PAGES

MISSING

CANADIAN ARCHITECT AND BUILDER.

VOL. VII.—NO. 6. JUNE, 1894 PRICE 20 CENTS $2.00 PER YEAR.

—THE—
CANADIAN ARCHITECT AND BUILDER,
A Monthly Journal of Modern Constructive Methods,
(With a Weekly Intermediate Edition—The CANADIAN CONTRACT RECORD).
PUBLISHED ON THE THIRD THURSDAY IN EACH MONTH IN THE INTEREST OF
ARCHITECTS, CIVIL AND SANITARY ENGINEERS, PLUMBERS, DECORATORS, BUILDERS, CONTRACTORS, AND MANUFACTURERS OF AND DEALERS IN BUILDING MATERIALS AND APPLIANCES.
C. H. MORTIMER, Publisher,
Confederation Life Building, - TORONTO, CANADA.
Telephone 2362.
Branch Office: NEW YORK LIFE INSURANCE BUILDING, MONTREAL.
Bell Telephone 2299.

SUBSCRIPTIONS.
The CANADIAN ARCHITECT AND BUILDER will be mailed to any address in Canada or the United States for $2.00 per year. The price to subscribers in foreign countries, is $2.50. Subscriptions are payable in advance. The paper will be discontinued at expiration of term paid for, if so stipulated by the subscriber; but where no such understanding exists, will be continued until instructions to discontinue are received and all arrearages paid.

ADVERTISEMENTS.
Prices for advertisements sent promptly on application. Orders for advertisements should reach the office of publication not later than the 12th day of the month, and changes of advertisements not later than the 5th day of the month.

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

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

ONTARIO ASSOCIATION OF ARCHITECTS.

OFFICERS FOR 1894.

PRESIDENT	EDMUND BURKE, Toronto.
1ST VICE-PRESIDENT	J. E. BELCHER, Peterboro'.
2ND VICE-PRESIDENT	W. A. EDWARDS, Hamilton.
TREASURER	H. B. GORDON, Toronto.

COUNCIL:

KING ARNOLDI	Ottawa.
FRANK DARLING	Toronto.
D. B. DICK	Toronto.
THOS. FULLER	Ottawa.
J. GEMMELL	Toronto.

REGISTRAR AND LIBRARIAN:
W. A. LANGTON - Canada Life Building, Toronto.

PROVINCE OF QUEBEC ASSOCIATION OF ARCHITECTS.

OFFICERS FOR 1894.

PRESIDENT	J. NELSON, Montreal.
1ST VICE-PRESIDENT	CHAS. BAILLAIRGE, Quebec.
2ND VICE-PRESIDENT	A. C. HUTCHISON, Montreal.
SECRETARY	JOSEPH HAYNES, Montreal.
TREASURER	J. Z. RESTHER, Montreal.

COUNCIL:

A. T. TAYLOR, F.R.I.B.A., R.C.A.	Montreal.
A. GENDRON,	Montreal.
J. B. BERTRAND	Quebec.
ERIC MANN	Montreal.
J. VENNE	Montreal.
G. F. TANGUAY	Quebec.

AUDITORS—THEO. DAOUST, J. F. PEACHY.

TORONTO BUILDERS' EXCHANGE.

BOARD OF DIRECTORS:

WM. PEARS, President.
WM. PARK, 1st Vice-President.
GEO. OAKLEY, 2nd Vice-President.
DAVID WILLIAMS, Treasurer.
JOHN ALDRIDGE.
JAS. CRANG.
FRED. WAKEFIELD.
WM. BOOTH.
JAS. ISAAC.
H. LUCAS.
JAS. THOMSON
H. MARTIN.

JOHN L. PHILLIPS, Secretary.

THE members of the American Society of Civil Engineers who are meeting in annnal convention at Niagara Falls, will visit Toronto on the 25th inst. by invitation of Sir Casimir Gzowski, ex-President of the Canadian Society. The members of the latter Society resident in Toronto, have arranged to give the visitors a fitting reception.

THE Court of Common Pleas at New York has decided that a plumber who is not registered in accordance with the provisions of the plumbing ordinance of that city cannot legally enforce the payment of his accounts. This decision is said to have fallen like a bomb in the ranks of about five hundred unregistered plumbers in that city, and the Health Department is crowded with applicants for licenses.

IN our correspondence columns will be found an interesting article, accompanied by illustrations, relating to the recent landslide at St. Albans, Que., by Mr. Chas. Baillairgé, of Quebec. It is a matter of some surprise to us that Mr. Baillairgé, or some person of like practical experience, was not chosen by the government to report upon the causes, etc., of this catastrophe. It will be remembered that in the case of the great landslide at Quebec, in 1889, where fifty persons were killed, Mr. Baillairgé's version of the cause of the accident prevailed over that of Prof. Laflamme, (who has been deputed to report on the latter occurrence) both before the Society of Civil Engineers and before the Supreme and Lower Courts, where the case was discussed.

THE effort of a company to secure the passage of a Bill through the Dominion Parliament giving them the right to construct an elevated railway through certain of the principal streets of Montreal, was nullified by the determined opposition of the citizens. The Bill, as it passed the House, provides that before construction shall begin, compensation shall be made to the owners of property which would be damaged in value by the carrying out of the enterprise. This provision of the Bill will it is believed be sufficient to stop the further progress of the scheme. In a city of compact area like Montreal, there does not appear to exist the slightest necessity for an elevated street railroad. The electric street cars answer all the requirements, and in placing property owners beyond the reach of possible blackmail, Parliament has done an act of simple justice. There has been too much juggling with public franchises of late in the city of Montreal.

ON the 13th inst., in the Chancery Division Court, before Justices Boyd and Meredith, the appeal of Mr. Neelon, contractor for the new Toronto city buildings, from the decision of Mr. Justice Rose, which affirmed that the architect had authority under the contract to dismiss the contractor, came up for argument. The court agreed with the construction put upon the contract by the trial judge, and dismissed the appeal with costs, unless the plaintiff chooses to pay the costs of such part of the proceedings as will be abortive in the event of a new trial, in case of which election and payment there will be a new trial. Mr. Neelon is said to have stated his intention previous to this appeal of carrying the case to the highest court of appeal should an unfavorable decision be recorded by the lower courts. Whether or not he still adheres to this determination we are not informed, but it is at least probable that the case will not terminate at the present stage.

WE regret to observe the published statement that dissension has arisen in the Hamilton Arts and Crafts Association regarding the disposition of the surplus of $110 from the late Exhibition. If, as is stated to be their intention, a section of the members resign and form a new society, the result is not likely to be satisfactory to either party. The history of the Arts and Crafts Association thus far would seem to show that when accorded the united support of all persons interested, one such organization might be made successful. On the other hand it is extremely probable that a division of effort would result in general failure. We therefore hope that in the best interests of the Arts and Crafts Association the members will be willing to endeavor to arrive at some adjustment of the present difficulty which will be satisfactory to all concerned.

THE Dominion Government will be asked to make a grant of money towards defraying the cost of a Dominion Exhibition in Toronto in 1895. The so-called Dominion Exhibitions which have been held in the past have not even in a moderate degree been representative of Canadian progress. An Exhibition which would be truly Dominion in character would be likely to result in adding to the population and business of the country. Something of the kind is needed at the present stage in our history, and we therefore hope the Federal and Provincial Governments will liberally assist the Toronto Board of Trade, the Industrial Exhibition Association and others interested in bringing the project to a successful issue.

A LARGE amount of stone is every year imported into Canada from the United States, displacing in the local market an equal quantity of native material. The owners of Canadian quarries do not appear to be sufficiently alive to the importance of making known and keeping before the attention of architects and builders the location, quantity, accessibility and price of Canadian building stones. We believe Canadian sandstones are available which, in color and quality, are equal to those imported from the United States. This being the case, it is not to our credit that foreign material should be so largely used. In view of the difficulty experienced in securing samples from Canadian quarry owners for the series of tests of Canadian building stones conducted a couple of years ago by the Ontario Association of Architects, the blame for the present condition of things would appear to be due in a considerable measure to carelessness on the part of owners of Canadian quarries. We regret to observe also a fondness on the part of some Canadian architects for the use of foreign materials, even in cases where an equally good Canadian article could be had. Architects who pass by native in favor of foreign material are quite as unpatriotic as the professedly Canadian company which gives work that should properly belong to Canadian architects into the hands of a foreigner. In this connection we observe that the affiliated building trades in New York City have passed a resolution that after June 1, 1894, they will "refuse to handle any imported decorative or other material, and will take any steps necessary to protect the industries affected." "The onus of this complaint," says Stone, "lies against the practice of wealthy men with snobbish tendencies favoring foreign material for their buildings, in other words awarding contracts to European firms for work that domestic firms could do as well and cheaply, thus enforcing idleness upon our workmen." We quite understand that in some instances it is necessary to go abroad for a suitable material, but this should not be done until the possibilities of home production have been exhausted.

THE MASSEY MUSIC HALL.

THE Massey Music Hall just completed in Toronto, was opened with a three days festival last week. The Music Hall, as announced in the festival prospectus, has been provided through the munificent liberality of a wealthy citizen of Toronto, Mr. Hart A. Massey. It is also stated that in this building, Toronto possesses a music hall worthy of her position as the chief city and artistic center of this great Province. There is an old saying that "one should not look a gift horse in the mouth," but there are some circumstances connected with this enterprise which we desire to bring to the notice of our readers. It is quite noticeable that the official prospectus of the opening festival contains a number of portraits of persons who took part in the inaugural concerts as promoters and performers, but no illustration of the design of the building nor any mention of the architect's name.

The plans were imported from an American architect. If our architects were as well protected in their work as Mr. Massey has been in the business by which he has been able to accumulate his wealth, this would probably have been otherwise. Mr. Massey did a very generous and public spirited act in donating so large an amount of money—$150,000—for such a purpose, but it was a very unpatriotic act, when he allowed any other than a Canadian architect to furnish the design.

We take exception to the claim that the building is a creditable and satisfactory fulfilment of the opportunity which existed when Mr. Massey came forward with his offer. We cannot go into an extended architectural criticism of the building, but wish to mention a few important particulars in which we consider it to be deficient. This we do without any reflection upon the architect. We do not know what limitations he may have worked under. The indications are that the principal aim was to get the largest possible number of sittings with the ground space and money available The exterior is about as aesthetical as the average grain elevator. There has been no attempt to make the structure fireproof. The floors, platforms, stairs, and seats are all wood work of the most inflammable kind. The exits will never be comfortable even for ordinary use, to say nothing of emergencies. The arrangement of seats is good. Commendable taste has been shown in the window glass, which is very plain, of light cathedral tints, with a few portraits in stained glass. On the whole, however, the interior effect is bad, made so by the pretense to ornamental construction of the upper portion in the Moorish style of architecture. This style of work, more than almost any other, requires a very elaborate treatment for agreeable results. It would be hard to find an interior so devoid of pleasing lines as the one referred to. The color decorations are what may best be described by the word "tawdry." The whole scheme has been carried out on an ill-advised basis. A lot should have been provided in some part of the city where the surroundings would have been favorable, and large enough for a building to contain from one to two thousand more seats, with ample room for approaches, both on foot and by carriage, inside of the street line. This with an appropriate design would have given the city a monumental building, which would have produced an effect impossible to be attained in the location chosen, even if the lot itself were of sufficient size. A building of this kind should fill a double purpose. While providing for those who could pay the prices of admission a suitable place for the enjoyment of good music with all its elevating influences, it should be constantly exerting a no less positive influence for good, from the artistic standpoint, on all who come within sight of its exterior. Many more persons would receive the benefit of the latter than could afford the privileges of the former, and as an educator of public taste it would be at least as valuable through its architecture as in its utility for large audiences.

We think Canadian architects are in a measure responsible for the great mistake that has been made in this scheme. When the preliminaries were under consideration, the Ontario Association of Architects should have pointed out to the committee associated with Mr. Massey that the funds were inadequate for the purpose. This suggestion if unheeded should have been followed by a formal protest in unmistakeable language, placing the architects on record as opposed to such a work being undertaken under conditions which were certain to result in an obstacle to the development of architecture. This building will for a number of years prevent Toronto from having a temple of music of a character to meet the requirements. Such a position on the part of the architects we believe would have commanded respect from the public. Similar conditions not infrequently occur in regard to public buildings and we trust that the architects will in all such cases hold up a finger of warning as has been done elsewhere in some instances. We very much regret that the Massey Music Hall is not a worthy subject for one or two illustrations in this journal.

THE Journeymen Stonecutters of North America will hold their convention in Toronto the first Monday in August.

Messrs. Oakley & Holmes, contractors, have removed their office and works from 68 to 89 Wellington St. W., Toronto.

THE ONTARIO ARCHITECTS' ACT.

THE Ontario Association of Architects are coming forward again with an effort to make the Ontario Architects' Act effective. The subjoined manifesto issued to candidates nominated for election in Ontario states the reasons why the Act should be amended, and it certainly seems as if it would be for the good of all that it should be so amended. The Association ask for no special privileges or powers for members of the Association as opposed to the public, but have accepted fairly the essential character of the Act as a measure passed in the interest of the public. Nor is there any injury offered to any class of practitioners engaged in building at present. Wherever there are persons now practising as designers for others and to whom the title architect is an object, the need is regardeda as right and it is proposed to throw open to them the Association on its new basis. Builders who design for themselves will be in exactly the same position as they are now; nor is it proposed to place any restriction upon their building for others without the intervention of an architect. In the city as well as the country there is much building that any experienced builder can do. But when it comes to the application of science or to artistic judgment and an architect is employed, the public—builders themselves—want to be assured that the name indicates certain qualifications. If the amendment can be established there seems to be no doubt that the profession of architecture will be raised and the whole building business with it. The following is the circular letter to the candidates for election:

OFFICE OF THE REGISTRAR,
CANADA LIFE BUILDING,
TORONTO, June 12th, 1894.

