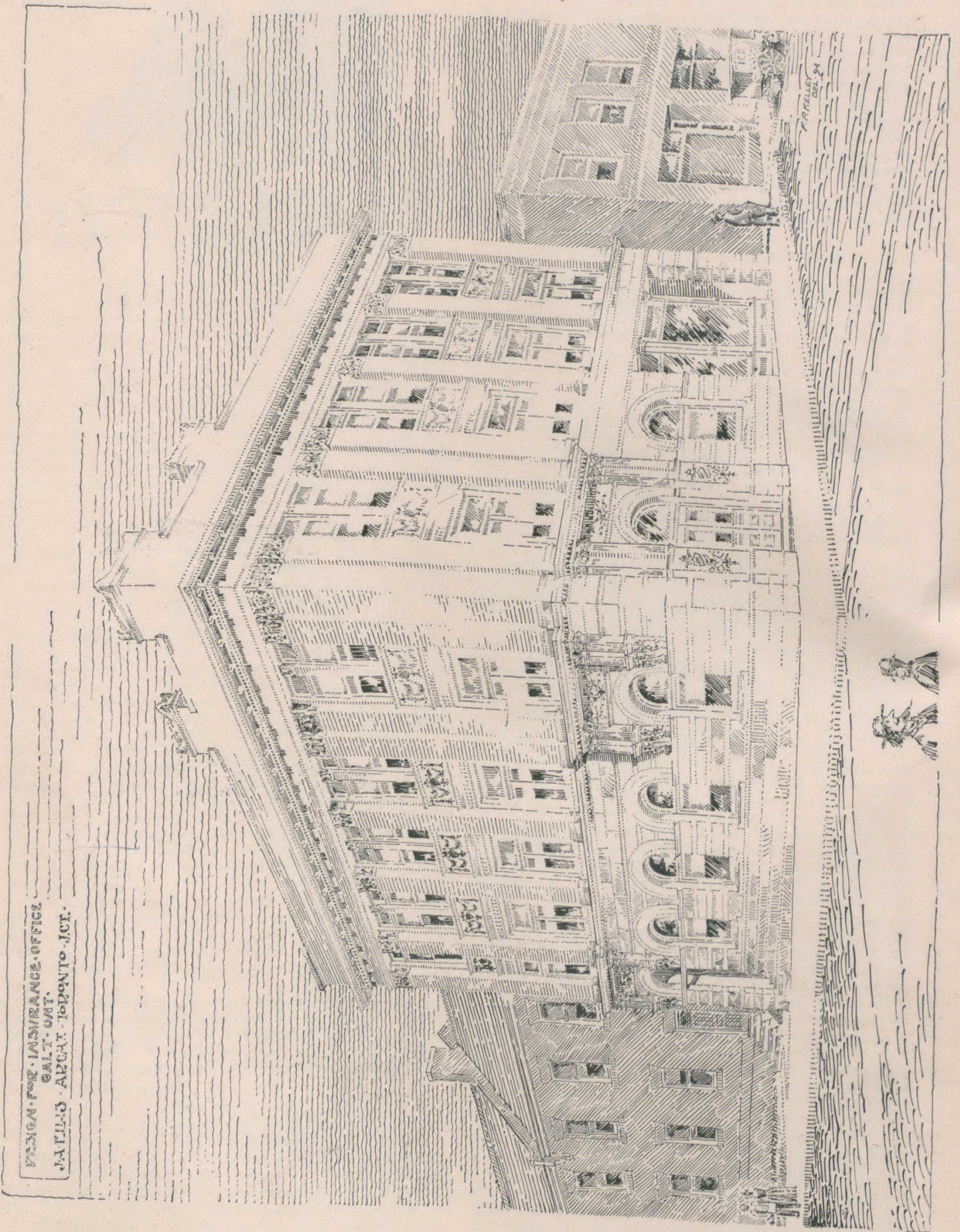
The schools of the Council of Arts and Manufactures of the Province of Quebec are institutions which interest in the highest degree architectural students, and apprentices devoted to the building arts in general, as they afford to pupils great facilities for developing their talents and taste in branches of study which are seldom met with in the daily routine of the office of the architect or in the workshops. These schools are established in all the cities of importance throughout the province, as in Quebec, Levis, Three Rivers, Sorel, Huntingdon, Granby, Sherbrooke, St. Hyacinthe, St. Jerome, and Montreal, which is their headquarters. The first schools, that is those of Montreal and Quebec, were founded in 1873 by the Provincial Government, which elected a board of management actually composed of Messrs. E. E. Paché, J. F. Peachy, G. E. Tanguay and Rev. J. C. K. Laflamme, of Quebec, T. Normand, M.P.P., of Three Rivers, D. Lainé, of Levis, A. G. Lomas, of Sherbrooke, Paul Payan, of St. Hyacinthe, L. I. Boivin, G. Boivin, A. Boyd, Victor Roy, J. McFarlane, J. D. Rolland, F. J. Hart, J. C. Wilson, and W. McMaster, of Montreal, and S. C. Stevenson, B.A., as Secretary.

As a representative of the CANADIAN ARCHITECT AND BUILDER, I had the opportunity of visiting, a few days ago, the Montreal school, and cannot too highly recommend its system of instruction to those who wish to acquire some knowledge of modelling, freehand drawing and building construction, and am glad to be in a position to give herein a short description of the school. The school occupies three buildings, completely independent from one another. Two are antique but massive and well built buildings facing the Champs de Mars on St. Gabriel street, and forming the two angles of Fortification Lane, which begins at this point. The school is maintained at the expense of the Provincial Government, and is open free of charge to all male pupils above the age of fifteen years. It opens on the 5th of November in each year, to close on 5th April. Applications for admission are received by the Professors at the class rooms and are presented by the candidates in person, accompanied by a letter of recommendation from their employers. As the number of applications for admission in some of the classes are sometimes in excess of the number that can be immediately admitted, it becomes necessary for the later applicants to wait until vacancies occur; they are then admitted in the order of their applications. The only exception to this rule is made when the number waiting is more than enough to fill the probable vacancies for the season—then preference is given to those whose occupations require a knowledge of the study sought.

Pupils who may obtain admission to a class for which they are not properly qualified, are referred by their Professor to such class as may be deemed proper. They are then entered as applicants for this class, if they so desire, but are subject to the same conditions as new applicants of the same date. Each pupil on being admitted to a certain class is required to make a deposit of one dollar, which is returned if he has not been absent more than four times during the session. But in any case, when a pupil has sufficient reason for absenting himself, he should always report to his Professor in order to retain his position in the school. At the close of the session pupils must take charge of their drawing boards, instruments, etc., and all drawings or other works executed in the school are retained during the session; at the close the Council may retain such works as it considers desirable, the remainder being returned to the pupils.

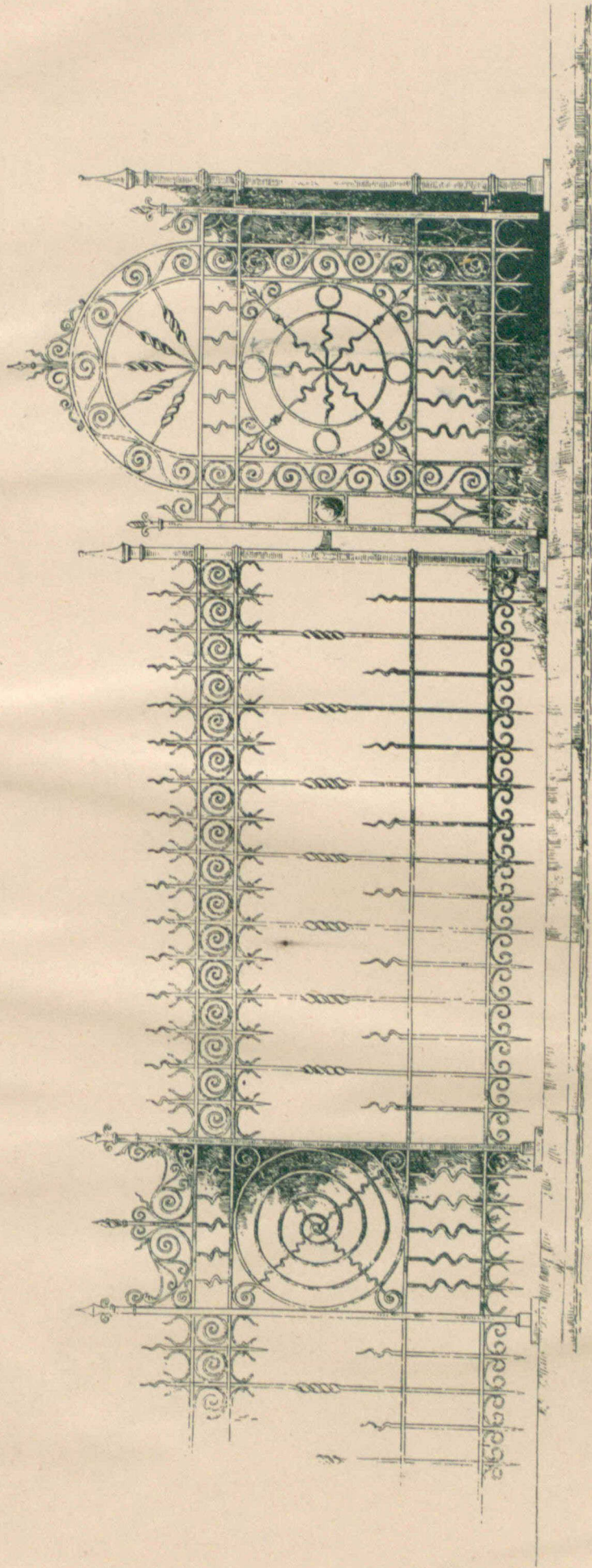
The building situated on the left hand side of Fortification Lane is three stories high and contains in the basement, which is reached by a side entrance, the class in lithography, with an attendance of 18 pupils, having at their head Mr. J. A. P. Labelle as professor. The instruction commences with the preparation of the lithographic stone for work, and proceeds by regular steps till the pupil is able to finish a drawing on the stone, ready for the press. Instruction is given in engraving on stone, crayon and pen and ink work. The stone and other materials required in the class room are provided free of cost to the pupil. This class meets every Monday and Friday between 7.30 and 9.30 p.m.

