CANADIAN ARCHITECT & BUILDER

Fine & Industrial Arts · Decoration & Furnishing · Construction & Sanitation · Engineering

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PAGES

MISSING

HEATING APPARATUS

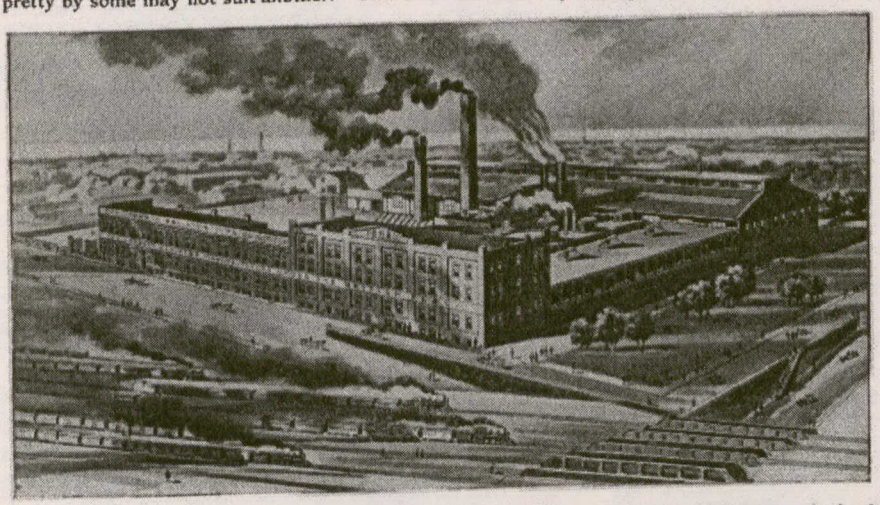
[From the Monetary Times.]

"Here is where they make the Safford radiators,' said the man to his son, as they passed a huge building on the road to the Toronto Industrial Fair.

"Who is Safford, Pa, and what are radiators?" asked the boy, who, it is plain, had not been accustomed to hot water or steam heating.

Both father and son would have known a good deal more about Safford radiatiors if they could have accompanied the writer over the Dominion Radiator Company's works the other day. For nearly a dozen years we have been hearing of radiators, have seen them and used them, recognizing their value, but never had witnessed the operation of making them or guessed with what delicacy and skill they were put together or what marvellous machinery is used to produce them.

This peculiar system of steam joints, we understand, is patented, and all the designs and names of the products of this company registered. Good workmanship is presumed, and good materials are necessary; but it is easier to produce ugly radiators than neat ones. This concern has shown remarkable taste as a rule in the designs of their work and the coloring of it. Of course, all tastes are to be consulted, and what is considered pretty by some may not suit another. This will account for a certain European country demanding an absolutely plain surface and a flat top in their heaters, while another wants lots of carvings and curlycues, with a curved top.



One man insists, for example, in having his house heated with a "Daisy" ornamental radiator, with several colors in the carvings, while his neighbor infinitely prefers the "Favorite" plain specimen, in white with a gold edge. Many have taken the "Perfect" for choice, but to our mind there is none among the lot so graceful as the "Florence," either in its shape or the pattern of its arabesques, which are as nearly pure Greek as the taste of the present generation for renaissance architecture will allow.

But we have not said anything yet about the way these curious masses of hollow-ware are put together, so as to make, throughout one's house, or shop, or hotel, a series of stoves giving out the mellowest sort of heat, which can be turned on or off room after room as a man will turn a cork-screw. Unless one sees the operation it is not easy to understand how a series of hollow sections can be so fastened together as to let water circulate through them without leaking, and yet no packing be used in the joints. But it is true that neither bolts, lead or packing is used in the Safford radiator. The Dominion Radiator Company having sole control of the "Safford" patent right and left screwed nipple, it is enabled to produce, not only an absolutely perfect joint, but with the patented machinery (which it also controls), a faced joint is obtained by milling the surfaces perfectly true, thereby securing a double connection, and of the most practical known to mechanism. With this right and left nipple system, each section is drawn face to face and held firmly without the use of red lead or any other substance. Each section of every radiator is subjected to a pressure of 120 lbs. to the square inch, which assures steam fitters that there can be no liability to leaky joints.

The list of the company's agencies abroad shows how great a business this enterprising concern has secured throughout the world. Besides five depots in five other principal Canadian cities, it has agencies in London, England; Edinburgh and Glasgow, Scotland; Auckland, New Zealand; Antwerp, Belgium; Berlin, Germany, and Christiania, Norway. Orders are now in hand, we are told, for heating a hospital in Glasgow, a public building in Antwerp, and several large halls in London and other cities.

Enormous premises are of course required for the making and storing of the great quantity of these goods required for a world-wide trade. And, indeed, the storage warehouses and their contents surprised us most. The foundry, in the shape of an L, extends 178 feet one way and 150 feet another, and is from 70 to 90 feet wide. There is a 58 foot cupola in the casting room, and what a sight to see them casting. The core room, the annealing furnace, the testing room, the tank room, the room where a machine (as wonderful in its way as a linotype), screws the iron sections so close together as not to leak—all this we saw, and more. The establishment occupies a square some 500 feet by 400 feet, from one to four stories in height, employing 170 men, and is entitled, we believe, to make the boast that appears on the cut of the works which we reproduce, that "We are the largest Radiator Manufacturers under the British flag."

The name upon the building is that of the Toronto Radiator Company, which is the name under which the concern has heretofore been known, but concurrently with an enlargement of the works and an increase of capital to $300,000, the name of the comany was made "The Dominion Radiator Company, Limited," and it has taken power to make a great variety of hollow-ware besides Safford radiators.

Of this company the first meeting was held on July 25th last, and the result was the election of the following directors: Joseph Wright, capitalist, president; David Carlyle, gentleman; John Stark, broker; John M. Taylor, manufacturer; Charles T. Stark, broker. These are the same gentlemen who have guided the concern for ten previous years. The manager and secretary, Mr. John M. Taylor, is the same, and there is every reason to assume that the enterprise and growth which have attended the Toronto Radiator Co'y will be continued by its successor.

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—THE—

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

EDITOR'S ANNOUNCEMENTS.

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

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Errata.

WE regret that a mistake should have occurred in the letter press description in our last number of the new Legislative Buildings at Victoria, B. C. The statue at the left of the main entrance is that of Sir James Douglas, first governor of British Columbia, not of Capt. George Vancouver, as stated. Capt. Vancouver is honored by a statue surmounting the dome.

Experts Disagree.

THE advantage or otherwise of using coke breeze or ashes in concrete is at present receiving attention in the British journals. A decided difference of opinion appears to prevail. One so-called authority, Mr. T. Blashill, architect, recommends "coke breeze and cement concrete, mixed four parts to one," as a material for "pugging," which stands fire and water better than anything else. Mr. H. B. Lang, another expert, protests against the use of breeze or ashes for such purposes, on the ground that such a material retains the heat longer than any other known, and thus causes the iron or steel girders to expand and twist.

Faulty Construction.

SEVERAL accidents of a serious nature, due to faulty construction of buildings, have taken place in Canada during the present year, yet no serious attempt seems to have been made to fix the responsibility or punish those to whose ignorance or neglect the disasters were due. In Great Britain they appear to do things differently. A large building known as the Westminster Mansions, in London, recently collapsed while under construction, killing seven persons. The Coroner's Jury found that the killing of these persons was due to culpable negligence of the architect in permitting a pier to be designed and constructed in a faulty manner, a secondary cause being careless mixing and inferior quality of the concrete. The London Daily News, in commenting on the case, remarks that "parts of the building, and those of the greatest structural importance, appear to have been put up by sheer rule of thumb. Established rules as to the proportions between the height and the breadth of the supports were wholly disregarded." The finding of the jury is tantamount to a verdict of

manslaughter against the architect, Mr. Pawley. Added to the verdict is the recommendation that a greater control should be instituted in the construction of buildings. The need of a proper standard of qualification for architects and the enforcement of wise and stringent building by-laws is every year becoming more apparent.

Swivel Windows.

A BUILDING ordinance was recently passed by the City Council of Chicago, compelling the use of swivel windows above the second story of all new buildings. The purpose of the law is declared to be the prevention of the numerous accidents attending the cleaning of stationary windows. The new law provides that upper story windows must swing on horizontal or vertical pivots, otherwise a balcony must be built in front of every window. Opposition has arisen to the law on the ground that it was designed to benefit the owners of patents on swivel windows, and also that the size of windows will have to be reduced owing to wind pressure, and accidents will result from falling window sash.

Rights of Trade Unions.

LORD Herschell, P.C., G.C.B., who is at present in Canada in the capacity of head of the British Commission to adjust the differences between the United States and the Dominion, when Lord High Chancellor of England, gave a celebrated decision in December last regarding the legal rights of trades unions. The case was that of Allen vs. Flood, in which it was held that Allen, as secretary of a trade union, violated the law by procuring the dismissal of Flood and another workman by threatening that their retention would be followed by a general strike of their fellow workmen. Lord Herschell, in rendering judgment, said he could not doubt that it would have been perfectly lawful for all the workmen to leave their employment. As against this view, we have the recent decision of Justice Bischoff, of the New York Supreme Court, preventing by injunction the officers of the Plumbers' and Gas Fitters' Benevelent and Protective Society from interfering with the workman of an employer who refused to join the association.

The Fallacy of Cheapness.

THE first cost of an article, whether for building purposes, or for furniture, is not the only thing the purchaser should consider. A house properly and substantially built, finished from cellar to attic in first-class style, and fitted with the best plumbing, ventilating, lighting and heating apparatus, must cost at first much more than a flimsy, cheaply built and cheaply fitted house of same dimensions. But the result is, the more costly house holds its own, while the cheap house settles, the plastering cracks and falls off, the timber shrinks and pulls everything with it, the roof leaks, a smell of coal gas permeates the whole building, the water pipes give continual trouble, while the furnace is a perpetual annoyance. Doors won't close, locks and bolts are always out of order, and the carpenter, plasterer, painter and plumber are always in request, while the yearly bills for repairs are actually appalling. The well built house requires no repairs for years after the workmen leave the finished contract; it looks well at first, and keeps up its appearance to the end. It is cool in summer, warm in winter, and its atmosphere is always clear and healthful, while its inmates are cheerful and happy. It may have cost several hundreds of dollars more than the cheap house at first, but the owner of the latter will have paid in five years, for repairs, doctor's bills, and irritable inconveniences and discomforts, much more than the difference in cost.

New York Building Code.

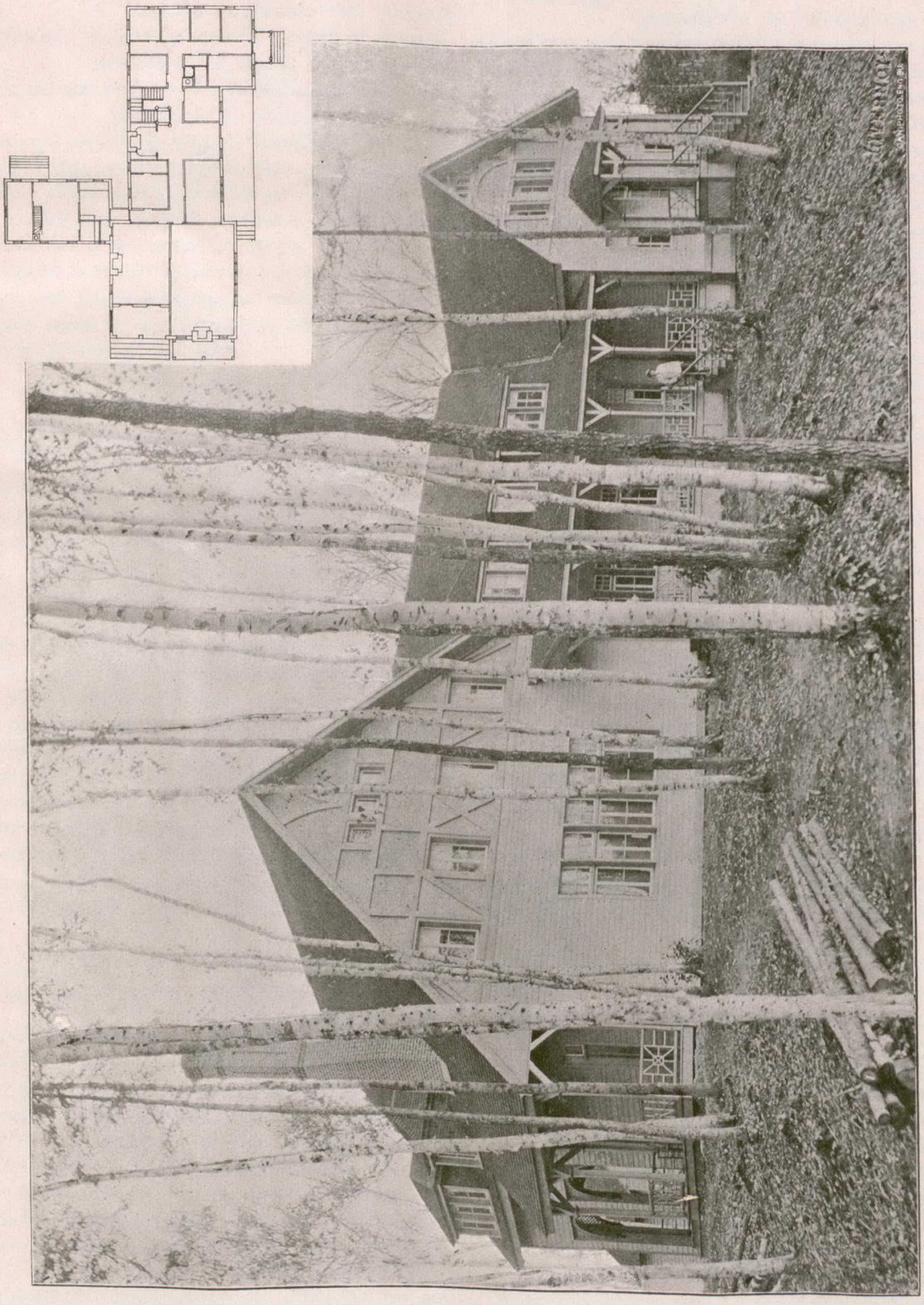
THE effort which is being made in New York to have a new building code prepared for the enlarged city is in the hands of a widely representative committee, consisting of delegates from the New York Chapter of the American Institute of Architects, the New York Board of Fire Underwriters, the New York Board of Trade and Transportation, the Mason Builders' Association, the Association of Master Plumbers, the Architectural Iron Manufacturers, the Builders' League, Mechanics' and Traders' Exchange, Building Trades' Club, Real Estate Exchange, the Real Estate Owners and Builders' Association, the North Side Board of Trade, West End Association, Upper East Side Association and the New York Fire Department. Three delegates from each of these bodies form a committee, which has been holding meetings for several months, and it may therefore be presumed are not only urging the Municipal Assembly to prepare a new building code, but are ready with a draft of suitable provisions.

Proposed Modern Hotel for Toronto.

