



PUBLISHED MONTHLY IN THE INTERESTS OF

Architects, Civil and Sanitary Engineers, Plumbers, Decorators, Builders, Contractors, and Manufacturers of and Dealers in Building Materials and Appliances.

VOL. I.—No. III.

TORONTO, CANADA, MARCH, 1888.

(PRICE 50 CENTS
\$2.00 PER YEAR.)

Canadian Architect and Builder

A JOURNAL OF MODERN CONSTRUCTION METHODS,

PUBLISHED MONTHLY IN THE INTEREST OF

ARCHITECTS, CIVIL AND SANITARY ENGINEERS, PLUMBERS, DECORATORS, BUILDERS, CONTRACTORS, AND MANUFACTURERS OF AND DEALERS IN BUILDING MATERIALS AND APPLIANCES.

C. H. MORTIMER, Publisher,

31 King Street West, - TORONTO, CANADA.

SUBSCRIPTIONS.

THE CANADIAN ARCHITECT AND BUILDER will be mailed to any address in Canada or the United States for \$2.00 per year. The price to subscribers in foreign countries, is \$3.50. Subscriptions are payable in advance. The paper will be discontinued at expiration of term paid for, if so stipulated by the subscriber; but where no such understanding exists, it will be continued until instructions to discontinue are received and all arrears are paid.

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EDITOR'S ANNOUNCEMENTS.

Contributions of technical value to the persons in whose interests this journal is published, are cordially invited, and if found to be of sufficient merit, will be paid for. Subscribers are also requested to forward newspaper clippings or written items of interest from their respective localities.

WE are indebted to the Department of Education, of Ontario, for the illustrations in this number of school house designs and methods of ventilating schools. They were originally published by the Department for the guidance of school trustees, in a book entitled "School Architecture and Hygiene."

WE print elsewhere in this paper an article from *Building*, exposing the operations of some of the Building Plan Associations which profess to supply builders and persons intending to build with all information necessary to enable them to become their own architect. In view of the fact that some of these associations have already commenced operations in Canada, it was our intention to sound a note of warning to those who might otherwise be led to invest their hard cash in a lot of skillfully sketched designs, the actual cost of which, perhaps, bears no proportion to the estimates accompanying them. As our New York contemporary in the article referred to has done the work so thoroughly, we shall content ourselves with simply calling the attention of our readers to the remarks contained therein.

WE notice that there is a movement to have the use of glazed sewer pipe done away with in the construction of the medium-sized sewers of Toronto, and to substitute brick. We understand that the object of this movement is to give more work to bricklayers. While this may be a very praiseworthy thing to do, yet, if the cost of these sewers should be greater, it would not be in the interest of the community to make the change. There is, however, a more important side to the question. A brick sewer, no matter how carefully built, cannot compare on sanitary grounds with a well laid glazed pipe sewer. It is impossible to build a brick sewer that will not retain more or less deleterious matter upon its surface. The glazed surface of a sewer pipe does not retain such matter to any extent. It is absolutely necessary that we should have the most perfect sewer

that it is possible to build, even though the cost should be considerable over the inferior article, and we hope that the interests of no class or section of the community will be considered, but that the general good will be served without fear or favor.

IN Europe and the United States, the value of artistic knowledge as applied to industrial and other pursuits of life, is forcing itself upon the attention of thoughtful minds, and the demand is being made for a larger amount of instruction in drawing and kindred subjects to the children in the public schools. In Canada the various art schools are doing a good work, but there is need that greater attention should be given to the subject of art by those who have in hand the training of the young in our public schools. To this the answer may be made that already the children are burdened with too many subjects for study, and therefore should not be saddled with more. Undoubtedly the number of subjects is too large, and it might be added, needlessly so. Several of the subjects named might, with very little if any loss to the pupils, be set aside altogether, which would allow time for more comprehensive and thorough instruction in the principles of art—instruction the fruit of which would be seen in after years in the skill of our artisans and the appreciation of our people for the beautiful and the true.

OUR thanks are due Toronto architects, builders, plumbers, decorators, etc., for the assistance they have so kindly given us in our efforts to provide matter of practical interest to our readers. To friends in Montreal, Hamilton, London and Winnipeg, we are under like obligations. It is our desire that this journal should be a record of construction work throughout the entire Dominion, and not for the city of Toronto or Province of Ontario only. To make it such, it is necessary that persons interested should send to this office from time to time such information as may be obtainable in the locality where they reside. The possession of this information will make this journal cosmopolitan instead of local in its character, and enable the editor to discuss intelligently matters affecting the interest of localities in the more remote provinces, as well as those near at hand. While on this subject, we may state that arrangements have been made whereby in future issues we shall supply builders with illustrations of details of construction which must prove of very great interest and value.

WE take pleasure in being able to present to our readers this month a synopsis of an address on the subject of "Carpentry and Joinery" delivered before the Architectural Draughtsmen's Association of this city by Mr. Wm. Simpson, the able Secretary of the Master Carpenters' Association of Toronto. It is our purpose to present in future issues of this journal a synopsis of the series of practical talks now being delivered to the members of the above Association by gentlemen belonging to the different branches of the building trades. Just here we take the liberty to remark that architectural students and others in any way interested in architecture and building, in this city, should make it a point to attend the meetings of the Association, as by doing so they may gain a large amount of information which will prove most valuable in helping them to solve the problems connected with their every-day duties.

Those residing outside of Toronto who are unable to avail themselves of the privileges of the Association, will find much to interest and instruct them in the reports published each month in these pages.

THE erection of the Toronto Court House proceeds, if at all, very slowly. Another year will pass without any actual work being done on the building. This in itself would not be a serious matter if anything was being done which would tend toward the erection of a suitable and complete building. The old condition of administrative incapacity of the past year still continues. There has been no intelligent attempt to put the matter in a sensible or satisfactory position. It is possible that the building will eventually be built, but when, or how, or by what means, it would at the present time be very hard to even guess. Of one thing we may be certain, without a great change comes over the Building Committee, that it will not be through any energetic or comprehensive action on its part that this much to be hoped for object will be secured. It is now about four years since competitive plans were advertised for, and nearly two years since the excavation was commenced, and yet we are not even ready to stake out the building. Still we have some hope that we shall see the walls ready for the first floor joists, or even for the roof, before we die.

THERE should be some municipal control over the erection of fences on the street line. There are many fences in this city which are dangerous to those using the sidewalks. A low iron fence, adorned with spikes every few inches along the top, is exceedingly dangerous when the sidewalk alongside the fence is covered with ice. Imagine what would be the result to a person who, walking alongside such a fence, should slip and fall upon it. That such a fall would result most seriously no one will deny. Some may say that the possibility of such an accident is not very great as no one has been hurt by falling on a fence. Such an answer will not do, as it is only right that every precaution should be taken to prevent accidents, and not wait until some one is seriously injured by what could have been easily prevented by ordinary foresight. Several persons have narrowly escaped falling upon low fences ornamented with dangerous spikes. If we must have fences on our street line, they should, if furnished with an array of spikes, be high enough not to allow of any one falling on the spikes, and if they are low, the top line of such fences should be such that very little injury would be received by any one falling upon them.

DOUBLE the number of building permits have been granted by the City Commissioner thus far this year than during the same period in 1887. This fact points to a season of unusual activity in the building line during the approaching season. It is a significant fact, however, that while the architects are busily at work preparing plans for new structures, they have instructions from their clients in many cases not to call for tenders or place contracts until such time as the rate of wages for the different trades has been agreed upon. Persons intending to build want to know what their buildings are likely to cost, and they also want the assurance that when the work of construction has been commenced, it will not be stopped or delayed on account of strikes on the part of workmen. It is a matter of regret that the

daily papers, by reporting the opinions of every Tom, Dick and Harry who assumes to represent the views of the workmen, are assisting to arouse feelings of discontent, the result of which may prove disastrous to all concerned. Bearing in mind the great distress to workmen, and the loss to the entire community which resulted from the protracted strike of last summer, it should be the aim of every one to do all that is possible to prevent a repetition of such conflicts. The present position of affairs may be fairly stated thus: A large amount of building is contemplated, and will be undertaken if the feeling of uncertainty regarding workmen's wages is at once removed. The probability of strikes would have the effect of delaying or stopping entirely a great deal of this work. Therefore, every workman and every employer who desires prosperity for himself and for the community, should seek to have all matters of possible dispute definitely and permanently settled without further delay.

It is to be hoped that some action will be taken to show how much or how little there is in Mr. Davies' scheme for the relief of the esplanade. Now is the time to give the scheme the careful consideration it deserves. The C. P. R. are about to erect a station building, and if erected to serve trains running on the present levels it could not be altered except at a very large outlay. The whole question of the esplanade is practically up at the present time for settlement. Whether the city will be cut off from the bay for all time to come, has now to be determined. If the railways are allowed to make further outlays on their present tracks, and to erect buildings to serve the present grades, it will be exceedingly difficult and much more expensive to make the change in the future. That the erection of an elevated track system will be of incalculable benefit to the city, if the bay front is to be taken advantage of, will readily be admitted. If the frontage on the bay is to become the home of manufactures, there is very little to be gained in doing away with the present dangerous "level crossings." But if we are to have a drive along the bay front in connection with the park system, and close and convenient points for the departure and arrival of the island ferries, nothing should prevent the doing away with the present dangerous system of level tracks, except our inability to carry out the work.

Very little care has been taken in the past to study out what may be the future requirements of the city, and to make intelligent provision to secure all the advantages possible. There is little doubt but that this city will increase very much in size and enormously in wealth in the next few years. What may now seem a heavy burden will then be but a light one, and we must not forget that the increased value of the property south of the present tracks will go a very long way towards paying for the erection of the iron work necessary to carry all through traffic above the esplanade.

It has been suggested to lower the tracks to a depth sufficient to allow of the free use of the esplanade by bridges at the street crossings. This does not seem a reasonable proposal. The present tracks are but little above high water line, and it will be impossible to place them any lower at the most than high water mark, except at an enormous cost. It must be remembered that the tracks ascend on the east and west to much higher ground, and that consequently to sink the tracks will increase the grade, but to raise them will make the grades much easier than they now are. The fact that Front street is so much higher than the esplanade, gives every opportunity for the arranging of proper station accommodation.

There can be but one opinion, and that is, that the placing of all tracks used for through traffic on trestle-work would be a most decided advantage from every point of view. That it may be too expensive, is another matter, but until it has received full consideration, and the cost has been carefully estimated, it should not be assumed that the construction of the necessary trestle-work would be beyond our means. It is absolutely necessary that this matter should receive the most careful consideration of our aldermen. The city has suffered long enough and sufficiently from the shortsighted, careless and indifferent policy of the past. Let us not give our descendants just cause to charge us with similar indifference to their welfare.

The accommodation furnished by the union station is very inferior, and by no means sufficient for the wants of the travelling public. That some very material enlargement of this station must be made very shortly is ad-

mitted, if any attention is to be given to the comfort of travellers. The through and local passenger traffic has grown immensely in the last few years, and must continue to increase. It is the intention of the C. P. R. to build a station between York and Yonge streets, on the south side of the esplanade. As everything which the C. P. R. does is well done, this new station will be fully equal to the merits of this city and of the C. P. R. traffic. But, if this station is built only to accommodate the traffic of the C. P. R., the city will have two stations, with all the accompanying inconvenience to the travelling public. The convenience of the railways should not alone be considered in the erection of station buildings. The public are very much interested in being supplied with the most convenient and ample station accommodation. One station is much more convenient than two or more. It does away with the trouble of transferring of baggage and the inconvenience of going from one station to another. It would be a great benefit to Toronto if the C. P. R. and G. T. R. would unite and build a grand union station, into and from which all trains would arrive and leave. One large and commodious building could be built much cheaper than two. The salary account would also be much smaller for the large station than for the two small ones, and the travelling public would have the benefit of ample and commodious station buildings arranged with the utmost attention to their wants. This great station could be erected south of the esplanade between Yonge and York street, and if the tracks on the esplanade were elevated for the through traffic, the general floor of the station could be on a level with the viaduct system. Passengers could gain access to the station by passing under the track system at all times and without danger. As it is at present it is impossible to gain access to the union station without crossing tracks over which trains are continually passing. This will likewise be true of the proposed C. P. R. station. A more inconvenient and dangerous arrangement it would not be possible to conceive, especially when the traffic will have increased to much greater proportions. It is time that by the erection of over-head bridges access could be gained to both these stations, but not in nearly so serviceable or convenient a manner as by the former method. That commodious stations can be erected with the train platform above the ground level has been successfully demonstrated. The ticket and baggage offices can be arranged on ground floor, and the waiting room on the platform level. Passenger and baggage elevators will give ready means of communication between the two floors. A large portion of the space on the ground floor could be advantageously given up to the use of carriages and cabs, and the public would have the benefit of being able to get out of and into cabs under cover, fully protected from the weather.

We are pleased to notice that since the above was written the Mayor, in a message to the Council, strongly urges the carrying out of the scheme which we advocate, and a committee of the Council has been appointed to co-operate with committees from the Board of Trade and other corporations interested with that object.

PERSONAL.

Phillips & Mottshed, builders, Hamilton Ont., have dissolved. Jas. Phillips continues.

It is said that Mr. Theo. Raphael, contractor, will be the Conservative candidate in Russell.

John Keefer, a plumber, was badly scalded by the bursting of a steam pipe at the Industrial Home, St. Catharines.

Alfred Haslings died at his mother's residence, 304 Parliament street, Toronto, on the 14th of Feb. He was an estimable young man, and had served an apprenticeship with architect Malloy, of this city.

Zeeuque Perrault, contractor, Montreal, has failed. Liabilities \$17,000.

Mr. C. M. Chardon, builder, Vancouver, B. C., has been visiting in Lindsay, Ont.

Architect Gordon, of the firm of Gordon & Hewittell, this city, has just returned from a three months trip to Europe.

A well-known Montreal architect, Mr. Victor Bourgenou, died in this city a fortnight ago, aged 28 years.

F. J. Leigh, superintendent of the Canadian Locomotive Works, Kingston, has been elected an associate member of the Institute of Civil Engineers, England.

Mr. A. H. Gregg, architectural student, of this city, has obtained a position in the office of a firm of leading architects in Boston, and has gone to take up his residence in that city.

Architect Roberts, of this city, has just returned from a trip to Chicago and other Western points.

The painter's union at London has decided to make \$1.75 the standard rate of wages per day of nine hours, after the 15th day of April next, that the hours of work shall be from 7 a.m. till 5 p.m., and that all overtime be charged time and a half.



PRIZES FOR COMPETITIVE DESIGNS.

THE editor of the CANADIAN ARCHITECT AND BUILDER has decided to offer the following premiums to the best designs sent to him not later than the 20th of April next. The subject of the competition is a town house, to cost not more than \$2,500. The house is to be placed on the north-west corner of two intersecting streets. The size of rooms and their number will be left to the decision of the competitors. In deciding the competition, the location and size of rooms for their several purposes will be taken into consideration. A good plan with a poor elevation will receive higher marks than a good elevation with a poor plan. Each competitor will be allowed to choose the material of which his design is to be constructed. Competitors will be required to give a short and concise description of their design, and state the material they propose to use.

The editor of this paper reserves to himself the right to publish any design sent in. All designs to be sent to the office of this paper, No. 31 King street west, Toronto, postage paid. All designs will be returned to their author within a reasonable time after the competition is decided.

The first premium will be \$10; second, \$5; third, fourth and fifth, one year's subscription to the CANADIAN ARCHITECT AND BUILDER. The best perspective sent in will be entitled to a premium of \$5, and the second, third and fourth to one year's subscription.

The decision as to the respective merit of the different designs submitted will be made by a committee appointed by the Architectural Guild of Toronto. The designs must be made with pen in black and white to allow of publication. No color will be allowed on any drawing, not even tinting the rooms on the plan.

If the designs submitted are not in the opinion of the examining committee of sufficient merit to deserve the premium offered no award will be made.

All architects practising in cities are debarred from this competition.

THE TORONTO FIRE BY-LAW.

EDWIN CANADIAN ARCHITECT AND BUILDER.