The ground floor is occupied by the administrative offices of the school, and the first floor by some government offices. The second floor is occupied by the architectural class and also by the pattern making class. The class of architectural drawing possess a fine room measuring about 15 x 50 feet, well equipped with drawing tables and other requisites, and has actually 23



DESIGN FOR INSURANCE OFFICE
GALT, ONT.
JAFFES - ARCHT. TORONTO - J.C.T.

F. P. M. L. E.
DEL. '94



WROUGHT IRON FENCE AND GATES TO RESIDENCE OF MR. A. A. ALLAN, TORONTO.

GORDON & HELLIWELL, ARCHITECTS, TORONTO.

pupils, following their courses under the guidance of Messrs. Henry J. Peters and P. N. Picard, both architects actually engaged in the practice of their profession. In this class, although mostly intended for carpenters, builders, cabinet makers, etc., the instruction is, however, adapted as far as possible to the requirements of the pupils. Exercises are given in geometry and projection, and pupils are instructed in the details of framing, plans and elevations of buildings, and the preparation of working drawings. Several architectural students I have noticed are following this course. This class meets on Mondays and Fridays from 7.30 to 9.30 p.m.

Next to this class is the pattern making class for boot and shoe makers, which probably does not interest us very much. This class also meets every Monday and Friday, with Mr. Jos. Godin as professor. It is established for the purpose of giving practical instruction for the study and practice of artistic pattern cutting for boots and shoes of all kinds.

In the building situated at the right hand side of Fortification Lane, which is about of the same style as the one first mentioned, is on the ground floor the modelling and wood carving class, two very important factors in architectural decoration. The room occupied by this class, although small in size and of very plain appearance, has an artistic look about it with its plaster models of Renaissance compositions hung on the wall, and statues and busts of historical personages reposing on pedestals. This class is intended to give instruction to all who use the chisel, but more particularly to marble and stone cutters, wood carvers, etc. The pipe clay which is used in modelling can be softened as often as required, thus enabling the pupil to work with ease and rapidity, obtain quick results, and become familiar with form; he first gives to the mass of clay the rough outline of the object he desires to reproduce, and then finishes it by the aid of the tools. The clay required is provided free of charge. Pupils who join this class have to be well up in freehand drawing, but in the case of stone cutters this condition is not rigidly exacted. I believe that this is the class that could do the most towards developing the artistic taste of the students, especially the students of architecture, affording as it does the opportunity to study with advantage the human figure, which is so essential a part of the education of every artist. This class, notwithstanding its importance, possesses only 18 students, five of whom are devoting themselves to wood carving. It is open every Tuesday and Friday from 7.30 to 9.30 p.m. under the supervision of Mr. J. O. Gratton, sculptor.

Now pass on to the Stair Building and Building Construction Class, a department of interest to builders and architectural students who wish to gain knowledge of a practical character. The class is composed of 26 pupils, headed by Prof. L. H. Blouin, who teaches them all matters connected with construction of buildings, and who gets them to make plans for stairs and other work, and execute the same in the class rooms adjoining the Modelling Class. Special attention is given to the important branch of stair building. Tools and materials are provided by the school free of charge.

On the first floor of this building, over the Modelling and Stair Building Classes, is the Freehand Drawing Class—one of the most important at the school—both as regards the work it accomplishes and the number of students who attend its courses. This department is under the charge of Professor E. Dyonnet, A.R.C.A., and is divided into two classes—the elementary and the advanced class. The elementary class is for those who have but a vague idea of drawing, and is intended as preparatory to the advanced class. The pupils begin by drawing differently shaped geometrical blocks, commencing with the most simple, and progressing to more complicated shapes. This method of drawing from solids from the very first has been generally adopted in all the best drawing schools of Europe. It shows the pupil in a more intelligible way than any other method, the first difficulties of outline, perspective, light and shade and tone, and as the pupil's intelligence is appealed to, there is comparatively little difficulty in showing him how these difficulties are to be overcome. After one season spent in the elementary class, the pupil who has made sufficient progress is promoted to the advanced class. He soon finds out that the principles he has learned in the first year are continually applied in the second. His eye and hand now gain sufficient accuracy and precision to enable him to draw parts of the figure from plaster casts. The simplest pieces are given at first, but as difficulties are overcome, more complicated ones are tried, until the full length antique figure is reached, after which he will soon be prepared to draw directly from the living model. This department is composed of about 30 pupils, who meet on Monday and Thursday for the Elementary Class, and Tuesday and Friday for the Advanced Class.

On Tuesday and Thursday pupils composing the Mechanical Drawing Class have their courses in the rooms occupied on Mondays and Fridays by the Architectural Drawing Class. The class is conducted by Messrs. J. T. Gardham and J. Clement. It is chiefly intended for those who follow mechanical pursuits, and to apprentices and others connected with machine building it proves to be of great value. It is aimed to make the instruction of a thoroughly practical character. Blue prints and figured sketches of familiar details of machine design are supplied, from which the pupils are required to make general drawings, etc., and to follow as far as possible the usual office practice.

This completes the number of classes contained in the two buildings forming the angles of St. Gabriel Street and Fortification Lane. On the other side of St. Gabriel Street, opposite the school, and adjoining the Champs de Mars, is old St. Gabriel Church, an historical relic of the last century. It was built in 1792, and is the first Protestant church built in Montreal. It is now the property of the Provincial Government, and is occupied to-day by the Plumbing Class of this school. It has been used during the past few years by the Decorative Painting Class, which was abandoned this year.

There are two professors—Messrs. W. Britton and J. A. Peard. The class is under the immediate charge of a Committee of the Master Plumbers' Association recently formed, and which I hear will apply at the next session of the Legislature for an act of incorporation. The class has an actual attendance of about 45 pupils, and meets every Monday and Friday from 7.30 to 9.30 p.m. The class has been arranged for apprentices, journeymen and foremen engaged in any branch of plumbing. The class room is equipped for about fifty pupils, each member having a gas furnace for melting solder and a drawer for holding tools. Instruction is given on such subjects as lead bossing, pipe bending, soldering and wiping joints, lead burning, water closets and their fittings, water waste preventors, baths, lavatories and sinks, taps, soil pipes, connection of drain to sewer, ventilation of soil pipes and drains, sizes of pipes, etc.; water supply, house cisterns, their construction, position and management; the use of tools, etc., etc. All materials are supplied free of charge.

It is in old St. Gabriel church that every year is held an exhibition of the most creditable examples of the work accomplished by the pupils of the different classes of the school during the session. As the pupils are at present just commencing the session, it is difficult to judge of their merit by their work, as they have hardly had time to do any yet, but I propose at the next annual exhibition of the school, which in all probability will be held as usual in April, to give a description of the principal works executed by the pupils during the present session.

BUILDING ACCIDENT.