THE announcement is made that at last the project for the erection in Toronto of a large modern hotel, has taken definite form. The Walker property on King street east, with additional land immediately to the east of same, is said to have been purchased at a cost of nearly half a million dollars as a site for the building. A survey of the site has been made by Messrs. Harding & Gooch, of New York, who will immediately proceed with the preparation of the plans. The building will have two frontages, on King and Colborne streets, with, it is said, an arcade connecting these thoroughfares. It will be made as nearly fire proof as possible, and will embody every modern requirement. The cost is placed at $750,000. We reiterate our belief that the enterprise, if properly managed, should undoubtedly prove a financial success and greatly add to the prosperity of the city, while some heavy and it is to be hoped profitable contracts should fall to the lot of our contractors for work and materials.

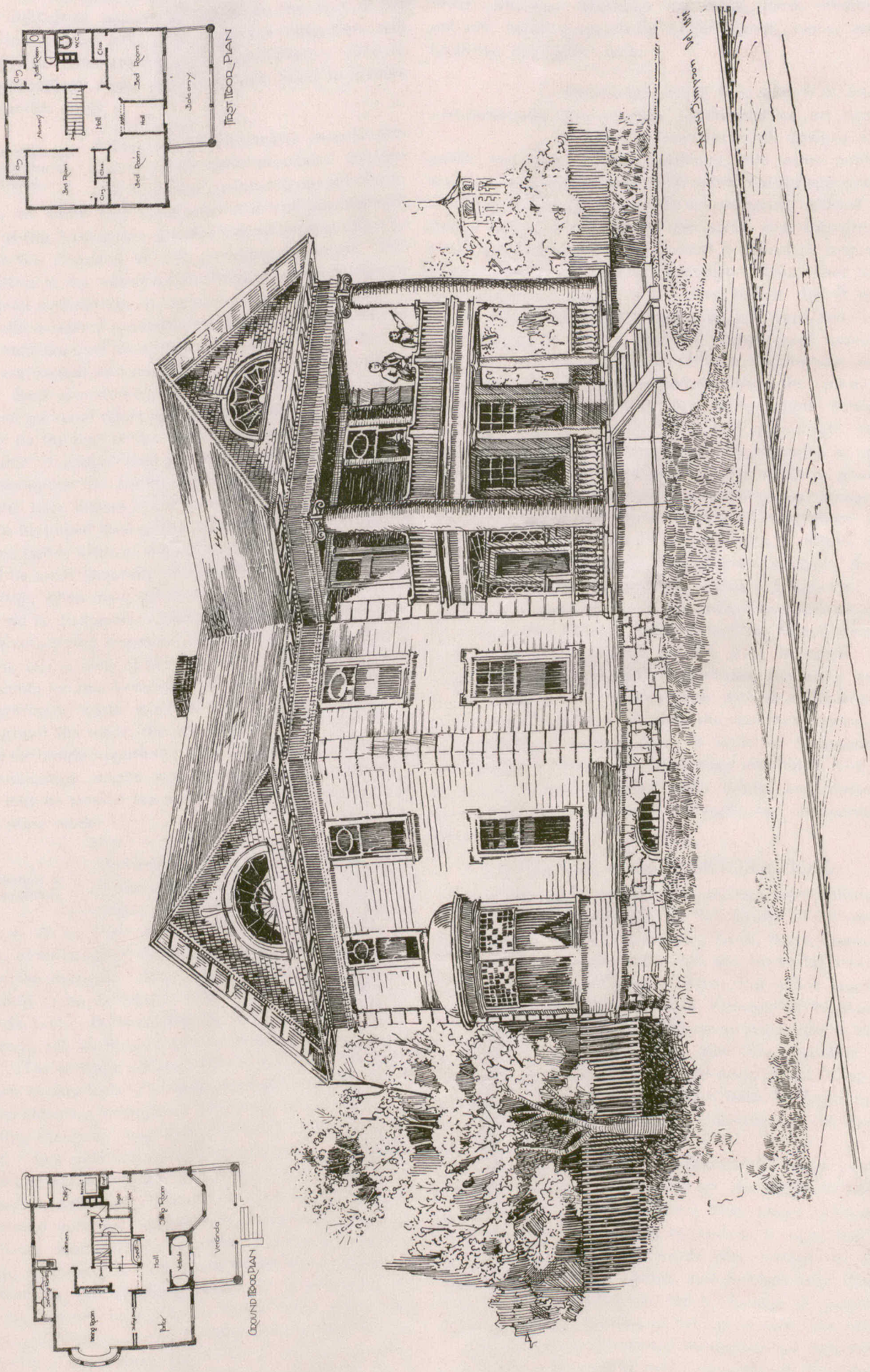
The British Workmens' Compensation Act.

THIS act, the purpose and provisions of which were recently outlined in these columns, went into operation on the first of July. It embodies an entirely new principle in law, by declaring that in future the undivided responsibility for accidents to workmen, arising from whatever cause, must be borne by the employers. From our point of view this is manifestly unjust. The employer's only means of security is to insure the lives of his workmen against accident, and in so doing to add another heavy charge to the constantly increasing expense of doing business, in the face of growing competition and decreasing profits. The greviousness of the situation is accentuated by the fact that the rates quoted by the insurance companies are six times greater than Mr. Chamberlain, the promoter of the bill, estimated they would be. This fact further serves to indicate the serious estimate entertained by the actuaries of the responsibility which the employers have



CLUB HOUSE OF THE TRITON FISH AND GAME CLUB, LAC A LA CROIX, QUEBEC.

HARRY STAVELEY, ARCHITECT.



RESIDENCE AT FORT WILLIAM FOR MR. CAMERON, SUPT. C. P. R.

SIMPSON & ELLIS, ARCHITECTS.

been compelled to assume. It is recognized that the present insurance rates are experimental and subject to revision as the results of the law shall become known. Many difficulties appear to stand in the way of the operation of the act, and expensive litigation will probably be necessary for its interpretation. Arbitration proceedings under the act are also likely to involve considerable costs.

National Plumbers' Association of Canada.

A PERUSAL of the various reports presented at the recent plumbers' convention at Quebec, printed in our July issue, serves to show that those entrusted with the management of the Association are making an earnest effort to elevate the standard of the plumbing business. The difficulties in the way of maintaining in successful operation local associations in the various provinces in affiliation with a central organization representing the entire Dominion are well nigh insurmountable in a country of such vast extent and having but a very limited population. Such a movement can only succeed as the result of great personal effort and much sacrifice of time and money on the part of the few who have the cause deeply at heart. It augurs well for the success of the plumbers' movement that the management of the central organization has been placed in the hands of men of this class. It is to be hoped that as the Association and its objects become better known, the advantages proceeding from it will be more generally recognized and appreciated by the trade, when many present discouragements may be expected to disappear. The appointment of a permanent secretary and organizer was a step in the right direction, but in view of the amount of publicity which it is possible for the Association to obtain in the columns of legitimate trade journals which regularly circulate throughout the trade, the necessity of an official bulletin is not strikingly apparent. The attention bestowed on its publication might with greater profit be given to what may be termed the more legitimate departments of association work.

Strength of Materials.

OUR readers will no doubt be interested in the results of tests of white pine, stone and bricks recently conducted by Prof. W. A. Pike at the University of Minnesota. Sticks of thoroughly seasoned white pine were tested for tensile strength. They were dressed to a uniform scantling 12 in. in length with shoulders on ends to take the pull. In scantling they varied from ¾ in. square to 1⅜ in. by 2½ in. ; average specific gravity 0.66. The average ultimate tensile strength was 7,373 lbs. per square inch. It was observed that the longitudinal shearing strength of the ends of the sticks, in resisting the pull, was less than has been generally given. The ends had a shearing area of 45 sq. in., but it was necessary to spike and clamp the ends in order to prevent splitting. Thirty-five tests were made of white pine wood for resistance to compression, in which the pieces varied from 1 in. cubes to pieces 3 in. square and 54 in. in length. Of those which broke by direct compression, the crushing resistance averaged 5,283 lbs. per square inch ; 1 in. cubes bore 7,800 lbs. Pieces 3 in. square and 54 in. long bore 5,222 lbs. per square in. ; 24 in. long, 5,038 lbs. ; and 12 in. long, 5,505 lbs. per square inch. Of those which failed by a combination of crushing and bending from 54 in. to 24 in. long and from 4 in. by 2 in. to 1 in. in return, the the average actual stress of load was about 3,000 lbs. Half bricks placed between pieces of pasteboard were tested for crushing resistance. St. Louis bricks failed flatwise under 6,417 lbs. per square inch ; edgewise, under 4,080 lbs. ; Hastings red brick, hard, medium and soft failed respectively under 2,017, 2,012, and 1,748 lbs. per square inch.

Art Commissions.

BROOKLINE, which is a suburb of Boston, recently established an art commission, before whom all designs for public buildings, parks, roadways, and other public works of importance were to be submitted for approval. A month or two ago the public school board selected a design for a new school, and the same was submitted to the art commission, which, after a thorough inspection, refused to approve of the design. This raised the ire of the school board, who gave it out that if the design submitted by the board was not approved, no school would be built ; and, as more school accommodation was imperative, the citizens succumbed, and straigtway repealed the law and abolished the commission, with the result that the objectionable school buildings will be erected, and will perpetuate the ignorance of the school board and the stupidity of the citizens. The incident, however, may result in good, as a movement is on foot to have an act passed through the legislature of the state making it compulsory on municipalities to appoint art commissions, to whom all designs of public buildings, monuments, bridges, &c., must be submitted for approval. This will take out of the hands of local boards or municipalities the power to make such a "bluff" as the Brookline board made, and will be in the interest of the state at large. If some such law was in force in Ontario, our cities and towns would not be "dotted" over with so many architectural monstrosities. It costs the country no more to build "things of beauty" than to build an ornamental nondescript. A little art knowledge combined with a modicum of brains, mixed with bricks and mortar, would often relieve us of much chagrin and disappointment.

EXTERNAL COLOR DECORATION.

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

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

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

SCHEDULE OF CHARGES OF THE R. I. B. A.

THE following revised code of professional practice and schedule of charges has recently been sanctioned by the Royal Institute of British Architects :—

1. The usual remuneration for an architect's services, except as hereinafter mentioned, is a commission of 5 per cent. on the total cost of works executed under his directions. Such total cost is to be valued as though executed by a builder with new materials. This commission is for the necessary preliminary conferences and sketches, approximate estimate when required (such, for instance, as may be obtained by cubing out the contents), the necessary general and detailed drawings and specifications, one set of tracings, duplicate specifications, general superintendence of works, and examining and passing the accounts, exclusive of measuring and making out extras and omissions.

2. This commission does not include the payment for services rendered in connection with negotiations relating to the site or premises, or in supplying drawings to ground or other landlords, or in surveying the site or premises and taking levels, making surveys and plans of buildings to be altered, making arrangements in respect of party walls and rights of light, or for drawings for and correspondence with local and other authorities, or for services consequent on the failure of builders to carry out the works, or for services in connection with litigation or arbitration, or in the measurement and valuation of extras and omissions. For such services additional charges proportionate to the trouble involved and time spent are made. The clerk of the works should be appointed by the architect, his salary being paid by the client.

3. In all works of less cost than £1,000, and in works requiring designs for furniture and fittings of buildings, or for their decoration with painting, mosaics, sculpture, stained glass, or other like works, and in cases of alterations and additions to buildings, 5 per cent. is not remunerative, and the architect's charge is regulated by special circumstances and conditions.

4. When several distinct buildings, being repetitions of one design, are erected at the same time from a single specification and one set of drawings, and under one contract, the usual commission is charged on the cost of one such building, and a modified arrangement made in respect of the others ; but this arrangement does not apply to the reduplication of parts in one building undertaking, in which case the full commission is charged on the total cost.

5. If the architect should have drawn out the approved design, with plans, elevations, sections and specifications, the charge is 2½ per cent. upon the estimated cost. If he should have procured tenders in accordance with the instruction of his employer, the charge is ½ per cent. in addition. 2½ per cent. is charged upon any works originally included in the contract or tender, but subsequently omitted in execution. These charges are exclusive of the charge for taking out quantities. Preliminary sketches and interviews, where the drawings are not further proceeded with, are charged for according to the trouble involved and time expended.

6. Should the client, having approved the design, and after the contract drawings have been prepared, require material alterations to be made, whether before or after the contract has been entered into, an extra charge is made in proportion to the time occupied in such alterations.

7. The architect is entitled during the progress of the works to payment by instalments on account at the rate of 5 per cent. on the amount of the certificates when granted, or alternatively, on the signing of the contract, to half the commission on the amount thereof, and the remainder by instalments during their progress.

8. The charge per day depends upon an architect's professional position, the minimum charge being three guineas.

9. The charge for taking a plan of an estate, laying it out, and arranging for building upon it, is regulated by the time, skill and trouble involved.

10. For setting out an estate, the position of the proposed road or roads, taking levels, and preparing drawings for roads and sewers, applying for the sanction of local authorities, and supplying all necessary tracings for this purpose, the charge is 2 per cent. on the estimated cost. For subsequently preparing working drawings and specifications of roads and sewers, obtaining tenders, supplying one copy of drawings and specification to the contractor, superintending works, examining and passing accounts (exclusive of measuring and valuing extras and omissions), the charge is 4 per cent. on the cost of the works executed, in addition to the 2 per cent. previously mentioned.

11. For letting the several plots in ordinary cases, the charge is a sum not exceeding a whole year's ground rent, but in respect of plots of great value a special arrangement must be made.

12. For approving plans submitted by the lessee, and for inspecting the buildings during their progress, so far as may be necessary to ensure the conditions being fulfilled, and certifying for lease, the charge is a percentage not exceeding 1¼ per cent. up to £5,000, and above that by special arrangement.

13. For valuing freehold, copyhold, or leasehold property, the charge is :—

On £1,000.....	1	per cent.
Thence to £10,000.....	½	"
Above £10,000.....	¼	" on residue.

In valuations for mortgage, if an advance is not made, one-third of the above scale. The minimum fee is three guineas.

14. For valuing and negotiating the settlement of claims under the Lands Clauses Consolidation Act or other Acts for the compulsory acquisition of property, the charge is on Ryde's scale as follows :—

ON AMOUNT OF SETTLEMENT, WHETHER BY VERDICT, AWARD, OR OTHERWISE.

Amount. £	Gs.	Amount. £	Gs.	Amount. £	Gs.	Amount. £	Gs.
100	5	2,200	24	5,200	39	8,200	54
200	7	2,400	25	5,400	40	8,400	55
300	9	2,600	26	5,600	41	8,600	56
400	11	2,800	27	5,800	42	8,800	57
500	13	3,000	28	6,000	43	9,000	58
600	14	3,200	29	6,200	44	9,200	59
700	15	3,400	30	6,400	45	9,400	60
800	16	3,600	31	6,600	46	9,600	61
900	17	3,800	32	6,800	47	9,800	62
1,000	18	4,000	33	7,000	48	10,000	63
1,200	19	4,200	34	7,200	49	11,000	68
1,400	20	4,400	35	7,400	50	12,000	73
1,600	21	4,600	36	7,600	51	14,000	83
1,800	22	4,800	37	7,800	52	16,000	93
2,000	23	5,000	38	8,000	53	18,000	103
						20,000	113

Beyond this half a guinea per cent.

