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MISSING

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—THE—
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NOTICE OF REMOVAL.

Subscribers and advertisers are asked to note that on the first of May the branch office of the CANADIAN ARCHITECT AND BUILDER in Montreal will be removed to the New York Life Insurance Building.

THERE seems to be evidence that building in New York, which was so dull at the end of last summer that many offices closed up altogether, is becoming active again.

WE have received a letter of recent date from a contractor in Vancouver, B. C., containing some practical suggestions, and requesting that more space be given in this journal to such matters as more particularly concern the builder, naming mortars, concrete, stone setting, hoisting machinery, etc. We are now preparing some articles on these and similar lines, and in the course of the year will give our Vancouver friend and his fellow contractors reason to consider our promises in the January number well remembered.

MRS. CORNELIA COSTER, of New York, has died leaving a will which directs that the whole of her estate of a million dollars shall be applied to erecting a sepulchral monument to her memory in Woodlawn cemetery. If these are the terms of the will it will require some agility on the part of the law to sanction such a liberal interpretation as would admit of the erection of some memorial to fill a useful purpose. An exact fulfilment of the instructions would, if carried out in good taste, be a combination of conditions not usually required of architects to keep down the size of the structure without failing to spend the money on it.

THE Citizens' Advertising Committee of Toronto, who have undertaken to watch over the attractiveness of the city, have turned their attention in the right direction in resolving, at their meeting on April 7th, to endorse the immediate improvement of the island lagoons, and the construction of miniature waterways and electric launches. The island is a great natural advantage and boon to Toronto now, and one cannot pass through the lagoons without being impressed with the possibilities of further development. But, in dealing with an opportunity of this kind, so much depends upon treatment that it is to be hoped that whatever body takes the matter up will take good advice. It is only an artist who can improve on Nature—by studying her effects and giving her improved opportunities to produce them. It would be easy with a crude idea conceived chiefly on paper, to make of the island a place less attractive than it is now in the beauty of its partial wildness.

THE lecture on "Current Architectural Styles" recently delivered in the hall at the School of Practical Science, Toronto, by Mr. Helliwell, and published in the CANADIAN ARCHITECT AND BUILDER last month, has received much favorable comment. Our attention has been called, however, to a peculiar omission from the examples of recent work shown on the canvas to illustrate the lecture, and the names of architects whose work is worthy of study, viz., that not one Canadian architect was mentioned nor a single view of Canadian work shown. This omission was the more noticeable from the fact that a large number of contemporary English and American architects were mentioned and recent examples of their work shown. Whatever explanation there may be to offer for the omission, we would suggest that it was hardly fair to the architects of Canada and their work. Perhaps it was owing to the lecturer's

modesty, but if so we would encourage a feeling of more pride and assurance as perfectly justifiable in regard to the work of Canadian architects, who have no reason to discount their work or allow others to do so, and no opportunity should be unused of letting this be understood, whether in Association work, private practice or a public lecture such as the one referred to. We trust we shall have other lectures of a similar kind, in which we shall see and hear more about Canadian architects and examples of their work.

AN electric launch from the World's Fair has been introduced upon the Grand Canal at Venice and the trial has been pronounced successful. This time it cannot well be said that progress is not an improvement for, apart from the fact that the graceful movements of the electric launch will be more in harmony with the style of Venice than were the steamboats which are to be displaced, the damage to the marbles of the palaces from the contamination of the atmosphere by smoke, which Ruskin deplored, will be removed. The silent progress of the electric launches is also in harmony with the quiet of a city in which there is neither wheel or hoop and in which the noise of the little steamboats was an intrusion. But, and here there is another side to the question, the steamboats on account of their neces sarily large size, were confined to the Grand Canal (where in truth they have been a great comfort) but a storage battery electric launch can be built small enough to navigate the small canals, and the gondola is in danger. The gondola amply exhibited its inferiority at the World's Fair where it plied over the same ground as the electric launches. But this very inferiority may save it. To those who had seen the gondola at home and watched constantly with increasing delight the ease and rapidity with which it threads its way through the traffic on the narrow canals, the lumbering appearance it presented on the lagoons of the World's Fair was a surprise and disappointment. The apparent speed of the gondola at home turns out to be only relative to the obstruction it meets and the absolute speed of the electric launch may turn out to be too fast. It is perhaps safest to hope that it will, for we know that with the gondola the local flavour which should be present with the architecture, is safe.

ARCHITECTS in all countries will watch with a lively interest the developments in the struggle which the American Institute of Architects are making to bring about a reform in the manner of furnishing designs for United States Government buildings. With the exception of a few comparatively unimportant buildings, the designs for many years have been prepared in what might be termed the Government's machine shop for designs, known as the Supervising Architect's office. The people's money has been lavishly employed for public buildings, and the architects through their Institute show very clearly that many millions of dollars have been expended with the grossest extravagance and to no purpose but that of providing for the needs of political favorites. It is now about ten years since the A. I. A. began the present fight against the existing system. They so far succeeded that in March, 1893, a bill which had been passed by Congress was signed by the President and became law, providing for the opening of government designs to competition. For the last twelve months the A. I. A. have been making strenuous efforts to have this new law put into operation, but so far without success. The bill seems to have been passed without a mandatory clause, and its operation is largely discretionary with the Secretary of the Treasury Department. There has been a considerable amount of correspondence between the present incumbent of that office and the President of the A. I. A., in which some strong language has been used, and the result at this time looks like a deadlock between the government and the Institute as will be seen from the following letter from the Treasury Department to the President of the American Institute of Architects :

WASHINGTON. D. C., March 12th, 1894.

MR. D. T. C. BURNHAM, President A. I. A., The Rookery, Chicago, Ill.

SIR:—Your very offensive and ungentlemanly letter of the 9th instant is just received, and you are informed that this Department will have no further correspondence with you upon the subject to which it relates, or any other subject.

Very respectfully,

(signed) J. G. CARLISLE, Secretary.

The letter from Mr. Burnham which is characterized by the Treasury Department as offensive and ungentlemanly is written in very plain language and amounts to an expression of the opinion on the part of Mr. Burnham, that while the head of the Governmental Department addressed professes to be in sympathy with the architects and favorable to the new law, he is casting about for excuses to prevent its being of any effect. It is unfortunate that the controversy has been brought to such a conclusion. It may have been injudicious of Mr. Burnham to have written so candidly, but after reading the full text of the correspondence as published in the *American Architect* of the 7th inst., we think he is quite justified in holding the opinion which he has expressed.

THERE are many buildings in our cities built just on the street line or very close to it, and so roofed that dangerous snowslides are of frequent occurrence, and at other times icicles are formed overhanging sidewalks so that if not removed they are a menace to the safety of passers by. A lesser evil, although a very disagreeable one arising from the same cause, is the falling of water from choked down pipes and overflowing eave troughs, in such quantities that people are driven from the sidewalk in places to avoid a drenching. In some cities there are regulations intended to provide for the proper disposal of roof water, but there is not sufficient care exercised for protection from snow and ice. On business streets, or any other, no part of a roof should be constructed in such shape that persons on the sidewalk below would be in any danger of a sudden fall of snow or ice. For dwelling houses the simplest prevention is to keep them far enough away from the street line to insure snow or ice from the roof falling inside private ground. If people wish to risk their own heads or those of callers, by allowing snowslides to make a target of the front steps they may be entitled to that privilege, but the line should be drawn when it comes to endangering in this manner all who are obliged or may happen to pass their property. On business streets where buildings are of considerable height and in solid blocks, showy roof architecture counts for comparatively little, and it would be in the interest of public safety if there were regulations making avalanches of snow and ice from roofs to sidewalks an impossibility. In this climate roofs sloping toward the sidewalk, with cornices and eave trough overhanging the street line, should not be allowed. Whenever there are buildings so constructed and situated that there is danger of the kind mentioned, and we are prepared to point out many such, especially in the city of Montreal, the authorities should compel owners to put suitable snow guards on roofs.

BUSINESS people in all parts of the Dominion have been greatly interested during the past few weeks in the revised schedule of customs duties, as proposed by the government at Ottawa. In many respects the changes are not as great as some would advocate, but it is probable that those who favor the strongest measures of tariff reduction, were they in power, would be obliged to proceed cautiously. Those interests connected with new building work in its various branches will not be directly affected by the new tariff except in a slight degree, as the changes are few and small. In some cases there should be changes where there are none. We will mention only as an instance of this, the item of plate glass, on which the duty is entirely too high. This is an important item among building materials, and as the duty is in no sense protective but all for revenue, the charge of 30 per cent. should be reduced by one half. We will be glad to receive any expression of opinion from interested persons relative to the duty on this or other building materials. An increasing and continued activity among the building trades must come from demands for present necessities which are comparatively easy to estimate, and from a general feeling of strong confidence in the future prosperity of the country. Expectation of new tariff legislation always creates uncertainty and interferes more or less with steady industrial progress. As the extent of cause for this feeling of uncertainty and hesitation is generally magnified to undue proportions, building interests will no doubt be enhanced by the knowledge of what the new tariff is to be, and by the greater confidence it will inspire in the stability of the business of the whole country. Let architects, contractors and all interested in building work keep up united action on any questions affecting their welfare, and which may be entitled to more consideration, legislative or otherwise. In alluding to questions involved in tariff regulations we would urge the most careful attention to the great need for

a thorough change in provisions for valuing and collecting duty on imported designs and plans. So far, the result of the operations of the customs regulations in this respect appears to have differed very widely from that which the government intended. This is a matter which concerns not only the architects, but manufacturers and supply dealers as well. Canadian architects are familiar with domestic resources for materials of all kinds, and may be depended on to specify for nothing requiring importation unless in special and unavoidable instances. The relative positions of Canadian and foreign materials and manufactures is reversed when plans and specifications are prepared outside of the Dominion. The more firmly just claims in these respects are pressed the greater will be the respect and business commanded by our own people. On these lines there is still much need for thorough organization and persistent effort.

THERE are now about one hundred and sixty men at work at the new Toronto City buildings, and the number will be increased next month to over three hundred. Mr. Lennox, the architect, predicts that the building will be completed in about three years. An electric hoisting machine, operating a group of three derricks, has recently been added to the plant. As this is perhaps the first attempt to use electricity for this class of work in Canada, the result will be looked for with interest. When steam is superseded by electricity for this purpose, as it no doubt will be in a short time, the general public will appreciate the change through the absence from the streets where large building work is in progress, of the steam, smoke and noise of the old style engines.

ONTARIO ASSOCIATION OF ARCHITECTS.

The examinations of 1893 held in March resulted as follows:—

Final Examinations.—Passed, A. E. Wells.

Second Intermediate.—Passed, J. P. Mac Laren; conditioned, S. F. Smith.

First Intermediate.—Passed, C. J. Burritt, J. A. Heaman, M. White; conditioned, C. P. Band, J. L. Havill, C. P. Meredith, G. E. Stevenson.

THE ROYAL CANADIAN ACADEMY.

The annual assembly of the Royal Canadian Academy was held in Ottawa on the 30th day of March, and was largely attended by members and associates.

On the evening of the 29th the annual exhibition, held in the National Gallery, was opened by His Excellency the Governor-General, a large number of artists, their patrons and friends being present. The president, Mr. R. Harris, read a short address on the progress and aims of the academy, after which the assembly was addressed by His Excellency the Governor-General, and the exhibition declared open.

On the forenoon of the 30th March the last meeting of the Council of the academy for the year 1693-94 was held. At this meeting Messrs. D. B. Dick, of Toronto, and J. Hammond, of St. John, N.B., who had been previously elected as members of the academy, submitted their diploma pictures—Mr. Dick the perspective drawing of the new library for the University of Toronto, and Mr. Hammond an oil painting, "Herring Boats," both pictures being then on exhibition in the gallery. These were accepted, and both gentlemen were admitted to full membership. The Council also resolved to purchase several pictures then on exhibition for presentation to the National Gallery.

The following selections were made, viz., "A Song at Twilight," by F. S. Challener; J. L. Graham, "Across the Sea"; "St. Levan's Church, Cornwall," by F. M. Knowles; "A Brotles Interior," A. C. Williamson; "Bass Rocks," by J. M. Barnsley.

In the afternoon of the same day the general assembly was held, and after the reading of the reports and other routine business the meeting proceeded to the election of two painter academicians, the ballot resulting in the election of Mr. Cruikshank and Mr. Greer, of Toronto.

The following were elected as associates, namely, Franklin Brownell, Ottawa; W. E. Atkinson, Toronto; A. C. Williamson, Toronto; J. L. Graham, Montreal.

The following were elected officers for the ensuing year:

R. Harris, Montreal, president.

A. C. Hutchison, Montreal, vice-president.

J. Smith, Toronto, secretary-treasurer.

H. Langley, auditor.

The following members were declared the Council for the ensuing year: D. B. Dick, J. Hammond, O. R. Jacobi, L. R. O'Brien, T. Mower Martin, J. Griffiths, W. Raphael, T. S. Scott, A. H. Howard, F. M. Bell-Smith, A. D. Patterson, G. A. Reid.

In the evening the members and associates dined at the Russell House, and spent a very pleasant evening together.

It is generally admitted that the pictures exhibited on this occasion surpass in merit, as a whole, those of any previous exhibitions, Great care and judgment appears to have been exercised by the Hanging Committee in making suitable selections from the large number of pictures submitted for their approval. We are pleased to know that a number of the pictures have been purchased by residents of Ottawa, who have thus greatly encouraged the artists in their labors.

ILLUSTRATIONS.