The roof of a six storey building in course of erection at the corner of Craig Street and Place d'Armes Hill, for the Montreal Street Railway Company, fell in a few days ago. All but three of the twenty-one workmen employed on the roof at the time received sufficient warning of the approaching accident to enable them to safely reach the walls before the crash came. The others were carried down with the roof. Two of them are reported to have died from their injuries. Messrs. J. W. & E. C. Hopkins are the architects of the building. Ald. Dubuc is the contractor for the stone work, Ald. Brunet for the brickwork, Ald. Robert for the woodwork, and the Dominion Bridge Co. for the structural iron. All sorts of causes are being assigned for the accident, but I prefer not to mention any of them prior to the investigation, which I understand will shortly be held.

RECENT CANADIAN PATENTS.

Patent No. 47,069, has been granted to Jules Colas, Montreal, for a draining well.

Louis Rosenfield, New York, has been given a patent No. 47,064, for a hoisting apparatus.

A patent No. 47,044, for a door knob, has been granted to Albert E. White, Dutton, Ont.

Messrs. Darling Bros., Montreal, have been granted a patent, No. 46,961, for a combined bracket and shelf.

A patent No. 47,070 for an elevator brake, has been secured by Ernst C. Heydenreich, Mount Clemens, Mich.

John Heard, Strathroy, Ont., has been given a patent on moulds for forming concrete into pipes for drains, &c.

Patent No. 46,969 has been granted to Geo. Belanger and others of Quebec, for a cement formed of quartz and other substances.

Samuel John Laughlin and James Hough, of Guelph, Ont., have received a patent No. 47,003, for a sketching and designing table.

A patent on apparatus for repairing asphalt pavements, was granted on Sept. 20th, to the Western Paving and Supply Co., Chicago.

Jas. Peckover, Harrisburg, and John E. Johnson, Philadelphia, Pa., have obtained a patent dated 24th Sept., 1894, on a stone sawing machine.

Theophile E. Ayotte and Arthur A. Charbonneau, Montreal, were given a patent, Sept. 26th, on a process for making brick and artificial stone.

Hugh C. Baird and Oliver Baird, of Parkhill, Ont., assignees of James and Eli Elliott, of Wingham, Ont., have obtained a patent No. 47,054, on a brick and tile machine.

Charles H. Dalrymple, Detroit, Mich., and Chas. E. Hassey, Hamilton, Ont., have been granted a patent, No. 47,031, on a roofing composition, consisting of sheets of wood fibre, rendered impervious to moisture, and having abutting up-turned edges, the battens provided with a groove in their outer edge which receives the up-turned edges of these sheets to close the joints.

PUBLICATIONS.

The Review of Reviews for November, has some pertinent notes on European politics and editorial tributes to the memory of Dr. Oliver Wendell Holmes and Professor David Swing, of Chicago.

"The Art Schools of America," "The Great British Northwest Territory," "The Chiefs of the American Press," and the "Public Library Movement," are amongst the Cosmopolitan's table of contents for November.

A correspondent of the Illustrated Carpenter and Builder expresses the opinion that the best form of roof for a cottage, if expense is not a consideration, is to cover the rafters with $\frac{3}{4}$ in. dry boarding, and over this nail a layer of inodorous felt; then comes a row of vertical battens fixed to top of rafters, then the ordinary slate battens. The old slates may be reused, if sound and fit for reuse, and, in fact, may be preferable to new ones in some cases.

CORRESPONDENCE.

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

ARCHITECTURAL COMPETITIONS.

Editor CANADIAN ARCHITECT AND BUILDER.

SIR,—Apropos of your remarks on Competitions last month, the question has often been asked "Whether better results attend the giving of a commission to one architect or a Competition in which a large number of the profession are invited to send in designs." The answer is altogether conditional. Competition properly conducted for public buildings will probably call forth the more thoughtful and skilful design. Much depends, however, on the terms of invitation and the discretion of the committee of selection and their assessors.

The competitive system is becoming discredited amongst architects of known experience and ability in Canada, because of the unbusinesslike way in which competitions are conducted and the flagrant injustice of the awards—a condition which obtained in England at no very distant date, until the architects combined in their endeavor to obtain fairness and justice. There were many years of isolated outbursts of indignant remonstrance from disappointed competitors against committees and boards for unfair decisions before the obvious remedy was seen, or at any rate applied. The conduct of Competitions will be what those who enter into them are collectively content to allow them to be, and it is evident that only by combining together in one solid phalanx against the loose system at present in vogue, can the standard be raised. If promoters of Competitions were made to see that professional men of ability would not respond unless an assessor of unquestioned standing were appointed, whose advice on the merits of the design would be accepted, and certain broad rules for the conduct of Competitions be adopted, a healthier system would soon be established.

I am aware that the Ontario Association of Architects have formulated some excellent rules which, with little amendment, would serve the purpose suggested, but they remain practically a dead letter, because their authors do not insist on their adoption, and it is left to anybody or nobody to take the initiative of enforcing them. The conditions for the conduct of a Competition should be framed with the single purpose of obtaining a perfectly fair competition, and having been issued, should be rigidly enforced. They should very definitely state the amount to be expended, and that all designs which cannot be carried out for that amount will be disqualified, that the chosen design will not be accepted unless bona-fide tenders can be obtained within 5% in excess of the figure stated. There should be no irksome restrictions in the conditions or arbitrary dictation of plan. I remember hearing Mr. Waterhouse, R. A., at the R. I. B. A., say: "I would have every competitor put as nearly as possible in the position of an architect acting for a private client, who, though he may have suggested his requirements, would probably listen to his professional adviser, if he gave good reasons for not literally adhering to them in all cases." If Competition designing is to be made successful, it must be spontaneous and free. Instructions which are ambiguous and which a competitor feels he cannot alter or modify without being disqualified, are prejudicial to the end in view of Competition, that of obtaining the most skilful design at a given cost. In conclusion let me say, that as far as Toronto is concerned, nothing can be accomplished until the architects act more in concert with each other. To this end they should meet together oftener and probably carry out the scheme of a common meeting and reading room as outlined by "A City Member" in the October issue of the CANADIAN ARCHITECT AND BUILDER.

Yours truly,
J. WILSON SIDDALL.

ONTARIO ASSOCIATION OF ARCHITECTS.

AT the supplemental examinations held in October the following students came up and passed:—

S. F. Smith, 2nd Intermediate; C. P. Band and G. E. Stephenson, 1st Intermediate.

E. Langley, who had intended to come up for the 1st Intermediate in March, but was prevented by illness, was allowed to take at the supplemental examination a full examination on the 1st Intermediate subjects, and passed.

Mr. C. H. C. Wright, Lecturer in Architecture at the School of Practical Science, will give a lecture on Graphic Statics to the Association on the evening of November 16th. The lecture will be given at the Canadian Institute, 58 Richmond street east, and will begin at 8 o'clock. This lecture, being on a technical subject, has not been announced as a public lecture, but we are authorized to state that any person interested in the subject will be welcome.

Judging by the new lines of furniture displayed by the leading dealers and manufacturers, a reaction is setting in towards natural finish in oak. Very little antique oak is shown, and the peculiar and fanciful colorings so popular a year ago, are nowhere to be seen. If the wood is toned at all, the tendency is toward shades of yellow or to a slightly reddish cast.

ILLUSTRATIONS.

THE TOWER OF PALAZZO VECCHIO, FLORENCE, ITALY.—
DRAWN BY MR. E. J. BIRD.

This tower, so admirable for its solid construction, united to graceful proportions, is ninety-four metres high.

The Palazzo itself was raised by the genius of the architect, Arnolfo di Cambio, in 1298, A.D., and has been enlarged at different times by Michelozzi (1434) and Varsari (1550). This palace was the seat of the Signoria of Florence, then the principal offices of the Granducal Government, and at present belongs to the municipality, the offices of which are here.

WROUGHT IRON FENCE AND GATES TO RESIDENCE OF MR. A. A. ALLAN, TORONTO—GORDON & HELLIWELL, ARCHITECTS—
EXECUTED BY SHIPWAY MFG. CO., TORONTO.

HOUSE FOR MR. DUBUC, MONTREAL—A. RAZA, ARCHITECT,
MONTREAL.

DESIGN FOR INSURANCE BUILDING, GALT, ONT.—J. A. ELLIS, ARCHITECT, TORONTO JUNCTION.

OLD MEN'S REFUGE, VANCOUVER, B. C.—R. MACKAY FRIPP,
F.R.I.B.A., ARCHITECT, VANCOUVER.

IMPACT TESTS OF CAST-IRON PIPES UNDER
HYDROSTATIC PRESSURE.

REFERRING to a frequent specification requirement for striking a cast-iron pipe with a hammer while it is subjected to heavy water pressure, S. Groves writes in a recent number of The Foundry that he conducted some experiments to determine the effect of those tests when in 1889 he was engaged with a large English pipe foundry.