The above scale is exclusive of attendances on juries or umpires, or at arbitrations, and also of expenses and preparation of plans.

15. For estimating dilapidations and furnishing or checking a schedule of same, the charge is 5 per cent. on the estimate, but in no case less than two guineas. For services in connection with settlement of claim by arbitration or otherwise, extra charges are made, under Clause 8.

16. For inspecting, reporting and advising on the sanitary condition of premises, the charge must depend on the nature and extent of the services rendered.

17. In all cases travelling and other out-of-pocket expenses are paid by the client in addition to the fees. If the work is at such a distance as to lead to an exceptional expenditure of time in travelling, an additional charge may be made under Clause 8.

18. When an architect takes out and supplies to builders quantities on which to form estimates for executing his designs, he should do so with the concurrence of his client, and it is desirable that the architect should be paid by him rather than by the builder, the cost of such quantities not being included in the commission of 5 per cent.

Among the colors upon which lime has no bad effect, and which may therefore be employed with safety for water-colored ceilings, walls, etc., are siennas and umbers, Vandyke brown, ivory black, Naples yellow, French ultramarine and Chinese vermilion.

Experiments have been made in England to ascertain the action of concrete on lead pipe buried in it, with the following result, as reported by a contemporary. If the matrix of the concrete is lime, and the concrete is in a damp position, the lime will reduce the metal to ceruse or carbonate of lead, or a crude white lead. If Portland cement instead of lime concrete is used, the lead will be oxidized, or reduced to a hard, brittle, dirty-red looking material. Examples of such deterioration are frequently found at the junctions of lead soil-pipes, as used in England, with stoneware drains, and where pipes pass through walls below the damp course. Lead pipe may be protected by laying it through stoneware drain-pipes embedded in the concrete ; but in such cases the ends of the pipe should be open, in order to prevent the accumulation therein of carbonic acid gas, which would act injuriously upon the lead. Pitch and asphalt are both good materials for protecting lead pipes that are exposed to corrosive influences. But drain-pipes afford the best protection, as the lead pipe can then be withdrawn for repairs.

BY THE WAY.

A QUEBEC paper has an account of the narrow escape of an architect of that city from drowning. While attempting to escape from the pranks of acquaintances on the wharf, the architect is said to have precipitated himself and a lady companion into the water by overturning the boat. The names of the principals in the adventure are not given.

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IN designing porches a young architect of my acquaintance has recently introduced a feature which is regarded with favor. The usual railing between the supporting posts at the corners is omitted, and the floor between these posts carried out two or three feet, the sills being extended to support it. The swinging of hammocks between the supporting posts of the porch or verandah is thus rendered possible, and the comfort of the occupants of the house during warm weather thereby greatly enhanced.

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THERE is said to be a large granite quarry about fifty miles from St. Johns, Newfoundland, where granite has been hewn, by some convulsion of nature, into rectangular blocks of different sizes, so conveniently assorted that schooner loads of selected stones have been brought to St. Johns, and used in some of the public buildings and warehouses, with little or no hand-dressing by masons. The new post-office and custom house, built after the great fire which practically wiped out all the business part of the town, are, says Stone, partly constructed of these granite blocks hewn by nature.

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INDIAN Engineering relates how the authorities of a certain eastern state imported an expensive road roller, without having taken the precaution to see that the weight of the machine was proportioned to the strength of the highway bridges over which it would be required to pass. The working weight of the roller proved to 15 tons, and it turned out, says our contemporary, to be a veritable "Invecta," for its unsuitability for the numerous bridges and culverts intersecting the main roads, was soon discovered in a manner better imagined than described. The sad alternative is to either take the roller to pieces at every bridge or culvert, or to dismantle the latter and rebuild them to suit the former.

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WHEN the builders on the island of Crete are in want of stone, they go to the peasants, who excavate half a meter below the level and help themselves to ready-made material from the walls of the ancient cities. The peasants find the sale of this second-hand material more profitable than the cultivation of the land. The stones are sold to those who are building houses in the villages near the ancient city and also exported to the other villages of the Massara plain and to the neighboring provinces. The Turkish government, so zealous in preventing the work of explorers who come to carry on scientific work or excavations, pays no attention whatever to the work of destruction daily going on under its eyes. In fact, when it has public constructions to erect, it goes so far as to procure its material by the very same system, thus often tearing down important monuments, which disappear without leaving a trace of their former existence.

ILLUSTRATIONS.

STORE AT BERLIN, ONT.—W. A. LANGTON, ARCHITECT.

RESIDENCE FOR MR. CAMERON, FORT WILLIAM, ONT.—SIMPSON & ELLIS, ARCHITECTS.

The building is frame on a stone foundation, the outside being clapboarded and the interior finished in quartered oak. It is designed in the Colonial style.

CLUB HOUSE OF THE TRITON FISH AND GAME CLUB, LAC A LA CROIX, QUE.—HARRY STAVELEY, ARCHITECT.

The club house, which is situated on the shores of Lac a la Croix, about one hundred miles from Quebec, is built of wood, clapboarded, the gables in rough cast, using large pebbles taken from the beach—some of them quite bright in color. The building contains 30 bedrooms, besides club lounging room, dining room, photo room, writing room, guides' dining room, etc., etc. Cost about $7,000.

DRILL HALL, QUE.—E. E. TACHE, ARCHITECT.

The Quebec drill hall, erected on Grande Allee, presents thereon a facade of 345 feet in extent, the main building measuring 265 feet and the two pavilions flanking the same 40 feet. It is designed in the early French Renaissance style, constructed in front of Beauport rock face masonry; the plinth base of Terrebone cut stone; the cornices, moulded string courses, door and window dressings, etc., of Dechambault cut stone; the back and side exterior walls and inside divisions of Canadian brick.

The drill hall itself measures inside 260 by 90 feet. A continuous gallery supported by wrought iron brackets extends around the whole room. Staircases in the turrets and on each side of the rear entrance give access to this gallery, which also communicates with the second flat of each of the pavilions.

The armories, which occupy the rear and sides of the building, open on the main hall.

This edifice was erected by the Department of Public Works, Ottawa, from plans prepared by E. E. Tache, Assistant Commissioner of Crown Lands, P.Q., under his supervision and that of W. J. Peters, Clerk of Works, and was built by Costelow & Lortie, contractors.

The original contract price thereof was $62,000, and its actual cost $66,722, of which $15,000 was defrayed by the local government and $15,000 by the city corporation—the building being also designed to accommodate provincial exhibitions when necessary. The operations of construction began in 1884 and were closed in 1887.

The complete project comprises also an outer castellated wall, extending from the pavilions 80 feet on each side, returning back 235 feet, and in the rear having a total front development of 505 feet. The space thus enclosed is intended to serve as parade grounds, and contains (resting back on the outer walls) open sheds for field guns, artillery trains, etc., and intended as well for exhibiting purposes. This part of the project has not yet been realized.

The Prince of Wales has approved of Mr. Lutyens to design the English pavilion for the coming Paris exhibition. The pavilion is to be in the style of an old English manor house. One wing of the building will be particularly ornate in furniture and fittings, for the prince has signified his intention of residing there while in Paris.

(Correspondence of the CANADIAN ARCHITECT AND BUILDER.)

HER MAJESTY'S THEATRE.

The new playhouse on Guy street, which is to be known as Her Majesty's Theatre, is being roofed in, and will be completed early in the autumn. The building was designed by Messrs. J. B. McElfatrick & Son, the well-known theatre architects of New York. The dimensions are 170 feet square, with a seating capacity of 2,000. The building, which is in the Italian Renaissance style, is constructed with limestone foundation and pressed brick superstructure. Precautions against fire have been made to accord with the requirements of the New York fire department, which are said to be the most stringent in the world. The contractors are Messrs. Peter Lyall & Sons, and the sub-contractors: Thomas Ford, carpentry work; William Rodden, iron work; G. W. Reed & Co., roofing; John McLean, plain and ornamental plastering; J. W. Hughes, steam heating, gas fitting and plumbing; W. Anderson, Ottawa, electric wiring.

FIRE PROTECTION FOR HOSPITALS AND CONVENTS.

The Montreal Gazette, referring to the recent hospital disaster at St. Hyacinthe, sounds this note of warning, which the authorities of such institutions would do well to heed:—"The unfortunate affair at St. Hyacinthe, like that which caused so sad a sensation when the Roberval convent was burned, carries a lesson for the managers of all institutions where considerable numbers of persons live and sleep. This province (Quebec) has an unusual number of these, many of them unprovided with means of suppressing a fire, and almost all of them, outside of the cities especially, without means of escape, in case of imminent danger, save the ordinary staircase and the windows." It should be stated that fire escapes are not the best means of protecting life in institutions occupied by invalids and women. The proper means to this end is to make the buildings themselves as nearly as possible fireproof. The materials and methods for so doing are now available, and the cost has been so greatly reduced of late as to constitute no serious obstacle. This is a matter that might with advantage occupy the attention of the Province of Quebec Association of Architects.

FAULTY CONSTRUCTION.

Mr. Lacroix, City Building Inspector, recently took proceedings against Mr. Louis Riopelle for non-compliance with the requirements of the building by-law in connection with the construction of a building on Nobert street. The Court appointed Messrs. Hutchison, Nelson and Lapierre, architects, to examine the building and report upon the character of its construction. They reported the construction to be defective and contrary to the requirements of the by-law, whereupon Mr. Riopelle was fined $25 and costs and notified to demolish his building within twenty-four hours. This order not having been complied with, the Building Inspector, with a staff of workmen, proceeded to the building for the purpose of tearing it down. They found it barricaded and the owner inside. One of the Inspector's men who attempted to scale the barricade was struck with a scantling, whether accidentally, as Mr. Riopelle alleges, or otherwise, does not yet appear. Riopelle was arrested on a charge of assault, being afterwards liberated on bail. The Building Inspector is determined to carry out the order of the court by demolishing the building. It is understood that the changes in construction required by the Inspector, and which Mr. Riopelle refused or neglected to make, were: To renew south-east foundation, which is considered dangerous; to replace pillars supporting different storeys by stronger ones; to replace joists, which are too short and of insufficient support, in accordance with Sec. 59-61 of Reg. 107; to take away stone divisions and replace with brick; to lower the front 25 feet, beginning at the north-west side; to build at back of house a masonry wall to shut off entirely a house in rear, which it supports—in accordance with Sec. 12-14, Reg. 107.

CORRESPONDENCE.

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

ROOFING.

To the Editor of the CANADIAN ARCHITECT AND BUILDER.

SIR,—My attention has been drawn to an article on this vexed question in your June number. My experience of fifty years in practical building, as builder, architect and owner, has been dearly bought. I certainly agree with the writer as to the merits of a gravel roof. I never could understand why some other means were not taken to keep the pitch in place; certainly the gravel has never attained that end. The weight added to building runs from 1,000 to 2,600 pounds per square. The roof is perfectly filthy after it has been on two or three years. About a month ago I was asked to inspect roofs on a manufactory not forty miles from Toronto, and found as much as 4½ inches of gravel and dirt on part of the building. The roof had sagged from four to five inches, and water stood on roof the year round, or filtered into the building.

I do not think the writer's remarks in the article referred to fit the present requirements, the conditions having entirely changed in twenty years in Toronto as regards metal roofs of all kinds. At that time, gases, acids, etc., from coal and manufactories of different kinds had not to be reckoned with, which entirely changes the situation. One case occurs to me now where one iron and three tin roofs were eaten off in four years. This building is now covered with a composition roof (a patent in its fourth year) for sixteen months, and is as good as new. Although nails, washers and wire are used in this roof, they do not come to the surface, consequently are not affected by the acids. This roofing complete only weighs 150 pounds to the square, and can be used at from half an inch to the foot up to four inches rise. This is a decided advantage over gravel, as the gravel roof is generally specified at half an inch rise. Returning to iron and tin roofing, I know of one steep tin roof that has been on fifty years, but never painted and never subject to gas or acids. I do not think a coat of paint once in seven years is any good to the roof. Once in two years might be a benefit, but what of the cost? As to adding 25 years to the life of a tin roof by painting once in seven years, I consider that altogether out of the question, owing to the change of conditions before mentioned, as the rust takes hold inside of a week. Oil or lead paints are about useless for roof-painting. I am using a composition having japan as the fluid, and find it will last as long as four coats of paint, which is a sure protection from acid. About five years ago, I was asked by a brother contractor and inspector to get up a first-class composite roof. A year later I summed up my experience, which went back to 1848—when coating magazines for the British government—by adopting asphalt to neutralize the pitch, and then wool to confine the two, strengthened with embedded wire, fastened with nails and tin washers coated with japan, mica, soapstone and sand—producing a light non-conductor, water, fire, acid, and, I think, lightning proof, and which will not crack. The patentee will keep full control until it has been tested for five years, before selling any rights to use it. I think Mr. W. A. Langton, architect, of your city, is the only person in Toronto having it in use, and that on a business block in an adjacent town.

DANIEL ALLEN.

GALT, ONT., July, 1898.

Mr. Fred. Langley, of Toronto, who is engaged in the study of architecture in New York, is at present home on vacation.

Mr. F. M. Rattenbury, architect, of Victoria, B.C., accompanied by his wife, recently made the trip from Dyea to Bennett in twenty-six hours.

The capstone of the tower of the new municipal buildings at Toronto was laid by the Mayor a few days ago. The tower, which is 240 feet high, will be surmounted by a spire 45 feet in height. It rests on a concrete foundation 72 feet square, the superincumbent weight being about 14,000 tons. The architect states that there has been no settlement of the structure.

STORE AT BERLIN, ONTARIO.

W. A. LANGTON, ARCHITECT.

NEW MANITOBA LIEN ACT.

FOLLOWING is a brief summary of the provisions of the new Mechanics' Lien Act passed at the last session of the Manitoba Legislature, and which went into operation on the 1st of June last :—

Any person, unless he signs an agreement to the contrary, who performs any work upon, or furnishes any materials for the erection or repair of any building, etc., shall have a lien for the price of such work or materials on such building, etc. No lien can be had for a less sum than $20. A lien, upon registration, shall arise and take effect upon the commencement of the work or service, or from the placing of the materials, as against instruments registered or unregistered. The lien shall attach the estate or interests of the owner. Mortgages against property existing at time of commencement of work or placing materials upon the ground, have priorty over a lien to the extent of the actual value of the land at time of commencement of improvements. Insurance money upon property upon which a lien exists is liable to application in reduction of lien after the satisfaction of mortgage placed upon the property before the commencement of the improvements. The owner is not liable for a greater sum than payable by the owner to the contractor. Where lien is claimed by any person other than the contractor, the amount is limited to the amount owing to the contractor or sub-contractor or other person. Persons liable on a contract for the payment of money shall, where the amount is $15,000 or under, retain 20 per cent. of the amount of the contract price for a period of thirty days after the completion or abandonment of the work. Where the amount is over $15,000, 15 per cent. shall be retained. All payments up to 80 per cent., or 85 per cent., where the contract price exceeds $15,000, made in good faith, and before notice of any lien to be considered good, and operates as a discharge to the owner. Payments of the percentages retained by owner may be made to discharge liens after thirty days from the time of the completion or abandonment of the work. Payments made by owner or contractor to persons performing work or furnishing materials, without notice of lien and in good faith, are considered good. This does not apply, however, to the percentage moneys, which must be retained by the owner. Liens, after notice of registration, have priority over all judgments, etc. Mechanics and laborers, whose lien is for wages, have, to the extent of thirty days' wages, priority over all other liens, as against the percentages retained by the owner. All other liens rank equally, there being no priority by virtue of prior notice or registration. Where a contractor makes default in the performance of contract, the percentages shall not, as against a wage earner claiming a lien, be applied on account of damages, etc. Every device to defeat a lien is null and void. "Wages" embraces all moneys earned by a mechanic or laborer for work done, whether by the day or piece work. During the continuance of a lien, no portion of the material affected shall be removed so as to prejudice the lien. When material is actually brought upon the ground to be used in connection with any building, it shall be subject to a lien in favor of the person supplying same until put into the building.