SIR,—It is about time that we had a revision of the fire by-laws in Toronto. As at present constituted they militate against picturesque designs, while affording little real protection against the spread of a conflagration. Under the cloak of re-construction, the most flimsy devices are allowed to pass, as witness a building within a stone's throw of Lombard street fire hall. If any architect wishes to construct, on a detached residence, an overhanging gable of frame covered with tiles, making a practically fire-proof wall, he is told by the Commissioner that he cannot do it unless he backs it up with good brickwork—frequently an impracticability. But by giving this same wall a slope of 3 or 4 inches, and calling it a mansard, he can build it in as flimsy a manner as possible, providing it be covered with tin, slate, or shingles in mortar.

Another restriction which curbs variety in design, is the refusal of the Commissioner to permit the construction of oriel windows which project beyond the street line on upper stories. Such projections are permitted in all the large cities in the United States, and there is no reason why they should not be permitted here under proper restrictions. Of course, in the business portion of the city, the framing of such projections should be constructed entirely of metal. Very good effects can be obtained on copper, which does not require painting, and improves in appearance with age, taking on a "bloom," which often gives exquisite effects in color.

The following from the Chicago Bulletin hits the nail on the head: "The idea of protecting the city from another general conflagration by the passage of the fire limits law was a good one, and worthy of commendation. In the central portion of large cities frame improvements should be prohibited; that is all right, not only because of their depreciating the value of business property, but their increasing the danger of fire. But some judgment must also be exercised in the enforcement of this particular kind of ordinance, and while public safety should be well guarded, the rights of citizens in other respects must be taken into consideration. The fire limits law as now enforced, but on the

bare prairie, miles away from improvements, is becoming a bug-bear, a farce and a nuisance." ARCHITECT.

OUR ILLUSTRATIONS.

RESIDENCE OF J. A. HENDRY, ESQ., KINGSTON ONT.

We illustrate this month one of the finest residences in the "Limestone City," that of J. A. Hendry, Esq., situated on the corner of King and West streets, opposite the park. The building is constructed of red pressed bricks pointed in marble dust, and trimmed with sand stone and terra cotta. It is finished throughout in hard wood, and is heated and ventilated with direct and indirect hot water system. Messrs. Power & Son, Kingston, are the architects.

DESIGN FOR OVERMANTEL.

We present this month a sketch of a wood mantel in old English oak or mahogany, designed and executed by Messrs. William H. Bell & Co., 56 Pearl street, Toronto. This design is of the modern renaissance style, and produces a very handsome effect. The above sketch is very elaborately carved in the renaissance order, but can be produced in a less expensive manner by using the same lines and moderating the carved details. The mantel, as shown, is 8 ft. 6 in. in height, the shelf being 5 ft. 6 in. in length. There are twenty-five 5x5 in. bevel mirrors in the overmantel, the centre large mirror being 42x18 in.

HOUSE ON PEMBROKE STREET, TORONTO, FOR W. J. DAVIS, ESQ.

The contract price of the above house was \$4,800. It is built of brick with slate roof, and front gable tile hung. The entire house is finished internally in stained and varnished pine. The basement extends beneath the whole house, and contains laundry, store and furnace rooms. All drains inside of house are of "extra heavy" cast iron, and the plumbing is of the best. The ground floor contains parlor, dining room, reception hall, pantries and kitchen. The first floor has three bed rooms, a cosy study, bath room and linen closet, and the attic, three bed rooms, childrens' play room, and a store room. Messrs. Langley & Burke, of this city, were the architects.

DESIGN FOR TOWN CHURCH.

THE TONGUEKEEPSIE BRIDGE—DETAILS OF CONSTRUCTION.

SCHOOL HOUSE DESIGNS.

DESIGN FOR COUNTRY CHURCH.

THE ARCHITECTURAL GUILD OF TORONTO.

THE last monthly meeting of the Architectural Guild of Toronto took place on Thursday evening, March 8th. There was a good attendance and much interest taken in the proceedings. An animated discussion took place on the proposed reduction in size of brick by the Brickmakers' Association. The general feeling was against a reduction in size, especially in the length and width of the brick. The arguments of the brickmakers for a reduction were stated to the meeting, viz.: That the small bricks would dry quicker in the hacks and that fire would strike through much sooner than in the large brick, and that consequently a harder and better article could be furnished. As all the members were desirous of having a hard brick, they determined on recommending a reduction in the thickness to 2 1/2 inches, which would make a brick which would dry rapidly in the hacks and burn hard with much less fire. The size finally agreed upon was 8 1/2 in. x 4 1/2 in. x 2 1/2 in. The committee which had met the brickmakers' and the contractors' representatives on Wednesday, were re-appointed to meet them on Friday at 3 o'clock. At that meeting it was finally agreed that the size of brick should be 8 1/2 x 4 1/2 x 2 1/2, which is very nearly the size agreed on by the architects.

The members of the Guild agreed to specify not less than 80% of all brick used in their work to be hard brick, with the liberty to specify 100% when they so desired. This will result in much better building than we have been having, and of more uniform quality. The brickmakers have also agreed to furnish brick hereafter at the rate of 80% hard when no special arrangement is made as to quality. The discussion on this question shows conclusively that there are many matters relating to building in this city which can only be properly handled by the different architects meeting occasionally as they have been doing recently and working intelligently with all the different interests concerned.

The next meeting of the Guild will take place on Thursday evening, April 12th, when the usual dinner will be partaken of and an adjournment made to the Public Library, when an inspection of the many architectural works therein contained will be made. Mr. Bain, the Librarian, with his customary kindness and desire to do all he can to forward the interest of our

citizens and make the many advantages of the Public Library known, has offered to do all in his power to make the evening both a profitable and an agreeable one to the members of the Architectural Guild. That it will be an evening to be long remembered by the members we have no doubt, and that many of them will be astonished at the number and the variety of the works on architecture and kindred branches, we have no hesitation in affirming. Without doubt there will be a very full attendance of the members at this meeting.

The financial condition of the Guild is exceedingly good, nearly all the fees having been paid in, and the large balance over and above the necessary amount required for running expenses placed at interest to form a "nest egg" for some future effort which will result to the great benefit of the architects as a body, and to the advancement of this branch of art in this country.

COMPETITIONS.

By "CRITIC."

THE object of an architectural competition is to obtain the best possible design for a proposed building. That all competition is successful in this object will not be affirmed by anyone who has had any experience of competitions. There have been many competitions which have been very successful, but there have been many more which have been failures. Does the success or failure lie with those who arrange the competition, or with those who enter? We believe that the success or failure of a competition can in nearly all cases be laid to the manner in which the terms of the competition have been prepared. If the terms have been prepared with the idea that the building committee must protect themselves from the competitors as though they were a lot of most unprincipled men, it is no wonder that



NEW Y. M. C. A. BUILDING, DETROIT.

competitions fail. But if they are prepared by those who believe that the interests of the building committee and of the competitors are one, they will be almost always a success. The object of the building committee is to secure the best plan, and the object of the competitors is to have the best plan erected. Their interests are identical, and it will be found that the building committee which recognize this first, secure what they desire, viz., a good design in more than the majority of cases.

To influence good men to enter a competition the terms must be liberal, the work worth having, and the certainty of fair and honest treatment assured. No man who has an assured position, and plenty of work, is going to throw away a part of his time in a competition, any more than a sound, intelligent business man will buy lottery tickets, or deal in bucket shop speculations.

The decision should always be made by competent experts, and not by the members of a building committee, who are no more able to judge of the merits of a good plan than an architect is capable of judging of the quality of groceries or dry goods from the merchant's standpoint. Many designs have been selected because the members of a committee took a fancy to some feature that may in itself have been good or bad, but which should not have been allowed to decide such an important matter. The first place in a competition was once given to a design because the competitors showed a semi-circular end to the library, the object of which was to allow of all book shelves being arranged on the radial lines, and thus allow the librarian to sit on the central point and be able to keep his eye on all the books. What he wanted to sit on a stool for and watch the books, no one could ever find out, but it struck this inexperienced building committee very favorably, and they

immediately decided on this plan. That this room could never be extended, and that it was in point of fact the worst possible arrangement for a library, did not count with them. The arrangement seemed to them "just perfectly lovely," and they fell victims to their ignorance, and likewise the competitors who had really sent in the best design. Is it any wonder that men who have professional training refuse to have the merits of their work decided by those who very often have but little knowledge of the profession or line of business by which they themselves gain their subsistence? The terms of no competition can be so bad that there will be no competitors. There are always a number of inferior men to enter any competition, and occasionally one or two who have, or think they have the thing fixed, and that it is a sure thing for them.

It is necessary to a successful competition that the terms be simple and explicit—that there shall not be any attempt to protect one party to the gain of the other. Sufficient time should be allowed for studying out the requirements, and for careful designing. A full and complete statement should be made of the requirements, together with a general explanation of the purposes for which the building is to be erected. All points definitely determined on should be stated, but they should be as few as possible, so that the designer may not be unnecessarily hampered in trying to overcome what may turn out to be only a whim on the part of some one who did not fully understand the difficulties of the question. No information should be furnished any competitor, no matter how unimportant it may seem, without supplying it to all. It is not wise to limit the cost of the building to a hard and fast amount which will very likely prove to be inadequate. If it is definitely stated that any design which will cost more than the amount named in the terms will be thrown out, thrown out it should be, or else the competitors are not fairly or honestly treated. Where terms are made, they should be most strictly adhered to, no matter what the consequences are. Therefore it is advisable to estimate as carefully as possible what the expenditure should be, and also the amount which it is advisable to expend, and state that such amount is what the building committee desire not to exceed. It should be distinctly understood that this amount will not be exceeded if a good and suitable design can be obtained which can be erected for that amount; however, if there is no such design, that the best and most suitable one which least exceeds the amount named will be adopted. This plan will allow of each competitor judging for himself whether it is wise for him to design an inferior building within the money limit, or a good building which will exceed that amount in its construction. No injury is done anyone, for each is allowed to judge for himself what to do in the matter. But when an amount is named, and it is distinctly affirmed that no design which will exceed that amount in its erection will be adopted, and one is adopted which will cost a much greater amount, it is exceedingly unfair to the competitors who have attempted to keep within the amount specified. If a sum is mentioned, and the desire is expressed that the design is to be kept within that amount, but that a good design will be built, even if it should cost more, rather than an inferior one at the stated amount, it allows a choice of the best and most suitable design. Of course it must not be supposed that the cost is not to be considered in the decision as to the merits of the respective designs. For instance, it would not be just to adopt a design which is but little better than another, but which will cost much more to erect. There is no doubt but that the hard and fast money limits have been the source of more trouble in competitions than almost anything else. The plan which has been outlined, should to a large extent overcome this ground of trouble and complaint.

Another most troublesome point, is the question of deciding as to which design sent in is the best. There is no doubt but that these questions should be decided by the highest professional talent, and not left to the whim or caprice of ignorance and conceit. The expert should be a man of the highest attainments in the profession of architecture, and of unblemished reputation for honesty. It has always been understood that when a man accepts the position of an expert he forever forfeits the right to carry out the work. This unwritten law has been established that an expert may act squarely to all competitors. Otherwise a man might report against all competitors and secure for himself the much coveted commission. That such has been done it is not necessary to affirm, as anyone who has any knowledge of how competitions have been conducted is fully aware of the facts. It may be safely affirmed that there are not many men following the profession of architecture with a reputation for good work, who would accept a commission to carry out a work where there had been a

competition, and had filled the position of expert. He would be perfectly aware that his honesty and honorable dealing would be looked upon as questionable, no matter how honorable or honest his intentions may have been.

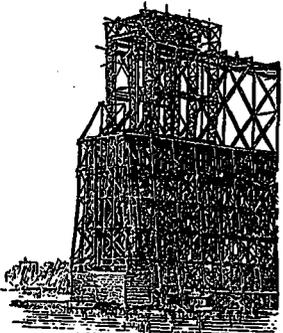
To secure the success of a competition a building committee should make the terms such as would induce themselves to enter the competition if they were architects. It is always possible to have competitors, but it is not always possible to get good men to compete. If there is any object in a competition, it is certainly to obtain the best possible design, and how that is to be obtained through a competition of second and third-rate men, we cannot understand. There is a mode of holding a competition which has resulted very satisfactorily in many cases, and that is to choose several good men to send in competitive designs, paying a stated amount to each, and allowing other designs to be submitted without any remuneration to the competitors. In this style of competition, the decision by a capable expert is just as necessary as in any other form. No man will risk his reputation, except where he believes that he will only be placed second to another because that is his proper position. There is nothing more galling to a man than to know that he has submitted the best design, and yet another has received the prize because of the incapacity and ignorance of the deciding authority.

At the regular meeting of the Architectural Draughtsmen's Association to be held on Tuesday evening the 20th inst., Mr. R. J. Hovenden will offer some remarks on the subject of "Painting." At the succeeding meeting on the 27th inst., the subject of "Sketching in Design" will be considered.

"Constans Fides" writes: I would advise students of architecture to study the following works: "William Chambers' Civil Architecture," 2 vols., by Joseph Gwilt; "Thomas Rickman's Gothic Architecture of England," 1 vol.; "Ferguson's Illustrated Hand Book of Architecture," 3 vols.; "Donaldson's Specifications and Law of Contracts," 2 vols.; R. J. Hatfield's "Transverse Strains," 1 vol.; "Encyclopedia of Architecture," 2 vols.; "Practical Mason," 1 vol.; "Brown's Domestic Architecture," 1 vol.

Basswood may be enormously compressed, after which it may be steamed and expanded to its original volume. Advantage has been taken of this principle in the manufacture of certain kinds of moldings. The portions of the wood to be left in relief are first compressed or pushed down by suitable dies below the general level of the board, then the board is planed down to a level surface, and afterward steamed. The compressed portions of the board are expanded by the steam so that they stand out in relief.

The Laborers' Convention, consisting of representatives from Thorold, Merriton and St. Catharines, and the Builders' Laborer's



Union, has adopted the following scale of wages:—Builders' laborers, 17 1/2 cents per hour, nine hours to constitute a days work, pick and shovel men, 15 cents per hour; corporation laborers, \$1.25 for a nine-hour day.



THE BRIDGE AT POUGHKEEPSIE.

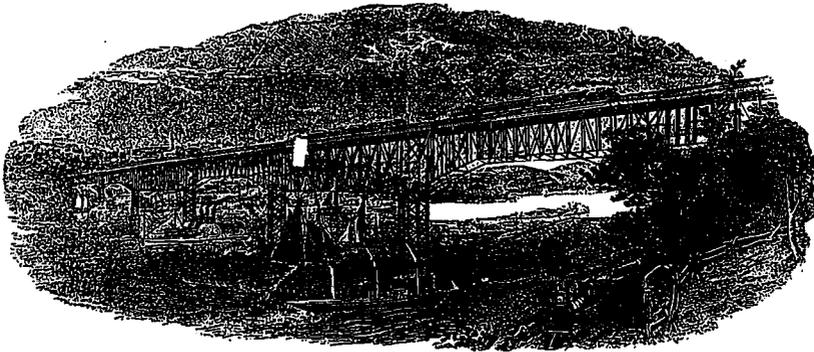
NO river in America is crossed by so many persons and so many tons of freight as the Hudson, and all pass by some means of water carriage if the passage is made below Albany. A glance at the map shows that from the coal and iron fields to the mills and shops of New England, for the greater part, a straight line will cross the Hudson far below Albany, and as a consequence all rail communication between these points requires a long detour. A straight line from Boston to Pittsburg traverses Massachusetts and Connecticut and the coal and iron fields of Pennsylvania, and crosses the Hudson at or close to Poughkeepsie, the same line prolonged passes near to Cincinnati, Louisville and St. Louis. With the exception of a short section west of Poughkeepsie, this line is traversed by existing railroads.

The idea of bridging the Hudson has been entertained for a long time, but the possibility of erecting a bridge which would not interfere with navigation is of recent date and the opposition of those who are interested in water carriage has been sufficient to defeat all projects which contemplated bridging the river near the water level.

Advances in the art of engineering have been very great during the past few years, and constructions are now easy which have been beyond the range of possibility; much of this is due to the invention of the cantilever.