"Two socket and spigot pipes 4 inches in diameter by 9 feet long by three-eighths inch thick—one cast vertically, the other cast at an angle—were subjected in the hydraulic proving press to a hydrostatic pressure of 260 pounds per square inch, and while under this condition a wrought-iron ball weighing 1 1/2 lbs. was let fall upon a chalk line mark on the body of the pipe, at given points and from varying heights, as indicated by Figs. 1 and 2. The pipes are then taken out of the press and broken longitudinally into two parts. On the inside of each pipe, at the points where the ball had struck dead upon the center line, was a star-shaped fracture, Fig. 4. The fractured half of each pipe was then broken into two parts, and each piece upon which a blow had been struck was carefully broken through the star-shaped fracture. In each section was an oxydized fracture penetrating through the inside skin of the pipe into the body metal,

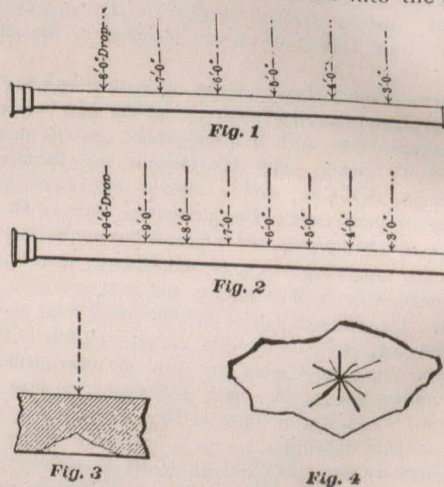


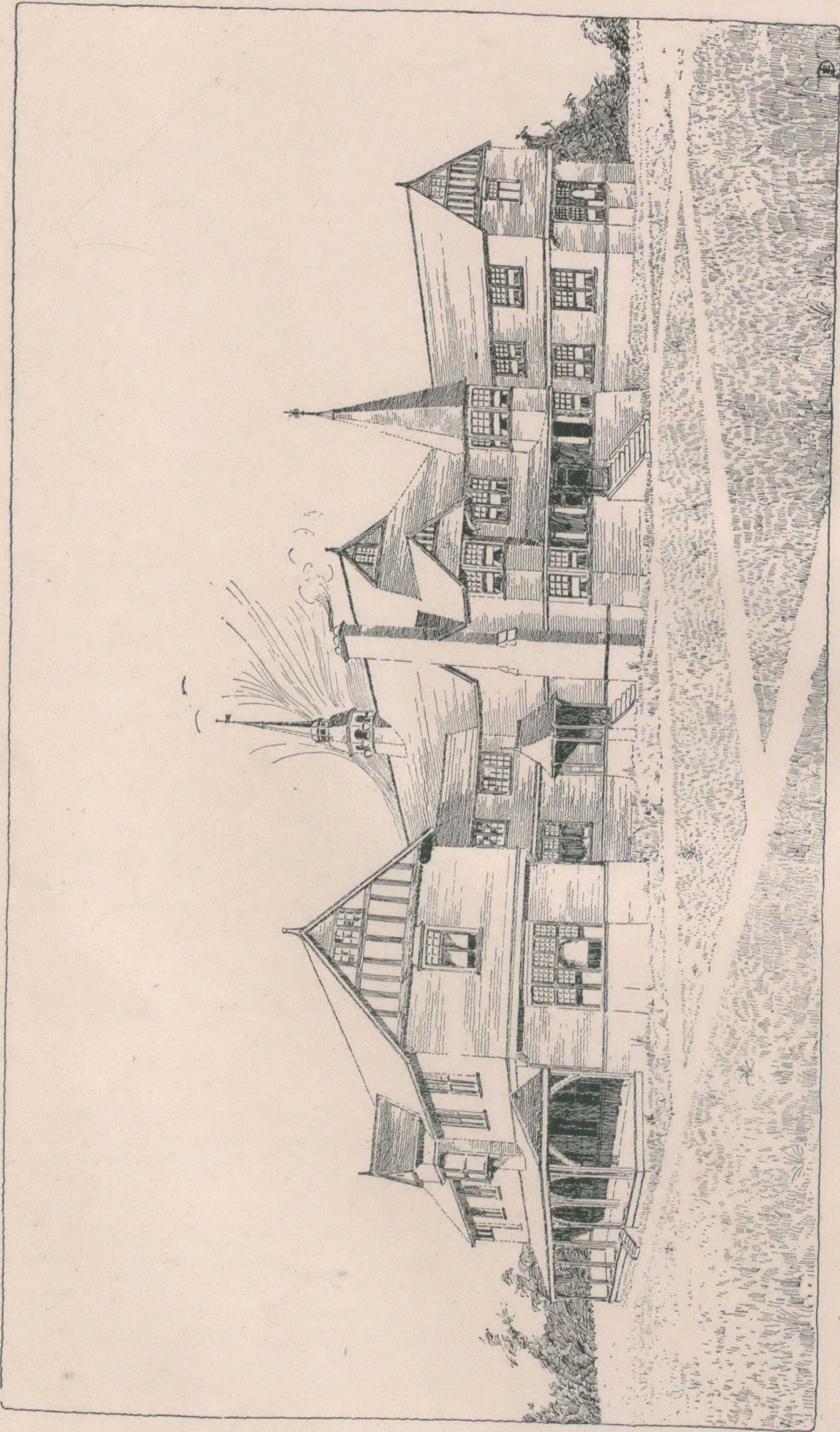
Fig. 3, and in no case was the depth less than three thirty-seconds inch, the greatest being five thirty-seconds inch.

The following is a table showing the depth of the respective fractures:

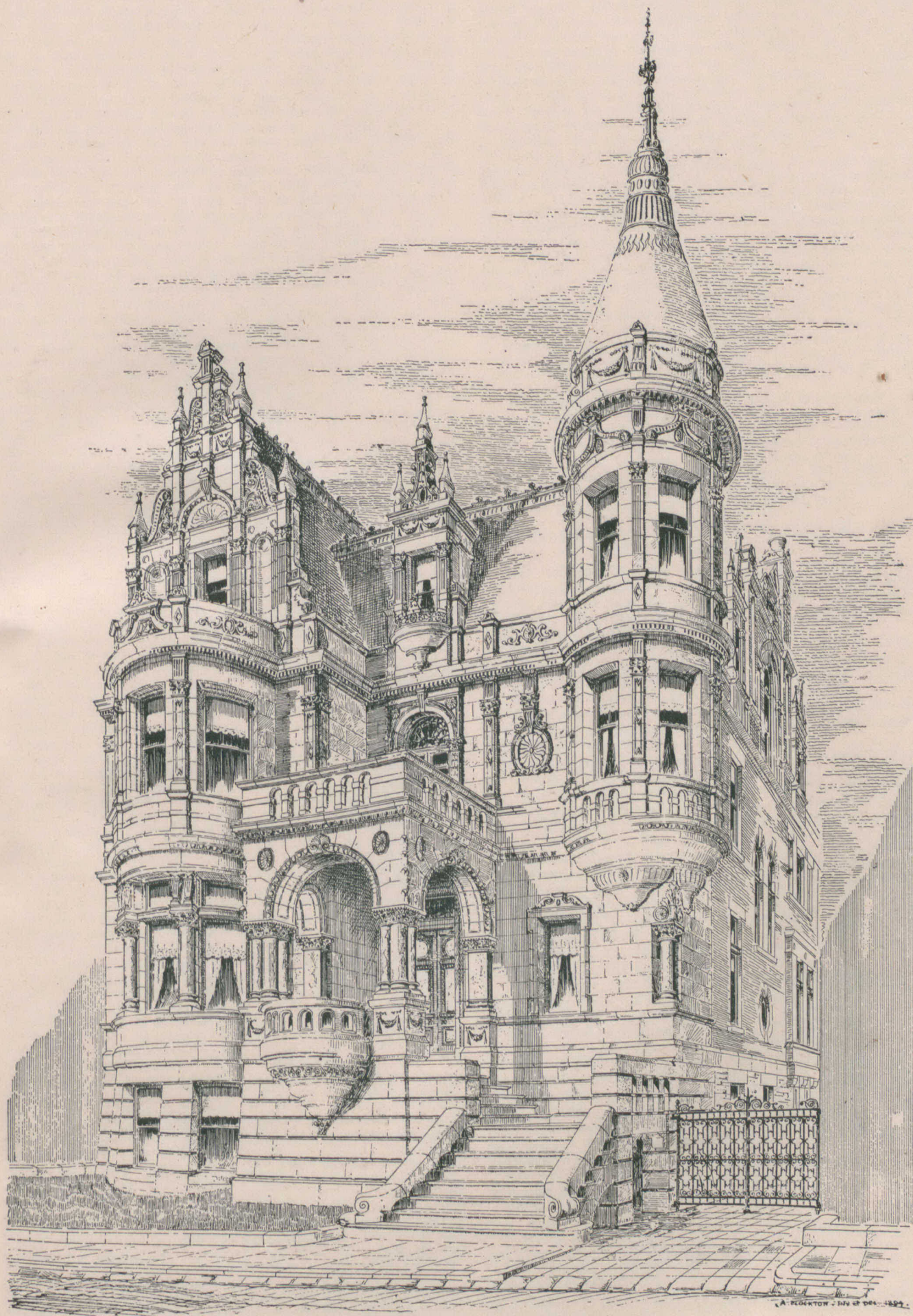
PIPE CAST VERTICALLY.	
Drop.	Depth of Fracture.
3 feet.	Slight.
4 "	3-32 inch.
5 "	Slight.
6 "	Slight.
7 "	1/8 inch.
8 "	5-32 inch.
PIPE CAST AT AN ANGLE.	
Drop.	Depth of Fracture.
3 feet.	Slight.
4 "	Slight.
5 "	1/8 inch.
6 "	Slight.
8 "	5-32 inch.
9 "	3-32 inch.
9 "	Slight.
9 "	6 inches. 3-32 inch.