Liens are to be registered in the land titles offices. A claim for a lien shall state : Name and residence of persons claiming lien ; name of owner of property to be charged; person for whom work has been done or materials furnished ; time within which work has been done, and a short description thereof; the amount claimed; the description of the land to be charged, etc. (Schedule of form is contained in act.) A lien may include claims against any number of properties, and a number of persons may unite in one lien. Claims are not invalidated by informality. Liens registered are an incumbrance against the land. A lien of a contractor or sub-contractor, to be effective, must be registered during the performance of the contract, or within thirty days after the completion thereof. A lien for materials may be registered before or during the furnishing thereof, or within thirty days after the furnishing or placing ; a lien for services at any time during the performance of the service, or within thirty days thereafter. A lien for wages at any time during the performance of the work, or within thirty days after the last day engaged. Liens not registered within times above stated to cease to exist. Liens registered to cease to exist if proceedings be not taken within ninety days after the work or service has been completed or materials furnished. Upon death of lien-holder, his right shall pass to his representatives. A lien may be discharged by a receipt signed by the claimant or his agent duly authorized. Money may be paid into court for security of lien. Court may vacate the registration of lien on any ground. Taking of promissory notes or other security by the claimant does not destroy right to lien. Lien-holders are entitled to know terms of contract from owner. Court may on summary application order production of contract for purpose of inspection. Any number of lien-holders may join in one action.

Actions to enforce a lien shall be tried before a judge of the court of Queen's bench at regular sittings, or, when the aggregate amount of the liens do not exceed $1,000, by a local judge of the court in whose district the cause of action arose. Local judge has all the powers of a local master under the Queen's bench act; may determine the issues involved or refer same to a judge of the court of Queen's bench. Persons who have not, at the time of trial, proved their claims, may be let in to do so upon certain conditions, (proceedings are laid down as to mode of trying issues resulting from the registration of liens). Any decision on a lien by a judge is subject to appeal where the amount involved is over $100. The plaintiff's cost in an action to substantiate a lien shall not exceed in the aggregate 25 per cent. of the amount of the lien. The same provision applies in case costs are awarded against plaintiffs. Ordinary judgment may be given where a person fails to establish a lien. The act not to apply to liens existing prior to the passing of the act. The former lien act (chapter 97 revised statutes and chapters 28 of 58 and 59 Vic. and 14 of 59 Vic.) is repealed.

USEFUL HINTS.

Boiling hard putty in a little water to which has been added a small quantity of raw oil will cause the putty to absorb the oil while hot. After pouring off the oil, the putty may be easily worked into good condition.

Fine bolted whiting is a good thing to add to graining color for oak when it is desired to thicken it without changing the shade. Melted bees' wax, or soap dissolved in hot water, and added to the color while warm, may also be used.

The maximum economy of metal in a plate girder exists, says J. A. L. Waddell in Indian Engineering, when the weight of the flanges is equal to the weight of the web with its stiffening. As for the question of deflection, there is no need of figuring on it at all, because any depth of web that will involve the greatest economy of metal in the girder will provide ample stiffness.

HARDWOOD FILLER.—The following is found in Meyer Brothers' Druggist : Use boiled linseed oil and enough powdered starch to make a very thick paste—add a little japan and reduce to proper consistency with oil of turpentine. Add no color for white oak or white ash ; for other wood add enough color to cover the white of the starch. For dark ash and chestnut use little raw sienna ; for walnut, burnt umber and a very little Venetian red. Apply the filler with brush or rags, let dry for several days, then sandpaper.

Stucco is made by diluting very fine newly-baked plaster in a hot solution of white Flemish glue, so as to make a soft paste. Various coloring substances are added to the paste to imitate marble. These colors are the same as those employed for painting houses. When the mixture is dry it is polished with pumice stone and then with whetstone and tripoli. A final polish is given by rubbing it with a piece of felt and soapsuds and then with oil. With this imitation marble pillars, floorings and children's toy marbles are made.—Science Francaise.

For heat resisting putty, a handful of burnt lime is stirred in 120 grams of linseed oil and boiled down to the ordinary consistency of putty. The elastic mass is then allowed to dry in a thin layer in a place not reached by the rays of the sun. It becomes very hard. For use the putty is held over the fire or the cylinder of a lamp, and the cracks caused by heat or the cracked pieces are cemented with it. Over the lamp cylinder the putty becomes soft and very pliable, but after cooling it gets very hard and binds the different materials very firmly together.

The Germans are showing a predilection to paper floors, an important advantage in the use of which is said to consist in the absence of joints, whereby accumulations of dust, vermin and fungi dangerous to health are done away with. The new paper floors are bad conductors of heat and sound, and, in spite of their hardness, have a linoleum-like, soft feel to the foot. The cost is considerably lower than that of floors made of hardwood. The paper mass receives a small addition of cement as binder, and is shipped in bags in powder form. The mass is stirred into a stiff paste, spread out on the floor, pressed down by means of rollers and painted with oakwood, nutwood or mahogany color, after drying.

MANUFACTURES AND MATERIALS

TERRA COTTA IN ARCHITECTURE.*

By Joseph Joiner.

In speaking of the treatment of terra cotta in architecture, I would commence by using the remark of one who has said "One of the most essential functions of architecture is expression, and all architecture should be, as far as possible, expressive of two things—its purpose and its construction. The question of purpose affects the general design of a building; the question of construction affects the special uses of the several materials composing it," and terra cotta really demands a special treatment at the hands of architects in order to produce the most satisfactory results. The uses to which terra cotta can, with more or less propriety, be applied are so many and so various that it is somewhat difficult to define where its application should commence and where it should cease. The plasticity of the material, whilst it gives great liberty and freedom to the designer and modeler, and as to artistic execution is capable of almost endless variety of treatment, yet from the nature of the manufacture it would, looking at it from the most successful and economical point of view, demand a limit as to the size of the individual blocks themselves. Terra cotta should not be made in too large pieces, as the larger the piece the more difficult it is to handle in the manufacture, and the greater the risk in the burning, and although I have seen some extraordinarily large columns and other work made by the Northwestern Terra Cotta Company and other companies, and which, as special pieces to suit a special purpose, were very good, they must have cost much labor and trouble and time in producing. I would not advocate pieces that would cube up more than six feet or seven feet, unless it is absolutely imperative for the sake of construction, and as much under this as possible, and the more readily and more easily a terra cotta block can be handled in the manufacture, the better the result, and I think the architect would be much helped in making his design and application of terra cotta work generally by paying an occasional visit to terra cotta factories and becoming acquainted in some measure with the manufacture, if only on the score of the old adage that "Ignorance is expensive, but knowledge is power." The most pleasing effects from the use of terra cotta will most surely come from those buildings that have been especially designed for terra cotta, because much can be done by the architect in studying his design to counteract and allow for any little irregularity of shape and outline contiguous to the material, for whilst it would be very difficult to design anything in terra cotta that could not be built in stone, yet a building could be designed for stone which could not be reproduced in terra cotta in the same way, and right here is where the co-operation of the manufacturer would be of much assistance to the architect. The matter of design and the manner of treating terra cotta are subjects for much thought, and require not only artistic ideas, but the exercise of good judgment, for if terra cotta is made to imitate stone, it immediately becomes a counterfeit; it is a deception, hence it is an error, and one of the greatest pleasures which arise from the use of terra cotta in architecture is the satisfaction engendered by the simple merit of the material.

RELATION TO BRICK AND STONE.

In speaking of terra cotta in combination with brick and stone, or in comparison with either one or the other, I would say that terra cotta has in itself more the nature of brick than stone. It can be used very successfully in combination with either one or the other, or both, according to the scope of the design, but its effect is often marred by the attempt to make it an imitation. Mr. Wagner, of the Northwestern Terra Cotta Company, says: "The great difference between terra cotta and stone is that stone is ready for its designation after receiving the finishing touch by the carver or mason, whereas terra cotta, when it leaves the hands of the modeler or presser, has yet to be dried and burnt, and this is a slow process, and one that is not always crowned with success, as a piece of terra cotta will sometimes warp and twist and crack and be off color. When stone is in the building it can be adjusted and worked up and the face wrought upon with a chisel, because the body of stone is homogeneous throughout, so that the same identical surface may be produced ad libitum, whereas terra cotta has but one surface, which, once destroyed, can never be restored. Ends and unexposed parts may be trimmed like stone, but the face cannot be touched after burning." In the matter of smaller pieces, in comparison with stone, and the necessary frequency of joints in terra cotta work, and which may be a point of objection with some architects, I would say this is remedied and overcome by making a lap or cover joint on all washes, and it must be conceded that the class of modeling and ornamentation that is now being produced in terra cotta is far ahead of the general character of all stone carving, for terra cotta modelers are not mere mechanics, but artists, and appreciate the value of beautiful figures and graceful lines. And as to the surface finish of terra cotta, whilst terra cotta should have its own particular finish, yet, if so desired, any kind of masonic finish can be placed upon the surface of it. Mr. Sullivan, of Chicago, the eminent architect, says: "The artistic possibilities of this fine material are limitless." There are several other important characteristics relating to terra cotta, and which make it stand pre-eminently to the front as building material, viz., color, strength, durability, fire-proof quality, adaptability for steel and iron construction, and economy.

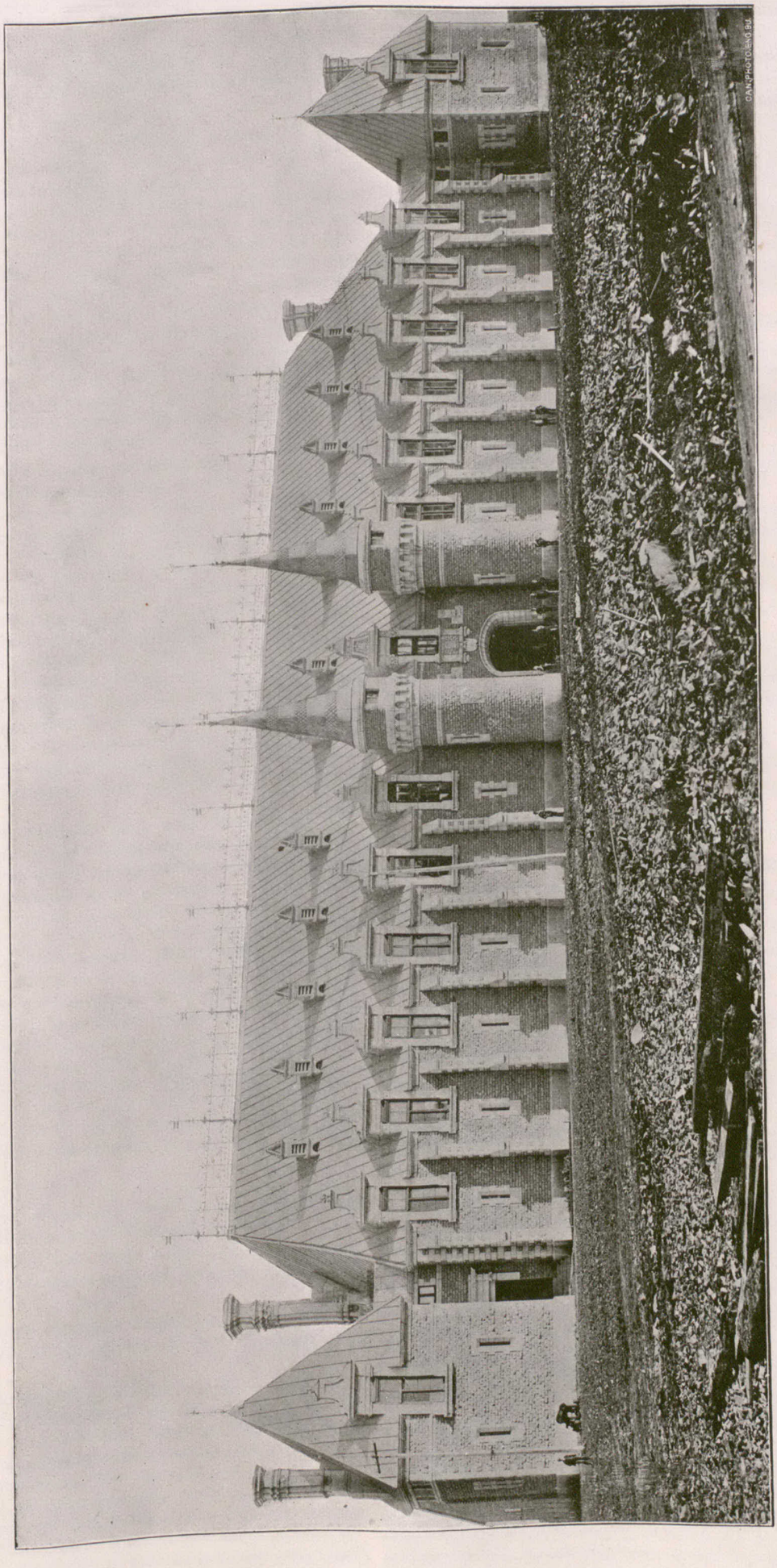
COLOR.

In speaking of color, there is always a peculiar brightness in the general appearance of all terra cotta, which I think is due somewhat to the metallic condition of the ware after having been subjected to the high temperature of heat in burning, that lends a more cheerful aspect to buildings than any other building material known. Some twenty years ago two or three colors seemed to predominate, principally buff and red, but in the eighties an agitation of colors commenced, and demands for various colors were constantly being made, which demands were met as soon as they could be permanently and practically responded to by the manufacturers, until to-day enough colors can be produced to satisfy the most fastidious taste. I think a mistake is made where the terra cotta is required exactly to match the stone or brick in color. If the terra cotta part of the design has a special "motif" or expression, which it should have, that part of the design should most certainly be expressed in a slightly different shade of color to the brick or the stone—not too much to make it conspicuous, but enough to bring out the expression of the design readily, and here it would be well to add that architects must not expect perfection in the uniformity of color in every block of terra cotta, any more than the same expectation can be fully realized in the use of stone. Much has been said of late upon the subject of "white" or "cream" as a color, and many buildings have been erected with terra cotta of these shades of color, but it has yet to be proved whether these very light colors are the most serviceable to adopt in the atmosphere of our large cities.