DEAR SIR:

The Ontario Association of Architects, incorporated in 1890, was founded, as the preamble to the Act of Incorporation states, for the better protection of the public interests in the erection of public and private buildings in the Province of Ontario, and to enable persons requiring professional aid in architecture to distinguish between qualified and unqualified architects and to ensure a standard of efficiency to the persons practising the profession of architecture in the Province, and for the furtherance and advancement of the art of architecture.

The act provides that membership of the Association can only be attained by passing qualifying examinations, and the distinction given to architects thus qualified is the title "Registered Architect."

It has been found in practice that the Act fails to secure the ends set forth in this preamble, because the title "Registered Architect" is considered to be of no practical advantage so long as there is no restriction as to the use of the traditional title Architect. For this reason the influence of the Association upon both students and architects is materially weakened.

The course of study required for the examinations of the Association has been of great service to such students as have come up for the examinations, but these students are the few. The majority decline to prepare for the examinations and many give openly as their reason that they can see no use in doing so when they can call themselves Architects without examination.

Many Architects also, who, as persons practising architecture at the time the Act came in force, were registered as members of the Association, have since withdrawn their names and support from the Association on the ground that they do not find it necessary to belong to it.

In this way there will soon be a majority of persons practising architecture in the Province who will not be members of the Association.

Building operations are, in the meantime continually growing more complicated and involving more branches of scientific knowledge. The education of an architect no longer consists only of an acquaintance with the ancient forms of design, but spreads, of necessity, over a wide field of scientific knowledge; and the difference between the trained and the untrained architect is now not in point of taste only, but in matters directly affecting the public safety.

For this reason it seems proper that the profession of architecture should be put upon the same footing as that of law, medicine, or surveying, since its proper conduct as regards the convenience, health and safety of the public is as much dependent as these professions upon the exact knowledge and skill of the practitioner.

Nor can it be said that a fundamental training that will raise the general quality of design in the Province, is an unimportant public consideration; for the Province is being built up, in most parts permanently, and may with the same material and the same cost be made either attractive or unattractive, according to the skill of the architects. But in a new country where there are no traditions of good design and no ancient standards of excellence constantly before us, the attainments of architects in this direction will depend upon the opportunity they may have for a training which shall enable them to go beyond what their surroundings can teach them.

The first step to ensuring in architects of the Province a standard of efficiency in the many branches of knowledge now necessary to an architect, is to make the right to use the traditional title "Architect" dependent upon the attainment of this standard, tested in the only possible way by examination. The Ontario Association of Architects therefore intend to petition at the next sessions of the Legislature, that the right to the title, "Architect" be restricted to such persons as have succeeded in passing the examinations of the Association, conducted on such a basis and by such persons as the government may see fit.

It is not, of course, proposed to restrict the right of designing or building to architects. It is only proposed that persons who design or build without being qualified according to the accepted standard be known by some other name than architects.

Nor is it desired to injure those who, at present, make use of the title "Architect." The necessity of admitting all such persons will prevent any immediate change in the condition of practice in the Province; but the process of education will be going on amongst students and the good effect of the Act will appear after a few years in the general improvement of buildings in point of economy, safe construction, and sound sanitation; and also, there can be no doubt, as works of art.

I have been instructed by the Council to state the matter to you, and to ask you if you will give it your support in the House.

I am yours truly,

W. A. LANGTON,
Registrar Ontario Association of Architects.

ILLUSTRATIONS.

RESIDENCE OF MR. GEO. I. TUCKETT, HAMILTON, ONT.—JAMES BALFOUR, A.R.C.A., ARCHITECT.

This house is built of Credit Valley stone and Beamsville pressed brick. The inside is finished with native and imported hardwoods of various kinds, except drawing room, which is finished in white enamel, and the attic and kitchen apartments, which are finished with pine in natural finish. The house is heated with hot water and lighted by electricity.

CANADIAN ARCHITECT AND BUILDER COMPETITION FOR A DRUG STORE.—DESIGN SUBMITTED BY "TOLEDO"—AWARDED SECOND POSITION.

The author in submitting this design states that he has done his best to comply with the published conditions of the competition. He has endeavored to provide a convenient plan, and in designing the elevation has chosen a style adapted from the Spanish Renaissance. The material is Ohio buff stone and buff brick. The roof would be constructed of Spanish tiles. The woodwork would be painted in two shades of cream and white. The facade on the side street would be treated in a similar manner, the brickwork starting from the first stone course above the ground; the bottom 16 courses to be glazed bricks.

SUBURBAN RESIDENCE—DESIGNED BY J. C. A. HERIOT, MONTREAL.

COTTAGE AT VALOIS—A. F. DUNLOP, ARCHITECT, MONTREAL.

On old work the painter often wants to use a putty that dries quick, sandpapers easily, and sticks where it is placed. To make just such putty, mix dry white lead in a good grade of brown japan, add enough lampblack to color it a good bit, give a binding quality by putting in a few drops of rubbing varnish, and lastly give the whole a dash or two of turpentine. The more rubbing varnish is added, the tougher the putty and the slower it sandpapers.

The term "bay window" is applied to a projecting window rising from the ground on a polygonal plan: it may be half a square or half a sexagon (the latter being the most common)—both of them have three sides. Sometimes they are built on plan as half an octagon—that is showing four sides. Those with more sides than four are not frequently used, and the two-sided or canted bay is the least common of all bay windows. When a projecting window rising from the ground shows a half circle, or a segment of a circle, it is called a "bow window," in reference to its shape. An "oriel window" does not rise from the ground like a bay window. It projects from the outer face of the wall, and is supported on a bracket or corbel. The word "oriel" formerly meant a small chamber or apartment. These distinctions of bay, bow, and oriel windows are often used synonymously; but the above definitions will be found to be the correct ones.

THE QUEBEC ASSOCIATION OF ARCHITECTS.

WE desire to call the attention of architects and students of architecture to the removal of the above Association from the Canada Life Building to the more commodious, handsome, and convenient rooms on the lower floor of the New York Life Building, Montreal. The former location was found to be too inconvenient for the easy access which is desirable, especially at night.

To reach the new rooms no climbing of stairs is needed. Under the new arrangement, the new rooms will be kept open on all days of the week, from 8.30 a.m. until 6 p.m., and on Wednesdays the hours will be extended until 9 p.m.

Those who visit the new rooms will be highly pleased with the success of the Association. All kinds of literature, books, etc., will be found there, for a thorough study and reference on all subjects dealing with architecture and building.

The Council are desirous that all architects and students should take advantage of the privileges offered by the Association. We have confidence that such opportunities will be valued and used as they deserve to be.

THE EFFECT OF FROST ON GREEN MASONRY.

DURING the construction of the new theater in Zurich, Switzerland, it became necessary to carry on part of the masonry during the winter. The contractors obtained advice from several sources as to the manner in which the work should be done, but as the recommendations were very diverse the Austrian Society of Engineers and Architects, which has made a special study of cements, limes, and mortars, was asked to recommend a course of procedure. The matter was turned over to the Cement Committee, and this body instituted a series of experiments, which are described in the following free translation from the report in the Society's journal.

The experiments were made in two ways, the first with brick masonry and the second with rubble masonry, using stone of two kinds. This appeared desirable in order to determine if there was any difference between materials which were unlike hydroscopically. The materials used were dry and free from snow and ice, and the mortar was mixed as stiff as possible. The limes and cements were all tested in the municipal experimental station according to the system of the Society.

The separate pieces of brick wall tested were about 3.28 feet long, 6.56 feet high, and 12 inches thick, and were made with lime, Roman cement, Portland cement, mixed lime and Portland cement, and slag cement. The test walls made with these five mortars were laid with unwarmed water from the city mains and with water warmed to a temperature of 77° Fahr. A series of tests were also made with Roman and Portland cements and cold water to which 7 per cent. of its weight of cooking salt had been added. All mortars were made with 1 part of the cementing material and 2 parts of sand. In the mixed mortars twice as much lime as Portland cement was used. The lower half of the walls was partly protected by timbers, but the upper portion was entirely exposed. A few tests were also made with brick masonry laid with Hausleitner's frostproof Roman and Portland cements.

The test blocks of rubble masonry were 3.28 feet long, 6.56 feet high, and 16 inches thick. The stone used was partly limestone and partly sandstone. These blocks were made with lime mortar, Roman cement mortar, and Portland cement mortar, mixed with cold and hot water and cold brine as before.

The brick walls were started the last part of December, when the temperature was 26° Fahr., and the 14 pieces were finished in about three weeks. The temperature of the air was taken three times daily until the middle of April, the lowest temperature being on January 2, when 3 degrees above zero Fahrenheit was registered. The walls were pulled down June 6. It was at once apparent that those pieces of masonry laid with mortar containing lime had suffered more from the frost in the exposed upper part than in the portions protected by timbering, since in the former the mortar had plainly been frozen. The following remarks give an idea of the condition of the walls, as revealed by an examination of the joints with a sharp iron.

1. Lime mortar mixed with cold water. The mortar in the joints had hardened but feebly, and the bricks could be pulled apart by hand without exercising any noticeable amount of strength.

2. Lime mortar mixed with warm water. The mortar in the joints had hardened feebly, and there was no adhesion between the bricks and mortar.

3. Roman cement mortar mixed with cold water. The mortar in the outer and inner joints had hardened moderately, and there was considerable adhesion between the bricks and the mortar.

4. Roman cement mortar mixed with warm water. The joints were quite brittle and the inner portions of the mortar not particularly well hardened; the adhesion between the bricks and mortar was quite good. The part of the walls protected by timbers was in better condition and excelled any of the preceding walls.

5. Portland cement mortar with cold water. The joints were hard and the mortar clung well to the bricks. The protected part was better than the other in this case.

6. Portland cement mortar with warm water. The joints were hard, the mortar adhered well, and the entire piece of wall was a little better than any of the preceding.

7. Lime and Portland cement mortar mixed with cold water. The mortar was badly mixed, brittle and crumbling, but adhesive.

8. Lime and Portland cement mortar mixed with warm water. The mixture was uniform in this case, but the mortar was brittle and not well hardened in the interior, although adhesive.

9. "Frostproof" Roman cement mortar mixed with cold water. The mortar was well hardened and there was a good adhesion between it and the bricks. A plaster of the same material put on a part of the wall at the request of Herr Hausleitner was thoroughly hard and without sign of injury.

10. "Frostproof" Roman cement mortar mixed with cold water. This mortar was well hardened and adhered very well to the bricks. A plaster of the same material was thoroughly hard and without defects.

11. Wittkowitz slag cement mortar with cold water. The joints were brittle and the mortar fell into little particles when scratched out with the iron. The inner parts which had hardened somewhat were crumbling and showed but a slight adhesion to the bricks.

12. Wittkowitz slag cement mortar with warm water. The condition of this wall was but slightly better than of the last noted.

13. Roman cement mortar mixed with cold water to which 7 per cent. of salt had been added. The mortar was brittle and crumbling, adhering but slightly to the bricks.

14. Portland cement mortar mixed with cold water to which 7 per cent. of its weight of salt had been added. The mortar was well hardened throughout and adhered well to the bricks.

The masses of rubble masonry were built on a succeeding year, being started on December 28 and completed about two weeks later, the temperature ranging from 7° to 25° Fahr. The blocks were examined on April 7, and were found to be in the following condition:

Limestone Rubble. 1. Lime mortar mixed with cold water. The mortar was completely frozen and brittle, without any adhesion to the stones. The block had fallen completely.

2. Lime mortar with warm water. The mortar was entirely frozen, brittle and without adhesion.

3. Roman cement mortar with cold water. The mortar had hardened pretty well, but had not the slightest adhesion to the stones, which could be removed from their beds without injuring the latter.

4. Roman cement mortar with warm water. The mortar was quite well hardened, but did not adhere in the slightest degree to the stones.

5. Roman cement mortar mixed with cold water and salt. In this block there was a partial adhesion between the stone and cement, and the latter had hardened somewhat better.

6. Portland cement mortar with cold water. The mortar had hardened very well and the adhesion between stones and mortar was quite good.

7. Portland cement mortar with warm water. The conditions were the same as with the last block, although the adhesion may have been a trifle greater.

8. Portland cement mortar mixed with cold water and salt. The mortar was very hard and adhered to the stones very well. The tearing down of the wall required considerable strength and necessitated the use of bars and other tools.

Sandstone Rubble. 1. Lime mortar with cold water. The mortar was entirely frozen, brittle, easily broken, and without a trace of adhesion to the stones.

2. Lime mortar with warm water. The condition of this block was the same as that of the first.

3. Roman cement mortar with cold water. The joints were badly frozen, the mortar crumbling and slightly hardened. There was no regular adhesion between it and the stones.

4. Roman cement mortar mixed with warm water. This block was in the same condition as the last.

5. Roman cement mixed with cold water to which salt had been added. The mortar was well hardened and adhered fairly to the stones.

6. Portland cement mortar with cold water. The mortar was well hardened, but its adhesion to the stones was only partly good.

7. Portland cement mortar with warm water. The conditions were much the same as in the last block.

8. Portland cement mortar mixed with cold water to which salt had been added. The mortar had hardened very well and adhered firmly to the stones. The block could not be broken apart without tools.

The conclusions of the committee from these experiments are that in brick masonry laid in frosty weather mortars into which any part of lime enters should not be used. Roman cement mortars behave fairly well under such conditions, and Portland cement mortars give good results. The use of warm water gave somewhat better results, and salt materially increased the resistance to frost. With rubble masonry, using either sandstone or limestone, lime mortar was entirely out of place and Roman cement mortar gave poor results unless mixed with salt. Portland cement mortar behaved well, especially with the addition of salt. The final recommendation of the committee is that in laying brick or rubble masonry in winter to use only Portland cement mortar, mixed with salt if possible.