ART INSTITUTE, MOUNT ALLISON LADIES' COLLEGE, SACKVILLE, N.B.—EDMUND BURKE, ARCHITECT, TORONTO.

THE art collection, consisting of some 400 canvasses and 100 pieces of statuary, to accommodate which this building is being erected, is a private collection gathered in St. John, N. B. It was given to the Mount Allison college at Sackville, on condition that suitable buildings be erected. The drawing and painting classes connected with the institution will also be housed in the same building, ample provision being made for a large number of pupils. The studios will be lighted by large windows facing north, while the galleries will be lighted entirely from the roof. The buildings will be faced with a light olive local stone. The decorative panels relieving the walls will be of terra cotta, with medallions bearing the names of noted painters and sculptors. The cost will be about $54,000.

DESIGN FOR A COUNTRY OR SUBURBAN HOUSE—BY "DEMOS."

The house is designed to face south, and it is assumed that the site is such that there is abundance of light and air on all sides. The ground floor comprises parlor, library, dining-room and kitchen, etc. An alcove, with fireplace, forms a feature in the library, and the verandah suggested forms a valuable addition to the house. Upstairs there are four bed-rooms and a bath-room, besides a small room which would serve for sewing or dressing room. In the attic there is ample space for three bed-rooms and a lumber room.

The regularity and compactness of this plan is such that the house might be heated by a hot air furnace very cheaply and effectively.

The cost of this design in execution is estimated at from $2,500 to $3,000, varying according to local conditions.

ST. LAURENT, ROUEN, FRANCE—FROM SKETCHES BY ANDREW T. TAYLOR, A.R.I.B.A., MONTREAL.

RELIEF ORNAMENT, AND WHERE TO USE IT—ELLIOTT & SON, TORONTO.

THE BATTLE CEMENT WORKS AT THOROLD.

From a special Trade Edition of the St. Catharines Standard, we extract the following particulars concerning the above works, and their founder and present owners:—The extensive quarries covering an extent of forty-four acres, are situated on the east side of the new canal. A steam drill is kept in operatian the whole year round, convenient tracks running from the quarries to the kilns, where the burning is done, and is then brought to the mill, situated on the old canal, where it is manufactured. Almost the first introduction of the cement manufactured by this firm was its use in the Victoria tubular bridge at Montreal. It was also used exclusively in the building of the old Welland canal and also in the new Welland canal. It was also extensively used in the construction of the great St. Clair tunnel between Port Huron and Sarnia. Forty hands altogether are employed. The mill is a three-story frame structure, fitted up with all the latest appliances necessary for carrying on the business, and is 150 × 50 feet in extent. The founder of the business, the late John Battle, was born in 1851, in the town of Ballymote, Sligo County, Ireland, coming to Canada in 1842. He settled in Thorold where he lived for half a century, lacking one year. He began life as a day laborer on the canal, but being industrious and frugal he soon accumulated sufficient to purchase a team, and so went on till he became one of the richest men in the district. The sons, Matthew, David, and James, are all natives of Thorold, where they are all highly respected. The latter gentlemen, is freely spoken of as the coming Conservatite candidate for the House of Commons.

LEGAL DECISIONS.

William Knox versus Armstrong & Cook, real estate agents, was an action in which William Knox, architect, of Cleveland, formerly of the firm of Knox & Elliot, Toronto, sued in the Toronto Courts to recover $200 for plans supplied to the defendants. The defence set up was that the houses were to cost $3,000, and to be finished by Dec. 1st, 1890, the architects to receive 3½ per cent. The plans they prepared were for houses that would cost $3,500 or $4,000. It was necessary to get new plans and the contract set up, was recinded by the plaintiff. The defence also put in a set off to the effect that Knox owes them on an old contract to buy two lots on Spadina avenue, in 1889, and also, that they hold an unsatisfied judgment, March 20th, 1893, for $202.30 writs which are now in the sheriff's hands. The set-off was put at $318.02. Judgment was given for the defendants.

These United States patents have been granted: Hot water generator for stoves, Aleck Saunders, Goderich; wood carving machine, Aleck Saunders and John Story, Goderich.

CORRESPONDENCE.

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

TORONTO INTERNATIONAL EXHIBITION, 1897.

400TH ANNIVERSARY OF THE DISCOVERY OF CANADA BY JOHN AND SEBASTIAN CABOT.

Editor CANADIAN ARCHITECT AND BUILDER.

SIR,—A suggestion has been thrown out by the Board of Trade of Toronto and by some of the daily papers concerning the above subject, but in such a spiritless way as to make it appear that the prime movers had but little anticipation of a satisfactory result being realized. It has occurred to the writer that the CANADIAN ARCHITECT AND BUILDER, with its wide circulation, is a most excellent medium for arousing sympathy, if not enthusiasm, for the project, and for helping to set the ball rolling.

There are two prime considerations in connection with any International Exposition, viz.:

1. Probable financial cost,
2. Probable financial return,

and these of course may be legitimately subdivided ad infinitum.

With respect to the cost of a prospective Canadian International Exposition—at the outset the fact of the Columbian Exhibition having cost upwards of $33,000,000 all told need not concern us in the least, either as to comparison or as to a final squelcher of the enterprise. The question simply is, are we able to produce an exhibit of creditable pretension that will pay? Let us forget for the moment the recent magnificent and unparalleled display and let us consider the approximate cost for us.

It was certainly thought in most circles that the Paris Exposition, which cost a trifle over $8,000,000, was such a tremendous success that America could scarcely hope to equal it, certainly not surpass it. But the wonder of the world was that the Columbian Exhibition not only equalled the Paris Exposition, but as far surpassed it as Paris surpassed the great exposition of 1851. Now, surely if the centre and pivot of European arts and culture considered the expenditure of $8,000,000 sufficient to startle the world, one-third of that amount would be more than creditable to a nation of five millions or so. Again, if the total expenditure of the Columbian Exposition was in round numbers say $33,000,000, then about one-twelfth part of that would be the amount in proportion to our population. And again, if Canada should expend about the same amount as was expended by Great Britain for the initial exposition of 1851, or for some of the following international expositions, it should and would be considered a very marvellous effort, and the money would more than return to us in many ways as an advertisement alone. The amounts of comparison are as follows, viz.:

One-third the cost of the Paris Exposition, '89.			$2,750,000
One half the cost of Columbian Exposition, '93.			2,750,000
Cost of London Exposition,		1851.....	1,460,000
" " Paris	"	1855.....	1,700,000
" " London	"	1862.....	2,300,000
" " Paris	"	1867.....	4,000,000

So that looking at either of the above examples of cost, to expend either of which amounts would be sufficient for Canada, the affair does not really assume such formidable and insuperable difficulties as one might have supposed. Take the average of the above as a basis upon which to consider what the cost of a Canadian International Exposition should be, and in round numbers the amount is $2,500,000, and even this amount is more in comparison for us than was $33,000,000 for Chicago, for we have at least a good $1,000,000 worth of buildings and land already in shape, while Chicago had to expend over $4,000,000 for works which we do not need so much to consider, i. e.,

Dredging.....	$ 600,000
Electrical plant.....	1,000,000
Docking.....	268,000
Statuary and fountain.....	725,000
Sewerage.....	926,000
Railway of Illinois Central Railway tracks and other Railway works.....	650,000
Total.....	$4,169,000

and scores of other large amounts. Can this country raise the amount required? and how? and would it be worth while so to do? are the all important questions. Off-hand then, suppose that

Toronto guarantees.....	$ 750,000
Ontario Government.....	400,000
Dominion Government.....	650,000
Other Provinces.....	250,000
Subscription in stock.....	750,000
	$2,800,000

Is there anything out of the way in such a position? The amounts are not gifts, but loans and guarantees. The stockholders would have their amounts returned in full with a dividend—the others probably in full. Supposing the cost of maintenance, premiums, judges, &c., should be say another $1,000,000—this would make a total of $3,500,000, which with our splendid nucleus at Exhibition Park, would carry us through in triumph.

Compare for a moment the extent of ground: We have more area in acres at Industrial Park than had many of the most successful International Exhibitions. The grounds at Exhibition Park may be easily added to so as to make at least 150 acres. Paris, 1867, had about 87 acres; Paris, 1878, had about 100 acres; Paris, 1889, had about 173 acres; London, 1862, Paris, 1855, London, 1857, all less than 25 acres.

Supposing an exhibition to be held in 1897, the works would be in preparation for three years, and Toronto's grant spread over that number of years, or $250,000 a year, would be no heavy burden considering the substantial benefits which would accrue to the city. It can readily be perceived that the above amount would be full enough to provide magnificent and adequate accommodation. Already the live stock buildings are perhaps unequaled on the continent, and with a small expenditure can be permanently made so. The main building ought in any event to be enlarged, and this could be done with advantage by adding T shaped ends in size about 200×125 feet. A large and commanding Liberal Arts' Building should find place at the north limit of the park, in size about 800 feet by say 250 or 300 feet, if the ground would allow. If all the small buildings were removed from the space north of the present main building and placed in some other part of the grounds, large new permanent Art and Horticultural buildings could be erected there to take up all the space, or nearly so. Two large buildings ought then to be erected south of the present main building and drive having a splendid avenue or court between them of 250 feet. These large structures would be approximately—for the western one, say 450×150 feet, and the eastern one 450 feet square.

Enlarge the poultry and dog houses so as to be the finest in America, or at least three times their present capacity. Remove the annex to some other portion of the grounds, and add to it by making a part of an H shaped building and with some few other minor additions, it will readily be seen how easily and economically we may avail ourselves of our resources.

It is a matter of great importance and interest to know that 30 or 40 acres additional may at any time be added to this very attractive park at an estimated cost of from $250,000 to $300,000 by building a jetty or pier southward in continuation of Dufferin street for about 1,000 feet and continuing same at right angles eastward for 2,000 feet, then sloping the bank and partially filling in the enclosed area, making artificial lagoons and islands with fountains. The islands would preferably be parallelogram in shape, as being easily formed. The islands and piers would be shaped with cribbing, and upon two of them Marine Exhibition and a permanent Aquarium, also perhaps an Electric Building, could be advantageously placed. The layout of the grounds as suggested, with the new water front with buildings thereon, backed in the high ground with the immense new Main Building, would make a most beautiful view from the lake.

There is really no need to fight shy of such an exposition, either as to considering our inability, or cost, or extent of ground required—for it must also be borne in mind that while no doubt many foregin nations will exhibit, they will not desire to do so so largely in Canada as they did in the United States. Further ground might still be required for concessionaries, and this can also be obtained to good advantage and at small rental by taking a central strip 300 feet wide out of the property north of the railway tracks to King street, which could be let out as a Hive or Midway Plaisance if you like, with of course special admission fees, thereby materially adding to the revenue. Access to this would be by a wide bridge over the railway tracks in line with the present main north drive.

The average attendance at Chicago and Paris was considerably over 100,000 per day. The smallest paying attendance for one day at Chicago was 10,791 the largest 729,203.

As Toronto is well situated in the line of travel we might well expect and count on an average attendance of at least one fifth of the Chicago Fair say 25,000 per day, which, with the receipts from the Midway Plaisance or Hive, and exhibition fees, &c., would give a much larger revenue than the calculated expenditure. And even if some extra expense was incurred and all the guarantee was not returned to the corporation and governments, save that the stockholders received in full with a dividend, what would it matter so long as the great result was a gain to Canada?

The arts and sciences would be stirred as by no other means; many millions would be brought into the country; manufacturers would be helped and more especially would the gain be great for the capital of Ontario. We have a magnificent country, a well governed Christian province, a beautiful city, and if all were well advertised who can doubt what a stimulus would be given to trade.

The result of such an exhibition would not be in the nature of a boom, with the following natural collapse, but a grand stable advertisement, much in the same way as our Industrial Exhibitions, only on a vaster scale: and following Industrial Exhibitions would be enormously helped, having so much more extensive and beautified grounds to operate in. To the painstaking Directorate of the Industrial Exhibition, the Board of Trade, and all others interested, therefore, this article is humbly submitted in the hope that the agitation may be kept up until something solid is produced.

HERBERT G. PAULL.

LETTER FROM THE SECRETARY OF THE NATIONAL ASSOCIATION OF BUILDERS.

166 Devonshire Street, Boston, Mass., April 3rd, 1894.

Editor CANADIAN ARCHITECT AND BUILDER.

DEAR SIR,—Enclosed please find list of such organizations in Canada as come within the meaning of our term "Exchange," as per my records. As to the standing and condition of these organizations I know nothing, their existence is all that comes within our statistics.

The other organizations in our records comprehend associations among architects, plumbers, plasterers, masons, carpenters, painters, lumbermen, steam and hot water fitters, electricians, etc.

I take the liberty of sending you by this mail a copy of my report to the last convention, to correct the statement in your editorial columns, clipping enclosed. You will observe by comparing your statement with my report that there is no foundation in fact upon which to base your observations. There seems to be little room for the implication that we are trying to claim affiliation from the Canadian Association. The "half dozen" you mention as being in affiliation are evidently the result of more incorrect information, as none of your exchanges are connected with our association. Yours truly,

WM. H. SAYWARD, Secretary.

