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MISSING

CANADIAN ARCHITECT AND BUILDER.

VOL. IX.—NO. 7. AUGUST, 1896 { PRICE 20 CENTS $2.00 PER YEAR.

—THE—

CANADIAN ARCHITECT AND BUILDER,

A Monthly Journal of Modern Constructive Methods,

(With a Weekly Intermediate Edition—The CANADIAN CONTRACT RECORD).

PUBLISHED ON THE THIRD THURSDAY IN EACH MONTH IN THE INTEREST OF

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

C. H. MORTIMER, Publisher,

Confederation Life Building, - TORONTO, CANADA.

Telephone 2362.

Branch Office: NEW YORK LIFE INSURANCE BUILDING, MONTREAL.

Bell Telephone 2299.

SUBSCRIPTIONS.

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

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

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Buildings for the Paris Exhibition.

FIFTY-NINE designs have been submitted in competition for the two principal buildings to be erected in connection with the Paris Exhibition of 1900. One of the buildings is to be devoted to the industrial and the other to the fine arts. The latter is to become the art gallery of the city upon the close of the Exhibition. The London Builder sums up a criticism of the leading designs by saying: "The competition is certainly not without interest, and represents an immense amount of work. But one can hardly say that it presents any great or epoch-making qualities of national architecture, though one must recognize that as the competitors have only had two months and a half in which to prepare their designs, the result under those circumstances is somewhat remarkable."

Free Silver Agitation.

THE possibility of the triumph of the advocates of free silver coinage at the approaching presidential election is seriously disturbing business conditions in the United States at the present moment. A clause requiring all payments to be made in gold coin, has become a common feature of business contracts, and the National Association of Builders have under consideration the advisability of embodying such a clause in the "Uniform Contract." Building operations in the large cities are, it is said, being seriously hampered by the refusal of financial institutions to make loans to builders and others, except under agreement for repayment in gold. The tremendous risk which a speculative builder would assume who should consent to such a stipulation is sufficient to deter most from proceeding with contemplated enterprises. The same uncertainty prevails to a greater or less extent throughout every department of business, and is exerting a paralyzing influence upon national enterprise.

The Province of Quebec Association of Architects.

THE Province of Quebec Association of Architects are to be congratulated on the progressive spirit in which they are endeavoring to promote the welfare and usefulness of the organization and advance the interests of architecture and the kindred arts in the Province of Quebec. During the present year meetings of the members resident in Montreal have been held monthly, at which interesting papers were read and discussed. Following these meetings the members have been accustomed to dine together and talk over in a social way

matters in which the Association is interested. No doubt as the result of this frequent intercourse and discussion, the Association has determined, with the assistance of the Arts Association of Montreal, to hold an Arts and Crafts Exhibition in the Art Galleries, commencing on the 8th of October, particulars of which are printed in our Montreal correspondence. It is to be hoped that the Ontario Association of Architects and other kindred societies will lend a helping hand to the enterprise. We doubt not the Exhibition will prove a gratifying success and a source of pleasure and instruction to all who may have the opportunity of visiting it.

Competitions.

It is very doubtful, indeed, if the conditions of architectural competitions in Canada are improving. They seem rather to be becoming more unsatisfactory as the years go by. For example, competitive plans were lately invited from architects throughout the Dominion and even in the United States for a public building to be erected in one of the remote parts of the country. When the designs were all in, and a meeting had been called to consider their merits, a member of the committee coolly suggested at the very outset that only the plans submitted by local architects should receive consideration. Fortunately there were on the committee men with clearer perceptions of equity, through whose influence the outside competitors received more considerate treatment. If it is the wish to give work of this character to local architects, the competition should be restricted to these. It is a most despicable proceeding to invite outside architects to submit designs, with the intention of appropriating the fruits of their study and skill for the benefit of a local architect. This, however, is the course which has been followed in more than one competition in this country.

The Good Roads Movement.

It is announced that in connection with the annual convention of the Ontario Good Roads Association to be held simultaneously with the Toronto Industrial Exhibition, there will be given an exhibition of road-making and road-making machinery. The movement for improving the public highways throughout Ontario was started at a most auspicious time, when the bicycle was commencing to achieve its prominence and popularity. The Good Roads Association can count upon the support of the army of bicyclists who have encountered the country road in all its deformity as it exists at present in many parts of the province. As large numbers of bicyclists are now to be found in every town and city in the Dominion, their advocacy should prove an important factor in bringing about the improvement which the Good Roads Association is endeavoring to promote. The appointment by the Ontario Government of Mr. Campbell, late city engineer of St. Thomas, as Provincial Road Instructor, has also been the means of giving strength to the movement. In this connection we notice that Mr. Campbell is not confining himself to giving instruction to the officials of rural municipalities, but is also placing his time and knowledge at the disposal of town and village corporations. In so doing it appears to us he is stepping beyond the legitimate bounds of his position, and is trenching upon work which the professional engineer might reasonably feel himself entitled to, and for which the municipality should feel called upon to pay.

The O. A. A. Conventions.

The Royal Institute of British Architects recently made a departure from their usual custom by holding their annual dinner in the town of Manchester. This action of the Institute has met with approval, its tendency being to encourage a closer intimacy between metropolitan and provincial architects, resulting in advantage to their mutual interests. We submit to the Council of the Ontario Association of Architects that if meetings of the Ontario Association were occasionally to be held in cities like Ottawa, Kingston, London and Hamilton, it might be the means of inducing the architects of those cities to take a deeper interest in the welfare of the Association and the objects which it aims to accomplish. The fact that a large proportion of the membership of the Association resides in Toronto is no reason why the meetings should always be held in that city, as the attendance of outside members is always proportionately as good as of city members. Seeing that many of the city members are so lacking in interest that they do not put in an appearance at the meetings, it is scarcely fair that the outside members should be called upon every year to bear the expense of coming to Toronto. The members have had ample opportunity to become acquainted with the architecture of Toronto. Would it not be advisable to introduce them to the architecture of the other cities of the province and afford the architects of those cities a chance of occasionally doing the honors?

Building Regulations in Toronto.

Immediately subsequent to the great fires which took place in Toronto in the early part of 1895, a committee of members of the Ontario Association of Architects spent much careful effort in the preparation of a building by-law for submission to the City Council. The Council at that time extracted from the proposed by-law a few clauses which were incorporated into the existing by-law. The remainder of the recommendations submitted have since received no attention at the hands of the aldermen, and from present appearance the disinterested labors of the committee will be to a large extent valueless. It is well known to those who have anything to do with building operations in Toronto that the existing by-law is full of imperfections, and furthermore that it is very loosely administered. We have frequently referred to the fact that perhaps in the majority of instances building permits are granted subsequent, instead of previous, to the commencement of the construction of the building; thus it becomes well nigh impossible to enforce compliance with the building regulations if these have been departed from by the designer or builder. The present by-law is noticeably defective in one or two particulars. Persons making application for a building permit are not required to submit with their plans a copy of the specifications, without which it is impossible to fully understand the manner in which the work is to be carried out. Again, no copy of the plans is kept on file in the building department, and there is consequently no means of knowing when changes are made in the original drawings. An instance of the laxity with which the by-law is administered came to light the other day when a scaffold which was being used in connection with some repairs to one of the departmental stores, gave way, resulting in injury to several workmen. On investigation it was found that the work was being carried out without a permit from the

building department. It is desirable that the building by-law should be amended and properly administered, and during the present period of dullness, the City Council might profitably turn its attention to the matter.

Cheapening Production.

However much condemnation may be heaped upon "combines" of manufacturers in the same line of business for the purpose of maintaining prices at a point which would insure a fair margin of profit on invested labor and capital, much can be said in favor of such organizations. Overproduction in almost every line has resulted in competition which, if not restrained in some manner, must work disaster to manufacturers and their employees. To illustrate the effect which this striving after cheapness of production has upon the workman, we may cite the case of a manufacturer of a certain class of appliances used in building construction, who recently put in operation mechanical apparatus by means of which, with the assistance of a couple of laborers, he is enabled to do work which formerly required the services of eight skilled mechanics. This method of cheapening production has been forced upon him by the invasion of his territory by several new competitors. By and by these competitors will either be forced out of the field and suffer the loss of their capital, or will have discovered means of reducing the cost of production to a point which will enable them to hold their own in the race. When that time shall have arrived an effort must be made to further cheapen production, and so the struggle to outdo one another continued until the margin of profit is entirely wiped out, and the skilled workman reduced to the level of the laborer, with his chances of employment reduced in like proportion. Do the public want cheap goods at such a sacrifice? Whether they do or not, manufacturers should decline to sacrifice their interests and those of their employees to satisfy so unreasonable a demand. When competition reaches the point where there is no profit with which to pay a fair return to capital and labor, the combine becomes justifiable.

A Brightening Outlook.

It is gratifying to observe indications of a revival of building operations in Toronto, where a stagnation has prevailed for several years past. We are advised that owners of land in the out-lying districts are beginning to erect houses, owing to the fact that the extension of the street railway system, and the widespread use of the bicycle has made it possible for persons engaged in the business part of the city to reach the out-lying districts as conveniently, and in less time, than was required a few years ago to reach points a mile or two nearer the centre. The conditions of residence are certainly more desirable in the out-lying sections, and now that time and distance have to so large an extent been annihilated, it may reasonably be expected that comfortable houses in these districts will find tenants as readily as those in the more populous localities. The steady decline in the rate of interest is also inducing the erection of new buildings. Within the past few weeks, loans have been made on real estate in the city of Montreal at as low a rate as 4½ per cent., and we are informed that English capital is now available at this rate for any legitimate enterprise which gives promise of proving reasonably remunerative. With money available at this low rate of interest, persons who for a number of years have been holding vacant lands, from which they were unable to derive any revenue, and on which they were obliged to pay city taxes, are said to be coming to the conclusion that they might better build thereon a class of houses which would be likely to command a fair rental.

Taking a broader view, there are indications to be seen pointing to a more prosperous condition of affairs in Canada in the near future. The collapse of the South Africa boom, the unsatisfactory conditions prevailing in Australia, together with the unsettled state of affairs in the United States, as the result of which a large amount of British capital has recently been withdrawn from that country, and the possibility of the adoption of a silver coinage, which would lead to a still further withdrawal of British investments, all point to Canada as one of the most desirable fields for the investment of foreign capital in the future.

The recent gold mining developments in British Columbia are certain also to prove a most important factor in our future prosperity. We have the assurance of experts of the highest authority that the gold mines of British Columbia are the richest in the world. At the present time millions of foreign capital is being invested in these mines, and the prophesy is being made that a large influx of population will be received within the next few years. Owing to the disappointing experience of British capitalists who invested so largely in Grand Trunk securities, Canada has hitherto been shunned by the British investor, and other fields which were less promising have benefitted at our expense. It now seems probable that our turn will come in the near future. We have one of the richest countries in point of natural resources upon the face of the globe. We have also a favorable climate, and unrivalled transportation facilities. We lack capital and population, and it seems probable that these necessities are now about to come to us. If so, we may expect to witness improvement in every line, in which event no industry is likely to derive greater benefit than that in which architects, builders, and manufacturers and dealers in building materials are connected.

PERSONAL.

Mr. Anderson, Building Inspector, Hamilton, is recovering from a severe attack of typhoid fever.

Mr. Charles Rose, a well-known Toronto builder, died unexpectedly while visiting friends in Portsmouth, England.

Mr. R. P. LeMay, of the firm of Berlinguet & LeMay, architects, Quebec, is at present in Charlottetown, P. E. I., superintending the construction of the new Catholic cathedral in that city.

The appointment of Mr. E. G. Barrow to the position of city engineer of Hamilton, Ont., rendered vacant by the death of the late Mr. Haskins, has been officially announced. Mr. Barrow was assistant engineer for some time, and is thoroughly familiar with the details of the work. He was born at Clifton, near Bristol, Gloucestershire, England, forty-nine years ago, and educated in the Taunton College School. He served three years under Francis Fox, chief engineer of the Bristol & Exeter Railway of England, and at the expiration of that period his ability was recognized by his appointment as assistant engineer of the branches of the same road. Mr. Barrow came to Canada in 1871, and had charge of the work of locating the line of the Midland Railway, and afterwards that of the Northern & Northwestern from Georgetown to Collingwood. For the latter work the late Mr. Haskins was chief engineer. Thereafter Mr. Barrow worked for the city under Mr. Haskins, although not permanently appointed assistant until 1888. He superintended the construction of waterworks at Teeswater, Paisley and Campbellford, and also the Government waterworks at Mimico.

(Correspondence of the CANADIAN ARCHITECT AND BUILDER.)

ARTS AND CRAFTS EXHIBITION BY THE P. Q. A. A.

As briefly announced in the ARCHITECT AND BUILDER for July, the Province of Quebec Association of Architects will hold an Architectural and Arts and Crafts Exhibition in the Galleries of the Art Association, Phillips Square, commencing on Thursday, 8th October, 1896. This exhibition will consist of: (a) Architectural Drawings; (b) A Loan Collection of Antiques; (c) Modern Industrial Art in its Application to Architecture.

The Art Association of Montreal have kindly granted the use of their fine galleries for the purpose, and are co-operating with the Architects' Association in promoting the Exhibition.

Committees composed of members of the Association of Architects and Art Association have been appointed to select and arrange the exhibits. These Committees will have power to reject any work which in their opinion does not possess sufficient merit to entitle it to a place in the Exhibition.

The Architectural Section to consist of Pen and Ink and Colour Perspectives, Drawings of Original Designs, of Sketches in Ink or Colour of Old Work; all Drawings must be suitably framed.

The Industrial Art Section to consist of Stone and Wood Carvings and Sculpture, Original Architectural Models, Artistic Iron and Metal Work, Ornamental and Figure Glass Work and Original Cartoons for same, Original Designs for Wall Paper, Artistic Book Binding, Coloured Designs for Interior Decoration, Figure Mosaics in Glass, Marble or Tile, Architectural Ceramic Work, Textile Fabrics applicable to Interior Decorations, &c., &c.

As the space in the galleries is limited, articles for exhibition in the Industrial Section must be of reasonable size, and the Committee will exercise their discretion as to the size of articles that can be accepted.

Antiques loaned for exhibition will be sent for and returned to the owners, and will if required be insured on such terms as may be agreed upon.

Drawings and works other than Antiques are to be addressed to the Art Association, Phillips Square, and delivered there not later than the 24th September, and are to be removed immediately after the close of the exhibition, the delivery and removal to be at the risk and expense of the exhibitor.

Every care will be taken of the works while on exhibition, but no liability will be assumed for insurance, damage or loss from any cause whatever.

In connection with my reference last month to the forthcoming Loan Exhibit under the the direction of the P. Q. A. A., by a misprint the name "R. Findlay" appeared for that of Mr. R. Lindsay, of the Art Association, in the list of members of the Committee.

A DESIGN COMMITTEE.

The Committee of the Province of Quebec Association of Architects to consider designs submitted on different occasions is composed of the President, the Vice-Presidents and the Secretary. For this year the Committee is as follows: A. C. Hutchison, President; A. T. Taylor, 1st Vice-President; J. F. Peachy, 2nd Vice-President; Jos. Venne, Secretary.

STREETS OF MONTREAL.

The question of repairing the pavements on several of the streets is under consideration by the city fathers. Although it has been stated that the civic authorities intend to have the contractors make the repairs according to their agreement, nothing has yet been done. But it appears in many cases that the contractors' guarantee has expired, and the city will, in consequence, do the repairs at their own expense.

BY THE WAY.

THE payment by the city of Toronto of $15,000 to Mr. Mansergh, the English engineer, for a report on the best means of obtaining a sufficient and satisfactory water supply, was the subject of considerable comment a few months ago. It may interest our readers to learn that as engineer for the new water-works system of Manchester, England, Mr. Mansergh has received in commissions £102,000, or upwards of half a million dollars.

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IN conversation with an architect the other day, I happened to touch on the subject of holidays, and was informed that Toronto Island was the farthest remove from the duties of his office that he had any expectation of reaching. Said he, "Did you ever think how peculiarly situated many architects are with regard to a vacation. If we are so fortunate as to have work on hand, we are obliged to stay at home and give it our attention, while if we haven't the work, we can't afford to take a holiday."

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SOME enterprising plumber's apprentice has prompted the reporter of the Toronto World to suggest that master plumbers who wish to secure the largest share of the repair business should furnish their journeyman and helper with a tandem bicycle, thus effecting a saving of time in going to and from work, and a proportionate saving to the customer. There's nothing in it, either for the master plumber or his customer, but a great deal for the journeyman and apprentice, who, instead of being obliged to spend a few monotonous hours in the park, would have the opportunity of exploring the beauties of the various pleasure resorts adjacent to the city.

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DURING the four or five years of business depression through which we have been passing, all classes have been on the lookout for indications of returning prosperity. As a rule they have seen little of an encouraging character, while with some things have been going from bad to worse. I met a man thus situated recently, to whom I propounded the oft-put question: "What is the business outlook?" The answer I received is worthy of preservation. Said he, "Two or three years ago you and I were living on our Faith that the times would improve. Last year we thought we could discern signs of promise and we lived on Hope. This year I am living on Charity."