The cases marked 'slight,' were due to the deflection of the ball, in consequence of not falling dead upon the centre line. In every instance where the ball struck true a serious fracture resulted.

Instead, therefore, of the hammer-sounding test being a safeguard, it is actually a danger; worse than a variation in body thickness of one-sixteenth of an inch, for which many a pipe has been sent to the scrap heap.



OLD MEN'S REFUGE, VANCOUVER, B. C.
R. MACKAY FRIPP, F. R. I. B. A., ARCHITECT, VANCOUVER.



HOUSE FOR MR. DUBUC, MONTREAL.

A. RAZA, ARCHITECT, MONTREAL.

STUDENTS' DEPARTMENT.

DISCOVERIES IN ARCHITECTURE.*

DISCOVERIES of things absolutely and always unknown are always rare; and in some branches of study—architecture among others—are in the nature of things impossible. But in the sense of finding out or uncovering something previously unknown to the discoverer discovery occurs frequently, and it is by far the most healthy, the most interesting, and the most successful form of study. I propose then, in this lecture, to begin with the simple, but most valuable, discoveries which you as students must make for yourselves if you are really to master the art of Architecture; and then to proceed to notice some of the discoveries which have taken place in recent years which are more brilliant in their character and relate to architectural matters that have long lain hid. I propose to distinguish these, and call them respectively personal and public discoveries; for there is this distinction certainly between them, that the discoveries which a student makes are mostly of importance to him personally, but are not such as need be made public. Those which an explorer may make are perhaps quite as important to the general public as to the discoverer, and are usually published to the world.

The information you obtain in the offices where you work, or from attending classes like those about to begin in this college, is hardly discovery; it is instruction, and the worst of it is that, as it is not difficult to get, it is very apt not to stick in the memory. The information discovered by making researches on your own account is mostly obtained with difficulty and trouble, but it is seldom, if ever, forgotten. You may make discoveries in a library. For example, let us say that you are advised to read a handbook, say "Fergusson's History," and you do so, finding it perhaps a rather laborious task, as the reading of any condensed book always must be. You notice, however, that the numerous wood cuts all have reference to the names of writers from whose publications they are copied, and having access to books, say to the Institute library, or that at South Kensington, or some other collection of books, you begin to consult some of the original authorities, and among them you discover some book of which the illustrations or the letter-press, or both, bear on what you have been reading about, and are full and clear and interesting. The book you have discovered only occupies a corner of the vast field that Fergusson travels over; but then the writer really has the leisure to take possession of that corner, and to throw a clear light upon it. The mere fact that you have to some extent unearthed the book for yourself helps to give a zest to the reading of it, or the examination of its illustrations. It is a discovery. Nor is it in a public library only that such discoveries can be made. In any collection of books or photographs or prints to which you have access, and on the shelves of second-hand booksellers and the tables of book-stalls, you can have the same good fortune. I, for example, myself possess not a few valuable books on subjects connected with architecture which first came to my knowledge through finding them on book stalls. This reference to discovering books ought not to be made without alluding to the help to be got from one very valuable book of reference, which just now possesses a melancholy interest for some of us. I allude to the "Dictionary of Architecture," of the Architectural Publication Society, a work bristling with sign-posts—if I may use such a phrase—calculated to direct the student (in his search for knowledge) to the best sources of information. In almost all the articles the most copious lists of references occur, and it is of the greatest use to a real student to have sources of information so liberally spread before his view. This work (begun by a circle of architects, some of whom only have survived to see its completion) would have been left unfinished but for the indomitable energy and public spirit of Mr. Cates, and the learning and patience of the late Mr. Wyatt Papworth, and it is impossible just now to mention the "Dictionary" without alluding briefly to the great loss which architecture has within the last few weeks sustained in the recent death of the last-named architect (Mr. Papworth). He was full of accurate and well-digested information on every subject connected with our profession. He was an indefatigable, systematic and accurate worker, singularly quiet and simple in his manner and bearing, and was universally esteemed. In many ways his vast store of technical information has been made useful to the members of his profession. To you, gentlemen, his work, as editing Gwilt's "Dictionary," the value of which he practically doubled by the additions he made to it, is pretty sure to be familiar; but there are many others, and many important memorials of him in the literature of our profession, and his death leaves a blank which it will not be easy to fill up. To return, however, to students' discoveries—of which, by the bye, the late Mr. Papworth made many and valuable ones—architecture can be better learned from buildings than from books, and it is in visits to buildings, ancient and modern, that you will make the discoveries that will be of most use to you. The most simple building, if it is good, has some secrets, if you can but make them out. Why is it pleasing? Why are there certain irregularities? How is it constructed? What has been its history as a structure? These, and such-like questions, should present themselves to the mind, and if we can but discover the answer to one such question, the visit to the building in respect of which it is asked will have been fruitful. Among the most interesting features of ancient buildings are the traces of their history which they bear indicating the successive enlargements, alterations, rebuildings and so forth, which they have undergone, and the discoveries of this sort which a keen student, examining an old manor house or a church, a cathedral or a castle, may make for himself, are extremely interesting and extremely instructive. One of the most complete accounts of such a series of discoveries, illustrating the past history of a great building by its actual visible marks, exists in the account of Canterbury Cathedral, from the pen of the late Prof. Willis. No man during the present time of careful research has been more keen or more successful in his examination of ancient buildings than he, and this record is a good example of the manner in which it is possible to make them tell the story of their varied changes, alterations, rebuildings and extensions. Even without a tenth part of the minuteness and elaboration of Willis's investigation, if you simply establish the broad divisions of Saxon, Norman, Early English and so forth, in a building with

a chequered history, and recognize the most obvious features of each period, you will have discovered the leading facts in the history of the building. In this sort of research it is peculiarly true that "to him that hath shall be given." To a person even of artistic taste and power of observation, entirely devoid of architectural knowledge, a building is almost a sealed book; but when you have got even a little knowledge from other sources a building begins to be legible. As an example, I would suggest to any student who has read something of the changes in tracery, in vaulting, and in mouldings which occur in English architecture, that when he has obtained some knowledge of these things from books he should go to Westminster Abbey cloister, getting first from Scott's book the dates at which it was done, and identify the different features of each period, and the changes both in feature and general proportions. He will find that he has discovered a good deal of what is really meant by the terms Early English, Decorated and Perpendicular. It is possible to make discoveries on drawings of buildings as well as on the buildings themselves. An example of what I mean: If you take the drawings of one of Sir Christopher Wren's churches, and examine them carefully, you may perhaps discover some of the principles upon which he designed them. He was a very orderly and mathematical worker. He had strongly impressed upon his mind the conviction that the establishment of geometrical relations between the main dimensions of his building was a means of securing that their proportions should be pleasing, and if, with this clue in your mind, and a pair of dividers in your hand, you examine a series of engravings giving the plans, sections, and elevations of his churches, and St. Paul's Cathedral, you will, I think, find it possible, and extremely instructive, to discover some of his methods of working. The plan and sections of St. Stephen's Church, Walbrook, generally recognized as the best among Wren's many successful interiors, will be very good to begin with. A famous place to investigate is a good museum. I doubt whether any one of you has seen, let alone studied in, all the museums of London which furnish information about architecture, though I hope most of you have studied, or will study in some.

That an architect should overhaul the church in any village or town where he may be, if it be of good design or possessed of features of interest, is, I hope, so much a matter of course, that I do not stop to point out how much can be discovered and appropriated in journeys and country rambles; but I am disposed to dwell upon the modern work which awaits the traveller in various parts of England. The country is now thickly sprinkled with fine mansions and smaller country houses, nearly all of them good, and many of them extraordinarily good.