[The list of Canadian organizations to which Mr. Sayward refers in his letter is as follows:

Builders, Contractors and Dealers Exchange of Hamilton, James and King William streets; secretary, William Hancock. Contractors' and Builders' Association, Hamilton, Ont., secretary, C. L. Smith, 177 West avenue north. The Builders' Exchange of London, Ont., Masonic Building; secretary, Herbert Simpson, 814 Dundas street. Montreal Contractors' Association, 99 St. James street; secretary, A. LaPierre, 107 S. Hubert street. Contractors' and Builders' Association of Ottawa, St. Andrew's Hall, Elgin street; secretary, William Northwood, 56 Rideau street. Builders' Association of Rat Portage, secretary, William R. Gerrie, Fifth and Main streets. The Builders' Exchange of Toronto, 16 Victoria street; secretary, John L. Phillips. The Builders' Exchange of Windsor, Ont., secretary, D. Willis Mason.

Several of these organizations, we regret to say, exist in name only. They should be made to form the nucleus of a strong, active and useful Dominion Association or of associations of a provincial character.—EDITOR C. A. AND B.]

TORONTO BUILDERS' EXCHANGE.

25 George Street, Toronto, 30th March, 1894.

Editor CANADIAN ARCHITECT AND BUILDER.

DEAR SIR,—In your last issue there appears a letter signed "Material Man," which embodies some reflections on the *esprit de corps* of the Builders' Exchange, and as its anonymity places each of the "supply" members under the possible imputation of its authorship, a general disclaimer may not be out of order. I have written the Secretary of the Exchange calling his attenion to the misstatements in the letter. Unfortunately there is no supply section in the Exchange, and this is solely due to the attitude of such persons as "Material Man," who will not frankly approach their so-styled fellow members, but assail the Exchange generally in such anonymous wails to the public as this letter in question contains. The efforts for five years past to form an association have failed owing to the anonymous violations of such conditions as could be agreed upon, and the present anonymous violation of good taste fairly represents the difficulty of combination. Let "Material Man" materialize himself and endeavor to organize his "fellow members." This he cannot do anonymously, nor outside the limits of the Exchange.

Yours sincerely,
ALBERT E. S. SMYTHE.

Editor CANADIAN ARCHITECT AND BUILDER.

SIR,—In the last issue of the ARCHITECT AND BUILDER a "Material Man" complains of not being fairly dealt with under what he terms regulations of the Builders' Exchange, and calls the attention of the Board of Directors to a matter of which I am sure they know nothing. Being a member myself, I can safely say that there are no such regulations of the Exchange, and therefore it is useless to call the Board of Directors' attention to it. If this "Material Man" is a member of the Supply Dealers' Section, why does he not complain to them or call on the secretary (who is ever courteous), and explain matters to him, and if he has been wronged it will surely be made right. If "Material Man" has such interest in the benefits of membership as he speaks of, he could have those interests better protected by making himself and his wants known at the Exchange than by writing "sore head" letters to the press, for even if such conditions as he refers to did exist the Board of Directors would want something more definite to work on than anonymous letters.

Yours truly,
T. CANNON, JR.,
95 Marion Street, Toronto.

THE COURT HOUSES AT WINNIPEG MAN., AND TACOMA, W.T.

LOMBARD STREET, WINNIPEG, MAN., March 22, 1894.

Editor CANADIAN ARCHITECT AND BUILDER.

SIR,—In the March issue of your paper your Winnipeg correspondent does me infinite honor in likening my little court house in this city, costing $70,000, to the edifice in Tacoma, costing—as appears from a telegram I have this day received—upwards of $300,000.

Dear me, what a wealth of detail could have been lavished on my small effort for the other $230,000! Even its alleged squattiness could have been obviated.

To quote your correspondents own words, "great minds have the same thoughts." I thank him humbly, very humbly. for his commendation, but I very much fear that, emanating as it does in this instance from an unsuccessful competitor, his opinion is deprived of much of its value.

Trusting to your courtesy in publishing the above letter, I have the honor to remain, your obedient servant,

CHAS. H. WHEELER.

[A portion of Mr. Wheeler's letter has been omitted as being foreign to the matter under discussion, and having a tendency to arouse personalities which contributors to these columns are requested to avoid.—EDITOR C. A. AND B.]

HOISTING MACHINERY.

THERE is probably no non-productive machine about a shop that earns as much, to put the matter paradoxically, writes J. H. Allen in the Illustrated Carpenter and Builder, as the crane. When we see a group of men working until every muscle is strained to the very limit of its endurance in attempting to lift a heavy casting into position on a lathe or planer, all in default of a suitable hand hoist wherewith one man could do the work in one-tenth the time with one-thousandth the actual exertion, we are disposed to look upon the proprietor of that shop as being an old fogey who is so far behind the times that it is a hopeless task for him to so much as make the attempt to catch up.

There is no shop so small, no business so poor, that should not have its complement of cranes and hoists. First of all there should be the self-sustaining hoist with a capacity equal to the heaviest of the probable requirements. When we come to the cranes they may be a simple ring in the ceiling into which the hoist is to be hooked, or the elaborate travelling crane. But for the small shop there are a multitude of simple designs that can be made at a low cost and which will serve their purposes most admirably. The most common is the straight bar, slightly curved up at the outer end, and suspended by a stay to the post, about which it swings. Old railroad iron seems to be the most suitable material for such a swinging jib. It has the advantage over the plain flat bar, in that the head and flange give it a lateral stiffness, so that it is not likely to buckle, and the unnecessary metal which it contains receives a compensation in the very low price at which it can be bought. Such a jib can be hung to a post or to the wall; the only care that need be taken is that the horizontal pull should be carefully calculated, so that it may not exceed the resistance of the wall and pull it down. It seems superfluous to call to the attention of our readers that the greater the distance between the point of attachment of the upper end of the stay and the heel of the jib, the less will be the horizontal pull on the wall.

Sometimes, however, there is no post or pillar near at hand, and the jib must be held by its own swinging post. Belts and machines may be thickly strewn around, and yet when the trolley cannot be made to serve, the swinging jib crane can usually be worked. It goes without saying that there must be some space in the floor and the ceiling above for stepping and fastening the post. So we first locate this, and then proceed to put in the longest jib that will swing over the desired arc and clear the belts. Of course, this is not long enough to pick up our work and put it where we want it; so we devise an extension jib. This can be done by building our main jib in two parts, and carrying a set of rolls flush with the bottom and top, and running our extension between the two parts, and taking the upward and downward thrusts on the rollers. If they are well put up and kept level, one will be surprised at the ease with which the heavily-loaded extension can be worked in and out, and the load swung in and around the belts, that at first sight would seem to preclude all possibility of the use of a crane.

When we pass beyond the domain of the simpler tools, it is doubtful if it will pay any proprietor to construct his own hoisting tools, unless he does it to keep his men busy in a dull season and to avoid breaking into the efficiency of his working force.

If the need arises for a peculiar construction of crane for doing a special piece of work, it is probable that someone has had the same need before, and that the shop of some crane builder will have the pattern to furnish just exactly what you want. The height of hoist, the weight to be hoisted, and the power available can all be combined, and the result will be a tool especially suited to your wants.

The first travelling crane with which we had to do was one of our own designing, and of home manufacture. Its capacity was ten tons, and its span 40 ft. A railroad shop received the benefit. It was operated by hand, it moved slowly, and the general manager thought it no good. But when he learned that with this infant the time required for putting a cylinder on the planer was dropped from an hour and a half with four men to five minutes with two he looked interested. When the time of taking an engine cab from its place and putting it on the painting scaffold was cut down from three hours to twenty minutes, he ceased to gibe at our little tool made of four by six pine sticks; and when he saw a boiler come travelling down the shop far above the impediments of the floor, he owned the tool to be a handy one, and before it had been in the shop a year, he OK'd a requisition for a power tool that would lift thirty tons and cost a very pretty penny. Such is the educational influence of small things.

WATERPROOF WALLS.

A USEEUL little brocure entitled "Szerelmey and Walls," says Building News, describes the cause and cure of damp and decay in masonry. The rationale of dampness in walls is interestingly illustrated by two experiments. The proportion of water soluble in air increases with the temperature, and thus it happens that when the air is cooled, being unable to hold the water it did when it was warmer, dew or mist is formed. A damp atmosphere is really present when the air cannot hold in solution the water it contains. Then there are some substances like chloride of lime, which have a great attraction for water, and withdraw from the air the moisture it contains. Walls of absorbent materials are always damp, even in a comparatively dry air. With the varying state of the atmosphere, moisture is continually passing in and out of stone, really causing disintegration of the particles. As most of our readers know, Szerelmey's process was, after a ong series of tests, and on the report of experts—amongst them Professor Faraday, Sir Roderick Murchison, Sir Charles Barry, and others—unanimously pronounced the best, and was tried on the Houses of Parliament. The ashlar walls of the Speaker's Court, to which the process was applied more than a quarter of a century ago, are in good condition. In 1875 the Szerelmey process underwent revision, and a new product, called "Szerelmay Stone Liquid No. 101" was introduced, and the older compositions are no longer made. By interposing a waterproof layer or coat between the wall and the source of damp, the water is arrested. An internal treatment is useless; so are substances which chemically combine with the masonry, or injure the stone. Ample evidence is accorded which shows that the liquid can be used for porous stone, brick, plaster, and similar walls. The stone liquid is laid on the outside of the wall with a common brush by any painter, and it sinks easily into the wall and waterproofs it. It is first stirred, then rubbed on, and Szerelmey's steel-wire brush is recommended. This stone liquid has now been in use for 18 years, and the reports appended numbering so, selected from scientific men, the clergy, managers of public companies, architects, builders, and painters show the efficacy of this remedy, which has been established by the test of time.

STUDENTS' DEPARTMENT.

"CANADIAN ARCHITECT AND BUILDER" STUDENTS' COMPETITION.

SEVERAL additional designs have been received in this competition. In a number of instances, however, students have expressed dissatisfaction with the proposed method of deciding the competition, and in the case of some this objection was so strong as to prevent them from taking part. In view of this, it has been thought desirable to abandon the idea of deciding the competition by a vote of the students, in favor of the method heretofore pursued in competitions of this character. The designs submitted will therefore be referred to a commitee of three architects to be selected by the Toronto Architectural Guild, who will adjudicate upon them, and whose report thereon, together with the design that shall be given first position, will be published in the May number of this Journal.

In this connection, will the author of the design with the nom de plume "Toledo," kindly forward his name and address to this office, in order that he may be entered on our list of subscribers, and the subscription which he forwarded placed to his credit.

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.

[14]. Would it be safe to build a chimney of a factory of sandstone? The height would be probably 200 feet. Is the stone strong enough not to crush in the lower courses?—ASPIRANT.

[15]. Could you solve for me this problem in foundation work? The site for the proposed building is half limestone and half clay. The limestone crops out at an angle, roughly, of 45°, and the clay seems to lie on the tolerably smooth side of the limestone. So far as I have been able to test the formation there does not appear to be any ledge on the limestone which would serve to hold the clay; none at any rate for a depth of 20 feet. I fear lest the clay should slide on the limestone with the weight of a building. What kind of a foundation ought I to use?—PREDICAMENT.

[16]. What is the weight of snow in a slushy condition? How much extra weight ought to be allowed for in the construction of a large flat roof in addition to the ordinary allowance for snow, where it might be difficult to get the snow off before it thaws? FROSTY.

[17]. Is there any rule, or where could I find a rule, for making a sun-dial? I think an answer published in your columns would tend to make the sun-dial more popular.—J. L. T.

[18]—1. Will you kindly let me know if there is such a thing as a durable paint by means of which brick could be given their natural whitish colour, and if so, should the brick be rubbed level before the paint is put on? 2. What paint should be used to blacken the mortar used occasionally in putting up brick buildings.—CHARLES SCHURLER, Mildmay, Ont.

ANSWERS.

[9]. "Budding Architect"—Here is a suggestion: 1. "Ferguson's Hist. of Architecture," Students' Edition; 2, "Notes on Building Construction," S. Kensington, latest edition; 3, "Building Construction," Clarke; 4, Binns' "Orthographic Projection"; 5, Paley's "Mouldings"; 6, Gwilt's "Encyclopedia." —OLD BOY.

[10]. J. B. M.—It would hardly be possible to give an answer to your question which would be certain to answer; the only way is to try one or two remedies. Coal tar, applied with a large flat brush, boiling hot, in two or three coats would probably waterproof the stone sufficiently. Boil two or three gallons at a time and set it alight when boiling. Stir continually while blazing. This will reduce the volume, and as it cools it becomes pasty, in which condition it is ready for application, but it must be boiled up for use.

[11]. My suggestion of a "reading club," or "circulating architectural journal club," or whatever it might be called, has not apparently met with a favorable reception. I should have suggested such papers as The Building News, The Builder, and such papers as are not regularly taken by the principals in our offices, but unless there is in next issue a demand for such a "club," I shall drop it. The expense need not be more than a dollar per member.—G.

[12]. A simple and thoroughly effective way of preventing the rushing of snow off a roof is the placing of iron hooks at intervals of 4 feet all over the roof in rows about 2 ft. or 3 ft. apart. These hooks hold up the snow so that it thaws gradually, and when it slips, it does so in sections, which make little noise and fall lightly.—B. X.

[8]. "Architect"—The answer given by "Architectus" to your question on "telling good cement from bad," is not satisfactory, the methods he suggests being too crude and out of date. Use cement of home manufacture, then you can get at the maker if they are not as satisfactory as represented. "Faiza" on the manufacture and use of Portland cement is a work you should read.

ANS.—[18.]—1. Do not rub the surface of brickwork before painting, except with a dry brush to remove dust or loose dirt. Good lead and linseed oil paint will be the most durable for the kind of work mentioned. The best color effect will be obtained by a practical painter mixing the tints to suit the condition of the work. This will vary with different bricks and locations. First coat with pure oil or very little color, followed by two coats in the ordinary way. 2. For mortar color the only safe thing is to use one of the best brands of the manufactured article, which may be obtained from firms whose names will be found in our advertising pages.