CHIPS.

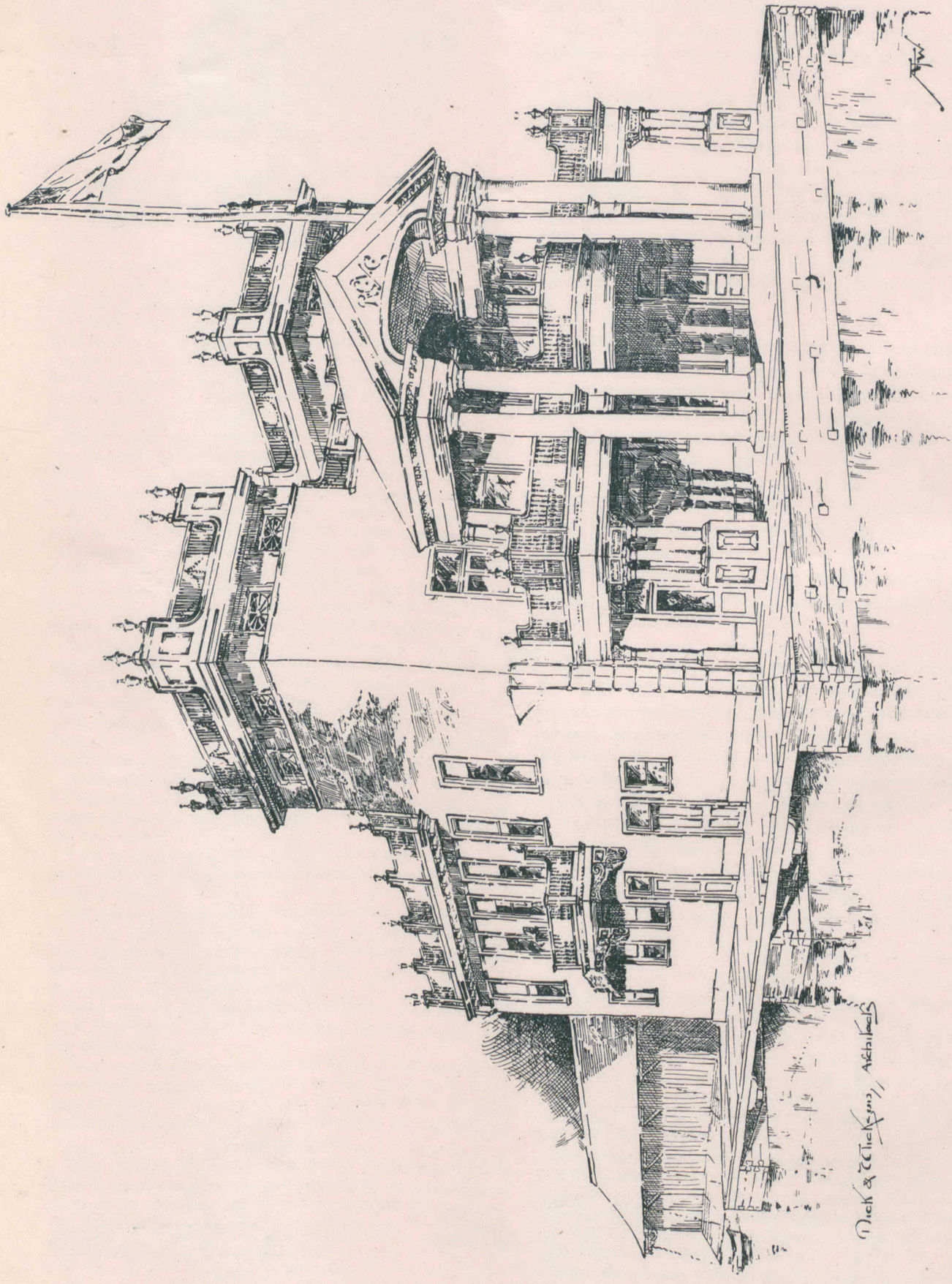
George Nelson, contractor, Rossland, B. C., was recently burned out.

The corner stone of the new Knox church at Woodstock, Ont., was laid a fortnight ago. The cost will be upwards of $45,000.

The Privy Council of England has confirmed the decision of the Supreme Court of Canada awarding Emanuel St. Louis, contractor, a balance of $63,642 on the Curran bridge, which the government had refused to pay.

The Pacific Coast Cement Company has been incorporated by J. C. Ferguson, C. W. Robson, H. J. Warsnap and T. R. Hardiman, of Vancouver. The object of the company is to acquire the Canadian Pacific Railway Company's cement works at Vancouver, and also the Saanich Lime Company's location on Tod Inlet, Saanich Arm. The capital is $500,000.

At the last meeting of master plumbers and steamfitters of Toronto, a communication was read from the City Council with reference to the lowering of the license fee. After a lengthy discussion it was resolved that a high license, and thorough examination, before allowing apprentices to work at the trade, were necessary to protect the master plumbers against unjust competition, and to insure good sanitary arrangements for citizens.

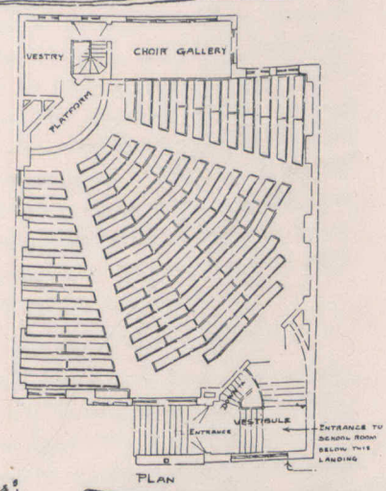


DESIGN FOR CLUB HOUSE FOR ROYAL CANADIAN YACHT CLUB, TORONTO.

DICK & WICKSON, ARCHITECTS.

Plans Building for the Broadview Ave. Conch. Church

Dick and Wickson Archts.



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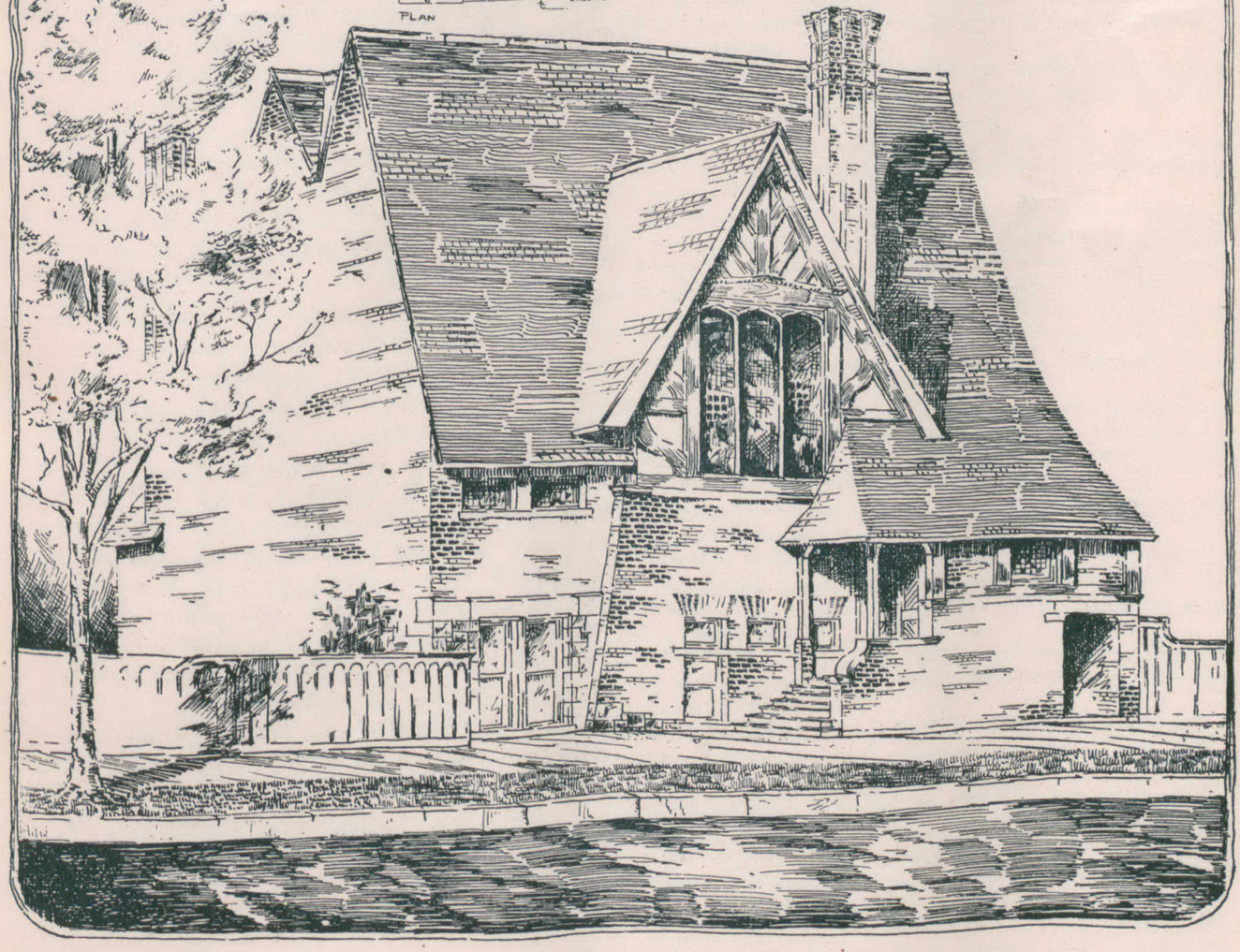


ILLUSTRATIONS.

DESIGN FOR A PRIVATE RESIDENCE, SUBMITTED IN THE FINAL EXAMINATION OF THE PROVINCE OF QUECEC ASSOCIATION OF ARCHITECTS, 1896, BY JOS. FORGET DESPATIE, MONTREAL.

DESIGN FOR CLUB HOUSE FOR ROYAL CANADIAN YACHT CLUB, TORONTO.—DICK & WICKSON, ARCHITECTS.

This building was recently destroyed by fire. It was not an entirely new building, the original structure being a large square frame building, the towers and verandah being added to it, the shape and size making the improvements a rather difficult problem to deal with.

DESIGN FOR BROADVIEW AVE. CONGREGATIONAL CHURCH, TORONTO.—DICK & WICKSON, ARCHITECTS.

The plan of this church is arranged with a slope in the floor towards the pulpit corner, and the choir was so placed that they could be both seen and heard without being obtrusibly near the preacher. The Sunday School room was to have been built with an auditorium several feet below the ground level. The roof is shown to have been constructed with three steel trusses over the entire span, the ceiling forming a shallow dome between them. The exterior was to have been of dark red brick and clear plaster in the timber work.

BRIDGE AT ISLAND PARK, TORONTO.

This bridge is an ornamental one of three arch spans, the centre one being 60 feet in the clear, and the two outer spans 30 feet in the clear; the roadway is 22 feet wide between parapets. The whole structure is of steel and cast iron, no woodwork being used except for bridge deck. The design for the bridge and all working drawings of the cast iron parapet, galvanized iron columns and other ornamental work were made at the office of the City Engineer, Toronto.

The masonry, piers and abutments were constructed by Mr. A. J. Brown, of Toronto, and the superstructure executed by the Central Bridge and Engineering Company, of Peterborough.

COMPETITIVE DESIGN FOR PROPOSED HIGH SCHOOL BUILDING, ST. JOHN, N. B.—CURRY, BAKER & CO., ARCHITECTS, TORONTO.

This design was submitted in competition in the ordinary way, that is to say, the School Board advertised for sketch plans for a twelve-room school, class rooms to be 28 ft. x 32 ft., 14 ft. high. Total cost not to exceed $45,000. No premiums were offered, but it was intimated that the design most approved would be adopted and the author appointed architect of the building. Before taking these steps the board sent a commission to Boston and other parts of the Eastern States to examine school buildings there, and an exhaustive report was returned, showing the buildings visited to be very costly for the amount of space provided.

The authors of this design proposed to heat and ventilate the building on the "blast fan" or "plenum" system, heat being provided from two steam boilers.

It was proposed to use buff pressed brick, with light green stone trimming, the roofs to be of red tile.

The Dominion Glass Company, of Montreal, has been incorporated, with a capital stock of $100,000.

Mr. W. H. Carrick, vice-president of the Gurney Foundry Co., Toronto, has returned from Great Britain, and appears to be well pleased with the prospects for the extension of the company's business in Europe.

THE LARGEST ARCHED ROOF RINK IN AMERICA.

DEY BROS., of Ottawa, are building the largest rink in America of the arch style, without posts. It is to be 246ft. long by 100ft. wide, and 58ft. 6in. high. The disadvantage of arched roofs is the settling of snow on the top. This is overcome by jack rafters, giving a pitch from 30 to 40 degrees.

To the front is built a two-storey structure. On the lower floor are two entrances into the parlors. Each parlor will be 22ft. x 42ft., and a long double-backed upholstered seat runs down the centre of each room. Above the main entrance is the Vice Regal box, sacred to the use of the Government party. On one side is a large banquet hall, and on the other three club-rooms. A gallery at front end and a promenade along the sides and rear afford accommodation for spectators.

The ice space will be 81x201 ft. The roof will be covered with 2,320 squares of shingles down to within 15 feet from the ground, from where it will be covered with iron sheeting.

OTTAWA LETTER.

(Correspondence of the CANADIAN ARCHITECT AND BUILDER.)

THERE are several buildings going up in this city, but not as many as last year. The Canada Atlantic coming into the heart of the city has necessitated the removal of some buildings, among them being Dey Bros.' rink. They are building another at corner Ann and Bay streets. The old military stores are used as a temporary station. It is the intention of the railway company to run the line right down to Brigham's ferry, at which place the bridge across to Hull is to be built.

The McLeod street Methodist church, on the corner of Bank street, is constructed of grey stone, and is to cost in the neighborhood of $30,000.

Grant's music hall, corner of Bank and Sparks streets, has been overhauled, the floor raised, and a gallery put in, under the superintendence of G. M. Bayley, architect.

The Contractors' Association of this city had at one time a prosperous association, but the meetings have been neglected and the rooms almost permanently closed.

Ottawa should have a master plumbers' association to keep up with the other cities of the province, but as there is no plumbing inspector, any person can call himself a plumber. We know of instances where ⅜-inch pipe has been used for service pipe.

The plumbers' supply houses seem to be busy. Law Bros. have large orders ahead. Thos. Lauson is recovering from the fire in which he lost many of his patterns, and F. G. Johnson & Co. have developed into a supply house.

The city authorities are helping the working man by the extensive improvements of the streets and sidewalks. As many as 250 men have been working on Sussex street day and night. $50,000 is being expended on granolithic sidewalks.

Wadsworth & McWhinney have opened up on Bank street under the name of the Ottawa Roofing and Cornice Works.

Douglas Bros. having withdrawn their branch from here, Mr. J. R. Douglas has formed a company under the name of J. R. Douglas & Co., to carry on business as roofers, heating engineers and cornice workers.

The Gas Company have recently completed a large building, containing 600,000 bricks. The building is 83 feet long and has a radius of 30 feet.

Orme & Sons' new block contains 800,000 bricks, is four storeys high, and faced with light colored pressed brick.

The Toronto Brass Company, Toronto, have commenced the manufacture of builders' hardware, gas and electric fixtures.

The Bras d'Or Marble Company, of West Bay, N. S., have recently received orders for the supply of large quantities of marble for building purposes. They are said to possess fourteen varieties of marble in the immense deposit at Marble Mountain, some of which are exceedingly beautiful. The company are taking steps to extend their trade, and as the bulk of granite used in Ontaria and Quebec is imported from Italy, it is quite probable that a portion of this trade at least can be secured by Canadian companies.

TESTS OF PAVING BRICKS.

THE accompanying table shows the results of tests of several kinds of paving bricks conducted under the direction of Mr. E. H. Keating, City Engineer of Toronto. The following particulars of the method of conducting the experiments are furnished in his annual report:

For the abrasion tests, the bricks, after being measured and weighed, are placed in a tumbler with 200 lbs. of foundry shot. The machine is then run for 2,000 revolutions at 30 revolutions to the minute. The bricks are then taken out and weighed, the percentage of loss estimated and returned to the tumbler, which is given another 2,000 revolutions at the same rate.

Upon the completion of the second 2,000 revolutions the percentage of loss from the original weight is again determined, and the loss in cubic inches for each square inch of surface can be calculated. The tumbler in use measures 24x37 inches, inside measurement. A good paving brick under this treatment should not lose more

TESTS OF PAVING BRICKS.