The charter of the Poughkeepsie Bridge Company was granted by the State of New York in 1871, but the death of the principal subscriber to the stock, and the panic of 1873 brought the work to a stop after the expenditure of about \$1,000,000 in preliminary work and the accumulation of material.

The bridge is accurately shown in the engraving and will be one of the most extensive and magnificent structures of its kind in the



world. It will consist of five spans over the river channel, three of them cantilevers 550 feet each, and two truss spans of 525 feet each. The material is steel, and will be supported on tall steel towers resting upon stone piers 252 1/2 feet on top.

The bridge is to have two tracks and be of sufficient strength to support two trains each drawn by 85-ton locomotives, and a morning load of 2,000 pounds per linear foot on each track. The bottom of a truss and the cantilever spans will be 150 and 160 feet respectively, above high water, and the track will be 212 feet above high water.

Last year the Manhattan Bridge Company was organized and acquired all the rights of the previous company. This new company made a contract with the Union Bridge Co. for the entire work of the foundation and superstructure, and on this contract operations were re-commenced in September, 1885. In the new plans now made, the charter requirements of 500 ft. clear channel openings and a clear height of 130 ft. below bottom chord were of course still adhered to, and the two foundations partly completed were to be utilized, and the new foundations sunk in similar open cribs. But the piers and superstructure were entirely changed. For the solid masonry piers of the old plan metallic towers resting on stone piers, 40 ft. high, were substituted, and the superstructure was changed to two connecting and three cantilever spans with the rails 212 ft. above high water. The dimensions of these spans were also controlled somewhat by the change in conditions on the west bank where the West Shore R. R. now has its tracks.

At the bridge site the river has a depth of water ranging from 50 to 60 ft. The general character of the bottom is made up of a fine, soft mud and clay and sand mixed to a depth of at least 100 ft. below high water, when a firm, hard sand and gravel stratum was met with, overlying the bed rock, which latter was about 140 ft. below high water mark.

The crib was 69 ft. wide by 190 ft. long at the bottom; and for the first 20 ft. in height there was a cutting edge made of solid timbers shod with a 12x12 inch oak stick. All the timber used in the crib was 12x12 in. hemlock, saving the oak shoe before referred to. The triangular end portions formed close pockets to be used in sinking the crib through the mud, etc., and holding it down against flotation. Above the cutting edge the walls of the pockets were made of two thicknesses of timber, or a ft. wide. The longitudinal walls were firmly tied together by six cross walls (not in

cluding the end walls) each 2 ft. thick also, and starting just above the oak shoe. There were 14 clear openings each 12x12 ft. used for dredging pockets through which all the material was removed by the clam-shell dredge as the crib was sunk by the weight in the central and side pockets. The 12x12 in. timbers were so laid that the longitudinal and cross courses alternated in direction, and the spaces between in each case were closed with fillers of the same timbers. All halving or jointing of sticks was thus avoided and the entire mass was thoroughly tied in each direction, with solid walls from bottom to top. Each course was fastened to the one below by round 1 in. drift-bolts, 20 in. long, with 4 1/2 bolts to each full course.

The actual sinking of the cribs to hard bottom was accomplished by dredging, under the usual conditions of such work, the cribs

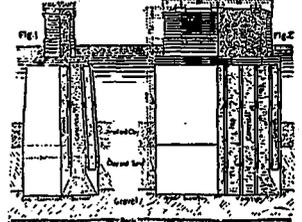


hanging for a time and then descending with a drop of some feet at a jump, settling more or less out of level in either direction. Mr. O'Rourke, we understand, introduced some very practical modifications in the dredging practice which resulted to the better maintenance of the level of the crib in sinking. When hard bottom was at last reached the dredging pockets were filled with concrete deposited under water by boxes holding one cubic yard each and opened at the bottom by a latch and trip line. The concrete was made alongside the crib on a float especially fitted. This float carried a raised mixing platform with the concrete mixer set beneath; cranes on this float handled the boxes and deposited the concrete at a maximum rate of 300 cu. yards per day, which is an almost unequalled rate of progress. It should be remarked that before this concreting the weighting pockets had been solidly floored over with twelve inch timbers and the concrete was levelled off within them by the aid of divers.

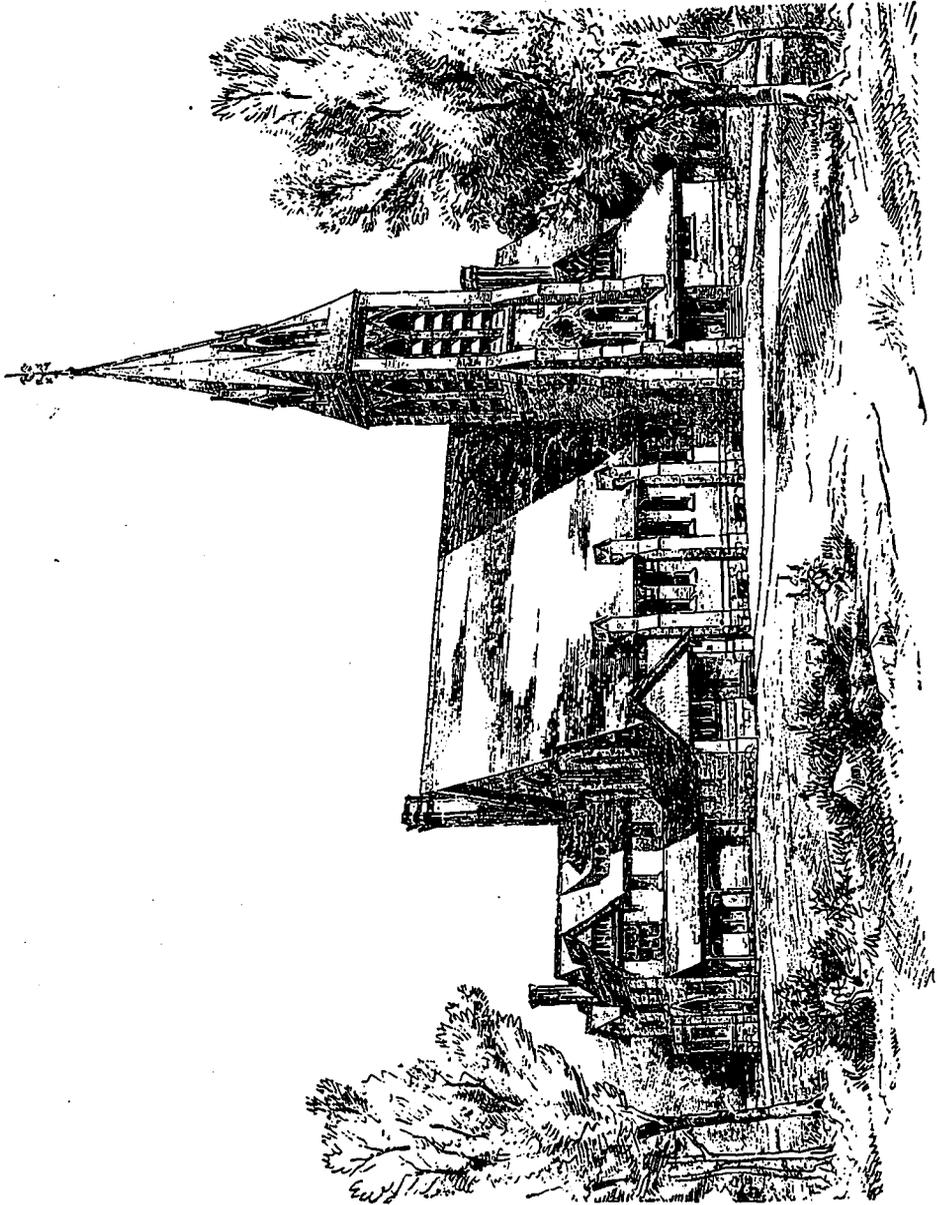
A floating caisson surmounts the crib and carries the masonry on its six foot deck. The bottom of the caisson is six feet deep, made of twelve inch timbers laid in three two foot steps or courses. The sides are double layers of two inch plank, calked on the outside, with the a gale pitched, covered with canvass and battened. Holding-down bolts and cross-girders permitted the sides to be removed as soon as the masonry was above the water sufficiently. The caisson was towed out over the crib and the masonry started, and when it would only float at high water (for the tide reaches this point in the river) it was exactly located and sunk to a final bearing by additional weights.

The piers are very handsome in design, and are built with a face of dark limestone laid in magnificent courses of 3 feet and upwards in depth and the interior filled with concrete. The surrounding coping is very pleasing in its effect, with just enough tuckwork upon it not to detract from the mass and position of the pier.

This completes the general description of the foundations, and we now come to some of the difficulties of the work. The first trouble was found at pier 2. Here the old bridge company had completed the foundation, and had built its masonry pier to a height of 20 ft. above high water, with top dimensions of 22x68 ft. This was not a sufficient base for the metallic towers of the Union Bridge Co., which called for dimensions of 25x87 ft. and the old masonry had to be taken down and the pier widened and



lengthened somewhat. But the old company had had trouble here too, and it came about in this way: In the old crib the upper eight courses had been calked, and a coffer-dam commenced upon it, and carried down with the crib until its bottom was 38 ft. under water. When this dam was pumped out, the upward pull proved too great for the holding power of the combined bolts and concrete, and the whole mass lifted several feet at the north end,



DESIGN FOR A TOWN CHURCH—DARLING & CURRY, ARCHITECTS, TORONTO.

hanging at the south. It came down again when water was admitted, but the bolts and debris prevented a closer fit than 8 in. In this emergency a pneumatic caisson, 29 1/2 ft. in size was used to secure a bearing on the solid part of the foundation, and as a consequence the masonry was started 2 1/2 ft. below high water.

The Union Bridge Co. was thus compelled to sink a coffer-dam, 48 3/4 ft. around the old caisson and masonry, and resting on the old crib at a point where its dimensions were 50x100 ft. This coffer-dam was made of two walls of 12x12 in. timbers with verticals of the same size between, and the pacesets thus formed were filled with concrete for 16 ft. in height and finished out with clay. Mr. O'Rourke says this last was a mistake, as it could not be rammed, and gave them trouble from leakage. The bottom of the dam was filled, by the assistance of the divers, with concrete, made with a part of cement, 3 of sand and 6 of screened gravel. The masonry of the present pier is erected within the limits of the old pneumatic caisson, excepting only two end sections which carry no weight, and the old 8 in. rupture was hoisted up lightly and Portland cement was injected through six 3 in. standpipes left for that purpose.

At pier 3, all rotten timber in the upper courses was replaced by sound sticks, and the dredging recommenced until its bottom was 126 ft. below high water. The center of the crib was found to be 3 ft. east of its proper position, but as the crib is 60 ft. wide and the masonry only 25 ft. wide, this fact gave no trouble.

Piers 4 and 5 were entirely new and in mid-channel, and it was found to be a very difficult feat, at first, to hold them to their anchorage, before grounding. Commencing with pier 4, we have a weight to handle of about 5,000 tons, in an unsteady form, and presenting an outside surface to the river current of 17,000 sq. ft. with several thousand additional square feet in the inside walls. The crib drew 52 ft. of water, and it was at first proposed to hold it by three up and three down stream anchors, but it was found necessary to employ 8 up streams 8 down streams and 6 side anchors.

The following extract from a letter of Mr. O'Rourke, engineer in charge, gives the present status of the work:

"The two abutment piers were first erected on an ordinary false-work. Spans 2 and 3 were next erected on a false work, a part of which is shown in the accompanying figure, by means of a traveler, also shown in same. The false work consists of 26 bents, 23 resting on 24 piles each and 4 resting on the masonry. Of the latter 2, the outer ones rest on the piers, and the remaining two on the concrete in the bottom of the caissons. The two cantilever arms and 218 suspended spans between them, were next put in place, without falsework by means of the two travelers shown in the cut. The accuracy of the work done is testified to by the fact that the last pieces fitted exactly in their places.

Meanwhile the falsework under 2 and 3 was removed and the foundation piling pulled up for use next season.

This closes the river work for the winter. Until spring work will be confined to the erection of the viaducts for which nearly all the pony piers have been built."

The Chief Engineer for the Union Bridge Co. and the one in charge of the works is Mr. J. F. O'Rourke, while Mr. P. P. Dickson still represents the old Poughkeepsie Bridge Co., and Mr. A. B. Payne is Chief Engineer of the Manhattan Bridge Co.

LONDON.

I HAVE forwarded you a copy of a new contract agreed upon by architects and builders of this city, and under which contracts for the coming season will be performed. I also send you a copy of the old contract in order that you may institute comparison between them. A careful perusal will show great differences between the two. The revised contract calls for all plans and details to be prepared before tenders are submitted, whereas formerly the details were given as the work progressed. Under the old contract it was customary to pay 75 per cent. as the work advanced, and the balance in 60 days. Under the new contract 80 per cent. is payable as the work advances and the balance in 30 days. The principal change, however, is that whereas formerly the contractor was bound by the decision of the architect on any matter in dispute, except deductions, now he has the right to appeal from any decision. These are the principal points of difference between the old and new contracts.

We do not anticipate any trouble here, and see no cause for it. There will not be a great deal of work offered this season, owing to the depression in trade, but we expect better things for the fall.

MONTREAL.

(Correspondence of THE CANADIAN ARCHITECT AND BUILDER.)

THE following building permits were issued from the office of the Building Inspector, Mr. Lacroix, Montreal, during the month of February—Jos. Vezina, 1 dwelling, Berri street, cost \$1,800; F. Mandeville, 2 dwellings, Cadieux street, cost \$1,500; Jos. Belanger, 2 dwellings, Papineau road, cost \$3,600; L. E. Philibert, 1 dwelling, Chartron street, cost \$1,500; J. A. Vanboogert, 1 dwelling, Drolet street, cost \$1,500; M. Galarneau, 1 dwelling, Dufferin street, cost \$800; M. Dinanq, 4 dwellings, same, cost \$3,600; F. X. Monette, 2 dwellings, Fuhrum street, cost \$2,400; M. Galarneau, 1 dwelling, Streville street, cost \$900; J. Lamerche, 1 shop, Joseph street, cost \$1,000; F. X. Charrier, 1 dwelling, Maple street, cost \$1,500; G. Chaboussou, 1 dwelling, Maple street, cost \$1,800; J. Yves Charrier, 1 dwelling, Montcalm street, cost \$1,300; Laperre & Papeete, 1 factory, Notre Dame street, cost \$3,600; G. A. Chevalier, 1 3-story dwelling, Ontario street, cost \$1,500; Chas. Laberge, 2 dwellings, Ontario street, cost \$3,500; Patrick Stanford, 1 dwelling, Rivard street, cost \$1,800; J. B. Dumand, 4 dwellings, Rivard street, cost \$6,000; Zephirin Charost, 1 dwelling, Rachel street, cost \$1,800; A. Dumoulin, 1 dwelling, Rivard street, cost \$1,000; Richard Kendall, 1 dwelling, Richmond street, cost \$1,200; P. Caulainet, 4 dwellings, Rivard street, cost \$1,000; C. Roussin, 1 dwelling, St. Lawrence street, cost \$800; F. Davis, 1 dwelling, St. Denis street, cost \$2,200; E. Carpentier, 2 dwellings, St. Dominique street, cost \$2,500; N. Paquette, 1 dwelling, St. Denis street, cost \$2,000; Jos. Sarreault, 1 dwelling, William street, cost \$1,000; M. J. Cummings, 2 dwellings, Wolf street, cost \$3,600.

WINNIPEG.

(Correspondence of THE CANADIAN ARCHITECT AND BUILDER.)

THE outlook for the building trade in this city is not of the most encouraging character. In fact, as far as public information has been given, there are few new buildings of any importance as yet projected. Messrs. Timewell & Son, architects, have just taken tenders for the erection of an addition to the general hospital which will cost about \$9,000, and are preparing plans for a new maternity hospital and small theatre and operating room for the hospital. These are about the only works actually decided upon, though it is less possible that if the railroad negotiations at Ottawa result successfully there may be some change in the situation. There are a number of firms in Winnipeg that occupy business premises that are inadequate in character, and a number of citizens that have in contemplation the erection of residences in which to establish their homes. These two classes, although in many instances having plans prepared, have been looking back, awaiting the turn of events and uncertain of the wisdom of making investment.