STRENGTH.

As to strength, whilst terra cotta in itself has immense strength, both by way of support and resistance, yet it is never advocated that it should be placed into buildings in the same hollow condition that it comes from the factory, but, on the other hand, every block should be filled up solid with concrete or brickwork. The first crushing tests of terra cotta, as far as I can gain any information, were made in the city of London by David Kirkaldy on June 17, 1868, at the instance of Charles Barry, the architect, who had been using $140,000 worth of terra cotta in one building, Dulwich College, mentioned before, and amongst the many tests that were made I would present this one to your notice: A six-inch cube of Bath stone crushed at 88 tons per square foot; a six-inch cube of Portland stone crushed at 283 tons per square foot; a six-inch cube of solid terra cotta crushed at 442 tons per square foot. And which at once declared, at that time, the superiority of terra cotta over stone in this respect. Mr. James Taylor, in an article in the Clay-Worker, reports some crushing tests made in May, 1885, by the Boston Terra Cotta Company, which were eminently satisfactory, and which, in fact, showed a better result than the tests on the English-made terra cotta of previous years. Mr. Meyenberg, in the same paper, also bears testimony to the crushing strength of this material. Mr. Wagner, in the same paper, says: "The tensile strength of terra cotta is about 1,000 pounds per square inch; compressive strength about 10,000, and if the voids and the solid portions of a hollow piece of terra cotta were as one to one, it would compare favorably with good stone." Thus it will be seen that terra cotta is fully competent to sustain its proper proportion of weight in a building. The weight of hollow terra cotta with braces or reinforcements at intervals, made in the ordinary way, is about 70 pounds to the cubic foot, but when filled in solid it would weigh about as much as brickwork.

* Abstract of a paper read before the Cincinnati Chapter of Architects.



DRILL HALL, QUEBEC.

E. E TACHÉ ARCHITECT.

DURABILITY.

The advantage that terra cotta has in this respect needs no special proof in this paper, for they are all around us, and if we need a century proof in all ocular demonstration, we must surely wait a little longer. We know that timber will rot, stone will disintegrate, iron will oxidize, and all other materials will more or less yield to the destroying influences of the elements; but hard-burned terra cotta will stand in defiance of all weather.

FIRE-PROOF QUALITY.

Terra cotta is claimed to be fire-proof, and from what I understand of the results of our many recent fires, terra cotta did all that was claimed for it in this respect, and this is a very important matter, for in these days of tall buildings, under the present method of steel construction, it is very necessary that such materials be used, and in such a way as to render these "mammoth structures" or modern "bee-hives" as nearly as possible fire-proof, hence the proper thing is to encase the iron work of the front of the building with terra cotta entirely, or brick and terra cotta combined, for stone is not a good fire-resisting material, and encase the iron framing with what is called "fire-proof terra cotta," so as to prevent the heat arising from a fire affecting it, for we know that if iron is not properly protected it becomes the frailest possible material in the event of a fire, but if properly protected it becomes an important factor in all high buildings.

As to the cost of terra cotta in comparison with stone, and which is the only building material that it legitimately comes in contact with in this respect (for galvanized iron, though much used, cannot be recognized in the category of constructional building materials), I would say that in perfectly plain work it is a sharp tussle between the terra cotta and the stone, and if it is a work of no repetition, stone is liable to be somewhat cheaper, for, although the cost of terra cotta, from increased experience and improved methods on the part of the manufacturers the past few years has been much reduced, the cost of stonework, from improved methods of cutting and planing, has been reduced also, but where there is much repetition of the same form, and where any amount of ornamentation is introduced in the mouldings, then the cost of terra cotta is far below that of stone, and the effect of all such ornamentation is, from the plasticity of terra cotta as a material in its clay state, far superior to anything that can be produced in stone.

In conclusion, I would like to say a word about setting terra cotta. Much terra cotta is marred by imperfect setting down by common brickmasons, and it can be at once seen that a good stonemason is the best man to set terra cotta. He can use a chisel, has been accustomed to set blocks of stone in alignment, and would be much more skilled in this connection with terra cotta than any ordinary brickmason. Hence a better job could be expected from a workman of this character. Terra cotta, when it arrives at the building should be laid down on some floor to ascertain the jointing that will be necessary to bring all the pieces together in good form, and thus the setter will become acquainted with each individual block, and what it requires at his hands, before he puts it into the wall. If a stonemason cannot be obtained, the next best man is one who has been accustomed to lay up best front brickwork. This is the final operation and requires just as much care and attention as any part of the manufacture.

A company has been organized at Owen Sound, with a capital of $25,000, to manufacture granolithic paving material.

Messrs. Reid & Brown, Front street east, Toronto, will shortly commence the manufacture of a hot water boiler for heating purposes.

A handsomely printed catalogue descriptive of the "Daisy" heater is being sent out by Messrs. Warden King & Son, of Montreal.

We are told by Cassier's Magazine that in spite of the fact that there are, at present, in existence at least nine or ten processes for rendering wood non-combustible, none of them have been adopted by the British admiralty, though all have been subjected to careful and repeated trials. The United States naval authorities tried one kind of non-inflammable wood on the armored cruiser Brooklyn some time ago, but have since taken it up and replaced it with ordinary wood. The German naval authorities, who are profoundly convinced of the necessity of using non-inflammable wood in the construction of their warships, have made numerous experiments in this direction during the past four years without any tangible results.

MANUFACTURE OF FIRE CLAY IN BRITISH COLUMBIA.

THE Union Coal Co., of Union, Vancouver Island, B.C., have commenced the manufacture of fire brick on quite an extensive scale. The clay beds connected with the company's mines appear to be inexhaustible. The brick for the company's first set of coke ovens was manufactured from this clay. Subsequently the company determined to erect the necessary buildings and plant with which to make the bricks themselves. A kiln is being built near the coke ovens, and the fuel for its operation will be supplied by the gas generated in the manufacture of coke. The company's output of fire clay last year amounted to 1,600 tons, being three times greater than in 1894. Near at hand the company also own deposits of excellent building sand and gravel. A handsome building stone is brought from their own quarries, and the magnificent trees of fir, pine and cedar are cut into planks at the company's saw-mill, the only building material which it is necessary to purchase away from home being lime.

COLORS USED IN DRAWINGS.

A CORRESPONDENT of the National Builder gives the following colors used to designate materials in architectural drawings:

MATERIALS.	COLORS TO REPRESENT THEM.
Brass.	Gamboge.
Brickwork (in section).	Crimson lake.
Brickwork (in elevation).	Crimson lake, mixed with burnt sienna.
Cement.	Sepia.
Concrete.	Sepia, mottled with burnt umber.
Copper.	Crimson lake, mixed with gamboge.
Glass.	Cobalt (mottled).
Iron (wrought).	Prussian blue.
Iron (cast).	Payne's gray.
Lead.	Indigo.
Leather.	Vandyke brown.
Plaster.	Sepia.
Slate.	Indigo, mixed with crimson lake.
Steel.	Crimson lake, mixed with Prussian blue.
Stone.	Burnt umber.
Tiles.	Indian red.
Wood.	Burnt sienna.

THE TRADE JOURNAL.

There's a proper time for all things.

The proper time to make a business proposition to a man is when his mind is on business, when he is right in the thick of just the business you want to talk about.

When a man sits down and commences to read his trade journal his mind is on just the business you want to interest him in.

The question of what to buy and where to buy it is one of the things he depends upon the journal to solve.

If you have anything to sell him and your ad isn't there to tell him all about it, some other fellow's will be.

That's why the other fellow gets the trade—and it's quite reasonable, proper and just that he should.—Chas. Austin Bates.

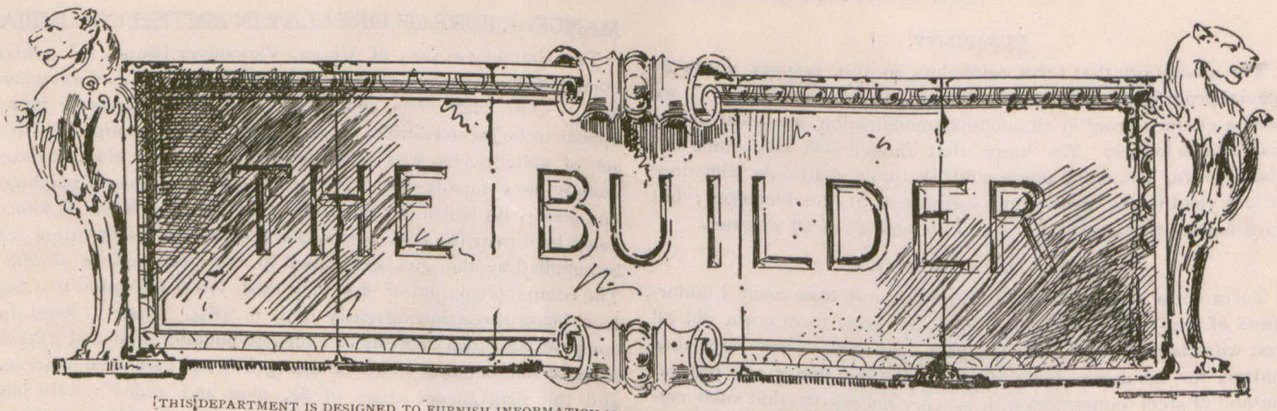
The aggregate value of brick buildings in course of construction at Windsor, Nova Scotia, is placed at $225,000 and of wooden residences $500,000.

The Robert McCausland Stained Glass Company, of Toronto, are busily engaged on the contract awarded them three months ago for decorative glass windows for the new municipal buildings.

The Mechanics' Supply Co., of Quebec, have recently received the agency from Mr. Samuel Cabot, of Boston, for "Deafening Quilt," an insulating material, in the manufacture of which ell grass is principally employed.

Cape Colony, during 1897, consumed 69,920,051 pounds of cement, and stone and slate of all kinds to a value of $95,935. In Cape Colony and Natal there were in 1897 in operation, 147 stone quarries, with only 78 employees, and 6 stone and marble works, with 256 employees.

The American Public Health Association will hold its twenty-sixth annual meeting in Ottawa on Sept. 27th, 28th, 29th and 30th next. By suggestion of the Montreal Master Plumbers' Association, a Committee on Sanitation, of which Mr. J. W. Hughes, the well-known Montreal plumber, was elected chairman, was formed last year. This committee will give its special attention to drainage, plumbing and ventilation of buildings, and is expected to present an interesting report at the above mentioned convention.



[THIS DEPARTMENT IS DESIGNED TO FURNISH INFORMATION SUITED TO THE REQUIREMENTS OF THE BUILDING TRADES. READERS ARE INVITED TO ASSIST IN MAKING IT AS HELPFUL AS POSSIBLE BY CONTRIBUTING OF THEIR EXPERIENCE, AND BY ASKING FOR PARTICULAR INFORMATION WHICH THEY MAY AT ANY TIME REQUIRE.]

Making Veneered Doors.

VISITING a large woodworking factory some time ago, in New Haven, Conn., where veneered doors are made in large quantities, I interviewed the foreman with regard to the method of manufacture of these doors, with the following results: "Our first operation is to take common coarse white pine boards, with sound knots, and which have been well kiln-dried. The stock used is generally 16 feet long, 1 × 12 inches. This stuff is surfaced on both sides by a Daniels planer without regard to thickness, as some boards are thinner than others, while others are warped in drying, and the thickness of the boards is immaterial, perfectly seamed surfaces only being necessary. After the stock is planed up it is cut into such lengths as the bill of doors calls for. They are ready now to be glued up. The face board of whatever hardwood to be used is planed generally to ¾ of an inch thick, and is also run through a Daniels planer. The stock is now ready to go to the glueing press, and as the Daniels planer makes the best glueing surface in the world, no scratch planing is needed. After properly heating in a box the stock is brought out and carefully glued, the hardwood face parts marked for it. From three to five parts are put in the press at one time, and a pressure of twenty tons, brought down by screws, is put upon these parts. After remaining in the press the proper time they are taken out, and generally remain several days before being worked up, which gives the glue plenty of time to harden. When ready to work again these parts are taken to a Daniels planer and squared up, after which the parts are taken to a very nice cutting table or bench saw, and are cut up to sizes required, leaving them ⅛ of an inch large for future dressing. It is a positive necessity that the saw cuts free and clear, as heating has a tendency to warp the stock or spring it slightly, which would make it necessary to dress the stuff again. If the saw does not heat, the stiles come out perfectly straight, and these stiles can be laid on a Daniels planer bed, and a light shaving taken off. They are now straight, and if the saw table is in good condition, square, the other side may be finished with pony planer or with a Daniels, I prefer a Daniels, because it makes a better glueing surface, and if the planer is in good shape the work is turned out from the planer perfect, so far as square and surface are concerned. The work is now ready for the veneering, the thickness of which is immaterial, as it may vary from the thickness of thin paper to ¼ inch. Heated cauls are now used for the veneer, and the stiles, if heated at all, are just warmed, and the veneer glued on by piling up with a hot caul between each stile. The old fashioned way of making veneered doors may do very well when only two or three doors are to be made, but in these days of sharp competition we are obliged to adopt the quickest methods compatible with efficiency and good finish. I may say we never make less than fifty doors at a time."

A Few Pointers.

IT has been estimated that 100 square yards of woodwork will require for painting one coat, 20 pounds of white lead and 4 gallons of oil. The second coat will take 40 pounds of lead and 4 gallons oil; and the third coat will take the same amount of lead and oil as the second coat. For three coat work, on this basis, 100 yards will require 100 pounds of white lead and 12 gallons of oil. Tin valleys for shingle roofs should never be less than 14 inches wide and for slate roofs not less than 20 inches wide. The cost of laying in valleys, including cost of material, tinned nails, scaffolding and labor will be about nine cents per square foot. One man will lay 1½ squares per day of valleys in plain work; when roof is steep or valleys cut up one square is a fair day's work. Flashings for chimneys, and where one part of a building joins another, are worth, put in place, about ten cents per square foot, this, of course, includes everything. An approximate cost of gutters is about as follows: 4 inch are worth, put up, 10 cents per lineal foot; 5 inch gutters are worth 12½ cents per foot; 6 inch gutters are worth 15 cents per foot. Down spouts or conductor pipes cost as follows: 2 inch pipe is worth 8 cents per lineal foot; 3 inch pipes are worth 10 cents per foot; 4 inch pipes are worth 12½ cents per foot, and 6 inch pipes are worth 25 cents per foot. These prices, of course, are in full for material and labor in putting them in place. Additional cost will follow if the pipes are made square section and for elbows, also for ornamentation on face of gutters or on receiving hoppers. Something, too, must be allowed for the quality of tin employed; if the quality is different from I C, charcoal tin, which is the brand the figures given are taken from. Roofing tin comes in sheets, 14 × 20 inches, and a box of tin contains 112 sheets, so that, allowing the usual amount for side ribs and top and bottom laps, a box of tin will cover 182 square feet. Then if a box of tin costs six dollars—which is the average price—the cost of a box of tin roofing will be about as follows:

Box of tin	$6.00
10 lbs. solder at 15 cts	1.50
Preparing tin for roof	1.50
Laying tin, 1 1/5 days at $2.25	2.70
Total	$11.70

As this covers 182 square feet it brings the cost of tin-

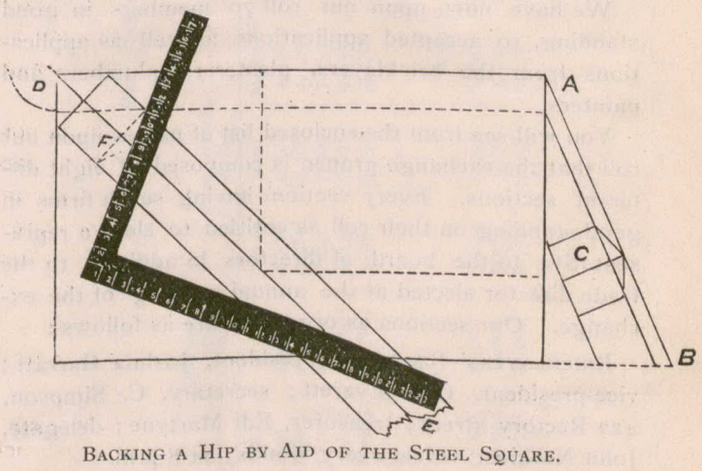
ning a roof to about six and a quarter dollars per square. In practice this is not enough to give the contractor any profit over and above the actual cost.