No. of Specimen.	Size.	Specific Gravity.	Abrasions. Original Weight.	Weight after 2,000 Revolutions.	Weight after 4,000 Revolutions.	Percentage of Loss by Weight after 2,000 Revolutions.	Percentage of Loss by Weight after 4,000 Revolutions.	Absorption. Loss in cub. inches per sq. in. of surface after 4,000 Revolutions.	Weight before Immersion.	Weight after Immersion.	Per cent. of Increase by Weight.	Length of Time Immersed.	Source of Brick.	Remarks.
	inches.		lbs. oz.	lbs. oz.	lbs. oz.							days.		
46	8½x5½x2¼	1.93	8 11.5	8 9.5	8 8	1.43	2.53	.0180	86.78 gmm.	88.290	1.74	3	Pyrogranite	
47	8x5x3	2.21	8 7¼	8 3	7 14½	3.30	6.60	.0501	8 lb. 7½ oz.	8 lbs. 10½ oz.	2.21	3	Massillon Shale and Fire Brick Co.	Bevelled edges.
									10 4	10.6	1.22			
48	8½x4½x2½	2.21	20 13	18 12	17 12	9 80	14.57	.0965	6.12	6.14½	2.3	3	" " "	3 bricks.
49	8¾x4x2½	.....	6 8	4 14½	4 9	24.5	30.0	.192	6.8	6.8	.....	3	Dr. Farwell, Bronte	Dark brick.
49a	8¾x4x2½	.....	6 13	6 1	5 11	11.0	16.5	.1055	6.13	7.2	4.85	3	" "	Light red brick.
50	.....	2.42	6 14	6 9	.....	4.0	.....		76.474	76.860	0.50	3	J. H. New, 30 Colborne St.	Hamilton brick.
51	8¾x4x2½	.....	5 12½	5 4½	5 2½	8.7	16.8	.0838	5.12½	5.15½	3.24	3		
			5 12	5 5	4 14	7.6	15.2	av'r'ge of two.						
			lbs.	lbs.	lbs.				5.12	5.14	2.17	3	Don Valley P. B. Co.	
52	.....	.....	18.12	13.53	.....	25.50	.....						Toronto Paving Brick Co.	3 bricks.
53	8½x4x2¼	2.25	19	.....	14.56	.....	23.4	0.1518	5.47	5.50	0.54	3	Burlington P. B. Co.	3 bricks.
54	8¾x4x2½	2.12	19.31	15.87	15.50	17.60	19.7	0.1960	4.81	4.94	2.70	3	" "	Repressed.
55	.....	.....							5.37	5.34	18.00	3	Don Valley P. B. Co.	White.
56	7½x3½x2½	.....	19.31	16.31	15.20	15.5	21.2	0.139	5.56	5.63	1.08	3	" "	Red.
	(a) 8¼x4x2½	.....	14.44	13.40	13.09	7.2	9.35	0.0503					Burlington P. B. Co.	
57	(b) 8¼x4x2½	2.29	7.45	6.97	6.50	6.4	12.70	0.0824	7.09	7.22	1.83	3	Canton Shale	(a) Common brick; 2 bricks marked B.
	(c) 9x4x3	.....	9.44	8.84	8.65	6.35	8.37	0.0602						(b) Repressed.
58	9¼x4x3	2.21	25.70	23.37	22.5	9.07	12.50	.0866	7.20	7.31	1.54	3	Massillon Shale and Fire Brick Co.	(c) Block similar to (a) in appearance.
59	8¾x4½x2¾	2.22	20.44	16.5	15.37	19.26	24.77	0.1626	5.31	5.44	2.45	3	" " "	
60	8¾x4½x2¾	.....	20.62	17.75	16.68	13 94	19.09	0.1248	5.68	5.81	2.30	3	Standard Massillon	
61	8¾x4½x2¾	.....	21.68	18.25	17.23	11.23	20 52	0.1342	5.87	6.00	2.21	3	Standard Canton	
62	8¾x4½x2½	.....	14.75	13.05	11.97	11.44	18.85	0.1230	6.15	6.37	3.57	3	Paver Canton	
63	8¾x4½x2¾	.....	7.37	6.56	6.23	11.02	15.68	0.1330	6.22	6.37	2.41	3	Holloway Canton	
64	8¾x4x2½	2.30	28.37	26.41	26.03	6.98	8.26	0.0544	5.24	6.68	None	3	Franklin Shale, Penn.	
65	9x4x3	.....	19.06	17.94	17.05	5.90	10.50	0.0756	8.34	8.44	1.10	3	Harris Paver	
66	9x4x3	.....	9.71	8.97	8.65	7.70	10.90	0.0784	8.65	8.71	0.80	3	Harris Holwood	
67	8x3½x2	2.47	16.00	14 96	14.71	6.55	8.06	0.0454	71.438 gmm	71.99 gmm	0.76	3	Temple, Toronto	No absorption on whole brick in 3 days.
68	8¾x4x2½	.....	12.05	10.40	10.06	17.80	20.40	0.130					Dr. Farwell, Burlington.	Marked No. 4.
69	8¾x4x2½	.....	13.125	10.25	10.09	21.80	23.10	0.1490					" "	No. 1.
	(a) 8¾x4x2½	.....	7.125	6.50	6.25	8.79	12.3	0.0797					(a) Canton Shale	
70	(b) 8¾x4x2½	.....	6.44	5.41	5.30	16.00	19.2	.1245					(b) Dr. Farwell, Burlington (Light)	These four bricks were all tested in rattler at same time.
	(c) 7½x3½x2	.....	5.35	4.90	4.78	6.66	8.9	.0576		No absorption.			(c) Temple	
	(d) 8¾x4x2½	.....	6.66	5.44	5.20	17.07	20.7	.1343					(d) Dr. Farwell, Burlington (No. 3)	
71	8¾x4x2½	.....	13.06	9.34	8.78	28 40	32.7	.2070					Burlington Repressed, No. 1	2 bricks.
72	8¾x4x2½	.....	12.31	8.84	8.59	33.06	35.4	0.2200					Burlington, No. 2	2 bricks.
73	8¾x4x2½	2.23	6.50	5.56	5.44	14.40	16.1	0.1037					" No. 3	
74	8¾x4x2½	2.36	21.65	19.68	18.75	9.10	13.4	0.087	68.945	69.59	0.93	3	Standard Canton Shale Holloway Block	Absorption in one day same as in four days.
75	8¾x4x2½	.....	20.94	18.31	16.31	12.50	22.1	0.1434	7 16	7.28	1.64	4	Holloway Canton Repressed	
76	8¾x4x2½	2.21	18.20	15.31	14.20	15.90	21.9	0.1295	6.59	6.72	1.97	4	Don Valley	The whole absorption was taken in 1st 24 hours.
77	8¾x4x2½	.....	22.87	18.87	16.71	15.60	24.9	0.1623	5.94	6.03	1.51	4	Carrollton Repressed Standard Brick	
78	8¾x4x2½	.....	23.15	20.59	19.09	11.05	17.80	0.1150	5.24	5.28	0.76	3	" Standard	
79	8¾x4x2½	2.21	30.31	22.125	20.40	27.00	32.70	0.1380	6.06	6.09	0.50	3	Don Valley	
80	8¾x4x2½	2.37	28.78	25.62	24.75	10.90	14.00	0.0908	57.185	57.82	1.09	3	Standard Canton	Used on Ossington Ave., Dundas to College.
81	8¾x4x2½	.....	26.34	20.31	18.00	22.80	31.60	0.2011	100.503	101.51	1.01	3	Dr. Farwell, Burlington	
82	(a)	.....	14.44	13.50	12.50	6.5	13.10	0.085					Standard Canton	
	(b)	.....	12.00	10.50	9.12	12.5	24.00	0.1419					Don Valley	
83	8¾x4x2½	.....	24.125	20.56	19.75	14.6	18.10	0.1070					" "	
84	8x3½x2½	2.31	25.81	23.87	22.44	7.5	13.00	0.0821	5.00	5.18	3.60	3	Ontario Paving Brick Co.	Repressed brick.
85	8.3¾x2½	2.31	25.87	23.44	22.31	9.3	13.78	0.0870	5.58	5.65	1.25	3	" " "	" "
86	8¼x2½	.....	11.94	10.69	9.56	15.3	19.80	0.1170	96.802	98.57	1.79	3¼	" " "	" "
87	8x3½x2½	2.31	12.59	11.34	10.63	9.9	15.7	0.095					Don Valley	
88	8¼x4x2½	.....	21.94	21.00	20.50	4.00	6.5	0.043					Ontario P. B. Co.	These were culls from Selby Street.
89	.....	.....	18.53	15.44	14.75	16.6	20.34		7.225	7.24	0.28		Standard Shale Brick Exchange	Amelia Street work.
90	8x3½x2½	2.31	6.31	5.78	5.71	8.4	9.5	.0604					Don Valley	
													Ontario Paving Brick Co., Selby Street	These were tested in rattler at same time.

Size of Tumbler, 24 x 37 inches inside; 200 lbs. foundry shot; 30 revolutions per minute.

than 9 per cent. in 2,000 revolutions, and not more than 12.5 per cent. in 4,000 revolutions, nor should the loss in cubic inches per square inch of snrface exceed 0.09.

The absorption test should be made with the whole brick and also with broken pieces after being thoroughly dried and allowed to cool. The length of time the bricks should be immersed is 3 days, during which time the brick must not absorb more than 2¼ per cent. of its weight. Most of this absorption appears to take place during the first day.

The biggest association of master painters in the world, considering the area of ground covered, is that of Pennsylvania. This consists of nearly fifty different local associations, in as many cities, towns and villages, so that practically every master painter in the state is a member. The association exists by no means to "put down" the working man; on the contrary, delegates from the journeymen's unions are invited to be present at some of the meetings, while great efforts are made in fostering technical education and the interests of the apprentices.

AN INTERESTING SUIT.

Koksilah Quarry Co. vs. the Queen, a case of much general interest and involving a large sum of money, was commenced before Mr. Justice Walkem at Victoria, B. C., recently. This was an action brought by the Koksilah Quarry Co. to recover $12,500 damages by reason of alleged breach of contract in connection with the supply of stone for the Provincial Parliament buildings. The petition recites that in 1893 the government approved of a quality of stone quarried by the company and asked them for tenders for the delivery of stone from their quarry, to be used in the erection of the said buildings, and the company accordingly sent in a tender. In reply the deputy commissioner wrote the company that their stone had been selected and urged them to proceed with all necessary quarry work so that there might be no delay when the stone was wanted.

Afterwards, in February, 1894, some stone was delivered at the site of the said buildings, and the company allege was accepted as a part performance of the contract and actually used, but about this time the contractor refused to accept any more stone, although suppliants were always ready and willing to go on and complete their part of the contract. The company further say that stone has been used and is still being used, which, under the terms of the agreement, could have been supplied by them.

The defence contended that they never contracted with the company for the stone, but that the contractor for the buildings, the late Frederick Adams, was the party who made the contract for the stone. It is further stated that the stone was condemned by the architect of the building as unfit for the purpose required.

A dispute has arisen between Mr. Borque, the contractor for the Dominion reformatory at Alexandria, Ont., and the government architect, regarding the foundation which is being laid, and the contractor has asked that an outside authority be called in. Mr. Perrault, of Montreal, has been asked by the Department of Public Works to report in the matter, and has consented.

CORRESPONDENCE.

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

EFFECT OF THE CHICAGO CANAL ON CANADIAN WATER LEVELS.

To the Editor of the CANADIAN ARCHITECT AND BUILDER.

SIR :—Anent your query as to Mr. O'Hanley's remarks on the effect on our Canadian waters of the so-called Chicago Drainage Canal—but which has merely been called so to disarm suspicion, by conveying the impression of it's being a very trifling affair, while in reality intended as a maritime canal for commercial purposes, and which the Government at Ottawa must have been blind indeed to Canada's interests to have allowed to proceed without even a protest of any kind on the part of the Dominion—I have not seen anything of Mr. O'Hanley's report on the subject, but if, as I am told, this gentleman was, when too late, "appointed by the then Dominion Government to report upon the probable effect of the Chicago Drainage Canal upon the water levels in Canada," I fail to see why he should have limited his conclusions to Lakes Michigan and Huron, while it is evident that Lakes Erie and Ontario must be correspondingly affected, since these lakes are naturally made up not only of their own particular watersheds, but of the outflow of the upper lakes into them by the St. Clair and Niagara rivers; and while it is, moreover, doubly evident that the whole of the St. Lawrence river between Ontario and tide waters at Quebec or Three Rivers must be ten or a hundred fold more affected in its levels than are the great lakes, or in the ratio of the narrowness of the latter to the immense expanse of the former.

There is no doubt that every inch less in depth of water in the lakes must diminish by so much the draught to be given to every vessel frequenting these inland seas, to allow of their reaching to the same distances up rivers, into bays and creeks and other inland waters.

The effect of the drawing off of some 600,000 cubic feet of water from Lake Michigan has been variously stated at from one to seven inches, and this shallowing of the water has been correctly figured at millions of dollars loss on the combined lake trade.

But the difficulty and damage or loss, as far as the lakes are concerned, is not an irremediable factor, for it can be conjured and avoided by damming and locking the St. Clair and Niagara rivers and the outlets of Lake Ontario at Kingston, or preferably, and at less expense, below the Thousand Islands, and the waters thus raised again and kept up to any required level as in a reservoir; while, where the injury will admit of no remedy, and which does not appear to have as yet struck any one—not even a professional engineer—notwithstanding that I was the very first in Canada or elsewhere to point out the evil and sound the note of warning as early as in January, 1895, (now more than 20 months ago) in an article then published in this journal, though written during the preceding December, 1894, and subsequently by letters to our Quebec papers, the Montreal Star of March 6, 1895, the Canadian Engineer, the New York Engineering Record, and my conclusions reproduced also by the Montreal Herald; I say, sir, that where the evil will not admit of any compensatory process, and must forever remain unremedied, is, or will be, when the "canal" is completed along the shores of the St. Lawrence between Kingston and tidal waters at Quebec or Three Rivers.

An inch of water less upon the lakes may be comparatively of no moment, and it is absolutely indifferent to lake traffic whether the lakes drain south towards the Gulf of Mexico or eastward to the Atlantic, towards the Mississippi or the St. Lawrence; but while the quantity of water illegally diverted from the St. Lawrence may be most trifling in its depth when minimized by being spread over such an area as that of our great lakes, not so, by any means, on the narrower waters of the rivers of which these lakes are feeders.

The flow of water over Niagara is hardly more than 18 million cubic feet per minute, so the quantity we are being robbed of by our "American Cousins" (600,000 cubic ft. per minute, as already stated), is not less than one-thirtieth, or 3⅓ per cent. of the whole, and without going into mathematical formulae to ferret out the exact number of inches by which the depth of flow must be effected, after allowing for the thereby slightly diminished velocity and slightly increased friction due to diminished depth, our people, unprofessional and all, will not be slow to see that, in the same way as in a sluice of any kind, a diminished quantity of water must be productive of less depth on the floor or bottom thereof, so must a diminished quantity of water flowing through the St. Lawrence, as of any other river, resolve itself into a lesser depth of water over the floor or bed of the river.

In Lake St. Peter, for instance, where the present depth of channel, as dredged out, at a cost of so many millions to the country, is still but 27½ feet or thereabout, and Montreal clamoring for the expenditure of another $5,000,000.00 to increase the depth to 30 feet, such depth, even if attained, would be reduced by some eleven inches, or say a foot in round numbers, the moment the Chicago canal were open; and then more millions would have to be thrown away in making up the deficit, while, so soon as deficit No. 1 were made up, the projected enlargement of the canal in question (and which is already provided for in the purchase of the right of way) would decrease the flow of the St. Lawrence by another 3⅓ per cent.; and the carrying out of the other projected ship canals from the great lakes towards New York and the Atlantic by way of the Hudson river successively another and still another and further or additional deficit of 5 and 10 per cent.; or a total of from 12 to 17 per cent., equivalent to a loss of depth and draught of one-eighth to one-sixth of the present flow through the St. Lawrence.

Nor would this decreased draught for all species of river craft affect the St. Lawrence only between Kingston and Quebec; but, though in a less degree, be prejudicial, retardatory of navigation far below Quebec, where, as at the "Traverse," so-called, vessels would have to wait an additional hour for their full complement of water, both on their journey up and down, and thus lose two hours or more, which at present can be improved in loading or unloading, or in other useful ways.

Again, this dearth of water would in no way be confined to the St. Lawrence, but affect also its tributaries, as the Ottawa, the Richelieu, the St. Maurice and other feeders, where all river craft must henceforth forego the advantage of ascending these tributaries to anything like the wonted distance as of yore.

Sir, to me, the most outrageous feature of this whole concern is the daring and unfriendly spirit in which this work has been conceived, and by Congress sanctioned and proceeded with, in absolute disdain and mockery, so to say, of Canada and our people; for it cannot but strike everyone, as it struck myself the moment I read of it for the first time in December, 1894, and while glancing behind me at my map, that though Chicago be, it is true, some 500 miles within the northern frontier of United States territory, still are the waters of Michigan, as well as those of Superior, Huron, Erie and Ontario, and as much as these, the feeders of the St. Lawrence, and that, if anything, Canada has the best right to them, as they are mostly of northern watershed, and that the taking possession of any portion thereof, without agreement or without compensation to Canada, can therefore be looked upon solely as the grossest, the most outrageous spoilation of our national rights—a most pertinent lesson too—while our solons at Ottawa were during the interval fooling away their time in squabbling over the Manitoba school question, making it a subject of discord and disunion between us all, while the Pope of Rome is and has been long endeavoring to create peace and harmony between French and English, Protestants and Catholics, by his attempts at christian-like union and forbearance.