USEFUL HINTS.

RESIN is utilized for making the varnish used by Venetian blind manufacturers for painting their blinds. This varnish is mixed with the desired color, mostly green, and when painted gives a hard gloss enamel surface.

Radiation of heat is diffusion of heat by projection of it into right lines into space, from a body having a higher temperature than space surrounding it, or body or bodies enveloping it.

In painting houses situated at the seaside, a good deal of trouble is frequently experienced because of the action of the salt and fog upon paint, especially when it is first applied. A practical painter recommends that no paint shall be applied to work situated at the seaside until the sun is well up, in which case the wood will have had a chance of getting dry. Ochres or earth paints should not be used for priming as they are likely to be attacked by mildew, especially where boiled oil is employed as the vehicle.

Animal and vegetable substances with fine fibres, such as air, cotton, felt, wool, fur, are the slowest or worst conductors of heat, owing chiefly to their interstices being filled with air, which is a still worse conductor. Wood, sawdust, chalk, sand, stone and brick are slow or bad conductors of heat. Brick work, of either common brick or fire brick, is a bad conductor of heat. Non-conducting coverings, for preventing radiation from steam pipes, steam cylinders and steam boilers, are composed of materials which conduct heat slowly.

The painter is often credited with a great deal of the shortcomings of the carpenter, and this fact renders all contracts for painting more or less uncertain. A price may be given in that would yield a profit if the paint were applied to properly finished work, but when it is applied to wood that is knotty and sappy, or full of cracks and holes, it of course has to be made good before the paint can be put on, and this means considerable labour and expense. Such defects are more likely to occur in cheap work than in high-class work, so that in estimating on inferior jobs it is always well to leave a broad margin to cover such items.

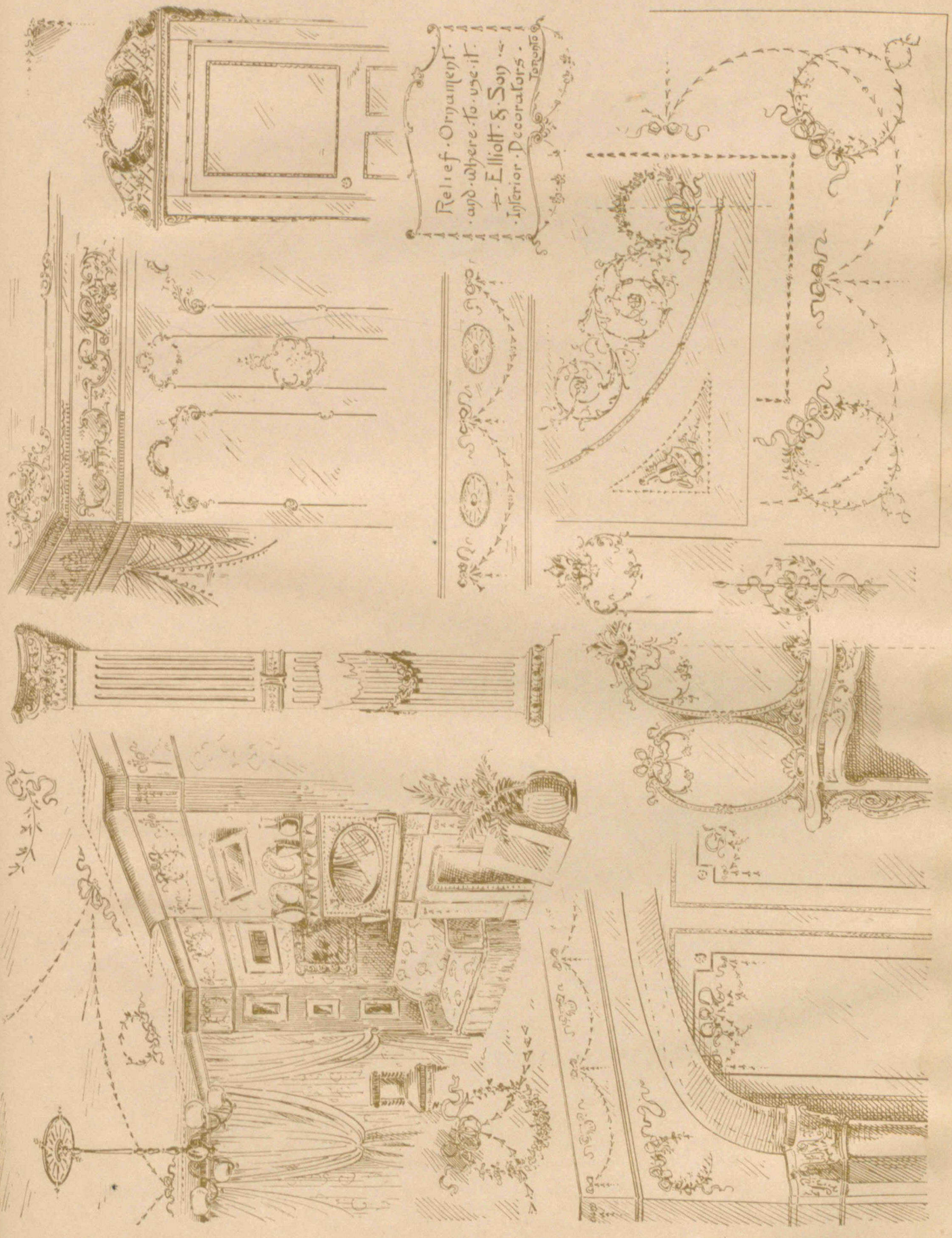
The best method of comparing two samples of pigment together for tint and brilliance is as follows:—Procure two glazed porcelain tiles, one black for whites, pale yellows, greens, and pale colours generally; the other white for blacks and dark colours generally. A little of the sample is taken upon the point of a pallette knife and placed on the tile, and a similar quantity of the "standard" samples taken and placed close to the sample on the tile; the two heaps are then pressed by means of the knife so as to obtain a flat, smooth surface on the samples, and by holding them up nearly on a level with the eye and looking along the surface of the heaps of colour; by these means any difference in the shade of the two samples can readily be detected.

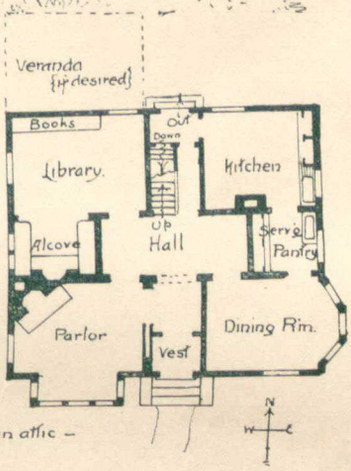
In a paper on the purification of the air in public buildings and dwellings, read before the Society of Arts by Mr. Wm. Key, an apparatus was described for filtering and washing the air. It consists of a screen formed by stretching some thousands of cords of suitable material from the ceiling to the floor of the air chamber. The cords touch each other and are interlaced horizontally with copper wires, which are drawn tight to give the screen a flat surface, so that it has the appearance of coarse cloth. Air passing through is broken up into minute streams, and is washed free from impurities by water trickling down the cords. Experiments showed that not a particle of the densest fog passed through the screen, the air being filtered "bright and clear, perfectly sweet, and free from odor." Dust particles were not so perfectly removed, but it was noticed that after removal of fog, the air was so much brighter and clearer than usual as to suggest that the artificial production of fog might ensure the complete removal of very minute dust particles.—Scientific American.

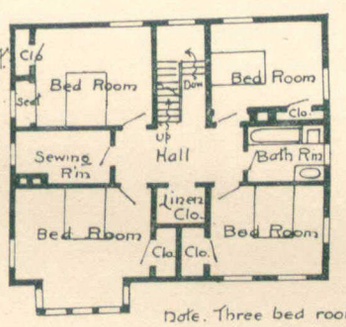
The effect of different beds in making compression tests of stone has been investigated by Prof. Malverd A. Howe, of the Rose Polytechnic Institute. Cast iron, soft pine, sole leather, sheet lead, and tar board were tried, and the results indicate that to obtain the best idea of the comparative strength of stones, the specimens should be cut with perfectly parallel plane ends and tested between parallel iron or steel plates. As this calls for considerable labor and expense, other materials may be used, but the results were not accurate. Sheet lead seems to distribute the pressure well, but lowers the strength, as registered, by an undetermined amount, depending on the structure of the specimen. Pine splits so easily as to be undesirable. Tar board was found to distribute the pressure very well, but raises the registered strength of the specimen; in spite of this defect Professor Howe believes it to be the most reliable bed for commercial tests of the five materials examined. This conclusion is based upon but 80 experiments, but is considered warranted by the uniformity of results and conditions.

CHARACTERISTICS OF VARIOUS WOODS.—It has long been known that certain woods possessed capabilities fitting them for particular classes of work; but a concise table of collected data on this point will be found useful. The woods noted for elasticity are: Ash, hickory, hazel, lancewood, chestnut (small), yew, snakewood. Elasticity and toughness: Oak, beech, elm, lignum vitæ, walnut, hornbeam. Even grain (for carving or engraving): Pear, pine, box, limetree. Durability (in dry works): Cedar, oak, poplar, yellow pine, chestnut. Furniture: Beech, birch, cedar, cherry, pine, whitewood. Best Furniture: Amboyna, black ebony, mahogany, cherry, maple, walnut, oak, rosewood, satinwood, sandalwood, chestnut, cedar, tulipwood, zebrawood, ebony. Building (ship-building): Cedar, pine (deal), fir, larch, elm, oak, locust, teak. Wet construction (as piles, foundations, flumes, etc.): Elm, alder, beech, oak, plane tree, white cedar. House building: Pine, oak, whitewood, chestnut, ash, spruce, sycamore. Machinery and millwork (frames): Ash, beech, birch, pine, elm, oak. Rollers, etc.: Box, lignum vitæ, mahogany. Teeth of wheels: Crab-tree, hornbeam, locust. Foundry patterns: Alder, pine, mahogany.—Illustrated Carpenter and Builder.

The death is announced of Mr. Thomas Cuthbertson, the well-known architect, of Woodstock, Ont., which occurred about a fortnight ago.


Relief Ornament
and where to use it.
E. Elliott & Son
Interior Decorators
Toronto

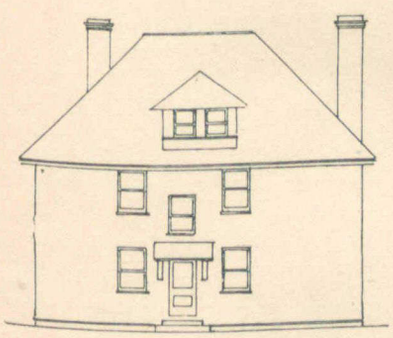




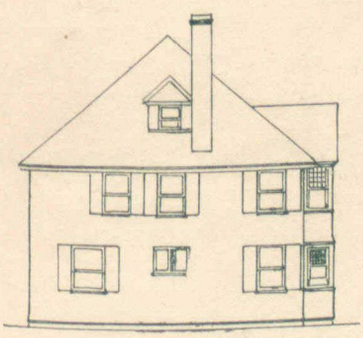
Scale for South and East Elevations:— 20 ft.