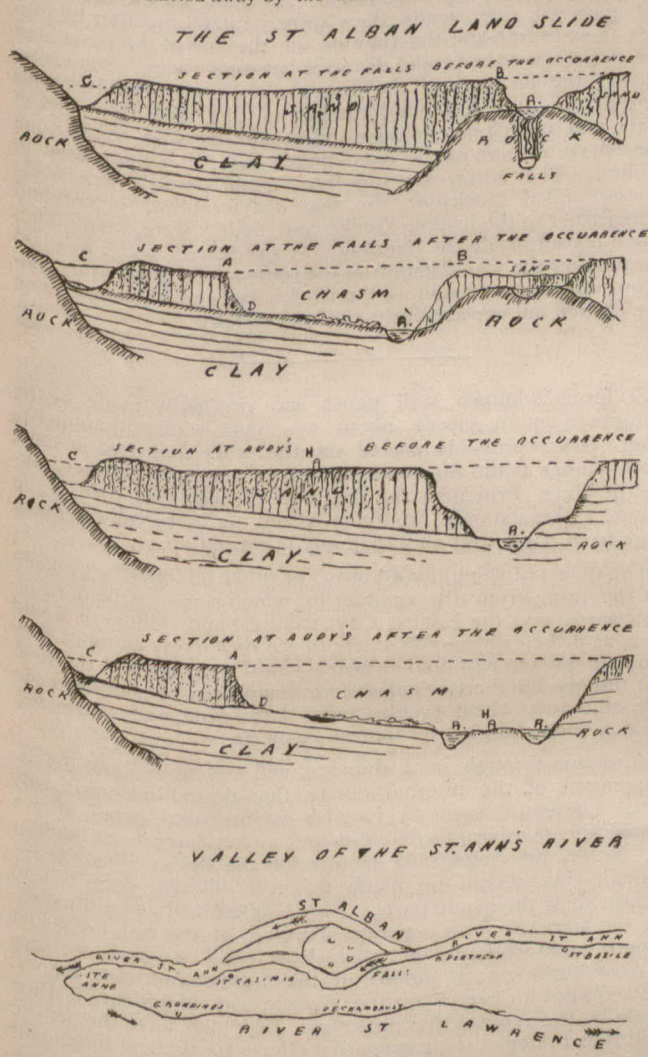
THE LANDSLIDE AT ST. ALBAN'S, QUE.

QUEBEC, June 3, 1894.

Editor CANADIAN ARCHITECT AND BUILDER.

SIR,—I have as requested by you put a few notes together anent the late slide at St. Alban's, on the North side of the river St. Ann, some 36 miles from Quebec, or about 20 miles from where the river empties itself into the St. Lawrence. The accompanying plan or diagram of the locality and the several sections are self-explanatory, and almost sufficient of themselves to account for the occurrence, but I may add that as shown by the first or uppermost of the four sections, the river above the Gorrie Mills, or eastwards thereof, ran at a level of nearly 100 feet above that pursued by its course westward, or, towards the St. Lawrence, there being a fall of some 95 feet over a ledge of rock separating the two.

Section 2 shows the channel over the falls, or leading to them, to be now obstructed by an immense amount of sand, clay and forest debris; the hog's-back of sand at B having precipitated itself into and filled the gorge at R, through which the river ran. This caused the waters to rise above the falls, or eastward thereof, to a height estimated by Professor Laflamme of the Laval University (whom the Local Governmentt sent there to survey and report upon the accident) to 100 feet above their normal level. The hydrostatic pressure due to this head of water soon burst through the comparatively narrow barrier of sand—some 300 to 400 feet in width at this point—between the upper and lower levels of the river at the falls; when the impounded water made a new channel for itself at R, in section 2, and the rushing torrent reaching to a height of fully 50 feet above its normal surface —as evidenced by the St. Alban bridge, which though at that height above the stream, was carried away by the water—undermined the sandy shores



above the clay formation, thus causing a large portion of the land to slide into the river and be swept away into the St. Lawrence, which it rendered thoroughly muddy, and even thick with mud as far down as Quebec, discoloring the St. Lawrence for miles below.

This will not be wondered at when I say that the chasm created by the slide is, at the western extremity, not less than a square mile in area, and as its average depth is some 75 feet, or say 30 feet at A and 120 feet at the river, the quantity of soil and of sand and clay removed and carried away by the river cannot have been less than 75 million cubic yards at the western extremity of the slide alone, and much more than this if the portion be added from above the falls, which is said to extend some 3 miles eastward thereof, but which I did not make an inspection of.

The sections, though of course curtailed in length, of which the scale is some 20 times less than that of the respective heights or depths of soil, show how the material removed must have slid upon its clayey bed, well lubricated, so to say, by the percolating water through the sand, and of which at the time of my visit I counted not less than 80 streamlets issuing at D or from between the clay and sand in say 800 feet along the rear line A of slide, or where the land parted.

Some three houses were displaced or moved down with land towards the river, one of which, occupied by the Gauthier family, must be buried deep under the clay and sand; while those of Audy and Darveau, which before the slide were at H in section 3, were found the next morning to be at H in section 4, or some 25 arpents, says Mr. Laflamme, from where they started; and, due to one portion of the land sliding or travelling quicker than the other, had actually veered around by almost 180 degrees, though maintaining their verticality. The translation having occurred at dark and accompanied by roaring and fearful noises all around them, due to the rush of waters, it was only at daylight the next morning that Audy and Darveau found that they had travelled nearly a mile from their former position on the hill.

The disaster at St. Ann, some 20 miles further down the river, was entirely due to the rush of waters from the St. Alban blockade, after they burst the boundaries, as they then rose so high, as already stated—some 10 feet or more at St. Ann, where the river is so much broader than at St. Alban—that they gradually ate away the shore for a distance of some 1700 feet north eastward of the C. P. R. bridge, several houses and outbuildings being thereby undergrounded and tumbling into the river, while about a dozen others were at the time of my visit being hastily moved back to prevent the possibility of further damage.

While the accident at St. Alban could not have been foreseen or, if so, guarded against, the same thing cannot be said of St. Ann, where every time there is a freshet, the shore is eaten into and made to recede towards the east or village.

A man named Godin, who was busy putting his house back, informed me that this was his second removal in 8 years, due to a like cause. At St. Paul's Bay, where I was called lately to advise them as to their proposed aqueduct, I found the same features exactly as at St. Ann's, though on a smaller scale, the Riviere du Gouffre being of less capacity than the other. The citizens there, however, had faced the difficulty and set to carrying out the self-suggestive mode of protecting the sandy river shores by piling driven to some 10 feet below the bed of the river or to a hard bottom; some 500 feet lin. of this work had been done at a cost of only $300.

The same remedy is required at St. Ann, or the balance of that portion of the village north of the railway will go with the next freshet. It is passing strange that this idea of piling their respective frontages should not have occurred to these riparians, who cannot surely have forgotten already how, only a few years ago so to say, they were witness to the way in which piles were driven to stand the piers of the bridge on a sure foundation. This piling of some 1700 of the river frontage here might cost, say $5,000, at the utmost, while as appears by the figures given by a Quebec journal, the "L'Electeur," the loss in ruined tenements and removing others is not less than $20,000.

As a minor feature of the accidental outcrops at the lines of parting of the removed material, the student in geology may see both at St. Ann and St. Alban, as could also be seen at Portneuf when the hill was excavated into for the bridge abutments, layer upon layer of clay in the process of formation into stratified beds of stone; and I may say here, that in visiting a sand quarry at Beauport while surveying the locality for the then proposed and now constructed aqueduct to the lunatic asylum, it was my good fortune to see, which I never had a chance at before, perfectly defined, horizontal layers of sand of equal thickness. some 6 inches or thereabout, apparently in the process, a lengthy one though it be, of elaboration into stone.

Again adverting to St. Alban, it is to be feared that in the not remote future there may be a recurrence of these slides in adjoining parishes under concomitant circumstances; the subsoil being very probably honeycombed by water infiltrating through the overlying sand, and the underground rumblings often heard in these vicinities seem to give warning of the impending danger.

Only three years ago a slide, though on a smaller scale, occurred a little above the St. Alban on the same river. Some 20 years ago or less, an exactly similar slide of a mass of sand and loam over its well lubricated bottom of hard clay, took place at St. Valier, when an extent of land some several acres in area moved bodily, trees and all left standing, into river Boyer, causing it to change its course entirely at that locality; while others on all scales, large and small, are of daily occurrence in some part of the world or other.

C. BAILLARGE.

ON THE ADAPTATION OF A PRICE BOOK TO MEET VARYING RATES OF WAGES.

(FROM "LAXTON'S PRICE BOOK.")

THE following table shows a method by which an approximate estimate of the proportion which labour bears to material in each of the several branches of the trades, may be calculated:—

Trade	Approximate proportion for Material.	Approximate proportion of Labour.	Proportion of total requiring adjustment.
Excavators, navvies or other labouring work			The whole, except such margin as may be apportioned to eartage.
Drainage work.. ...	66⅔ per cent.	33⅓ per cent.	one-third.
Bricklayer.....	66⅔ " "	33⅓ " "	one-third.
Mason.....	33⅓ " "	66⅔ " "	two-thirds.
Carpenter.....	66⅔ " "	33⅓ " "	one-third.
Joiner.....	33⅓ " "	66⅔ " "	two-thirds.
Plasterer.....	50 " "	50 " "	one-half.
Plumber.....	75 " "	25 " "	one-fourth.
Painter.....	40 " "	60 " "	three-fifths.

MEMO.—Each of the above carries with it its own labourers in attendance. The trades of slater, smith and founder, gas fitter, bell-hanger, etc., are purposely omitted, as they are mostly dealt with upon a different basis, and in fact should be regulated by their prime cost.

Example—Supposing it be desired to adjust an estimate or measured account upon the basis of mechanics' wages at 10d. per hour, instead of 9½d., then add one-nineteenth (or say 5¼ per cent.) on to the proportion of such trades as is given in the outer right-hand column thus: If the joiner's bill in the summary of an estimate, amounted to £450, the proportion attributed to labour would be two-thirds, or £300, to which we add the one-nineteenth, for increase in wages, making £15 15s. 9d., and raising the total to £465 15s. 9d.

Or supposing the case of the plasterer's bill amounting to £90, the proportion attributed to labor would be ½, or £45, to which we add one-nineteenth, or £2 7s. 4d., raising the total to £92 7s. 4d., as the corrected amount to meet the altered rate of wages.

Or, again, suppose it be desired to apply London prices to suit the lower rate of wages of a provincial town, say 8d. per hour hour instead of 9d., then deduct from the proportion one-ninth (or, say 11 per cent.), thus: If the bricklayer's bill amounted to £1,130, the proportion attributed to labor would be one-third, or £376 13s. 4d., from which deduct one-ninth, or £41 17s., giving the revised total as £1,088 3s. to adjust the variance in wages.

STUDENTS' DEPARTMENT.

INTERCOMMUNICATION COLUMN.

This column is intended to afford a means of correspondence for students, builders and all our readers desiring information they cannot otherwise obtain. Questions for which an immediate reply is required should be marked "Urgent." Names and addresses of correspondents must be sent with their communications, but these may be signed with initials or otherwise for publication.

QUESTIONS.

[20]. I am roofing a brick building, which we faced with pressed brick. The brick were only damp enough to lay nicely and the walls well protected from the weather. A white substance which seems to come out of the bricks themselves now covers the wall in many places, thus greatly disfiguring it. We had the same trouble on a building which we built over a year ago. I write hoping that you may be able to suggest a remedy. Do you think oiling the wall after cleaning it with acid would be a permanent cure.—A. E. C., B. Columbia.

[21]. Counting 25 bricks to a cubic foot when laid, and allowing fifteen per cent for waste, how many bricks would it take to build a chimney of square cross section, having its outside dimensions 6×6 feet at the base and 3×3 feet at the top, its inside dimensions 2.5×2.5 feet at the base and two feet at the top? (The fifteen per cent. to be added to the theoretical number required to build the chimney.) The height of the chimney is to be 60 feet. With the same diameters, how many bricks would it take to build it 70 ft. high?—STUDENT.

REPLIES.

[19].—"Country Builder"—To give a full answer to your question we should have to print a table giving the comparative strengths of ropes of all diameters, but a few examples may suffice you at present. For instance a 1 inch girth hemp (hawser) has a breaking weight of .20 tons, whereas an iron wire of same girth will only break at 1.40 tons, and a steel wire at 2.50 tons. A 2 inch hemp breaking weight .80 tons, iron wire 5.60 tons, and steel 10.00 tons.—[Ed. Inter. Col.]

[20]. So far as we can learn, there is no process which is effectual in preventing the exudation of magnesia from brick work. We are informed that there is a standing offer on the part of the leading brick manufacturing companies of Canada and the United States of $10,000, for the discovery of a process which will prevent effiorescence from brick work. If the bricks before being laid in the wall, are dipped in linseed oil to the depth of an inch and a half on the surface to be exposed, it will prevent to a considerable extent the magnesia from coming to the surface. The cost of dipping would be from sixty to seventy cents per thousand. Experience in Toronto and elsewhere has shown, that with constant washing by rain and drying by sun, the efflorescence usually disappears to a large extent, if not entirely, after the building has been exposed one or two seasons to the weather. This being the case, it is considered hardly necessary to go to the expense of dipping the bricks in oil. So far as our information goes, we do not think that oiling the wall after cleaning it with acid would prove a satisfactory remedy. We understand the amount of magnesia in the brick depends largely upon the depth at which the clay used in their manufacture is obtained. In bricks made from clay dug at a considerable depth below the surface the quantity of magnesia is less than in those made from surface clay. We might add that the defect to which you refer appears not to be confined to any particular deposit of clay, but it is incident to bricks everywhere. The problem of how to avoid it is one which has for a long time given brick manufacturers a good deal of anxiety. If any of our readers are possessed of any additional information on this subject, we will be pleased if they will contribute it.