The Contractor's Association at present is in statu quo from almost the same reason as given above, viz., the almost stagnation of business generally. There will be a great demand during the summer for carpenters, as there will be a great number of grain elevators built throughout the province.

HAMILTON.

(Correspondence of THE CANADIAN ARCHITECT AND BUILDER.)

I DID intend forwarding a list of the buildings to be erected in Hamilton as shown by the Building Inspector's book, but I was sorry to find that this book was no criterion to go by as to the building prospects. On the contrary, I ascertained that notwithstanding the fact that the Council had passed a resolution that no person shall commence the erection of any building within the fire limits of the city of Hamilton until he shall have lodged with the Inspector of Buildings a notice thereof, to be entered in a book kept for that purpose, one half at least of the buildings erected last year were not so entered, and only a few of a large number of buildings that I know are in contemplation for erection on the opening of the season, are recorded up to the 7th instant. This state of things must not exist. The by-law must be enforced, and a recent complaint laid before the Council will no doubt straighten the matter out effectually.

From all reliable accounts the building prospects for the season are good, but already promise to be ruined by the unwise action of the bricklayers' union; which is already letting its thunder be heard. As can be seen in the daily papers, the union leaders seem strangely insensitive as to their own duties as they are doing to their own members by their off-handed dealing with their prospective employers. If in this connection the leaders alone were the parties that would suffer, the matter would be of little consequence, but such is not the case. Means must be taken in the interest of the Building Committee and the mechanics themselves to counteract the paid efforts of these creatures of discord.

In the last issue of your journal I notice a very comprehensive article headed "An Appeal for Organization," in which reference is made to a letter in a previous issue. "Consans Fides" urges the revival of the Canadian Institute of Architects. That Institute was organized with the purest and best of motives, as a means of uniting its members in friendly intercourse for social and professional improvement, and its revival would certainly be productive of much good. The Architectural Guild, of Toronto, is a brilliant effort in a local direction, and promises to attain the object sought by developing into an incorporated association of architects, and there is little doubt that with the urgent pressure and claims of the rising generation of architects, whose eyes are open to the myopia of their predecessors, such an institution can and will be incorporated, but this incorporation will not certainly be the desired attachment unless the architectural name and profession is thereby protected against the usurpation of quacks to the same extent, at least, as the other learned professions. This is certainly the main question at issue, and now is the time to push the matter with united efforts to final success. I am glad to see that the growing interest taken in this journal is being evinced by the useful contributions made to its columns. In this connection all have a duty to perform in upholding a work of such real merit. Let the architect and engineer of long practice adorn his pages with useful essays from their fountains of knowledge; for the benefit of those less favored, and juvenile brethren, and then for the gratification of having enriched themselves of the best possible medium for imparting a share of their knowledge and experience to those by whom it will be most appreciated. The elements of architecture afford a wide field for commentary, and local essays on acoustics and other kindred subjects would certainly be valuable matter for discussion, especially for the students, who would improve on the opportunity of entering the arena themselves and submitting their individual ideas and questions.

There is another matter that has engaged the attention of architects, and is deserving of comment, that is the prevailing practice, among Canadian architects especially, of advertising for tenders. Some architects uphold the practice on the principal of right and justice to their clients, in providing them with a number of offers to select from. Others look favorably on the practice as a direct means of advertising the amount of work entrusted to them. But to the gratification of having enriched themselves of the best possible medium for imparting a share of their knowledge and experience to those by whom it will be most appreciated. The elements of architecture afford a wide field for commentary, and local essays on acoustics and other kindred subjects would certainly be valuable matter for discussion, especially for the students, who would improve on the opportunity of entering the arena themselves and submitting their individual ideas and questions.

"Equitable Contract" passed by the Builders', Contractors' and Dealers' Exchange, has been passed in consequence of the great injustice they have repeatedly suffered through certain architects withdrawing the certificates given them in good faith, and putting the contractors to great loss, and forcing them into suits of law where the richer man can keep the contractor out of his justly earned money. The architects are perhaps not aware that the law on contracts specifically states that the proprietor and architect or engineer can be subjected to punishment for collusion to keep the contractor or contractors out of their money. This has been done so, so the contractors have stated.

ANON.

IMPORTANCE OF CARPENTRY.

THE carpenter has more to do with the construction of a building than any other person employed by the architect. Whether a building is to be erected of brick or stone, still it is the carpenter who forms all the patterns and guides for the bricklayer or the mason to work from. Nay, even if a cottage is to be built of wood, the first step is to procure boards adapted by the carpenter for forming moulds, by which this mud is brought into the required form; or, even if the mud is heaped up with forks, as in the cob walls of Devonshire and Wiltshire, the carpenter is required to supply what are called wooden bricks to be built into the walls for attaching, at a future period, the internal finishings.

In the interior of the house everything depends on the carpenter, and most things are, indeed, done by him. The floors and doors and windows are almost entirely his work, and he forms mouldings for the cornices which are put up by the plasterer. If, therefore, we could improve the taste of the rising generation of carpenters, we should have no fear of operating, through them, on all the various artisans employed in the construction of houses, and ultimately, on the general taste of the whole community.—J. C. London.

ENGINEERING NOTES.

FROM the address of President Thos. C. Keefer, C. M. E., at the annual meeting of the Canadian Society of Civil Engineers, we make the following extracts:

"As Engineers, our foremost were as good as our back-bone. If we plan locks to suit the vessel of the future, instead of having to build vessels to suit the locks. It should be mentioned, however, that the dimensions of our locks were established by a commission representing the trade, of which commission the late Sir Hugh Allan was chairman.

We are about to start the Sault Ste. Marie canal, which, since Lake Superior has become an important entrepot of Canadian commerce is necessary to complete the Canadian system. It will, no doubt, be upon a much larger scale than any other Canadian canal, and, if so, well, I think, soon raise the question of a further enlargement of the Welland Canal, so that vessels which can now reach Buffalo may extend their voyages to Prescott, within a little over two miles from the ocean steamer.

The Pennsylvania Railroad is substituting stone arches for iron bridges where practicable, and the same question is attracting attention in England. The centralizing system by which bridge plans have been decided at the head office from profiles of the crossings has no doubt been responsible for many cases in Canada where iron girders and abutments have cost as much as an arch. The girder is always a bridge with all its contingencies; while the arch, where it can be depended upon, practically abolishes the crossing, and substitutes a causeway for a bridge.

Of future engineering works I can say but little. Our railway system penetrates all parts of the Dominion, and will extend itself wherever and as soon as required. The only remaining national railway not yet accomplished is the one projected to reach Hudson's Bay. I do not believe this will become an exporting route in competition with the St. Lawrence, not that 500 or 600 miles of railway without local traffic or through connection, can be sustained by a few months ocean navigation in Arctic waters. The crop of the Northwest cannot be exported before navigation closes, and the railway will have little traffic to keep open its line during winter, because grain will rarely be sent to cool off for six months or more in elevators on Hudson's Bay. Our eastern trunk lines, with the advantage of a few shorter lines, are our chief artery, cannot hyperbate at Montreal and Quebec, but have been obliged to push on to the open sea.

I believe, however, that as a nation we should tap Hudson Bay at the bottom, in James Bay, where it approaches within a few hundred miles of our railway system in the Ottawa Valley. It would be the valuable fisheries, furs and other Arctic exports from an enormous coast line would gravitate southward to such a railway, and that its terminus would be the depot for a fishing fleet, which would compete with the whalers of the United States.

In bridges Canada has the finest samples of the various types, and the only tubular ones on this continent. While there is undoubtedly a surplus of iron in the Victoria Bridge, I do not think there is an unnecessary amount of masonry work in the piers. Its location and exposure to the sea, however, require more massive piers than bridges where only running ice has to be encountered. Moreover, the liberal dimensions with the stream are sufficient for a second line of rails.

But we have a bridge project, which when carried out will in length of span be second only to the Forth which is 1661 feet. This is the proposed cantilever at Quebec. The car traffic of the Canada Atlantic has warranted that road in deciding to supercede a costly ferry system by a bridge, and let us hope that a similar case may soon be made out for Quebec.

The Railway Bridge over the St. Lawrence at Lacolle recently completed by the Canada Pacific Railway is an example of rapid construction of the best masonry in a difficult situation, which has not I believe been equalled anywhere before—the work being done between the leaving and the taking of the ice in the same year. The tunnel or sub-way to give mill power to the mill at Prince Edward Island is another of the great engineering works proposed. It is difficult at present to say whether the physical or

the financial obstacles are the greatest, but when the money is forthcoming I have no doubt a way will be found to reach the inland.

The last great project I have to notice is the proposed ship railway between the Bay of Fundy and the St. Lawrence, located in the neighborhood of the route surveyed for the *Bas de Verte canal*. I will not participate in the paper to be presented to the Society by one of our members, who is the projector of the scheme, by an attempt to describe it in detail, but will only say: No route could be more favorable in an engineering sense for the inauguration of this new system. A practically straight and level line less than 20 miles in length, is available. I have the utmost faith in the practicability of the enterprise. There is no novelty in raising or moving vessels on wheels. France is now transferring torpedo boats between the Atlantic and the Mediterranean by rail. Ships have been hauled out on wheels, and been put back in the same water; the ship railway only proposes to carry them farther and put them in another water.

NOTES ON CARPENTRY AND JOINERY.

By Wm. SIMPSON.

THE following notes on the above subject formed the basis of a very interesting and practical address delivered by Mr. Wm. Simpson, Secretary of the Master Carpenters' Association, to the members of the Architectural Draughtsmen's Association of this city, on Feb. 27th:

Regarding joisting I would suggest that trimmers should, as a rule, be hung on iron hangers, or stirrups as they are sometimes called, with tie-bolt to bring snug up to trimmer joists. It is quite enough for the tail joists to be framed with the usual double tenon. I have on several occasions been called on to put supports at this point on account of the trimmers splitting.

For deafening I would recommend that felt be used in place of mortar, as being equally effective, and adding only a trifling weight to the floors. The value of felt will depend on its quality, and the number of thicknesses to be used.

I think strips should be used in brick walls, and plugs in stone. The strips should be kept at least half an inch from face of wall in order to give sufficient depth for rendering by plasterer. In many cases they are all but flush, so that to give the wall a proper coat the ground is lost sight of, and the carpenter is obliged to scrape off the mortar, or as is very often done, drive his nails into the bricks if they are soft enough to receive them. In many parts of the wall I have known the mortar to be not over $\frac{1}{4}$ inch, which can be of no service whatever.

I will also remark with regard to strapping that an error is very often made by the carpenter not furring out beams and trimmers coming flush with ceilings and walls. This neglect is the cause of so much faulty plastering, especially in staircases. In frame houses this is particularly noticeable, when the lath is nailed on the girth or plate as the case may be.

I consider that in all cases grounds should be used for trimmings, even when the joiner work may be fixed on the first coat of mortar. As to the grounds being bevelled, I do not think it is of much consequence, nor do I think that their being dressed is at all necessary. When the job is first-class I think the windows should have the ground and strap combined—that is, a piece $2\frac{1}{2}$ with $\frac{3}{16}$ checked out, thus giving good and firm nailing.

The subject of roofing is so extensive that I will only offer a thought on the commonest treatment of the jack rafter. I think that in many cases the introduction of principal and purlines could be avoided by increasing the depth of the common rafters and collar ties, and by the use of struts or braces where the span is wide. I have seen principals of great strength on church roofs, but placed at such a distance that the purline was over-taxed, and, as a consequence, the dipping of the ridge would be quite apparent, and were you to cast the eye along the wall line at the eave, you would find that it was rounding considerably.

I will next give you my opinion as to the treatment of rafters when moulded at the line of cornice. You will readily see that it is difficult, as well as a laborious task, to mould the rafter on itself. I believe that more accurate work can be assured by the rafter proper terminating at the wall plate, and the mould portion being nailed or bolted on as a separate piece.

I have just a word or two to say on the subject of arches. You will have noticed that in many cases the elliptic arch is crippled to such an extent as to be painful to witness, and as the carpenter has usually to stand the consequences of the line being true, I would simply say that in my opinion the best method of describing the ellipse is with the trammel. I would also point your attention to a defect in masonry. You will have noticed what a variety of lines is in practice in the formation of the skewback of a flat arch. Now I believe I am correct in saying that generally speaking the bricklayers

have no fixed rule to work by, and the consequence is the arches in many of our speculation buildings are scarcely self supporting. I think the angle of 60 degrees is the best and simplest rule for guidance in this matter.

On the subject of joinery I desire, first of all, to say that the carpenter has much to contend with in the matter of window finish, as no matter how carefully the frame may have been squared on the bench, or how plumb it may have been set, he often finds when he comes to finish that it is neither plumb nor level, and thus gives him much trouble should the window be finished with box shutters. This, of course, is all avoided when the building is of stone, as the carpenter then sets the frame with "screeds," and wedges it to its true position. The weight drags on back plumb stile when made of thick material. Pulley stiles should not be more than $\frac{3}{4}$ inch thick, instead of $1\frac{1}{2}$ to $1\frac{3}{4}$ as is often the case. I might describe various methods of hancing shutters and blinds, for example, a separate shutter in front hinged to architrave, the shutter and blinds proper being hung to window casing, and thereby being concealed, the window presenting a finished appearance at all times, also a method lately introduced of sliding the shutter into a pocket similar to sliding doors.

In a jib head window the bottom sash should have the horn of stile left long and moulded so as to carry up the slip head without coming in contact with sash fastener.

The subject of stairs is to my mind one of the most interesting in the department of joinery, but I will have time to give it only a passing notice, and will simply refer to such points as may have happened to escape your observation. The dog-legged stair being the most common, requires no comment, but I would suggest that when the stair is a good one, and situated between walls, the first flight might be wider than the return flight. This will give the stair a finer appearance towards the hall, and show less soff, besides giving more light to the staircase window. Where there are quarter landings I would suggest square newells where at all practicable in order to meet the different heights of rail. In an open newell stair I would also advise that the position of step be such as to procure equal height of newells on landing. In the treatment of a cylinder stair, it is advisable to diminish the step before reaching the cylinder, which will have the effect of lowering the height of rail over the nosing from pitch to pitch. With regard to the art of hand-railling I would observe that the hard and fast rules as laid down by Nicholson and others need not be followed in their entirety, but should be humored to suit the hand as well as to appear pleasing to the eye. As to difficulties often met with in stairbuilding, these can best be overcome by the practical stair-builder if well skilled in the art.

The soffits of stairs in good buildings should either be sheathed or panelled according to finish. When a stair has a continuous rail string moulding should be eased, and mitred in a newel stair. Steps of inside stairs should have a fall of $\frac{1}{8}$, and outside steps $\frac{3}{8}$.

The proper height of rail over nosing is usually considered to be 2-6 $\frac{1}{2}$, and the landings 2-8. As to the fixing of balusters, I think the better plan is to groove out the rail and cap of string with pieces set in between. The curial step is of great advantage in fixing the newel, as well as enhancing the appearance of the stairs. In fixing rises and step it is best to tongue the riser into tread, but not the cove, as used to be the practice, and in all cases the joint should be plain at back of step.

In the hanging of doors the first thing to be done after the door is fitted is to apply it to the frame at right angles, and project the bottom hinge to suit any irregularity of the floor.

If possible, casings should not mitre through, but only as far as the first moulding, so that the other members may break the joint, thus preventing shrinkage.

When difficult to obtain thoroughly seasoned lumber for counter tops, etc., it is well to fasten same to the frieze and button down to counter framing.

DRIVING STONE HEADINGS WITHOUT EXPLOSIVES.