"CANADIAN ARCHITECT AND BUILDER" STUDENTS' COMPETITION.

THE publisher of the CANADIAN ARCHITECT AND BUILDER invites designs from students for a Muskoka Summer Cottage to cost not more than \$1,000. The accommodation required is a generous living room, with pantry and kitchen; five bed rooms, and provision for fuel.

The cottage is to be erected on a wooded island or point, the principal view being southward. The actual site is rocky and broken, with no extent of level surface, the space to be occupied by the cottage varying in level some 8 or 10 feet.

Competitors are required to submit floor plans and two elevations, unless accompanied by a perspective, in which case one elevation will be sufficient.

Each design (including elevations, plans, etc.) must be made on a single sheet of heavy white drawing paper or bristol board, 14 x 20 inches in size, and must be drawn sufficiently coarse to have the proper appearance when reduced by the photo-engraver to one half the above size. The drawing must be made in FIRM, STRONG LINES, with PEN and BLACK ink. No color or brush work will be allowed. Each drawing must be marked only with the *nom de plume* of its author. The author's full name and address, enclosed in sealed envelope, with *nom de plume* on the outside, must accompany each drawing submitted. This envelope will not be opened till after the competition shall have been decided. There is also required a brief description of the design, mentioning the materials proposed to be employed in the construction of the building.

Drawings for this competition must reach the office of the CANADIAN ARCHITECT AND BUILDER, Confederation Life Building, Toronto, not later than the 20th of December, 1894.

The first premium is the sum of \$10; the second, \$5; the third, one year's subscription to the CANADIAN ARCHITECT AND BUILDER. The decision as to the merits of the designs submitted will be made by three members of the Ontario Association of Architects. This decision will be final. The publisher of the ARCHITECT AND BUILDER reserves the right to publish such of the designs submitted as may be deemed suitable, and to withhold the award should none of the designs be found to satisfactorily meet the requirements.

All drawings will be returned to their authors within a reasonable time after the competition is decided.

Architects are debarred from this competition.

WHEN the national pike bridge, west of Richmond, Ind., was in process of construction, says the Indianapolis Sentinel, the workmen at the west side of White Water river dug down to find a solid foundation. They struck a great and seemingly bottomless bed of quicksand. Vainly they labored to find a safe resting-place for the foundation. Finally the civil engineer and the contractor struck on a novel expedient to overcome the difficulty. They sent men all through the country to buy wool. This wool they packed into the quicksand till the sand would take no more. At last, on this woolly foundation, the rocks were laid and to-day the western abutment of the old national bridge rests on a bed of compressed wool.

*Abstracts from an inaugural lecture delivered at University College, London, on Thursday evening, October 11, 1894, by Prof. T. Roger Smith, F.R.I.B.A.



THE EXTERNAL COLOUR-DECORATION OF BUILDINGS.*

BY T. G. CESARE FORMILLI.

AMONGST the many considerations suggested by the works of the old masters in Art, there is one concerning the external decoration of houses which leads to the enquiries: Why is it that to-day, when the words "old masters" are on the lips of all, when we consult and study them, that we do not take examples from the various methods that they had of externally decorating their edifices with such beautiful effect? and why do we not also unite coloring with architecture? Colour does not disturb form in any way; in fact, when colour is well-conceived, it greatly helps to bring out the full beauty of form. The Assyrian Art, the Egyptian, Greek, Roman, Arabian, Gothic, and finally, the Art of the fifteenth century, entered into the decoration of innumerable edifices of great importance, some with monochrome colours and some in polychrome; whilst we, with few exceptions, when we want to do something above the ordinary level, generally resort simply to the usual terra-cotta or stone of uniform colour and to very little else.

We must, however, here note that, in spite of the general similarity of the external decoration of the present age, we see in them from time to time a tendency to more closely study the old masters, and we notice a certain revival of old ideas of great artistic value relating to external decorations in colour.

There is much that could be said about the art of uniting colour with architecture in the Greek and Roman periods, but the time is too limited on this occasion to attempt to cover so extensive a field. I will, therefore, limit myself to a few remarks about the methods adopted by the fifteenth-century artists for adding beauty and variety to their edifices. I ought also to say that amongst the many and varied styles of external decoration of the different artistic periods in different countries, that used by the fifteenth-century masters, which lends itself so particularly to our requirements, greatly surpassed every other style of decoration which had, up to that period, been used. What have we, it may be asked, more beautiful in external decoration than the immortal majolica of the Della Robbia, and the graffitos, *chiaroscuro* and frescoes of Polidoro da Caravaggio, Pellegrino da Bologna, Maturino, Fiorentino, Guillo Romano, and Raffaele? These artists, who possessed such refined taste, covered many and many external walls of houses and palaces, which, for the proportion of the windows, the elegance of the columns, and that of the cornices, have excited immense admiration, and yet those beautiful and various decorations, framed, as it may be said, by the surrounding elements of architecture, have hardly been considered worthy of study, except in very rare cases.

Rome, Florence, Venice, and many other principal and secondary cities of Italy can give innumerable examples of the beautiful art of external decoration, which, in virtue of the material used and the mode in which the work was done, have endured through many centuries, as well as the architectural stonework which encloses them.

However, we must note that in these golden times the term "decorator" conveyed something more elevated and noble than it is frequently understood to mean to-day. In fact, in the past, a Michelangelo, a Raffaele, a Cellini, were embraced in the title of decorator. Whereas in these days it is rarely that we see a work of industrial art executed by an artist of high reputation; there seems to be a prejudice against such work. Why then, do we not entirely abolish this prejudice? Why do not artists who have great names, and those who have not, return to those good and wise traditions of the old times? What variety, what elegance of effect might be added to the many houses that are now being constructed with so much good architectural taste if there were introduced in some or all of the blank spaces decorations of majolica, graffito, *chiaroscuro* or fresco as in the fifteenth century.

Let us, however, now pass on to the principal methods of external decoration most used in that period, beginning with that of majolica.

Besides being extremely beautiful, the majolica decoration has the advantage of preserving the walls by preventing the penetration of moisture into the interior, and thereby protecting in the same way both the owner's property and the occupier's health. As is generally known, external decoration in majolica is often seen in the Southern climates, whereas, in England, if it is used at all, it is chiefly for interiors. If we ought to believe in the old Latin saying, *utile dulce*, majolica would hardly be selected for the internal decoration of dwelling-houses in cold climates, for although in a certain sense it must be considered useful, it certainly would tend to discomfort indoors under ordinary circumstances during cold weather.

Externally, however, as already said, it protects the walls from rain, fog, and from dirt; presenting at the same time to the eye a magnificent and varied effect. We may imagine the effect of the front of a house well designed by the architect for the appli-

cation of majolica, having beautiful friezes, medallions, panels, &c., in this material, and of the truly artistic creation in the sober sense in which the old masters intended. A big frieze, as made by Luca, Giovanni, or Andrea Della Robbia, with spaces between the windows, fitted with beautiful symbolical figures, representing, for example, scenes from family life, or fitted with scenes of child life, as Andrea fitted the famous medallions which decorate the space above the arches of the Hospital of the Innocents, in Florence.

What beautiful and sublime external decoration is made by the five figures of Giovanni Della Robbia, in Pistoria, namely, Faith, Hope, Charity, Prudence and Justice; also by the immortal frieze, called "The Seven Works of Mercy," of which beautiful copies can be seen at South Kensington Museum, and which are good in any case as an inspiration in that class of external decoration. Not less important or beautiful are the medallions of the arms of the King of Anjou, and the months of the year, both by Luca, and also found among the many treasures of the same Museum.

It would be too long to enumerate the many examples of decoration in majolica by the Della Robbia's family, who began with Michael, born about 1320, followed by Luca about 1399, by Andrea in 1435, and by Girolamo in 1488. Afterwards one branch of this family became almost French, and finished with Guido Della Robbia, who did not reach the age of touching the clay, but died in 1625 at the age of only five years.

Another system of external decoration not less beautiful and well adapted to resist atmospheric changes is without doubt that of graffito, which was adopted with immense technical and artistic knowledge in the renaissance of the Italian Art.

Such decoration, whether it be for its weathering powers in severe climates or for the magnificent artistic and at the same time subdued effect which it produces to the eye, certainly merits being considered as beautiful as-decoration in majolica.

On the Continent, and especially in Germany and Italy, the art of Graffito is extensively used, but here in England many must regret that graffito decoration has been almost entirely neglected. It is difficult to account for this unless it is due to the erroneous impressions that the English climate would injuriously affect the work, or that it may be too expensive for general application.