[21]. In order to get the volume of brickwork in the chimney it is necessary to find the volume of the outside frustum of a pyramid and that of the inside frustum or flue, and to subtract the latter from the former. The volume of a pyramidal frustum having its base and top parallel is found by adding together the areas of its base and top, and the area of their mean proportional, and multiplying their sum by $\frac{1}{3}$ the perpendicular height. The area of the base of the outer frustum is 36 square feet; that of the top 9 square feet; their mean proportional is $\sqrt{36 \times 9} = 144$ equals 18 square feet. Then $36+18+9=63$; $63 \times 20 = 1260$ as the number of cubic feet without deducting the volume of the flue. The flue has its base area $2.5 \times 2.5 = 6.25$ square feet; as its top area $2 \times 2 = 4$; the mean proportional between these two areas is $\sqrt{6.25 \times 4} = 25 = 5$. Then $6.25+5+4=15.25$; $15.25 \times 20 = 305$ as the number of cubic feet in the flue; this being taken from the outside volume 1260 leaves 955 as the number of cubic feet of brickwork. If there were 25 bricks to the cubic foot that would call for $955 \times 25 = 23875$ bricks without allowing for waste, and fifteen per cent. of this would be 3581 for waste; so that the total number required be 27476 bricks.

SALT WATER FOR BRUSHES.—The water in which brushes are kept during the warm summer months, often though it be changed, is apt to get foul. To prevent this put a little salt in the water.

A NOTABLE CASE OF MOVING A BUILDING.

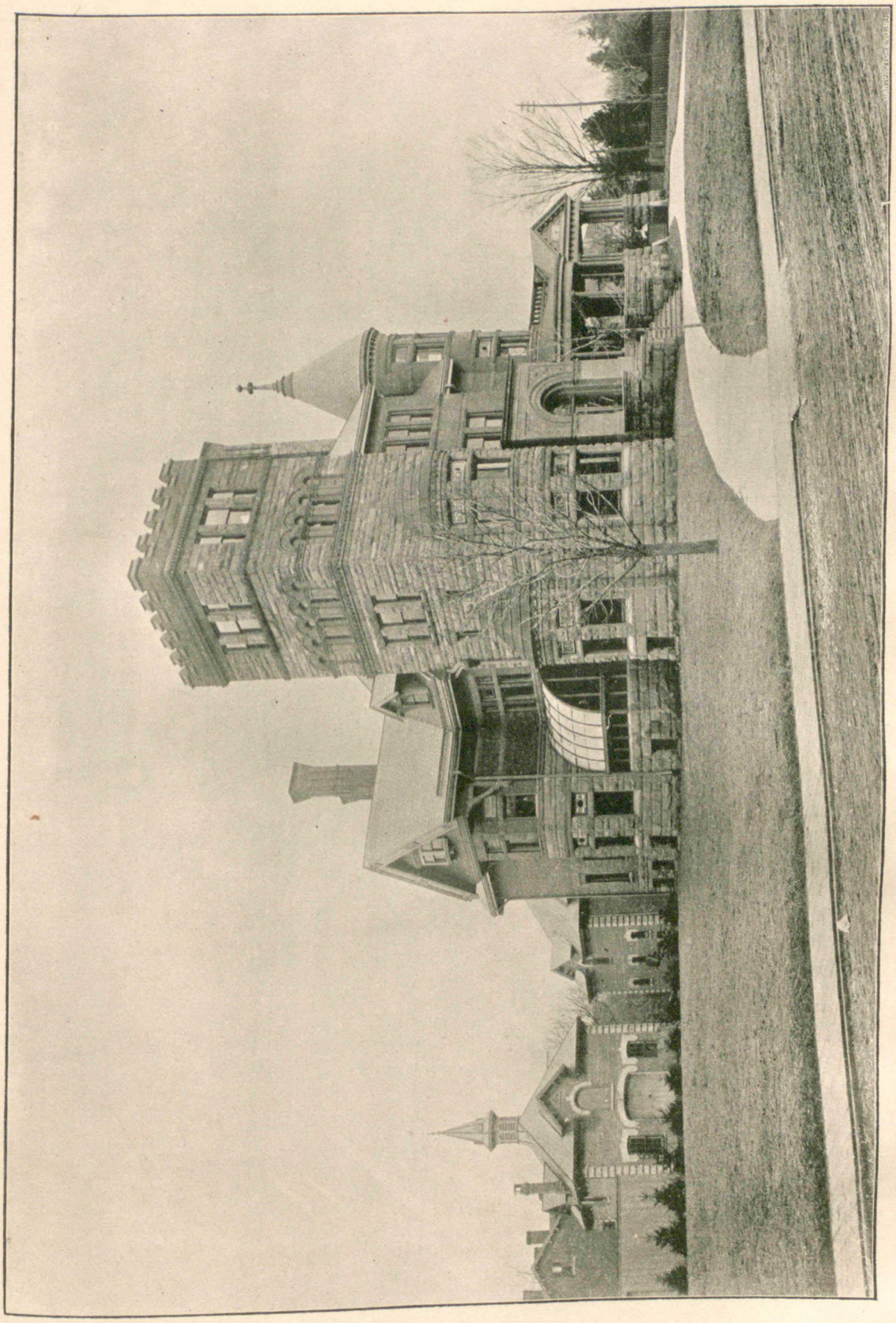
A NOTABLE instance of removing a large building was the removal at Rouen, in France, of a large timber and iron shed, 194 ft. long, with a 97 ft. span, over a distance of several hundred feet. The structure was made up of twelve trusses, supported on double posts at each end, and the total load to be lifted amounted to about 180 tons. The crucial part of the undertaking was in the lifting of the twenty-four supporting posts at one and the same time, and it was indispensable also that this raising should be accomplished in a manner which would not in the least degree alter the relative positions of the posts. One circumstance largely favoring the undertaking was that the slope of the ground over which the shed had to be moved was slight, and that the posts, when in their new position, would require raising to the extent of only about 10 in. The mechanical appliances necessary, therefore, were comparatively simple, comprising only some winches, cables, and screw jacks, some strong blocks, and the special trucks which had to be built to carry the posts in transit. Rails and sleepers, necessary to complete the outfit, did not add greatly to the expense. The first operation consisted in laying a track underneath each line of posts, and then building around each post a truck on to which, subsequently, the posts were lifted. As soon as all the trucks had received their loads they were coupled together by iron rods so as to transmit the traction in the line of the posts, and also to preserve the proper distance between them. Somewhat beyond the far end of the distance to be traversed two piles were driven into the ground almost in line with two rows of posts, and at each side of these piles another and smaller one was driven to serve as the fixed points for the cables used in hauling. The latter, starting from these, passed successively around pulled blocks on the two heavier piles, then around blocks fixed to the leading trucks, and finally were wound on a winch placed inside the building. A graduated plank was laid down along the whole length of the route to aid in securing uniformity of progression in all the trucks, and the whole operation was carried out expeditiously and successfully.

So far as is known, wall paper was originally made by the Chinese in square pieces, about 20 inches wide and 20 inches long. It was probably pasted on the wall, and used in some such manner as the Spaniards used their stamping leather, taking the place of the arras of the French, and the tiles of the Dutch. China stands prominently out as being able to make more from paper and pulp than any other nation.

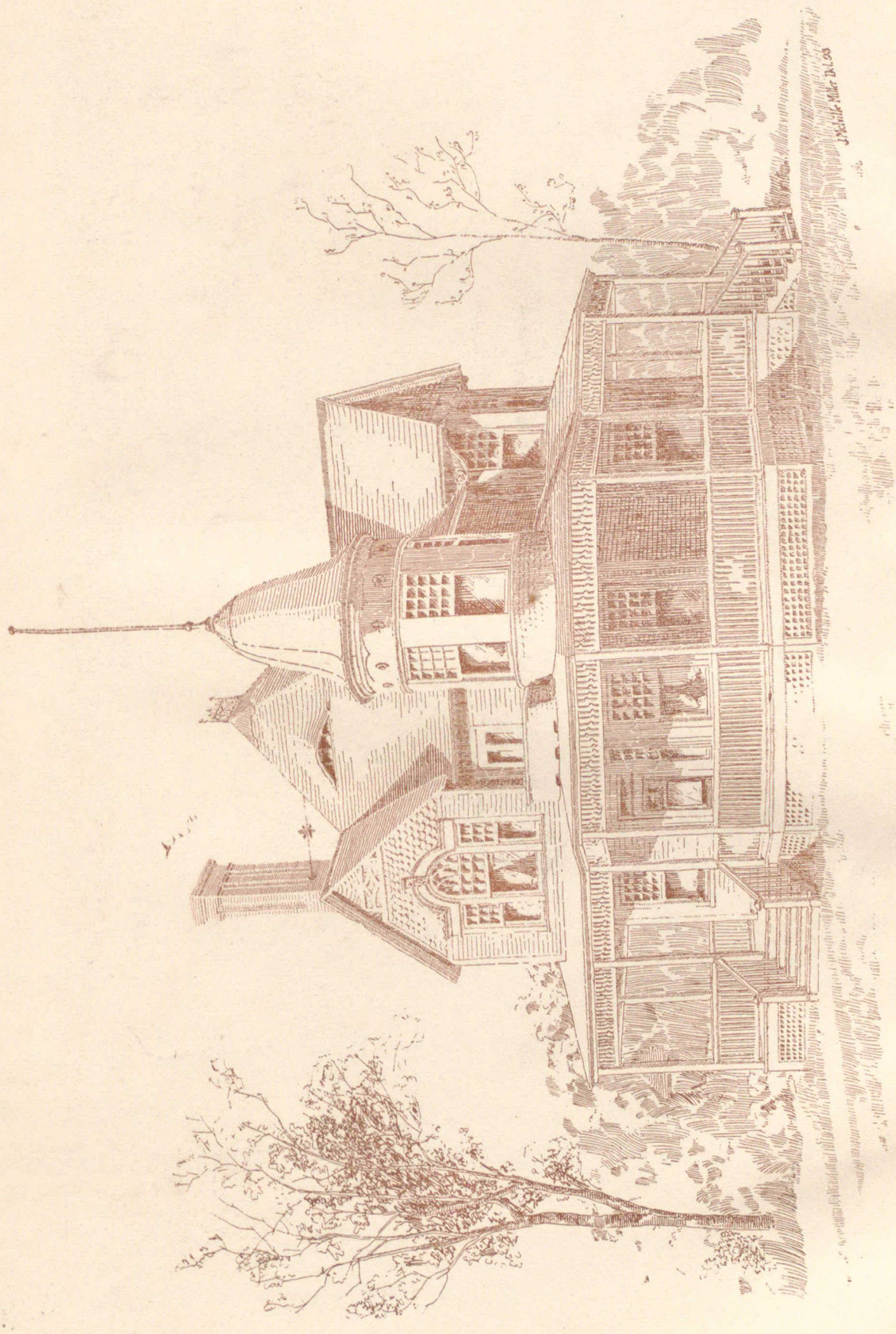
The object of shingling a house, or other building, is to keep out the rain; from the manner in which some carpenters do their work, says the Kansas City Architect and Builder, it would seem as if their object was solely to see how many shingles they could make one nail hold in place—until they got off the roof. But the good and conscientious workman lays the shingles right side up, spaces them evenly, puts butts even, and drives two nails in each shingle over four inches wide.

A section through in a drawing will tell more about the arrangement of the internal details than dotted lines ordinarily can. Therefore, says an English architectural paper, after a sufficient number of side views and a plan have been made—or, better, an isometrical picture of the device illustrated—enough cuts should be made through different parts of it to clearly show the inside parts. This practice will generally obviate the necessity for a separate drawing of the full details on experimental work and on tools, where it will be found necessary to draw but few such details of the more complicated shapes. Dotted lines for every covered part are an abomination when made by the average draughtsman. Few men have the artistic skill thus to depict the transparent effects so that an intelligent view is given of the internal parts. A section here and there, on the other hand, makes all parts clear and so well within the capacity of the most ordinary draughtsman to depict, and in the power of the most crude mechanic to read, that there can be no two opinions as to the advisability of plenty of sections and few or no dotted lines. In a long experience we have found it to pay, as a corrective, to make sections, for many of the mistakes of draughtsmen may thus be caught and remedied.

A NATURAL bridge is said to have been discovered on the Columbia river near West Kootenay. It is composed of grey granite, allied to syenite. The piers on each side are 20 feet high, when the arch begins to spring and rise in the centre to a height of 90 feet above the ground. The distance from pier to pier is 264 feet, and this enormous span is covered by a roof of granite 30 feet wide, and varying in thickness from 10 feet at the sides to 12 feet in the centre. The form of the arch is that of a rainbow, the under side being smooth, but not water-worn, and without angles or bosses. It is cracked in radiating lines, which divides the centre into self-supporting keystones, but the joints are quite close, without fissure between them. The sides of the piers are as smooth as the arch, and great firs and cedars grow beneath the arch. This remarkable monolith does not appear to have been caused by the wearing away of the rocks aronnd it, nor by falling from a higher level, but seems to have either been elevated en masse or left standing on the subsidence of the surrounding land.