CHAS. BAILLAIRGE,
City and Civil Engineer.

Quebec, July 23, 1896.

CHIPS.

A piece of rapid construction has been that of the roadbed of the Moncton, N. B., street railway. The whole length of the main line is over 12,000 feet, or 2¼ miles. The work of construction occupied 47 days.

Charles Thompson, an employee of the Owen Sound Stone Company, was killed in the quarries at Orangeville on the 24th of July. He was standing on a coil of rope which was attached to a derrick, when the workmen on the derrick commenced to hoist it. Thompson endeavored to get off the rope and became entangled in it. He was carried up into the air and then fell with terrific force between two large rocks.

The privy council of England has dismissed the appeal from the judgment of the supreme court of Canada of December 9, 1895, affirming a decision of Mr. Justice Burbidge in the case of Ross and others against the Queen. The appellants brought an action in the court of exchequer of Canada by petition of right to recover from the Dominion government the sum of $231,806, which they claimed to be due on two contracts for the construction of sections 9 and 15 of the Intercolonial railway.

MANUFACTURES AND MATERIALS

ASBESTOS.

To the question, "What is asbestos?" it is not altogether easy to find an answer. Geologists classify it among the hornblends. In itself, asbestos is a physical paradox, a mineralogical vegetable, both fibrous and crystalline, elastic yet brittle, a floating stone, but as capable of being carded, spun and woven as flax, cotton or silk. It is apparently a connecting link between the vegetable and the mineral kingdom, possessing some of the characteristics of both. In appearance it is light, buoyant and feathery as thistledown; yet, in its crude state, it is dense and heavy as the solid rock in which it is found. Apparently as perishable as grass, it is yet older than any order of animal or vegetable life on earth. The dissolving influences of time seem to have no effect upon it. The action of unnumbered centuries, by which the hardest rocks known to geologists are worn away, has left no perceptible imprint on the asbestos found embedded in them. While much of its bulk is of the roughest and most gritty materials known, it is really as smooth to the touch as soap or oil. Seemingly as combustible as tow, the fiercest heat cannot consume it, and no known combination of acids will destructively affect the appearance and strength of its fibre, even after days of its action. It is, in fact, practically indestructible. Its incombustible nature renders it a complete protection from flames, but beyond this most valuable quality, its industrial value is greatly augmented by its non-conduction of heat and electricity, as well as by its important property of practical insolubility in acids.

Asbestos has been found in all quarters of the globe. It comes from Italy, China, Japan, Australia, Spain, Portugal, Hungary, Germany, Russia, The Cape, Central Africa, Canada (Fig. 1), Newfoundland, this country, and from Southern and Central America.

Notwithstanding this wide distribution of asbestos, the only varieties which at present appear to demand serious consideration, from a commercial point of view, are the Russian, the South African, the Itallan and the Canadian.

Before the development of the Canadian fields, the Italian asbestos was supreme in the market. For nearly twenty years Italy has been looked to for the best grades of the fibre. From a point on the northern mountain slope of the Susa valley is taken the floss asbestos fibre, the appearance of which in gas stoves is so familiar. In the same locality is found a fine white powder of asbestos, which serves for paint and other purposes. The mining is carried on at a height of from 6,000 to 10,000 feet above sea level.

But the Italian asbestos industry, once so important, is already on the down grade. The difficulties of mining are very great, and unduly increase the cost of production. The asbestos itself, judged by the latest standards, is of inferior quality; it is not easy to spin, and it does not pulp well in the making of paper. The best grade is extremely rare, and its cost of mining and

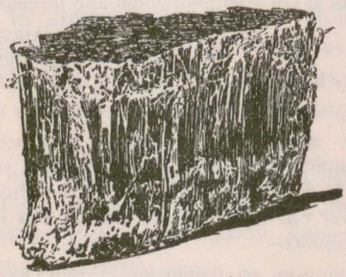


FIG. 1.—CANADIAN ASBESTOS.

transportation is prohibitive. The supply from the Italian mines is rapidly falling off. As a matter of fact, Canada contains the great asbestos region of the world, in the sense that while its mines are practically unlimited in productive capacity, the product is of a quality which fully meets the requirements of the newest and most exacting of the innumerable uses that are daily being found for it.

The process of manufacture is intensely interesting, more especially from the fact that as the industry is constantly entering upon novel phases, new methods of treatment and special machinery have to be devised. One of its special uses is for wall paper. This is a new application which will have a distinct effect in modifying the practice of indoor plastering. Instead of the ordinary tedious and elaborate preparation of studs and strips, and the use of inferior and dust creating mortar, with its after-scoring, which is necessary to give cohesion to the final coat of plaster of Paris, a single coating of the asbestos is laid on. It has a glossy surface that will not crack, as, while firm, it is perfectly flexible. It can be put on the raw brick; and a room of which the walls have been bullt in the morning can, before night, have a smoothly finished interior surface, shining like glass and as hard as a rock. A kindred application of asbestos is now coming into vogue in the shape of inflammable decorations for walls and ceilings. These are used a great deal for the saloons of steamships. They are embossed in very beautiful designs, and can be treated with gold, varnish, lacquers, or any other substance, for the enhancement of their ornamental effect.

Firemen clad in asbestos clothing and masks, as are those of London and Paris, can walk through the hottest flame with comparative impunity. Asbestos fireproof curtains have reduced the mortality of theatre fires in a very appreciable degree.

Probably one of the first applications of asbestos in this country

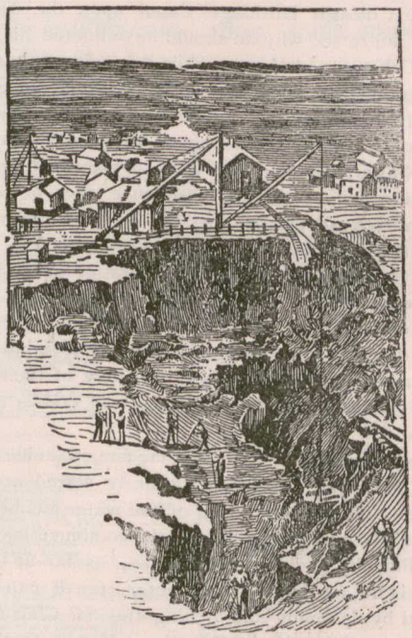


FIG. 2.—ASBESTOS MINING.

was to roofing. To buildings covered with this material, the shower of sparks from a neighboring conflagration involves no danger. The fact that woodwork can, by its use, be made uninflammable has come to be an important factor in the insurance of buildings.

One of the largest branches of asbestos manufacture is that of sectional cylinders for pipe coverings, for retaining the heat of steam and other pipes, felt protective coverings for boilers, frostproof protections for gas or water pipes, and cement filling, which can be laid on with a trowel, for the covering of steam pipes, boilers or sills. In some of these cases, where it is only necessary to retain the heat, the asbestos is mixed with other substances; but where the protection must be fireproof as well, only asbestos is used.

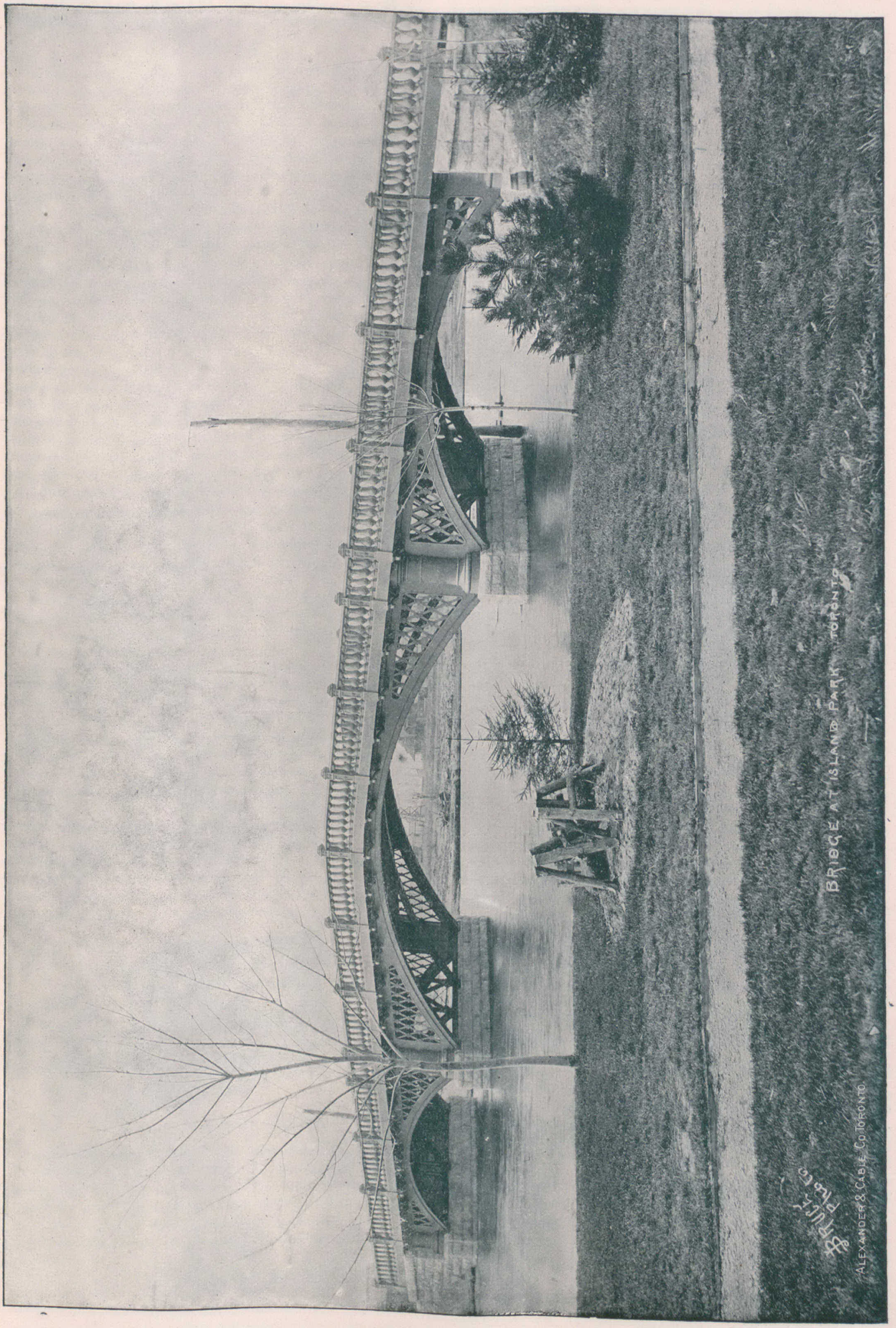
Another very extensive department in asbestos manufacture is that of packings. Of these there are an infinite number of forms.

The making of asbestos paper varies from the building up of the thickest millboard to the production of a writing paper which, from its indestructibility, is valuable in case of fire for preserving charters, policies, agreements and other important documents.—George Heli Guy, in New York Evening Post.

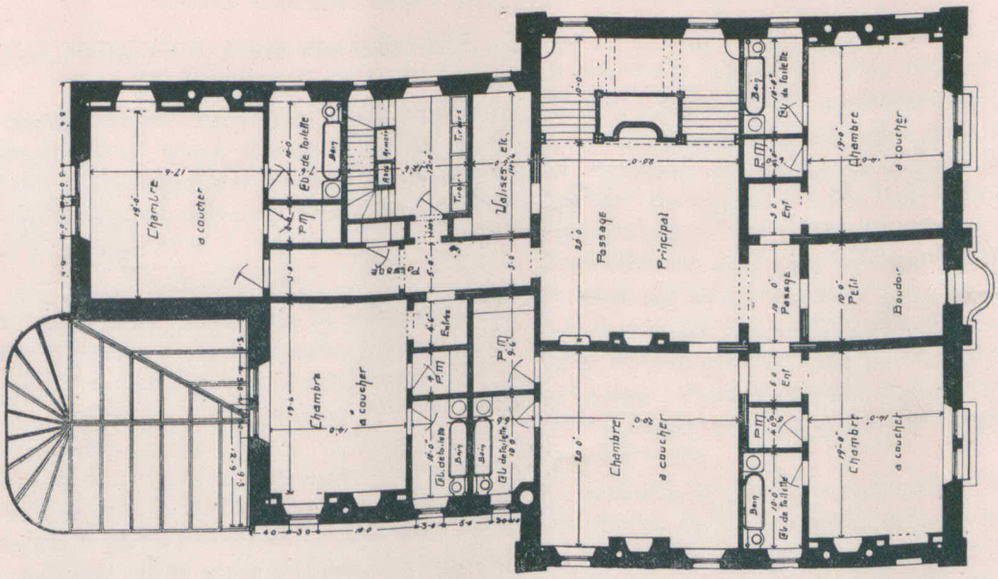
Some twenty cars of stone, from the Tilsonburg quarries, have arrived at London for the construction of the Grand Trunk shops.

It is reported that Mr. Thomas Parker, proprietor of the Port Credit Pressed Brick & Terra Cotta Co., is negotiating for the purchase of the works of the Toronto Pressed Brick Company at Milton, Ont.

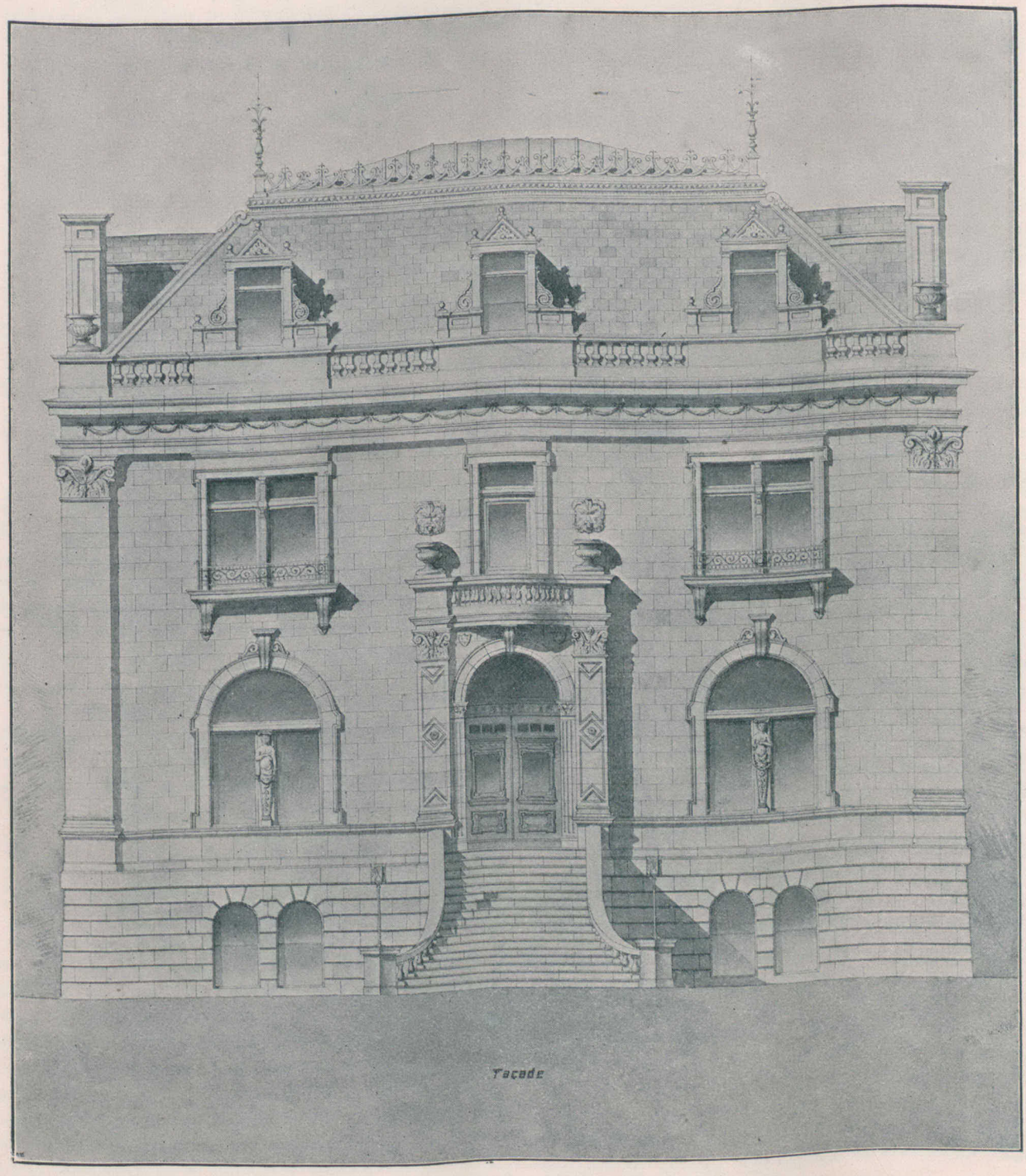
The French syndicate which recently purchased the St. John Stone Chinaware Co.'s potteries at St. Johns, Que., has completed its organization in Paris, and Messrs. Graves, Aube and Vannier, the promoters, sailed for Canada on the 15th inst. Mr. Adrian Vannier has been appointed manager.