Pointing Up.

In finishing off the outside faces of brick walls, the operation of pointing is often resorted to; this consists in filling up all the joints with superior mortar, and in the better class of work with cement. To properly "point" a wall requires great care, and indeed, some skill, where thorough neatness and finish in the joint are to be secured. Moreover, pointing requires to be conscientiously done, for much of the capability of a wall to resist the action of damp and of driving rains depends upon the way in which the joints are made good. The first operation of "pointing" is to remove all the mortar from the face of the wall which has been pressed out from between the bricks in placing them in bed; the mortar is next removed or raked out from between the joints with a tool made for the purpose, and for some distance inwards, this being done in order to give a "key" bond or hold for the mortar or cement used in the pointing. As a rule, all brickwork intended to be "pointed" or "tucked" is laid first with ordinary common brick mortar, the bond properly made and the walls kept plumb, and before the mortar is set hard it must be raked out of the joints about half an inch deep. When there is not much ornamental work in brick on the face of the building, the brickwork may be laid "overhand"—that is, the bricklayer may do his work from the inside of the building—and then "tucked" or pointed from a swinging scaffold. In common brickwork, where the bricks used are of an inferior kind—that is, not pressed and of a uniform color, it may be necessary to stain the whole work, because some of the bricks are much darker than others, and give to the wall a mottled appearance when finished that is not at all pleasing. The first thing to be done in preparing for all kinds of tuck-pointing, is the cleaning down or washing of the walls to be pointed, and clearing them of all mortar stains or dirt. This should be done with a solution of muriatic acid and water, making use of one pint of acid to each pail of water used. That the acid may not leave any damaging effects after it, the work should also receive a cleansing of pure water immediately after the application of the solution. It is only necessary to clean as much of the wall at a time as can be easily reached by the workman doing the pointing. The next operation to be performed is the stopping. Red stopping is composed of one part of fine putty lime to three parts of fine white sand washed clean. This is colored with Venetian red and Spanish brown, and made to suit in shade as near as possible a brick colored with the intended stain. There should be sufficient stopping made at one time to complete the work, as it cannot be made a second time to have the same shade as at first. It takes three hods of stopping to point 200 feet of superficial brickwork, so it will not be difficult to find out how much will be required for the whole work. The stopping should be "stayed" with copperas, say one pound of copperas to every three hods of mortar or stopping, dissolved in hot water and incorporated when cold. The joints are then stopped or pointed in a rough manner, and no more should be done at a time than can be immediately finished by applying the putty joint before the stopping has become too hard. If this is not done, the putty joint will not combine with it as it ought, and it will fall off in a very short time. When a sufficient amount is stopped in, it is usual to rub it well with a piece of dry carpet or sacking, or something of that kind, and rub the stopping well into the pores of the bricks, that the work may appear as uniform as possible. When this is properly performed, the wall is ready for the color, which is composed of the same mineral paints as the stopping, Venetian red and Spanish brown, one pound of each to one and one-half gallons of water, and as these colors have no setting properties, it is necessary to add about one pound of copperas to three gallons of the stain, prepared in the same manner as for the stopping. Alum is also used in the same proportions; and sometimes half a gallon of stale beer to the same quantity of color for setting. Two ounces of red analine dissolved in alcohol will brighten up a barrel of the color, if such is desired. This is applied with a flat brush the usual way, after which the work is ready to receive the tuck joint, which may be rendered in either black or white joint or putty, and which will be described in next issue.

Backing a Hip Rafter By Aid of the S. Square.

The illustration presented herewith exhibits two methods of finding the "backing" of the angle on a hip rafter. The methods are as simple as any known: Take the length of the rafter on the blade of the square, and the rise on the tongue, place the square on the line D E, the plan of the hip; the angle is given to bevel hip rafter, as shown at F. This method gives the angle only for a right-angled building where the pitches are the



Backing a Hip by Aid of the Steel Square.

same, and for no other. The other method applies equally to right, obtuse and acute angles, where the pitches are the same. At the angle D will be seen the line from the points K L, at the intersection of the sides of the angle rafter with the sides of the plan. With one point of a compass at D, describe the curve from the dotted line, cutting A, then draw a line parallel to A B, the pitch of the hip. The angle bevel will then be found at G, which is a section of the hip rafter.

Painting Old Work.

In estimating painting old work the first thing to do is to find out the nature of the surface to be painted, whether it is porous, rough or smooth, hard or soft. The surface of stucco, for example, will take a great deal more paint than one of wood, much depending on the circumstance whether it has been painted, and what state the surface is in. A correct estimate of re-painting wood work cannot be made from the quantities only; a personal examination ought to be made in every case where

there is much work to be done. In old work there is often scouring to be done, old paint to be removed, cracks to fill up, and extra sand papering to be done, that must be considered if the contract is to be made reasonably profitable. Painting old work without first cleaning and rubbing it down is sure to end in disappointment to some one concerned. It is impossible to make good work by applying paint to a dirty or unprepared base. When the work is to be grained the old paint should be removed or so rubbed down with pummice stone that the surface is as smooth and even as a plate glass surface, and after the first coat is applied it should stand for several days and should then be rubbed down with fine sand-paper and made smooth before the next coat is applied.

LONDON BUILDERS' EXCHANGE.

We are indebted to Mr. Geo. S. Gould, secretary-treasurer, for the following resume of the proceedings of the above exchange since the time of organization :

We were incorporated April 19th, under the name of the Builders' Exchange of the City of London, for the various purposes specified in the declaration of incorporation.

We occupy very comfortable rooms in the Ontario Loan and Debenture Company's building, on the corner of the market, and they are in constant use.

Our board of directors have had plenty of work to do so far in preparing laws and rules for our guidance, and our general exchange meetings have been made interesting by the discussing of, and passing upon the same.

We have now upon our roll 70 members in good standing, 10 accepted applications as well as applications from the bricklayers, plasterers, plumbers and painters.

You will see from the enclosed list of names upon our roll that the exchange proper is composed of eight different sections. Every section having seven firms in good standing on their roll is entitled to elect a representative to the board of directors in addition to the trade director elected at the annual meeting of the exchange. Our sections as organized are as follows :

Bricklayers' Section.—President, Joshua Garratt ; vice-president, Geo. Everett ; secretary, C. Simpson, 422 Rectory street ; treasurer, Ed. Martyne ; delegate, John Nutkins. Meet every Monday at 8 p.m.

Carpenters' Section.—President, Wm. Tytler ; vice-president, Thos. Jones ; secretary, C. A. Smith, 90 Wharncliffe road ; treasurer, Jno. Shopland ; delegate, John Purdom. Meet every Thursday at 8 p.m.

Plasterers' Section.—President, J. G. Pritchett ; vice-president, John Fenn ; secretary-treasurer, Geo. S. Gould, rear of 292 Dundas st ; delegate, J. G. Pritchett. Meet every Tuesday at 8 p.m.

Manufacturers' and Dealers' Section.—President, John Logan ; secretary, J. W. Caurse, 93 York street. Meet every Monday at 8 p.m.

Painters' Section.—President, Geo. Burdick ; vice-president, Ern. Fitzgerald ; secretary, Geo. Berry, 748 Princess avenue ; delegate, W. C. Morrison. The night of meeting is the first Thursday in every month at 8 p.m.

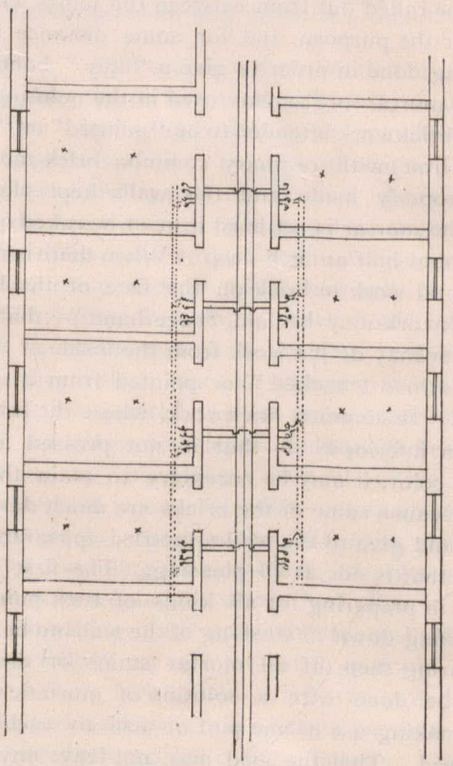
The plumbers are waiting until the applications for membership from the members of the Master Plumbers' Association, now before the board, are acted upon before proceeding to form a separate section.

The general meetings of the Exchange are held on the second Tuesday in every month at 8 p.m., and the Board of Directors on the Thursday preceding the general meeting at 8 p. m., and at other times when summoned by the Executive.

Our members are all busy at present, I believe, but the bulk of the work is being done at a very low figure.

WIRING OFFICE BUILDINGS.

Much difficulty is encountered in wiring office buildings on account of the necessity of having to alter offices, and the consequent changes to the wiring for electric light meters. The accompanying sketch illustrates to a certain extent a method adopted by Mr. H. F. Strickland, and which has been put into practical use. By it a building can be so wired that a suite of offices can be interchanged from one meter to separate meters, or vice versa. The sketch shows a section of an office building with a three-wire service in the corridor, with taps for each office. The four wires extending out of wall are two from service and two from outlets. The dotted lines might be termed a loop circuit, and by



Method of Wiring an Office Building.

this circuit the current can be either connected direct to each office through a separate meter or carried through one meter to all the offices, and the meter can be placed in either office. An additional cost of running two wires through the offices, with a tap coming out beside each meter outlet, will save considerable expense in the future. Mr. Strickland, the electrical contractor, 77 Adelaide street east, Toronto, is the originator of this method.

An increase of wages has recently been granted to the journeymen carpenters of Winnipeg.

The Plumbers' Union of Ottawa has instructed its members to refuse to sign rules adopted by Messrs. Butterworth & Co., under which workmen are charged for windows broken by them in houses where they work, and for the time of other employees in cases where work is imperfectly done and requires further attention.

A United States government report says heavy wood is harder than lighter wood ; the wood of the butt is therefore harder than that of the top ; the darker summer wood is harder than the lighter spring wood. Moisture softens, and seasoning, therefore, hardens wood. Wood is much harder when pressed longitudinally than when pressed transversely to the fibres, and it is somewhat stronger tangentially than radially. Though harder wood resists saw and chisel more than softer wood, the working quality is not always a safe criterion of its hardness.

RESULTS OF EXPERIMENTS ON THE STRENGTH OF WHITE PINE, RED PINE, HEMLOCK AND SPRUCE*

By Prof. H. T. Bovey, L.L.D., D.C.L.

In a paper read before the Canadian Society of Civil Engineers, in 1895, the results were given of a number of experiments on the transverse strength of timber beams; but in the calculations it was assumed that the distortion, or diminution of depth at the bearing surface, was sufficiently small to be disregarded. It often happens, however, and especially when the timber contains a large amount of moisture, that the change in depth due to compression is excessive, producing a corresponding increase in the skin-stress. The method of conducting these experiments was fully described in the paper referred to, and therefore the following points only are noted:

All the transverse tests were made with the Wicksteed machine. The middle of the beam was supported on a hardwood bearing of 44 inches diameter. The two ends were forced down by rams under hydraulic pressure, which can be gradually increased at any required rate, or can be maintained constant for any given time. The end pressures were kept normal to the surface of the beam by means of spherical joints, which allow the end bearings to revolve. In previous experiments, the wire used in observing the deflections was found to be somewhat coarse, and a special wire was therefore drawn of .002-inch diameter.

The flexure theory is admittedly unsatisfactory, and frequently gives results which are contrary to experience. Possibly, when a certain limit has been passed there is a tendency towards equalization of stress, and the so-called neutral surface may be moved towards that portion of the beam that is best able to bear the stress. It may indeed be more correct to assume that the distances of this surface from the tension and compression faces are in the ratio of the ultimate tensile and compressive strengths of the beam. This assumption at all events seems to give results which are more in accordance with practice. For example, in the case of a cast-iron Tee bar, tested in the University Laboratory, the tensile skin-stress should be 22,030 lbs. per sq. inch, and the compressive skin-stress 102,050 lbs. per sq. inch, whereas the ordinary theory gave 33,000 lbs per sq. inch as the tensile and 20,800 lbs. per sq. inch as the compressive skin-stress.

TABLE I.

White Pine From Ordinary Stock.

No. of Beam.	Dimensions in inches. l.	b.	d.	Breaking weight in lbs.	Skin stress (f) in lbs. per sq. inch. Max.	Min.	Mean.	Coefficient of elasticity in lbs per sq. in. E.	Sp. wt. in lbs. per cub. ft. at date of test.	Per ct. of weight lost when dried at 212 deg. F. at Centre.	Left end.	R't end.	Character of failure.
15	186	6.225	15.2	23,850	5,021	4,777	4,889	1,296,950	36.43	......	......	......	Crippled.
16	186	6.32	15.25	22,690	4,774	4,480	4,627	1,339,050	38.64	......	......	......	Longitudinal shear.
28	138	9.1	15.21	39,000	4,403	4,018	4,210	1,078,230	27.121	17.29	12.89	13.21	Longitudinal shear.
32	186	6.025	12.25	16,000	5,531	5,153	5,342	1,368,500	27.983	28.262	27.014	27.274	Crippled.
46	186	5.725	5.9	5,200	8,967	7,312	8,389	1,625,220	23.794	......	......	......	Crippled.

TABLE II.

White Pine Dried at 212° F.