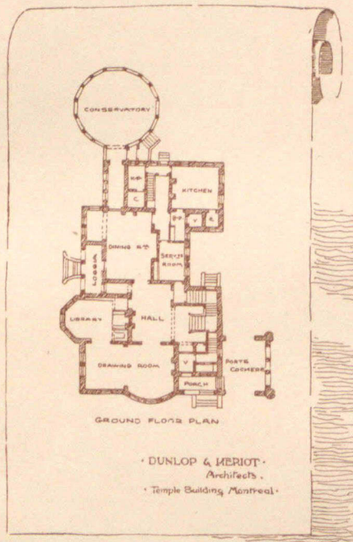


RESIDENCE OF MR. GEORGE T. TUCKETT, HAMILTON, ONT.
JAMES BALFOUR, A.R.C.A., ARCHITECT.



'COTTAGE AT VALOIS'
FOR R. WILSON ESQ.
A.F. DUNLOP ARCHITECT

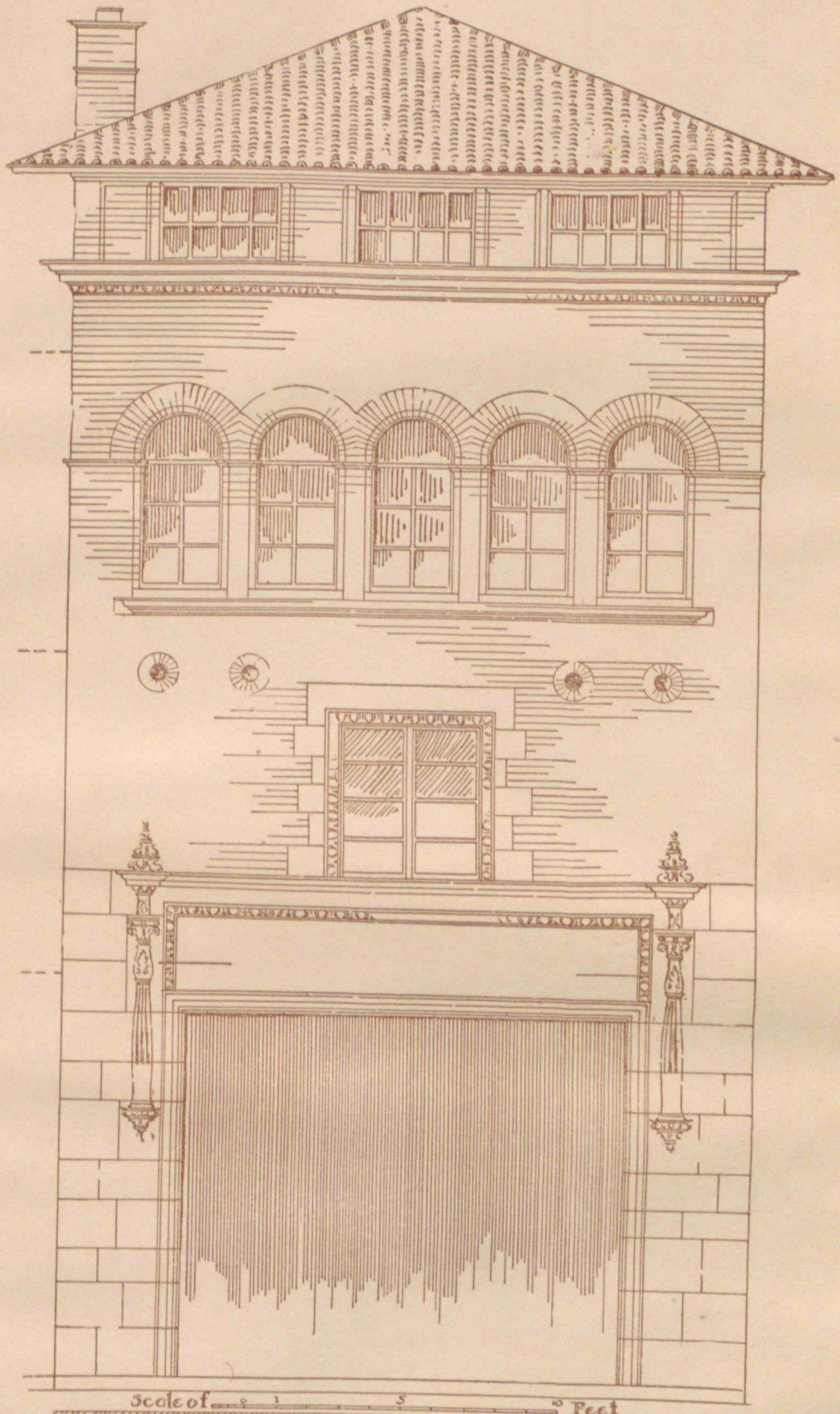
SUBURBAN RESIDENCE.



GROUND FLOOR PLAN

DUNLOP & MERIOT
Architects.
Temple Building Montreal

DESIGNED and DRAWN by
J.C.A. MERIOT.



"CANADIAN-ARCHITECT AND-BUILDER" COMPETITION for a DRUG-STORE DESIGN-SUBMITTED-BY "TOLEDO"

MONTREAL.

(Correspondence of the CANADIAN ARCHITECT AND BUILDER.)

The Hon. Mr. Nantel, Minister of Public Works for this Province, has returned from a trip to Europe, Egypt and the Holy Land. He is reported to be much improved in health.

The Sanitary Engineer has reported to the Health Committee that certain large educational establishments now in process of construction have failed to carry out by-law No. 105, section 26, which requires them to submit to the Board of Health plans of the internal arrangements, plumbing, etc., after being duly notified to do so.

At a meeting of the Council of the Province of Quebec Association of Architects held in their new rooms in the New York Life Insurance Building on May 29th, Mr. Joseph Haynes tendered his resignation, which was accepted. Mr. A. C. Hutchison has consented to act as secretary till the next annual meeting. Mr. Hutchison is known to be a hard worker in the interests of the Association, and the secretaryship could not be in more capable hands.

The members of the Carpenters' and Joiners' Union are not likely to again order a strike in this city, at least until the recollection of their present defeat shall have become less painful. They demanded that their working hours be reduced to nine instead of ten, and that their wages be increased to a minimum of 20c. per hour instead of 16c. per hour. These demands, the master builders refused to grant. After having lost five weeks of their time, and an advance in wages, which they might have got from their employers at first, they have been compelled to return to work at the same hours as before, and some for less wages than they were getting previously. Indeed they have not all succeeded in getting employment. Some employers took non-union men on during the strike, and they now refuse to replace them by the strikers. Those union men to whom employment has been given are not recognized as such. The men claim that about fifty of the builders have acceded to their demands, but this statement appears to be exaggerated. It has only been possible for me to find two, and of these one has failed since the settlement, and the other I hear discharged his union men immediately after the settlement. The Carpenters' and Joiners' Union probably selected for their strike the slackest time we have had for the last twenty years. There are very few buildings in course of construction this year; and the foundations of these are hardly in yet. The only work that is always going on perhaps is jobbing, which in the month of May is a little more active than usual. All this no doubt helps to account for the little success which rewarded the carpenters' recent effort to force payment of a higher rate of wages. Speaking to a prominent contractor the other day in this connection, I was told that he had only fifty men in his employ at present; when business is brisk he employes from one hundred to one hundred and fifty men. Of the fifty at present employed, about half are union men to whom before the strike he offered an advance in wages of ten per cent., which was refused. He also said that a good many of his former employees applied to him for employment after the strike, but he refused to grant their request. The absurdity of this strike when the business is so dull is clearly illustrated by the fact that hundreds of men are necessarily idle, and as this contracter said: "Applicants are so numerous that I had to put up a notice at my office entrance to prevent them from coming in." Last week this contractor said that he received over 70 applications for employment, and at the beginning of this week about thirty. This is not the opinion and experience of one man only, but of the most prominent contractors of the city. A few architects interviewed on the subject with one exception said the strike affected them very little; one said it had been the means of stopping work on ten of his buildings; but it is yet early in the season, and with men plentiful, there is time enough in which to gain the lost time.

HAMILTON, ONT.

(Correspondence of the CANADIAN ARCHITECT AND BUILDER.)

The City Council have been petitioned to further extend the fire limits.

The City Council recently passed a by-law exempting builders from payment of water rates. It is said an effort will be made to have the by-law declared to be illegal on the ground that there was not a quorum of members of the Council present at the meettng.

An Arts and Crafts Exhibition in Canada is a sign of progress. Hamilton exhibition, which was held in the well-lighted rooms of the Art School, opened on Queen's birthday and closed on June 2nd. About 250 persons visited it daily, and most of them will undoubtedly have received an object lesson as to the real meaning of art and handicraft. The walls were covered with pictures by local artists, and 40 selected works from the Ontario Society's exhibit, interspersed with some excellent works loaned by Hamilton citizens. The "Crafts" section occupied the centre and filled a row of benches across the end of the large lecture room. The architectural designs were hung in the hall and staircase. Messrs. John Ireland, Stark Gordon, J. S. Gordon, A. Stuart and L. Stuart; Madames Ireland, Hull and Birely, and Misses Luxton, Sheed, Galbraith, L. Hamilton and Baine, were the most conspicuous exhibitors among local artists. Mr. S. John Ireland's "Attraction in Reflection" and "Washed Ashore," and Miss Galbraith's "My Mother's Garden," were worthy of the praise bestowed on them. Space is too limited to review the pictorial section, and as many of the best works have been lately considered while on exhibition at Toronto, it is unnecessary to do so; it is presumed also, that the readers of the CANADIAN ARCHITECT AND BUILDER will be more interested in the Architectural and Crafts' sections. The architectural exhibits consisted of design for exhibition building by E. Patterson; city hall in French Renaissance style,—the planning is good and the facades are effective. James Balfour, A.R.C.A., exhibited a perspective, in line, of a municipal building —a good composition and a most creditable bit of draughtsmanship; he had also a perspective of his Detroit Museum of Art. W. A. Edwards had a fairly good design for a school, but the coloring detracted somewhat from its merits. R. Clohecy had a pen and ink of additions to Loretto Convent; Messrs. Rastrick had a colored perspective of Mr. Lucas' house; John A. Sellard exhibited his silver medal drawings for a museum, art school and gallery; A. W. Peene had a nice bit of pen work, a porch shelter, of very appropriate design. The wallpaper designs by A. McKenzie, Gilbert Clayton and Misses Lucy McInnes, D. Trigge, Lena Bowman, were good, as were also the tiles by Thos. Davidson. Designs for painted ceilings—by Frank Nairn, Misses L. Bowman and Marguerite Jackson. Design for grate and overmantel, by Miss Ida Thompson—this drawing was quite refreshing; to see such good technical work by a girl is unusual; this drawing was exhibited at Chicago. Brasswork—a lectern by Chadwick & Sons.

Wood carving and cabinet work was best represented in the Crafts' section. J. Hoodless & Son had a magnificent bedstead in Empire style, designed by Jas Burton, and carved by J. A. Thompson and W. Taylor; a bric-a-brac cabinet by Malcolm & Souter—designed by J. Souter, carved by Jas. Thompson, and cabinet work by R. Newbegging. This was sold for $110. There was also shown centre tables by R. Boase and Mrs. Robt. Evans; flower stand by Miss Ethel Hamilton; folding screen by Amy Barnard, this received an award at the Columbian Exhibition; carved panels, F. J. Morrison—particularly good examples of Renaissance; clock cases, etc., by J. Souter and J. Thompson. Needlework, designed and wrought by Madames W. H. Ballard, Leith, Wright, McBrier; lace, Mrs. A. W. Peene and Miss C. McIlroy, also original designs.

In bent iron work, Miss M. E. Anderson, of Glasgow, Scotland, had a varied display.

In carriage painting, Malloy and Malcolm had a case of samples showing every stage of carriage painting up to 14 coat work; this exhibit attracted everybody's attention.

In the German specimens of raised wool work, loaned by Senator Sandford, the horses' heads were really wonderful, being shaded and shorn till it was a work of modelling as well as needlework.

A modelled figure of Venus was exhibited as the work of Miss R. A. Baine, the indefatigable secretary of the Association. In silversmiths' work Andrew Dwine had a nicely modelled figure of a curler, and his brother Robert an automatic perfume fountain—these exhibits were loaned by the Merriden Brittania Co. In stained glass there were designs by Walter R. Duff and Arthur Adam.

The exhibition was a success financially, $244.50 being received at the gates. Over $100 is to be expended in the purchase of works of art to form the nucleus of a collection for an art gallery.

THE MARITIME PROVINCES.

(Correspondence of the CANADIAN ARCHITECT AND BUILDER.)

The citizens of Moncton, N. B., are very much in earnest in their determination to secure harbor improvements for the town. With regard to the need of such a work and the valuable results to flow from it, its advocates are able to point out that Moncton has already made fine progress as a manufacturing town; that it is the natural outlet of varied and extensive natural products seeking foreign markets; that it is well located to become an important manufacturing centre, and that the town already has a good record as a shipping port. Coming now to the possibility of providing the town with a good harbor, the Harbor Improvement Company present an elaborate series of plans showing how, by an expenditure that would be very moderate compared with the cost of similar works at other ports, the place can be provided with a wet dock covering 14 acres, with also a dry dock for making light and another for more extensive repairs to vessels. The Petitcodiac river flows beside the town. Just beside the sugar refinery, cotton mill, B. & M. railway terminus and the pumping station, flows Hall's creek, a winding tidal stream, tributary to the Petitcodiac. The proposition is to convert this Hall's creek into a wet dock, with, as already stated, 14 acres of available water for ships. Wharves will be built along the banks of this dock to accommodate vessels as the business develops. The entrance would be through a lock with double gates, and out of which the water could be withdrawn, leaving a dry dock where a vessel could make light repairs. If more extensive repairs, involving considerable time, were needed, another dry dock at the extremity of the wet dock can be provided for. As the land is ordinary high marsh, there would be no difficulty in excavating wherever necessary, and the construction material could be of wood and practically indestructible, because experience has proved that timber in the Petitcodiac river is free from worms.