IN driving a stone drift at the Bois de Botsau Colliery, in the Mons District, Belgium, the strata were found to be so charged with fire-damp that it became impossible to continue the use of explosives. Recourse was therefore necessarily had to other means of carrying on the driving. The system adopted has shown itself to be adequate to the circumstances of this case, and is worthy of mention as a successful solution of a somewhat difficult problem. The rock was a very hard grit, lying in horizontal beds. A machine drill, of the Dubois & Frénois, type, was employed on the face of the heading in the following manner: Across the middle of the face a row of holes was bored, from 3 to 4 inches in diameter and 2 feet deep, the distance of the holes apart being from 5 to 6 inches. When all these holes had been bored a special tool was substituted for the drills, having a rectangular

striking surface 6 inches long, by 2 inches wide, and provided with teeth like a saw. By means of this tool the rock left between the holes was cut through, leaving a horizontal groove, varying in width from a inches to 6 inches, and of a depth of 3 feet, extending across the face of the heading. This groove was intended to serve the same purpose as the "holding" or undercutting in coal. Other holes of smaller diameter were then bored above and below the groove, not in greater or less proximity to it, according to the strength of the rock. Conical iron wedges of slow taper, placed in these holes and driven by the machine drill, provided with a hammer for the purpose, broke down the rock between the holes and the groove. These operations were continued until the whole face had been brought down, when an adroze had been made of about 3 feet 8 inches. The shifts, which were of 8 hours, consisted of three men, one in charge of the drill and two laborers. The driller worked 16 consecutive hours. The average rate of progress made under these conditions was 8 feet 2 $\frac{1}{2}$ inches a week, the section of the heading being 6 feet 11 inches by 7 feet 2 $\frac{1}{2}$ inches.

BUILDING PLAN ASSOCIATIONS.

THE receipt of a small book, well gotten up, as far as advertisements and general appearance are concerned, published by a building plan association in a western city, is the reminder that a note of warning should be given as to the character of these somewhat fascinating but very fallacious publications. The book referred to, like others of a similar description, contains designs of buildings purporting to be possible of erection at most absurdly low figures. It is about time that the public should realize exactly what such associations are. Any organization in any profession that pretends to cut rates to the extent they do must be dangerous. One can have no hold on them. They prepare plans in their offices for buildings which they say can be put up for a certain amount of money, often forty or fifty per cent. lower than the building would cost if erected by honest labor and from the plans of a responsible architect.

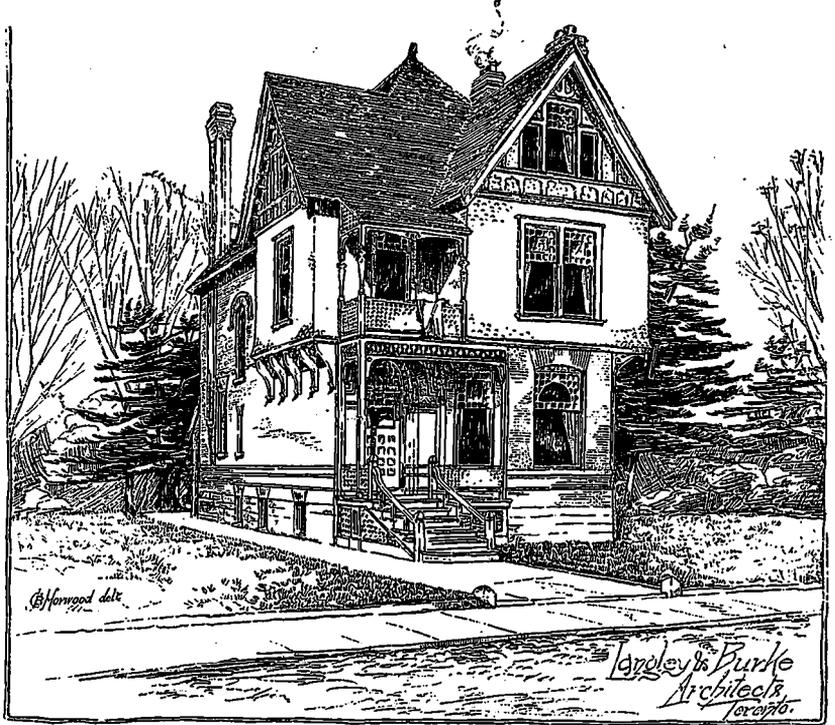
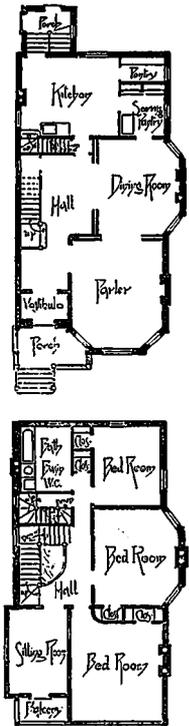
These organizations are formed either by "smart" business men or by architects who have failed to support themselves in the legitimate practice of their profession. They employ one or two good draughtsmen at a small salary and the portion of the business relating to the building plans is left in their hands. Frequently the men at the head of these organizations are capable only of misrepresenting and twisting facts to the beguilement of unfortunates clients, and the rest of the business is left to the draughtsmen. These last may be clever men with the pencil, but when they act as full-fledged architects they are apt to prove failures, not in the way of drawing an attractive design, but in the matter of estimating expenses. This point is the most important one, and the knowledge of it can be gained only by experience. No amount of books in regard to estimating can do away with the necessity of practical experience.

A case came to our knowledge but recently of a man living on a very moderate salary who, tempted by the advertisements of one of these "Plan Associations," procured a set of plans for a small cottage on the representation of the "Architects" (?) that it could be built for \$1,500, bought a lot for \$500 and prepared to build. He then obtained bids from builders and found their estimates far exceeded both his expectations and his means, and not having the money to erect the cottage he had to give up the idea of building and was left with a vacant lot on his hands which he could not use.

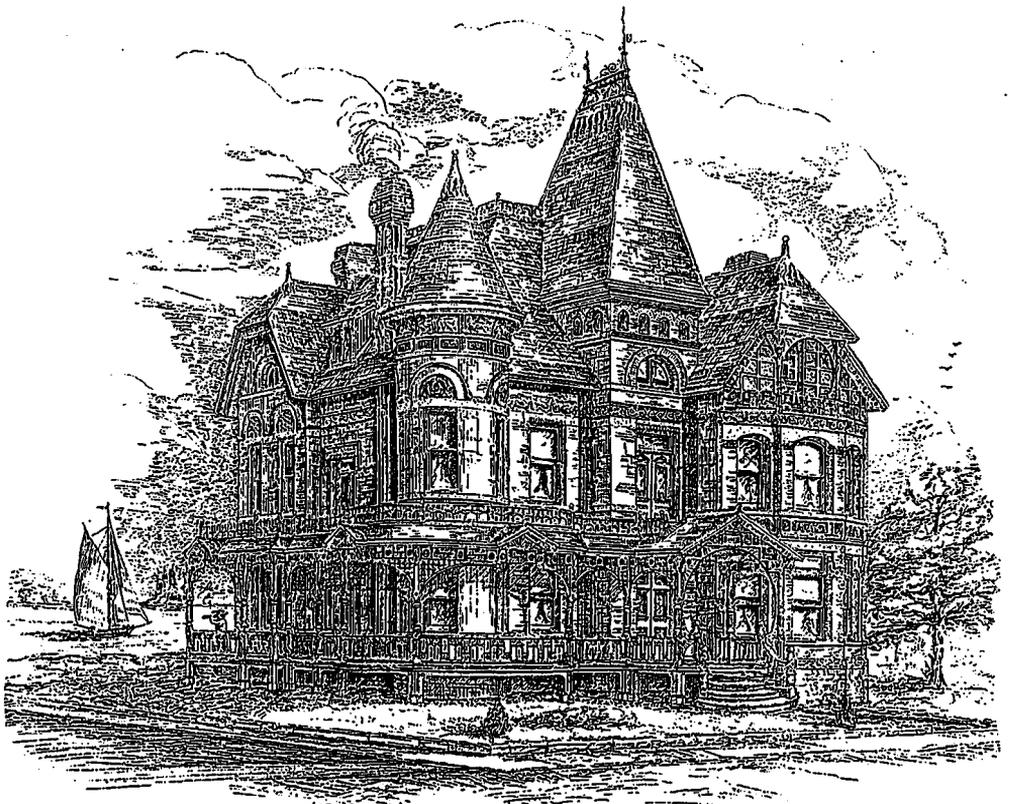
We are safe in making the statement that in seventy-five per cent. of the cases, plans furnished by these building associations can not be carried out for the amount of money stated by them, and we are willing to follow up this assertion by stating that a large proportion of such plans, examined by a responsible architect and estimated on by a reliable builder, will prove to be faulty. These organizations endeavor to catch the eye of the public by attractive books containing, in many cases, good designs of cottages and buildings, which will stand little or no scrutiny by a man who has any experience in architecture. A portion of the public, notably those residing away from the commercial centres, do not realize at all the duties of an architect. We urgently advise any one wishing to build that the first step necessary towards the guarding of his interests is the employment of a responsible architect. The fee paid to him for his services is well worth the money, and any one getting plans by other means will find out, sooner or later, that he has made a serious mistake.—*Building*.

Inspector O'Reilly in his yearly report to the Ontario Legislature says that the floors of the London Jail need a thorough repainting. All the old brick floors should be taken up and replaced with flagging or good cement.

It is reported that the Dominion Government has decided to enlarge the St. Lawrence Canal to equal the proportions of the enlarged Welland canal. The work is estimated to cost \$18,000,000. Of this amount the following sums will be expended during the coming fiscal year: On the Cornwall canal, \$24,000; Lachine canal, \$88,000; Welland canal, \$175,000.



HOUSE ON PEMBROKE STREET, TORONTO, FOR W. J. DAVIS, Esq.



RESIDENCE FOR J. A. HENDRY, Esq., KINGSTON, ONT.
POWER & SON, ARCHITECTS, KINGSTON.

ARCHITECTS and contractors, says the *Sanitary News*, will be interested in the action taken by the National Builders' association at its annual meeting in Cincinnati last week. The association decided that general plans, details and specifications, when offered for final and competitive estimates, should be on a scale of not less than one-eighth of an inch to the foot, should be done in ink or some enlaving process, and be complete in every part; such parts of the work as require a higher scale to be comprehended should be one-fourth of an inch to the foot; specifications should be definite; estimates should not be made to cover an indefinite depth of foundation, but where the soil requires going below the depth indicated on the plan, it should be paid for as extra work at agreed prices; the specification is to be the guide for estimating, and all demands made by the specifications, unless objection is made thereto in writing when the bids are submitted, should be covered in the estimate offered; improper demands made by plans are not to be considered; grouping of special work must be mentioned and placed under appropriate headings; specifications must distinctly state when it is necessary to cut or change the work of one mechanic in placing the work of another, and such work should be cut or changed by the mechanic who put it in at the expense of the mechanic for whose accommodation the change is made; contractors are not to be restricted as to the work to be done without notice; on reserved portions of the work, let by the owner to a third party, the principal contractor should receive 10 per cent; the lowest invited bidder, whether a general or sub-contractor, should be given the contract and estimates for changes should be made only by him, unless the changes involve a complete alteration in the plans, and then the full competition should be again opened; in no case are the lowest two bidders to be called upon to estimate upon changes to see which shall have the contract; if the price estimated for changes should not be satisfactory to the owner, it should be settled by arbitration. Compensation for the lowest bidders when all estimates are rejected is demanded as follows: For estimates amounting to \$5,000 or under, 25; \$5,000 to \$50,000, \$50; over \$50,000, \$100. When security is demanded of the contractor, a like sum should be given by the owner. A good deal of discussion was indulged in on the rights of sub-bidders in the hands of architects and the general contractors—unsolicited bids—and a rule was passed to the effect that any member detected in trading on any of the sub-bids will be liable to forfeiture of membership, censure or suspension. It was also decided that bids should be opened in the presence of bidders when practicable, and that when a penalty is demanded for delay in completion beyond the day named, a premium of like amount be awarded the contractor for completion before the time. These remedies, some of them, are new, but all seem to be just, and we await with interest their practical operation.

Geo. Dethle & Sons, roofers, Toronto, have dissolved a varnish factory has been started at Woodstock, Ont. Building will be lively at Georgetown, Ont. next summer. The citizens of Coldwater, Ont., are calling for more cottages. The new Baptist church at Woodstock, Ont., will cost \$9,500. Wrentham, Ont., expects a boom in the building trade in the spring. The prospects for the building trade in Alvinston, Ont., are very promising. A new post office, costing \$30,000, has just been completed at Peterborough, Ont. The work on the C. P. R. hotel, at Banff, N. W. T., is being rapidly pushed forward. A large number of dwelling houses will probably be erected at Cannington, Ont. next summer.

It is expected that not less than \$50,000 will be expended at Neepawa, Man., in buildings next season. The new public school building at Senfouth will be built by Mr. John Lyons at the contract price of \$3,675. Contractor Joshua Garrett has commenced operations on the new graded school on Simcoe street, London, Ont. The Peterboro' Bridge Company has received the contract to build a new iron bridge at the Narrows, Orillia, Ont. The Salvation Army of Peterboro, Ont., are building a new brick temple, with seating accommodation for 1,000 people. George Hildebrand has the contract to build the new residence for the pastor of the Lutheran church New Hamburg, Ont. Six or seven members of the Builders' Exchange, London, Ont., who were expelled last summer, will be reinstated at an early date. The congregation of St. Catharines' church, St. Catharines, Ont., has just closed the contract for the enlargement of their building.

The building of the new city hall at Halifax, N. S., has been taken out of the contractor's hands, by the council. A law suit will be the result. The Canadian Pacific is to build a house on each quarter section in the Belcan colony in Calgary, on which three hundred families are expected to settle in time to commence spring work. Mr. John Redwood, contractor, has just finished another tall chimney for Bell & Co.'s new organ factory, Guelph. The chimney is 90 feet high and contains between 33,000 and 34,000 bricks. Mr. Thomas Grayson, contractor and builder, of Mossomin, N.W.T., will shortly commence the erection of a large stone house at Camington, Moose Mountain, by Mr. Hanson, an English gentleman, who proposes starting a ranch.

Mr. W. J. Burroughs, plumber, gasfitter and founder, of this city, assigned last month. Messrs. S. M. Marchant & Co., manufacturers of fireproof safes, chisels, plumbos, etc., of this city, succeeded in effecting a compromise with creditors.

Messrs. Timewell & Son, Architects, Winnipeg, Man., have a scheme for erecting five elevators throughout the province, to be started in municipalities that will give the necessary bonus of \$500 towards the construction of each 40,000 bushel elevator.



Architects, Engineers, Builders, Owners and others are invited to send particulars of all kinds of construction work for contemplation, or publication in this journal. Please state location, character and cost, and names of person or persons controlling the work.

LEAMINGTON, ONT.—A new public school is soon to be built.
 CAMBRAY, ONT.—Mr. R. James is preparing to build a public hall.
 ALMA, ONT.—The people have decided to build a new English church.
 LONDON SOUTH, ONT.—The Baptists are going to build a new church.
 GRAVENHURST, ONT.—A new English church will shortly be built here.
 EASTMAN'S SPRINGS, ONT.—There is talk of putting up a big hotel here.
 COLDWATER, ONT.—Mr. J. C. Arnold will build a new brick school this season.
 YARMOUTH, N.S.—It is proposed to remodel and enlarge the Yarmouth Hotel.
 UXBRIDGE, ONT.—The Methodists propose building a new church this year.

ILKENIKU, ONT.—Arrangements are being made for building a new English church.
 NIAGARA, ONT.—The Methodists are to have a new brick Sunday school this spring.
 GEORGETOWN, ONT.—The site occupied by Clarke's hotel will be built up next summer.
 BROOKE, ONT.—S. S. No. 9, intend building a new school house this coming summer.
 OAK LAKE, MAN.—Alford & Co. will rebuild their hotel recently destroyed by fire.
 LETHBRIDGE, N. W. T.—A number of new buildings will be erected here in the spring.
 MILLBROOK, ONT.—The block of buildings recently destroyed by fire will be rebuilt as soon as possible.
 KINCARDINE, ONT.—\$8,000 will be expended by the Government in improving the Kincardine harbor.