Note. Three bed rooms and lumber room in attic —

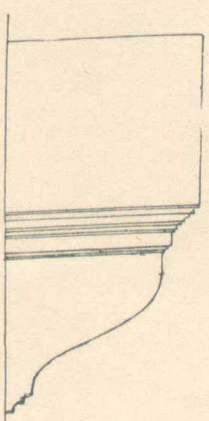
Scale for plans etc 20 ft

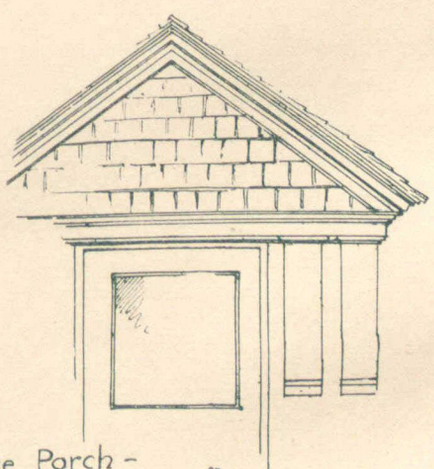


— North Elevation —



— West Elevation —



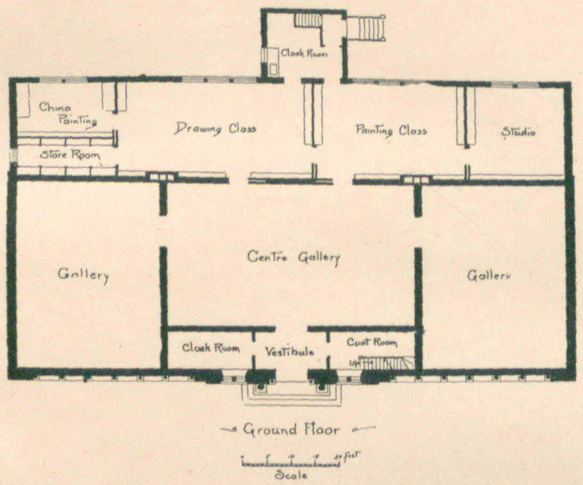


— Detail of Entrance Porch —

Scale — 3 ft

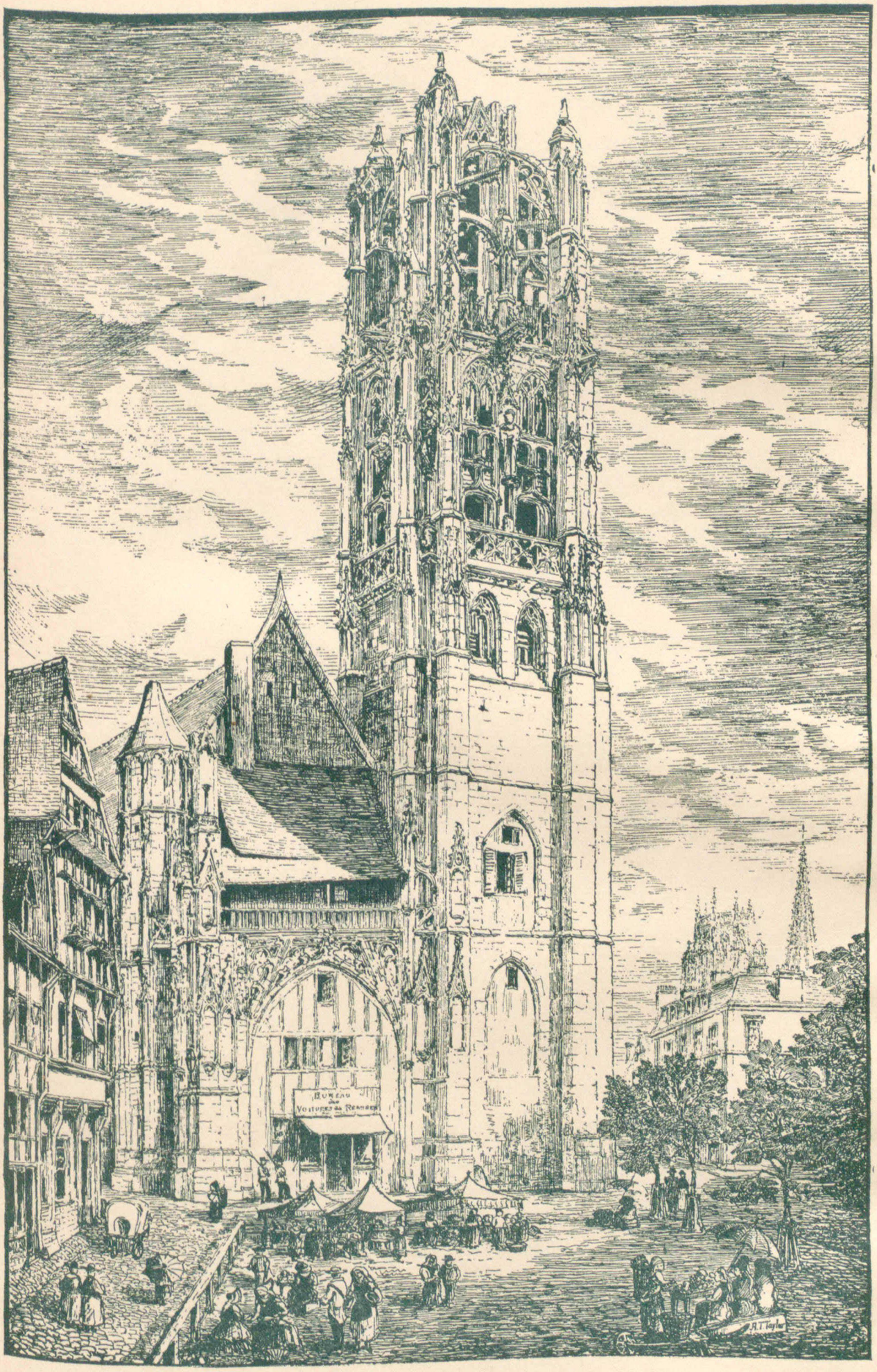
"Demos"

DESIGN FOR A COUNTRY OR SUBURBAN HOUSE.



ART INSTITUTE, MOUNT ALLISON LADIES' COLLEGE, SACKVILLE, N.B.

EDMUND BURKE, ARCHITECT, TORONTO.



ST. LAURENT ROUEN, FRANCE.

FROM SKETCHES BY ANDREW T. TAYLOR, F.R.I.B.A.

WINNIPEG.

(Correspondence of the CANADIAN ARCHITECT AND BUILDER.)

The Provincial Government have decided to erect a new Court House at Portage la Prairie, and build an addition to the jail there. Mr. George Browne, architect, has charge of the work. The buildings are to be of local brick, on stone foundation, with trimmings of Calgary stone, and heated with hot water. The present court house was erected in the early days, and is now in a very dilapidated condition as well as inconveniently situated, being at the extreme east end of the town, some distance from the business portion, owing to the latter having moved west after the fire swept the then business centre a few years since.

Building promises to be brisk in the "Portage" this summer, for besides the above buildings, there are to be erected two brick school buildings, a large store for the Hudson's Bay Company, and a post office as well as several residences. Mr. Smith Curtis is at the head of an excellent scheme for widening the water power of the Assiniboine river, and turning the useless slough into a useful lake which would make the town a favorite summer resort, and provide a delightful place of retreat for the weary worker.

The fine weather we have been enjoying the last week or two, has helped to stimulate one another into good works, or at least to project them, for parties who propose building, are now rushing their plans forward, in order to have the contracts let before there is a rise in prices, which is supposed will take place as soon as the season opens up.

If an arrangement can be made with the Dominion Government for the support and education of the deaf and dumb, of the Territories, they will be brought there and the deaf and dumb building will be enlarged to accommodate them, an appropriation of $10,000 having been made for that purpose at the last session of the Provincial Legislature.

MONTREAL.

(Correspondence of the CANADIAN ARCHITECT AND BUILDER.)

Messrs. Dunlop & Heriot, architects, have designed for St. George's church in this city a new and graceful tower to be over 100 feet high and in the perpendicular style, delail in the early decorated style to which the church belongs.

The Hon. Mr. Nautel, Minister of Public Works for this province has instituted an action for $10,000 libel against a weekly paper of Quebec which insinuated that the expenses of his present trip to the Holy Land were being defrayed by the contractors of the Montreal Court House.

It was recently enacted by the Legislature of this province that every advocate, notary, physician, dentist, land surveyor, civil engineer, veterinary surgeon, artist, painter, musician, sculptor, and architect, practising his profession within the limits of the province, shall pay an annual tax, the amount whereof shall be that indicated in the following tariff:—If he has his principal office or place where he exercises his profession: *a.* In the city of Montreal or Quebec, six per cent. on the rent or annual value of such office or place; *b.* In any other city or town, $6; *c.* In any other municipality, $3.

The following requirements for specifications for concealed incandescent wiring in houses under construction have been adopted by the Montreal Electric Club, and are recommended for use by Canadian architects:—

1. All wire used must be rubber covered and equal to either Habirshaw, Grimshaw or Bishop.
2. No gauge smaller than No. 16 B. & S. shall be allowed to be used.
3. Wire for 52 volt current, on two wire principle, loss not to exceed two per cent.
4. All joints to be well made and properly soldered, and shellaced, covered with a layer of rubber tape, also with an outer covering of good black friction tape.
5. Place necessary cut outs as required by Board of Fire Underwriters rules, the same to be on slate or porcelain bases and double pole.
6. Where wires pass through walls and floors they are to be protected by an extra covering in the shape of a durable and moisture proof insulating material, excepting soft rubber tubing, equal in thickness to the insulation on the wire.
7. Where wires run along ceilings and walls, they must be kept at least two and one-half inches apart; where passing through holes in the walls and flooring, each wire must have a distinct hole for itself.
8. All speaking tubes, gas pipes, and metallic substances of like nature are to be avoided, but where it is necessary to cross same, the wires must be bridged over with wood or hard rubber tubing. If the pipe is for hot water or steam, an air space of at least 4 in. is to be allowed between wires and pipes. All wires crossing water pipes should pass over said pipes if possible or be protected from drip.
9. Outlets for single pole switches may be left where there are not more than 8 amperes to be controlled; where there are more than this quantity the outlets must be arranged for double-poled switches.
10. No staples or metallic fastenings will be allowed for holding wires in place.
11. Outlets must be taped when passing through plaster.

Place outlets as follows:

The Electric Club in a circular to architects, add the following by way of suggestion:—

We might also suggest that electric work (even electric bells) be placed on a separate tender. This will not stop any reputable plumber, who does electric work, from tendering on either electric light or electric bell wiring, whilst it will stop subletting the electric bell work or electric light work, thus causing a double profit to be added to same by those plumbers who do not. The above remark we have thought in season seeing that it is customary with some architects to place electric bell and annunciator work, and sometimes electric light wiring, even, in the regular plumbers' specifications along with gas and steam fitting.

PUBLICATIONS.

"The Progress of the World" of the April Review of Reviews contains a timely discussion of the question why the English game of politics is more exciting than the American game. Other topics are, the Seigniorage bill, filibustering in Congress, the outlook for bimetallism, the Wilson bill in the Senate, the Senate report on Hawaii, the triumph of the Brazilian republic, the fight against the House of Lords, the Russo-German commercial treaty, the death of Louis Kossuth, and many matters of international interest.

A siccative material is any compound which, added to linseed oil, either hot or cold, hastens its drying qualities, which are naturally slow, and renders its use in painting and varnishing practicable and efficient. Liquid drier is simply a concentrated boiled oil. The most reliable form of drier is a compound of bases having the property of several oxides and series of salts.

QUEBEC MECHANICS' LIEN ACT.

On the 8th of January last the Legislature of the Province of Quebec gave its assent to the following amendments to Chapter 46 of 57 Victoria, relating to the privileges of builders, labourers, workmen and suppliers of materials, which are here printed for the information of contractors doing business in Quebec.—

1. Paragraph 7 of article 2009 of the Civil Code is replaced by the following:

"7. The claim of the labourer, workman, supplier of building materials and builder (chief contractor), subject to the provisions of articles 2013."

2. Article 2013 of the said Code is replaced by the following articles:

"2013. The labourer, workman, supplier of building materials and the builder (chief contractor) have a right of preference upon immovables, to the amount of the increased value given by the work done or materials furnished, over any other creditor except the creditor having one of the privileges mentioned in the first six paragraphs of article 2009 (1) and shall further have a preference over all chirographic creditors upon the said immovables.

"2013*a*. The privilege of the labourer, workman, supplier of the materials and builder (chief contractor) ranks as follows:

1. The labourer;
2. The workman;
3. The supplier;
4. The chief contractor.

"2013*b*. The right of preference or privilege upon the immovable exists as follows:

1. Without the registration of the claims in favor of the debt due the labourer, workman, supplier of materials and the builder (chief contractor), during the whole time they are occupied at the work or while such work lasts, as the case may be; and with registration, provided it be registered within the thirty days following the completion or the cessation of the work;

2. But such right of preference or privilege shall exist only for two years from the date of the registration, unless a suit be taken in the interval, or unless a longer delay for payment has been stipulated in the contract.

"2013*c*. The preservation of the privilege is subject to the following conditions:

1. The labourer and workman must give notice, in writing, or verbally before a witness, to the proprietor of the immovable, that they have not been paid for their work, for each term of payment due.

Such notice may be given by one of the employees in the name of all the labourers or workmen who are not paid.

2. The supplier of materials shall, before delivery of the materials give notice in writing to the proprietor of the immovable, of the contracts made by him for the delivery of materials, and mention the cost thereof and the immovable for which they are intended.

3. The sub-contractor shall, within eight days from the signing of the contracts, also inform the proprietor or the *bailleur de fonds*, or either of them, as the case may be, or his agents, of the contracts he has entered into with the chief contractor.

"2013*d*. In order to meet the privileged claims of the labourer, workman and supplier of materials, the proprietor of the immovable may retain an amount equal to that which he has paid or will be called upon to pay, according to the notices he has received, as long as such claims remain unpaid.

"2013*e*. In the event of a difference of opinion between the creditor and the debtor with respect to the amount due, the creditor shall, without delay, inform the proprietor of the immovable, by means of a notice which shall also mention the name of the creditor, the name of the debtor, the amount claimed and the nature of the claim.

The proprietor retains the amount in dispute until notified of an amicable settlement or a judicial decision."

3. Article 2103 of the said Code is replaced by the following articles:

"2103. The privilege of the persons mentioned in article 2013 dates, in the cases mentioned in paragraph 1 of the article 2013*b*, only from the registration, within the proper delay, at the registry office of the division in which is situated the immovable affected by the inscription of a notice or memorial drawn up according to form A, with a deposition of the creditors sworn to before a justice of the peace or a commissioner of the Superior Court, setting forth the nature and the amount of the claim and describing the immovable so affected.

2. In registering such memorial, it is sufficient to mention, opposite the official number of the cadastre which describes the immovable, if the cadastre be deposited, or opposite the title of the registered deed, if the cadastre be not yet deposited, the name of the claimant and the amount due at the time the memorial is filed.

3. The memorial shall be made out in duplicate, one copy of which shall remain in the archives of the registry office and the other be delivered to the creditor with the registrar's certificate thereon.

4. The creditor shall, within three days from the registration of the memorial, give a written notice to the proprietor of the immovable, or to his agent if he cannot be found.

"2102*a*. The sale to a third party by the proprietor of the immovable or his agents, or the payment of the whole or a portion of the contract price, cannot in any way affect the claims of persons who have a privilege under article 2013, and who have complied with the requirements of articles 2013*a*, 2013*b*, 2013*c* and 2013 of this Code."

4. All articles of the Civil Code inconsistent with the provisions of the Act are repealed.

FORM A.