Hence it is claimed, the cost would be relatively small, considering the amount to be done and the value of the works when completed. The largest ships could be accommodated, for the largest vessels can ascend the Petitcodiac to Moncton. The wet dock would be steadily supplied with fresh water from the creek above, or by pipes from a reservoir within two miles of the town. When completed the new harbor would be beside the sugar refinery and cotton factory, with connection with the I. C. R. and B. & M. railways, and special facilities would be afforded for the establishment of new industries along the wharves, one of the inducements being a nominal or low rate water supply, and another easy access by water to the coal mines of Cumberland, Nova Scotia, and by rail with the quarries of Westmorland, Albert and Kent counties, to say nothing of the lumber and farm products of the surrounding country.

It is stated as a strong point in favor of the proposed work, that old shipping men not only recommend it but will back it with their support. The people of Moncton themselves are prepared to aid the project in a substantial way and the company are willing to thrust their hands deep into their own pockets, believing the investment would be a good one. The growth of Moncton, they point out, would be for the advantage of the traffic on the I. C. R. and of the trade of St. John, and for the good of the whole country. Therefore they maintain the whole country should favor the scheme.

A mass meeting was held in Moncton a short time ago and the sentiment as expressed was strongly in favor of the new docks. The Provincial as well as the Dominion government will, it is believed, support the scheme.

A move is being made by Campbellton merchants to improve their harbor. According to the survey of the river made in 1839, which appears to be the last general survey made, there is 23 feet of water in the channel opposite the ballast wharf at the lowest neap tide. But on the traverse there is at times only 11½ feet. This gradually deepens, however, till at the Battery point there is plenty of water for the largest ships. The plan proposed is to dredge out the south channel, which joins the north channel opposite Point La Garde. This would make a direct course up the middle of the river, and it is contended the current would keep it clear when once opened up. About two miles would require to be dredged, but the channel is partly open now. A petition was sent to Mr. McAllister, the representative at Ottawa, and it is believed there will be little difficulty in getting it through the House.

A. H. Mc.

PERSONAL.

The death is announced of Mr. Charles Goswell, a prominent builder and contractor of Winnipeg.

Mr. F. H. Herbert, architect, Toronto, has recently removed to new and more commodious offices at 32 Queen street East.

The Hon. William Harty, of Kingston, has been appointed Commissioner of Public Works for the Province of Ontario to fill the vacancy caused by the recent retirement of Hon. C. F. Fraser.

Mr. J. A. Ellis, architect, of Toronto Junction, in conjunction with Mr. Wm. Fingland, late of Toronto, has opened an office in the city of Baltimore, and is about to temporarily remove to that city. On the eve of his departure from Toronto Junction he was tendered a complimentary banquet by a number of the prominent citizens. Mr. Ellis' popularity is well deserved, and his departure is the subject of much regret.

The government are being urged to restore the duty on white granite ware to 35 per cent., as at the reduced duty of 30 per cent. difficulty is being experienced in organizing a company to continue the large industry at St. Johns, Quebec, formerly carried on by the St. Johns Stone Chinaware Co.

THE WUENSCH AND MELAN SYSTEMS OF FIRE-PROOF FLOOR CONSTRUCTION.

WITHIN the last few years Austrian engineers have been adopting various systems of combination iron and concrete arch floor construction in buildings where the floors are subjected to heavy loads, with a considerable reduction in cost and a great gain in the rapidity of construction over the old form of brick arch construction. For some years the Monier system, illustrated and described in Engineering News of May 23, 1891, and Feb. 16, 1893, has been most generally specified for floors, but recently two other systems, the Wuensch and Melan, have been very successfully used in a number of large buildings. The application of these two systems to actual structures is shown in the accompanying illustrations.

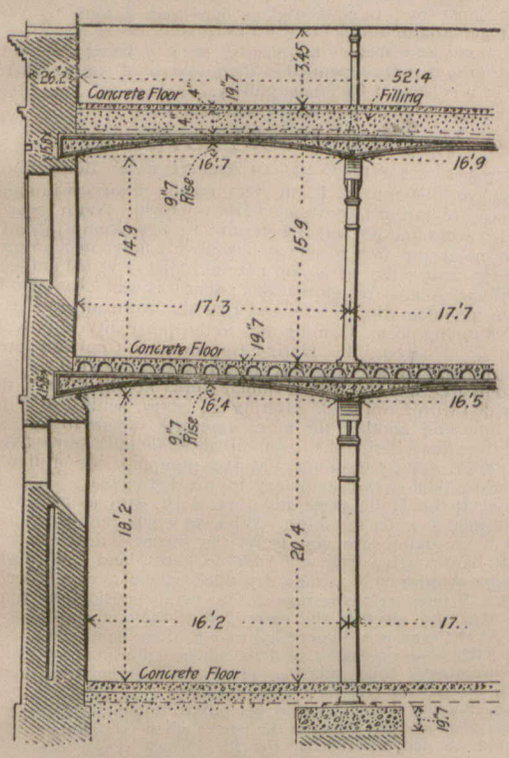


FIG. 1.—TRANVERSE SECTION OF BREWERY AT BUDAPEST, SHOWING WUENSCH SYSTEM OF IRON AND CONCRETE FLOOR CONSTRUCTION.

In Fig. 1 is shown the construction of the Wuensch system as used in the floors of a large brewery at Budapest, Hungary. In this building the second floor had to be designed for a load of 240 lbs. per sq. ft., and the third floor for a 80 lbs. per sq. ft. load. The space to be covered was $174 \times 52\frac{1}{2}$ ft. Two rows of columns were run lengthwise of the building 18 ft. apart and 16 ft. from the side walls of the building, and upon these was placed the system of concrete and iron arches shown in the illustration (Fig. 1). As will be seen, this system consists of a series of arches spanning the spaces between columns lengthwise of the building, and these arches carry other arches which span the space transversely. The longitudinal arches act simply as girders which support the arches forming the floor proper and are only $15\frac{3}{4}$ ins. wide, 14 ft. span and 1.4 feet rise. They are made up of four $2.16 \times 2.16 \times 0.28$ in. angles, two of which are curved to form a bottom chord, so to speak, for tension, and two of which form a horizontal top chord for compression, and are filled in with concrete. It will be seen that the system is simply a modified form of the Monier system, in which the wire nettings are replaced by stiff angle or T-sections.

The tranverse arches are constructed in exactly the same manner as the longitudinal arches, except of course that they form continuous vaults the entire length of the building and use

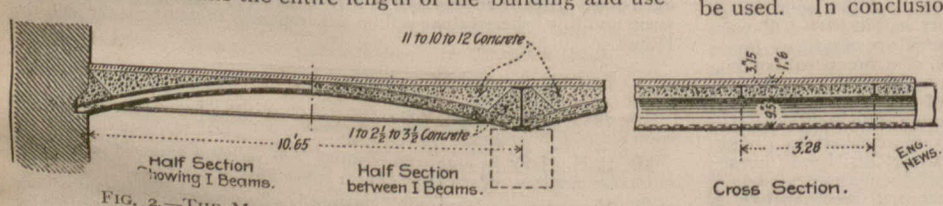


FIG. 2.—THE MELAN SYSTEM OF IRON AND CONCRETE FLOOR CONSTRUCTION.

T-sections instead of angles for the iron skeleton. Two of these arched vaults have spans of 16 ft. and one a span of 18 ft. and the iron frames are placed 7.9 in. apart for the second floor and 13 ins. apart for the third floor. The T-sections used are $1 \times 1 \times 0.15$ in. The composition of concrete was 1 cement, 2½ sand and 3½ broken stone.

The time taken to construct this floor with 8,500 sq. ft. of area was four days: the centers were allowed to stand one week after the concrete had been placed. Mr. Schustler, the designer, works out the cost of the floor, as compared with a floor consisting of twelve 14-ft. span brick arches laid between I-beam girders supported on cast iron columns (a design which was at first proposed for the work) as follows:

	Brick.	Wuensch.	Saving by using Wuensch system
Weight of floor per sq. ft..	500 lbs.	320 lbs.	180 lbs.
Weight of cast iron columns	82 800 lbs.	65,000 lbs.	17,800 lbs.
Weight of wrought iron used	108,400 lbs.	56,400 lbs.	52,000 lbs
Volume of brick or concrete	13,603 cu. yds.	798 cu. yds.	562 cu. yds.
Depth of floor.....	40 ins.	6.7 ins.	33⅓ ins.

Mr. Schustler further states that the saving in cost over brick arches in this floor was 30%. It is to be remembered, however, that this statement applies to the cost of materials and labor in Hungary. The high price for labor in this country would make the saving considerably less.

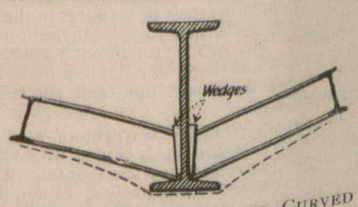


FIG. 3.—CONNECTION OF CURVED I-BEAMS WITH FLOOR GIRDERS, MELAN CONCRETE AND IRON FLOOR CONSTRUCTION.

The second system of floor construction shown is what is known as the Melan system of arch construction. As already described in Engineering News, this system consists in embedding curved I-beams in concrete and has proved very strong under heavy loads. The illustrations, Figs. 2 and 3, show the system as applied to the floor of the spinning-room of a large factory at Tetschen, in Austria. This floor has an area of about 40,000 sq. ft., and is loaded with heavy spinning machinery. As will be seen the concrete is filled in between the beams, coming down below the concave flange of the curved I-beam and being level with the upper flange of the arch. A poorer quality of concrete is generally used for the spandrels and ashes are used for filling. The connection of the curved I-beams at the floor girders is shown in Fig. 3, where it will be seen that simply a couple of wedges are used, there being no riveting of any sort.

The manner of laying the concrete is first to build a centering with tight lagging conforming to the intrados of the arch. The manner of constructing the centering is shown in the accompanying sketch, Fig. 5. The iron frames are then placed and the concrete rammed in place in layers, as is also shown in Fig 5. In this manner a gang of 14 men have laid from 700 to 800 sq. ft. of floor in a day of ten hours, including the spandrel filling of poorer concrete which, of course, had to be laid separately. This gang consisted of four men placing the I-beams, fastening them and placing the centering; one man for sand and one for cement; four men mixing the concrete; two men carrying the concrete and two ramming it into place. With

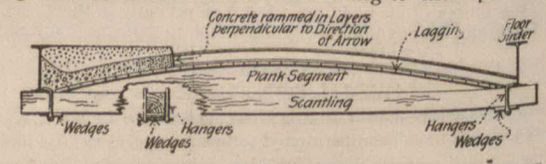


FIG. 4.—SKETCH SHOWING METHOD OF CONSTRUCTING MELAN CONCRETE AND IRON FLOORS.

this gang the amount of concrete laid per hour per man was 2 cu. ft. This record is low, however, and on bridgework the average amount of concrete laid is 5 cu. ft. per man per hour.

In Fig. 2 it will be seen that a tie-rod has been used in the arches abutting against the wall. Usually the stiffness of the I-beams is sufficient to prevent any movement without these. The arrangement of the I-beams and the depths of the concrete for different span arches are shown in the accompanying table:

Space, feet with rise of 1-2 to 1-15.	I-Beams— Depth. ins.	Weight.	Dis. apart, ins.	Weight, lbs. per sq. ft. of floor.	Depth of concrete. in ins.
10 to 12.....	3	6	40	1.8	4
12 to 16.....	4	6	40	1.8	4½
16 to 20.....	4	7½	40	2.25	4½
20 to 24.....	5	10	50	2.4	5½

For smaller spans than 10 ft. T-iron instead of I-beams will be used. In conclusion, it may be of interest to mention some tests recently made by the Austrian Society of Civil Engineers and Architects to determine the comparative strength of different systems of concrete arch floor construction. The Wuensch system was not included in these tests, but other tests made by the Hungarian Government show it to be far superior to the Monier system. These tests may be tabulated as follows:

	Brick.	Concrete.	Monier.	Melan.
Span.....	13½	13½	13½	13½
Rise.....	15¾	15¾	15¾	11
Thickness at crown.....	6	4	2⅜	3⅛
Lbs. iron used per sq. ft.....	..	..	8	4
Breaking load, lbs. per sq ft....	321½	737	839	3,360

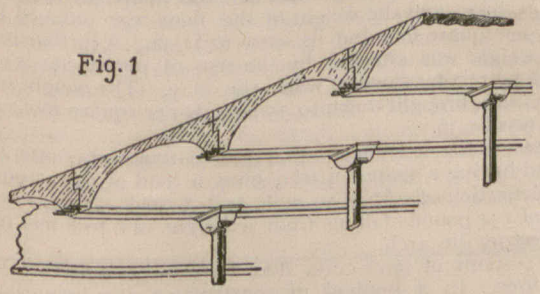
We are informed that in practice the relative strengths of the several arches when all are made of equal thickness are as follows: Brick arch, 1; concrete arch, 5; Monier arch, 16; Melan arch, 36. On the other hand, the relative thickness of different arches of the same strength would be: Brick arch, 12 ins.; concrete arch, 5 ins.; Monier arch, 3 ins.; Melan arch, 2 ins

CONCRETE CONSTRUCTION. *

On account of the small and very uncertain tenslie strength of ordinary concrete it has appeared to be entirely unadapted for horizontal beams of floors or any parts of a structure subject to other than compressive force, nor did it appear a hopeful field for investigation and experiment. However, many efforts have been made during the past 20 y ears to unite the tensile strength of iron with the compressive strength of concrete in such a manner as to secure the whole value of each material for its respective position. These experiments demonstrated many years ago the feasibility of the union, but the methods were more or less complicated, and wasteful of the more expensive material, iron, for which reason little use was made by the discovery until Mr. Earnest L. Ransome, of our city, invented and applied plain, square, cold, twisted iron bars for this work, and demonstrated clearly that this simple process was perfect in its results, even showing a much greater advantage than the original tensile strength of the iron. The present paper will contain notes of the principal work that has been executed in this vicinity and that has come under the writer's observation within the past few years.