BRIDGE AT ISLAND PARK, TORONTO.



— Second Floor —



DESIGN FOR A PRIVATE RESIDENCE.

Submitted in the Final Examination of the Province of Quebec Association of Architects, 1896,
By JAS. FORGET DESPATIE, Montreal.

CHARACTERISTICS AND PROPERTIES OF WOOD.

FROM a comprehensive discussion of the characteristics and properties of wood, prepared by Mr. B. E. Fernow, Chief of the Division of Forestry of the United States, the following valuable information for architects and engineers is obtained :

WEIGHT OF WOOD.

The two main factors of weight in wood are : The amount of cell wall, or wood substance, constant for any given piece, and the amount of water contained in the wood, variable even in the standing tree, and only in part eliminated in drying.

In general, it may be said that none of the native woods in common use in this country are, when dry, as heavy as water, i. e., 62 pounds to the cubic foot. Few exceed 50 pounds, while most of them fall below 40 pounds, and much of the pine and other coniferous wood weighs less than 30 pounds per cubic foot.

The weight of the wood is, in itself, an important quality. Weight assists in distinguishing maple from poplar. Lightness, coupled with great strength and stiffness, recommends wood for a thousand different uses. To a large extent weight predicates the strength of the wood, at least in the same species, so that a heavy piece of oak will exceed in strength a light piece of the same species, and in pine it appears probable that, weight for weight, the strength of the wood of various pines is nearly equal.

WEIGHT OF KILN-DRIED WOOD OF DIFFERENT SPECIES.

	Specific weight.	Approximate. Weight of 1 cubic foot.	Approximate. Weight of 1,000 feet of lumber.
		Pounds.	Pounds.
(a) Very heavy woods : Hickory, oak, persimmon, osage orange, black locust, hackberry, blue beech, best of elm, and ash	0 70-0.80	42-48	3,700
(b) Heavy woods : Ash, elm, cherry, birch, maple, beech, walnut, sour gum, coffee tree, honey locust, best of Southern pine, and tamarack	.60- .70	36-42	3,200
(c) Woods of medium weight : Southern pine, pitch pine, tamarack, Douglas spruce, western hemlock, sweet gum, soft maple, sycamore, sassafras, mulberry, light grades of birch and cherry	.50- .60	30-36	2,700
(d) Light woods : Norway and bull pine, red cedar, cypress, hemlock, the heavier spruce and fir, redwood, basswood, chestnut, butternut, tulip, catalpa, buckeye, heavier grades of poplar	.40- .50	24-30	2,200
(e) Very light woods : White pine, spruce, fir, white cedar, poplar	.30- .40	18-24	1,800

Since ordinary lumber contains knots and also more water than is here assumed, and also since its dimensions either exceed or fall short of perfect measurement, the figures in the table are only approximate.

Thus, 1,000 feet, B. M., of longleaf pine weighs :

	Pounds.
Rough and green	4,500
Boards, rough but seasoned	3,500
Boards, dressed and seasoned	3,000
Flooring, matched, dressed and seasoned	2,500
Weatherboarding beveled and dressed	1,500

The rapidity with which water is evaporated, that is, the rate of drying, depends on the size and shape of the piece and on the structure of the wood. An inch board dries more than four times as fast as a 4-inch plank and more than twenty times as fast as a 10-inch timber. White pine dries faster than oak. A very moist piece of pine or oak will, during one hour, lose more than four times as much water per square inch from the cross section, but only one-half as much from the tangential, as from the radial section.

In a long timber, where the end or cross sections form but a small part of the drying surface, this difference is not so evident. Nevertheless, the ends dry and shrink first, and being opposed in this shrinking by the more moist adjoining parts, they check, the cracks largely disappearing as seasoning progresses.

In thin boards all parts soon attain the same degree of dryness ; in heavy timbers the interior remains moister for many months, and even years, than the exterior parts. Finally an equilibrium is reached, and then only the outer parts change with the weather.

With kiln-dried wood all parts are equally dry, and when exposed the moisture coming from the air must pass in through the outer parts, and thus the order is reversed. Ordinary timber requires months before it is at its best; kiln-dried timber, if properly handled, is prime at once.

Steaming the lumber is commonly resorted to in order to prevent checking and "case-hardening," but not, as has frequently been asserted, to enable the board to dry. Yard-dried lumber is not dry, and its moisture is too unevenly distributed to insure good behavior after manufacture. Careful piling of the lumber, both in the yard and kiln, is essential to good drying. Piling boards on edge or standing them on end is believed to hasten drying. This is true only because in either case the air can circulate more freely around them than when they are piled in the ordinary way. Boards on end dry unequally ; the upper half dries much faster than the lower half, and horizontal piling is, therefore, preferable.

SHRINKAGE OF WOOD.

Shrinkage of wood is due to the fact that the cell walls grow thinner on drying. The thicker cell walls and therefore the heavier wood shrinks most, while the water in the cell cavities does not influence the volume of the wood. Owing to the great difference of cells in shape, size, and thickness of walls and still more in their arrangement, shrinkage is not uniform in any kind of wood. This irregularity produces strains, which grow with the difference between adjoining cells and are greatest at the pith rays. These strains cause warping and checking, but exist even where no outward signs are visible ; they are greater if the wood is dried rapidly than if dried slowly, but can never be entirely avoided.

Temporary checks are caused by the more rapid drying of the outer parts of any stick ; permanent checks are due to the greater shrinkage, tangentially, along the rings than that along the radius. This, too, is the cause of most of the ordinary phenomena of shrinkage, such as the difference in behavior of entire and quartered logs, "bastard" (tangent) and "rift" (radial) boards, etc., and explains many of the phenomena erroneously attributed to the influence of bark, or of the greater shrinkage of outer and inner parts of any log.

Rapidly dried in the kiln, the wood of oak and other hard woods "case-harden," that is, the outer part dries and shrinks before the interior has a chance to do the same, and thus forms a firm shell or case of shrunken, commonly checked wood around the interior. This shell does not prevent the interior from drying, but when this drying occurs, the interior is commonly checked along the medullary rays, as shown in fig. 1. In practice this occurrence can be prevented by steaming the lumber in the kiln, and still better by drying the wood

in the open air or in a shed before placing in the kiln. Since only the first shrinking is apt to check the wood, any kind of lumber which has once been air dried (three to six months for 1-inch stuff) may be subjected to kiln heat without any danger. Kept in a bent or warped condition during the first shrinking, the wood retains the shape to which it was bent and firmly opposes any attempt at subsequent straightening.

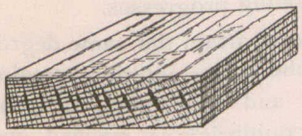


FIG. 1.—"Honeycombed" board. The checks or cracks form along the pith rays

To avoid "working," or warping and checking, all high-grade stock is carefully seasoned, preferably in a kiln, before manufacture. Thicker pieces may be made of several parts glued together; larger surfaces are made in panels or of smaller pieces covered with veneer. Boring is sometimes resorted to to prevent the checking of wooden columns.

Since repeated swelling increases the injuries due to seasoning, wood should be protected against moisture when once it is dry.

Since the shrinkage of our woods has never been carefully studied, and since wood, even from the same tree, varies within considerable limits, the figures given in the following table are to be regarded as mere approximations. The shrinkage along the radius and that along the tangent (parallel to the rings) are not stated separately in the following table, and the figures represent an average of the shrinkage in the two directions. Thus, if the shrinkage of soft pine is given at 3 inches per hundred, it means that the sum of radial and tangential shrinkage is about 6 inches, of which about 4 inches fall to the tangent and 2 inches to the radius, the ratio between these varying from 3 to 2, a ratio which practically prevails in most of our woods.

Since only an insignificant logitudinal shrinkage takes place (being commonly less than 0.1 inch per hundred), the change in volume during drying is about equal to the sum of the radial and tangential shrinkage, or twice the amount of linear shrinkage indicated in the table.

Thus, if the linear average shrinkage of soft pine is 3 inches per hundred, the shrinkage in volume is about 6 cubic inches for each 100 cubic inches of fresh wood.

APPROXIMATE SHRINKAGE OF A BOARD, OR SET OF BOARDS, 100 INCHES WIDE, DRYING IN THE OPEN AIR.

	Shrinkage.
	Inches.
(1) All light conifers (soft pine, spruce, cedar, cypress.....	3
(2) Heavy conifers (hard pine, tamarack, yew), honey locust, box elder, wood of old oaks.....	4
(3) Ash, elm, walnut, poplar, maple, beech, sycamore, cherry black locust.....	5
(4) Basswood, birch, chestnut, horse chestnut, blue beech, young locust.....	6
5) Hickory, young oak, especially red oak.....	Up to 10

INFLUENCE OF WEIGHT AND MOISTURE ON STRENGTH.

It has been stated that heavy wood is stronger than lighter wood of the same kind, and that seasoning increases all forms of resistance. Let us examine why this is so.

Since the weight of dry wood depends on the number of fibers and the thickness of their walls, there must be more fibers per square inch of cross section in the heavy than in the light piece of the same kind,* and it is but natural that the greater number of fibers should also offer greater resistance, i. e., have the greater strength.

The beneficial influence of drying and consequent shrinking is two-fold: (1) In dry wood a greater number of fibers occur per square inch, and (2) the wood substance itself, i. e., the cell walls, become firmer. A piece of green longleaf pine, 1 by 1 inch and 2 inches long, is only about 0.94 by 0.96 inch and 2 inches long when dry; its cross section is 10 per cent. smaller than before, but it still contains the same number of fibers. A dry piece 1 by 1 inch, therefore, contains 10 per cent. more fibers than a green piece of the same size, and it is but fair to suppose that its resistance or strength is also about 10 per cent. greater.

The influence of the second factor, though unquestionably the more important one, is less readily measured. In 100 cubic inches of wood substance the material of the cell walls takes up about 50 cubic inches of water and thereby swells up, becoming about 150 cubic inches in volume. In keeping with this swelling the substance becomes softer and less resistant. In pine wood this dimunition of resistance, according to experiments, seems to be about 50 per cent., and the strength of the substance, therefore, is inversely as the degree of saturation or solution.

SOME PRACTICAL CONCLUSIONS.

In framing, where light and stiff timber is wanted, the conifers excel; where heavy but steady loads are to be supported, the heavier conifers, hard pine, spruce, Douglas spruce, etc., answer as well as hardwoods, which are costlier and heavier for the same amount of stiffness. On the other hand, if small dimensions must be used, and especially if moving loads are to be sustained, hardwoods are safest, and in all cases where the load is applied in form of "shocks" or jars, only the tougher hardwoods should be employed. The heavier wood surpasses the lighter of the same species in all kinds of strength, so that the weight of dry wood and the structural features indicative of weight may be used as safe signs in selecting timber for strength.

In shaping wood it is better, though more wasteful, to split than to saw, because it insures straight grain and enables a more perfect seasoning.

For sawed stock the method of "rift" or "quarter" sawing, which has so rapidly gained favor during the last decade, deserves every encouragement. It permits of better selection and of more advantageous disposition of the wood; rift-sawed lumber is stronger, wears better, seasons well, and is less subject to warping.

All hardwood material which checks or warps badly during seasoning should be reduced to the smallest practicable size before drying, to avoid the injuries involved in this process; and wood once seasoned should never again be exposed to the weather, since all injuries due to seasoning are thereby aggravated. Seasoning increases the strength of wood in every respect, and it is therefore of great importance to protect wooden structures, bearing heavy weights, against moisture.

Knots, like crossgrain and other defects, reduce the strength of timber. Where choice exists, the knotty side of the joist should be placed uppermost, i. e., should be used in compression.

Season checks in timber are always a source of weakness; they are more injurious on the vertical than on the horizontal faces of a stringer or joist, and their effect continues even when they have closed up, as many do, and are no longer visible.

DURABILITY AND DECAY.

All wood is equally durable under certain conditions. Kept dry or submerged, it lasts indefinitely. Pieces of

* This imperfect assumption is used only for comparison.

pine have been unearthed in Illinois which have lain buried 60 or more feet deep for many centuries. Deposits of sound logs of oak, buried for unknown ages, have been unearthed in Bavaria; parts of the piles of the lake dwellers, driven more than two thousand years ago, are still intact.

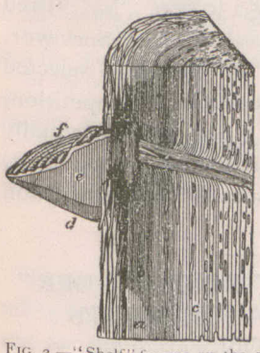


FIG. 2.—"Shelf" fungus on the stem of a pine. (Hartig.) a, sound wood; b, resinous "light" wood; c, partly decayed wood or punk; d, layer of living spore tubes; e, old filled up spore tubes; f, fluted upper surface of the fruiting body of the fungus, which gets its food through a great number of fine threads (the mycelium), its vegetative tissue penetrating the wood and causing its decay.

On the radial section of a piece of pine timber, with one of the shelf-like, fungus growths, as shown in fig. 2, both bark and wood are seen to be affected. A small particle of the half-decayed wood presents pictures like that of fig. 3. Slender, branching threads are seen to attach themselves closely to the walls of the cells, and to pierce these in all directions. Thus these little threads of fungus mycelium soon form a perfect network in the wood, and as they increase in number they dissolve the walls, and convert the wood substance and cell contents into sugar-like food for their own consumption. In some cases it is the woody cell wall alone that is attacked. In other cases they confine themselves to eating up the starch found in the cells, and merely leave a stain (bluing of lumber). In all cases of decay we find the vegetative bodies, these slender threads of fungi, responsible for the mischief. These fine threads are the vegetative body of the fungus, the little shelf is its fruiting body, on which it produces myriads of little spores (the seeds of fungi). Some fungi attack only conifers, others hardwoods; many are confined to one species of tree, and perhaps no one attacks all kinds of wood. One kind produces "red rot," others "bluing." In one case the decayed tracts are tubular, and in the direction of the fibers the wood is "peggy." In other cases no particular shapes are discernible.

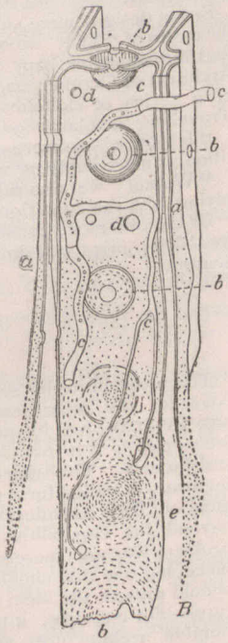


FIG. 3.—Fungus threads in pine wood. (Hartig.) a, cell wall of the wood fibers; b, bordered pits of these fibers; c, thread of mycelium of the fungus; d, holes in the cell walls made by the fungus threads, which gradually dissolve the walls as shown at e, and thus break down the wood structure.

It appears that warmth, preferably between 60° and 100° F., combined with abundance of moisture (but not immersion), is the most important condition favoring decay, and that the defence lies in the proper regulation or avoidance of these conditions, or else in the use of poisonous salts, which prevent the propagation of fungi.

STIFFNESS.

If 100 pounds placed in the middle of a stick 2 by 2 inches and 4 feet long, supported at both ends, bend or "deflect" this stick one eighth of an inch (in the middle), then 200 pounds will bend it about one-fourth inch, 300 pounds three-eighths inch, the deflection varying directly as the load. Soon, however, a point is reached where an additional 100 pounds adds more than one eighth inch to the deflection—the limit of elasticity has been reached. Taking another piece from the straight grained and perfectly clear plank of the same depth and width, but 8 feet long, the load of 100 pounds will cause it to bend one eighth inch, but will deflect it by about 1 inch. Doubling the length reduces the stiffness eightfold. Stiffness then decreases as the cube of the length.

Cutting out a piece 2 by 4 and 4 feet long, placing it flatwise, so that it is double the width of the former stick and loading it with 100 pounds, we find it bending only one-sixteenth inch; doubling the width doubles the stiffness.

Setting the same 2 by 4 inch piece on edge, so that it is 2 inches wide and 4 inches deep, the load of 100 pounds bends it only about one sixty-fourth inch; doubling the thickness increases the stiffness about eightfold.

It follows that if we double the length and wish to retain the same stiffness we must also double the thickness of the piece.

A piece of wood is usually stiffer with the annual rings set vertically than if the rings are placed horizontally to the load.

Cross grained and knotty wood, to be sure, is not as stiff as clear lumber; a knot on the upper side of a joist, which must resist in compression, is, however, not so detrimental as a knot on the lower side, where it is tried in tension.

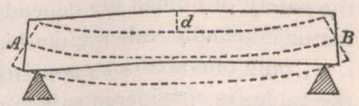


FIG. 4.—BENDING A BEAM.