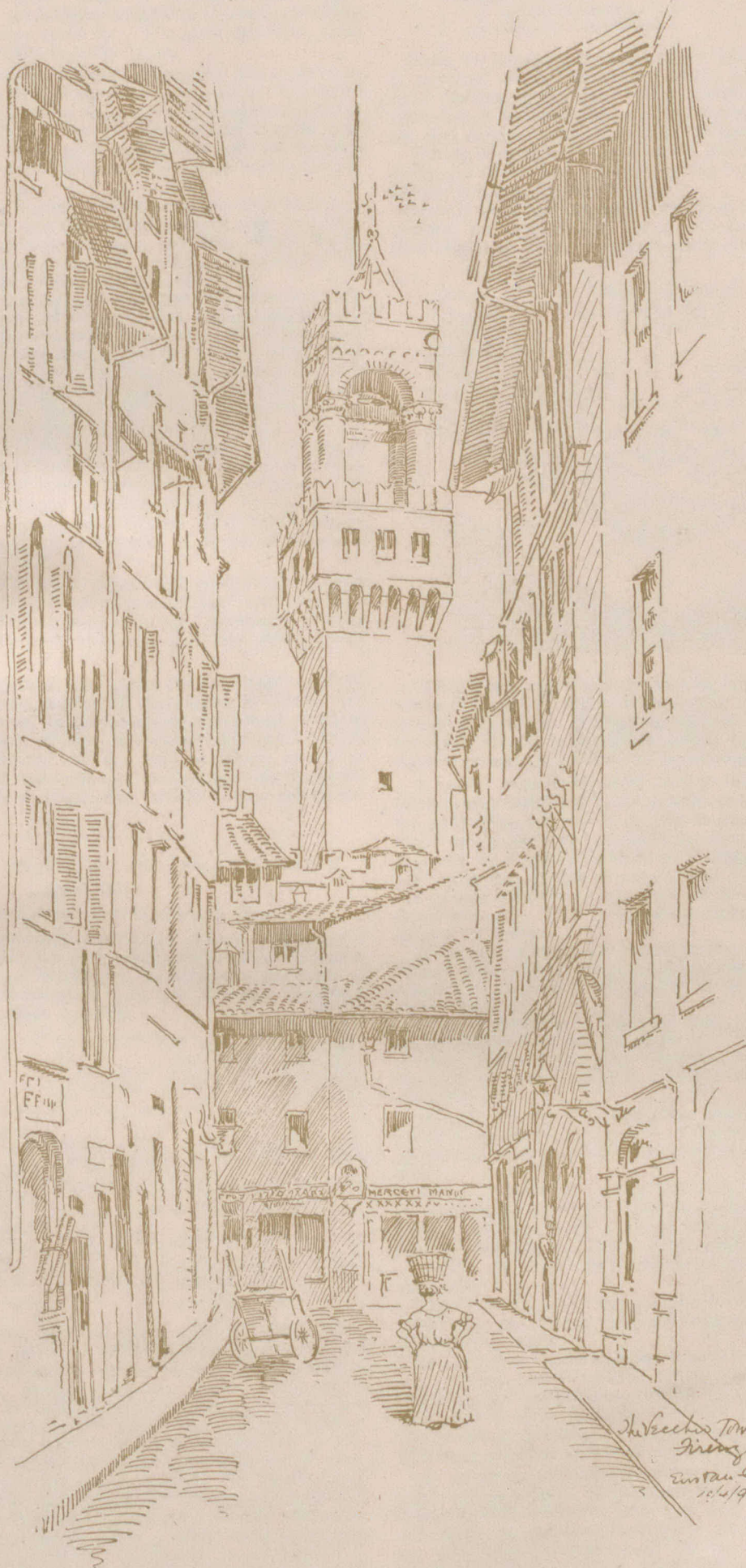
Regarding the cost, I need only say that it would compare favorably with any decoration, even if it were of the simplest description, in stone or terra-cotta.

As to the durability of graffito, it is, if properly executed, quite capable of resisting heat, frost and rain, because it presents a very hard surface, and is much less porous than ordinary stones or bricks, whilst it lends itself to being easily washed, which is an advantage in foggy and smoky atmospheres. Of the very few examples of graffito existing in London, that which is at South Kensington, although not executed according to the method of real graffito, affords nevertheless good evidence that decorations of this character do not suffer materially from long exposure to atmospheric changes. If they are a little darker in tone than when they were executed, they still are perfectly distinct, and, without doubt, of a finer tone and more harmonious than when done by the artist. Here I ought to add that the work just mentioned is cut much deeper than graffito as intended by the old masters in this art—masters to whom we feel deeply grateful for having added this treasure to their already invaluable bequests.

Vasari wrote of the graffito of his day, and gave considerable information about it. He referred to it in words which may be translated as follows:—"Artists have another sort of art, which is called graffito, and serves for ornamenting the fronts of houses and palaces, which may be quickly decorated by such a system, and more surely resists the rain. Its durability is entirely due to the etching on the wall instead of being simply drawn in *chiaroscuro* or in colours." He then describes the process of preparing and tinting the cement or plaster which is to be laid on the part of the building to be decorated, and which forms the background of the work, and explains how this is afterwards covered with a wash of lime of travertino, through which the lines are etched with an iron point. He further describes how backgrounds are obtained by the entire removal of the surface wash, and shows how strong projecting shadows for grotesque figures or designs of foliage may be produced by adding stronger shades of the same color to the background.

Referring again to the graffitos at South Kensington, they may be described as low relief in graffito rather than graffito proper, because the cut into the plaster or cement bed is excessively deep. The depth of the cut made with the iron or steel point by the artist in that particular work is a disadvantage, necessitated by plastering on the final coat instead of merely washing it on. So deep a cut gives a hard appearance to the design, and impedes the water from running off the walls, whilst tending to accumulate dirt. The true Italian graffito is without this inconvenient feature, because the depth of the cut is scarcely perceptible. The cut or score made by the instrument does not generally exceed the thickness of a sheet of drawing paper, or in other words, very little more than the thickness of the surface layer with which the bed-work is covered. Extremely beautiful effects can be produced under these conditions, perhaps more beautiful than can be obtained with a soft pencil on a rough paper. The weight of the leaning point of iron is itself sufficient

* A paper read at a meeting of the "Art-workers' Guild," London, on October 5.



to remove the light surface, and to make the dark background appear without fatigue to the hand

In some backgrounds colors in monochrome are sometimes added, and these are treated just as you treat fresco, which is very easy after experience has taught the difference between the tint in its wet and dry state. Some of the finest and richest effects are reached by the addition of gilding to some part of the graffito, as ribbons, fruits, arms, &c. The gold, however, must be added when the graffito is perfectly dry.

Naturally there is much in graffito decoration that experience teaches, but it is not very difficult to execute, and it seems to be deserving of more attention in these days of progress, in virtue of its durability as well as of the excellent effects it lends itself to producing. There seems to be a good field open for teaching graffito decoration in the art schools, which have been so largely established in this country.

There are still other modes of decorating the exterior of edifices which were adopted by the fifteenth-century artist—namely, that of chiaroscuro in fresco, and fresco in colors. The first has, at a distance, all the appearance of graffito, and, although the design is not cut, it has similar color and effect.

Much was done in this style by Maturino Fiorentino and Polidoro da Caravaggio, both of whom arrived to the highest point in this art of decoration with their immortal work of chiaroscuro in fresco in Via della Maschera d' Oro in Rome. Many other examples could also be mentioned, but as this work is the most important among the others, it will suffice as an illustration of this beautiful art. The frieze representing historical scenes is the most important decoration, and in a certain sense it recalls to mind the sequence of pictures which compose the triumph of Cesare, by Mantegna, at Hampton Court. Speaking of fresco, what is meant is the real Italian fresco, and not tempera or incausto, which is occasionally confused with it. As an external decoration it may be considered to be truly ideal, and it is to be regretted that in England it appears to be absolutely out of fashion.

Outside fresco, when it is done with good and pure earth colors, upon suitable lime mixed with much sand and puzzolana of that sort which the Romans used on the Colosseum, becomes very solid, hard, lasting and washable, just like compact and durable stone.

It is really to be regretted that to-day the exterior of buildings is so much limited in the matter of decoration to frames, columns, or, in a few words, to architectural mouldings, whereas the old masters of nearly all ages introduced into their edifices all that contributed beauty. Why, it may be asked, render so poor the mother of all Arts—the one which more directly speaks to our souls, which is so impressive, which cheers and covers us?

A STATEMENT IN FAVOR OF HOLLOW BRICK WALLS.

By E. BOYDEN, ARCHITECT, WORCESTER, MASS.