The first example in point of time is the Bourn & Wise wine cellar at St. Helena, erected in 1888. This building is 400 feet long, 75 feet wide, and three stories high. The entire site is cut into the side of a gentle sloping hill and so arranged as to have driveways 15 feet wide along the entire length at the rear and at the levels of both first and second floors, while beyond the driveways and retaining walls are 13 tunnels, 16 feet wide, penetrating the hill about 200 feet. On the site of the building and immediately surrounding it were an abundance of boulders, of very hard basaltic

Fig. 1

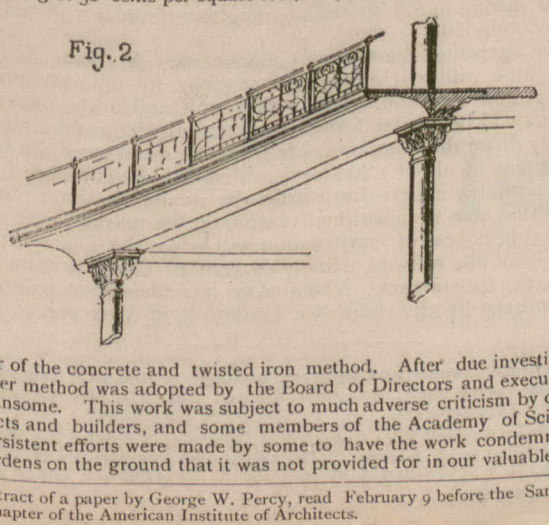


stone, quite unsuitable for rubble-stone work, owing to their rounding form, but excellent material for concrete when crushed; the finer materials were obtained in the form of gravel from a neighboring creek. A good quarry of the soft but durable volcanic tufa so common in Napa Valley was found within half a mile of the building, and as it could be quarried, hauled, and built into the walls for 17 cents per cubic foot it was employed for all walls and partitions of the building. The foundations, retaining walls, lining of tunnel entrances, and the main floor laid on the ground, were formed of concrete in the usual manner. The entire second floor, together with the driveway at that level, was constructed with concrete and twisted iron rods in the form of beams and elliptical arches, as shown in Fig. 1, and as here described. Two rows of iron columns 7 feet 4 inches on centre were placed lengthwise of the building, dividing the width into three sections of about 25 feet each. The floor was constructed with concrete beams 7 feet 4 inches on centers passing entirely across the building, with their soffits resting on the iron columns. The beams were 24 inches deep from soffit to surface of floor, and each had four 1¼ x 1¼-inch twisted iron rods near the bottom, with a vertical joint along the center of each beam, protected against leaking by a strip of lead embedded in each half of the beam. The arches between the beams were elliptical in form, and the concrete 5 inches thick at crown of arches.

The floor was estimated and intended to carry with safety on each beam, for each 25-foot section, two casks, each containing 2,000 gallons of wine, or a total weight, including cooperage, of 40,000 pounds, on each section 7′ 4″ x 25′, or about 220 pounds per square foot, uniformly distributed. The arrangement of the casks was intended to leave a gangway 8 feet wide in the center of each section, thus giving less stress than a uniformly distributed load. Before the building was finished one of these sections was tested with a uniformly distributed load of 300 pounds to a square foot, and produced a deflection of one-eighth of an inch at the center; on removing the load the beam returned to very nearly its original position. Since the building has been occupied many of the gangways have had tiers of large casks placed two in height along their entire length and smaller casks set between the upper bilges of the large casks, thus loading the floor largely in excess of its intended capacity. Implicit faith seems to be placed in this construction by those engaged upon it that it will carry anything that can be put on it. These floors have now been in use four or five years, and answer the purpose for which they were designed by making a strong and non-absorbing floor and assisting in keeping a uniform temperature throughout the building.

The next building of importance in which the writer employed concrete and iron floors was the California Academy of Sciences in this city. In this case a careful estimate of cost was made of the usual steel-beam and hollow tile construction, and compared with the cost of this method. The result was a saving of 50 cents per square foot, or $20,000 for the entire building,

Fig. 2



in favor of the concrete and twisted iron method. After due investigation the latter method was adopted by the Board of Directors and executed by Mr. Ransome. This work was subject to much adverse criticism by certain architects and builders, and some members of the Academy of Sciences, and persistent efforts were made by some to have the work condemned by fire wardens on the ground that it was not provided for in our valuable compilation known as the building ordinances. Several visits were made to inspect the work by parties connected with the Fire Department, but as they could not find anything about the construction that could be injured by fire, and had sense enough to perceive its great strength they declined to take any action in the matter. To satisfy all skeptics in regard to the strength of this work a test was made on a section of the second floor 22 feet span and 15 feet wide; this was loaded with gravel uniformly to 415 pounds to a square foot, and showed a deflection of one-eighth of an inch at the center of the beam. The load was left on this floor four weeks, and during that time many of the critics were invited to examine it. That very few availed themselves of the opportunity may indicate an unwillingness to have wrong opinions corrected. To those, however, who were directly interested in the work and had entertained honest doubts of its strength this test was satisfactory and conclusive.

The floors in this building were constructed with large beams about 15 feet apart and flat panels 8 inches thick between, with the plastering ap-

Fig. 3

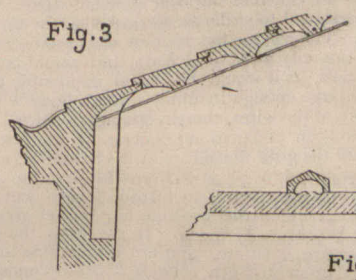


Fig. 4

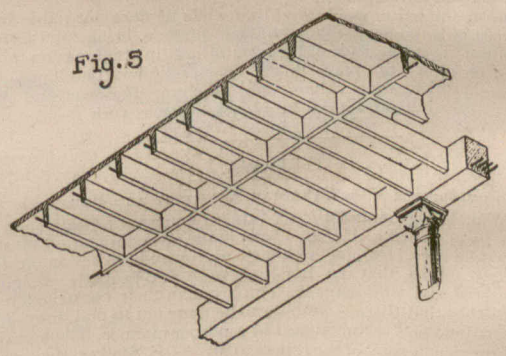
plied directly to the concrete and cornices run on the splayed sides of the beams, while the colored cement floor was laid directly on the concrete and marked off into tiles. The tension rods in these floors are hooked into wall anchors at the wall ends, and into holes cased in the flanges in iron columns at the other ends, while all around the large light well the rods clamp the iron columns together. After these floors were put in it was considered advisable to extend the floors 4 feet beyond the line of columns, thus narrowing the light shaft with balconies 4 feet wide all around. This was readily accomplished by placing the forms and filling in the concrete with ¾x¾-inch twisted iron rods near the top, placed 1 foot 6 inches apart, and extending from 2 to 4 feet into the old concrete (by cutting the grooves and grouting the rods), as it is evident the tensile strain is at the top in this example. (See Fig. 2.)

The Leland Stanford, Jr., Museum at Palo Alto is probably the largest most important building in the world constructed entirely of concrete. It was designed to have dressed San Jose sandstone for the external walls, backed up with brick, and to have brick partitions, with concrete floors. Owing to the great cost of stone work it was decided to build the walls of cement concrete colored to match sandstone used in the other university buildings, and to carry out the classic design first adopted. This led to making the entire structure, walls, partitions, floors, roof, and dome, of concrete, making it in that respect a unique building.

Having some knowledge of the disadvantages and defects natural to a monolithic building, such as result from the shrinkage and expansion and contraction of walls, floors, and roofs, several new experiments were tried to overcome them, with varying results of success and failure. It was thought to overcome the cracking of walls by inserting sheets of felting through the walls following the lines of the joints as near as practicable on each side of windows. The lapping bond of the concrete, however, proved too strong to ollow the cracking to follow these joints; in most cases the weakest points were found at the openings, and small cracks appear from window sills to head above.

Joints were formed through the floors about 15 feet apart, and in most cases the cracking has followed these joints and been confined to them. To prevent the possibility of moisture penetrating through the walls, and also to render them less resonant, hollow spaces 5 inches in diameter were

Fig. 5



molded in the walls within two inches of the inside face, and with about 2 inches of concrete between them. These are successful for the primary object, and partially so for the secondary.

The roof being the greatest innovation, and the first attempt known to the writer of forming a finished and exposed roof entirely in concrete, required the greatest care and consideration. The result in form and appearance is shown by Figs. 3 and 4 and is described as follows: The roof is supported on iron trusses 10 feet on center and has a pitch of 20 degrees. The horizontal concrete beams rest on the iron rafters and with half arches form the horizontal lines of tiles about 2 feet 6 inches wide with joints lapping 2 inches and a strip of lead inserted as shown. Vertical joints are made through the concrete over each rafter with small channels on each side. These joints and channels are covered with the covering tiles shown on drawings, and similar rows of covering tiles are placed 2 feet 6 inches apart over the entire roof, thus forming a perfect representation of flat Grecian tile or marble roof. Notwithstanding the precautions taken, this roof presented several unexpected defects. The most serious proved to be in the Venetian red used for coloring matter and mixed with the cement. This material rendered the covering tiles absolutely worthless, many of them slacking like lumps of lime, and all were condemned and remade. The same material injured the general surface of the roof, rendering it porous and necessitating painting. The roof over the central pavilion, being hidden behind parapets, is made quite flat and covered with asphaltum and gravel over the concrete. This roof, with its low, flat dome, is without question the largest horizontal span in concrete to be found anywhere on earth, being 46 x 56 feet, the flat dome having all its ribs and rings of concrete, with the

* Abstract of a paper by George W. Percy, read February 9 before the San Francisco Chapter of the American Institute of Architects.

panels or coffers filled with 1 inch thick glass, and weighing about 80,000 pounds. This structure, covering 21,000 feet, and containing over 1,100,000 cubic feet of space, and requiring about 260,000 cubic feet of concrete, was completed in seven months' time from the commencement of the foundations, and at a cost of about 18 cents per cubic foot of space. This the writer believes to be a very low figure for a thoroughly substantial and fireproof building with marble stairs and wainscoting, cast iron window frames and sashes, and other parts equally enduring, and would call attention to the fact that concrete walls with iron rods embedded, when cracked are not in the bad condition of stone or brick walls without bond, but the iron ties are always good to prevent spreading or falling, while several methods may be devised for allowing free expansion and contraction without producing unsightly cracks. Some such method should be employed on all finished structures.

One of the rooms in this building was designed to be the receptable of many valuables, and to render it burglar-proof the floor, walls, and ceiling had copper wires embedded in the concrete not over 3 inches apart, forming a continuous circuit, and designed to strike an alarm bell at the university if any wire should be cut. This device has been in use at the United States Sub-Treasury vaults in this city for several years, and would be very effectual for prison walls and cells, as it would be almost impossible to cut a hole through strong concrete large enough to admit a man's body without cutting or breaking one or more of the wires, thereby giving an alarm.

Other important works have been executed in concrete in this vicinity, among which may be mentioned the girls' dormitory at the Sanford University, a three-story building completed in 90 days from the time the plans were ordered. Also the torpedo station on Goat Island, 86x250 feet, with walls about 30 inches high, built under the direction of Colonel Mendell: and the addition to the Borax Works at Alameda. In the latter the walls, interior columns, and all floors are concrete, and are remarkable for the lightness of the construction and great strength. These floors are constructed as shown in Fig. 5. In these floors the clear span is 20 feet. The floor consists of beams 4 inches wide at bottom, 5½ inches at top, and 1 foot 6 inches deep from bottom beam to top of finished floor. The beams are placed 2 feet 6 inches on center and the floor over the beams is only 3 inches thick. A section of this floor 10x20 feet was tested February 28, 1893, with the following results: Before testing there was a uniform load of 195 pounds to a square feet, when the scale was set to indicate deflection.

With	234	pounds	per	square	foot, deflection.....	1-16 inch.
"	273	"	"	"	"	1-8 "
"	312	"	"	"	"	1-8 "
"	390	"	"	"	"	3-16 "
"	468	"	"	"	"	3-16 "
"	551	"	"	"	"	¼ "

This deflection is in addition to any that may have existed with the initial load. In November, 1893, the writer visited the building with Mr. H. G. Jacobs, Government Inspector of Buildings, and in our presence a test was made on a section of the third floor, that was selected as an apparently weak spot owing to several cracks showing on the ceiling. A sliding rod was adjusted under the center of the beam. There was a distributed load of about 200 pounds per foot at the commencement; 225 pounds per foot additional were applied, and the deflection noted was less than one-sixteenth of an inch. This type of floor appears to be the best form yet devised for obtaining great strength with the minimum weight of concrete and least expense of carpenter work, the forms used being standard size to be used over again. With the present price of materials and labor such floors can be built with 20-foot span of safe strength for 250 pounds per square foot, and with finished cement surface, for 45 cents per square foot, and without the finished floor surface for 30 cents per square foot. Level plastered ceilings may readilly be suspended from the beams and wood or tile floors laid over it, as in other methods of fireproof construction. This method of forming floors with the minimum of very rich concrete is lighter than the common method of steel beams and hollow tiles, for the same strength. The concrete should be composed of 1 part of Portland cement to 3 parts of selected aggregates.