PORTAGE-LA-PRAIRIE, MAN.—The Methodists are collecting funds to build a new church next summer.
 RAT PORTAGE, ONT.—J. W. Humble, merchant, will erect a new store, to be built of stone, 20x30 feet.
 REGINA, N. W. T.—J. A. McCane intends building a three storey, seventy-five room hotel this season.
 DEAYERTON, ONT.—The Town Council are considering the question of the erection of a new Town Hall.
 FOREST ONT.—Over \$2,000 has already been subscribed by the members of Christ church for their new building.

OTTAWA, ONT.—The Congregationalists, of this city, have decided to build a new ten thousand dollar church.
 SOUTH WINCHESTER.—Arrangements are being made for the erection of a new Anglican church and parsonage here.
 NEW WESTMINSTER, B. C.—Local architects are preparing plans for a dozen or more new houses to go up in the spring.
 HILLSBURG, ONT.—The brick, sand and stone is now on the ground for enlarging, beautifying and remodeling the Baptist church.
 TILBURY CENTRE, ONT.—Mr. Dick, Architect, Ridgeway, is preparing plans and specifications for the proposed new English church.

WESTMINSTER, B.C.—Contractors are getting ready to proceed with their contracts. Several houses have already been commenced.
 SAULT-STE-MARIE.—It is reported that a syndicate with Mr. R. M. Caldwell, of Toronto, at its head, is about to build a \$43,000 hotel.
 STRATHROY, ONT.—An official of the Government has been selecting a site for new public buildings. Contracts will be let shortly.
 PARKDALE, ONT.—A large brick block will shortly be built on the south side of Queen street, between Cloze and Jamieson Avenues.

STRATFORD, ONT.—The plans for the proposed addition to the Waterloo Street Methodist church are out. The addition will cost about \$3,000.
 PETROLIA, ONT.—Building operations will be brisk here the coming season. Among the proposed new structures will be a 3 storey Oddfellows' hall.
 BRANTFORD, ONT.—The School Board has requested architect Broughton to report with reference to proposed alterations to the Central school.—A new school house to cost \$2,500 is to be built at Pleasant Ridge, near this city.

FORT WILLIAM, ONT.—The Canadian Pacific Railway Company intend erecting car shops and a large elevator, besides doubling the capacity of the docks.
 BELLEVILLE, ONT.—About \$5,000 will be spent in remodeling John street church. The improvements will consist of a new half horse-shoe gallery, large pipe organ, from pillars in place of wooden ones, and new seats arranged in amphitheatre form, new pews and tiling.—The Grand Trunk workshops are to be enlarged in the spring.

KINGSTON, ONT.—St. James church is to be enlarged in the spring.—Improvements will shortly be commenced to Queen's University buildings.—The congregation of Chalmers' church will build a new church to cost \$35,000.

LINDSAY, ONT.—The contract for the new Collegiate Institute has not yet been awarded. Only two tenders were put in and they were both too high. The building committee has decided to ask for separate tenders from the different trades.—The Lindsay and Ope Boys of Health have united and have decided to purchase or erect a suitable building for a hospital for contagious diseases.

LONDON, ONT.—A wealthy citizen has placed \$10,000 in the city solicitor's hands to be set apart as an endowment fund for a city hospital on condition that the building be erected on a certain site located by him.—A new small-pox hospital will probably be erected here shortly.—Alterations are contemplated in the Mechanics' Hall which will afford accommodation for the proposed free library.—Architect Geo. C. Muddock is calling for tenders for building the Medical School here. Tenders are to be in by Saturday, March 17th. Probable cost, \$10,000.—Gould & Stralford, plasterers, have secured the contract for plastering the Church of Our Lady in Guelph, of which Joseph Connelly, of Toronto, is the architect.

TORONTO, ONT.—The plans and specifications and also the probable cost of the proposed new Board of Trade building will likely be submitted to the Board at an early date.—The special committee appointed by the Council has decided to establish a second Collegiate Institute in the city, and will have a consultation with the High School Board regarding the site and cost of building.—An architect will be appointed by the Council to report on the best method of enlarging the good building.—Two or three new schools to be erected, and some of present buildings to be enlarged. Estimates are also wanted for improved heating and ventilating apparatus.—Address Secretary Public School Board for particulars.—The government will ask tenders for the erection of a cavalry school shortly.—The following building permits have been issued at the office of the City Commissioner during last month: David Walker, five one-storey and two two-storey attached brick houses, north-west corner York and Front streets; R. Heath, 3 stores and alterations, College, near Markham street, cost \$3,500; Hall & Son, 2 1/2 storey brick addition, 213 Queen street, west, cost, \$1,500; Chas. Bantley, 4 one storey and mansard r. c. dwellings, S. W. Cox, Sexton street, and Wilton Avenue, cost \$2,300; Rev. Mr. Glover, a storey brick house, Lowther Avenue, cost \$3,000; Douglas Sloan, a storey and attic, McCaul street, cost \$3,000; Scott & Crots, pair a. d. a storey and attic, Gordon Ave., Rosedale, cost \$6,000; J. P. Kersey, 3 storey brick store and a storey brick addition, 562 Queen street, cost \$4,000; Land Security Co., stables and blacksmith shop, Richmond St., cost \$10,000; John Welton, addition and alterations to 744 Yonge street, cost \$1,000; Jas. Hewitt, three storey and attic attached brick dwellings, Ontario street, near Wellesley, cost \$7,000; H. Reynolds, two one storey mansard r. c. dwellings, east side Darling Ave., cost \$1,000 and three of same kind west side Darling Ave., cost \$1,250; W. H. Sexton, pair a. d. a storey r. c. dwellings, Blecker, near Howard street, cost \$2,900; W. Simon, pair 1 storey and mansard brick dwellings, 119 and 121 Queen street west, cost \$1,600; Jas. Nealon, brick hotel, King street, east, cost \$12,000; John Wighton, a storey brick dwelling 612 Bathurst street, cost \$2,500; J. Anderson, pair 2 storey and attic r. c. dwellings, 167 Blecker street, cost \$2,000; A. Herren, storey and attic brick dwelling, D'Arcy street, cost \$2,000.—The Senate of University College will recommend the Government to provide funds for erection of a new science building to cost \$45,000.—The Eastern Branch of Women's Temperance Union will build a new hall.—The undergraduates of Toronto University propose to erect a union building to answer the purposes of club rooms, gymnasium and society rooms. It is expected to cost about \$25,000.—Architect King & Goswold report: Block of stores, offices, etc., corner Queen and McCaul sts., cost, \$15,000; business block, Queen street east, cost, \$18,000; two stores with dwellings over, in Parkdale, cost, \$8,000; four residences, costing on an average \$7,500 each, also several fine residences and two large blocks outside the city.

THE WATER JET IN PILE-SINKING.

SPEAKING of the discovery of the value of a water jet in sinking pila in sand, a correspondent of the *Engineering News* supplies some interesting particulars. It appears that in 1859 or 1860, Capt. W. H. Stevens, afterward a brigadier-general in the Confederate Army, was engaged in constructing an iron lighthouse near Galveston, Tex. The platform carrying the plant for sinking the screw piles intended for the foundation was wrecked by a storm, and the mass of iron-work was soon firmly embedded in the quicksand beneath. In the attempt to recover the lost material, Capt. Stevens donned a suit of submarine armor and went down to study the effect of a jet of water in loosening the buried members of the lighthouse. He soon discovered that by directing the jet to his feet, with the intention of freezing himself, was soon bored to his waist. However, signaling to his men to hoist, and at the same time stirring up the sand with the jet, he was rescued without difficulty. The experience was not lost upon him, and shortly afterward he successfully applied the jet action in sinking piles in sand.

As a matter of interest, it may well be stated that during the American war Col. S. H. Lockitt, chief engineer of the Department of the Gulf, in this manner filled the Bay of Mobile with obstructions, sinking trunks of trees 3 feet in diameter, and sharpened at both ends, in the sand and finally anchoring them there by the use of a jet from a common fire engine on a steamboat. The piles were planted from 12 to 20 feet deep, and they settled in the sand at the rate of 12 inches per second under a jet from a 1 1/2 inch nozzle on a 2 1/2 inch hose. The nozzle was held by two stowages down near the point of the pile, and was secured there by a small rope passed through the stowages. Five thousand piles were thus put in.



INTERIOR DECORATION.

By E. N. RICH.

WHILST so many important structures are being added to the list of great buildings in our cities, a few suggestions on the above subject may not be considered out of place. Considering first ecclesiastical decoration, the opinion is ventured that many crude and hazy ideas are held on the subject of beautifying the interior of sacred edifices, even by some who should be authorities, cramping their efforts in this desirable direction with unnecessary limitations and slavish adherence to absolute rules and traditions. If the same breadth and freedom permitted in more secular work were applied on the walls of a sacred edifice, not only would there be no "irreverent Philistinism," but more true worship in the sense that Ruskin preached it, by adhering more closely to Nature, and inferentially acknowledging the universal sway of her great Author. My idea is, in whatever form of decorative art, we should go to Nature first and always, not for leading ideas only, but continually renew touch with earth to regain vitality. As Achilles did, keep to Nature in the design, and in the execution of every detail of that design. As an embodiment of this theory in ecclesiastical decoration, subjoined is a sketch of the baptistry of a church in Northaw, Herbs, England, recently executed by the writer, with, it may be added, satisfaction to architect, donors and all concerned. The ground panel consists of a broad belt, whereon are depicted in conventional form water lilies, cats' tails (or bull rushes), vellum ornament on a ground of three blues with gold water lines. Next there is a cresting of gold shells on a terra cotta ground, water plants on water lines, with gold and silver fish. Above that is a blue ground with diaper of tongue of flame and cross in gold, centre of dove white, with gold rays pointing towards font. The border above is on blue ground and represents clouding. Above that again, on a vellum ground, is an olive pattern, Waterhouse brown with gold olives. The splays of windows are lilies with scrolls and appropriate texts, on same ground as cross, and frame with pale blue ground and gold stars in upper part.

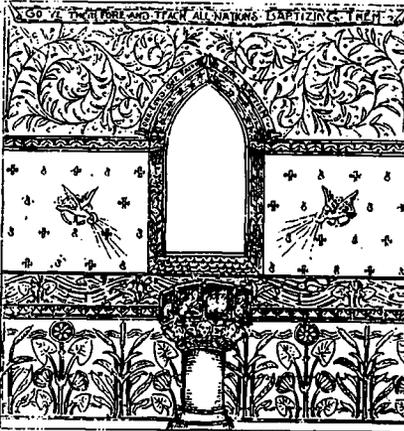
All this, though conventional in arrangement, and conforming somewhat to the character of the surrounding features of the building, nevertheless admits of natural forms being retained and the matchless harmony of tints that Nature alone displays to those who will diligently seek for them. We know of her more pronounced moods—her dying sunsets, and the glories of her autumn foliage—but how many decorative artists seek for samples of her more subtle graces—her symphonies in grey and silver, sunrises and sombre settings. At our very feet lie neglected lessons in the lichen and moss on the trunk and roof of hoary forest trees, the boulders on the hillside, or shells and pebbles on the sea shore.

One of the greatest decorative artists of the age, the late Clement Heaton, of England, decorated the interior of Eaton Hall, the residence of the present Duke of Westminster. During the three years I was engaged on that one interior, under the supervision of Mr. Heaton, the designer, I learned many useful lessons. So complete a practical designer, and so enthusiastic a lover of Nature was the principal, it was almost impossible to avoid the contagion of his enthusiasm. So thorough was the adhesion to Nature, for instance, that the Duke's keeper had instructions to supply the artist with any thing alive, from a deer to a squirrel, or a hawk to a robin. Conservatory and garden were ransacked, all fruit and foliage laid under contribution, and yet there was no attempt at picture painting; it was conventionalized and subservient to a well-digested plan, but Nature, pure and simple, was the keynote that ran through all.

To briefly apply one of these lessons, bear in mind that in determining the prevailing tint for a room, re-

gard should be had not only for its purpose, but also for its aspect, as thus: giving warm, comforting hues to the north, and cool, refreshing tones to the south.

As an idea for a dining room, take in the rough as follows: A rich brown band at base to represent earth, with the greens in tone and in conventional form of shrubs, plants, grasses, frogs, mice or other "small deer" for greater animation; then trees with fruit, birds in keeping, and finally sky, with birds on the wing: you would thus have skirting, dado, cresting, filling, frieze and ceiling.



BAPTISTRY OF CHURCH AT NORTHAW, ENG.

Take a drawing room and treat it similarly as to subdivision, but adhering mainly to flowers and flowering shrubs, with medallions, perhaps, of poets, musicians or painters.

Halls and stairways may have a continuous pattern, with Esop's fables. An ornamental arrangement for a staircase is a climbing squirrel on ascending pattern, combined with a hazel nut. Many such quaint suggestions in adapting Nature to ornamental forms, the west has learned from the "most eastern east"—from

These rough suggestions are thrown out in the hope of inducing art lovers to accept the principle I have tried to enunciate, and the practice of which would inevitably awaken purer harmonies, greater service to true art, and more reverend and devoted love for Nature.

COLORS IN DECORATIVE PAINTING.

THE most valuable colors in decorative painting, says the *Decorator and Furnisher*, are the ochres, which vary from a bright, though not vivid, yellow, to a color nearly approaching a tawny brown. The best ochre produces quiet tints in white and other colors, including a valuable green when combined with prussian and other blue. In combination with vermilion, Indian and Venetian red, it produces refined and quiet colors of great value. Most useful reds are light-red, Indian and Venetian red; these may be lightened to any required degree with vermilion. The three reds produce good ground colors when mixed with white, white and yellow ochre, or white and black. Lake and vermilion produce a rich crimson. Of all blue pigments, blue ochre is the most permanent, and prussian blue the most useful. Blue, combined with white, is of the utmost value to prepare permanent greens, and produce pleasant tones. Cobalt blue is highly commended for preparation of clear, bright blues. The finest small blue is durable and useful, being unaffected by lime. As a general rule, blues, with a slight greenish tint, are more pleasant in decoration than those which incline to purple. Greens for decoration should, as a rule, be mixed with pigments. The ordinary greens of commerce cannot be depended on. Bright and shining greens should be sparingly introduced

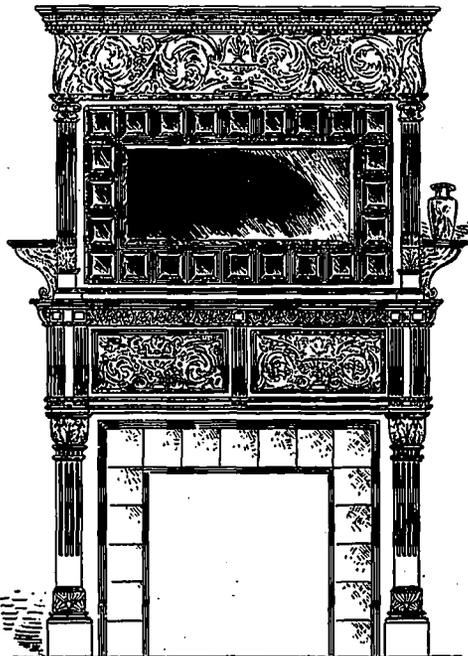
being too hard and forcible, but all tones of suitable green may be found in autumnal foliage. Such greens are readily produced with prussian blue and cobalt blue, and permanent yellow with the ochres, lemon, yellow, and raw and burnt sienna. To compounds of these Indian and Venetian reds, Vandyke brown and burnt umber may be added. All greens may be brightened with bright and lemon yellow. Lake, vermilion, Venetian and Indian red are to be valued for the bright intensity of their colors. All colors of a decidedly neutral character prove tame and ineffective. Beads and chamfers, in gold and gold and black, are always appropriate and telling in effect on panels. Lines of light or full colors should be sparingly used on borders, finials and crockets in flat paneling. In the painting of mediaeval times, it is noticeable that pure colors are rare; these are most generally toned, and with admirable effect. The absence of the primaries is a rebuke to the writers on theory colors, who lay down in a way to indicate the presence of such colors as indispensable to rich decoration, the proportions in which they should appear. The toning of colors is a very simple matter, but it requires system. The adoption combination changes colors. Where the form of pattern undergoes repetition in stenciled ceiling, bands is the most satisfactory made, as it helps to remove, in a considerable degree, the unavoidable hardness of such bands, and a quiet effect will be secured by bringing the counter-changed colors close to one another in intensity.