IN order to give a thorough knowledge of what is required, I quote the report made by the government officer of the Ordnance Department U. S. A., at Watertown Arsenal, of a test made of seven bricks from Providence, R. I., for the Norcross Brothers, of Worcester, Mass., Sept. 14, 1892.

Test Numbers.		Dimensions in Inches.			Sectional Area	First Crack. Lbs.	Ultimate Str.	
							Total lbs.	Lbs. Per Sq. Inch.
8698	No. 1. Long Island Brick Co.....	2.30	3.50	8.15	28.52	58,000	128,100	4,492
8699	No. 2. Danvers.....	2.00	3.72	7.94	29.54	91,800	194,700	6,591
8670	No. 3. N. E. Steam B. Co. Rough Pav.....	2.20	3.80	7.78	29.56	132,000	372,800	12,612
8701	No. 4. N. E. Steam B. Co. Smooth Pav.....	2.20	3.51	7.78	27.31	177,000	383,900	14,057
8702	No. 5. N. E. Steam B. Co. Sewer Brick.....	2.25	3.90	8.00	34.20	114,000	282,600	3,263
8703	No. 6. N. E. Steam B. Co. Light Hard.....	2.40	4.16	8.33	34.65	67,000	159,000	4,592
8704	No. 7. Nyatt Brick Co.....	2.28	3.58	7.29	28.35	98,000	209,900	7,404

I consider the above tables of great value to the building community. We are indebted to the enterprising firm of Norcross Brothers, who caused the above tests to be made, for much valuable information. By their great desire to know the strength of materials, and by the many precautions they take, they have gained an enviable reputation as being most thorough builders.

From exhaustive tests made during the building of the Allegheny County court house and tower, the tower being three hundred and twenty-five feet high, something over one hundred feet higher than Bunker Hill Monument, it was ascertained that the strength of brick built in walls or piers is very nearly one third of the crushing strength when crushed between smooth surfaces or imbedded in plaster; so that, in work where it is necessary to be near the margin of safety, it may be assumed that well-laid brickwork will carry in a wall one third the crushing strength of a single brick. In some parts of the above mentioned tower the brickwork carries twenty-four tons per square foot

We also have other authority, taken from a book published by

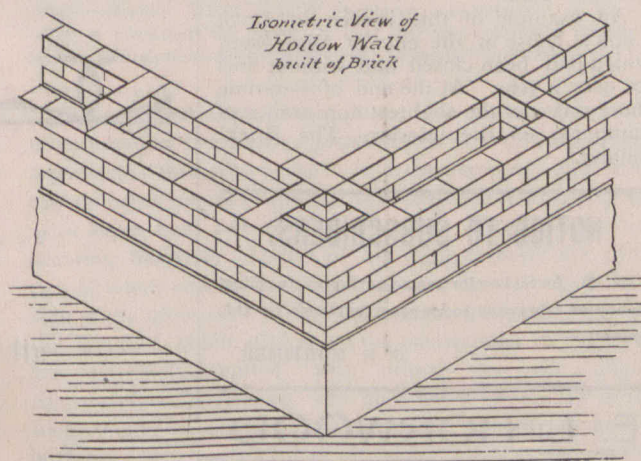
Frank E. Kidder, C. F., in 1892. On page 171 we find the following table:

	STRENGTH OF MASONRY.	
	per square inch,	
Brick (common) Eastern,		10,000
" (best pressed),	" " "	12,000
" (Trautwine),	" " "	770 to 4,600
Brickwork (ordinary),	" " "	300 to 500
" (good, in cement),	" " "	450 1,000
" (first-class, in cement),	" " "	930

Take, for instance, from the above table, "Brickwork (good, in cement)," using the lowest figures, 450 pounds per square inch. Assuming the weight of brickwork to be 112 pounds per cubic foot, it would require a brick column one foot square and 580 feet high to crush the brick at the bottom.

Taking one brick 3 3/4 by 8 inches which gives us a surface of 30 square inches, and multiplying this by 450, we have the sustaining strength, 13,500 pounds.

Now if we should lay one brick upon another to a height of 100 feet, we would have 500 brick with a weight of 2,000 pounds, thus leaving us 11,500 pounds to carry the load.



In a 16-inch hollow wall 10 feet long laid with the solid bonded wyths of brick, 30 inches from centre we have 1,080 square inches of surfaces. Multiplying this by the lowest number of the seven Rhode Island bricks tested, 4,492, we have 4,851,368 pounds, or 2,425 1/2 tons, as our sustaining strength.

A hollow wall 10 feet long and 50 feet high contains 8,500 brick, with a weight of 34,000 pounds or 17 tons. Five hundred feet of flooring and roof at 25 pounds per square foot equals 6 1/4 tons; weight snow at 15 pounds per square foot equals 3/4 ton; required by Boston ordinance for loading of floor, at 75 pounds per square foot, equals 15 tons; total, 39 tons. On deducting the 39 tons from the 2,425 1/2 tons, we have 2,386 tons of additional strength. This is certainly enough to make it secure beyond all doubt.

If, instead of using the 16-inch hollow wall, we had used a 12-inch solid wall of the same height and length, it would have required 2,570 more brick, giving us 5 1/2 tons additional weight on our foundations.

In using a hollow wall we gain many advantages, aside from the less weight and number of brick.

First. The hollow wall stands on a sixteen-inch base, while the solid wall has a twelve-inch base, making the former much the stiffer wall.

Second. We have a much dryer building, and one that is cooler in summer and warmer in winter; and frost will not appear on the inside of the wall, as is frequently seen on solid walls.

Third. The vacuum in the wall may be used to ventilate the cellar, and also to receive a pipe to conduct off the water.

This was done in the residence of the late George Crompton, of Worcester, Mass., and has never needed repairs.

Fourth. A hollow wall will stand fire much better than a solid wall.

This is shown in the Ashburnham Academy, where the entire woodwork was burned away, leaving almost the entire hollow wall standing erect.

In my practice as an architect I have built a great many buildings in which I have used the hollow wall. Some of these were very large and tall buildings, as the Congress Hall of Saratoga, N. Y., which is in part seven stories high. I have used this wall in many dwellings, schoolhouses, stables and mills, all of which are standing as firm as the day when they were built.

All the above calculations are based upon good materials and good, thorough work. When these are obtained I claim that the hollow wall is much the best, and that buildings constructed with them are the most desirable to live in. I hope that the city authorities will soon change the ordinances so that we will not be compelled to put in more material than is necessary, to the injury of the building. I would rather pay for the extra brick and then leave them out, than to put them in; for the thicker the wall the longer it will retain the dampness.

A reliable architect made a statement before a city committee that he had seen a candle blown out through a solid brick wall

twelve inches thick. In fact this was done before the Institute of Architects at Albany.

The apparatus used consisted of two tunnels placed one on each side of the wall. The connections were made thoroughly tight so that no air could escape. The candle was placed close to one, and some one blew in at the other. The candle was extinguished through twelve inches of solid brick. This experiment confirms the fact that dampness will penetrate a solid brick wall.

I have often asked the residents in houses built with the hollow wall if it is ever damp enough on the inside to cause mildew or mould, or the swelling of the woodwork. This question has invariably been answered in the negative, thus proving the superiority of the hollow over the solid wall.

An example of this is seen in J. G. Clark's house in the city of Worcester, which had been closed and without fires for over a year. At the end of that time there was not the slightest appearance of dampness on the interior.—The Brick builder.

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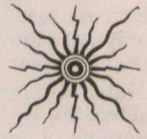
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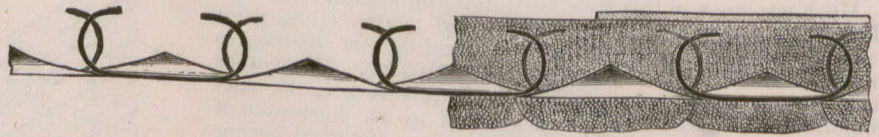
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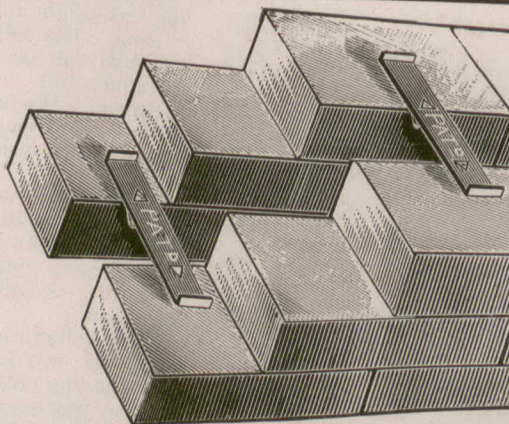
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