Form of notice or memorial.

A. B. (*name and residence of claimant*), do hereby declare that I have worked upon the immovable of (*name of the proprietor*), at the following works (*nature of the works*), (or I have supplied, *if he be a supplier, etc., as the case may be*) since (*give the date*); that the amount due me is (*amount of the claim*); that the immovable on which I have worked is described as follows: (*Number of cadastre or description by metest and bonds as much as possible.*)

Sworn before me, this day of 18 } (*Signature*) A. B.

C. D., Justice of the Peace.

(1) PRIVILEGES ARTICLE 2009 of the CIVIL CODE.

1o. Law costs and the expenses incurred for the common interest of the creditors.
2o. Funeral expenses, such as declared in article 2002 (that is limited to the station and means of the deceased) when the proceeds of the movable property have not proved sufficient to pay them.
3o. The expenses of the last illness, such as declared in article 2003, and subject to the same restriction as funeral expenses.
4o. The expenses of tilling and sowing.
5o. Assessments and rates.
6o. Seigniorial dues.

THE HARMONY AND FUNCTIONS OF COLOUR IN ART. *

By Andrew T. Taylor, A.R.I.B.A.

The love of colour is natural to man. All savage and barbarous peoples have in common the love of br ght colors. Pioneer traders and explorers in Africa and in the South Seas, knowing this, always take care to supply themselves with gaudy cloths and bright coloured beads for purposes of gifts, or of barter. A child is attracted by colour perhaps more quickly than by anything else. It is only as we emerge out of childhood whether of the individual or of the nation we become more fastidious in our harmonies of colours.

Imagine if you can all colour taken out of the world, we would still have the same beautiful shapes which are lavishly strewn around us in mountain and valley, in tree and rock, in wild flower and grass, in bird and fish and animal, but with what a difference—the light would have died out of them; the whole surface of nature would be neutral tint—an ashen grey. Nature would come out in old Quaker costume. Our colour sense rejoices in the polychromatic feast continually spread before it, and there is no purer enjoyment than the contemplation of the rich colouring of nature, ever varied and ever varying with the changing year.

Do we ever stay to enquire why nature is so lavish with her beautiful colours? No doubt the colours of many of the flowers have their usefnl purpose, such as attracting insects and bees and humming birds, who in the beautiful ordering of nature are thus unknowingly working out its great laws. And we know that at certain periods the plumage of some birds assumes a brighter and more gorgeous hue; but after allowing for all this there is infinite beauty and variety of colour which we can only accept gratefully as the creation of a Beneficient Giver to minister to our pleasure and enjoyment and gratify and delight the love implanted in us for beautiful things. There are people so utilitarian as not even to allow this, and who would fain argue that every variety of tint and shade in leaf and blade and mountain side has its direct use, and only to be justified on that ground.

As *Punch* jocularly but with great truth asks—"Are we to deny the existence of any good that is not visible, that is not tangible, that cannot be measured with a tape or weighed in scales?" and goes on to say—"There are people who would find the universe none the poorer had Praxiteles carved nothing more immortal than an occasional cold fowl; had Homer swept his lyre, not in commemoration of the fall of ancient Troy, but to celebrate the rise of a new soap; and had Titian lavished all his wealth of glowing colour and gorgeous hues upon the unretentive surface of some suburban pavement." It is not for such people, however, that nature spreads her colours upon her palette, but for those who having beauty in their own natures, feel a responsive chord vibrating to that of nature around.

It seems prosaic and callous to analyze the colours and tints instead of being content to enjoy them as we see them in nature, or in some great picture, but we shall be able more intelligently to enjoy them if we understand something of the principles which underlie the harmonies of the colours, for nature has rules for her colouring as well as for her economy, and we shall be able in the measure in which we understand them, to reproduce in our homes and our own handiwork something of the same gratification and pleasing emotions which we feel in nature—often without understanding the reason for it. This knowledge I need not say has been very much neglected, with the result that we all deplore, but which might have been expected, viz., in harmonious arrangements of colour in dress, home decorations and in all our surroundings. It will be my endeavor to state some of the elementary principles underlying harmony of colour, and if time permits, attempt to show their application to our general art.

The source of all colour is light acting upon the retina of the eye; without light we can have no colour. White light was once supposed to be a primary element, but as you all know, it has long been known to be composed of a number of colours which cannot be divided into fewer colours than three, and these are therefore called the three primary colours. This was first clearly shown by Sir Isaac Newton in his solar spectrum. The reason for it may be stated thus: Although light travels with immense rapidity, being at about the speed of about 186,000 miles in a second, yet a sensible time is occupied in this transmission, as we know that light takes about 8¼ minutes to come from the sun to our earth. The velocity of light is also affected by the media through which it comes. For example, a beam of light made to pass through a glass prism is retarded by the different thicknesses of the glass, so that if the light, after passing through the prism be thrown on a white screen or even onto any object, a variety of colours will be obtained.

The vibrations composing white light are unequal and possess different degrees of energy; the red and orange are the most powerful; the green and yellow come next, and the blue and violet are the weakest of all. These coming through the medium of the atmosphere, keep together, and even passing through ordinary glass are not much affected, but in passing through a prism the weaker vibrations are more deflected out of their course than the others, while the stronger ones take the nearest way to their straight course; thus red and orange are the least refrangible rays, then come yellow and green, and blue and violet are the most refrangible. It has been found that, for example, violet light is caused by vibrations of about the 57,000 part of an inch long; as these vibrations are reduced the violet changes to a bluer light and soon to green, and then yellow and orange, until we get the uncompromising red with vibrations of about only the 39,000 part of an inch. So that, to speak more scientifically, light is simply vibrations of different intensity, and acting upon the retina of the eye, produces sensations which we call colours. The different sets of nerves of the retina respond to certain vibrations of light and produce the sensation of red, or yellow or blue. But that is not all. Natural bodies have the power to select and absorb certain of the vibrations and to reject the others; these rejected vibrations are received upon the retina and produce the colour which we ascribe to the object. There is really no original color in any object.

The splendid colors of the feathers of certain birds, as of the peacock, the lustre of beetles' wings, the sheen of mother of-pearl and certain precious stones, are only due in a very few instances to any actual coloring matter in themselves; in nearly all cases they are caused by the reflection and refraction of the rays, owing to minute inequalities and folds and marks on the surface of the feathers or shells. This has been imitated by Japanese metal workers who employ the same methods to get iridescence and variety of hue in their articles made of iron and copper. It would be going out of the scope of this paper to pursue this part of the subject further, but I have tried to indicate enough to enable you to understand what I have now to say.

Sir David Brewster's arrangement of the colors has been long accepted as correct, viz., red, blue and yellow as the three primary colours, but of late Wiinsch's and Young's theory has been taken up, adopted and advocated by men of acknowledged position in physics, such as Helmholtz, Maxwell and Rood. Even they are not agreed as to the exact hues, each varying slightly, but roughly speaking it may be said that they agree on adopting red, green and violet-blue as the three primaries. There is, however, in this selection a measure of arbitrariness, and there must be a certain liberty allowed. But to understand this aright, a distinction must be made between lights and pigments; experimenting with rays of light they found that blue and yellow lights do not produce green when mixed, but they also found that blue and yellow pigments when mixed *do* produce green. How is this? In this way: There is no actual colour in the pigments, their colour arises from the absorption of certain rays. What they do *not* absorb gives the colour, it is those rays we see by reflection. In Young's theory they recognize three primary colour *sensations*; in Brewster's we have three primary *colours*,—a very important distinction. For a purely theoretic study of the subject of colour we should adopt Young's theory, but for our purpose and for practical study, we will follow Brewster's theory. These rays, red, blue and yellow, cannot be further divided, or as it is called decomposed. These colours or rays, however, are not equally strong. If you wish to harmonize so that each is neutralized or destroyed, you must take them in the proportion of *three* parts of yellow, *five* of red, *eight* of blue, making together sixteen parts. These three primaries in the state of transient colours, such as for example in the colours of the prism, when recomposed, will produce white light. Any *two* of these colours mixed in their proportions, give what we call secondary colours. For example, three yellow and five red will produce orange, and orange will harmonize with blue, the remaining primary colour, in the proportion of 8, making 16. Also five red and eight blue will produce purple, which will harmonize with the remaining primary colour, yellow, in the proportion of 3, making 16.

Also eight blue and three yellow will produce *green* which will harmonize with the remaining primary red in the proportion of five, making 16.

Now we have got red, blue, yellow, the three primary colours, and orange, purple and green, the three secondary colours, and we got the secondary colours by mixing two of the primary colours together.

To obtain the *tertiary* colours we proceed to mix two of the secondary colours together. For example, orange and purple will produce the tertiary colour *Russet-brown*, and will harmonize with the remaining secondary green in the proportion of 21 russet to 11 green.

Also purple and green will produce the tertiary colour *olive*, and will harmonize with orange in the proportion of 24 olive to 8 orange.

Also green and orange will produce the tertiary colour *citrine*, and will harmonize with the remaining secondary, viz., purple, in the proportion of 19 citrine to 13 purple.

We have thus got the primaries, the secondaries and the tertiaries, and you will observe that as we get to the tertiaries, the tendency is to destroy the strength of the colour, and to make them neutral, because the whole three primaries are in them.

Every colour has got its complimentary colour, that is its opposite contrasting colour, which will make it look best and most agreeable to the eye, and it is very important to know the complimentary color of each. How shall we know that? Very easily. Bear in mind that any scheme of colour is never satisfactory that has not got all the three primaries in one form or other, and this will enable you to know what is the complimentary colour or shade to any colour you may have.

Thus, take yellow, the brighest of all colours, and nearest light—to get a harmonious scheme of colour you want the other two primaries; these are red and blue, which make *purple*; and purple, therefore, is the complimentary of yellow, and is also almost the darkest of hues,—the contrast therefore is as light to dark.

Again take red, which is a warm, exciting, hot colour, the other two primaries are blue and yellow. These mixed together make *green*, and green is the complimentary colour of red, and it is also the most soothing and quieting to the eye,—the contrast is therefore between exciting and quieting. We find this in the red flowers and green leaves and red fruits and green foliage.

Again take *blue*, which is the coldest colour—the other two primaries are red and yellow, which mixed together make *orange*, and orange is the complimentary colour of blue, and it is also the warmest colour. The contrast is between coldness and warmth. We find this in nature in the blue sky and the warm sunshine. You can prove this by a simple experiment. Take a piece of white paper and put a red spot in the middle, gaze fixedly at it for a minute in a good strong sunlight; remove or cover the red spot and you will see a green spot instead of the red, the green being the complimentary colour of the red, being made of the other two primary colours, blue and yellow.

The reason for this curious phenomenon is this: The eye tires quickly of one colour. The particular nerves excited by that colour become wearied and fatigued, and in the ratio in which this happens, so the other nerves become correspondingly excited towards the complimentary colour to that which fatigued the other nerves, and you see as I have described. As the wearied nerves recover their tone the hues blend into their proper relations again. You may take a similar experiment with the sun when low down in the sky—say at sunset—after gazing fixedly at it, you will see a purple disc, purple being the combination of red and blue, the remaining primaries after the yellow, and so with the other colors.

You will please bear in mind that each shade of colour has its complimentary, and as there are hundreds of shades, I can only give you the general principle on which the harmony of colours depends.

In making these experiments and mixing colours and shades, which I hope you will all do for yourselves, you will please bear in mind that the colours you deal with are not pure, and that it is only an approximation to the pureness that you can get, so that your experiments can never be absolutely correct, but you will get something near to it. The theory is, of course, built on pure colours as in the spectrum.

I need not say that you will hear colors spoken of as warm or cold, and when you hear this you will know that all orange and yellows and reds are warm, and all blues, grays and the blue greens are cold, and the colours become cool as they have blue in them, and warm as they have red or yellow.

Now we will go a little further. There is what is called simultaneous contrasts of colour, and may be either *contrast of depth* or intensity, as when two tints are placed together, and the *contrast of hue* making an apparent change of colour when certain shades are put beside it. This arises from the fact that all colored bodies reflect a certain amount of their complimentary rays, and also of white light. For example, take two patterns of the same colour, the one light and the other dark, and put them together, the one will appear lighter and the other darker by contrast; and if you take two different colours of unequal intensity and put them together, you will find not only one will be lighter and the other darker, but each will be slightly affected by the complimentary colour of the other. That is the reason that colours often look different when placed on a wall with other colours than they did on the sample. You will also find that by putting two complimentary colours together they will both look fresher and richer and give the most agreeable impression; on the other hand, if you put colours which are not complimentary together, both are injured and hurt, and a disagreeable impression is felt. For example, take red and green—both look their best, but if you put red and orange or red and purple, both will be injured.

(To be Continued.)

* Paper read at a meeting of resident members of the Province of Quebec Association of Architects, at Montreal.

A TEST OF FIRE DOORS.

H. Clarkson, of Topeka, Kan., has been experimenting with fire doors. The following is an account of the tests made:

"The shutters experimented on were of small size and consisted of wood covered with tin and other light metal. Two thicknesses of mortised boards with the grain of the wood in the two sections placed at right angles were used for the interior and were nailed tightly together. Several kinds of covering were tried. One was a single thickness of black iron, the second two thicknesses of galvanized iron, the third one thickness of tin, the fourth two thicknesses of tin, the fifth two thicknesses of tin lined with asbestos, and sixth a single thickness of tin lined with abestos.