A good ground for dark oak is made of pure white lead, golden ochre, and royal red. Deep orange chrome is sometimes used for ground for dark oak when a bright tone is desired. The graining color is made of burnt sienna, raw sienna, and Vandyke brown.

Slightly tinted green glass is introduced by decorators in certain rooms having abundant light, as grateful to the sight and having a subduing influence on the decoration.

THE highest art education is that which fits one for the making of a home—a home, not a storehouse or curiosity shop.—*Edmund Russell.*

A picture we may pass by, and seldom study or feel. It tells a story, and we go to it when we want to be interested. The color of our walls we dwell in; it surrounds us as sunlight and atmosphere; it does not speak to us, but envelops us; it forms our material environment, and is as subtle in its effects as our spiritual one. Color is the moral element of the material world.—*Edmund Russell.*



DESIGN FOR OVERMANTEL.

Sepoy, Burmese, Chinese, or last of all, Japanese artists, where, through every quaint line of the most pronounced national character Nature can be easily traced. An almost infinite variety to suit every phase of public or private life, could be made of objects of permanent beauty on these lines.

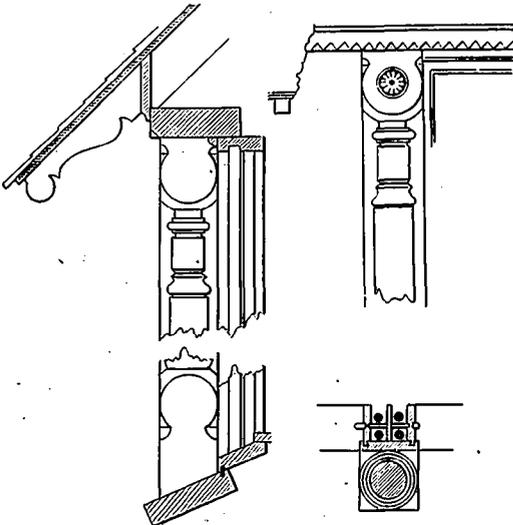


HEATING AND VENTILATING SCHOOL HOUSES.

THE principle and aim of ventilation are thus explained in the United States work on School

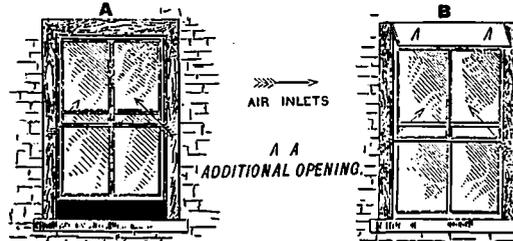
on School Hygiene; speaking of window "air inlets," says of them:—
 "No apparatus that can be named will do as much good, at a very small cost, as the window board—that is a plain piece of board, as long as the window is wide, and from four to eight inches in width. The lower sash is raised, the wood is inserted and the sash is shut down upon it. The air enters (as shown in fig. 5) in a thin stratum, passing upwards between the upper and lower

sashes upwards, to direct the current in that direction.
 2. "Raising the lower sash and filling in the space left under it by a piece of board, as shown in the accompanying diagram. The air gets in through the space left between the lower part of the upper sash, and the lower



FIGS. 1 AND 2.

Architecture.—"Briefly, the aim of ventilation should be to maintain a steady supply of fresh air and with-



FIGS. 3 AND 4.

drawal of foul at all parts of the room, removing the products of respiration and organic particles as fast as thrown off, and leaving no corner stagnant or unswep by the purifying current."

The author adds:—"Nothing can take the place of aeration by means of open windows. Artificial ventilation, though required for changing the air when the windows are necessarily closed, is insufficient, even under the best of circumstances, unless the room is from time to time thoroughly refreshed and purified by the sweep of the free winds through all its windows widely opened. Such an atmospheric washing should be secured three or four times daily in all weathers. The process affords opportunity for this." No fixed transoms or immovable arched bends should be permitted to exist over windows.

Besides the general airings, in which all the windows are thrown wide open, it is possible and very desirable during three-fourths of the year to keep some of them partly open. If they extend to the ceiling, as shown in fig. 1, the upper part at least of the south windows, in rooms properly supplied with other fresh air inlets, may be pretty widely opened in the coldest weather without causing a noticeable draught. Such openings, if on the leeward side, often interfere with the action of extraction shafts by drawing to themselves the current of escaping air; but this, with care, might be minimized.

There are times, however, when the windows cannot be opened with safety. But means must be taken for ensuring the withdrawal of the respired air from the room in some other way. Dr. D. F. Lincoln, in his report to the New York State Board of Health

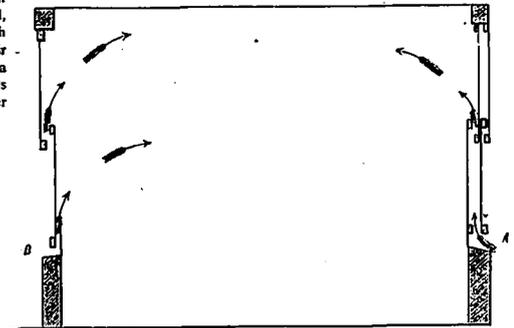


FIG. 5.

sashes in a nearly perpendicular direction, without causing perceptible draught. Fig. 5 (to the right) represents a double window provided with a board, the air entering at A. This gives great protection from the cold, and also enables the air to enter the room slightly warmed by contact with the lower pane. All four sashes of double windows should be moveable. At B (in the other window) there is a different arrangement for mild autumn or spring weather. The board is made wider and is placed an inch or two from the sash, in such a way as to direct a current upwards. The arrows indicate the direction of the currents entering the room through each kind of window when the boards are arranged as directed.

part of the lower one.

3. "A board placed just inside the lower window frame will act in the same way when the latter is slightly raised.

4. "Placing wire screens in spaces of entrance of air. Sometimes they are tacked to the window frames and folded up when the windows are closed.

5. "By louvered openings.

6. "By double panes, with an open slit at the bottom of the outside one and at the top of the inside one, thus giving an upward current.

The ordinary system of heating rural schools is by means of a stove. In most cases this system is unaccompanied by any plan of systematic ventilation, or of securing pure air from outside the building. The door

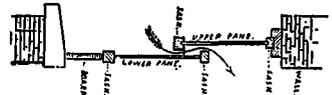


FIG. 6.

and windows (the latter often tightly shut) are often depended upon for such fresh air as they may casually admit to the school room. Efforts have been made by our Public School Inspectors to remedy this great evil, and to introduce a system of heating by hot air, a system the very principle of which is to displace the vitiated air already in the room. An example of an Inspector's success in this direction is furnished by Mr. David Fotheringham, Inspector of North York, in the shape of a plan of heating by hot air, which has been adopted, on his recommendation, by the trustees of a public school near Newmarket. Mr. Fotheringham has furnished a

Dr. Oldright, in his paper on "Heating Homes," published in the report of 1883 of the Provincial Board of Health, makes the following suggestions for dealing with windows without pulleys, by—

1. "Having a piece of board nailed on to the top sash of the window,

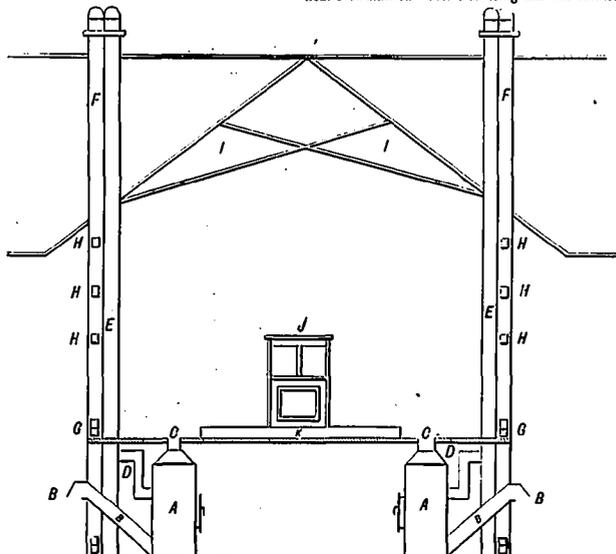


FIG. 7. A.A.—Hot Air Furnace. B.B.—Cold Air Duct. C.C.—Hot Air Registers. D.D.—Smoke Pipes. E.E.—Chimneys. F.F.—Ventilation Shafts. G.G.—Cold Air Escape. H.H.—Ventilation Registers. I.I.—Principal rafters—giving air space of 16 feet at sides, and 20 feet in the centre of the room. J.—Glass Door. K.—Teacher's platform.

copy of this plan, which is inserted herewith (Fig 7). He says :

From the accompanying diagram (Fig. 7) you will understand my plan for ventilation. While I should avail myself of the ordinary means, through raising and lowering windows, and by ventilators in the ceiling and gable ends, I should have a shaft in connection with the chimney, composed either of a section of the chimney

openings at the top of the windows and by transoms over doors. The openings are so small and numerous that no sensible draught can occur."

A Medical Commission was appointed in Germany not very long since, to report on certain questions relating to school house construction. In the report which the Commission prepared, it was laid down that 2,120 cubic feet per hour for each pupil was the minimum quantity of fresh air which should be supplied to each pupil. The Commission stated that in the best arranged ventilating shafts, of metal, fitted with gas-flames, stoves, or other artificial means of promoting the draught, the upward current of vitiated air will occasionally reach a velocity of a thousand feet per minutes in cold weather, although the average, in ordinary cases, is rarely more than five hundred feet and generally much less ; so that to ventilate a room containing sixty pupils thoroughly, it should have an outlet shaft of four square feet or more, in sectional area, to be even capable of such ventilation as is essential.

In conclusion it may be well to emphasize the statement in a recent report of the Board of Public Instruction for the City of Albany, N. Y., that no system of ventilation is automatic. And unless teachers will themselves attend to the regulation of the temperature of their room, and act upon the directions ordinarily given, not even in the most perfect system of heating and ventilation will keep room free from foul air, and the inmates from discomfort.

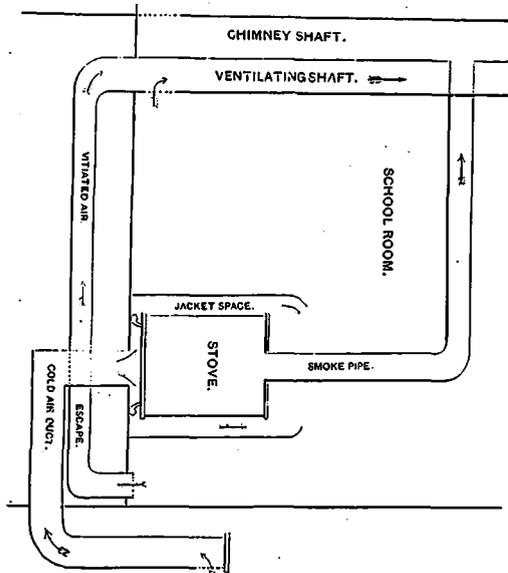


FIG. 8.

divided off by sheet iron (which would heat the air in the shaft), or by a pipe inside the chimney, either for the smoke or for ventilation. You will notice that I suggest cold air escapes at the floor into the basement, or into tubes opening outside the building ; higher up I suggest large ventilating registers to be under control of teacher.

Although a furnace or heater, in the basement, as illustrated by Mr. Fotheringham, is considered the best means of heating school rooms, yet the plan of heating them by stoves in the school room, is the most common. Without certain arrangements and precautions, this is a very faulty and unhealthy system. As a general rule, no provision is made for ventilation by the constant production of warmed air and the exit of vitiated air. The stove is often placed at one end of the room, and the pipe is carried over the heads of pupils—to their serious detriment. The only way to obviate these defects, if a stove must be used, is to place it near the north-east angle of the school room, and bring fresh cold air in from the north side of the school house, in the manner illustrated in the accompanying simple diagram.

It will be noticed, that in Fig. 9 one of the escapes for vitiated air is under the teacher's platform ; others are under the desks, etc. In no case should the fresh air be admitted from the ground level outside ; but it should be invariably taken from about three or four feet above the level, through an air duct, as shown in Fig. 8 with wire gauze covering or a register. The following illustration shows what would be the practical working of such a system in the school room :

The Cottier system of ventilation, recently adopted in the school houses of Portland, Oregon, has worked well. It is based upon the use of the attic as a warm air, or expansion chamber, out of which there is an ejection through the roof into the open air. From a detailed account by Mr. T. H. Crawford, City Superintendent of the Portland City Schools, has been condensed the following summary on the subject :—

"The tin flues for vitiated air used (four in each room) are ten inches by four in size. They reach from the rooms to the attic, and extend a few feet above the attic floor. To ensure a strong draught, hot-water coils (or hot air through flues will answer), are placed in the attic, some feet above the floor. To enforce a more rapid ventilations a gas burner is placed in each tin vitiated air flue, five feet from the floor, with a glass door opposite to it in the flue. The attic, or expansion chamber, is made air tight, and all doors leading to it closed. Hot air pipes are placed under the windows, etc., on two sides, or on one side and end of the room. The warm air rises and receives the cold air from one-inch

PLUMBING AND DRAINAGE.

By B. KIRK, PLUMBING INSPECTOR, TORONTO.

TORONTO'S plumbing by-law has, in spite of many defects, worked good results. It has made the way of the skin plumbers hard. Better material is used, and the construction is much better. The standard of workmanship also is being elevated, which is the natural result of close inspection by practical men, the plumber being encouraged to do his best when he sees his work closely scrutinized by the inspector, who is constantly comparing the quality of his work with that of other plumbers.

There have been nineteen informations laid in the Police Court for violation of the by-law. Seven of these were against plumbers; the balance were against owners and builders for improperly laid drains. Convictions were secured in each case, but owing to ignorance of the provisions of the by-law the offenders were leniently dealt with.

The architects have been slow to recognize the provisions of the by-law. They do not submit their plans and specifications for approval, and many of their specifications call for material which is prohibited by the by-law. Venting of taps is often omitted, and some of the plumbers imagined that if they kept up to their specifications they were all right, however wrong the specifications might be. One of the defendants at the Police Court made the plea that although his work was not up to the requirements of the by-law, it was done in accordance with the provisions of his contract with the owner, whereupon the magistrate replied: "Then you made a contract to break the law."

This difficulty will be avoided since the city engineer has decided to refuse permits for private drains until the plans and specifications of plumbing and drainage have been filed in his office, and the same approved. This, with the withholding of water supply until the inspector's certificate has been obtained, will ensure a pretty strict conformity to the requirements of the by-law. These are some of the requirements : Ventilation

of the drain and soil pipe ; an air inlet just inside the main trap ; soil pipe extended through the roof ; every fixture separately trapped, including rain water pipes when they open near windows ; trap ventilation ; all work to be left uncovered until inspected.

"Defective plumbing" is invariably the verdict rendered on finding any unpleasant odor in the dwelling, and a suspicious look comes over the face of the occupant as he peeps into the waste outlet of the kitchen sink, but he rarely thinks of looking for a defective drain, and they are legion. Wherever I see a tile drain in a house I regard it with suspicion. Fully four-fifths of the sewer gas that gets into dwellings comes from faulty drains. They are generally laid by laborers, some of whom may be very careful about their work, but the majority are not to be trusted with such important work. It may be said that a tile drain properly laid is as good as a cast iron one. That is probably true, but it is impossible for any inspector to certify that a tile drain is properly laid without seeing every portion of it being laid. Then after it has been covered with clay it is out of sight, and consequently out of mind. The question arises what should be substituted. The answer is cast iron, with the joints properly leaded, and when practicable run on the cellar walls, or suspended from the cellar ceiling, and if is necessary to run under cellar floor, let it be laid in a trench lined with brick, cemented and covered by boards or stone slabs so that it can be inspected at any time, and cleaning screws placed at convenient points for cleaning any stoppage which may occur at any time.

It is a good plan to expose to view all, or as much of the drainage and plumbing system as possible. There is a feeling of security where one can trace all the waste pipes and soil pipes to their connection with the drain, and then follow that up until you see it pass outside the walls of the house.