No. of Beam.	l.	b.	d.	Breaking weight in lbs.	Max.	Min.	Mean.	E.	Sp. wt.	Centre.	Left end.	R't end.	Character of failure.
36	150	5.95	11.925	......	2,201	2,164	2,182	1,245,780	22.007	......	......	......	Tensile.
38	75	2.965	5.925	5,000	5,911	5,569	5,740	1,272,440	22.105	......	......	......	Crippled.
42	150	5.7	5.9	8,000	9,538	9,247	9,392	1,282,770	20.674	......	......	......	Tensile.
43	150	6.05	11.725	23,000	9,992	7,091	8,542	1,171,240	22.648	......	......	......	Tensile.

TABLE III.

Red Pine from Ordinary Stock.

No. of Beam.	Dimensions in inches. l.	b.	d.	Breaking weight in lbs.	Skin stress (t) in lbs. per. sq. inch. Max.	Min.	Mean.	Coefficient of elasticity.	Sp. wt. in lbs. per cub. ft. at date of test.	Per ct. of weight lost when dried at 212 deg. F. at Centre.	Left end.	R't end.	Character of failure.
17	186	6.15	15.2	21,350	4,531	4,322	4,426	1,252,700	32.279	......	......	......	Crippled.
18	180	5.75	15.0	21,730	4,589	4,466	4,527	1,351,350	......	......	......	......	Crippled and longitudinal shear.
31	186	5.975	12.275	23,400	7,840	7,469	7,654	1,814,190	35.95	17.38	16.9	12.94	Longitudinal shear.
45	186	6.025	6.025	7,600	10,034	9,871	9,952	2,768,630	37.144	......	......	......	Crippled.
49	188	5.75	14.925	22,700	5,240	5,100	5,170	1,669,010	30.592	8.8	8.7	8.1	Longitudinal shear.

TABLE IV.

Red Pine Dried at 212° F.

No. of Beam.	l.	b.	d.	Breaking weight in lbs.	Max.	Min.	Mean.	Coefficient of elasticity.	Sp. wt.	Centre.	Left end.	R't end.	Character of failure.
37	150	5.75	11.875	21,000	6,160	5,953	6,056	2,049,430	30.072	......	......	......	Longitudinal shear.
41	150	5.885	5.925	8,800	9,572	9,472	9,522	2,261,820	30.858	......	......	......	Tensile.
44	150	5.875	11.785	20,000	5,732	5,617	5,674	2,219,550	34.038	......	......	......	Longitudinal shear.

The following tables give the breaking weights, skin-stresses (transverse), coefficients of elasticity and specific weights of a number of air-dried, saturated, frozen and kiln-dried beams.

Beams 15 and 16 were sawn out of trees felled at Keewatin in 1894 and were received into the laboratory on the 13th of December, their weights being 415.75 lbs. and 457.78 lbs. respectively. They were both tested on the 2nd of February, 1895, when it was found that beam 15 had lost 36.69 lbs., or 8.8 per cent. of its weight, and that beam 16 had lost 46.59 lbs., or 10.2 per cent of its weight. When the beams were sawn through after the test they were still found to be completely saturated with water excepting for a depth of 1 inch from the surface. The beams were from the central portion of the trees, the heart running from end to end. Beams 28 to 43 were sawn from trees felled in water,

* From a paper read before the British Association for the Advancement of Science, Toronto, 1897.

1893-4, in Quinze Lake Co., P.Q. They remained in water one year, and were received into the laboratory on October the 4th, 1895. They were all first quality timber, and generally speaking, straight in grain and free from knots and shakes. In order to determine the excess of moisture in the timber, three slabs, one near the middle and one at each end, were sawn out of the beams immediately after they had been tested and were at once placed in a chamber kept at a temperature of 212° F. by steam pipes. The moisture was also removed from the whole beams by drying them in the same chamber. Beam 36 failed suddenly under a very small load, the fracture commencing at a knot in the tension surface. On examination it was also found that the grain on the face was oblique to the neutral surface, while there were shakes running from end to end in the neighborhood of the heart which, on the average, was below the middle of the depth of the beam. The results of this test should be discarded, as the beam was not of fair average quality. Beam 38 was cut out of beam 36 in such manner that the grain was straight.

Beam 43 failed under a breaking load of 23,000 lbs., but a somewhat long continued and slowly increasing deflection under a load of 22,000 lbs., seemed to indicate that at this point the beam failed in compression, although there were no apparent signs of crippling.

Remarks.—Beams 17 and 18, containing the heart, were cut from trees felled at Keewatin in 1894, and were ordinary 1st-quality timber. There were shakes in beam 17, reaching the heart at points. The grain on the lower half of the beam was straight, but ran cross-wise on the tension surface. From the time the beam was received into the laboratory to the date of the test, a period of 57 days, the beam lost 13 per cent. of its weight. After the test a 3-inch slab was cut out, and the weight of this slab on Feb. 15th, 1897, by which time the natural drying can be considered to have been completed, was found to be 28.037 lbs. per cubic foot. Beam 18 was tested after remaining in the laboratory 42 days, in which time it was found to have lost 8.79 per cent. of its weight. It failed by crippling and longitudinal shear, simultaneously. The grain for about 10 inches on each side of the centre was clear, straight and free from knots. The logs from which beams 31 to 49 were sawn were felled in the Bonnechere district in the winter of 1894—95, and remained in the water for six months. They all contained the heart, and were ordinary 1st-quality timber. Beam 32 failed by longitudinal shear along a shake in the neighborhood of the neutral surface, but there were indications that this had been immediately preceded by a slight crippling.

TABLE V.

Hemlock From Ordinary Stock.

No. of Beam.	Dimensions in inches. l.	b.	d.	Breaking weight in lbs.	Skin stress (f) in lbs. per sq. inch. Max.	Min.	Mean.	Coefficient of elasticity.	Sp. wt. in lbs. per cub. ft.	Per ct. of weight lost when dried at 212 deg. F.			Character of failure.
25	222	8.815	10.1	13,000	5,132	4,995	5,063	1,581,710	53.025	50.43	39.93	47.85	Crippled.
26	186	8.975	10.015	20,000	6,615	6,371	6,493	1,498,640	36,533	.....	.....	.....	Crippled.
29	186	9.85	11.95	20,040	4,133	4,058	4,096	883,291	36,235	34.6	.....	.....	Tensile.

TABLE VI.

Hemlock Dried at 212° F.

No. of Beam.	l.	b.	d.	Breaking weight in lbs.	Max.	Min.	Mean.	Coefficient of elasticity.	Sp. wt. in lbs. per cub. ft.	Per ct. of weight lost			Character of failure.
40	87	4.35	4.925	3,500	7,946	5,054	6,500	1,379,860	31.346	.....	.....	.....	Longitudinal shear.

TABLE VII.

Hemlock Saturated and Frozen.

No. of Beam.	l.	b.	d.	Breaking weight in lbs.	Max.	Min.	Mean.	Coefficient of elasticity.	Sp. wt. in lbs. per cub. ft.	Per ct. of weight lost			Character of failure.
22	138	9.0	11.875	30,800	5,393	5,166	5,280	1,174,700	38.69	.....	.....	.....	Tensile.
23	138	9.025	11.9	21,000	3,482	3,450	3,466	1,242,150	45.23	.....	.....	.....	Tensile.
35	190	9.175	10.05	22,000	7,188	6,960	7,074	1,633,050	50.707	51.07	49.75	57.42	Crippled.

VABLE VIII.

Spruce From Ordinary Stock.

No of Beam.	Dimensions in inches. l.	b.	d.	Breaking weight in lbs.	Skin stress (f) in lbs. per sq. inch. Max.	Min.	Mean.	Coefficient of elasticity.	Sp. wt. in lbs. per cub. ft. at date of test.	Per ct. of weight lost when dried at 212 deg. F. at Centre.	Left end.	R't end.	Character of failure.
24	222	9.175	10.1125	15,800	6,208	5,846	6,027	1,629,050	32.307	26.7	24.7	27.3	Crippled.
27	186	8.725	10.025	14,600	4,899	4,758	4,829	1,458,360	29.354	.....	.....	.....	Crippled.
30	186	8.728	11.875	15,900	3,758	3,682	3,720	2,020,300	30.603	11.1	.....	.....	Longitudinal shear.

TABLE IX.

Spruce Dried at 212° F.

No of Beam.	l.	b.	d.	Breaking weight in lbs.	Max.	Min.	Mean.	Coefficient of elasticity.	Sp. wt.	Centre.	Left end.	R't end.	Character of failure.
39	78	3.775	4.35	5,800	9,774	9,603	9,689	2,373,080	31.606	.....	.....	.....	Longitudinal shear.

TABLE X.

Spruce Saturated and Frozen.

No of Beam.	l.	b.	d.	Breaking weight in lbs.	Max.	Min.	Mean.	Coefficient of elasticity.	Sp. wt.	Centre.	Left end.	R't end.	Character of failure.
33	186	9.2	10	14,000	7,212	6,887	7,050	2,373,080	39.78	30.618	33.55	.....	Crippled.

Remarks.—Beam 22, 23 and 35, containing the heart, had lain in the water for a considerable time, and were completely water-soaked. When tested, beams 22 and 35 were found to be hard-frozen. Beam 23 was also frozen, but not throughout, as was shown when the beam was cut in two at the centre. Beam 22 was straight grained, free from knots, and failed with a sudden sharp fracture. Incipient decay had commenced near the heart of beam 23, which, however, was regarded as a fair specimen of ordinary commercial quality. It was full of large knots and the grain was curved from end to end. Beam 35 was straight grained, clear, comparatively free from knots and of exceptionally good quality; beam 40 was cut out of beam 35 after the latter had been tested. Beams 25, 26 and 29 all contained the heart. Beam 25 was a good specimen, and was completely water-soaked. Beam 26 was saturated throughout, excepting for a depth of 1½ inches from surface, and, although an apparently poor specimen, was considered to be of ordinary commercial quality. It was full of knots and its grain was curved.

Remarks.—Beam 24 was wet, but was in good condition and comparatively free from knots. Beam 27 was of ordinary commercial quality, with fairly straight grain and a large number of small knots. Beam 30 was of ordinary commercial quality, but with large shakes run-

ning from end to end and dividing the beam practically into four sections. Beam 33 was water-soaked and hard-frozen when tested. It was of exceptionally good quality, free from shakes, and had clear, straight grain. Beam 39 was cut out of beam 33 after the latter had been tested.

In the transverse experiments the greatest possible care was taken to increase the load at the same uniform rate, the average time occupied in adding each increment and in taking the corresponding reading being slightly greater than one minute. In many cases the beam was loaded, then relieved of load, and reloaded again, the readings in all cases being carefully noted. This operation was sometimes repeated more than once. Whenever a beam or a specimen under tension or compression was subjected to repeated loadings, the first series of readings were almost invariably discarded as the increments of deflection, and changes of length were found to be more uniform after the preliminary loading. The initial loading seems to eliminate certain inequalities of resistance.

In beam 15 there was an increment of .401 inches in the deflection, corresponding to an increment of 7,000 lbs. in the load. On reducing the load to 500 lbs., there was an apparent set of .006 inches, which would have undoubtedly disappeared in a short time. Upon reloading the beam the increment of deflection for the same increment of load was .4 inch. In beam 17 the increments of deflection under the first and second loadings were exactly the same, viz., .415 inch for an increment of 7,000 lbs. in the load. When the load, after the first series of readings, was reduced to 500 lbs., there was an apparent set of .005 inch, which would have certainly disappeared had the beam been allowed to rest for a few minutes. In beam 24 (spruce), for an increment of 6,000 lbs. in the load the increment of deflection was 1.04 inch in the first loading and 1.034 inch in the second. Upon being entirely relieved of load, there was an apparent, but evidently only apparent, set of .01 inch. In beam 25 (hemlock), for an increment of 6,000 lbs. in the load, the increment of deflection was 1.165 inch in the first loading and 1.155 inch in the second, the apparent set when entirely relieved of load being .01 inch. In beam 27 (spruce), after being loaded and then entirely relieved of load, there was an apparent set of .005, which in two hours had fallen to .002 inch. In beam 26 (hemlock), after being loaded and then entirely relieved of load, there was an apparent set of .004 inch which had entirely disappeared after an interval of about two hours.

In the case of beam 28 (white pine), there were three sets of loadings, the increments of deflection corresponding to an increment of 12,000 lbs. in the load being: .238 inch and .234 inch for the first set, .237 inch and .232 inch for the second set, .237 inch and .232 inch for the third set.

When the beam was entirely relieved of load after the first set, there was an apparent sett of .002 inch, which had entirely disappeared in 25 minutes. The second set of loadings commenced after an interval of 18 hours. The mean increment of deflection = .2344 inch; the mean compression = .0827 inch, and, using the ordinary formula, the corresponding value of E = 1,066,980 lbs.

The increments of deflection for repeated loadings corresponding to an increment of 6,000 lbs. in the load were: .675 inch, .660 inch, .650 inch for beam 29 (hemlock), .335 inch, .330 inch, .337 inch for beam 30 (spruce), .492 inch, .485 inch, .487 inch for beam 31 (red pine), .675 inch, .655 inch, 653 inch for beam 32 (white pine), .313 inch, .305 inch, 305 inch for beam 49 (red pine).

The increments of deflection for repeated loadings, corresponding to an increment of 7,000 lbs. in the load, were: .625 inch, .620 inch, .620 inch, .625 inch for beam 33 (spruce). The increments of deflection for repeated loadings, corresponding to an increment of 5,000 lbs. in the load, were: .590 inch, .556 inch, .555 inch for beam 35 (hemlock).

For beams dried at 212° F., the increments of deflection for repeated loadings were: .420 inch, .400 inch, .405 inch, .405 inch, .405 inch for beam, 36 (white pine), and an increment of 6,000 lbs. .178 inch, .173 inch, .173 inch, for beam 37 (red pine), and an increment of 4,000 lbs. .039 inch, .042 inch, .040 inch, .040. inch, for beam 38 (white pine), and an increment of 300 lbs. .048 inch, .048 inch, .048 inch, .049 inch for beam 39 (spruce), and an increment of 300 lbs. .071 inch, .070 inch, .070 inch, .070 inch for beam 40 (hemlock), and an increment of 300 lbs. .363 inch, .358 inch, .358 inch, .363 inch for beam 41 (red pine), and an increment of 1,200 lbs. .669 inch, .672 inch, .675 inch for beam 42 (white pine), and an increment of 1,200 lbs. .411 inch, .416 inch, .408 inch, .402 inch for beam 43 (white pine), and an increment of 6,000 lbs. .243 inch, .240 inch, .238 inch, .241 inch for beam 44 (red pine) and an increment of 6,000 lbs.

From these results and from the further observations up to the point of fracture, the following inferences may at once be drawn: (a) The increment of deflection diminishes and therefore the coefficient of elasticity increases with the elimination of the moisture from the beam. (b) The increments of deflection are much more uniform in amount in the case of kiln-dried beams.