"The outer coverings were all made air-tight and the nail heads covered. The sample shutters were put into an improvised furnace and subjected to a heat of 1,600 degrees for forty-five minutes with very good results. All of the samples came out in good shape except one, in which a layer of metal was placed between the wooden layers inside. The edges and corners of the others were in perfect form and were not warped out of shape. The wood inside, of course, was turned to a perfect charcoal, but as it could get no air did not burn up.

"The heat to which the samples were subjected is hotter than shutters would receive on building, for there it would only be on one side.

"The samples were afterward sawed in two and it was found that the tin lined with asbestos was probably the most satisfactory of all. One great advantage, besides its not warping, in this kind of shutter is that in case of fire within, the tin and wood can be cut through with an axe. Later experiments will probably be made with full-sized shutters."

TRANSVERSE STRENGTH OF BRICK MASONRY.

THE following abstract of a series of experiments on the transverse strength of brick masonry made by Messrs. M. A. Earl and A. B. Loomis, of the engineering department of the University of Illinois, and published in a recent number of the "Technograph," a student's publication, is, therefore, of considerable interest.

In these experiments eight beams and two piers were broken. The beams were broken as simple beams with a concentrated load at the center, and the piers were first broken as cantilever beams and afterward as simple beams. The conditions and results of the several tests were as follows:

Beam No. 1 was built of two thicknesses of stretchers like an ordinary double wall, with the third course from the bottom headers. There was also a bond at the ends. Its depth was 14.7 ins. and the distance between the supports 43.75 ins. Its age when broken was 28 days. The beam failed at the center, about as much from lack of cohesion in the mortar as from mortar separating from the brick. This statement will apply to all the beams. One brick was broken by tension. Since the weight of the beam, 350 lbs., acts as a uniform load, its effect is the same as 175 lbs. at the center. Hence the breaking load = 1,652 + 175 = 1,827 lbs. The modulus of rupture, therefore,

$$= \frac{6\,M}{d^2\,b} = \frac{6 \times 1827 \times 43.5}{4 \times 7.75 \times 217.56} = 70.7$$

Pier No. 1 was pulled over as a cantilever beam. Age 28 days. Failed by mortar separating from brick. Weight of pier, 295 lbs. Force to break, 205 lbs. applied 42.5 ins. from joint of rupture. Maximum tension per sq. in.

$$= \frac{Ml}{2I} \quad \frac{W}{S} = \frac{205 \times 42.5 \times 11\frac{1}{2}}{2 \times \frac{1}{2} \times 7\frac{1}{2} \times (11\frac{1}{2})^3} \quad \frac{295}{7\frac{1}{2} \times 11\frac{1}{2}} = 49.3$$

Beam No. 2 consisted of pier No. 1 broken as a simple beam. Length between supports, 43 ins.; depth, 7½ ins.; width, 11½ ins. Weight, 295 lbs. Load to break, concentrated, 160 lbs.; weight of beam considered at center, 148 lbs.

$$S = \frac{6M}{b\,d^2} = \frac{6 \times 308 \times 43}{4 \times 11\frac{1}{2} \times (7\frac{1}{2})^2} = 30.7 \text{ lbs. per sq. in.}$$

In this case, and also in the pier, the unit stress is necessarily small, since there is no interlocking action of the brick as in an ordinary beam.

Beam No. 3 was built essentially the same as No. 1. Age 56 days. Length 4 ft.; depth, 4¾ in.; width 7¾ ins.; distance between supports, 43 ins. Weight 350 lbs. Concentrated load, 3,273 lbs. The beam did not fail, thus showing a strength of at least 117.2 lbs. per sq. in.

It was then turned on the flat side and broken with a concentrated load of 1,507 lbs., or 122.4 lbs. per sq. in.

Beam No. 4.—Age, 49 days; depth and width consisted of the same number of courses as No. 1; depth, 15 in.; distance between centers, 122 ins.; width 7¾ ins.; weight, 1,000 lbs. Five bricks broke when the beam failed. When this beam was broken deflections were taken at the center by means of a level and rod. These are given in the following table:

Deflections, in.	Differences.	Weights applied.
0.00	0.00	0.00
0.05	0.05	....
0.06	0.01	+ 200 lbs.
0.07	0.01	+ 400 "
0.11	0.04	+ 600 "
0.17	0.06	+ 800 "
0.23	0.06	+ 1,000 "
	Beam broke.....	+ 1,224 "

At the vertical joints the mortar separated from brick; at the horizontal joints the mortar failed in cohesion. Strain, 181 lbs. per sq. in.

Beam No. 5.—Depth, 15 in.; width, 7¾ ins.; distance between supports, 55 ins.; weight 500 lbs.; age 61 days; breaking load appl ed at center, 1,678 lbs. Strain, 91.2 lbs. per sq. inch.

Beam No. 6.—Width and depth the same as No. 5; distance between supports, 55 in.; age, 62 days; breaking load, 2,070 lbs.; weight of beam, 500 lbs. Strain, 115.5 lbs. per sq. in.

Beam No. 7.—Age, 62 days; distance between supports, 44 ins.; depth, 7¼ ins.; width, 3½ ins.; center load, 378 lbs.; weight of beam, 80 lbs.; strain, 153.8 lbs. per sq. in. The beam was not broken.

Beam No. 8.—Two courses high and two courses wide; depth, 4½ ins.; width, 7½ ins.; distance between supports, 45 ins.; weight of beam, 125 lbs.; breaking load, 200 lbs.; age, 62 days; strain, 112.7 lbs. per sq. in.

Beam No. 9.—Lower section as No. 2; built as pier; distance between supports, 37 ins.; width, 7½ ins.; depth, 11½ ins.; age, 62 days; weight of beam, 270 lbs.; center load, 970 lbs.; strain, 54.3 lbs. per sq. in.

Beam No. 10.—Age, 35 days; distance between supports, 6 ft.; depth, 14 ins.; width, 8 ins.; center load, 1000 lbs.; weight of beam, 670 lbs.; strain, 99 lbs. per sq. in.

A summary of the results of the tests giving the modulus of rupture for the several beams is given in the following table;

No of beam.	Ag. days.	Strength of mortar at that age in lbs. per sq. in.	Modulus of rupture of beam in lbs. per sq. in.	Remarks.
3	56	50	117.2 to 122.4	Broken sidewise
4	49	48	181	Mortar 1 to 2 by vol.
5	61	52	91.2	"
6	62	52	115.5	"
7	62	52	152.8	"
8	62	52	112.7	"
10	35	45	99.0	"
9	62	52	54.3	"
2	28	40	30 7	Mortar 1 to 2 by wgt.
1	28	40	71.1	"
Pier	28	40	49 3	"

The table shows, roughly, that the beams built as regular masonry have a modulus of rupture of about twice the tensile strength of the mortar used. With the best construction it may be even three times the tensile strength of the mortar, as shown by beams Nos. 4 and 7. When built as piers, with no interlocking action, the modulus of rupture is about the same as the tensile strength of the mortar used. The experiments on deflections with beam No. 4, while not enough to draw any certain conclusions from, would seem to show that brick masonry is elastic, and that up to a certain point the deformation is proportional to the stress applied. The result of experiments in the past, while showing a certain transverse strength, have not been definite or uniform enough to furnish reliable conclusions. While the nature of this subject does not permit of its being carried in an experimental way as far as might be desired, without considerable expense, it is suggested that much can yet be done toward finding the strength actually obtained in brick buildings. The tearing down or failure of such buildings affords an excellent opportunity for this, and it is to be hoped that experiment and observation will be turned in this direction.

FOUNDATIONS.

No foundation is more ineligible for a heavy structure than one that is rocky, especially if the rocks are in small masses, or if a sufficient surface is offered of one mass, in strata which dip considerably: in the former case, from the rottenness of the soil in which rocks are generally bedded and which consists for the most part of their detritus; and in the latter, from the liability of stratified rock to crack and slip, against which no precaution is available. Dry gravelly soils, again, are not only loose and infirm, but are exceedingly liable to vacuities of various extent, which are hardly sufficiently provided against by piling: wet gravel is generally more compact and may be better trusted both with and without piles. A deep compacted sand will be found firm if a sufficient surface of it be embraced by the footings, which should be wider in that than most other cases. In large and deep beds of alluvial deposits the heaviest building may be laid with security, if precautions be attended to for the equal distribution of the pressure throughout. The city of New Orleans, in a delta at the mouth of the Mississippi, rests on a bed of mud, which is held together by a bonding of trunks and arms of trees, but on a broad level bed below. Here the only precaution taken in erecting a structure of the greatest magnitude is to make the trenches for the walls wide and level, and to floor the whole of their surface with thick planks properly bonded; on these the footings are laid, and if any settlement occurs it is of the whole edifice and no injury accrues to any part of it at any time. Clayey and chalkey soils are generally understood to form the best natural foundations; in these, under ordinary circumstances, no preparation is required, though for very heavy and unequally pressing works, such as bridges, which are placed on piers made as small as they possibly can be, piling has been considered a necessary precaution. Indeed, except perhaps on an extensive horizontal bed of firm compact rock, no foundation can be considered better than that afforded by piling in a deep clay

NOTES ON RECENT ADDITIONS TO OUR KNOWLEDGE OF PORTLAND CEMENT. *

By John Purser Griffith.

In his address to this institution five years ago the author made the following allusion to Portland cement: "The introduction of Portland cement has revolutionized the construction of marine works, and provides, when judiciously employed, the most useful cementing agent at our disposal. Cement concrete has naturally grown rapidly in favour on account of the facility with which it can be moulded into blocks or deposited *in situ* under water; and of late years it has been used in almost every work of magnitude in some form or another. Recently we have been startled by accounts of serious failures of works constructed with Portland cement concrete, and what may almost be termed a panic has taken the place of previous unqualified confidence. All manner of theories have been started to explain the deterioration of the cement. Additional tests have been suggested to detect these so-called dangerous properties, and numerous persons are to be found ready to predict the ultimate destruction of all works in which Portland cement has been used. It would be more profitable to investigate carefully each particular failure; to trace back the history of the work, the mode of construction, the proportion of cement used, and especially the manipulation of the concrete. My own experience leads me to think that we have nothing to fear if the material is fairly treated and a reasonable amount of common sense used." These remarks referred especially to Portland cement concrete which had occurred at the Aberdeen graving dock. As the details of these failures and others of more recent date have been made public by responsible engineers, and we are not dependen ton unauthenticated information, we are now at full liberty to discuss them, and any such discussion must be productive of good.

The reports of the disasters at Aberdeen produced a scare, resulting in what may be called the magnesium bogey. Chemical analysis of the disintegrated concrete showed the presence of magnesium hydrate in large quantities, and the conclusion jumped at by many engineers was that magnesia in the cement was the source of all evil. Tests were introduced to remedy this, and it was proposed, on high authority, that under no conditions was cement to contain more than 1 per cent. of magnesia. With one stroke of the pen English engineers proposed to remove from the category of cements useful for marine works the bulk of those used in the United States of America. With one stroke of the pen English engineers propose to nullify the experience of Chatoney, Vicat and Gilmour, who maintained that cements such as the Rosendale cements, which contain large quantities of magnesia, resist the dissolving action of the sea-water better than those composed only of the silicate and aluminate of lime.

It is satisfactory to know that further research and consideration has materially modified these views, and that it is now more generally accepted that the injury has been caused by the percolation of sea-water, than to the presence of magnesia in the cement. The effect of the flow of sea-water through Portland cement concrete appears to be identical with the effect of sea-water on lime mortar. This latter effect has been very fully explained by Dr. B. B. Stoney in a paper he presented to this institution many years ago "On the Action of Sea-Water on Lime Mortar," which may be found in vol. vii. of our *Transactions*.

The great lesson we have to learn from these failures is, that our concrete must be made impermeable. That appears to be the sum and substance of the various discussions on the subject, with which those of us who are members of the Institution of Civil Engineers must be familiar. At the beginning of the last session a most valuable paper on Portland cement was read in London by Mr. H. K. Bamber, a chemist evidently acquainted practically with the manufacture of Portland cement. The conclusions drawn may be briefly stated as follows: The cement should be very finely ground, not alone as making it an economical cement, but a safer and more reliable cement. The cement should be mixed with the full quantity of water it can take up. It was the author's privilege to have the opportunity of discussing these points with his friend the late Mr. Harry Napier Draper, who became so interested in the subject that he brought to bear on it the full powers of his cultured mind. Unwilling to approach the subject merely on information gained second-hand, he determined to manufacture Portland cement in his laboratory from its known chemical ingredients. This he succeeded in doing after several instructive failures. For our purpose it is sufficient to know that his experiments proved to him the need of subjecting the clinker to a sufficiently high heat and afterwards pulverizing it to the greatest possible extent. Mr. Draper's next step was to take a number of analyses of Portland cement which had been published. In these he found that the lime, silica, and alumina, which form the active constituents of the cement, averaged about 89 per cent. of the weight of the cement. Accepting Le Chatelier's theory, that the potentially active components of cement were tricalcic silicate and tricalcic aluminate, Mr. Draper proceeded to construct a rational formula on this theory, which would approximate to the known analysis of Portland cement. In Mr. Draper's formula lime represents 63 per cent. of the cement. If this be true then cements containing this amount of lime could not be considered as over-limed—the lime being chemically combined. He next examined the reactions which followed mixing such a cement with water, and was able to confirm the views of Le Chatelier that by the addition of water a certain quantity of calcium hynrate was set free, though all the lime in the original cement was in a state of combination. Mr. Draper considered this freed calcium hydrate an important factor in the efficiency of cement, as it slowly combined with the siliceous sand, and also absorbed carbonic acid, forming the protective film noted by some writers. One of the most interesting points brought out by Mr. Draper's investigations was that if 89 per cent. of the cement consisted of tricalcic silicate and tricalcic aluminate, in the proportion indicated by his formula, and that the hydration reactions of Le Chatelier were correct, no less than 41 per cent. of water would be required to complete hydration. To those of us who are practically acquainted with the gauging of briquettes of neat cement, a proposition that we should use 41 per cent. by weight of water to mix the cement at first sight seems difficult to understand. We must, however, remember that Mr. Draper was referring to cement which throughout its bulk was potentially active.