Every large timber which comes from the central part of the tree contains knots, and much of its wood is cut more or less obliquely across the grain, both conditions rendering such material comparatively less stiff than small clear pieces.

The same stick of pine, green or wet, is only about two-thirds as stiff as when dry. A heavy piece of long leaf pine is stiffer than a light piece; heavy pine in general is stiffer than light pine, but a piece of hickory, although heavier than the pine, may not be as stiff as the piece of longleaf pine, and a good piece of larch exceeds in stiffness any oak of the same weight.

Since it is desirable, and for many purposes essential, to know beforehand that a given piece with a given load will bend only a given amount, the stiffness of wood is usually stated in a uniform manner and under the term "modulus (measure) of elasticity."

If AB, fig. 4, is a piece of wood, and d the deflection produced by a weight or load, the elasticity of the wood, as usually stated, is found the formula:

$$\text{Modulus of elasticity} = \frac{W\,l^3}{4\,D\,bd^3}$$

where W is the weight, l the length, b and d the breadth and depth of the stick, and D the deflection for the load W. In the following table the woods are grouped according to their stiffness. The figures are only rough approximations which are based on the data given in Vol. IX of the Tenth Census. The first column contains the above modulus, the second shows how many pounds will produce a deflection of 1 inch in a stick 1 by 1 by 12 inches, assuming that it could endure such bending within the limits of elasticity, and the third column gives the number of pounds which will bend a stick 2 by 3 inches and 10 feet long through 1 inch.

The stick is assumed to rest on both ends; if it is a

cantilever, i. e., fastened at one end and loaded at the other, it bears but half as much load at its end for the same deflection.

From the third column it is easy to find how many pounds would bend a piece of the same kind of other dimensions. A 2 by 4 inch bears eight, a 2 by 6 inch twenty-seven times as much as the 2 by 2 inch; a piece eight feet long is about twice as stiff as a 10 foot piece; a piece 12 feet, only about three-fifths, 14 feet one-third, 16 feet two-ninths, 18 feet one-sixth, and 20 feet one-eighth as stiff.

The number of pounds which will bend any piece of sawed timber by 1 inch may be found by using the formula:

$$\text{Necessary weight} = \frac{4\ E\ bd^3}{l^3}$$

where E is the figure in the first column, b, d, l, breadth, depth and length of the timber in inches. If the deflection is not to exceed one-half inch, only one-half the load, and if one-fourth inch, only one-fourth the load is permissible.

To allow for normal irregularities in the structure of wood itself, as well as in the aggregate structure of timbers, an allowance is made on the numbers which have been found by experiment; this allowance is called the "factor of safety." Where the selection of the wood is not very perfect, the load is a variable one, and the safety of human life depends on the structure; the factor is usually taken quite high, as much as 6 or 10, i. e., only one-sixth or one-tenth of the figures given in the tables is considered safe, and the beam is made six to ten times as heavy as the calculation requires

TABLE OF STIFFNESS (MODULUS OF ELASTICITY) OF DRY WOOD.—GENERAL AVERAGES.

SPECIES.	Modulus of elasticity $E=\frac{Wl^3}{4\ D\ bd^3}$ per square inch.	Approximate weight which deflects by 1 inch a piece— 1 by 1 inch and 12 inches long.	2 by 2 inches and 10 feet long.
	Pounds.	Pounds.	Pounds.
(1) Live oak, good tamarack, longleaf, Cuban and shortleaf pine, good Douglas spruce, western hemlock, yellow and cherry birch, hard maple, beech, locust and the best of oak and hickory.	1,680,000	3,900	62
(2) Birch, common oak, hickory, white and black spruce, loblolly and red pine, cypress, best of ash, elm and poplar and black walnut	1,400,000	3,200	51
(3) Maples, cherry, ash, elm, sycamore, sweet gum, butternut, poplar, basswood, white, sugar and bull pine, cedars, scrub pine, hemlock and fir...	1,100,000	2,500	40
(4) Box elder, horse chestnut, a number of western soft pines, inferior grades of hardwood	1,1 0,000	12,500	40

[1] Less than.

THE VALUE OF ADVERTISING.

ONE of the largest advertisers in London says: "We once hit upon a novel expedient for ascertaining over what area our advertisements were read. We published a couple of half-column ads, in which we purposely misstated half a dozen historical facts. In less than a week we received between 300 and 400 letters from all parts of the country, from people wishing to know why on earth we kept such a consummate idiot, who knew so little about English history. The letters kept pouring in for three or four weeks. It was one of the best paying ads. we ever printed, but we did not repeat our experiment, because the one I refer to served its purpose. Our letters came from school-boys, girls, professors, clergymen, school-teachers and, in two instances, from eminent men who have a world-wide reputation. I was more impressed with the value of advertising from those two advertisements than I should have been by volumes of theories."—Exchange.

Large quantities of asbestos are now being shipped from the Thedford mine in Quebec to England.

Allister McKay, contractor, Chatham, has succeeded in perfecting a mammoth steam plow, which is now in successful operation on his Point Pelee farm. The plow is propelled by a steam engine at each end of the field, and performs its work fast and effectively.

STUDENTS' DEPARTMENT.

AN IRISH COMPETITION.

THE corporation of Belfast, Ireland, invite sketch designs for a new city hall, to cost £150,000. Mr. Alfred Waterhouse, R. A., and Mr. Bretland, City Surveyor, are the assessors. The authors of the three selected designs will be required to engage in a final competition, and among these the sum of £300 will be equally divided. The City Surveyor will furnish a copy of the conditions on payment of one guinea. The competition will close on the 25th of October.

"CANADIAN ARCHITECT AND BUILDER" STUDENTS' AND DRAUGHTMEN'S COMPETITION.

THE reports of the committees, composed of members of the Province of Quebec Association of Architects and of the Ontario Association of Architects, who kindly undertook to judge the merits of the designs submitted in the above competition, have been received, and are printed in full as follows:

"The Committee of the Province of Quebec Association of Architects appointed to consider the designs submitted in the CANADIAN ARCHITECT AND BUILDER competition for a frontispiece for the New Year Number, 1897, herewith beg to present their report.

Seven designs were submitted. Of these the one sent in under the motto of "Dix" we ruled out of the competition, for the reason that it is an exact copy of a drawing published in the American Architect of October 22, 1892, by W. M. Maccafferty, being one of a series of sketches made by him as American Architect Travelling Scholar, 1892.

"Ich Dien" we were also compelled to rule out of the competition as not complying with the published conditions as to size.

"Wilmot" we also ruled out as being in pencil and not complying with the conditions as to size.

Of the others we consider that none are of sufficient merit to be awarded a prize, nor do we consider them suitable for the object sought.

ALEX. C. HUTCHISON, President.
ANDREW T. TAYLOR, Vice-President.
JOS. VENNE, Secretary.

TORONTO, Aug. 3rd, 1896.

The problem to be solved by this competition, viz: "a front cover for the New Year Number of the CANADIAN ARCHITECT AND BUILDER, was by no means an easy one, and in the committee's opinion it is not surprising that the result should not be satisfactory. The subject is outside the ordinary scope of architecture. It called for a superior quality of draughtsmanship, and most of all for considerable designing ability, and therefore rather beyond the capabilities of the average student Moreover, the problem was not merely to design an ordinary journal frontispiece, but one that should be distinctively architectural and which should present the ideal rather than the practical side of architecture. For example, if the design was intended to depict some notable architectural monument either in whole or in part such representation should either be conventionalized or it should form a portion only of the whole composition, being supplemented by something more idealistic. At the same time simplicity of design is of first importance, and a crowded or complex composition is to be avoided. This defect is forcibly illustrated in the design submitted by "Wilmot." Here both the real and the ideal are presented (and for this it is to be commended,) but so many insignificant and feeble details are introduced as to completely mar the whole effect. On the other hand the design by "Dix," who selects an entrance doorway, is lacking in ideal qualities, it being solely a representation of an old doorway in Siena, Italy.

The committee, after an examination of the various designs, would award the first place to "Ich Dien" and the second to "Confident."

The design under motto of "Dix," before referred to, while being an excellent example of artistic draughtsmanship, and under proper conditions worthy of a high place, we must decline to consider, as it is an exact copy even to the most minute detail (the original draughtsman's initials only excepted) of a drawing by Mr. W. M. Maccafferty, as published in the American Architect of October 22nd, 1892.

As to the other designs the committee would make the following comments and criticisms:

"Ich Dien" easily occupies the first place. The subject chosen is a domestic doorway in the Renaissance style, the steps with side parapets of stone surmounted by ornamental lamp standards in wrot iron or other metal. The composition is quite artistic, it is well drawn and the lettering is good and well arranged. Its chief fault is a certain smallness and prettiness suggestive of the decorative accessories of architecture rather than of architecture itself.

"Confident" submits a well drawn design in many respects,

suitable and appropriate. It is, however, devoid of artistic feeling and very commonplace in design. The brackets under the cornice and the outline of the parapet or pediment over cornice are particularly objectionable. The figures and the Ionic capital in the pediment are good.

"Lion" sends a carefully drawn design, devoid of architectural character. It would be quite as appropriate for a journal devoted to the interests of agriculture.

"Wilmot's" design has already been criticised. It, moreover, has the disadvantage of being in pencil only.

In the case of "Le chat noir" the criticism applied to "Lion" would be equally applicable, with the further defect of extreme paucity of ideas.

"Heman's" design is commonplace and badly proportioned, while the drawing of the ornamental or freehand portions is very indifferently rendered.

GRANT HELLIWELL,
F. S. BAKER,
J. FRANCIS BROWN,
} Committee.

In view of the fact that none of the designs submitted possess standard of merit which would justify their use for the purpose intended, we regret to be obliged to withhold the awards, as in the conditions we reserved our right to do. As we feared at the outset, the subject of the competition proved to be somewhat unfamiliar to and beyond the scope of the students and draughtsmen in a young country such as Canada, but we are pleased that so many were to be found willing to make the attempt to meet the requirements. We exceedingly regret that one of the competitors—a clever draughtsman—should have had so little ambition and such small sense of honor as to attempt to palm off upon the judges as the product of his own brain an exact copy of a formerly published illustration of a well-known existing piece of architecture.

A CHAPTER FROM THE BOOK OF COMPETITIONS.

PERHAPS the following amusing skit may enable those interested to fully realize the difficulties of a competition, and the very natural dissatisfaction of competitors with awkward conditions which are not after all taken as binding conditions in settlement :—

2. In the beginning was a certain place, named Seadrain, and great was the dirt around it.

2. And certain of the people shouted, saying, "We would wash, but baths there are none."

3. And others that were in it said, "We would read, but books there are none."

4. Then those in authority spake unto the people saying, "Will ye be rated therefor?"

5. And the people shouted "Yea," and the law went out.

6. And the head men of the parish wrote to Cautious street, where is the Society for the Protection of Young Ideas and Gray Hairs, saying,

7. "Name, we pray thee, an adviser, one of exceeding good judgment and cunning, that we walk in the paths of Wisdom."

8. And the wise man named one of exceeding great respectability, whose works none knew nor could cavil at.

9. And the accessor shut him in a secret place, and communed with his own spirit, and the understanding which was in him.

10. But he walked not in the ways of Damp-cottage, whose wisdom is always most evident.

11. For the papers he drew up contained those things which they ought not to have contained, and left unsaid many things that ought to have been said, and there were many words and little common sense in them.

12. And they laid burdens grevious and impossible to carry out on the backs of the competitors, while the assessor smiled to himself, saying,

13. "Many printed pages have I written that the Building Committee may laud and magnify me for all time."

14. "For they will say, careful is he and of exceeding cunning; these fellows of architects we have chastised with whips, but he breaketh their backs with scorpions."

15. Then certain of the profession murmured and raised an outcry, saying,

16. "Hard and impossible are our conditions; how can a market be a town hall, or a fish be a serpent in aspect?"

17. "And why should we of the profession make details useless and unnecessary to thy judgment?"

18. "How can we judge of old lights, knowing not what existed of old time?"

19. But the assessor hardened his heart and laughed in his sleeve, saying,

20. "It is practice most excellent for ye, and in no way will I save ye the trouble."

21. And he finally gave judgment in this wise, pronouncing,

22. "Rabbit place I first, and others second and third in merit."

23. And certain of the competitors muttered and murmured aloud, saying,

24. "Thou regardest not thy own conditions, nor givest judgment by thy printed provisions."

25. But he was exceeding merry and laughed again, and told them,

26. "No man hath kept the conditions to the letter, for the conditions were impossible and in many ways utterly needless."

27. "Lo, I could have thrown all ye aside, saying,

28. "Fools and idiots were ye, not to see you were trapped, and but sheep for the slaughter."

29. "No one will believe ye or listen to your cries, but will only speak thus and thus,

30. "He envieth one Rabbit, and his soul is utterly filled up with blackness."

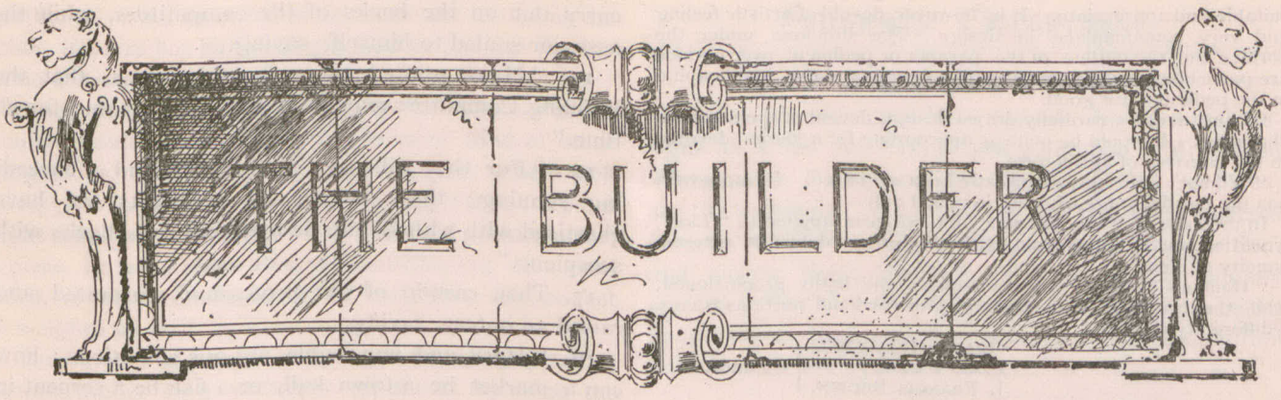
31. Thus it took place that men might write in after time, saying,

32. Easier is it for a camel to gallop through the eye of a needle, than for justice and wisdom to be evident in the conduct of a competition.—W. W. H., in the British Architect.

In filling up a cracked ceiling, use a plaster putty to which some glue size has been added, but take care to cut out the cracks in a V shape so as to form a key.

To make a tint stand well we must have at least two good coats of the same colour, on a good, firm, even foundation; and it is better still if the prime coat is tinted with the same colour.

STRENGTH OF STEEL.—An experiment with a view to ascertain the relative resistance, under pressure, of the hardest steel and the hardest stone, was recently made at Vienna. Small cubes, measuring 1 centimeter of corundum and of the finest steel, were subjected to the test. The corundum broke under the weight of six tons, but the steel resisted up to forty-two tons. The steel split up with a noise like the report of a gun, breaking into a powder, and sending sparks in every direction, which bored their way into the machine like shot.



The National Association of Bnilders.

THE tenth annual convention of the National Association of Builders of the United States will open at Buffalo on September 15th. In view of the recent change of methods on the part of the labor unions in substituting for strikes a united effort to wrest from the governing bodies such legislation as will secure to them advantages over the employers, the National Association propose at their approaching convention to discuss thoroughly the reasons for and against the Association of Builders. It is felt that if the master builders are not to be placed at the mercy of the unions they must seek by as perfect organization as possible to protect their rights and interests. Some of our Canadian master builders might profitably attend the Buffalo convention, get thoroughly imbued with the ideas of their American contreres, and on their return to Canada set the ball rolling in favor of a Provincial or Dominion Builders' and Contractors' Association. In view of the beneficial work which lies before such an organization, it is most surprising that nothing of the kind exists in this country.

Reading Drawings.

As a rule country builders know very little about draughtsmanship, and care less. Very few farm buildings are put on paper before the work of erection begins, unless the farm is pretty close by a city or town; then the house assumes a somewhat pretentious character, and, when this is the case, the country builder generally fights shy of the contract and the work falls into the hands of the city or town contractor. We see no reason why country builders should not be able to read an architect's drawing just as well as his city rival, and there is no cause for fear on his part of a trained architect exacting more from the countryman than the owner of the building would. Indeed, under the supervision of an architect, the builder stands a much better chance of being fairly dealt with and of giving better satisfaction than would otherwise obtain. If builders in the rural districts would master the art of plan reading, which they can readily do, we fancy they would not have so much prejudice against them or against architects, and they would thereby be in a better position to successfully compete with the town or city contractor on work in their own neighborhood—a condition worth striving for.

Damp Courses.