It is, of course, impossible to maintain a beam in a kiln-dried state. As soon as it is exposed to the atmosphere, it at once commences to absorb moisture, and the absorption continues until there is an equilibrium between the hygrometric conditions of the beam and atmosphere. The beam is then in its normal state, and the experiments indicate that the increments of deflection, corresponding to this state, are approximately uniform. The rate of absorption depends essentially upon the nature of the timber, and proceeds more slowly as the density increases. The weight of a central 2-inch slab of beam 30 (spruce), increased 3.6 per cent. in 24 days, and 8.5 per cent. in 47 days. The influence of moisture on the deflection of a beam was well illustrated in the case of 15 inch x 6 inch Douglas fir beam on 186 inch centres. On June 15th, 1895, it was placed in position and was loaded with a weight of 1,000 lbs. at the centre, producing a deflection of .071 inch. The daily observations, extending over several months, showed a continually increasing deflection, until, by the evaporation of the moisture, the beam had attained its normal state. The average deflection now remained constant, varying, for example, between .09 inch on August 24th, and .082 inch on September 2nd, the greater deflection of course corresponding to an increase of moisture in the atmosphere. On the 4th of September the load was increased to 2,000 lbs., which produced a deflection of .127 inch. This load remained on the beam until January 8th, 1896, the deflection during the same period varying between .129 inch and .114 inch.

Of 20 non-kiln dried beams, 11 failed by crippling on the compression side, 6 failed by longitudinal shear, and 3 hemlock beams only failed by the fracture on the tension side. The experiments on the direct tensile and compressive strength of the timbers show that this is precisely what might be expected to take place. In every case the direct tensile strength is very much greater than the direct compressive strength, and failure by crippling is likely to take place under a load much less than the material could bear in tension. Under all circumstances, therefore, in practice, it is advisable to place a beam so that the portion of the timber which is strongest and in the best condition should be in compression. Again, the experiments conclusively show that kiln-drying enormously increases the direct compressive strength, but greatly diminishes the shearing strength, while the direct tensile strength does not appear to be much affected, although in the majority of cases it was diminished, and sometimes considerably. The large increase of strength in compression due to kiln-drying might have been naturally expected, as in the process of drying the walls of the cells are stiffened and hardened, and thus become better able to resist a compressive force. The walls, however, are at the same time much more brittle, and it is possible that a sudden blow might cause the failure of a kiln-dried column, which would have remained uninjured had the moisture not been eliminated. It may also be of interest to note that in the re-tests of specimens after the injured portion had been removed, the compressive strength was, almost without exception, increased. Hence, by kiln-drying a beam its compressive strength is made to approximate more closely to its tensile strength, and its transverse strength is consequently sometimes considerably increased. It must be remembered, however, that this kiln-drying invariably largely diminishes the shearing strength, and therefore proportionately increases the tendency to shear longitudinally. Thus, of the nine kiln-dried beams in the preceding tables, only one failed by crippling while four failed by fracture on the tensile side and four failed by longitudinal shear. Indeed, generally speaking, kiln-dried beams will fail either by a tensile fracture or by a longitudinal shear, and this result has been further verified by experiments subsequent to those referred to in the present paper.

In practice, of course, beams cannot be maintained in a kiln-dried state, but they rapidly pass into the normal state. The question of how far it is desirable to eliminate the moisture depends essentially on the balance to be maintained between the tensile, shearing and compressive strengths, and a beam should always be placed so as to exert its relative strength to the best advantage. Kiln-drying, unless some special method of prevention is adopted, develops shakes in the timber and causes existing shakes to become more pronounced. Some of these shakes often extend to a great depth, and run the whole length of the beam, so that it not infrequently happens that only a slight layer is left to hold the beam together. Such a beam, although otherwise sound and clear, offers very little resistance to longitudinal shear, and might more justly be regarded as being made up of two or more superposed beams.

PLUMBING IN OTTAWA.

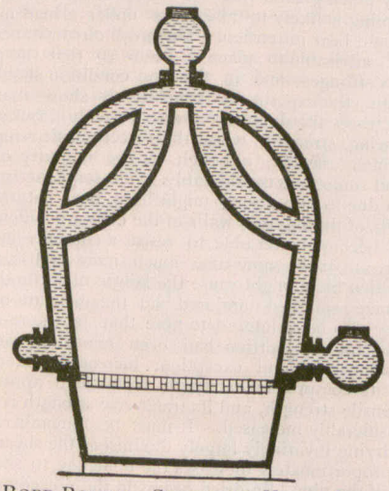
THE Master Plumbers and Plumbers' Union of Ottawa have appointed a committee to interview the Council and learn why the plumbing by-law passed in 1893 has not been enforced. The by-law calls upon every master plumber to take out a license at $2 per year, and to give a bond of $200 as a guarantee of good work; the license fee for journeymen plumbers is 25 cents. It is claimed that the health of the citizens has suffered because of defective plumbing work done by incompetent and irresponsible firms, and the Council will be urged to enforce the law for the future, and to incorporate in it a provision that iron pipe in houses should be carried through the foundation and protected by a stone arch, so that when the foundation sets the drain still remains unimpaired.

WAXING FLOORS.

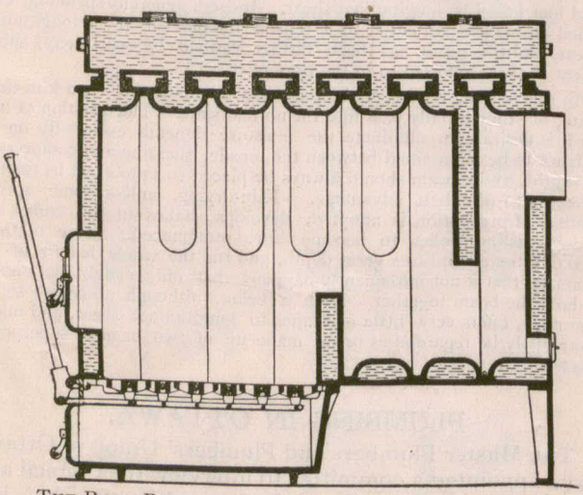
AN excellent method for waxing floors is as follows: Take a pound of the best bees wax, cut it up into very small pieces and let it thoroughly dissolve in three pints of spirits of turpentine, stirring occasionally, if necessary. The mixture should only be a trifle thicker than the clear turpentine. Apply it with a rag to the surface of the floor, which must be perfectly clean. This is the most difficult part of the work; for, if too much or too little is put on, a good polish is impossible. The right amount varies, less being required for a hard, close-grained wood, and more if the wood is soft and open-grained. It is best to try a foot or two of the floor before going over the whole. Put on what may be considered enough and leave the spot untouched and unstepped on for twenty-four hours, or longer if needful. When thoroughly dry, rub with a hand brush. If it polishes well, repeat the process over the whole floor. If it does not, remove the wax with fine sand paper and try again, using more or less than before, as may be necessary; and continue experimenting until the desired result is secured. If the mixture is slow in drying, add one part japan to six of turpentine.

THE "ROBB" HOT WATER HEATER.

THIS heater was designed and patented by Mr. D. W. Robb and is manufactured by the Robb Engineering Co., of Amherst, N. S. A number have been placed in buildings in different parts



THE ROBB BOILER—SECTIONAL VIEW, CROSSWISE.

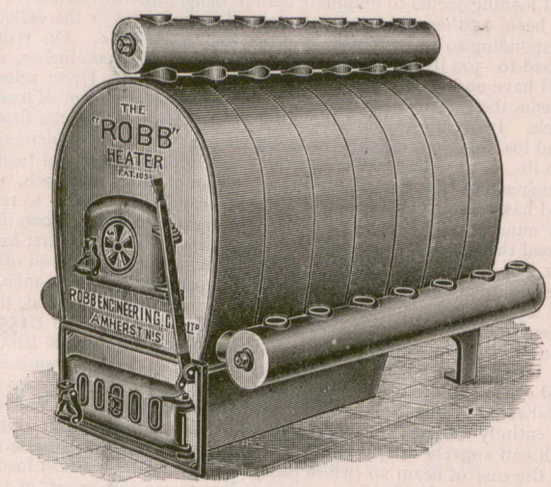


THE ROBB BOILER—SECTIONAL VIEW, LENGTHWISE.

of the Maritime provinces during the past two years, and are said to have given highly satisfactory results.

The heater, as described by the manufacturers, consists of a number of upright cast iron sections of the general shape of a horse shoe, with circulating pipes on each side of the crown. The height is much less than in most others types, permitting of its use in very low cellars, and as it may be shipped in sections it is easily taken into any building through the doors or windows. It is provided with rocking grates extending about half the length of the heater, which are easily operated by a lever. The hot gases are directed upward by a fire bridge at the rear of the grate and then downwards by a shield which prevents them escaping too quickly out through the smoke pipe. The part of the outer rim of each section that is exposed to the fire is curved, increasing the heating surface very largely.

On account of the shape of heating surfaces and their direct exposure to the flame, soot cannot collect. This allows of the



use of soft coal as well as hard without cleaning out and keeps the heater always at its highest efficiency. The flame being in one large body admits of more perfect combustion or greater heat than is obtained where it is divided into thin sheets before the gases are fully ignited.

The water circulates from the return headers at the bottom to the flow header at the top in an almost vertical direction. The movement is therefore very rapid, giving much quicker heating than is usually secured with hot water. This rapid circulation also assists largely in the economy shown by this heater, as it is necessary for the best results that the water should escape as fast as heated, allowing colder water to take its place.

The main thing to be thought of in the erection of scaffolding of any kind is that men have to risk their lives and limbs on it, and that true economy in its erection is that which makes it safe beyond a doubt, and there should be no sparing of time, labor or money in accomplishing that end.

WALLS AND WALL PAPERS.*

By L. A. Shuffrey.

New walls, if intended to be painted, should be plastered with Parian or Keene's cement, and have two coats of white lead and linseed oil and litharge mixed rather thin, to soak into the plaster and stop absorption. The third coat should be thicker and mixed with spirit of turpentine and color, and the fourth thicker still and mixed with equal parts of linseed oil and turpentine, with sugar of lead as a drier. The color should be be darker than intended to be finished, each coat should be allowed to dry thoroughly before the succeeding one is applied, and should be well rubbed down with glass paper. The finishing coat is best stippled with large flat brushes, as a granular surface is obtained, the wearing properties are not impaired, and the unpleasant reflecting surface is broken up. The internal walls of large rooms and passages are best left from the trowel with a granular surface.

Any appearance of damp must have the cause removed, as no tinkering with the face of the wall will be a lasting remedy.

Any patching or chases should be made good with Parian or Keene's cement, which can be painted soon after, provided that the bed or backing has been first painted with oil color to prevent the damp from the cement soaking into it.

*Extract from a paper read at a recent meeting of the Architectural Association.

It is claimed for adamant plaster that it can be painted in twenty-four hours, but my experience of it is that this cannot be done with safety if cement has been used in the wall or floor, as the salt from the Portland will continue to come through for weeks after the plastering is done. The manufacturers recommend a wash of barium chloride, but this I have not tried.

The most convenient way of finishing walls, and that most largely adopted, is covering them with printed wall papers. It is a simple process, and may be quite inexpensive, and they are easily cleaned off and renewed. Skilful paper-hangers are not difficult to find, so a badly hung wall paper should not be tolerated.

The surface of the wall should be rubbed over with glass paper to remove all excrescences, and it should then be clearcoled, and the papers hung without joint from top to bottom, having their joints carefully trimmed and butted. On new walls it is a good plan to hang white lining paper preparatory to hanging a more expensive paper. This gives the latter a much better chance as far as discoloration from the fresh wall is concerned.

Walls should be lined with brown paper before hanging embossed or strong papers, as otherwise they are liable to slide in shrinking, and open at the joints. It is a good plan also to line and clearcole preparatory to distempering walls; it has an advantage over using a

tinted paper ground, as the joints need not show, which they would do in the case of the latter.

The varieties of wall coverings which may be suitably used for the space usually called the filling are numerous. Immense talent has of late years been employed in the designing of wall papers, until we have almost more than enough, and there is a temptation, when choosing from a number of ambitious designs, to forget that in most cases the wall on which they are to be hung should be looked upon as a background a purpose for which many of them are eminently unsuitable; and if there could be more connection between the designing and the using of them, the designs and coloring would be very much modified. I am now referring to the large flowered designs in natural colors which are exhibited in drapers' windows, accompanied by the notification that they can supply the chintz for hangings to match them. A less interesting arrangement I cannot conceive.

A piece of English wallpaper is twelve yards long by twenty-one inches wide, containing sixty-three square feet. French paper is nine yards long and eighteen inches wide, containing forty and one-half square feet; so in estimating the quantity required, half must be added to the measure for English paper, and the price considered in relation thereto.

The simplest wall paper consists of a pattern printed from a wood block, in repeats, with distemper color on previously distempered roll of white paper, and in this form is suitable in use from the servant's bedroom to the principal reception room, the dignity required depending upon the form of the design and coloring, and if we had nothing more than this, we should still be very well off.

The varieties of embossed coverings for walls now available for decoration are numerous. They have the merit, when hung on an ordinary plaster wall, of presenting a wearable surface, and one that is capable of decoration, after hanging in various ways, either by painting all over, parti-coloring, rubbed out, or stippled effects. The skill displayed in the Japanese leather papers in design, modeling and treatment of the surface with metal and color, make them very popular, and they have been used in place and out of place until we are rather overdone with them.

A luxurious finish to a wall is covering it with silk damask or brocade, and this plan can be adopted with more propriety now the electric light is more general, and the dirt and discoloration from gas got rid of. It may be treated as a continuous band round the room or introduced in the form of panels.

In either case it should be so arranged as to have a solid back to prevent the accumulation of dust behind it, and to enable it to be brushed.

Lastly, I may refer to the hanging of real tapestry, which I consider has a value beyond any other wall covering, either as covering the entire wall, suspended from the top, or in panels. No other decoration is required, and a tinted white for the woodwork appears to give the best value to the tapestry colors.

THE TORONTO BUILDERS' EXCHANGE.

As a result of the improved building conditions prevailing in Toronto as compared with recent years, the Toronto Builders' Exchange is in a more prosperous condition. The membership has increased fully 25 per cent., and the largely increased daily attendance at the Exchange rooms and at the meetings, is evidence of a growing interest by the members generally in the work of the organization.

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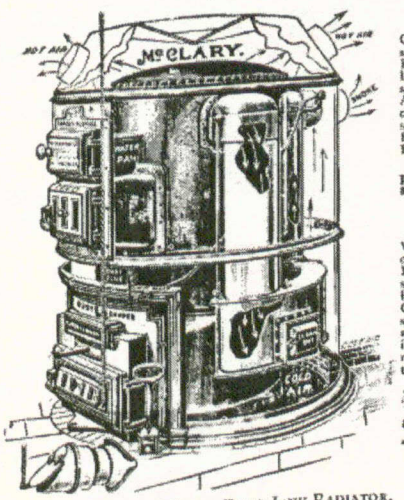

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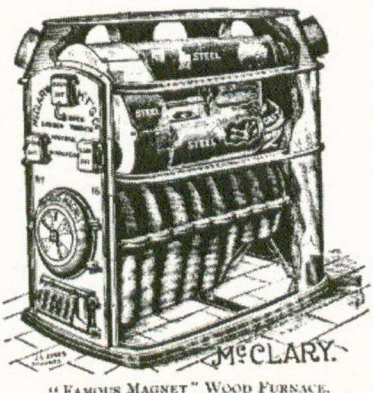

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