Now, when we are speaking of the Portland cement of commerce, we must bear in mind that high authorities on Portland cement have agreed that the residue left after sifting cement through a sieve of 5,000 meshes per square centimetre, or 32,000 meshes per square inch, is practically inert, or at any rate sluggish in hydration. Now, in our English cements, with very few exceptions, from 30 to 50 per cent. by weight will be rejected by a sieve of this fineness. You will see, therefore, that this cement, instead of requiring 41 per cent. of water, will only demand about 20 per cent. for mixing into biquettes. Practical experience has shown us that this is sufficient, and the rules so generally laid down in this country that cement should be mixed with the minimum quantity of water has led to this proportion of water being generally adopted and adhered to, although the grinding of cement has improved. There is abundant evidence to show that briquettes immersed in water gradually increase in weight by the additional absorption of water beyond what was used in mixing the cement. It seems more than probable that this is caused by the slow hydration of the coarser particles. This gradual hydration of the coarser particles leads to their expansion, and this expansion is accompanied by the setting up of internal stresses in the briquettes or cakes. These internal stresses neutralize or negative the tensile strength, producing either a reduction in the strength of the briquettes or cracks visible to the eye.

In making briquettes with a deficiency of water you will frequently find that a very much higher stress is obtained at the early tests than if the proper quantity of water were used; this may be followed in later tests by a falling off in the strength of briquettes, while the briquettes mixed with an excess of water shows a large increase in strength. Much greater pressure can be exerted in putting cement into the moulds if it is in a granular condition than if it is plastic, and the high seven days' results may be due to the particles of cement being brought into closer contact when little water is used than when a larger quantity is employed. At the same time the stress set up by the hydration of the coarser particles will, of course, produce more injurious results in the dense under-watered briquettes than in those which were guaged with a large quantity of water. These points may possibly be made clearer by the following experiments with neat Portland cement, mixed with 20, 25, 30, 35 and 40 per cent. of water by weight:

Percentage of water by weight.....	20	25	30	35	40
Breaking stress per square inch, after 28 days, in lbs	840	685	540	385	375
Breaking stress per square inch, after six months, in lbs.....	804	850	680	530	515
Increase in strength per cent.....	—	24	26	38	37
Decrease in strength per cent.....	4	×	×	×	×

Such results have led some of us to think that a cement giving moderate breaking stresses at seven days and gradual increments at later periods, is a safer cement than one giving high results at seven days and little or no increase afterwards. This is a subject requiring further careful study, as there is much to be said for the contention of many German authorities, that a cement which attains at seven days 90 per cent. of its strength, at 28 days is superior to another attaining at seven days only 50 per cent. of its strength at 28 days. Free lime had been charged with most failures, due to the cracking of cement; but it seems difficult to understand how free lime could escape immediate hydration when guaged with what appeared to the eye a sufficiency of water. It has been very reasonably asked, if the slow hydration of the coarse particles is the cause of failure, how comes it that for so many years we have, with great success, used cements which were much coarser than those now in the market, and that these disasters have apparently increased as the grinding of the cement has improved? We must face this criticism, and endeavor to explain what we must admit to be a fact. The author's belief is that the old cement-makers burnt their cement more highly than is now done, that the clinker approached more closely to a state of fusion, and that the coarse particles were so vitrified that

* Paper read before the Institute of Civil Engineers of Ireland.

absorption of water, unless they were reduced by grinding, was almost impossible.

There is also another possibility—namely, that these comparatively large particles became surrounded by a watertight skin or coating of cement, which stopped their further hydration. The author is inclined to believe that the cements of the present day are not as highly burned as formerly, and that the slow hydration of the coarser particles is thereby facilitated. There are many leading authorities in Germany who stoutly maintain that the "idea that lightly-burned cement should be rejected is an erroneous opinion, if the present state of cement making and testing be considered, and that no cement is more reliable than one which gives good results, even when lightly burned." The meaning of this is that they recommend foregoing some of the advantages of high burning if it will ensure them a really finely-ground cement. Before we adopt any such proposition we must be prepared to insist on our cement being ground to the present German standard.

The time appears to have come when we may reasonably ask for finer cement than is now generally sold in the English market. We can get cement make in England at present which will entirely pass through the sieve of 2,500 meshes per square inch, leaving a residue of about 8 per cent. on the 5,800 sieve, and about 30 per cent. on the 32,000 sieve. But the author knows of no cement in this country which approaches in fineness some of the cements of Germany; for cement can be obtained in that country so fine that only a residue of from 3 to 10 per cent. remains on the sieve of 32,000 meshes per square inch, and, in some instances, so fine that it all passed through this sieve. To get such cement we must abandon high weight tests, as such a finely-ground cement will not weigh more than 70 lbs. per cubic foot in its dry uncompressed state. In this connection it may be worthy of remark that in the standard tests for Germany no tests are laid down for weight or specific gravity and it is a matter of considerable doubt whether we should retain such tests in this country, or even adopt a chemical test, as has been so strongly recommended by some chemists and engineers.

"Free lime" has long been the dread of engineers using Portland cement, and as a safeguard, many authorities have considered it desirable that cement should be stored for a considerable time and spread out in thin layers to "cool," or "air slake" It has been maintained that by so doing the cement is made safe for use, and that there will be no danger of its expansion and cracking. There are high authorities and scientific experts who now are equally positive that such treatment is not only not required with a high-class cement, but is actually injurious to it.

In the light of what has been discussed in this paper it is worth while examining these conflicting views. What are the effects of cooling cement with which we are familiar? First, the cement takes longer to set; second, the cement loses its strength; third, the cement increases in volume and consequently loses in weight. This "air-slaking" means the absorption of moisture and carbonic acid by the finest ground portions of the cement, rendering them inert and thus weakening the cement. If this air-slaking is continued sufficiently long the cement will become worthless, the coarser particles gradually absorbing moisture and carbonic acid. An examination of various analysis shows the presence of both moisture and carbonic acid in varying proportions. It seems more probable that air-slaking is a safeguard against under-burned and badly-ground cement than against the presence of so-called free lime. In such a cement the finely-ground portion of the cement would set rapidly, while the coarser particles hydrating at a later stage would swell and crack the cement. Air-slaking would, however, prevent this by rendering the finest portions of the cement inert through the absorption of moisture and carbonic acid, thus leaving only the coarser portions to act as cement. The natural result is, of course that after such cooling the strength of the cement is reduced. The true remedy seems to be the manufacture of a cement so finely ground as to be uniformly active, and if this cement is highly burned the results will probably be all the better.

In conclusion, the lessons we may learn from recent additions to our knowledge of Portland cement are: First, the paramount importance of fine grinding; second, the absolute need of using sufficient water to ensure the complete hydration of the cement; and, third, the necessity of making concrete exposed to the action of sea-water impermeable.

Mr. M. Ryan, brickmaker, of Smiths Falls, Ont., has made arrangements to operate all the machinery in his brickyard by electricity.

The Toronto Lock Co., who make an announcement in the advertisement pages of this paper, have lately commenced the manufacture in Toronto of the finer grades of builders' hardware.

With regard to ink erasers, Mr. James F. Hobart, of Brooklyn, N. Y., writes: In recent issues of Carpentry and Building, "J. W. G." and "S. P. G." recommend as good ink erasers broken glass and half worn sandpaper. They will do the work, but better results may be obtained by using a bit of rubber that has been prepared for erasing ink by having incorporated with it during the process of manufacture fine emery or other abrasive material. Separate pieces of ink eraser rubber can be had, or there may be purchased at any stationer's neat bits of polished wood with a piece of ink eraser projecting from one end and an ordinary pencil eraser from the other. After using the ink eraser it is well to go over the work with the ordinary rubber, in order to remove the grit that may remain.

USE OF LIME IN MORTAR.

THERE is a common superstition, which probably retains its hold upon builders solely through the profit that they find in maintaining it, but which, says the American Architect, sometimes really imposes upon laymen, to the effect that cement mortar is improved, in cold weather, by the addition of lime to it. As the mason ingenuously explains to his employer, the heat developed by the lime, in slaking, keeps the cement warm, and thus prevents it from freezing; and, on this theory, the advent of a frosty day is utilized by multitudes of sharp builders to load the mortar, which they have agreed to make of sand and cement only, with a quantity of lime, which saves cement, and makes the mortar easy to work, but destroys its water-proof qualities and injures its strength and hardness more or less, according to the quantity used. It is hardly necessary to say that the influence of the lime in "warming" the mortar is purely mythical. Lime mortar, without cement, is not much injured by freezing, while cement mortar is totally ruined, so that a mortar containing a large portion of lime would be harder, after freezing and thawing, than one containing cement only; but it would gain the qualities of lime mortar only as it lost those of cement mortar.

The fact is, that the only time when it is desirable to add lime to mortar, which the contract requires to be made with cement, is in the summer. In very hot weather, cement, particularly of the quick-setting sorts, will sometimes harden in the mortar-tubs before it can be used. The average workman chops up the lumps, and re-tempers them, with more water, but this proceeding destroys half the value of the cement, and it is preferable, under such circumstances, to add a small quantity of lime to the cement, at the first mixing. A very small dose of lime will retard the cement long enough to make it manageable, without materially injuring its properties, and circumstances sometimes render it absolutely necessary to resort to such an addition, in order to be able to work the cement at all. In winter on the contrary, the object to be aimed at is to accelerate the setting of the cement as much as possible, so as to place it beyond the reach of injury from frost, which, if kept out for twenty-four hours, has little effect on good cement. In order to secure this rapid setting, however, all traces of lime, which is a powerful retardant, must be kept out of the mortar, and the bricks or stones which are to be set with the mortar must be thoroughly warmed before they are laid. To warm the mortar is perfectly useless. A bed of mortar, spread on one cold stone, and with another cold stone lowered into it, will freeze completely through in a few seconds, even though it may have been boiling hot when it was spread; and we have seen in a warm day, with the temperature well above the freezing-point, stonework in cement mortar freeze almost as fast as it was laid, simply because the stones had been cooled down during the cold day and night previous, and had not time to get warm. It is obvious that, roughly speaking, it would require four tons of mortar at a temperature of forty degrees Fahrenheit, to raise a single stone, weighing one ton, from zero to thirty-two degrees, so that the whole mass would be just on the verge of freezing; yet the masons would have us believe that by adding a little lime to the mortar, they enable a hod-full of it, not only to raise above the freezing point the temperature of a large mass of masonry from a point in the neighborhood of zero, but to hold it there, notwithstanding the temperature of the surrounding air, until the cement has had time to set. By warming the stones, or bricks, the conditions are reversed. A heated stone will keep the mortar in which it is laid above the freezing point as long as it remains itself above that point, and as either stone or bricks lose heat very slowly, it is easy to build in the coldest weather, a wall which will retain, in the interior, a temperature above the freezing point long enough to make the cement in which it is laid secure against frost, except in the superficial portions; and with suitable coverings, these may also be protected. Mr. O. W. Norcross, one of the most ingenious and careful of builders, warms foundation-stones with a jet of steam, before laying them in cement in cold weather, but this is an expensive process, if thoroughly carried out, as the heat penetrates very slowly into the mass of the stone; and a better way is to pile the stone or brick over a furnace of some sort, in which a moderate fire can be kept night and day. We have once or twice made use of the low flat furnaces used by the workmen for heating pebbles who lay coal-tar concrete. Three or four thousand bricks can, with care, be piled over one of these furnaces, the chimney coming up through them, and by renewing them as fast as the hod-carriers take them from the pile, the masons can be constantly supplied with hot bricks, which will make excellent work with cement mortar, in the coldest weather; and as the furnace is tight, there is no danger of spoiling the appearance of the bricks by smoke.

A majority of the contractors of Montreal have acceded to the demand of the carpenters' union for a nine-hour day at 20 cents per hour. The new scale of wages will come into operation on the 1st of May.

The Mayor of Toronto has expressed himself as being in favor of the amalgamation of the Central School of Art with the Toronto Technical School. The art school is seeking to have the yearly grant from the city increased from $500 to $2,000.

PERSONAL.

Mr. Thos. F. Walker, of 237 Sumach street, Toronto, a well known contractor, died in Montreal on the 15th of March.

Mr. Thomas, a prominent and highly respected contractor, of Hamilton, Ont., died in Chicago last month. Deceased carried out the contract for the stone work on the City Hall and Bank of Hamilton, at Hamilton.

SHAVINGS.

Reports from London, Ont., indicate that building operations will be brisk in that city during the present season.

During 1893, the Toronto plumbing inspectors issued 946 permits, visited 1,331 buildings, made 9,235 inspections, including more than 1,400 smoke tests.

Mr. Lennox, architect of the new city buildings, Toronto, recently presented a statement to the council showing that since the city took charge of the work $198,000 had been spent. On an average 250 men had been employed daily, 250 cars of Credit Valley stone, 43 Cleveland and 136 of New Brunswick, 2,352,580 bricks and 6391 barrels of lime has been used. Two and one half stories have been erected.

PAGES

MISSING