The results given above are much better than could have been expected or hoped for a few years ago, and it is quite possible we have not yet reached the highest development.

In conclusion the writer would say, that while he does not think that concrete in any form is likely to take the place of stone, brick, and terra-cotta for architectural work, he feels quite certain that in combination with iron it is destined to fill a large place in the construction of buildings, and for warehouses, factories, wine cellars, etc., it is now the best and cheapest material for producing substantial and incombustible work.

OTTAWA.

(Correspondence of the CANADIAN ARCHITECT AND BUILDER.)

Messrs. Wm. Hodgson and W. C. Edy, architects, of Ottawa, at the request of the local Board of Health, have made an examination of the new Contageous Diseases Hospital buildings in course of erection on Porter's Island. They report that the buildings were not properly designed and that the material and workmanship employed in their construction are so inferior in quality that there is nothing to be done but to pull down the work that has been done and reconstruct it in a proper manner. The Local Board of Health have sent a copy of the report to Mr. G. F. Stalker, the architect of the buildings, with the request that he will make reply. In the meantime the Chairman of the Board has been authorized to stop the work, while the contractors are appealing to the Courts to either allow them to complete their contract or be released from it.

HALIFAX.

(Correspondence of the CANADIAN ARCHITECT AND BUILDER.)

Early in the present year regulations were adopted by the City Council for the plumbing work, and providing for the proper inspection of all work done within the city in future. Mr. F. W. W. Doane, City Engineer, was appointed Sanitary Superintendant, and Mr. Claude Donovan, Plumbing Inspector. From the annual reports of these officials it is learned that since the first of May, 1892, 460 houses have been connected with the main sewer, and 240 permits granted for building work. Some idea of the sanitary conditions hitherto existing may be inferred from the fact that out of 162 houses inspected on complaint not one was found in a sanitary condition. Referring to the sanitary condition of the city in the past, the Sanitary Superintendent says: "There where no inspectors, and closets were fitted up in every conceivable design and in all kinds of places without any provision for ventilation or particular attention to drainage. A favorite location was under the back stairs, from which position, under the mode of construction followed in the past, the poisonous gases from the drains easily found their way all over the house. The drain ran to a cesspit or an old stone drain in a filthy condition, and is some cases to the water pipe trench in the street. Often in some of the best houses there was no trap at all on the closet or waste pipe. These features and many others equally objectionable, may be noted on inspection of the plumbing work in three-fourths of the houses in the city, and yet our efforts to effect a reformation have been strenuously opposed. The plumbers are, I think, with one exception, willing and ready to do good work in accordance with our requirements."

FIRE-PROOF FLOORS.

In a paper recently read before the Civil Engineers' Club, of Cleveland, William Sabin describes the forms of fire-proof flooring most commonly adopted in America. The oldest method was to place floor beams about 5 feet apart and turn a 4-inch brick arch between them, the beams being tied together to resist the thrust of the arches. The space above the arches was leveled up with concrete, in which were embedded strips of wood for the flooring. The plastering was applied directly to the bottom of the arches and over the flanges of the supporting beams. When exposed to a fire, however, it soon cracked off, and a special tile skewback is now used. Such a floor weighs about 70 pounds per square foot, exclusive of the weight of the floor beams. Its cost in America is about that of terra cotta. In this case the beams were placed 6 feet to 7 feet apart, the tiles being 10 inches deep, and the weight of the floor was reduced to 40 pounds per square foot and its cost to $1.34. A further reduction of weight was effected by the use of porous terra-cotta, obtained by mixing sawdust with the clay. The weight of the floor was thus brought down to 35 pounds per square foot, while its cost was $1.36.

In a test made at Denver, an arch of porous terra-cotta 4 feet wide and having a span of 5 feet, bore a load of 15,145 pounds with a deflection of 0.65 of an inch, and it took 11 blows of a weight of 134 pounds falling from a height of 6 to 8 feet to entirely destroy the arch.

Both systems of terra-cotta floor have successfully withstood severe fires. In a method of construction now being largely adopted, the span of the floor is increased to 12 feet, and it is supported by 12-inch I-beams. Between these beams is strained a galvanized wire net, said to be capable of carrying 1,000 pounds per square foot. A centre board is fixed below this net, and the space between it and the top of the floor filled with a very light concrete, made with crushed coke, cork, cement, and a little sand. This floor is 8 inches deep, the bottom flanges of the I-beams being protected by carrying the cement around them. Its weight is only 18 pounds per square foot, the deflection being only one-half inch. Its cost is about $1.05 per square foot.

MANUFACTURES AND MATERIALS

CAPE BRETON MARBLE.

A company has been organized to develop the extensive deposits of marble at Marble Mountain, Cape Breton. The directors of the company are: Rod Macdonald of Macdonald & Co., Geo. E. Francklyn, of S. Cunard & Co., Robie Uniacke, president Halifax Banking Co., James B. Hattie, of Hattie & Mylius, Ald. Mosher, Henry Saunders, and G. Hobrecker. The directors have elected the following officers to manage the affairs of the company: President, Rod Macdonald; vice-president, George E. Franklyn: sec.-treasurer, Geo. Hattie.

The capital required to develop the property has been subscribed, and work is to be carried on under the supervision of D. D. MacLachlan, manager.

The marble which is to be worked may be classified as follows: Pure white, variegated blue and white, pink, blue, dappled and water white.

Nature has made it possible to produce this marble very cheaply. Its location near to a good place of shipment, while no power but its own weight is necessary to move the marble from the quarries to the wharf; its proximity to the Cape Breton coal fields; its perfect natural drainage and the abundance of sand for sawing in the immediate neighbourhood are advantages seldom combined.

Active operations have been commenced. A steam channeling machine, mill machinery and castings for derricks are all on the ground and the erection of a mill and other necessary buildings will be carried forward as energetically as possible. A tramway down the mountain side from the quarries to the wharf—a distance of about 1,200 feet—will shortly be completed.

The company expect that within the course of three months they will be able to place their marble on the market.

A road in course of construction will bring the quarry within five miles of the railway. Samples sent to Great Britain have given great satisfaction. The quarry has also been examined and approved by an expert, Mr. Underhill, of Vermont.

A handsomely printed and illustrated catalogue relating to Wilson's inside and outside rolling blinds, has been received from Mr. Geo. Clatworthy, Toronto, Canadian agent.

The Crown Pressed Brick Company of Ottawa are applying for incorporation; capital stock $100,000. The provisional directors are G. W. McCullough, H. L. Corbell, J. J. B. Butterworth, all of Ottawa, and H. Mills, of Ormstown, Que.

MODERN EXPLOSIVES.

The compositions of some of the modern high explosives are as follows :

Dynamite.—Seventy-five parts of nitro-glycerine and 25 of infusorial earth.

Dualine.—Eighty parts nitro-glycerine and 20 of nitro-cellulose (gun cotton).

Rendrock.—Forty parts nitro-glycerine, 40 of nitrate of potash or soda, 13 of cellulose and 7 of paraffine.

Giant Powder.—Thirty-six parts of nitro-glycerine, 48 of nitrate of potash or soda, 8 of sulphur, and 8 of resin or charcoal.

Mica Powder.—Fifty-two parts of nitro-glycerine and 48 of pulverized mica.

Tonite.—Fifty-two and one-half parts of gun cotton and 47½ parts of nitrate of baryta.

Blasting Gelatine.—Ninety-two parts of nitro-glycerine and eight of gun cotton.

Atlas Powder.—Seventy-five parts of nitro-glycerine, 21 of wood fiber, 2 of carbonate of magnesia, and 2 of nitrate of soda.

Rackback.—77.7 parts of chlorate of potash and 22.3 of nitro-benzol.

It will be noticed that nearly all the above explosives are composed principally of nitro glycerine ; and it is probable that in most cases the other ingredients only act as absorbents for this liquid, and really add nothing to the explosive force. The decomposition of nitro-glycerine is practically instantaneous, and the slower acting nitrates and hydro-carbons must be left far behind when the mass is exploded. The power of all these substances is due to the paradoxical element, nitrogen, which is by itself the most neutral and inactive of all the elements, but, when forced into chemical combination, usually confers an element of weakness upon the entire molecule of which it forms a part.

LEGAL.

In the case of Lantheir vs. Ouimet, which came up for hearing recently in the Superior Court at Montreal, the plaintiff asked that the defendant be ordered to remove a certain building which plaintiff alleged defendant had transferred from his (defendant's) house, and placed at one side thereof, and in close proximity to the line and division between their respective properties. The plaintiff alleged that by a deed of sale of the property in 1884 the defendant especially bound himself never to erect any building in proximity to the portion of the property thereby sold by defendant to plaintiff, which might be injurious to plaintiff in any manner whatsoever. The pretension of the plaintiff was that, by removing the building and placing it where it now stood, the defendant had violated the stipulation of the deed, the bullding shutting off plaintiff's view of the main road and spoiling the appearance of his property. The court was of opinion that the weight of evidence sustained the plaintiff's pretension, and the judgment ordered the defendant to remove the building, or, in his default so to do, that it be removed by the officers of the court.

PUBLICATIONS.

The Canadian Office and School Furniture Co., of Preston, Ont., have issued a new catalogue, which is attractively printed and contains numerous illustrations of office furniture of various kinds.

Our thanks are due and are hereby tendered to Mr. H. Sayward, Secretary of the National Association of Builders of the United States, for a substantially founed copy of the proceedings of the eighth annual convention of that organization.

Dr. Albert Shaw, editor of the Review of Reviews, contributes to the June number of that periodical an interesting four page illustrated description of the new National Library at Washington and a pen-picture of the Librarian, Mr. Ainsworth R. Spofford. The new building is fast nearing completion, and another year will probably witness its occupancy by the greatest collection of books on this side of the Atlantic.

VALUE OF A LABORER IN CONTRACT WORK.

There is no article that enters into contract work of so uncertain value as that of labor. In all the multitudinous things to be done on a large contract, labour is one of the most important for various reasons. The conditions of every kind of work change so that labor values can not be accurately gauged. The times of year in which work is done, the class of work, and the experience of the laborer at the different kinds of work, all make a case where the discrimination of the contractor must come into play to arrange a system of gauging the value of a man's labor on any given work. Some contractors contend that skilled laborers at advanced prices pay better than hiring indiscriminately any and every class of men who present themselves for labor work. In hiring untried laborers much can be saved by having a live foreman, who is good at forcing the men to work; yet there are men of so stupid a disposition that getting work out of them is next to impossible. A contractor of wide experience says that he can, by intuition, tell in a short time just what men are capable of doing, and that he can detect a shirk in short order ; as soon as he finds a man inclined to shirk, that he discharges him at once, and finds that it has a salutary effect upon the others. The difference in the amount of labor that one man can perform, compared with another of the same physical strength, is in the same ratio when one accounts for the payment of the two men, that from ten to sixty minutes loss per day on a laborer would foot up in the course of a week. In employing a large number of men, day in and day out, there is no doubt a great variety of difference in the results of the labor performed, and those results depend very largely upon the study that employers and foremen give to the subject of labor. The loss of 10 cents per day on a man's labor does not apparently amount to much ; but on a hundred men it is $10. Now 10 cents is a small amount to reckon as difference in value of one over another for 25 cents would be nearer the mark. One can see when he pays close attention to the labor on his contracts where one contractor comes out ahead of another by close attention to labor details. Quantities and qualities of material in contract work can be valued to the penny but labor cannot.—Eastern Contractor.

USEFUL HINTS.

IT is officially calculated in New York that the tall buildings erected in lower Broadway up to date, have added seventy-five acres to the business area of New York city above the sixth story.

Concrete sidewalks should be laid four inches thick, in two courses; first or bottom course three inches, second or finishing course one inch thick. The top should be laid before bottom is set. Prepare foundation on which to put concrete in good coarse gravel or chip stone, well rammed or levelled. Proportion for bottom, one part cement, four parts clean sharp gravel, mixing cement and gravel thoroughly in the dry state, and sufficient water from a sprinkler to make a dry mortar, place at once and thorougly ram down. For top mix one part cement and one part clean sharp sand; mix well before adding water, add water as above to the consistency of plastic mortar.

A STOPPING for wood, sometimes called beaumantique, can be made as follows: Put one tablespoonful of shellac, one teaspoonful powdered resin, a piece of bees-wax the size of a walnut, into a cup or iron pot, and set on the stove or in the oven until melted. For mahogany, add to it a little Venetian red, to match up the wood; for oak, add yellow ochre; for ebony or rosewood, add lampblack; mix it well up. It can be used while liquid, or it can be made into sticks like sealing wax, by pouring it on to a board, and rolling it with another board slightly warmed. If made up in sticks in this way, it is a good plan to have a variety of colors. When using, melt it over a lighted candle or gas-light, and run it into the place to be repaired; level off with chisel, and smooth down with glass-paper.

MICROSCOPICAL investigation has proved that the pores of wood invite the passage of moisture in the direction of the timber's growth, but repel it in the opposite direction. This accounts for a phenomenon which is often noticed, and which puzzles a good many people, namely, why two pieces of timber sawn from the same section of a tree sometimes appear to possess very variable degrees of durability. If the wood, say of a gate post, is placed right end up, the moisture in the soil will affect it, but the rain falling on the top will do little harm; if, on the other hand, the butt end of the tree is uppermost, the top of the post will decay, because the moisture of the atmosphere will penetrate the pores of the wood more rapidly in this position. Many people have noticed that the staves of a wooden tub appear to absorb moisture irregularly, some getting quite sodden while others remain comparatively dry, and apparently almost impervious to moisture. In this case the dry staves are in the position in which the tree grew, while the saturated ones are reversed.

PAGES

MISSING