PURIFICATION OF WATER BY ELECTRICITY

THE purification of water by electricity is the latest electric discovery. This is said to have been accomplished by two Pittsburgh gentlemen, Prof. Blanck and R. W. Smith. A patent has been applied for and details are for obvious reasons suppressed; but it is claimed that very remarkable results have been achieved; and the destruction of all animal and vegetable life and the entire removal of everything deleterious to health, can be successfully accomplished, resulting in the production of water absolutely pure. It remains to be seen, says the Western Electrician, whether this can be accomplished on a sufficiently economical basis for general use. If so, it will be a great boon, as impure water is a fruitful cause of disease and there is probably very little water in use which is even approximately pure. In the rural districts the water obtained from wells and springs is largely impregnated with mineral impurities, and is surface water filtered through strata of rock and soil,

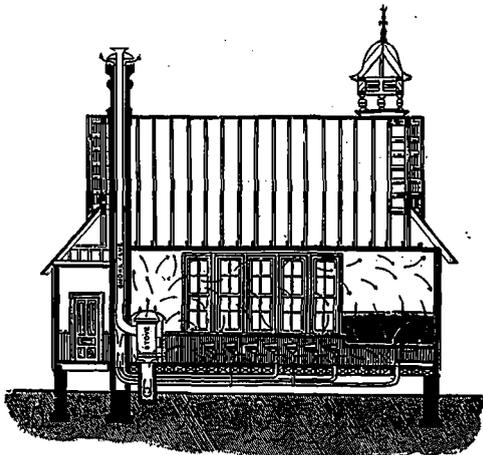


FIG. 9.

while the unfiltered surface water obtained from brooks and ponds is still more impure. In large cities the sewage is, in many cases a constant menace to the purity of the water, and wells in the vicinity of cemeteries, barnyards, and privy vaults are poisoned fountains.

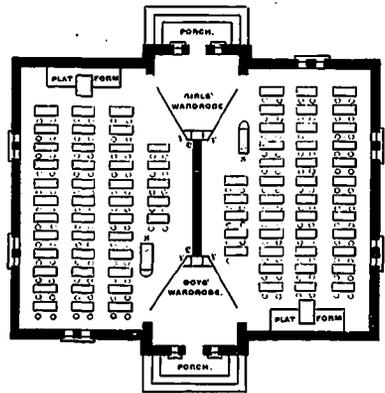
Builders are invited to contribute of their experience to the columns of this paper.



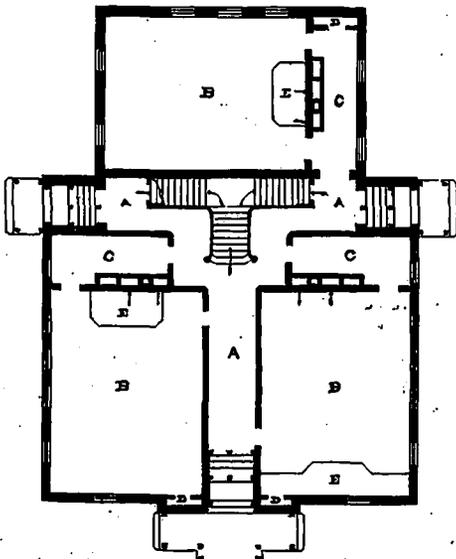
DESIGN FOR A TWO STOREY SCHOOL HOUSE.



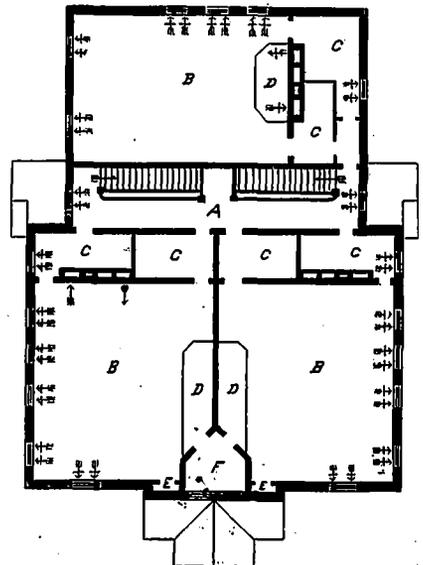
DESIGN FOR A GRADED, RURAL, OR VILLAGE SCHOOL HOUSE.



GROUND PLAN FOR A GRADED, RURAL, OR VILLAGE SCHOOL.



GROUND PLAN FOR TWO STOREY SCHOOL HOUSE.



SECOND FLOOR FOR TWO STOREY SCHOOL HOUSE.



Peterboro' brickmakers are preparing for a big season's sale.
 The Calgary Lumber Co. will make bricks at Cochinne this year.
 Mr. A. Diot, Montreal, will build a glass works at Ottawa if a bonus is offered him.
 Toronto manufacturers will in future make bricks of a uniform size. There will be no advance in price.

Mr. Wm. Davidson, builder and contractor, Mount Forest, Ont., is about to open a planing mill and sash and door factory.
 The Beckingham Brick and Tile Co., Montreal, has been incorporated with \$30,000 capital stock for the manufacture of brick, drain tile, &c.

Mr. A. S. Walker, talks of starting a brick kiln at Neepawa, Man. Good clay can be procured, and building next year promises to be brisk.
 One of the latest uses to which paper has been put is the building of chimneys. It is made in the form of blocks which are joined with silicious cement.

Dealers in Montreal are holding stocks of cement for higher prices. This anticipation of a rise is based on recent advances in prices in foreign markets.

Mr. Walter Beatty, Pembroke, Ont., has refused the offer of a \$3000 bonus to assist him in rebuilding his sash and door factory recently destroyed by fire.

For cement to make joints for granite monuments use clean sand, twenty parts; litharge, two parts, quicklime, one part; and linseed oil sufficient to form a thin paste.

Messrs. Jas. H. Donnel and H. C. Stavley have recently purchased the planing mill business formerly conducted by Messrs. Kincaid & McWilliams, Peterboro', Ont.

The Bell Telephone Company in Montreal is establishing telephone communication between different departments in large warehouses, thus doing away with speaking tubes.

For veneering for panels, thin stripes of white pine may be stained with bleached and tinted croose, both wood and croose being heated. When cold, the surface is to be varnished with shellac. The tones present a translucent appearance.

The pavement in front of the Fifth Avenue residence of the late W. H. Vanderbilt, New York, has one large stone forty feet long and twenty-five feet wide, the largest piece of flagging ever quarried, and alone cost \$9,000. The Vanderbilt pavement cost, altogether \$40,000.

It is said that carbonate of lime found in the vicinity of Whiting Lake, Grey Co., Ont., will produce a good quality of shafting, and that this, together with the clay of the district, will make excellent Portland cement. A company is being formed for the manufacture of these articles.

In a paper on the strength of different kinds of wood for building purposes, Professor Johnson calls attention to the fact, as now demonstrated, that many cheaper kinds of timber may prove more valuable for structures than more expensive varieties, which have been supposed to be stronger, and, therefore, more desirable. Thus pine supports or pillars have been found stronger than oak ones, when tested in large samples.

E. Van Noorden & Company, of Boston, manufacturers of metallic sky-lights, have contracted with the city of Charleston, S. C., to line the walls of four hospital wards constructed of wood, with glass, one-quarter of an inch thick, set in angle iron frames, held in place by galvanized sheet-iron caps; the ceiling will be of finely corrugated iron, arched to a radius of twenty-four feet. The wards are each 30x112 feet, one story high, with double pitch roofs. The idea in using glass is to prevent the absorption of disease germs and to secure cleanliness. Although glass has been suggested for this purpose, this is the first instance of its use of which we have heard. The people of Charleston are watching the work with interest.

A USE FOR BRICK WASTE.

ACCORDING to the statement of Mr. Miles, a well-known engineer, it is a fact peculiar to Spanish countries that ordinary brick dust, made from hard-burned, finely pulverized bricks, and mixed with common lime and sand, is universally and successfully employed as a substitute for hydraulic cement. Mr. Miles says that during an engineering experience of some six years in Cuba his opportunities were ample for testing its merits, and he found it in all respects superior to the best Rosendale hydraulic cement for culverts, drains, tanks and cisterns, and even for roofs. In an experiment to test the strength of this product, it was found that a block of it, 4-inch in thickness, without sand, and after an immersion in water for four months, bore, without crushing or splitting, a pressure of fifteen pounds per square inch. It is thought that, by the addition of pulverizing mill brick yards, to utilize the waste and broken bricks, a profitable manufacture might be carried on.

CASTING PLATE GLASS.

THE operation of casting a plate is as follows: The glass in the pots having attained the proper degree of liquidity, and having received a thorough melting and refining, the fire is slackened to render the mass somewhat viscous by cooling. The doors in front of the pots are lifted or taken away; the workmen, each with a long pair of iron pincers, take hold of the pot in the furnace, bring it upon an iron truck or carriage, and at a dog-trot carry it under the crane. The impurities of glass gall upon the surface of the glass are now scraped off and the pot carefully wiped on the outside with a wet cloth to prevent dirt from falling upon the casting table. The pot is now seized by a pair of strong iron tongs or nippers and raised over the table by means of the crane. The casting table is a large cast-iron slab well polished, mounted upon a carriage running over a railway. Upon this table, two iron rules of the thickness of the required plate are now laid on each side. The pot suspended above is now tilted over and the glass poured upon the table. A heavy iron roller is now passed over the glass, the ends of which rest upon the thickness rules. During the rolling, if any impurities are detected in the glass while yet plastic, they are removed with suitable instruments. The plate is then annealed, after which it is ground, smoothed and polished, each being an operation requiring time and care.

QUALITY OF BRICKS.

THREE main points with reference to bricks have to be taken into account, 1. The power of resistance under pressure; 2, the appearance of the fracture, which should present an even texture, and a fine and brilliant grain, without cavities in the interior, and neither ritzy nor stony; 3, the exterior, which should be smooth and regular, the angles and edges sharp and straight. When the size of the bricks is equal throughout the mass it is a proof that the brick earth has been well prepared and the bricks generally well made. A brick, when struck, should give forth a clear, ringing sound. Good bricks are generally of a dark reddish-brown color, and sometimes they show vitrified spots on the surface; it is not well however, to depend too much on the test fact, for it is often only an indication of the amount of heat to which the brick has been subjected, while the clay of which the bricks are made may be impure and ill prepared. Bad bricks are readily recognized by their reddish-yellow color, but still more by the dull sound which they emit when struck; their grain being soft they crumble easily, and absorb water with avidity. A good brick should not absorb more than about one-fifth of its own weight of water; it should appear, and in reality be, dry. A brick that does not take up any water at all is too much burnt; the mortar adheres to it imperfectly, but it is a good conductor of heat. Such bricks may be used in damp soil and for pavements. When a brick left in water either soaks or swells it is of bad quality and contains caustic lime. A brick which, being made red-hot, and then having water poured on it, does not crack, is of extraordinary and rare quality, and those which have borne the effect of moisture and dryness during two or three winters without scaling or cracking are excellent. In order to try if bricks will bear the effect of frost, let one be boiled for half an hour in a solution of sulphate of soda, saturated cold, and then suspended by a string over the vessel in which it has been boiled. In 24 hours the surface of the brick will be covered with small crystals; if the brick is then to be immersed again in the solution until the crystals dis-

appear, and again suspended, repeating this operation for five days, the crystals reforming after each immersion. If after this treatment a number of particles of the brick are found at the bottom of the vessel containing the solution, the bricks are incapable of supporting the effects of frost.—Carpentry and Building.

THE MARBLE QUARRIES OF CARRARA.

THE famous marble quarries of Carrara have been worked for centuries, and as yet show no signs of exhaustion. The marbles of this favored locality are among the very few which possess that exquisite fineness of texture, purity of color, and freedom from veins and spots which are demanded for the uses of the sculptor's art; and the major portion of the famous works of ancient and modern art have been chiseled from Carrara stone. The quarries of Carrara are very extensive, and give employment to 6,000 men; in addition to which there are in the town no less than 100 studios of sculpture and 65 saw mills.

The method of extracting the stone is peculiar. In some of the quarries the men are hoisted to the height of some 600 feet above the level of the quarry, and up aloft on the mountain side excavate and loosen colossal blocks of the precious rock. Each gang (as described by eye-witnesses), or the foreman of the gang, goes down with, and on, the block as it is swung by derrick ropes out into the air and swiftly brought to another stand. The free, easy primitive style of the Carrara flying ropes makes it appear doubly dangerous. The fact that hundreds of accidents happen every year does not appear to have any influence with the workmen.

The condition of these quarries and their offspring is described as being pitiable in the extreme. One who writes from personal observations, says of them: "Their food is dry bread, a raw onion and dirty water. It is the only place in Italy where wine is not drunk. Worn out by incessant toil, these people, insufficiently fed, fall into dissipation, violence and crime, dying like dogs and leaving on the white marble the sweat of their wretched lives. We see none of all this under the hand of art."

Fully \$800,000 worth of marble goes out annually from these marble quarries, the bulk of it to France. The price of it varies according to its beauty. The first quality is priced at \$60 to \$80 per square meter at the seaport. This is what we term statuary marble. The second quality is priced at \$45 to \$65, and the spotted at \$30 to \$50. They cover the more white but not statuary marble; the price is \$50 per square meter. The second quality is \$35, and the third is \$30. The valued quality is \$25. Violet-hued marble brings \$70 to \$100 per square meter. These are the ordinary tariffs, and on them the profits are absurdly high before the marble leaves the quarry. In some instances I have known first-class statuary blocks to be rated at \$12,000 each, regardless of market rates.

"I have a little ornamental work I should like to submit," said the Carved Design to the Corinthian Temple. "Thanks," replied the Temple, "but the pressure upon our Columns is so great that we shall have to Decline your Offer."

Tom—"We've got a bay window in our house." Bessie—"So have we. And a balcony." Tom—"Pooh! That's nothing. We have two bath-rooms." Bessie—"So have we." Tom—"We've got something you folks haven't. I heard papa tell mamma about it last night." Bessie—"I'll bet we've got some of 'em too. What is it?" Tom—"A defective flue."

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DEAR SIR,—I duly received your letter of the 2nd ultimo, requesting my opinion relative to the Cement manufactured at your establishment in Thorold, in reference to which the following is respectfully submitted: For the past forty years the natural Hydraulic Cement obtained at Thorold, Province of Ontario, has been of the highest quality, and in every instance the result has proved highly satisfactory. When properly burned, ground fine, and used fresh from the mill, it will compare favorably with any natural or artificial cement that I know of for building or other purposes in a moist position, or for walls that have been built a few weeks before water has been let in on them. It is well adapted for concrete foundations, walls, drains, cisterns, or indeed, for any hydraulic work of other purposes prepared and mixed with two parts of clean sharp sand to one of cement, the result will invariably give good satisfaction.
 I am, sir, yours very truly
 JOHN BATTLE, Esq.,
 Cement Manufacturer, etc., Thorold, Ont.
 JOHN PAGE,
 Chief Engineer of Canada, Canada.

QUEBEC, MONTREAL, OTTAWA & OCCIDENTAL RAILWAY.
 CIVIL ENGINEER'S OFFICE.

JOHN BATTLE, Esq., Thorold: MONTREAL, 31st March, 1881.
 DEAR SIR,—I have tested with Reibell's Testing Machine the tensile strength of six blocks made from the barrel of Thorold Hydraulic Cement which you sent me last summer. The blocks were made of wet cement, and were 15 inches square at the smallest part. Four of them were kept 23 days in air, and only broke under the following weights: No. 1, 470 lbs.; No. 2, 470 lbs.; No. 3, 470 lbs.; No. 4, 470 lbs. The average was 470 lbs. per square inch. The remaining two were kept one day in air and forty-two hours in water, and broke under the following weights: No. 5, 470 lbs.; No. 6, 470 lbs.; average 470 lbs. per square inch.
 Yours truly,
 P. A. PETERSON,
 Chief Engineer.
 Quebec, Montreal, Ottawa & Occidental Railway.

THE THOROLD CEMENT is sold by the following dealers:
 Hamilton.—W. A. Freeman, James St.
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