IF proper steps are taken when a foundation is laid which is intended to carry a brick or stone superstructure, there will never be any dampness in the walls above the lower joists. A "damp course" of slate should be laid in the wall across the whole thickness, under the first tier of joists, and should be well bedded in with neat Portland cement. If slates can not be obtained a thick coat of asphalt mortar may be used on top of the stone work on which the brickwork may start; if well done, the asphalt will prevent dampness from rising in the walls. If neither slates or asphalt is obtainable then it will be well to finish the top of the wall with a coat of "neat" Portland cement, and to lay the first two or three courses of bricks in cement mortar. This latter method is by no means a sure success, but, if adopted, it will do much towards keeping the upper walls dry. We have known sheet lead to be used on walls as a damp arrester and it was a decided success, but costly, and not by any means lasting. It is said that just below the line of earth around the base of the Cathedral of Cologne, sheet copper was laid on the walls for the purpose — it is supposed — of preventing dampness ascending the walls, which it has effectually done, and in the joints under the massive towers of the Cathedral where the copper was placed, the weight above has settled on the copper with such a pressure that the metal has actually oozed out of the joints and formed a solid copper bead which runs all round the foot of the towers, inside and out. No brick or stone building should be erected, particularly in the rural districts, without being fully protected by a "damp course."

Laying Base.

THERE are many places where it is the height of folly to put down base or wainscotting after the floors are laid. Take kitchens for instance: Here a floor is scarcely ever carpeted, and it is more used perhaps than any other floor in a house, and, this being the case, it is only a matter of time, and a very short time at that, before the floor will be so badly worn that a new floor will be absolutely necessary. Now, if the old floor is to be taken up—and in nine cases out of ten such will be the result—then the base or the lower member of the wainscot must be taken off the wall, a process that is difficult and fraught with danger to the wall and to the wood-work removed, as it is likely to be split, broken, or so badly shattered as to be unfit for use again. To avoid all this, in rooms in which the floors are likely to be much used and quickly worn out, a rough floor should be laid down first, and then the base or wainscotting should be put down, the lowest member fitting down to the rough flooring; then the top or finishing floor should be put down tight between the base boards. In the angle where the floor adjoins the base, an ovolo or quarter-round should be nailed well on the floor, which will have a tendency to keep the floor warm. When it becomes necessary to take the floor up, it may readily be done by removing the ovolo moulding—which may be used again—when the old flooring can be torn up without removing or injuring the base boards in the slightest. It is an awkward job to tear up an old floor and put down a new one, if all the base boards have to

be taken down and put in place again when the new floor is completed, and often the plasterer has to be called in to mend and patch the broken walls after the carpenter is through, and following in the heels of the plasterer comes the painter, who is obliged to repaint the whole base or wainscot, in order to cover over the splits, cracks and patches the carpenter left behind, and all because the base had been laid after the floors were down instead of being laid down before the finishing floor went down.

Painting Floors.

It is not an uncommon thing for a painter to be asked to paint a floor, and generally he is instructed as to the color and other little matters. If the floor is one that will be subject to much wear and is to be painted with oil paint, the workman should select such coloring substances of certain earthy matters only, for the use of white lead for this purpose is a mistake that should be avoided. Most people advocate the use of lead in painting floors because of its supreme density and body, under the mistaken idea that density adds to its wearing quality. As a matter of fact, no oil paint will stand less wear than white lead, or colors composed largely of white lead. It simply covers the surface, and is one of the best paints employed to protect wood-work, where there is no great wear. Ochres make the best wearing paints, and they may be applied in several ways. They may be mixed with the oil and applied with a brush in the usual way, or they may be applied when mixed with hot stale beer and glue water, and when dry two coats of oil may be laid on thinly with a good strong brush, and if properly done the work will be lasting and satisfactory. In every case the floor should be perfectly clean and dry, before the color is applied, and if the latter is mixed with the oil, the floor should receive two coats, both of which should be well brushed in. If it is desired that the floor should present a varnish-like lustre, the following may be employed, which answers the double purpose of making the paint more durable and adding the polish: Dissolve two parts of shellac in eight parts of alcohol of about eighty per cent., and add to it one quarter of a part of camphor. When the whole is completely dissolved, it can be filtered or strained through a cloth in order to separate the suspended impurities. Paint the floor with this composition once or twice as may be required, and it may then be rubbed over with a soft cloth on which a little sweet oil has been applied, when a surface will be obtained that will be hard and glossy. When this top coating has been partly worn off, another application of the shellac mixture will restore it to its shiny condition.

Sham Competition.

There is a species of competition practised by owners, and often winked at by architects, which, while not exactly dishonest, is somewhat fishy, and it would be better for all parties concerned if the practice was "stamped out" entirely. Estimates are called for on certain work from a member engaged in the calling pertaining to it, but the particular friend of the owner, or of someone deeply interested, is given a sly glance at the figures of his rivals, with the suggestion that the lowest bidder is to get the work. The favorite always understands what this means, and generally so modifies his original demand that he gets the contract. All really honest men will deprecate this form of confidencing the unsuspecting tenderers out of the contracts which they have justly earned by the recognized rules governing fair competitions. A favorite may have a certain claim for preference so long as his bid is as low as the lowest; but by what law of selection can he be chosen over those who put in lower original tenders for the same work with the implied understanding that all the contestants stood on an equal footing. This sort of sham competition is done every day by men who consider themselves as good and as honest as the best, and who would instantly resent any insinuations that reflected on what the world would term their honesty. True, there is generally a clause inserted in the advertisement asking for tenders which states, "that the lowest or any tender not necessarily accepted." But this clause is inserted in order to protect the owner against incompetent and irresponsible contractors, not for the purpose of "cheese-paring" the tenders, and therefore has no force in cases similar to those under notice. Aside from the injury to the party rightfully entitled to the contract, the parties to the deception are placed in such relations to each other that the letter of the specifications cannot be rigidly enforced as when the competition has been fair and open. The contractor feels that, as his own price was not given him, little slights in the execution of the work should not be complained of, and the owner, recognizing the force of this agreement, lets the matter pass. There is another thing in connection with this "sham contracting" that has a baleful effect. It has the effect of reducing the wages of the workmen, and of rushing the work through by driving the men at a steam engine pace, and it generally results in unsatisfactory workmanship and the introduction of inferior materials.

SETTLEMENT OF THE LONDON STRIKE.

The great strike in the building trades in London, Eng., in which 10,000 workmen were engaged, has been settled, as the result of a conference between representatives of the unions and the Central Association of Master Builders. An advance of ½d. per hour for plasterers, bricklayers, carpenters, mill-sawyers, and wood-cutting machinists, and a code of working rules for the future, has been agreed upon. The laborers refused an advance of ¼d. on the same terms, but returned to work at the old rate of wages. The agreement provides that unionists and non-unionists shall work amicably together, and that no dispute shall be undertaken until it has been referred to a joint committee of employers and workmen.

MASTER PLUMBERS' OUTING.

The union pic-nic of master plumbers and their friends held at Mountain View Park, Hamilton, on the 31st ultimo, was a most enjoyable affair. The representation from Toronto and Hamilton was quite large, the plumbers of the latter place having closed their places of business for the day. London, Sarnia, St. Catharines, Brantford and Guelph were also well represented, and in all over three hundred enjoyed the day's recreation. Among the usual sports was a baseball match between Toronto and Hamilton master plumbers, in which the Toronto contingent suffered defeat.

Mr. W. J. Burroughes, president of the Toronto Master Plumbers' Association, reports a steady increase in the membership thereof. At the last meeting no less than twelve new members were added to the roll, several being from adjacent towns.

STONE CRUSHER OPERATED BY ELECTRICITY.

THERE has recently been installed at Peterboro, by the Royal Electric Company, an electric motor for operating a stone crusher, used by Messrs. Corry & Laverdure, contractors for the construction of the Trent Valley Canal, to crush all stone required for that section of the canal. The plant is said to be the first of the kind and the only one in commercial operation in Canada.

The current to operate the stone crusher is transmitted from the station of the Peterboro Light and Power Company, a mile distant. The motor plant consists of a fifty kilowatt alternating current synchronous motor, with its exciter, and a five horse power starting motor. The alternating current is taken by the motor directly from the transmission line at 1,000 volts. The stone crusher is belted to one end of the shaft of the synchronous motor, to the other end being belted in tandem the exciter and starting motor.

To indicate to the attendant on the stone-crushing plant the proper time to connect the synchronous motor with the alternating current transmission line from the station, a synchronizer is used, which consists simply of two transformers, so connected that when the synchronous motor is at the required speed and in step with the generator, a mile away, a lamp connected with these transformers goes out, giving positive indication to the attendant when to connect the motor with the transmission line.

The plant was started June 17th and the stone crusher has been successfully doing its work every day. It has been put to the utmost test ; the greatest possible loads have been put on ; the crusher has been jammed full of the hardest stones obtainable ; the greatest variations possible in load, from nothing to the extreme capacity of the crusher, have taken place rapidly, but no variation in speed occurred, the synchronous motor meeting every demand upon it without change.

Messrs. Corry & Laverdure express themselves as pleased with the operation of the plant.

THE USE OF QUANTITY SHEETS IN PLUMBING.

MR. F. HORTON, contractor, of Montreal, writes as follows to the Plumbers' Trade Journal advising the use of quantity sheets in figuring on plumbing, heating, and electric lighting :

I enclose you a copy of plumbing, heating and electric and gas fitting quantities, which you may make public in your valuable paper, and which I claim has been much needed in the contracting business. The cost of the quantity sheets is very little more than ordinary paper. It takes less room in your pocket than a book would, and is also a memory refresher, by the notes being printed on the sheets, which leads you to examine the specification more closely. Also, you can tear one of the sheets from the pad which you carry, hand it to your bookkeeper, who needs no further explanations, thereby leaving you more time for other business.

I wish to say there have been many contracts taken below cost in Montreal by mistakes being made in taking quantities of the plans and specifications. I know of instances when the brother contractors have assembled and discussed about the successful contractor taking the contract below cost of their tenders, and the successful contractor at the same time felt sure he had made a good living profit on his price tendered to the architect. But on the completion of job, all charges being in for labor and material against the contract, he found that he was a loser of some hundreds of articles through leaving out by mistake things specified by not having a quantity sheet or memory refresher, which is, no doubt, the cause of so many jobs taken low.

I can scarcely understand that any sane contractor will take a job below cost. There is nothing in my estimation for a contractor to gain by doing ten thousand dollars worth of business which has cost him ten thousand five hundred. He has lost one year of his life and five hundred dollars in cash. He is a sadder and a wiser man than before he signed his contract, and may have to make arrangements with his creditors, and lose his honorable name, by not paying a hundred cents on the dollar.

F. HORTON, Contractor.

MONTREAL, ... 189

Heater No.	.....
Mains.	.....
	.....
Bronzing.	.....
	.....
Boiler Foundation.	.....
	.....
Expansion Tank.	.....
Peet Valves.	.....
Air Tap and Valves	.....
of Drain Tap.	.....
Drip Taps.	.....
Smoke Pipe.	.....
Labor.	.....
Cartage.	.....
	.....
Radiator.	.....
Coils.	.....
Rooms over.	.....

F. HORTON, Contractor.

MONTREAL, ... 189

Kitchen Boiler.	Couplings ..... Stand .....
Bath.	Taps ..... Overflow, N. P .....
Water Closet.	Tank .... Seat ..... N. P. Flush .....
Wash Basin.	N. P. Traps ..... Taps, N. P. .....
Marble Slab.	And ..... Back .....
N. P. Shower.	Hot and Cold .....
Laundry Tub.	Waste ..... Stand ..... Taps .....
Kitchen Sink.	Trap ..... H. C. Taps .....
Pantry Sink.	Trap ..... H. C. Taps .....
Urinals.	Taps ..... Tank .....
City Drain.	.....
Hot Water Pipe.	.....
Cold Water Pipe.	Stop Taps .....
Lead Waste.	Thimbles .....
W. C. Ventilator.	.....
Soil Pipe.	.....
Labor.	.....
Gas Lights.	Gasaliers .....
Electric Lights.	& Switches .....
Electric Bells.	Annunciator .....
Mechanical Bells.	& Pull .....

The Master Plumbers' Association of St. John, N. B., and vicinity held a meeting on the 7th inst., at which the following officers were elected for the ensuing year : President, Thomas Campbell, St. John ; 1st vice-president, J. H. Doody ; 2nd vice-president, Hamilton Kitchen, Fredericton ; secretary-treasurer, Peter Campbell, St. John.

THE CAUSE OF INSANITARY DWELLINGS.

A COMMISSION appointed by the London Lancet to inquire into the cause of the prevalence of insanitary arrangements and bad plumbing in dwellings, assigns for these three principal reasons, viz.: (1) The prevailing indifference and consequent ignorance of all classes as to the various sanitary appliances by which they are surrounded; (2) the bad work and cheap materials put in many houses by either unqualified or unscrupulous men, encouraged by a dangerous practice of putting such work up to tender, and (3) the cost of rectifying insanitary work. The first of these causes is, we believe, the foundation one. The majority of people will not take the trouble to study the principles of sanitation to the degree necessary to reveal to them its important bearing upon health and life. Knowing nothing about the subject, they do not trouble themselves about dangers which are not visible to the naked eye, but rather concern themselves with the outward and inward appointments of the house, and accept by faith the assurance that the drains are all right. If the public would wake up on this question, and be as particular about the sanitary as about the other appointments of the houses they live in, there would be seen an immediate improvement in the character of plumbing work. Great advancement has been made within the past decade as the result of efforts of local boards of health and municipal enactments. It is to the credit of the leading plumbers in Canada that they have always shown themselves eager to assist the public bodies in bringing about improved conditions, and the recently organized Dominion Master Plumbers' Association has avowed this to be the principal object of its existence.

PIC-NIC OF LONDON BUILDERS.

THE fifth annual pic-nic of the builders of London, Ont., was held at Port Stanley on Saturday, the 8th inst., and proved quite as enjoyable as any of its predecessors. There were present nearly 2,000 persons who were connected with the several trades in the building line. The games and sports were a feature of the day. The judges appointed were Messrs. W. Skelly, E. Fitzgerald, Geo. Tambling, Geo. Riddle, J. G. Pritchett and H. C. McBride. Races were arranged for the members of the several trades, and lively contests were witnessed. A baseball match was also played between two picked teams. The general committee in charge of the arrangements comprised:—Chairman, Wm. Smith; treasurer, John Nicol; secretary, Walter Toll, and Messrs. R. Lewis, N. Graham, J. Quick, H. Boyer, J. Eggett, Thomas Rich, W. Pring, W. Burleigh, J. Boon, L. Stevenson, B. Sage, J. Walker, T. Irwin, G. Rougley, W. Bennett, J. Pritchart, W. Stone, and Ed. Hunter.

MODERN PRACTICE IN INTERIOR WIRING.

IN the course of his paper on the "Evolution of Interior Conduits from the Electrical Standpoint," before the National Electric Light Association at New York, Luther Stieringer made the following statement:

The best experience in the past fifteen years in interior wiring has demonstrated the following facts:

First—Indiscriminate wiring with staples is universally condemned.

Second—Cleat wiring is admissible in exposed work where the circumstances admit, but not in concealed work.

Third—Wires imbedded in plaster, depending on the insulation only for protection, are condemned.

Fourth—Lead-covered wires are also condemned, except where protected in a conduit.

Fifth—Wires in mouldings do not afford mechanical or chemical protection, and are only admissible in surface work.

Sixth—Wires carried in plaster, and covered with split or zinc tubes to prevent injury by trowels, are condemned.

Seventh—Glass or porcelain insulators can only be utilized in special cases of exposed work.

Eighth—Paper tubes do not afford absolute mechanical and chemical protection.

Ninth—Insulated tubes covered with a thin coating of brass or other metals do not afford absolute mechanical and chemical protection, but in exposed work they are to a certain extent admissible.

Tenth—Woven fabric conduit does not afford absolute chemical protection.

Eleventh.—Heavy insulating covering, integral with the insulation offers no absolute protection against mechanical and chemical injury, and is analagous to rubber tubing for gas distribution installed throughout a building.

Twelfth—Concentric wiring is practiced in England with satisfactory results, but it is not in use in the United States. It offers many possibilities in the direction of a solid and fixed system.

Thirteenth—Paper-lined iron or steel pipes, known as "iron-armored conduit," "builders' tube," "armorite," "Clifton," and plain iron or steel pipe, are the only conduits that can afford absolute security against mechanical and chemical injury and assure permanence.

"TIPS" FOR BUILDERS.

NEVER compete with a "botch" if you know he is favored by the person about to build. He will undercut and beat you every time. Old material should never be destroyed simply because it is old.

When putting away old stuff see that it is protected from rain and atmosphere.

It costs about 15 per cent. extra to work up old material, and this fact should be borne in mind, as I have known several contractors who paid dearly for their "whistle" in estimating on working up second-hand material.

These remarks apply to woodwork only. In using old brick, stone, slate, and other miscellaneous materials it is well to add double price for working up.

Workmen do not care to handle old material, and justly so. It is ruinous to tools, painful to handle, and very destructive to clothing.

In my experience I always found it paid to advance the wages of workmen—skilled mechanics—while working up old material. This encouraged the men and spurred them to better efforts.

Sash frames, with sash weights, locks and trim complete, may be taken out of old buildings that are being taken down and preserved just as good as new by screwing slats and braces on them, which not only keeps the frame square, but prevents the glass from being broken.

Doors, frames and trims may also be kept in good

order until used, by taking the same precautions as in window frames.

Old scantlings and joists may have all nails drawn or hammered in before piling away.

Counters, shelving, drawers and other store fittings should be kindly dealt with. They will be wanted sooner or later.

Take care of the locks, hinges, bolts, keys, and other hardware. Each individual piece represents money in a greater or lesser sum.

Old flooring can seldom be utilized, though I have seen it used for temporary purposes, such as fencing, covering of veranda floors while finishing work on plastering, etc. As a rule, however, it does not pay to take it up carefully and preserve it. Conductor pipes, metallic cornices, and sheet metal work generally, can seldom be made available a second time, though all is worth caring for, as some parties may use it for repairs.

Sinks, wash-basins, bath-tubs, traps, heating appliances, grates, mantels and hearth-stones should be moved with care. They are always worth money and may be used in many places as substitutes for more inferior fixings.

Marble mantels require the most careful handling.

Perhaps the most difficult fixings about a house to adapt a second time are the stairs. Yet I have known where a man has so managed to put up new buildings that the old stairs taken from another building just suited. This may have been a "favorite accident," but the initiated reader will understand him. Seldom such accidents can occur.

Rails, balusters and newels may be utilized much readier than stairs, as the rails may be lengthened or shortened to suit variable conditions.

Gas fixtures should be cared for and stowed away in some dry place. They can often be made available, and are not easily renovated if soiled or tarnished.

It is not wise to employ men who have nothing but their strength to recommend them. As a rule they are like bears—have more strength than knowledge, and lack of the latter is often an expensive desideration. Employ for taking down the work good careful mechanics, and do not have the work "rushed through." Rushers of this sort are expensive.

Never send old material to a mill to be sawed or planed, no matter how carefully nails, pebbles and sand have been hunted for; the saw or planer knives will most assuredly find some you overlooked; then there will be trouble at the mill.

Have some mercy for the workman's tools. If it can be avoided do not work up old stuff into fine work. If not avoidable pay the workman something extra because of injury to tools.

Don't grumble if you do not get as good results from the use of old material as from new. The workman has much to contend with while working up old nail-speckeled, sand-covered material.

WHEN CARVING SHOULD BE EXECUTED.

It would be interesting to learn, says the Scientific American, just why so many stone carvers prefer to work on the material after it has been built into a structure rather than on the block before placing. When interrogated as to this preference the usual answer is that it is thus easier to match the cutting on adjoining blocks, or that one gets a better idea of the effect in this way. Or perhaps it may be argued that there is danger of damage to delicate reliefs in handling the blocks and getting them into position. Yet neither or all of these appear to be sufficient reasons—sufficient, that is, to offset the disadvantage of working in awkward positions, of not having spare tools handy, and of the danger of mutilation of a placed stone by a slip. As to the latter, which would apparently be a very serious and expensive matter usually, one carver, whose specialty is scroll and leaf cutting, medallions, pilaster and column capitals, etc., says that he can generally get over or conceal small breaks by slightly altering the design. But, after all, the practice does not seem reasonable, and none of the explanations are quite satisfying. Of course, there are cases where there is no choice, but for the most part the ornamental work could, it would seem, be done to better advantage in the yard or under cover than when the workman is slung up on a staging. All the delicate reliefs, even in limestone and sandstone, or soft material in general, could be crated and otherwise protected for handling in setting up.

Both systems seem to have been followed by the ancient Egyptian and Greek cutters, though it is not always easy to determine the method. From what is known of the skill of the old constructors in getting heavy material into place, making close joints and perfect matching, it may be concluded that a large part of the carving was done before erection. We degenerate moderns, too, have some tricks of our own, going so far now in good practice as to have pressed and ornamental bricks snugly packed in crates at the brickyards, transported in these crates, and finally swung up in them to the level where the bricks are to be set, and not for convenience in handling merely, but to avoid chipping of corners and edges, thus effecting quite a little saving. Finished stone also can be protected against rough usage in transportation, as is being done daily everywhere.

It was suggested to an expert carver who favored the plan of working on the building rather than on the unassembled parts of it, that his preference was perhaps only the outcome of convention and habit, and it was delicately intimated that possibly he had not even considered the matter seriously. But he would not have it that way at all, though he could not make the meddlesome outsider understand why he liked to work lying down or doubled up rather than in the normal posture of other artisans.

PERSONAL.

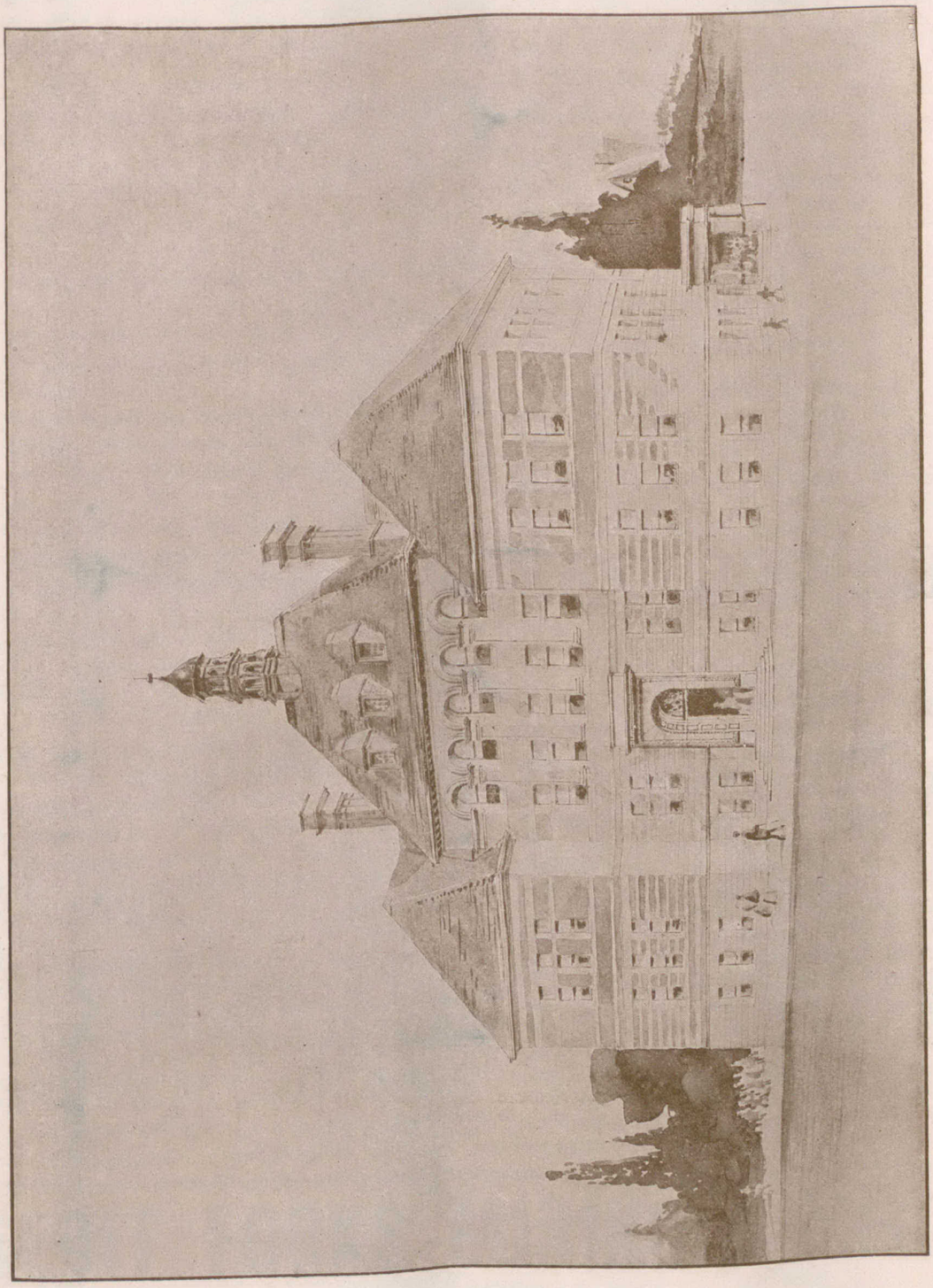
The death is announced of Mr. Wm. Cain, a prominent contractor of St. John, N. B.

Mr. Charles Crane, contractor, formerly of St. Thomas, Ont., met his death at Sault Ste. Marie by falling from a building.

Hamilton Kitchen, of the firm of Kitchen & Shea, plumbers, Fredericton, N. B., had his arm dislocated recently in a collision while riding his bicycle.

Mr. August Prestien, contractor, of Hespeler, was accidentally killed while stepping from the motor car to the trailer on the Galt, Preston and Hespeler electric railway. Deceased was a prominent citizen of the town, and had also served as municipal councillor.

Mr. Frank H. Doty, of the Doty Engineering Works, and President of the Toronto Dredging & Contracting Co., Toronto, was accidentally killed while engaged on a dredge at the island. He was standing on the platform of the dredge directing the movements of the scoop, when the big wheel slipped a cog and the iron bar swung suddenly around, striking him on the head.



COMPETITIVE DESIGN FOR HIGH SCHOOL BUILDING, ST. JOHN, N.B.

CURRY, BAKER & CO., ARCHITECTS, TORONTO.

BUILDER'S ESTIMATES.*

STONE-WORK is estimated by the perch; 24¾ cubic feet making one perch. An 18-inch wall, 1 foot high, and 16½ feet long, contains one perch.

BRICK-WORK.—Bricks are usually estimated at 25 to the cubic foot. They usually lay 5 courses to each foot in height.

For an 8-inch wall, allow 17 bricks for each square foot of surface. For a 12-inch wall, allow 25 bricks for each square foot of surface. For a 16-inch wall, allow 34 bricks for each square foot of surface.

CHIMNEYS.

Size of Chimney.	No. of Flues.	Size of Flues.	No. of Bricks per foot in Height
16 × 16 inches	1	8 × 8 inches	30
16 × 24 "	1	8 × 16 "	40
16 × 28 "	2	8 × 8 "	50
16 × 40 "	3	8 × 8 "	70
16 × 52 "	4	8 × 8 "	90
20 × 20 "	1	12 × 12 "	40
20 × 24 "	1	12 × 16 "	45

The above does not include waste, which must be allowed.

MORTAR FOR BRICK-WORK.—One cask of good lime to a load (about 20 bushels) of sand is sufficient for 1,000 or 1,100 bricks.

CEMENT FOR CELLAR BOTTOMS should be mixed in the proportion of 1 of cement to 3 of gravel, and should be laid 3 inches thick. One cask of cement will cover five or 6 square yards.

PLASTERERS' MORTAR.—One cask of lime to a load (20 bushels) of sand, and 2 bushels of hair, will cover about 50 square yards of surface; and ½ cask of lime will skim the same. In estimating the surface to be covered, plasterers deduct only half the area of openings, such as doors and windows, from the square yards in the walls.

TIMBERS.

TIMBERS FOR A LIGHT FRAME.—Sills, 4 x 6 or 6 x 6 inches. Flooring-timbers, 2 x 6 inches, put from 16 to 22 inches apart. Posts, 3 x 5 inches. Ledger-boards, 1 x 6 inches, well fitted and nailed. Studding, 2 x 3 inches, put 16 inches to centres. Plates, 3 x 4 inches. Rafters, 2 x 5 inches, put 2 feet apart. Partition studding, 2 x 3 and strapping 1 x 3 inches, put 16 inches to centres.

TIMBERS FOR A MEDIUM FRAME.—Sills, 6 x 7, 7 x 8, or 8 x 8 inches. Flooring-timbers, 2 x 8, 9, or 10 inches, put 16 or 18 inches apart, and bridged. Posts, 4 x 6 or 4 x 8 inches. Studding, 2 x 4 inches, put 16 inches to centres. Window and door studs, 3 x 4, or 4 x 4 inches. Ledger-boards, 1 x 7 or 8 inches, well fitted and nailed, or girts, 4 or 5 x 7 or 8 inches. Plates, 3 x 4 inches. Rafters, 2 x 6 inches, put 2 feet apart. Main partition studs 2 x 4 inches; other partitions, 2 x 3 inches, put 12 or 16 inches to centres.

TIMBERS FOR A GOOD HEAVY FRAME FOR DWELLING-HOUSE.—Sills, 8 x 8 or 8 x 10 inches. Flooring-timbers, first story, 2 x 12 inches; second story, 2 x 10 inches; third story, 2 x 8 inches, put 16 or 18 inches apart, and well bridged. Side girts, 5 x 8 inches. End girts, 6 x 8 inches. Outside studding, 2 x 5 inches, put 12 or 16 inches to centres. Window and door studs, 3 x 5 inches. Rafters, 2 x 8 inches, put 20 or 24 inches apart. Main partitions, 2 x 5 inches; other partitions, 2 x 4 inches, put 12 or 16 inches to centres.

To square the sills of a house, make a mark on the upper outside edge of the side sill 8 feet from the corner of the house, and 6 feet from the corner of the house on the end sill; when the sills are square, a 10-foot pole will just reach across from point to point.

FRAMING AND BOARDING.—To estimate the number of square feet of boards required to board a building, and lay the under floors, double the length, and also the width of the building; add these amounts, which gives the length around the building; multiply this by the length of the outside studding, which gives the square feet in the walls of the house. If the house has a pitch roof, multiply the width of the house by the rise of the roof: the result will be the square feet in 2 gables. Then, to find the square feet in the roof: to the length of the house, add the amount of projection at both ends (generally about 18 inches at each end, which makes 3 feet to be added), which amount multiply by twice the total length of the rafters, which gives the square feet in the roof. Then for the floors, multiply the length of the building by the width, and multiply this by the number of floors, which gives the square feet in all of the floors. Add together these different amounts, and add ⅛ for waste, which will give the number of square feet required. In estimating the labor in framing and boarding, some builders reckon eight or ten dollars per thousand feet.

*From "Modern Carpentry and Building," by Allen Sylvester

WIRE AND CUT NAILS.

SOME experiments were recently made to determine the comparative holding power of wire and cut nails. The tests were made on pieces of white pine, joined with simple lap joints fastened by the nails. These were subject to transverse stresses, in some cases parallel to the axes of the nails, in others at right angles. When the load was applied perpendicular to the nails, the wood was often split and the cut nails were often broken, while the wire nail joints were broken by bending and drawing the nails. When the load was applied in the direction in which the nails were driven, the joints were broken by nails being drawn almost without being bent. Under this same manner of loading, the wire nails were started by smaller loads than the cut nails, yet when the cut nails were started they yielded rapidly, while the wire nails held nearly as well as at first. In all the cases tried the cut nails were found superior in strength and rigidity, while in one-half the cases wire nails gave the joints greater resistance than cut nails.

USEFUL HINTS.

All dark colour pigments, being but slightly basic in their nature, require more oil in their preparation than light colours. It is noticed in picture and portrait paintings that the cracks in the paint are far more numerous in the dark colours (not blacks) than in the white or light colours.

PAINT FOR IRONWORK.—Professor J. Spennrath gives in the Deutsches Bauzeitung an account of some interesting researches which he has made relative to the value of paints for ironwork. As one result of these, the professor concludes that none of the metallic oxides commonly used combine chemically with linseed oil. The drying process depends exclusively on an absorption of oxygen in a purely mechanical way. The value of the different pigments used varies. Thus zinc white, when used for outside work, rapidly swells to double its previous volume, owing to the absorption of carbonic acid gas and water. Sulphuretted hydrogen will cause red or white lead to act in a similar way, but, when pure, Professor Spennrath considers these two latter pigments satisfactory. Carbon paints are very stable, as is heavy spar, but the covering power of the latter is small. In order to test the relative durability of various paints, sheets of zinc were coated with a number of different kinds. The zinc was then dissolved away by acid, leaving a film of paint. All these films, it was found, could be destroyed by the action of dilute nitric or hydrochloric acids, while the vapours of sulphuric and acetic acids acted similarly. Alkaline fluids and gases also destroyed the paints rapidly. Pure water was found to be more injurious than salt water, and hence the destructive action of sea water is to be attributed mainly to the mechanical effects of wash. Hot water was found to act more rapidly than cold. The most important discovery made was, however, the great influence of temperature. Films, similar to those already described, completely lost their elasticity and became brittle when exposed to a temperature of 203 degrees Fahrenheit. There was, at the same time, a large contraction.

Mr. W. A. Sylvester, of Boston, Mass., has published under the title "Modern Carpentry and Building," a revised edition of his "Carpenter's Companion." It treats of framing and stair building, builders' estimates, sizes, weights and strength of materials, house planning, etc. We are indebted to Messrs. Damrell & Upham, 283 Washington street, Boston, for a copy of the work.

PAGES

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